

FLORA OF HAZARIBAGH
DISTRICT, BIHAR

Volume - I
(MAGNOLIACEAE TO CYALIDACEAE)

N. D. Faria
S. P. Chattopadhyay

FLORA OF HAZARIBAGH DISTRICT, BIHAR

**Volume - I
(MAGNOLIACEAE TO OXALIDACEAE)**

**N. D. Paria
S. P. Chattopadhyay**



**भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA**

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FOREWORD

The publication of the Flora of Hazaribagh District, Bihar is being done under Series 3, pertaining to the publication of the Floras of important districts.

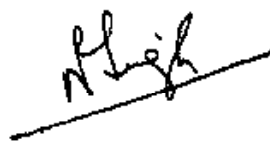
Bihar, one of the largest states in the country, is endowed with rich floristic wealth because of its varied topography. This state has not been adequately explored. Therefore, District Hazaribagh was selected and entrusted to Dr. N.D. Paria, Department of Botany, University of Calcutta for exploring the flora under a project financed by the Ministry of Environment and Forests. Accordingly, the Flora of Hazaribagh District, Bihar has been prepared, based on extensive survey and explorations in the District covering all seasons for about five years since 1985. The result of the entire work has been divided into two volumes. Volume-I contains Introductory chapters including topography and general features, geology and soil, climate, forest biota, general vegetation and its types, floristic analysis, economic and ethnobotanical notes on important plants, etc., and systematic enumeration of taxa explored beginning with the family Magnoliaceae to Oxalidaceae.

Volume-II contains largely the continuation of systematic enumeration starting with the family Tropaeolaceae to Orchidaceae followed by Concluding Remarks and Selected Bibliography. Some line drawings and coloured photographs have been provided in each volume. The systematic treatment deals with 972 species under 615 genera belonging to 142 families (Vol. I: 89 families, 279 genera and 452 species; Vol. II: 53 families, 336 genera and 520 species). The keys have been provided to facilitate easy identification at the level of group, family, genus and species. Notes on flowering and fruiting time, ecology, distribution, uses, etc. have been provided for each taxon in the text. The specimens collected are housed in the Central National Herbarium (CAL). There has been a slight deviation in the arrangement of families in not following the Bentham & Hooker's (1862) system as is usually done in B.S.I. Instead, Cronquist's (1981) System is followed here, which is difficult to change at this final stage.

I trust the Flora of Hazaribagh District, Bihar is a critical evaluation of the Floristic wealth of the District and will be of immense help for the

students and teachers of Botany, foresters, environmentalists, conservationists, ecologists, planners and other persons interested in Flora.

Dated:10.01,2000

A handwritten signature in black ink, appearing to read 'N.P. Singh', written over a horizontal line.

(N.P.Singh)
Director
Botanical Survey of India

PREFACE

The Project on the Flora of Hazaribagh District, Bihar, sponsored and financed by the Ministry of Environment and Forests through Botanical Survey of India, was undertaken by the senior author (NDP) for investigation in 1985. The major objective was to explore the flora of the district in view of its under-explored or un-explored status. The project was initiated during 1985-86 and continued for a period of five years. The second author prepared the flora in the form of a Ph. D. thesis and earned his degree from the University of Calcutta in 1992 under the supervision of the senior author.

The Flora of Hazaribagh District, Bihar is a revised, partly modified and edited version of the original thesis. IN preparing this Flora, the guidelines and format of the District Flora Plan of Botanical Survey of India have been followed.

The Hazaribagh District has a total area of about 11,165 sq km (total forest area 4,689 sq km) with a total population of 21,98,310 (1985) approximately. Based on the data gathered during the course of this project, the District represents some 972 species under 615 genera belonging to 142 families (Dicots: 114 families, 478 genera, 745 species and Monocots: 28 families, 137 genera and 227 species). In the systematic enumeration of taxa, the arrangement of families has been followed principally according to Cronquist's system of Classification of angiosperms (1981). One of the important features of the Flora is the incorporation of relevant information on ethnobotany for a good number of tribals of the District like Santhals, Munda, Bedia, Karmali, Oraon, etc.

We hope the Flora will be useful to the students and teachers of Botany, Foresters, horticulturists, agriculturists, pharmacologists and others involved in developmental planning of the country.

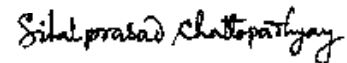
It is our pleasant duty to express our sincere gratitude to Dr. S.K. Jain, ex-Director, who initially allotted this project to the senior author, and to Dr. P.K. Hajra, ex-Director, Botanical Survey of India whose advice, interests and efforts made the publication of this Flora possible.

We are also grateful to Dr. N.P. Singh, the present Director, Botanical Survey of India for his keen interest in bringing out this Flora and very

kindly writing the "Foreword". In this endeavour, we must convey our thanks to Dr. M. Sanjappa, Deputy Director and Dr. M.S. Mondal, Deputy Director, for their kind suggestions, to Shri Utpal Chatterjee, Scientist-B, Shri S.K. Sur, Sr. Proof Reader, Dr. Chhabi Ghora and Smt. Chapala Rani Pal, both Sr. Scientific Assistants and their associates for technical assistance in publication of this Flora.



N.D. Paria



S.P. Chattopadhyay

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Fig.1: *Firmiana colorata* (Roxb.) R. Br.
 (a) a twig, (b) part of inflorescence, (c) Gynandrophore with stamens and carpels, (d) Stamens and carpels, (e) anthers, (f) carpels, (g) l.s. of carpel, (h) t.s. of ovary, (i) dehisced fruit.

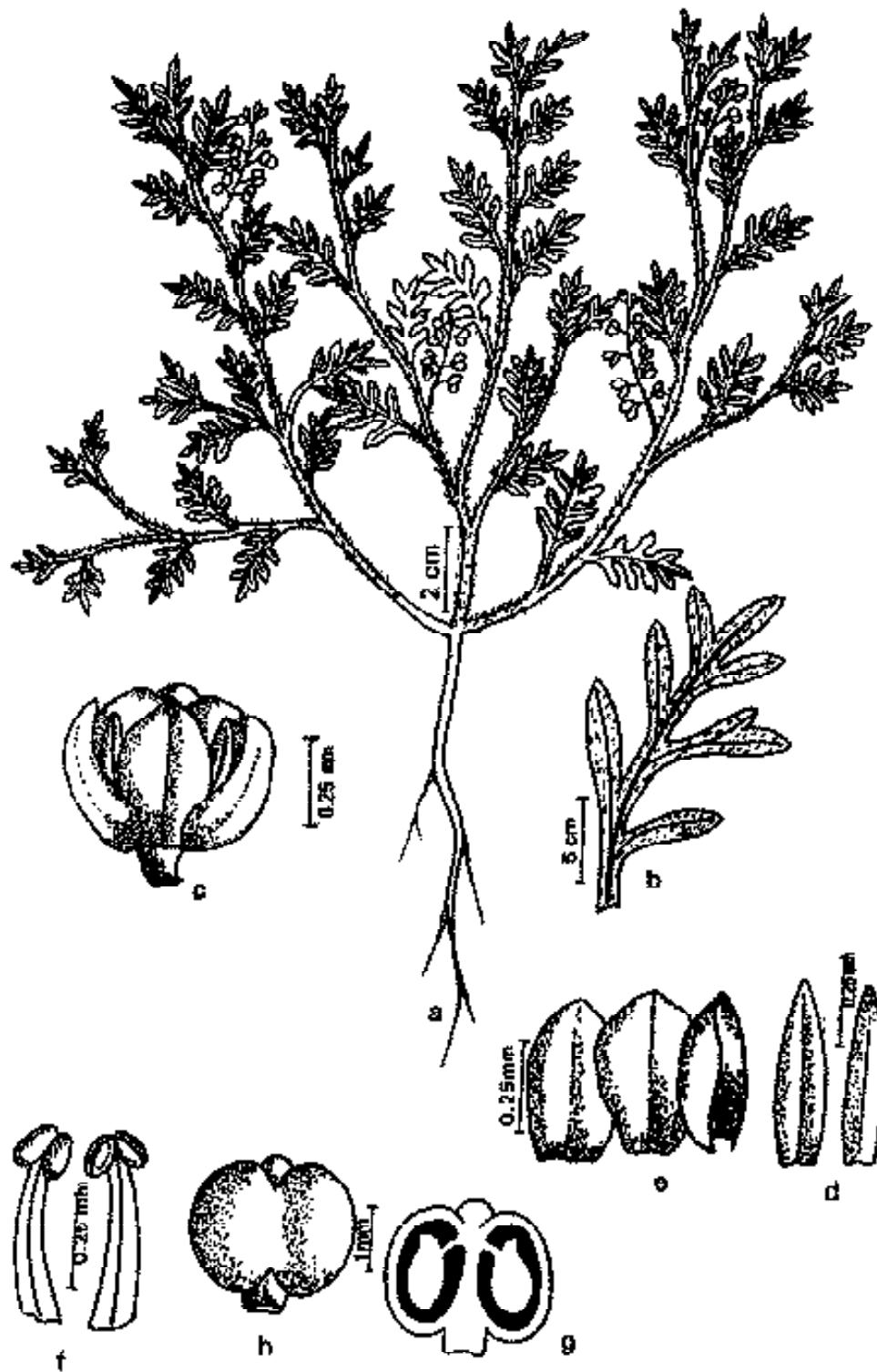


Fig.2: *Coronopus didymus* (L.) Smith
 (a) habit, (b) leaf, (c) flower, (d) petals, (e) sepals, (f) stamens, (g) l.s. of pistil,
 (h) pistil, entire.

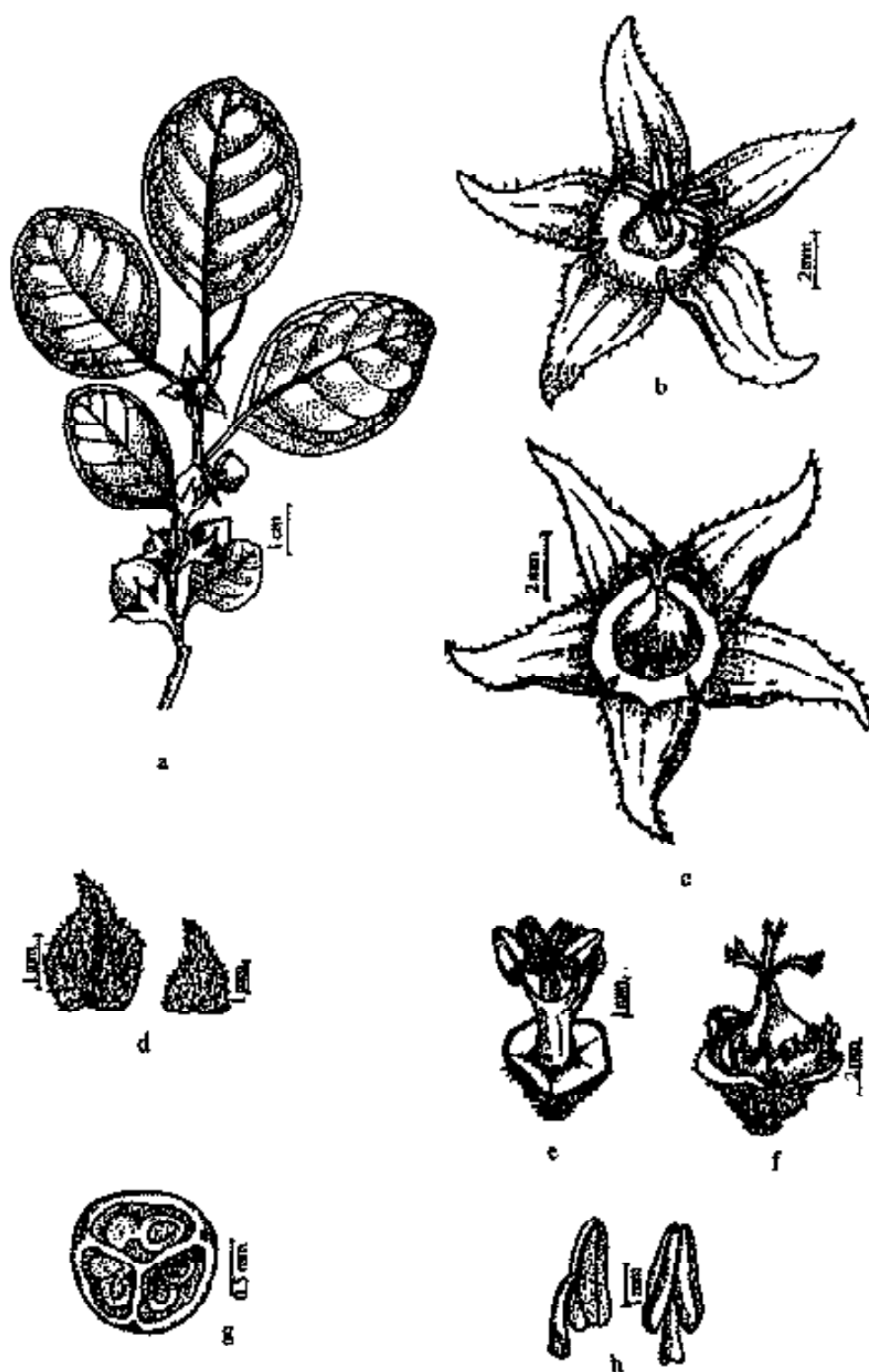


Fig.3: *Cleistanthus collinus* (Roxb.) Benth. ex Hook. f.
 (a) a twig with female flower and fruits, (b) male flower, (c) female flower, (d) bracts, (e) androecium, (f) pistil, (g) t.s. of ovary, (h) stamens.

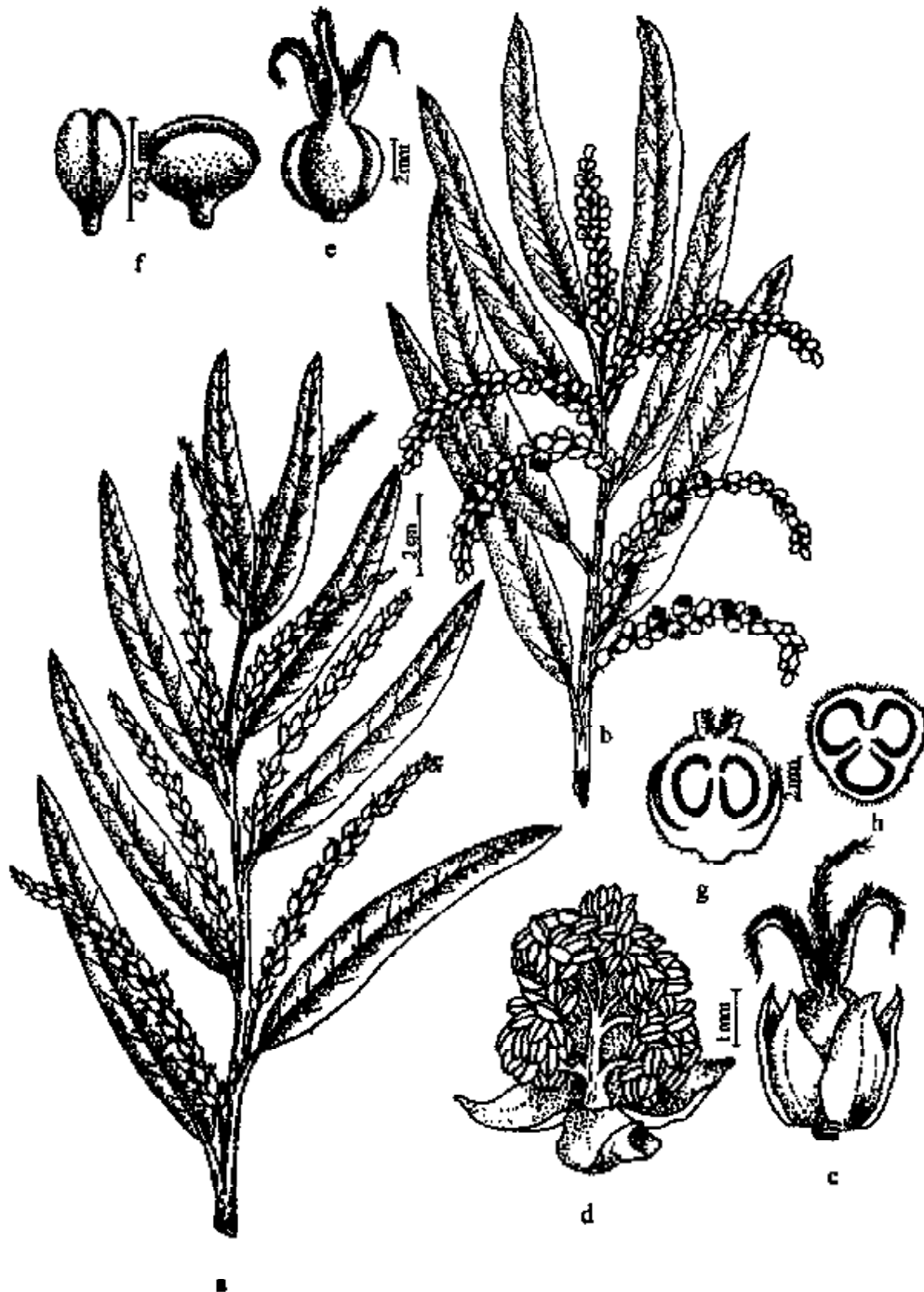


Fig. 4: *Homonola riparia* Lour.
 (a) a twig of female plant, (b) a twig of male plant, (c) female flower, (d) male flower, (e) pistil, (f) stamens, (g) l.s. of ovary, (h) t.s. of ovary.

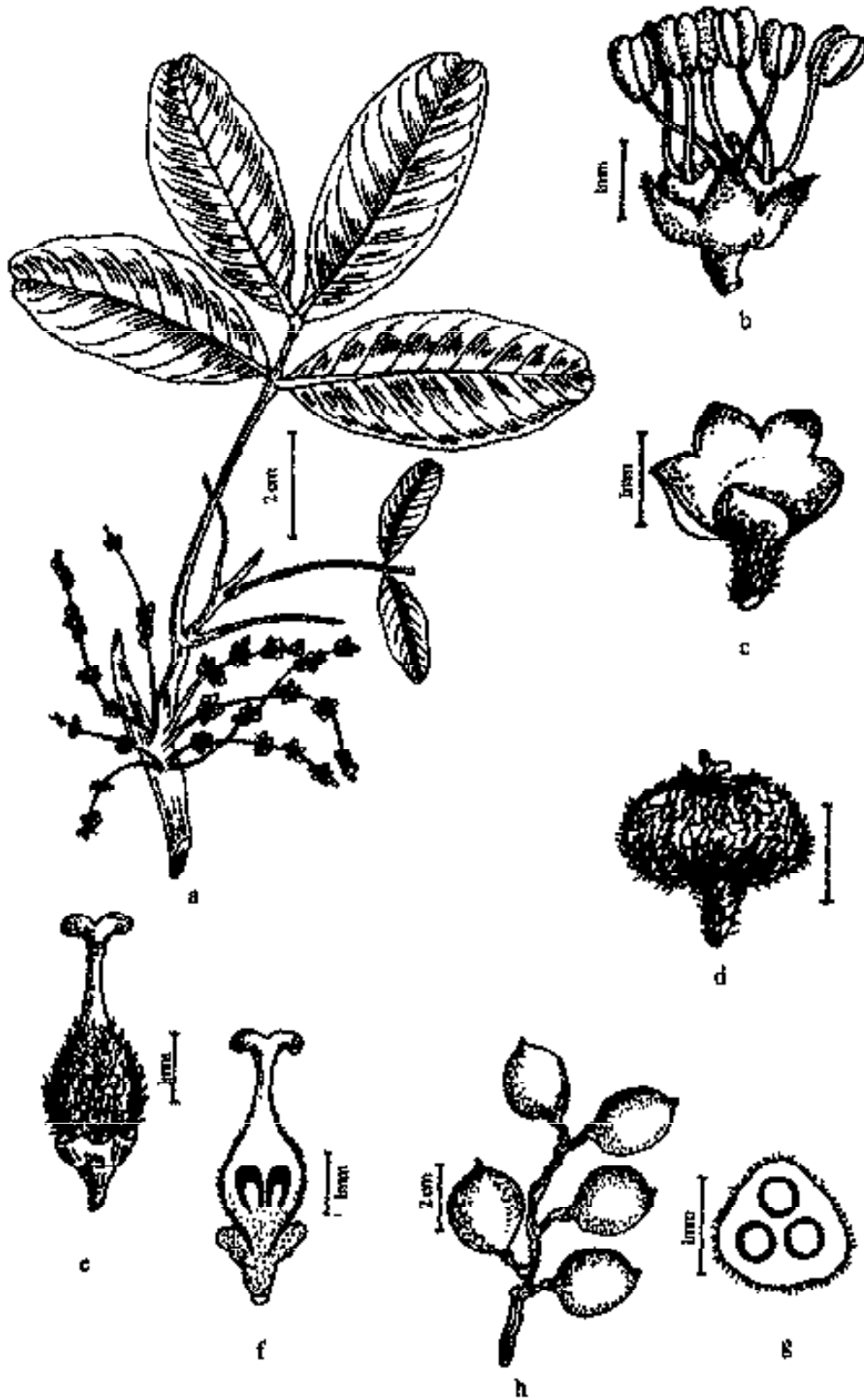
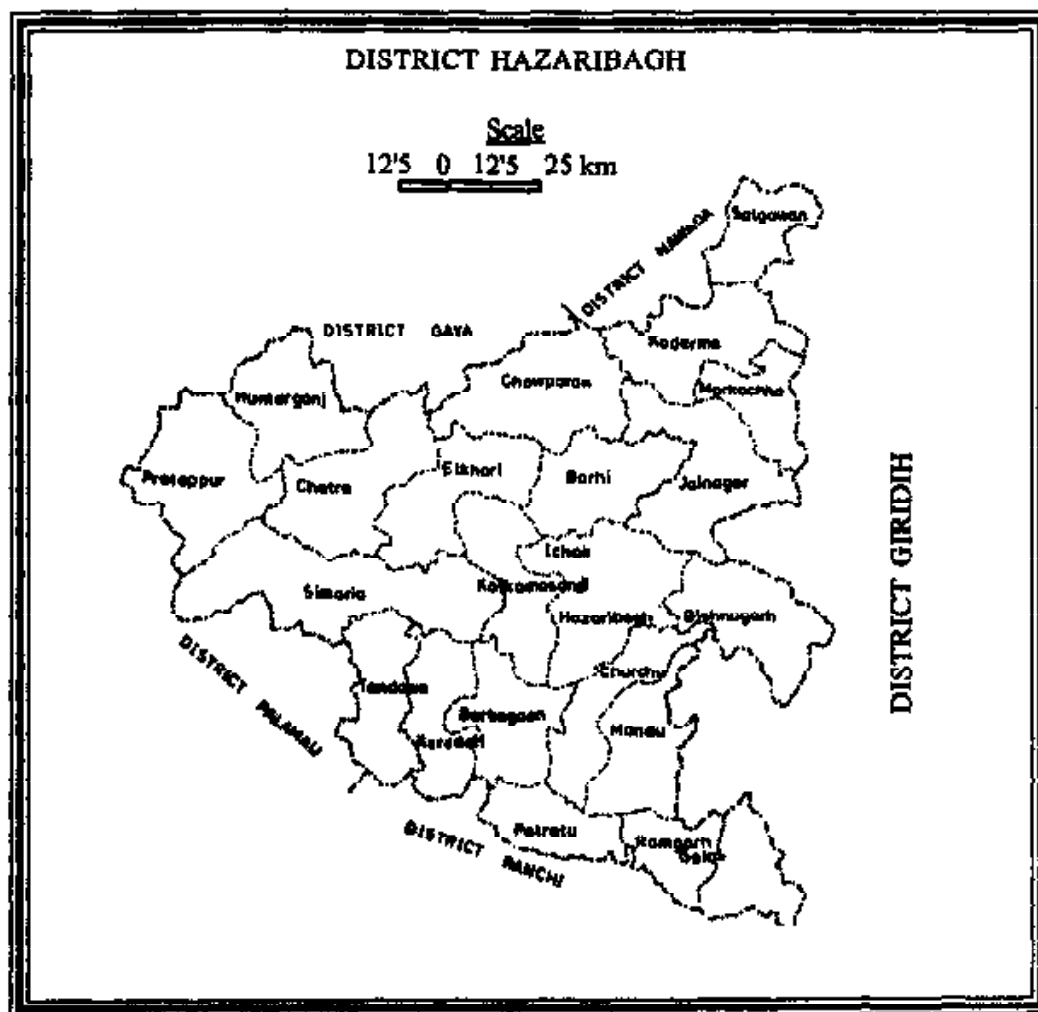
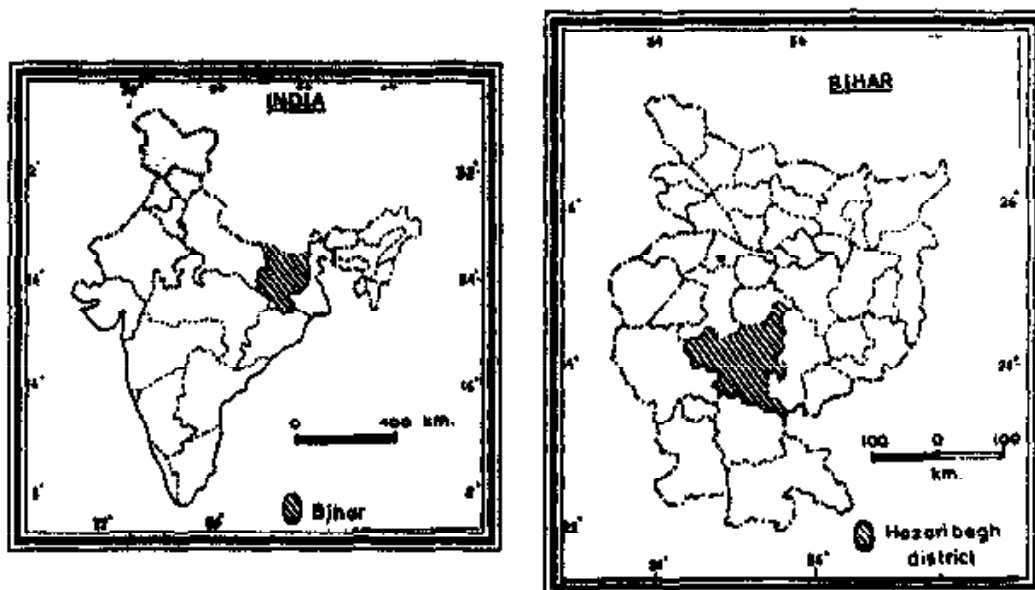
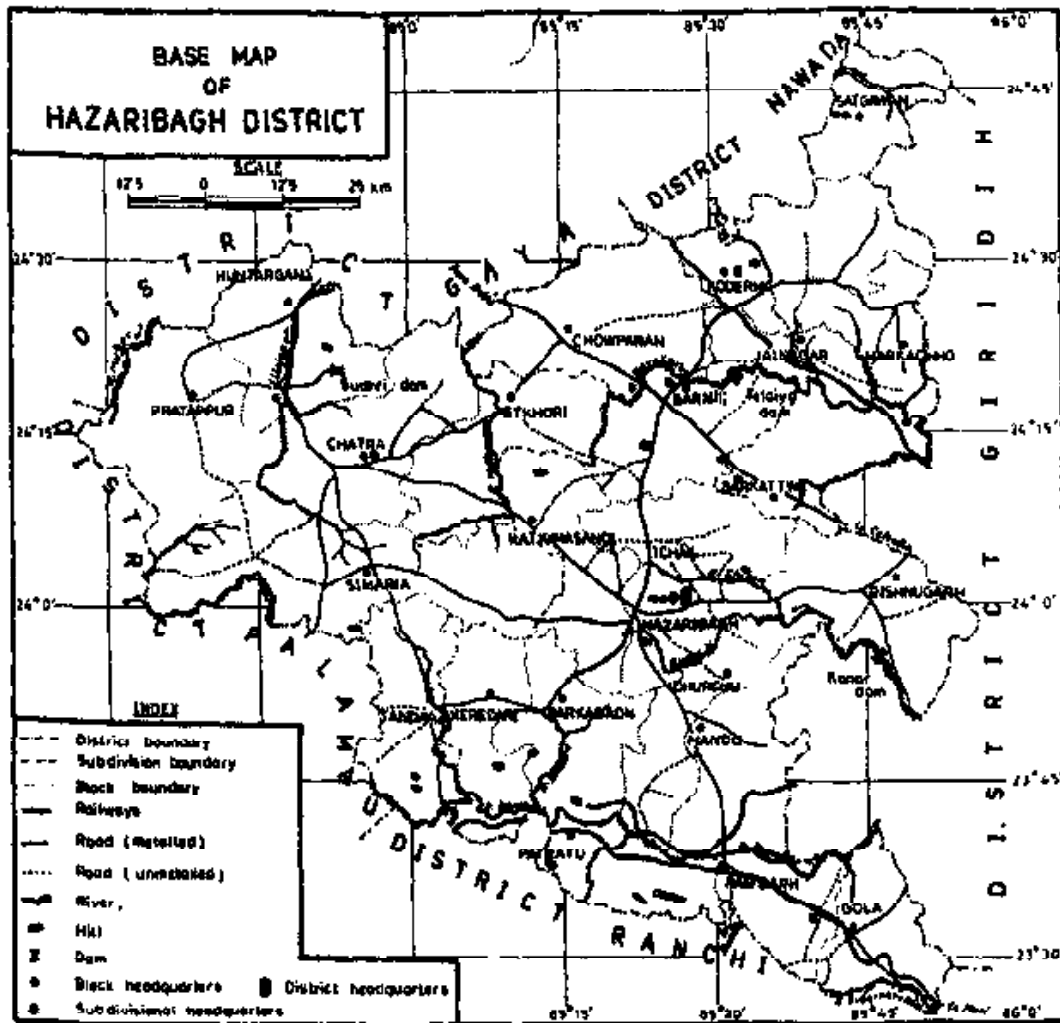


Fig. 5: *Schleicheria oleosa* (Lour.) Oken
 (a) a twig, (b) flower, (c) calyx, (d) pistillode, (e) pistil, (f) l.s. of pistil, (g) t.s. of ovary, (h) fruits.



Base map of Hazari begh District



Location Map of the study area

felling and grazing, the soil of the hills is exposed and erosion is frequent at rapid rate.

A considerable portion of the plateau is not under forest and cultivation is also not possible there without a good deal of expenditure and special steps. Such portions cover the areas where the rocks are exposed or where gullies have been formed or where the top soil is washed away due to heavy sheet-erosion.

According to the 'Revised Survey of the Forest Types of India' by Champion and Seth (1968), the forests of the Hazaribagh district conform broadly to the Northern Tropical Dry Deciduous Forests which may be classified into the following sub-types:

- I. *Dry Peninsular Sal Forests (5B/C_{1c})*
- II. *Northern Dry Mixed Deciduous Forests (5B/C₂)*
- III. *Dry Deciduous Scrub Forests (5D/S₁)*
- IV. *Boswellia Forests (5/E₂)*

I. *Dry Peninsular Sal Forests*: 'Sal' (*Shorea robusta*) is the most important and predominant species and occurs both on the plains as well as on the hills in the well-drained localities of the district. It is of low quality and height (10-15 m); its regeneration is slow and difficult. It is mixed with other species in greater number. They form part of the main canopy in dry deciduous sal-bearing forest. Practically all the trees are deciduous during the dry season, usually for several months and during monsoon season the forest takes on an almost luxuriant appearance. The lower canopy is likewise almost entirely deciduous or wherever evergreen or semievergreen species are present, they are inconspicuous and confined to rather moist pocket areas. An undergrowth of shrubs is usually present.

The chief associates of dry deciduous sal-bearing forests in the first storey are *Albizia procera*, *Anogeissus latifolia*, *Buchanania lanzan*, *Haldinia cordifolia*, *Lagerstroemia parviflora*, *Lannea coromandelica*, *Madhuca longifolia*, *Oroxylum indicum*, *Pterocarpus marsupium*, *Sclleichera oleosa*, *Semecarpus anacardium*, *Syzygium cumini*, *Terminalia alata*, *T. bellirica*, *T. chebula*, etc. The second storey consists of *Bauhinia variegata*, *Bridelia retusa*, *Careya arborea*, *Casearia tomentosa*, *Cassia fistula*, *Cleistanthus collinus*, *Croton roxburghii*,

Diospyros melanoxylon, *Flacourtia indica*, *Gardenia latifolia*, *Garuga pinnata*, *Holarrhena pubescens*, *Ougeinia oogeinensis*, *Phyllanthus emblica*, *Wendlandia heynei*, *Zizyphus mauritiana*, etc. The third storey consists of *Carissa paucinerva*, *Grewia hirsuta*, *Helicteris isora*, *Indigofera cassioides*, *Mallotus philippensis*, *Symplocos racemosa*, *Woodfordia fruticosa*, etc. The undergrowth includes *Catunaregam spinosa*, *Clerodendrum infortunatum*, *Desmodium pulchellum*, *Flacourtia indica*, *Flemingia chappar*, *Hyptis suaveolens*, *Lantana camara* var. *aculeata*, *Phoenix acaulis*, *Thespesia lampas*, *Thysanolaena maxima*, *Zizyphus nummularia*, etc. The ground cover includes *Achyranthes aspera*, *Andrographis paniculata*, *Aristida setacea*, *Carex cruciata*, *Cassia absus*, *Curculigo orchioides*, different species of *Cyperus*, *Euphorbia heterophylla*, *E. heyneana*, *Justicia betonica*, different species of *Oldenlandia*, *Spermacoce ramanii*, *Tephrosia purpurea*, *Themeda quadrivalvis*, *Vicoa indica*, etc. The important climbers and lianes are *Bauhinia vahlii*, *Butea superba*, *Celastrus paniculatus*, *Combretum roxburghii*, species of *Dioscorea*, *Millettia extensa*, *Smilax zeylanica*, *S. ovalifolia*, etc. The epiphytic orchids are rare and is represented by *Vanda roxburghii* only. Among parasites, *Cuscuta reflexa* are found on branches and *Dendrophthoe falcata*, *Loranthus cordifolia*, *Viscum orientale* and *V. articulatum* are found to grow on tree trunk. These forests are found in National Park, Ichak, Bishnugarh, Barkattwa, etc. of Hazaribagh East Sub-division, Tandwa, and Keredary of Hazaribagh West Sub-division, Koderma, Morkachho and Satgawan of Koderma subdivision, and Pratappur of Chatra West Subdivision.

II. *Northern Dry Mixed Deciduous Forests*: Very dry aspects as a rule do not carry sal but show a more xerophytic type, though not always of the same composition. This type occurs on the shallow and degraded sites both on the hills and the plains. Most trees have low-spreading crowns. Trees are deciduous during the dry season. The main species of first storey are *Acacia catechu*, *Anogeissus latifolia*, *Boswellia serrata*, *Buchanania lanzan*, *Butea monosperma*, *Diospyros melanoxylon*, *Lagerstroemia parviflora*, *Lannea coromandelica*, *Semecarpus anacardium*, *Terminalia alata*, etc. with patches of sal. Bamboo is also found to be thinly distributed. These forests are found in certain regions of Koderma, Jaynagar and Satgawan of Koderma Subdivision; Barkagaon, Keredari, Mandu and Bishnugarh of Hazaribagh West and East Subdivisions; and Hunterganj and Chatra of Chatra North Subdivision.

The second storey consists of *Aegle marmelos*, *Bambusa arundinacea*, *Bauhinia racemosa*, *Buchanania lanzan*, *Calotropis procera*, *Careya arborea*, *Casearia elliptica*, *Cleistanthus collinus*, *Flacourtia indica*, *Mallotus philippensis*, *Nyctanthes arbor-tristis*, *Ougeinia oogeinensis*, *Symplocos racemosa*, etc. The third storey consists of *Barleria prionitis*, *Catunaregam spinosa*, *Flemingia chappar*, *Grewia hirsuta*, *Hyptis suaveolens*, *Indigofera cassioides*, *Lantana camara* var. *aculeata*, *Pogostemon plectranthoides*, *Thysanolaena maxima*, *Woodfordia fruticosa*, etc. The undergrowth and ground vegetation consists of *Alternanthera sessilis*, *Apluda mutica*, *Aristida setacea*, *Blumeopsis flava*, *Boerhavia diffusa*, *Brachiaria ramosa*, *Carex cruciata*, *Cassia absus*, *C. tora*, *Chrozophora plicata*, different species of *Commelina*, *Euphorbia heyneana*, *Heteropogon contortus*, *Imperata cylindrica* var. *major*, *Mitrasacne pygmaea* var. *malaccensis*, *Nelsonia canescens*, *Phyllanthus dibilis*, *Sida acuta*, *Tephrosia purpurea*, *T. strigosa*, *Themeda quadrivalvis*, *Vicoa indica*, etc. The important climbers are *Bauhinia vahlii*, *Butea superba*, *Cryptolepis buchani*, *Dioscorea oppositifolia*, *Tinospora cordifolia*, etc.

III. *Dry Deciduous Scrub Forests*: These consists of about 3 to 6 m high shrubby growth which also include some tree species reduced to similar conditions, usually many-stemmed from the base. Some bamboos are also found to occur. Many shrubs like *Dodonaea angustifolia* and *Holarrhena pubescens* are also present. The stunted condition of vegetation and the low broken soil cover is due to maltreatment, usually directly or indirectly, connected with grazing. In mining areas, near habitations, and in easily accessible forests where over-exploitation and unrestricted hacking have continued for years by cutting down trees like *Butea monosperma*, *Croton roxburghii*, *Lagerstroemia parviflora*, *Maduca longifolia*, *Terminalia alata*, etc., the forests have been reduced to scrubs. Extremely xerophytic conditions have set in and species like *Acacia catechu*, *Butea monosperma*, *Carissa carandus*, *Cassia fistula*, *Combretum decandrum*, *Euphorbia heterophylla*, *Flacourtia indica*, *Ixora pavetta*, *Mimosa intsia*, *Phoenix acaulis*, *Vitex negundo*, *Wendlandia tinctoria*, *Zizyphus mauritiana*, etc. are common. It is felt that with the conditions becoming more and more xerophytic, the incidence of *A. catechu* in the subtypes described earlier is increasing. This type of forest is observed in Patraru, Gola and Ramgarh under Hazaribagh East Subdivision.

IV. *Boswellia Forests*: Champion and Seth (1968) recognised *Boswellia serrata* as an edaphic climax type. This type of forest is found on southern aspects, hill tops and more exposed localities of the district. The growth is generally stunted where the soil is shallow and has poor moisture retaining capacity. The main associates of this forests are *Alangium salvifolium*, *Anogeissus latifolia*, *Bridelia retusa*, *Buchanania lanzan*, *Carissa paucinerva*, *Catunaregam spinosa*, *Cochlospermum religiosum*, *Flacourtia indica*, *Garuga pinnata*, *Lannea coromandelica*, *Nyctanthes arbor-tristis*, etc. Such type of forest is found in Ghanghree of Chatra North Subdivision, certain areas of Katkamosandhi and Ichak of Hazaribagh West Subdivision, and Chauparan, Jaynagar and Markachho of Koderma Subdivision.

Apart from the vegetation types as described above, a good number of plants are found to occur in various habitats and areas of the district which may be summarized under the following heads:

(A) *Jungle and Thicket Vegetation* : Growth of jungles or thickets are generally found within the rural areas, in narrow patches of wastelands around tanks, ponds and ditches, etc. The woody species in this type of vegetation are *Antidesma acidum*, *Cordia obliqua* var. *wallichii*, *Ficus hispida*, *Litsea glutinosa*, *L. monopetala*, etc. The species forming undergrowth include *Costus speciosus*, *Glycosmis pentaphylla*, *Pavetta tomentosa*, *Rauvolfia serpentina*, etc. The ground cover consists of species like *Andrographis paniculata*, *Curculigo orchioides*, *Geodorum densiflorum*, *Justicia diffusa*, *J. japonica*, *Oplismenus burmannii*, *Peristrophe bicalyculata*, etc. The common climbers include *Cayratia trifolia* var. *cinerea*, *Cissampelos pareira* var. *hirsuta*, *Cissus repanda*, *Coccinia grandis*, *Coeculus hirsutus*, *Dioscorea pentaphylla*, *Dyplocyclos palmata*, *Luffa cylindrica*, *Mikania micrantha*, *Passiflora foetida*, *Tinospora cordifolia*, *Trichosanthes tricuspidata*, etc.

(B) *Gardens and Parks* : In gardens and parks, several species are found to grow. *Alstonia scholaris*, *Bombax ceiba*, *Borassus flabellifer*, *Caesalpinia pulcherrima*, *Cassia fistula*, *Casuarina equisetifolia*, *Delonix regia*, *Eucalyptus globulus*, *Grevillea robusta*, *Jacaranda mimosifolia*, *Kigelia africana*, *Peltophorum pterocarpum*, *Phoenix sylvestris*, *Pterospermum acerifolium*, *Swietenia mahagoni*, *Syzygium cumini*, etc. are the common trees and shrubs.

(C) *Roadside and Avenue trees and shrubs* : There are a number of trees and shrubs which occur on either sides of roads and avenues. These plants provide shade, bear colourful flowers or may be of aesthetic value. *Acacia auriculiformis*, *Albizia lebbek*, *Azadirachta indica*, *Dalbergia sissoo*, *Eucalyptus globulus*, *Gmelina arborea*, *Lagerstroemia reginae*, *Leucaena leucocephala*, *Mangifera indica*, *Millingtonia hortensis*, *Parkinsonia aculeata*, *Polyalthia longifolia*, *Tamarindus indica*, *Terminalia arjuna*, etc. are some of the common roadside and avenue trees and shrubs. However, some trees and shrubs are common to both gardens and parks, and roadsides and avenues.

(D) *Vegetation of abandoned and waste places* : These habitats serve as ideal sites for the growth and development of exotic as well as indigenous weeds. Some of the common indigenous weeds are different species of *Alternanthera*, *Anisomeles indica*, *Apluda mutica*, *Cleome viscosa*, *Corchorus aestuans*, *Dactyloctenium aegyptium*, *Dyschoriste depressa*, *Eleusine indica*, *Hyptis suaveolens*, *Justicia procumbens*, *Paspalidium flavidum*, *Pogostemon benghalense*, *Physalis minima*, different species of *Sida*, *Solanum*, etc. The herbaceous climbers are represented by *Ampelocissus tomentosa*, *Cardiospermum halicacabum*, *Cayratia trifolia* var. *cinerea*, *Cucumis melo*, *Ipomoea pestigridis*, *Leea asiatica*, *Momordica dioica*, *Spergularia daemia*, etc. With the onset of winter season different species like *Anagallis arvensis* ssp. *arvensis* var. *caerulea*, *Anagallis pumila*, different species of *Blumea*, *Launaea procumbens*, *L. asplenifolia*, *Mazus pumilus*, *Rumex dentatus* ssp. *klotzschianus*, *Sphaeranthus indicus*, *Sonchus asper*, *Vernonia ceneria*, etc. invade these habitats.

The exotic weed flora of these habitats are dominated by *Ageratum conyzoides*, *Bidens biternata*, *Cassia sophera*, *C. tora*, *Gomphrena serrata*, *Lantana camara* var. *aculeata*, *Solanum torvum*, *Xanthium indicum* and climbers like *Merremia hederacea*, *Passiflora suberosa*, etc.

Another interesting feature is that many cultigens are established as escapes in these habitats. The most common among them are *Brassica* spp., *Cajanas cajan*, *Capsicum annum*, *Cicer arietinum*, *Citrullus lanatus*, *Coriandrum sativum*, *Cucumis melo*, *Foeniculum vulgare*, *Luffa cylindrica*, *Lycopersicon esculentum*, *Momordica charantia* var. *muricata*, *Raphanus sativus*, etc.

(E) *Flora of old walls* : Dilapidated houses, brick walls of temples, fences and road bridges consists of *Arthraxon lancifolius*, *Bidens biternata*, *Euphorbia hirta*, *Ficus benghalensis*, *F. religiosa*, *Laportea bulbifera*, *L. interrupta*, *Lindenbergia indica*, *Oplismenus burmanii*, *Peperomia pellucida*, *Pilea microphylla*, *Portulaca oleracea*, and often *Tridax procumbens*, *Vernonia cineria*, etc.

(F) *Riverain vegetation* : A sparse vegetation along the courses of rivers, rivulets, streams and sandy rocky river beds is composed of some common trees and shrubs including some herbaceous ones occurring as ground flora. *Aegle marmelos*, *Bombax ceiba*, *Dalbergia sissoo*, *Ehretia laevis*, *Ficus hispida*, *Lagerstroemia parviflora*, *Mitragyna parvifolia*, *Terminalia arjuna*, etc. are some of the common trees and shrubs along the streams and river courses. The shrubby vegetation is represented by *Calotropis procera*, *Homonoia reparia*, *Ipomoea carnea* ssp. *fistulosa*, *Lantana camara* var. *aculeata*, *Rotula aquatica*, *Tragia involucrata*, *Vitex negundo*, *Woodfordia fruticosa*, etc.

The herbaceous flora is represented by *Ageratum conyzoides*, *Allmania nodiflora* var. *angustifolia*, *Alysicarpus vaginalis*, *Argemone mexicana*, *Boerhavia diffusa*, *Bulbostylis barbata*, *Cassia mimosoides*, *C. occidentalis*, *C. pumila*, *Cyperus distans*, *C. iria*, *C. rotundus*, *Dactyloctenium aegyptium*, *Fimbristylis miliacea*, *Gomphrena serrata*, *Heliotropium indicum*, *H. strigosum*, *Imperata cylindrica* var. *major*, *Phyla nodiflora*, *Polygonum barbatum*, *P. glabrum*, *P. hydropiper*, *Rumex dentatus* ssp. *klotzchianus*, *Saccharum spontaneum*, *Solanum xanthocarpum*, etc. are found in streams of sluggish water. Several cultivated species belonging to the families Apiaceae, Asteraceae, Brassicaceae, Cucurbitaceae, Fabaceae, Malvaceae, Solanaceae, etc. are found to grow as escapes.

(G) *Aquatic flora* : Aquatic flora is found in monsoonal ponds, ditches and puddles, temporary marshy depressions of forests, different water reservoirs catchment areas of dams, river beds and ravines, irrigated rice fields, etc. In Hazaribagh, aquatic species of perennial and monsoonal ponds, lakes, ditches and puddles are rather poor in number. *Lemna perpusilla*, *Pistia stratiotes*, *Spirodela polyrhiza* and *Wolffia globosa* together form dense cover over the water surface of these habitats. *Aponogeton natans*, *A. undulatus*, *Ceratophyllum demersum*, *Hydrilla verticillata*, *Lagerosiphon roxburghii*, *Ottelia alismoides*, *Potamogeton*

crispus, *P. nodosus*, *Vallisneria spiralis*, etc. are the common rooted submerged plants of perennial ponds. *Hygrophiza aristata*, *Ludwigia adscendens*, *Nelumbo nucifera*, *Nymphaea nouchali*, *N. pubescens*, *Nymphoides hydrophylla*, *N. indica*, etc. constitute the common rooted floating-leaved plants of ponds, ditches and lakes. The marshy borders of these habitats are inhabited by *Aeschynomene aspera*, *A. indica*, *Alternanthera sessilis*, *Echinochloa crusgalli*, *E. stagnina*, *Enydra fluctuans*, *Panicum repens*, etc. They together form dense floating meadow and extend themselves from shallow to deep water.

(H) *Vegetation of irrigated crop fields* : The vegetation of irrigated crop fields is rather different. During monsoon, these areas are filled up by water and plants like *Aponogeton natans*, *Butomopsis latifolia*, *Cyperus difformis*, *Elaeocharis geniculata*, *Fimbristylis miliacea*, *Monochoria hastata*, *M. vaginalis*, *Sagittaria trifolia*, *S. guyanensis* ssp. *lappula*, different species of *Scirpus*, etc. appear in due course. The watersides of rice fields are inhabited by *Commelina benghalensis*, *Echinochloa colona*, different species of *Eragrostis*, *Lindernia anagallis*, *Setaria glauca*, etc. The borders of irrigated canals are covered by plants like *Chrysopogon aciculatus*, *Saccharum spontaneum*, *Themeda quadrivalvis*, etc. After harvesting of rice and at the onset of the winter season the rice fields become dried. Most of the fields are left fallow, and few of them, where irrigation operation is possible, are cultivated with different winter crops. The common weeds in these fields are *Anagallis arvensis* ssp. *arvensis* var. *caerulea*, *Asphodelus tenuifolius*, *Chenopodium album*, *C. ambrosioides*, *C. murale*, *Coronopus didymus*, *Fumaria parviflora*, *Medicago lupulina*, *M. polymorpha*, *Melilotus alba*, *M. indica*, *Mollugo pentaphylla*, *Polygonum plebejum*, *Solanum nigrum*, *Soliva anthemifolia*, *Spergula fallax*, *Trianthema portulacastrum*, *Vicia hirsuta*, etc.

ANALYSIS OF THE FLORA

Statistical

Of the 972 species under 615 genera belonging to 142 families, the class Magnoliopsida (Dicotyledons) comprise 114 families, 478 genera and 745 species; and the class Liliopsida (Monocotyledons) comprise 28 families, 137 genera and 227 species. For the dicotyledons, the percentages of families, genera and species are 80.28, 77.72 and 76.65 respectively and for the monocotyledons the same are 19.72, 22.28 and 23.35

respectively. There are about 558 species (364 dicots and 194 monocots) of herbs, 130 species (117 dicots and 13 monocots) of shrubs, 176 species (167 dicots and 9 monocots) of trees and 108 species (99 dicots and 9 monocots) of climbers. The percentages of herbs, shrubs, trees and climbers in the flora are 57.41, 13.37, 18.11 and 11.11 respectively. Out of 558 herbaceous species, about 44 species (18 dicots and 26 monocots) are aquatics. The epiphytes, parasites and insectivorous plants are very few in number in the flora and these are 7(4 dicots and 3 monocots), 9 (all dicots) and 5 (all dicots) respectively. Out of the total of 972 species, about 445 species (345 dicots and 100 monocots) are annual and about 527 species (400 dicots and 127 monocots) are biennial or perennial. Their percentages are 45.78 and 54.22 respectively.

The proportion of monocots and dicots is 1:3.3 and that of families to genera is 1:4.3. The genus-species ratio is 1:1.6 as against 1:2.2 for Bihar and Orissa (Haines, 1921-'25), 1:6 for India alone (Chatterjee, 1939) and 1:7 for British India (Hooker f., 1904). This pattern of proportion of genera to species conforms to the general rule that within the same region, smaller the flora, smaller the genus-species ratio.

It is evident in the flora that the following 10 families (in order of dominance) are represented by 20 or more species.

Serial number	Family	Number of species	Percentage of total
1.	Poaceae	93	9.56
2.	Fabaceae	80	8.23
3.	Asteraceae	55	5.66
4.	Cyperaceae	41	4.22
5.	Euphorbiaceae	34	3.50
6.	Rubiaceae	33	3.40
7.	Acanthaceae	29	2.98
8.	Scrophulariaceae	24	2.47
9.	Caesalpiniaceae	23	2.37
10.	Malvaceae	21	2.16

Whereas 51 families (43 dicots and 8 monocots) are represented by single genus and species, 18 families (11 dicots and 7 monocots) are

represented by single genus and 2 or more species, 14 families (13 dicots and 1 monocot) by 2 genera and 2 or more species and the remaining 49 families (38 dicots and 11 monocots) by more than 2 genera and less than 20 species.

The 10 dominant families comprise 433 species i.e., 44.55% of the total species dealt with, remaining 132 families with a total of 539 species constitute 55.45%. The flora reveals that the Leguminosae (Fabaceae with 40 genera and 80 species, Caesalpiniaceae with 8 genera and 23 species, Mimosaceae with 7 genera and 13 species) is the largest family with 55 genera and 116 species. If the Fabaceae is considered a separate family, then the Poaceae with 57 genera and 93 species will come in the first position. In fact, the Leguminosae and Poaceae together constitute about two-ninth and the Leguminosae, Poaceae, Asteraceae and Cyperaceae together about one-third of the total angiospermic species. Among dicotyledons, the Leguminosae alone constitute more than two-thirteenth and Leguminosae and Asteraceae together much more than two-seventh of the total. While among monocotyledons, grasses alone constitute more than two-fifth and grasses and sedges together much more than one-half of the total.

The following 26 genera (21 dicots and 5 monocots) are represented by 5 or more species in the flora as mentioned within the brackets:

- | | |
|----------------------------|------------------------------|
| 1. <i>Cyperus</i> (15) | 14. <i>Jasminum</i> (6) |
| 2. <i>Cassia</i> (10) | 15. <i>Terminalia</i> (6) |
| 3. <i>Eragrostis</i> (10) | 16. <i>Acacia</i> (5) |
| 4. <i>Crotalaria</i> (9) | 17. <i>Alternanthera</i> (5) |
| 5. <i>Euphorbia</i> (9) | 18. <i>Bauhinia</i> (5) |
| 6. <i>Fimbristylis</i> (9) | 19. <i>Clerodendrum</i> (5) |
| 7. <i>Ipomoea</i> (9) | 20. <i>Corchorus</i> (5) |
| 8. <i>Desmodium</i> (7) | 21. <i>Dioscorea</i> (5) |
| 9. <i>Justicia</i> (7) | 22. <i>Ficus</i> (5) |
| 10. <i>Lindernia</i> (7) | 23. <i>Heliotropium</i> (5) |
| 11. <i>Phyllanthus</i> (7) | 24. <i>Panicum</i> (5) |
| 12. <i>Solanum</i> (7) | 25. <i>Polygonum</i> (5) |
| 13. <i>Indigofera</i> (6) | 26. <i>Syzygium</i> (5) |

About 329 genera (262 dicots and 67 monocots) are represented by single species and the remaining 260 genera (195 dicots and 65 monocots) by more than one but less than five species in the flora.

In order to get an idea of the relationship of the flora of Hazaribagh with that of Bihar and Orissa, and British India, a comparative list of 10 dominant families in order of frequency is presented below:

Hazaribagh (Present work)	Bihar & Orissa (Haines, 1921, 1925)	British India (Hooker f., 1904)
Leguminosae (Fabaceae + Caesalpi- niaceae + Mimosaceae)	Leguminosae	Orchidaceae
Poaceae	Gramineae (Poaceae)	Leguminosae
Asteraceae	Cyperaceae	Gramineae (Poaceae)
Cyperaceae	Compositae (Astera- ceae)	Rubiaceae
Euphorbiaceae	Euphorbiaceae	Euphorbiaceae
Rubiaceae	Acanthaceae	Acanthaceae
Acanthaceae	Rubiaceae	Compositae (Astera- ceae)
Scrophulariaceae	Labiatae (Lamiaceae)	Cyperaceae
Malvaceae	Scrophulariaceae	Labiatae (Lamiaceae)
Lamiaceae	Convolvulaceae	Urticaceae

The perusal of the above table reveals that the families Leguminosae and Poaceae occupy the first and second positions respectively in the flora of the Hazaribagh District, Bihar and Orissa but second and third positions respectively in British India where the first position is taken up by the Orchidaceae. In fact, the flora of Hazaribagh district exhibits greater correlation with that of Bihar and Orissa as the district is a component part of the former State. However, in the present flora the preponderance of Asteraceae over Cyperaceae, Rubiaceae over Acanthaceae and Scrophulariaceae over Labiatae may be attributed perhaps due to exotic introductions or migrations from the adjacent regions.

Lastly, it is important to mention that about 60 species (46 dicots and 14 monocots) which are marked with asterisks (*) in the systematic enumeration of the taxa are not found reported by the previous workers from the Hazaribagh District. On the contrary, six species viz., *Bignonia concanensis* DC., *Anotis foetida* (Dalz.) Benth. & Hook. f., *Physalis*

longifolia Nutt., *Vanda caerulea* Griff. ex Lindl., *Pennisetum hordeoides* (Lam.) Steud. and *Setaria pallide-fusca* (Schum.) Stapf. & Hubb. reported by Kanodia and Malick (1966) from different places of the then undivided Hazaribagh District and one species viz. *Aeschynomene americana* Linn. reported by Chatterjee (1960) from Hazaribagh town were not collected either from those or any other places in course of this investigation for the last five years. Perhaps due to low number and present climatic condition, these plants have disappeared or migrated elsewhere.

NOTES ON ETHNOBOTANY AND ECONOMIC PLANTS

India is very rich in ethnobotanical information. About 80 per cent of India's population live in villages, and a considerable proportion comprises tribals living in remote forest areas. The different traditions, beliefs, needs and cultures of the various tribes and the diversity of flora in India richly contribute to plant folklore. Out of the total population in the district Hazaribagh, the scheduled castes and scheduled tribes are over 10 per cent (Chari, 1975). The main tribes of this district are Santhal, Munda, Bedia, Karmali, Oraon, Mahali, Birhor and Khond. The district has a hilly terrain, mostly covered by dense forests which occupy nearly 46 per cent of the total area.

During ethnobotanical field studies in different parts of Hazaribagh district, Tarafder and Chaudhuri (1981) came across a large number of tribal people who are using wild plants for food, medicine, insecticides, etc. They gathered important ethnobotanical information on 50 plants growing in the district either from tribal medicinemen who accompanied them in the field or from old tribals who are very experienced and are actually prescribing these plant materials to cure different diseases. In addition, Tarafder (1983, 1984) contributed further to the knowledge of some plants which are often used by various tribals as local medicine. Some of the important plants having ethnobotanical values are *Acacia catechu* (Mimosaceae), *Bridelia retusa* (Euphorbiaceae), *Catunaregam spinosa* (Rubiaceae), *Croton roxburghii* (Euphorbiaceae), *Cryptolepis buchmanii* (Asclepiadaceae), *Curculigo orchitoides* (Liliaceae), *Dendrophthoe falcata* (Loranthaceae), *Desmodium pulchellum*, *Flemingia chappar* (Fabaceae), *Gymnema sylvestre*, *Hemidesmus*

indicus (Asclepiadaceae), *Leonotis nepetaefolia* (Lamiaceae), *Madhuca longifolia* (Sapotaceae), *Martynia annua* (Pedaliaceae), *Rivea hypocraeteriformis* (Convolvulaceae), *Terminalia alata* (Combretaceae), *Tribulus terrestris* (Zygophyllaceae), *Ventilago denticulata* (Rhamnaceae), *Vitex negundo* (Verbenaceae), etc.

An attempt has also been made in the present investigation to enumerate plants of economic importance and of medicinal value with notes on their local names, parts of plants and for the purpose for which they are used. It is expected that planned cultivation of some of these plant species on a larger scale may be of considerable help in pharmaceutical and other industries. Furthermore, a phytochemical study of the hitherto uninvestigated taxa of medicinal importance may unravel new compounds and potential drugs of great therapeutic value and in the year's ahead, may bring to market newer drugs of enormous utility in alleviating human suffering.

In addition to the specific economic uses of each plant as mentioned under the systematic enumeration, the following important economic plants occurring in the district deserve special mentioning:

Grasses and leaves of trees and shrubs are used as cattle food and for thatching (broad leaves) purpose. Sal (*Shorea robusta*) and bamboos are used for construction of houses and buildings and also for making agricultural and domestic implements. The flowers of 'mohua' (*Madhuca longifolia*) serve as food material for the poor people in the villages. The surplus mohua flowers, after meeting the local demand, are sometimes sent to the distilleries. The leaves of 'kendu' (*Diospyros melanoxylon*) are used for making 'bidi'. Khair (*Acacia catechu*) tree generally produces a quality of 'khair', used in preparation of betel. Fruits of 'harra' (*Terminalia chebula*) 'bahera' (*T. bellirica*) and 'amla' (*Phyllanthus emblica*) are used in ayurvedic medicinal system for the manufacture of 'trifala'. The nuts of 'piyar' (*Buchanania lanzan*) and the bark and gums of 'kahua' (*Terminalia arjuna*) have also developed industrial demand. The ropes and strings are made from 'mahualan' (*Bauhinia vahlii*). Wood of 'salai' (*Boswellia serrata*) is in great demand for making paper pulp. Packing cases for export of 'mica' are also made of it. The tubers of different species of *Dioscorea* are dug out by the tribals and other villagers living inside the forests. These are used as vegetable.

SEQUENCE OF FAMILIES
(Arranged Alphabetically)

MAGNOLIOPSIDA (Dicots)

<i>Sl.No.</i>	<i>Families</i>	<i>Sl.No.</i>	<i>Families</i>
1.	Acanthaceae	34.	Crassulaceae
2.	Aizoaceae	35.	Cucurbitaceae
3.	Alangiaceae	36.	Cuscutaceae
4.	Amaranthaceae	37.	Dilleniaceae
5.	Anacardiaceae	38.	Dipterocarpaceae
6.	Annonaceae	39.	Droseraceae
7.	Apiaceae (Umbelliferae)	40.	Ebenaceae
8.	Apocynaceae	41.	Elatinaceae
9.	Aristolochiaceae	42.	Euphorbiaceae
10.	Asclepiadaceae	43.	Fabaceae (Papilionaceae)
11.	Asteraceae (Compositae)	44.	Flacourtiaceae
12.	Balsaminaceae	45.	Fumariaceae
13.	Basellaceae	46.	Gentianaceae
14.	Bignoniaceae	47.	Hydrophyllaceae
15.	Bixaceae	48.	Lamiaceae (Labiatae)
16.	Bombacaceae	49.	Lauraceae
17.	Boraginaceae	50.	Lecythidaceae
18.	Brassicaceae (Cruciferae)	51.	Leeaceae
19.	Burseraceae	52.	Lentibulariaceae
20.	Campanulaceae	53.	Linaceae
21.	Cactaceae	54.	Loganiaceae
22.	Caesalpiniaceae	55.	Loranthaceae
23.	Cannabaceae	56.	Lythraceae
24.	Capparaceae	57.	Malpighiaceae
25.	Caricaceae	58.	Malvaceae
26.	Caryophyllaceae	59.	Magnoliaceae
27.	Casuarinaceae	60.	Melastomataceae
28.	Celastraceae	61.	Meliaceae
29.	Ceratophyllaceae	62.	Menispermaceae
30.	Chenopodiaceae	63.	Menyanthaceae
31.	Clusiaceae (Guttiferae)	64.	Mimosaceae
32.	Combretaceae	65.	Molluginaceae
33.	Convolvulaceae		

Sl.No. Families

66. Moraceae
67. Moringaceae
68. Myrsinaceae
69. Myrtaceae
70. Nelumbonaceae
71. Nyctaginaceae
72. Nymphaeaceae
73. Ochnaceae
74. Olacaceae
75. Oleaceae
76. Onagraceae
77. Oxalidaceae
78. Papaveraceae
79. Passifloraceae
80. Pedaliaceae
81. Piperaceae
82. Plumbaginaceae
83. Polygalaceae
84. Polygonaceae
85. Portulacaceae
86. Primulaceae
87. Protaceae
88. Punicaceae
89. Ranunculaceae
90. Rhamnaceae
91. Rosaceae
92. Rubiaceae
93. Rutaceae
94. Santalaceae
95. Sapindaceae
96. Sapotaceae
97. Scrophulariaceae
98. Simaroubaceae
99. Solanaceae
100. Sphenocleaceae
101. Sterculiaceae
102. Symplocaceae
103. Tamaricaceae
104. Tiliaceae
105. Trapaceae
106. Tropaeolaceae
107. Turneraceae

Sl.No. Families

108. Ulmaceae
109. Urticaceae
110. Verbenaceae
111. Violaceae
112. Viscaceae
113. Vitaceae
114. Zygophyllaceae

LILIOPSIDA (Monocots)*Sl.No. Families*

115. Agavaceae
116. Alismataceae
117. Aponogetonaceae
118. Araceae
119. Arecaceae (Palmae)
120. Bromeliaceae
121. Butomaceae
122. Cannaceae
123. Commelinaceae
124. Costaceae
125. Cyperaceae
126. Dioscoreaceae
127. Eriocaulaceae
128. Hydrocharitaceae
129. Juncaceae
130. Lemnaceae
131. Liliaceae
132. Musaceae
133. Orchidaceae
134. Pandanaceae
135. Poaceae (Gramineae)
136. Pontederiaceae
137. Potamogetonaceae
138. Smilacaceae
139. Strelitziaceae
140. Typhaceae
141. Xyridaceae
142. Zingiberaceae

Key to the Groups of Angiosperms

- 1a. Leaves usually net-veined (reticulate), with or without stipules, alternate, opposite or whorled. Flowers usually pentamerous or tetramerous, or parts numerous. Cotyledons usually 2, lateral (Dicotyledons):
- 2a. Perianth 2-seriate, outer calyx and inner corolla:
- 3a. Petals free from each other at their bases, usually falling as individual petals:
- 4a. Gynoecium consisting of 2 or more carpels, free from each other, sometimes carpel 1 and then plants dioecious climbers ... Group A
- 4b. Gynoecium consisting of a single carpel (then plants never dioecious climbers), or of 2 or more carpels united to each other wholly or in part, rarely ovaries free but styles united:
- 5a. Stamens more than twice as many as the petals ... Group B
- 5b. Stamens as many as, twice as many as the petals, or fewer:
- 6a. Ovary fully or partly inferior ... Group C
- 6b. Ovary superior:
- 7a. Placentation parietal or marginal ... Group D
- 7b. Placentation otherwise ... Group E
- 3b. Petals all united into a longer or shorter tube, falling as a complete corolla:
- 8a. Ovary fully or partly inferior ... Group F
- 8b. Ovary superior:
- 9a. Corolla actinomorphic ... Group G
- 9b. Corolla zygomorphic ... Group H
- 2b. Perianth mostly 1-seriate and sepaloid, or sometimes absent, rarely 2-seriate (some Loranthaceae and Euphorbiaceae):

- 10a. Ovary fully or partly inferior ... Group I
- 10b. Ovary superior ... Group J
- 1a. Leaves usually with parallel veins, without stipules, usually alternate (opposite in some aquatic plants). Flowers usually trimerous. Cotyledon 1, usually trimerous. Cotyledon 1, usually terminal (Monocotyledons):
- 11a. Ovary superior or flowers perianthless ... Group K
- 11b. Ovary inferior or partly so ... Group L

**Key to the families
Group A**

- 1a. Perianth-segments and stamens borne on a rim or cup being inserted below the ovary ... 57. ROSACEAE
- 1b. Perianth-segments and stamens borne independently below the ovary:
- 2a. Plants aquatic with floating peltate leaves. Flowers with 3 sepals. Carpels sunk individually in a top-shaped receptacle ... 6. NELUMBONACEAE
- 2b. Plants terrestrial, without peltate leaves (except some Menispermaceae). Flowers with sepals more than. Carpels not sunk in the receptacle as above:
- 3a. Dioecious climbers. Stamens 4 or 6 ... 10. MENISPERMACEAE
- 3b. Trees, woody shrubs or herbs. Flowers bisexual. Stamens more than 12:
- 4a. Anthers crowned by an elongated, \pm truncate connective. Endosperm convoluted ... 2. ANNONACEAE
- 4b. Anthers with connective not as above. Endosperm not convoluted:
- 5a. Sepals accrescent. Secondary veins parallel ... 29. DILLENIACEAE
- 5b. Sepals deciduous. Secondary veins not parallel:

- 6a. Herbs. Petals 5, 1-seriate ... 9. RANUNCULACEAE
- 6b. Trees or woody shrubs.
Petal more than 5, 2-4 seriate ... 1. MAGNOLIACEAE

Group B

- 1a. Perianth and stamens either borne on the edge of a rim or cup which itself inserted below superior ovary, or borne on top or side of inferior ovary:
 - 2a. Placentation free-central. Ovary partly inferior ... 23. PORTULACACEAE
 - 2b. Placentation otherwise. Ovary either completely superior or completely inferior:
 - 3a. Plants aquatic. Leaves peltate ... 7. NYMPHAEACEAE
 - 3b. Plants terrestrial. Leaves not peltate:
 - 4a. Stamens united into several rings or sheets ... 38. LECYTHIDACEAE
 - 4b. Stamens not as above:
 - 5a. Carpels superposed. Leaves not gland-dotted. Petals crumpled in bud ... 65. PUNICACEAE
 - 5b. Carpels side by side. Leaves gland-dotted. Petals not crumpled ... 64. MYRTACEAE
- 1b. Perianth and stamens borne independently below superior ovary:
 - 6a. Placentation axile, rarely parietal (e.g., *Feronia* of Rutaceae) and then leaves gland-dotted:
 - 7a. Leaves alternate:
 - 8a. Anthers opening by terminal pores. Ovary deeply lobed, borne on an enlarged disc or gynophore. ... 30. OCHNACEAE
 - 8b. Anthers opening by longitudinal slits. Characters of ovary not as above:
 - 9a. Inner whorl of perianth-segments bifid, nectar-secreting. Fruit a group of partly or fully coalescent follicles ... 9. RANUNCULACEAE

- 9b. Combination of characters otherwise:
- 10a. Leaves gland-dotted ... 87. RUTACEAE
- 10b. Leaves not gland-dotted:
- 11a. All or 2-3 of the sepals enlarged and wing-like in fruit.
Carpels 3 ... 31. DIPTEROCARPACEAE
- 11b. Sepals neither enlarged nor wing-like in fruit:
- 12a. Filaments free. Stipules deciduous ... 34. TILIACEAE
- 12b. Filaments united into a tube:
- 13a. Styles several, divided.
Stipules usually persistent.
Carpels 5 or more ... 37. MALVACEAE
- 13b. Styles 1, capitate or lobed.
Stipules usually deciduous.
Carpels 2-5:
- 14a. Stamens in 2 whorls, those of outer whorl usually sterile ... 35. STERCULIACEAE
- 14b. Stamens in several whorls, all fertile ... 36. BOMBACACEAE
- 7b. Leaves opposite ... 33. CLUSIACEAE
- 6b. Placentation marginal or parietal. Leaves not gland-dotted :
- 15a. Carpel 1 with marginal placentation.
Leaves bipinnate or modified into phyllodes ... 58. MIMOSACEAE
- 15b. Carpels 2 or more,
placentation parietal. Leaves not as above:
- 16a. Anthers opening by short pore-like slits.
Sepals 5. Seeds with cottony hairs ... 41. BIXACEAE
- 16b. Anthers opening by longitudinal slits.
Sepals 2, 3 or 4. Seeds without cottony hairs:
- 17a. Plants with yellow sap. Sepals 2 or 3, early deciduous. Ovary not borne on a stalk (gynophore) ... 11. PAPAVERACEAE
- 17b. Plants without sap. Sepals 4, persistent in flower. Ovary sometimes borne on gynophore ... 48. CAPPARACEAE

Group C

- 1a. Petals and stamens each numerous.
Stems succulent, mostly spiny. Leaves
usually absent, sometimes very reduced or falling early ... 20. CACTACEAE
- 1b. Petals and stamens each fewer than 10. Leaves
always present and well-developed:
- 2a. Anthers opening by terminal pores; filaments
usually geniculate, inflexed in bud: ... 67. MELASTOMATACEAE
- 2b. Anthers opening by longitudinal slits;
filaments neither geniculate nor inflexed in bud:
- 3a. Flowers mostly borne in umbels. Fruit
a schizocarp, made up of 2 mericarps ... 92. APIACEAE
- 3b. Flowers not in umbels. Fruit otherwise:
- 4a. Floating aquatic herbs. Leaf-petiole inflated ... 63. TRAPACEAE
- 4b. Terrestrial herbs, shrubs or trees;
rarely aquatic, then leaf-petiole not
inflated (e.g. *Ludwigia adscendens*
of Onagraceae):
- 5a. Herbs. Ovules numerous in each
cell; placentation axile ... 66. ONAGRACEAE
- 5b. Trees, or erect or climbing shrubs.
Ovules 1-5 in each cell,
erect or pendulous:
- 6a. Ovary 2-4-celled.
Petals cucullate, enclosing
the stamens. Leaves stipulate ... 76. RHAMNACEAE
- 6b. Ovary 1-celled. Petals not
cucullate; stamens free from
petals. Leaves exstipulate:
- 7a. Ovules 2-5. Fruit mostly
winged or angled ... 68. COMBRETACEAE
- 7b. Ovule solitary.
Fruit not as above ... 69. ALANGIACEAE

Group D

- 1a. Sepals, petals and stamens borne on a rim or cup being inserted below the ovary:
- 2a. Trees. Leaves 2 to 3-pinnate. Flowers zygomorphic. Functional stamens 5, of different length, alternating with 3-5 staminodes ... 50. MORINGACEAE
- 2b. Herbs or undershrubs. Leaves simple. Flowers actinomorphic. Stamens 5, x of same length; staminodes absent ... 44. TURNERACEAE
- 1b. Sepals, petals and stamens inserted individually below the ovary:
- 3a. Perianth zygomorphic:
- 4a. Gynoecium of a single carpel with marginal placentation :
- 5a. Corolla papilionaceous with descending imbricate aestivation; upper petals exterior ... 60. FABACEAE
- 5b. Corolla not papilionaceous with ascending imbricate aestivation; upper petals interior. ... 59. CAESALPINIACEAE
- 4b. Gynoecium of 2 or more carpels with parietal placentation:
- 6a. Petals and stamens each 5. Carpels 3. ... 42. VIOLACEAE
- 6b. Petals 4 and stamens 6. Carpels 2:
- 7a. Ovary usually borne on a gynophore. Stamens projecting beyond petals, not united into 2 bundles. Petals neither saccate nor spurred ... 48. CAPPARACEAE
- 7b. Ovary not on gynophore. Stamens not as above, united into 2 bundles of 3 each. Petals in 2 dissimilar pairs; one or both of outer petals saccate or spurred at base ... 12. FUMARIACEAE
- 3b. Perianth actinomorphic:

- 8a. Fruit a legume or lomentum. Carpel 1 with marginal placentation ... 58. MIMOSACEAE
- 8b. Fruit otherwise. Carpels 2-5, placentation parietal:
- 9a. Leaves with stalked glandular hairs having insect-trapping and digesting device ... 39. DROSERACEAE
- 9b. Leaves not as above:
- 10a. Climbers with tendrils. Ovary and stamens borne on androgynophore. Stamens 5, x of same length. Carpels 3. Fruit a berry, without replum. Corona present ... 45. PASSIFLORACEAE
- 10b. Herbs, or erect undershrubs, but never climbers. Ovary and stamens not borne on androgynophore. Stamens mostly 6, 4 larger and 2 shorter, rarely reduced to 2; carpels 2. Fruit a capsule, usually with a replum. Corona absent ... 49. BRASSICACEAE

Group E

- 1a. Perianth zygomorphic:
- 2a. Anthers cohering above the ovary like a cap. Sepals usually petaloid, the upper spurred ... 91. BALSAMINACEAE
- 2b. Anthers free. Sepals not as above:
- 3a. Stamens monadelphous; anthers opening by terminal pores. Petals adnate to the staminal tube. Ovary 2-locular ... 81. POLYGALACEAE
- 3b. Stamens free; anthers opening by longitudinal slits or by flaps. Petals free from stamens. Ovary 3-locular:
- 4a. Climbing herbs with tendrils. Leaves 2-ternate, not peltate. Dorsal sepal not spurred ... 82. SAPINDACEAE

- 4b. Suberect, trailing or decumbent herbs, without tendrils.
Leaves simple, peltate.
Dorsal sepal spurred ... 90. TROPAEOLACEAE
- 1b. Perianth actinomorphic:
- 5a. Placentation free-central ... 26. CARYOPHYLLACEAE
- 5b. Placentation axile, basal or apical:
- 6a. Sepals, petals and stamens borne on a rim, cup or tube being inserted below the ovary:
- 7a. Calyx-tube not ribbed. Seeds axillate ... 74. CELASTRACEAE
- 7b. Calyx-tube prominently ribbed.
Seeds exarillate ... 62. LYTHRACEAE
- 6b. Sepals, petals and stamens borne individually below the ovary:
- 8a. Leaves gland-dotted. Flowers with well-developed disc. Stamens twice as many as petals, or numerous ... 87. RUTACEAE
- 8b. Leaves not gland-dotted:
- 9a. Flowers with a well-developed disc, mostly nectar secreting below and /or around ovary:
- 10a. Stamens as many as petals and on same radii as them:
- 11a. Climbers with tendrils.
Stamens free ... 78. VITACEAE
- 11b. Erect shrubs without tendrils.
Filaments of stamens united at base ... 77. LEEACEAE
- 10b. Stamens more or fewer than petals; if as many then not on same radii as them:
- 12a. Resinous trees or shrubs:
- 13a. Ovules 2 in each cell of ovary ... 83. BURSERACEAE

- 13b. Ovule 1 in each cell of ovary ... 84. ANACARDIACEAE
- 12b. Non-resinous herbs, shrubs or trees:
- 14a. Plants polygamous or polygamo-dioecious:
- 15a. Fruit of 1-5 single-seeded samaras. Leaves imparipinnate, leaflets oblique ... 85. SIMAROUBACEAE
- 15b. Fruit variable, but never of samaras. Leaves paripinnate or simple ... 82. SAPINDACEAE
- 14b. Plants with hermaphrodite flowers:
- 16a. Stamens inserted from the margin or below margin of the disc:
- 17a. Leaves scale-like, sheathing and stem-clasping. Ovules numerous, basal. Seeds exarillate ... 43. TAMARICACEAE
- 17b. Leaves normally developed, neither sheathing nor stem-clasping. Ovules 2 in each cell, placentation axile. Seeds usually arillate ... 74. CELASTRACEAE
- 16b. Stamens inserted below the base of the disc. Seeds not arillate:
- 18a. Leaves compound:
- 19a. Leaves alternate, exstipulate. Filaments of stamens mostly united into a tube. (except *Cedrela*) ... 86. MELIACEAE
- 19b. Leaves opposite, stipulate. Filaments of stamens free ... 88. ZYGOPHYLLACEAE
- 18b. Leaves simple, alternate, exstipulate. Filaments of stamens free ... 70. OLACACEAE
- 9b. Disc absent, inconspicuous, or of glands adnate to and nectar-secreting outside the staminal ring, rarely nectar-secreting glands outside disc on sepals:

20a. Herbs:

21a. Leaves simple, entire or serrate but never lobed

22a. Ovary 6-10 celled by development of 3-5 secondary septa between original septa during maturity of flowers; ovules 1 to 2 in each cell

... 79. LINACEAE

22b. Ovary originally 3-5-celled; secondary septa absent; ovules numerous

... ELATINACEAE

21b. Leaves digitately or pinnately compound. Ovary 5-celled. Ovules numerous

... 89. OXALIDACEAE

20b. Trees, shrubs or woody climbers :

23a. Leaves alternate, imparipinnate. Fruit an indehiscent berry. Sepals without nectar-secreting appendages. Petals neither clawed nor fringed or toothed

... 89. OXALIDACEAE

23b. Leaves opposite, simple. Fruit of 2-3-winged samaras. Sepals with nectar secreting appendages. Petals clawed, fringed or toothed

... 80. MALPIGHIACEAE

Group F

1a. Inflorescence a capitulum, usually subtended by an involucre of bracts. Ovary 1-locular, 1-ovuled. Calyx usually modified into pappus, or reduced or scale-like. Fruit a cypsela (usually termed an achene)

... 114. ASTERACEAE

1b. Inflorescence not as above. Ovary 2-10-locular, each locule 1-many-ovuled. Calyx not modified as above. Fruit not a cypsela:

2a. Climbers with tendrils and unisexual flowers. Placentation parietal. Fruit berry-like (usually termed a pepo)

... 47. CUCURBITACEAE

2b. Combination of characters not as above:

3a. Stamens many, several-seriate, adnate to corolla-tube. Leaves exstipulate

... 53. SYMPLOCACEAE

3b. Stamens 4-6, 1-seriate:

- 4a. Stamens attached to the corolla-tube, generally well above the base. Leaves stipulate (inter-intra-petiolar), usually opposite or whorled ... 113. RUBIACEAE
- 4b. Stamens free from the corolla or attached at base of the tube. Leaves exstipulate, nearly always alternate:
- 5a. Style glabrous, with a solitary stigma. Fruit a circumscissile capsule. Plants apparently without a latex system ... 111. SPHENOCLEACEAE
- 5b. Style with well developed collecting hairs below the usually separate stigmas. Fruit usually a capsule, dehiscing by valves. Plants with a well-developed latex system ... 112. CAMPANULACEAE

Group G

- 1a. Stamens 2, Corolla-lobes imbricate or valvate. Ovules usually 2, rarely 3-4 in each cell. Leaves exstipulate ... 105. OLEACEAE
- 1b. Stamens more than 2, rarely (e.g. *Hoppea* of Gentianaceae) perfect stamen 1, with 3 rudimentary staminodes:
- 2a. Carpels several, free. Leaves succulent. ... 56. CRASSULACEAE
- 2b. Carpels united, or if ovaries x free, then styles united:
- 3a. Stamens more than the number of corolla-lobes:
- 4a. Plants dioecious or polygamous. Carpel more than one, placentation axile or parietal. Fruit a berry. Leaves simple:
- 5a. Soft trees or shrubs. Leaves long-petioled, palmately-lobed; ovules numerous, placentation parietal. ... 46. CARICACEAE
- 5b. Woody trees or shrubs. Leaves short-petioled, entire. Ovules 1 or 2 in each cell, placentation axile ... 52. Ebenaceae

- 4b. Plants with all hermaphrodite flowers. Carpel 1, with marginal placentation. Fruit a legume or lomentum. Leaves bipinnate or replaced by phyllodes ... 58. MIMOSACEAE
- 3b. Stamens as many as corolla-lobes:
- 6a. Placentation free-central:
- 7a. Ovary 1-ovuled. Styles or style-branches 5 ... 28. PLUMBAGINACEAE
- 7b. Ovary few-to many-ovuled. Style undivided:
- 8a. Fruit a capsule. Herbs ... 55. PRIMULACEAE
- 8b. Fruit a berry. Trees or shrubs ... 54. MYRSINACEAE
- 6b. Placentation otherwise:
- 9a. Gynoecium 10-12-carpelled. Stamens opposite to corolla-lobes ... 51. SAPOTACEAE
- 9b. Gynoecium 2-5-carpelled. Stamens alternate with corolla-lobes:
- 10a. Leaves opposite, or whorled, or if alternate (some Apocynaceae), then carpels free and only styles united or if carpels united then with a rim of hairy scales in corolla-throat hiding the stamens:
- 11a. Milky sap usually present. Fruit usually of 2, almost free follicles and seeds usually with silky appendages:
- 12a. Pollen granular. Corona absent ... 95. APOCYNACEAE
- 12b. Pollens usually in Pollinia. Corona usually present ... 96. ASCLEPIADACEAE
- 11b. Milky sap absent. Fruit a capsule or flesh berry. Seeds without silky appendages:

- 13a. Leaves jointed at base by interpetiolar stipules or raised horizontal lines. Corolla-lobes valvate or reduplicate in bud. Placentation axile ... 93. LOGANIACEAE
- 13b. Leaves exstipulate. Corolla-lobes twisted in bud. Placentation parietal ... 94. GENTIANACEAE
- 10b. Leaves alternate. Carpels never free, stamens never hidden by a ring of scales:
- 14a. Ovules numerous in each carpel:
- 15a. Plants aquatic with floating leaves. Placentation parietal ... 100. MENYANTHACEAE
- 15b. Plants terrestrial, sometimes of wet places. Placentation axile:
- 16a. Corolla-lobes folded edge to edge or each overlapping one other and overlapped by one other in bud. Style 1, entire. Septum of ovary oblique ... 97. SOLANACEAE
- 16b. Corolla-lobes imbricate in bud. Styles 2, distinct. Septum of ovary straight ... 101. HYDROPHYLLACEAE
- 14b. Ovules 1 to 2 in each carpel:
- 17a. Sepals free. Fruit a 2-4-valved, or circumscissile or irregularly rupturing capsule, rarely berry. Twining herbs or dwarf shrubs:
- 18a. Rootless, leafless, yellow, thread-like twining parasites. Corolla-lobes imbricate in bud. Staminodes 5, scale-like, alternating with stamens, present at base of corolla ... 99. CUSCUTACEAE
- 18b. Rooted, leafy, green non-parasites. Corolla-lobes induplicate-valvate in bud. Staminodes absent ... 98. CONVOLVULACEAE
- 17b. Sepals united. Fruit of 1-4-seeded drupe, or of up to 4, 1-seeded, indehiscent nutlets. Herbs, shrubs or trees ... 102. BORAGINACEAE

Group H

- 1a. Placentation axile. Ovules 4 or many:
- 2a. Ovules 4, if many then in vertical rows in each cell:
- 3a. Fruit a capsule:
- 4a. Leaves all opposite. Pedicels without swollen glands at base. Capsule usually opening elastically. Seeds usually supported on retinacula ... 107. ACANTHACEAE
- 4b. Upper leaves alternate. Pedicel with swollen glands at base. Capsule not elastic. Seeds not supported on retinacula ... 108. PEDALIACEAE
- 3b. Fruit a drupe or a berry or of 4-nutlets:
- 5a. Style gynobasic. Fruit of 4, one-seeded nutlets. Calyx and corolla usually 2-lipped ... 104. LAMIACEAE
- 5b. Style terminal. Fruit a drupe or berry. Calyx usually actinomorphic; corolla 2-lipped or subequally 5-lobed ... 103. VERBENACEAE
- 2b. Ovules numerous but not in vertical rows in each cell:
- 6a. Seeds winged. Trees, shrubs or climbers with opposite pinnate, digitate or simple leaves. Flowers large, usually showy ... 109. BIGNONIACEAE
- 6b. Seeds not winged. Herbs or shrubs with simple, opposite or alternate leaves. Flowers small, not showy ... 106. SCROPHULARIACEAE
- 1b. Placentation free-central or parietal:
- 7a. Insectivorous herbs of water or moist places. Leaves alternate or in basal rosettes, usually dimorphic with finely dissected submerged leaves bearing bladders. Placentation free-central. Corolla spurred at base ... 110. LENTIBULARIACEAE

- 7b. Herbs, non-insectivorous and usually of terrestrial places. Placentation parietal. Corolla not spurred. Leaves opposite, becoming alternate towards branch-ends, all alike:
- 8a. Fruit with a long beak separating into two lateral horns. Anther-cells divaricate. Corolla-tube ventricose and oblique, somewhat bilabiate ... 108. PEDALIACEAE
- 8b. Fruit without a horned beak as above. Anther-cells parallel. Corolla-tube not, as above ... 94. GENTIANACEAE

Group I

- 1a. Ovary 4-6-locular; ovules many. Non-parasites ... 5. ARISTOLOCHIACEAE
- 1b. Ovary 1-locular; ovule 1-3. Partial parasites:
- 2a. Stem-parasites. Ovule 1, erect. Perianth usually 1-seriate, if 2-seriate, then inner whorl large, coloured, outer minute:
- 3a. Flowers bisexual. Anthers dehiscing longitudinally. Stigma on a distinct style ... 72. LORANTHACEAE
- 3b. Flowers unisexual. Anthers dehiscing by pores. Stigma sessile ... 73. VISCACEAE
- 2b. Root-parasites. Ovules 1-3, pendulous. Perianth 1-seriate, calycine or corolline ... 71. SANTALACEAE

Group J

- 1a. Submerged aquatic herbs with dichotomous branches and whorled leaves divided into thread-like segments ... 8. CERATOPHYLLACEAE
- 1b. Terrestrial plants. Branches and leaves not as above:
- 2a. Stems jointed. Leaves reduced to whorl of scales ... 17. CASUARINACEAE
- 2b. Stems not jointed. Leaves not as above:

- 3a. Placentation basal or pendulous (apical):
- 4a. Placentation basal:
- 5a. Flowers unisexual. Plants usually with stinging or rough hairs. Gynoecium of one carpel. Fruit achene or drupe ... 16. URTICACEAE
- 5b. Flowers bisexual. Stinging or rough hairs absent:
- 6a. Stipule ochreate, rarely reduced or obsolete. Gynoecium of 1 carpel, ovule 1. Fruit a nut ... 27. POLYGONACEAE
- 6b. Stipule not ochreate:
- 7a. Perianth absent. Flowers sunk in fleshy spikes ... 4. PIPERACEAE
- 7b. Perianth present. Flowers not as above:
- 8a. Perianth petaloid. Gynoecium of 1 or 2 carpels:
- 9a. Fruit a circumscissile capsule. Ovules more than 1. Leaves stipulate. Subsucculent herbs ... 19. AIZOACEAE
- 9b. Fruit not a capsule. Ovule 1. Leaves exstipulate. Herbs or climbing shrubs but never subsucculent ... 18. NYCTAGINACEAE
- 8b. Perianth not petaloid, or sometimes absent. Gynoecium of usually 2, or more carpels. Ovules 1 or few:
- 10a. Perianth green, membranous or absent:

- 11a. Twining herbs. Bracteoles connate in a cup and adnate to the base of the perianth. Embryo spiral ... 24. BASILLACEAE
- 11b. Prostrate or erect herbs, but never twining. Bracteoles absent, or if present then free from the perianth. Embryo annular ... 21. CHENOPODIACEAE
- 10b. Perianth translucent and papery. Filaments united at base. Flowers bracteate and bracteolate ... 22. AMARANTHACEAE
- 4b. Placentation apical:
- 12a. Leaves glandular-punctate. Perianth-segments 6, united. Anthers opening by valves ... 3. LAURACEAE
- 12b. Leaves not glandular-punctate. Perianth segments variable. Anthers not opening by valves:
- 13a. Leaves with oblique base. Ovary 1-locular. Fruit a samara or drupe ... 13. ULMACEAE
- 13b. Leaves not oblique at base. Ovary 1-locular. Fruit a syncarp or an achene:
- 14a. Usually woody plants with milky sap. Perianth in male flowers of 2-6 free segments. Fruit usually a syncarp ... 15. MORACEAE
- 14b. Herbs or undershrubs without milky sap. Perianth in male flowers of 5 united segments. Fruit an achene ... 14. CANNABACEAE
- 3b. Placentation parietal, marginal or axile:
- 15a. Placentation parietal or marginal:
- 16a. Placentation parietal. Carpels more than 2. Fruit a berry or capsule ... 40. FLACOURTIACEAE
- 16b. Placentation marginal. Carpel 1. Fruit a follicle ... 61. PROTEACEAE

15b. Placentation axile:

17a. Ovules many in each cell. Flowers bisexual. Fruit a loculicidal capsule ... 25. MOLLUGINACEAE

17b. Ovules 1 or 2 in each cell. Flowers mostly unisexual. Fruit usually a schizocarp, or a septicidal capsule, rarely drupaceous ... 75. EUPHORBIACEAE

Group K

1a. Trees, shrubs or prickly scramblers with large pleated, palmately or pinnately lobed or divided leaves. Flowers \pm sessile, in fleshy spikes or panicles with large spathes ... 120. ARECACEAE

1b. Combination of characters not as above:

2a. Plants minute, free-floating aquatics, not differentiated into stems and leaves. Perianth absent ... 123. LEMNACEAE

2b. Plants various, rarely floating aquatics (e.g. *Pistia* of Araceae), differentiated into stems and leaves.
Perianth present or absent:

3a. Perianth entirely hyaline or papery, or reduced to bristles, hairs, scales or lodicules, or absent:

4a. Flowers minute, in axil(s) of scaly bract (s) and arranged in spikelets:

5a. Leaves alternate, in 2 ranks on a stem having mostly hollow, and cylindrical internodes. Leaf-sheaths open. Spikelets 2-sided; each flower mostly subtended by 2 sterile bracts (glumes) and usually enclosed by a lower lemma and upper palea. Perianth of mostly 2-3 lodicules, or absent. Styles generally 2, feathery ... 129. POACEAE

5b. Leaves arranged on 3 sides of mostly 3-angled stems having usually solid internodes. Leaf-sheaths closed. Spikelets 2-sided or cylindrical; each flower subtended only by a glume. Perianth of several bristles, hairs or scales, or absent. Style 1 with 2 to 3 papillose stigmas 128. CYPERACEAE

- 4b. Flowers arranged in heads, superposed spikes, spadices, corymbs, panicles or cymes, but never in spikelets:
- 6a. Dioecious trees or shrubs supported by stilt-roots. Leaves stiffly leathery, sharply toothed. Fruit a syncarp, usually woody ... 121. PANDANACEAE
- 6b. Combination of characters not as above:
- 7a. Inflorescence a simple spadix subtended by a spathe. Leaves usually net-veined ... 122. ARACEAE
- 7b. Inflorescence not a spadix. Leaves with parallel veins:
- 8a. Flowers unisexual, borne in heads surrounded by an involucre of bracts. Perianth in 2 series, usually greyish-white ... 126. ERIOCAULACEAE
- 8b. Combination of characters not as above:
- 9a. Flowers bisexual. Inflorescence a cyme, panicle, corymb or head. Perianth-segments 6, hyaline or brownish. Ovary with 3 to many ovules on axile or parietal placentation ... 127. JUNCACEAE
- 9b. Flowers unisexual. Inflorescence of 2 unisexual, dense, superimposed spikes. Perianth-segments a few threads or scales. Ovary with 1 pendulous ovule ... 130. TYPHACEAE
- 3b. Perianth well-developed, neither hyaline nor papery:
- 10a. Carpels free or slightly united at base:
- 11a. Inflorescence a spike. Perianth-segments 1 to 4:
- 12a. Stamens 6 or more. Carpels 3-6. Perianth-segments 1 to 3, petaloid, membranous ... 118. APONOGETONACEAE

- 12b. Stamens 4. Carpels 4. Perianth-segments 4, green, herbaceous ... 119. POTAMOGETONACEAE
- 11b. Inflorescence not a spike. Perianth-segments 6:
- 13a. Ovules many; placentation diffuse-parietal. Fruit of 6-7 follicles ... 115. BUTOMACEAE
- 13b. Ovule solitary, basal. Fruit of several achenes ... 116. ALISMATACEAE
- 10b. Carpels united for most of their length, or carpel solitary:
- 14a. Perianth-segements of both outer and inner series similar and petal-like:
- 15a. Inflorescence a raceme subtended by a spathe-like leaf sheath. Plants aquatic ... 137. PONTEDERIACEAE
- 15b. Inflorescence not subtended by leaf-sheath; if so (some Liliaceae) then the inflorescence umbellate. Plants terrestrial:
- 16a. Leaves mostly fibrous, borne in a dense tuft either at base or apex of the stem. Flowers more than 1 to each bract ... 139. AGAVACEAE
- 16b. Leaves not fibrous, basal or on the stem. Flowers usually 1 to each bract:
- 17a. Usually armed, dioecious climbers bearing 2 tendrils from leaf-stalks. Leaves broad, net-veined ... 140. SMILACACEAE
- 17b. Unarmed herbs, rarely (e.g. *Gloriosa*) climbing or scrambling by means of coiled tendrillar leaf-tips. Leaves not broad as above, parallel-veined, sometimes reduced to scales when cladodes present ... 138. LILIACEAE

- 14b. Perianth-segments of outer and inner series conspicuously different, the former usually sepal-like, and the latter petal-like:
- 18a. Flowers borne usually in cymes or panicles, or rarely solitary. Sepals equal, not enveloping the corolla. Ovary 2-3-celled; placentation axile ... 125. COMMELINACEAE
- 18b. Flowers in heads. Sepals unequal, lateral ones navicular with entire, dentate or ciliate crest, median member spatheiform and cap-shaped enveloping the corolla. Ovary 1-celled, placentation parietal ... 124. XYRIDACEAE

Group L

- 1a. Flowers actinomorphic or weakly zygomorphic. Stamens 6, 4 or 3, or rarely many:
- 2a. Unisexual climbers with entire or palmately lobed or divided leaves having cordate base. Root-stock tuberous or woody ... 141. DIOSCOREACEAE
- 2b. Combination of characters not as above:
- 3a. Plants rooted or floating aquatics. Placentation diffuse-parietal ... 117. HYDROCHARITACEAE
- 3b. Plants terrestrial, marshy or epiphytic. Placentation axile:
- 4a. Outer perianth-segments sepaloid and inner petaloid. Bracts overlapping and conspicuously coloured ... 131. BROMELIACEAE
- 4b. Perianth-segments all alike. Bracts not as above:
- 5a. Mostly soft-leaved herbs from a bulb or rhizome of corm. ... 138. LILIACEAE
- 5b. Mostly coarse, often strubby or arborescent plants with firm, usually perennal leaves ... 139. AGAVACEAE

- 1b. Flowers strongly zygomorphic or asymmetric.
Stamens mostly 5, 2 or 1:
- 6a. Ovary 1-locular with parietal placentation.
Fertile stamens 2 or 1, united with the
style to form a column. Pollen usually
borne in pollinia. Ovary spirally twisted ... 142. ORCHIDACEAE
- 6b. Ovary 3-locular with axile placentation. Fertile
stamens 5 or 1, rarely 6, not united with the style.
Pollen granular. Ovary not spirally twisted:
- 7a. Fertile stamens 5, or rarely 6.
Staminode absent, or if present, then
not petaloid:
- 8a. Leaves and bracts spirally arranged.
Flowers unisexual. Fruit a berry ... 133. MUSACEAE
- 8b. Leaves and bracts distichously
arranged. Flowers bisexual.
Fruit a capsule ... 132. STRELITZIACEAE
- 7b. Fertile stamen 1, others transformed
into petaloid staminodes:
- 9a. Fertile stamen with normal
structure, not petal-like. Style
filiform, enveloped in channel
of filament of fertile stamen,
with the stigma projecting beyond
the anther cells:
- 10a. Leaves and bracts
distichously arranged;
sheaths open. Plants aromatic,
with abundant oil cells ... 134. ZINGIBERACEAE
- 10b. Leaves and bracts spirally
arranged; sheaths closed.
Plants without oil cells ... 135. COSTACEAE
- 9b. Fertile stamen in part petal-like
and with only 1 pollen bearing
anther-lobe. Style petaloid and
usually winged, free from the anther ... 136. CANNACEAE

SYSTEMATIC ENUMERATION

1. MAGNOLIACEAE.

MICHELIA L.

Michelia champaca L., Sp. Pl. 536. 1753; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 42. 1872; Prain, Bengal Fl. 1: 197. 1903; Haines, For. Fl. Chota Nagpur 141. 1910 & Bot. Bihar & Orissa pt. 2: 8. 1921.

Local name: Champa.

Evergreen tree, to 25 m tall with dark grey bark. Stipules convolute, leaving a circular scar. Leaves ovate-lanceolate, (sub)cuneate at base, acuminate at apex, entire, dark green and shining above, enveloped in stipules in bud, 9-18 cm x 3-7 cm, with 8-14 pairs of secondary veins; petiole 2.5-3.5 cm long. Flowers to 5 cm in diam., axillary, solitary; peduncle to 2.5 cm long, stout; bracts 2, silky, caducous, leaving an annual scar below flower. Perianth-lobes 9-15, subequal, oblong, deep yellow, 2-3.5 cm long, those of inner series gradually narrower. Stamens many; anthers linear, apiculate. Carpels many, spiral on an elongated axis, ovoid, each with 2 or more ovules. Follicle-cluster 7-10 cm across; fruitlets warty, to 2 cm across, dehiscent along dorsal suture. Seeds scarlet, subglobose to 1 cm across.

Fl. : Apr.-May. *Fr.* : June-July.

Habitat: Common; planted in lawns and gardens for its fragrant yellowish flowers; also inhabiting in forests, etc.

Distribution : Planted throughout India but wild in the forests of Temperate Himalayas. Nepal, Myanmar, Thailand, Indo-China, S. Yunnan, S.E. Asia.

Specimens examined : Hazaribagh, 1638; Koderma, 1993.

Uses: Bark is employed as an abortifacient for 2-3 months old pregnancy. The root is made into paste with 21 fruits of black pepper and given as an oral contraceptive by local people after menstruation for 3 days. Seeds and fruits are used for healing cracks in feet.

2. ANNONACEAE

Key to the Genera

- 1a. Stamens loosely imbricate; connectives narrow, not concealing the anther-cells ... 3. MILIUSA
- 1b. Stamens closely packed; connectives broad, concealing the anther-cells:
- 2a. Inner petals much smaller than outer ones, or reduced to scales, or absent ... 1. ANNONA
- 2b. Inner petals subequal to or slightly larger than outer petals:
- 3a. Peduncles hooded. Petals connivent at concave base ... 2. ARTABOTRYX
- 3b. Peduncles not hooded. Petals flat, spreading from base ... 4. POLYALTHEA

1. ANNONA

Key to the Species

- 1a. Fruits with rounded, convex areoles separated by deep grooves. Pulp white ... 2. *A. squamosa*
- 1b. Fruits with flat, 5-cornered areoles separated by a reticulation of slightly raised ridges. Pulp yellow ... 1. *A. reticulata*

1. *Annona reticulata* L., Sp. Pl. 537. 1755; Baker in Hook. f., Fl. Brit. India 1: 78. 1872; Prain, Beng. Pl. 1: 206. 1903; Haines, For. Fl. Chota Nagpur 145. 1910 & Bot. Bihar & Orissa pt. 2: 10. 1921.

Local names : Anta, Ramphal.

Small tree, to 8 m tall. Branches greyish-sericeous when young, glabrate with age. Leaves oblong-lanceolate, or elliptic, membranous, cuneate or rounded at base, acuminate at apex, minutely pellucido-punctate, glabrous on upper surface, with a few scattered hairs on lower, 10-17 cm x 3-5 cm; petioles 0.8-2 cm long. Flowers green, several from internodal

cymes, rarely leaf-opposed. pedicels 1.2-1.5 cm long, elongating and becoming woody in fruit; bracts inserted at base or middle of pedicel. Sepals small, broadly ovate, acute, tomentose, 0.8-1 cm long. Petals puberulous on both surfaces; outer ones 30-35mm x 5-6 mm; inner ones minute, shorter than sepals. Stamens 1-1.3 cm long. Fruit subglobose or somewhat heart-shaped, areolate, smooth, yellow or yellowish-red when ripe, light green when young, 10-15 cm in diam; areoles flat, separated by a reticulation of slightly raised ridges. Seeds smooth, blackish-brown.

Fl. & Fr. : Sept.-Dec.

Ecology : Common; mostly cultivated, also run wild in jungles near village surroundings.

Distribution : Throughout India; native of West Indies, widely cultivated in the Tropics.

Specimens examined : Hazaribagh, 125; Ramgarh, 1133.

Uses : Ripe fruits are edible. Unripe fruits are anthelmintic and also used in curing biliousness and diseases of blood. Leaves and seeds are insecticidal.

2. *Annona squamosa* L., Sp. Pl. 537. 1755; Baker in Hook. f., Fl. Brit. India 1: 78. 1872; Prain, Beng. Pl. 1: 206. 1903; Haines, For. Fl. Chota Nagpur 145. 1910 & Bot. Bihar & Orissa pt. 2: 9. 1921.

Local name : Sharipha

Large shrub to small tree, to 6 m tall. Branches greyish to whitish-pubescent. Leaves oblong-lanceolate or elliptic, thin-coriaceous, cuneate at base, obtuse or rounded at apex, entire, glabrescent, glaucous beneath, 4-8 cm x 2-4 cm; petiole 1.2-1.5 cm long. Flowers solitary or few in leaf-opposed cymes; pedicels 1.5-2 cm long, bracteate. Sepals triangular, minute, pubescent, 2-3 mm long. Petals greenish-yellow, pubescent on both surfaces; outer ones thick, 2-3 cm long; inner ones absent or when present minute, ovate, about as long as stamens. Carpels distinct in flower. Fruit globose, ovoid, or conical, 5-9 cm across, glaucous, greenish-yellow; areoles rounded, convex, separated by deep grooves. Seeds brownish-black, smooth, to 1.4 x 0.8 cm.

Fl. : Mar.-Apr. *Fr.* : July - Sept.

Ecology: Common; cultivated in gardens, also naturalised in waste places and elsewhere.

Distribution: Almost throughout India. Native of West Indies, but spread through cultivation all over the Tropics.

Specimens examined : Hazaribagh, 181; Simaria, 1103.

Uses : Roots and leaves are used medicinally and as valuable insecticide. Ripe fruits are edible.

2. ARTABOTRYS R. Br.

Artabotrys hexapetalus (L.f.) Bhandari in Baileya 12: 149. 1965; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5: 51. 1985. *Annona hexapetala* L. f., Suppl. pl. 270. 1781.

A. odoratissimus R. Br., Bot. Reg. 5, t. 423. 1820; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 54. 1872; Prain, Bengal Pl. 1: 202. 1903; Haines, For. Fl. Chota Nagpur 144. 1910 & Bot. Bihar & Orissa pt. 2: 10. 1921. *Uvaria odoratissima* (R. Br.) Roxb., Fl. Ind. 2: 666. 1832.

A. uncinatus (Lam.) Merr. in Philipp. J. Sci. 7: 234. 1912; Das in Bull. Bot. Surv. India 5: 40. 1965.

Local name: Champa.

Climbing shrub, to 6 m tall. Leaves oblong-lanceolate, cuneate at base, shortly acuminate at apex, entire or undulate at margin, glabrous, glossy above, 7-15 cm x 2.5-4 cm; petioles 0.6-1 cm long. Flowers solitary or in pairs, fragrant, 1.6-2 x 3-3.5 cm long; peduncle to 1.5 cm long, curved and hooked; pedicels 1-1.2 cm long. Sepals 6-7 mm long, connate below, ovate, acute, recurved at tips, pubescent. Petals yellow, lanceolate, saccate or concave below, clothed with appressed silky hairs, 20-25 mm x 5-7mm. Torus concave or flat. Carpels ovate-oblong, glabrous. Fruitlets 14-20 in a cluster, obovoid, glabrous, apiculate, 1.5-3 cm long. Seeds solitary, oblong, deeply grooved on one side, pale brown, 1.2-2 cm long.

Fl. : Apr.-June. *Fr.* : Aug.-Oct.

Ecology: Common; planted in gardens; also in outskirts of forests.

Distribution : Throughout India. Native of Southern Deccan Peninsula and Sri Lanka; also distributed in Java and S. China.

Specimen examined : Hazaribagh, 231.

Uses : Leaves possess an antifertility principle. Flowers are used for making a stimulating tea-like beverage. An essential oil used in perfumery is extracted.

3. MILIUSA Leschen. ex DC.

Milusa tomentosa (Roxb.) Sinclair in Gard. Bull. Singapore 14: 378. 1955; Das in Bull. Bot. Surv. India 5: 46. 1963; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 44. 1985. *Uvaria tomentosa* Roxb., Pl. Corom. 1: 31, t. 35. 1795.

Saccopetalum tomentosum (Roxb.) Hook. f. & Thomson, Fl. Ind. 152. 1855 & in Hook. f., Fl. Brit. Ind. 1 : 88. 1872; Prain, Bengal Pl. 1: 200. 1903; Haines, For. Fl. Chota Nagpur 146. 1910 & Bot. Bihar & Orissa pt. 2 : 14. 1921.

Local name : Kirua.

Small to moderate-sized tree, to 25 cm tall. Young branches densely grey-pubescent. Leaves membranous, ovate-oblong, obtuse or rounded at base and shortly decurrent along petiole, obtuse or short-acuminate at apex, entire, tomentose above, woolly below, 7-15 cm x 4-7 cm; petiole to 6 mm long. Flowers ca. 1.5 cm across, axillary, solitary or in fascicles; pedicels slender, 3-6 cm long. Sepals ovate, minute, 4-5 mm long, woolly. Petals dark-purple inside; outer ones linear-lanceolate, 5-6 mm long; inner ones broadly ovate, obtuse, 12-15 mm x 4-5 mm, pubescent on both surfaces. Torus convex, woolly. Carpels tomentose, containing several ovules. Fruitlets to 20, globose, violet, long-stipitate, pubescent, 1.2-2 cm in diam; stalk to 2.5 cm long. Seeds to 12 x 8 mm, greyish-brown.

Fl. : May-June. *Fr.* : June-July.

Ecology : Common; in dry forests.

Distribution : India : Foot hills of Himalaya, Uttar Pradesh, Bihar, Orissa and Deccan Peninsula. Sri Lanka, Nepal.

Specimens examined : Pratappur, 900; National Park, 2050.

Uses : Wood is used for building huts and cattle sheds; also used in different carpentary works. Fruits are edible. Leaves are lopped for fodder.

4. POLYALTHIA Blume

Polyalthia longifolia (Sonn.) Thw., Enum. Pl. Zeyl. 398. 1864; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 62.1872; Prain, Bengal Pl. 1: 204. 1903; Haines, For. Fl. Chota Nagpur 143. 1910 & Bot. Bihar & Orissa pt. 2: 12. 1921; *Uvaria longifolia* Sonn., Voy. Ind. 2: 233, t. 131. 1782;

Local names: Deodar, Debdar.

Evergreen tree, to 20 m tall. Leaves narrow-lanceolate, subacute or rounded at base, tapering gradually into a long-acuminate apex, membranous, strongly undulate, shining, glabrous at maturity, 7-25 cm x 2-4 cm; petioles 5-8 mm long. Flowers 2.5-3.5 cm across, yellowish-green, many in axillary, raceme-or umbel-like inflorescences; pedicels slender, 2.5-4 cm long; bracts near the middle of pedicel, deciduous, to 1.5 mm long, pubescent. Sepals 3-4 mm long, triangular, pubescent, reflexed at tip. Petals linear-lanceolate, long tapering to apex, spreading, 8-15 mm long. Stamens ca. 1 mm long. Carpels few, each with one ovule, pubescent at apex; stigma sessile. Fruitlets 4-8, roundish-ovoid, 2-2.5 cm, purple, glabrous, stipitate; stalk 1-1.2 cm long. Seed 1, orbicular-ovoid, 1.2-1.8 cm long, pale brown, longitudinally grooved, shining.

Fl. & Fr. : Mar.-Apr.

Ecology : Common; planted in gardens, parks and along roadsides, in forests of drier zones, etc.

Distribution : Throughout India. Native of Sri Lanka.

Specimens examined : Hazaribagh, 109; National Park, 391.

Uses : Wood is used for making boxes; also suitable for packing-cases, pencils and matches.

3. LAURACEAE

LITSEA Lam., *nom. cons.*

Key to the Species

- 1a. Perianth-segments 0, or sometimes 3 ... 1. *L. glutinosa*
 1b. Perianth-segments 5-6 ... 2. *L. monopetala*

1. *Litsea glutinosa* (Lour.) C.B. Robins. in Philip. J. Sci. Bot. 6: 321. 1911; Kosterm. in Reinwardtia 7:505.1969. *Sebifera glutinosa* Lour., Fl. Cochinch. 638. 1790.

L. sebifera Pers., Syn. 2 : 4. 1807; Hook. f. in Hook. f., Fl. Brit. India 5 : 157. 1886; Prain, Bengal Pl. 2: 902. 1903; Haines, For. Fl. Chota Nagpur 153. 1910 & Bot. Bihar & Orissa pt. 5:793. 1924.

Local names : Maida, Lakri.

Tree, 5-15 m tall; apices of stem soft-pubescent. Leaves spirally arranged, coriaceous, elliptic-oblong or obovate, cuneate or rounded at base, acute or acuminate at apex, glabrous above, pilose beneath, pellucid-dotted, 10-30 cm x 3-13 cm; lateral veins 6-11 pairs; prominent beneath; petioles 1.2-3.5 cm long. Involucres of 4-6 bracts, arranged in umbel-like racemes, canescent, 6-13-flowered; peduncle 0.8-2.5 cm long; stalks of involucres 0.5-1 cm long. Tepals usually 0 or sometimes 3. Stamens and staminodes 9-15, pilose; glands long-stalked. Berry globose, black or dark-brown, 0.8-1 cm in diam.; fruiting pedicels obconical, 5-6 mm long.

Fl. : May-July. *Fr.* : Oct.-Dec.

Ecology : Common; along valleys of low hills, roadsides, banks of streams, rivers, etc.

Distribution : India : Punjab, lower Himalaya, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Meghalaya, Orissa, Deccan Peninsula. China, Myanmar, Sri Lanka, Java, Malesia and Australia.

Specimen examined : Pratappur, 596.

Uses : Wood is used for house-building, furniture, packing-cases and agricultural implements. Mucilaginous bark is used in diarrhoea and dysentery. Leaves and flowers in poultice are employed for bruises and wounds. Seeds yield a fat which is used for making candles and soap.

2. *Litsea monopetala* (Roxb.) Pers., Syn. 2: 4. 1806; Kosterm. in Nasir & Ali, Fl. W. Pakistan 118: 4. 1978. *Tetranthera monopetala* Roxb., Pl. Corom. 2: 26, t. 148. 1798.

L. polyantha Juss. in Ann. Mus. Hist. Nat. Paris 6: 211. 1805; Hook. f. in Hook. f., Fl. Brit. India 5: 162. 1886; Prain, Bengal Pl. 2: 903. 1903; Haines, For. Fl. Chota Nagpur 153. 1910 & Bot. Bihar & Orissa pt. 5: 794. 1924.

Local names: Meda, Katmarra.

Large shrub to tree, 5-15 m tall; branchlets pubescent. Leaves spirally arranged, chartaceous, broadly oval to elliptic-oblong, cuneate-rounded or subcordate at base, acute or obtuse at apex, glabrous above, hairy beneath, 5-17 cm x 2.5-9 cm; lateral veins 7-15 pairs; petioles 1-2.5 cm long. Involucres of 4-5 bracts, in fascicles or short racemes, 5-8-flowered. Tepals 5 or 6, ovate-spathulate, 2.2-2.5 mm long; stamens and staminodes 9-12; filaments pilose near base; glands of inner stamens or staminodes with 0.3-0.7 mm long stalk; inner stamens slightly shorter than outer stamens. Berry globose or ellipsoid, 6-8 mm in diam, purple when ripe.

Fl. : Apr. - June. *Fr.* : Aug. - Oct.

Ecology : Common; in shrubberies, along margins of tanks and ditches, river-banks, etc.

Distribution : India : Throughout the foot of Himalaya, Punjab, Uttar Pradesh, Bihar, West Bengal, Assam, Satpura Range, Coromandel. China, Thailand, Malesia, Java.

Specimen examined : Hazaribagh, 709.

Uses: Wood is used for house-building, furniture, and agricultural implements. Bark is used in diarrhoea. Seeds yield a fat which is used for making candles and in ointments for rheumatism.

4. PIPERACEAE

PEPEROMIA Ruiz & Pav.

Peperomia pellucida (L.) Kunth in H.B.K., Nov. Gen. Sp. 1: 64. 1815; Prain, Bengal Pl. 2: 894 1903; Haines, Bot. Bihar & Orissa pt. 5: 791. 1924; Huber in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 299. 1987. *Piper pellucidum* L. Sp. Pl. 30. 1753.

P. exiguum Blume in Verh. Batav. Genoots. Kunsten 11: 232, f. 36. 1826. *Peperomia exigua* (Blume) Miq., Syst. Pip. 77. 1843; Hook. f. in Hook. f., Fl. Brit. India 5: 97. 1886.

Delicate, glabrous, erect annual, 5-25 cm tall. Stems pellucid, simple or branched. Leaves alternate, rounded or broadly ovate deltoid, subtruncate-cordate at base, obtuse to shortly acuminate at apex, pale green, palmately 5-7-nerved from base, 7-30 mm x 6-25 mm; petiole 0.6-1.5 cm long, clasping decurrent along stem. Spikes solitary, terminal but frequently leaf-opposed by over-topping, slender, 2-5 cm long, loosely flowered; peduncle 3-5 mm long; bracts, peltate, \pm round, 0.2-0.3 mm in diam. Perianth 0. Stamens 2, ca. 0.15 cm long; anther-cells confluent. Stigma subapical, oblique; ovule 1, erect. Fruit baccate, globose-ellipsoidal, longitudinally striate, blackish-brown when mature, pointed, 0.06-0.08 cm in diam.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; on walls, wet rocks, house surroundings, roadside tree trunks, roofs and shady localities.

Distribution : Almost throughout India. Native of tropical America, introduced and widely naturalised throughout the tropics of Old World.

Specimens examined : Gola, 767; Hazaribagh, 2252.

Use : Plants are used as vegetables by poor people in villages.

5. ARISTOLOCHIACEAE

ARISTOLOCHIA L.

Aristolochia indica L., Sp. Pl. 960. 1753; Hook. f. in Hook. f., Fl. Brit. Ind. 5: 75. 1886; Prain, Bengal Pl. 2: 891. 1903; Haines, For. Fl. Chota Nagpur 385. 1910 & Bot. Bihar & Orissa pt. 5: 785. 1924.

Local name : Isharmal.

Twining, glabrous, herbaceous or twining perennial, with a woody rootstock. Branches slender, sulcate. Leaves linear-oblong to obovate-oblong or subpanduriform, rounded-subcordate at base, abruptly or gradually obtusely acuminate at apex, subentire-undulate, glabrous, 5-nerved, 4-10 cm x 1.2-2.5 cm; petiole 7-12 mm long, very slender. Flowers zygomorphic, 2-3.5 cm long, in few-flowered short racemes, or subfasciculate; bracts lanceolate, acuminate, 0.15-0.2 cm long. Perianth straight, greenish-white; inflated basal part 5-7 mm in diam., slightly 6-grooved; tube narrowly funnel-shaped, 1-1.5 cm long; mouth obliquely trumpet-shaped, 6-8 mm in diam.; limb produced into an oblong, strap-shaped, brown-purple lip of 1.2-1.8 cm long with revolute margins. Stamens 6, adnate to style column in a gynostegium. Stigmas fleshy, on top of column in a ring round a depressed centre. Capsule subglobose or broadly oblong, narrowed into pedicel, 3-5 cm long, dehiscing from base upwards, after dehiscence parachute-like; pedicel splitted into 6 strands continuous with middle of valves. Seeds deltoid or triangular, 0.7-0.8 mm.

Fl. & Fr. : July-Feb.

Ecology : Not common; in hedges, forests, etc.

Distribution : India: West Bengal, Bihar, Orissa, Deccan Peninsula. Nepal, Bangladesh, Sri Lanka.

Specimen examined : Hunterganj, 2137.

Uses : Rootstock is used as a gastric stimulant. Juice of leaves is used for cough. Seeds are used for inflammations and biliousness.

6. NELUMBONACEAE

NELUMBO Adans.

Nelumbo nucifera Gaertn., Fruct. Sem. 1: 73, t. 19. f. 2. 1788; Subram. Aquat. Angiosp. 8, f. 4. 1962; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 58. 1976. *Nymphaea nelumbo* L., Sp. Pl. 511. 1753.

N. speciosum Willd., Sp. Pl. 2: 1258. 1799; 1832; Hook. f. & Thomson, in Hook. f., Fl. Brit. India 1: 116. 1872; Prain, Beng. Pl. 1: 214. 1903; Haines, Bot. Bihar & Orissa pt. 2: 22. 1921.

Local names : Padma, Kamala.

Aquatic, perennial, stoloniferous herbs, with milky latex. Leaves orbicular, glaucous above, pruinose, partly flat, floating, with weak petioles, partly shallowly cup-shaped, on rigid petioles raised above water; larger leaves 35-60 cm in diam. Pedicels and petioles to 2m long, with sharp warts. Flowers far projecting above water, erect or cernuous, fragrant, 15-25 cm in diam. Sepals 2, early caducous. Petals many inserted at base of receptacle, pink, white at base, sometimes entirely white. Stamens many; appendage of connective readily recurved, white or yellow-white, anthers yellow. Carpels 12-30, free, sunk in apex of receptacle, the short style and stigma protruding only; ovule 1, hanging. Receptacle obconic, spongy, with flat apex, during anthesis yellow, later green, at last black-brown, 6-10 cm in diam. Nutlets 1.5-2.5 cm long, usually empty. Seeds exarillate.

Fl. Apr.-July. *Fr.* : Nov.-Jan.

Ecology : Very common; in ponds, tanks, deep pools, etc.

Distribution : Throughout India. Persia, Malesia, China, Java, Japan, Tropical Australia.

Specimen examined : Hazaribagh, 703.

Uses : Rhizomes and seeds are edible. Leaves are used to serve as food plates. Flowers are used in the Hindu temples for religious purposes. This is the sacred Indian Lotus flower, "Padma", devoted to Brahma. Rhizomes are given to children in diarrhoea and dysentery. Young leaves, petioles and flowers are eaten as vegetables.

7. NYMPHAEACEAE

NYMPHAEA L. emend. J.E. Smith, *nom. cons.*

Key to the Species

- 1a. Leaves glabrous beneath, entire or shallowly dentate.
Cells of ovary separating by double walls. Flowers
expanding in forenoon ... 1. *N. nouchali*
- 1b. Leaves densely short-hairy beneath, sharply dentate.
Cells of ovary separating by a single wall. Flowers
expanding in evening ... 2. *N. pubescens*

1. *Nymphaea nouchali* Burm. f., Fl. Ind. 120. 1768; Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 57. 1976.

N. stellata Willd., Sp. Pl. 2: 1153. 1799; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 114. 1872; Prain, Bengal Pl. 1: 213. 1903; Haines, Bot. Bihar & Orissa pt. 2: 21. 1921; Subram., Aquat. Angios. 6. 1962.

Local names: Nil-padma, Nil-kamal.

Rootstock cormous, ovoid, small, not nodular, 5-7 cm in diam. Leaves glabrous beneath, broadly oval, entire or shallowly undulate-dentate, green and pale purple beneath, 10-23 cm x 8-18 cm; main nerves 11-15. Flowers 7-15 cm in diam., slightly fragrant, closed at night, expanding in forenoon. Sepals with dark lines; nerves not prominent. Petals 8-18, pale purple, sometimes white or red, outer 2.5-5.5 cm long. Stamens 30-60, not separated from corolla by an empty space; apex of filaments beneath cells broader than 0.1 cm; anthers longer than filaments; connective concealing the dorsal side of thecae, produced over a distance of 1.5-3 mm. Ovary 10-20-celled; cells of ovary separated by a double wall; stigmatic rays appendiculate at outer margin.

Fl. & Fr. : Almost throughout the year, but chiefly during Aug-Nov.

Ecology : Very common; in shallow pools, railway ditches, inundated rice-fields, etc.

Distribution : Through out India. S.E. Asia and Africa.

Specimens examined : Hazaribagh, 750; Jhumri Telaiya, 2390.

Uses : Rootstock, peduncle and seeds are edible. Flowering stalks and unripe fruits are used as vegetables. Rhizome is demulcent and used in dysentery and dyspepsia. Seeds are used in cutaneous diseases.

2. *Nymphaea pubescens* Willd., Sp. Pl. 2: 1154. 1799; Gamble Fl. Madras 34 (24). Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 58. 1976.

N. lotus L. var. *pubescens* (Willd.) Hook. f. & Thomson, Fl. Ind. 241. 1855 & Fl. Brit. India 1: 114. 1872.

N. lotus auct. non L. : Hook. f. & Thomson. in Hook. f., Fl. Brit. India 1:114. 1872, *p.p.* excl. Syn. *N. rubra* Roxb. ex Andrews; Prain, Bengal Pl. 1: 213. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 21. 1921.

N. nouchali auct. non Burm. f. : Subram., Aquat. Angios. 6. 1962, *p.p.* ex Syn. *N. lotus* L.

Local names: Kora, Koi.

Rootstock rhizomatous, nodular, large, x 10 cm in diam. Leaves densely short-hairy beneath, broadly oblong, sharply repand-dentate, dark purple beneath, 15-50 cm x 12-45 cm. Flowers 8-25 cm in diam, mostly white, occasionally pink or red, expanding in evening, but closed before next afternoon, faintly foetid. Nerves of calyx distinctly prominent. Petals 13-28. Stamens less than 100, separated from corolla by an empty space; filaments broad, flat, inner anthers longer than filaments; connective hardly produced beyond cells. Cells of ovary separated by a single wall; stigmatic rays appendiculate.

Fl. & Fr.: Throughout the year, but chiefly during July-Nov.

Ecology : Very common; in ponds, ditches, pools, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Hazaribagh, 735; Patratu, 1332.

Use : Same as *N. nouchali*.

Note: Mitra and Subramanyam (in Bull. Bot. Surv. India 24: 83-86, 1982) remarked that this species of *Nymphaea* may prove to be a geographical subspecies of *N. lotus* Linn.

8. CERATOPHYLLACEAE

CERATOPHYLLUM L.

Ceratophyllum demersum L., Sp. Pl. 992. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 639. 1888; Prain, Bengal Pl. 2: 990. 1903; Haines, Bot. Bihar & Orissa pt. 5: 851. 1924.

Local name: Sivara.

Submerged, slender, rootless, much-branched, glabrescent herb. Leaves 6-10 in a whorl, dichotomously forked, with 2-6 or more filiform, toothed segments, 1.5-4 cm long. Flowers sessile, ca. 1.5 mm across, mostly in upper axils, solitary. Perianth segments 10-15, subequal, connate at base, subulate, 1 mm long, sparsely sericeous without, tipped with a purplish hair. Male flower : stamens 10-20; filaments short; anthers oblong, basifixed, extrorse; connectives broad. Female flowers: ovary globular, ca. 1 mm across; style stigmatic on one side. Achenes ovoid, laterally compressed, muricate or minutely tubercled, black when dry, 4-5 mm long, furnished with one terminal and 2 sub-basal appendages much longer than achenes. Seeds globose.

Fl. & Fr. : Almost throughout the year, but chiefly during Sept-Dec.

Ecology : Common; grows gregariously in ponds, ditches, and pools.

Distribution : Throughout India. Cosmopolitan.

Specimens examined: Ghanghree, 1038; Hazaribagh, 2254.

Use : Plant is useful in biliousness.

9. RANUNCULACEAE

Key to the Genera

- 1a. Carpels connate at base, ovules several in each carpel ... 1. NIGELLA
 1b. Carpels free, 1-ovuled ... 2. RANUNCULUS

1. NIGELLA L.

Nigella sativa L., Sp. Pl. 753, 1753; Prain, Bengal Pl. 1: 194, 1903; Haines, Bot. Bihar & Orissa pt. 2: 5, 1921.

Local names : Mugrela, Kalajira.

Stem to 30 cm tall, fistular, sparsely branched, striate, glandular-hairy. Leaves 2.5-5 cm long; lower ones petioled, upper ones sessile; segment linear or linear-lanceolate, entire, glabrescent, 2-2.5 cm long. Flowers 1.2-1.5 cm across. Pedicel 8-20 mm long. Sepals clawed, ovate, crenulate, 8-10 mm long. Nectarial petals geniculate, with a saccate gland in knee, one on face and one on apex of each lobe. Carpels 3-5; styles 7-10 mm long, persistent. Follicles oblong, tuberculate on back. Seeds black, tuberculate.

Fl. & Fr. : Feb.-Apr.

Ecology: Common; usually cultivated; also occurring as a weed in waste places, roadsides, cultivated fields, etc.

Distribution : India: Punjab, Himachal Pradesh, Uttar Pradesh, Bihar, West Bengal, Assam. Native of S.E. Europe, introduced in W. Asia particularly in the Mediterranean region.

Specimens examined: Ramgarh, 1907; Ghanghree, 2157.

Uses: Seeds are pungent, aromatic and stimulant, used by natives in curries. The plant is sometimes planted as a garden ornamental.

2. RANUNCULUS

Ranunculus sceleratus L., Sp. Pl. 551, 1753; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1 : 19, 1872; Prain, Bengal Pl. 1:193, 1903; Haines, Bot. Bihar & Orissa pt. 2: 6, 1921.

Erect, glabrous, annual, to 60 cm tall. Stems simple and glabrescent below, branched and usually pubescent above, hollow, deeply furrowed, rather fleshy, often stout. Lower radical leaves reniform, 2-5 cm across, long-petioled, 3-partite with obovate-cuneate, usually notched or variously lobed segments; upper cauline ones sessile, 3-palmatilobed or partite with narrow-oblong, entire or lobed segments; uppermost usually simple, linear-lanceolate. Flowers small, 6-8 mm across, numerous, terminating the branchlets and from the forks. Sepals spreading and reflexed, oblong, nearly equalling the petals, pubescent outside. Petals yellow, oblong, *ca.* 3 mm long, shortly-clawed. Anthers yellow. Head of achenes cylindrical, 6-10 mm long; achenes numerous, obliquely obovoid, faintly rugose, *ca.* 1 mm long. Receptacle oblong, hairy, to 8 mm long.

Fl. & Fr. : Nov.-Mar.

Ecology : Very common, along irrigated canals, river banks, swampy places and other streams.

Distribution : India: Plains of Northern India and in the warm valleys of the Himalaya from Kashmir to Assam. Temperate America, N. Africa, Europe, N. Asia, China.

Specimens examined : Hazaribagh, 55; Ramgarh Cant., 901; Tandwa, 1884.

Uses: Plant is consumed as vegetables after boiling. Plant-extract is used in sciatica, rheumatism, asthma and pneumonia. Seeds are used as tonic, stomachic and kidney troubles.

Note: Tutin (Fl. Eruop. 1: 233. 1964) maintained two subspecies, viz., *ssp. sceleratus* and *ssp. reptabundus* (Rupr.) Hulten. The specimens of this area are referable to the *ssp. sceleratus*. *Ssp. reptabundus* is distinguishable by densely pubescent stems, with 3-4 sepals and 0-5 petals.

10. MENISPERMACEAE

Key to the Genera

- 1a. Drupe with style-scar terminal. Stamens free ... 5. TINOSPORA
- 1b. Drupe with style-scar near base:

- 2a. Stamens completely connate into a peltate synandrium.
Carpel 1. Leaves peltate:
- 3a. Petals connate into a cupuliform corolla.
Inflorescence of corymbose cymes ... 1. CISSAMPELOS
- 3b. Petals free. Inflorescences of umbelliform cymes ... 3. STEPHANIA
- 2b. Stamens free or only filaments connate.
Carpels 3-12. Leaves not peltate:
- 4a. Endosperm not ruminant. Petals bifid or emarginate,
auricled. Leaves villous on both surfaces ... 2. COCCULUS
- 4b. Endosperm ruminant. Petals neither bifid nor
emarginate, cuneate. Leaves glabrous ... 4. TILIACORA

1. CISSAMPELOS L.

Cissampelos pareira L., var. *hirsuta* (Buch.-Ham. ex DC.)
Forman in Kew Bull. 22: 356. 1968 & in van Steenia, Fl. Males. Ser. 1,
10: 237. 1986. *C. hirsuta* Buch.-Ham. ex DC., Syst. 1: 535. 1817.

C. pareira auct. non L. : Hook. f. & Thomson in Hook. f., Fl. Brit.
India 1: 103. 1872, p.p. excl. Syn. *Menispermum orbiculatum* L., Prain,
Bengal Pl. 1: 208. 1903; Haines, For. Fl. Chota Nagpur 147. 1910 & Bot.
Bihar & Orissa pt. 2: 16. 1921.

Local name: Akanadi.

Climbing shrub. Old stems woody; leafy stems slender, densely to
sparsely pubescent to glabrous. Leaves peltate, \pm broadly ovate, rounded,
truncate or cordate at base, obtuse or retuse, mucronate at apex, entire,
sparsely pubescent or puberulous on upper surface, tomentose to pubescent
on lower, 4-11 cm x 4-12 cm, palmately 5-7-nerved; petiole 2-8 cm long,
densely to sparsely pubescent. Male inflorescence: axillary, subcorymbose,
peduncled cymes of 2-4 cm long, solitary, or a few in a fascicle. Male
flowers: green to yellowish on 1-2 mm long pedicels; sepals 4, obovate,
pilose without, 1.2-1.5 mm long; petals 4, connate in a cupuliform corolla,
puberulous without, ca. 0.5 mm long; stamens connate in a peltate
synandrium of 0.7-0.8 mm long. Female inflorescence: thyrsoid, to 16 cm
long, composed of a pseudo-raceme of fascicles; bracts suborbicular,
puberulous, accrescent to 1.8 mm long; pedicels 1-1.5 mm long; sepals 1,

broadly obovate, 1.2-1.5 mm long; petal 1, broadly cuneate-obovate, 0.7-0.75 mm long; staminode 0; ovary pilose, *ca.* 0.5 mm long; style glabrous; stigma divaricately 3-lobed. Drupe obovoid, orange or red, pubescent, 4-5 mm long; endocarp bearing 2 rows of prominent transverse ridges. Seed horseshoe-shaped.

Fl. : June-Nov. *Fr.* : Nov.-Jan.

Ecology : Common in forest edges, thickets, near river banks, along hedges, etc., often climbing over trees.

Distribution : Tropical and subtropical regions of India. Pantropical, through continental S.E. Asia, Australia.

Specimens examined : Hazaribagh, 244; Hunterganj, 1641.

Uses : Root is diuretic, antiperiodic, purgative, used in dyspepsia, dropsy and urinary troubles. Stems yield a fibre.

Note: According to Siddiqi (in Nasir & Ali, *Fl. W. Pakistan* 74: 3. 1974), the type variety of *C. pareira* L. appears to be confined to America.

2. *Cocculus* DC., *nom. cons.*

Cocculus hirsutus (L.) Diels in Engl. Pfl. R. Heft 46: 236. 1910; Haines, *Bot. Bihar & Orissa* pt. 2: 19. 1921; *Menispermum hirsutum* L., *Sp. Pl.* 341. 1753.

C. villosus DC., *Syst.* 1: 525. 1818; Hook. f. & Thomson in Hook. f., *Fl. Brit. India* 1: 101. 1872; Prain, *Bengal Pl.* 1: 210. 1903; Haines, *For. Fl. Chota Nagpur* 148. 1910.

Local name : Jamtikibel.

Villous, climbing shrubs, to 6 m long. Branches slender, terete. Leaves ovate to sub-deltoid, often 3-lobed, truncate, subcordate to cordate at base, obtuse and mucronate at apex, ciliate along margins, palmately 3-5 (-7)-nerved at base, villous above, densely so beneath, 3-6 cm x 2-3.5 cm; petiole 0.8-2 cm long. Male inflorescences: axillary panicles, 2-7 cm long;

peduncle 1-2.5 cm long. Male flowers: bracts minute, linear, 1.2-1.5 mm long; sepals 6, 2-seriate, free; outer 3 smaller, narrow-oblong, 1.2-1.5 mm long; inner 3 obovate 2-2.2 mm long; petals 6, free, green, obovate, 2-fid at apex, auricled at base, smaller than sepals, 1-1.2 mm long; stamens 6, free, in 2 whorls, embraced by petals; anthers dehiscing vertically. Female inflorescences: axillary, solitary or 2-3-flowered fascicles, rarely racemes, 8-15 mm long. Female flowers: bracts and sepals as in male, inner 3 sepals spatulate; petals as in male, hairy at lower half; carpels 3-6, free, 0.1-0.2 cm long. Drupe pisiform, ca. 3x2.5 mm, black-purple, laterally compressed, with basal style scar; endocarp transversely ridged.

Fl. : Nov.-Apr. *Fr.* : Mar.-May.

Ecology : Not common; in hedges and thickets.

Distribution : Throughout tropical and subtropical India. Tropical Africa.

Specimens examined : Barhi, 897; Tandwa, 1424; Chouparan, 1687.

Uses : Leaves-juice is used as refrigerant; also applied to eczema. Roots are laxative and demulcent, also used for bilious dyspepsia, rheumatism and stomach-ache in children.

3. STEPHANIA LOUR.

Stephania japonica (Thunb.) Miers, Ann. Mag. Nat. Hist. ser. 3, 18: 14. 1866, *p.p.* excl. Cuming 1160; Forman in Kew Bull. 11:49. 1956 & in van Steenis, Fl. Males. ser. 1, 10: 247. 1986. *Menispermum japonicum* Thunb., Fl. Jap. 193. 1784.

Cissampelos hernandiifolia Willd., Sp. Pl. ed. 4, 4: 861. 1806 ('hernandiifolia').

Stephania hernandiifolia (Willd.) Walp., Rep. 1: 96. 1842; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1:103. 1872; Prain, Bengal Pl. 1: 208. 1903; Haines, For. Fl. Chota Nagpur 148. 1910 & Bot. Bihar & Orissa pt. 2: 17. 1921.

Local names : Akanadi, nimuka

Slender climber, 2 - 10 m long. Stems herbaceous, glabrous, striate. Leaves peltate, broadly triangular-ovate to ovate, papyraceous, broadly rounded at base, acute or subacuminate at apex, entire, glabrous on upper surface, puberulous or often glaucous on lower, 6-12cm x 4-10 cm, palmately 8-13 nerved at base. Petiole slender, striate, 3-10 cm long. Male inflorescences: axillary, compound, umbelliform cymes, 4-10 cm long. Male flowers: small, green, white or yellow, sessile or sub-sessile; bracts subulate, minute; sepals 6 or 8, free, in two whorls, outer smaller than inner, oblanceolate-spathulate, puberulous outside, 0.8-1.2 mm long; stamens connate into a peltate synandrium of 0.6-1 mm long. Female inflorescences: similar to male. Female flowers: sepals and petals as in male but the number often reduced; carpel 1, ovoid, 0.7-1 mm long; stigma 3-lobed. Drupe sessile or sub-sessile, obovoid-suborbicular, glabrous, 5-7 mm across; endocarp with deep dorsal transverse ridges. Seed horseshoe-shaped.

Fl. : May-Oct. *Fr.* : July-Dec.

Ecology : Common; on wayside hedges and thickets, exposed slopes on hills, forest edges, banks of rivers, etc., forming clusters.

Distribution: Almost throughout India. Japan, S.China, Indochina, Thailand, Malesia, N. & E. Australia, Polynesia.

Specimens examined : Hazaribagh, 76; Gola, 779, Morkachho: 1476.

Uses : Roots are used in fevers, diarrhoea, dysentery, dyspepsia and urinary diseases.

4. *TILIACORA* Colebr.

Tiliacora acuminata (Lam.) Hook. f. & Thomson, Fl. Ind. 1: 187. 1855; Haines, Bot. Bihar & Orissa pt. 2: 19. 1921; *Menispermum acuminatum* Lam., Encycl. 4: 101.1797.

T. racemosa Colebr. in Trans. Linn. Soc. London 13: 67, t. 6. 1822; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1:99. 1872; Prain, Bengal Pl. 1: 210. 1903; Haines, For. Fl. Chota Nagpur 149. 1910.

Local names : Bhaga-mushada, Bhaga luta.

Woody climber, to 5 m long. Stems sparsely puberulous to glabrous, striate. Leaves ovate to ovate-lanceolate, chartaceous, truncate to subcordate at base, acuminate at apex, entire-undulate, glabrous, 8-12 x 3.5-7 cm, with 3-5 sub-palmate basal nerves; petiole 1.2-2 cm long, articulate at base. Inflorescences: pseudoracemose, 3-10 cm long, composed of 1 (in female infl.) to few-flowered peduncled cymes of ca. 1 cm long. Male flowers: yellow; sepals 6, 2-seriate, free, outermost smallest, inner ones longer, elliptic, 4-4.5 mm long; petals 6, minute, obovate, concave, 1-1.5 mm long, stamens 6, free, subcylindrical, 3-3.2 mm long. Female flowers: sepals as in male; petals 6, sub-unguiculate, 1-2 mm long; staminodes absent; carpels 8-12, glabrous, ca. 1 mm long, borne on short branches arising from a puberulous gynophore. Drupes oblong-ovoid, subcompressed, red, 1-1.2 cm long, glabrous, borne on branched gynophore of 6-8 mm long; endocarp obscurely reticulate.

Fl. : Apr.-June. *Fr.* : June-Nov.

Ecology : Common, in hedges and thickets.

Distribution : Throughout tropical parts of India. Nepal, Upper Myanmar, Sri Lanka.

Specimens examined : Koderma, 160; Pratappur, 946; Gola, 1524.

Use : Plant is used as a cure for snake-bite.

5. TINOSPORA MICTS

Tinospora cordifolia (Willd.) Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 97. 1872; Prain, Bengal Pl. 1: 209. 1903; Haines, For. Fl. Chota Nagpur 149. 1910 & Bot. Bihar & Orissa pt. 2: 18. 1921; *Menispermum cordifolium* Willd., Sp. Pl. ed. 4, 4: 826. 1806.

Local names : Gurach, Gulancha, Amrita.

Woody climber, to 10 m long. Stems succulent, corky, entirely glabrous, striate when young. Leaves thinly papyraceous, broadly ovate, orbicular or sub-deltoid, deeply cordate at base with broad basal sinus and large rounded basal lobes, abruptly acuminate at apex, entire, palmately 5-7 nerved at base, glabrous, with glistening glands beneath, 5-15 cm x 5-13 cm; petioles pulvinate, 3-7 cm long. Male inflorescences: axillary or

arising from axils of leaf-scars on older leafless stems, solitary, pseudoracemose, 5-12 cm long, composed of few-flowered fascicles. Male flowers: pedicels 3-4 mm long; sepals 6, 2-seriate, free; outer 3 ovate, 1-5 mm long; inner 3 elliptic, concave, 3-4 mm long; petals 6, green, free, rhombic-unguiculate, with incurved lateral edges, papillose on lower part, 2-2.5 mm long; stamens 6, free, clavate 2.5-3 mm long. Female inflorescences: similar to male, but flowers arising singly along axis. Female flowers: pedicels 4-5 mm long; sepals similar to male; petals 6, broadly spatulate, papillose on lower part, 2.2-2.5 mm long; staminodes 6, subulate, 1.2-1.5 mm long; carpels 3, ellipsoid, 1.5-1.7 mm long; stigma capitate. Drupes pisiform, red, radiating from shortly 3-branched carpophore, ca. 6 x 5 mm; endocarp rounded at both ends, ventrally flattened, slightly papillose, with a weak dorsal ridge.

Fl. : July - Dec. *Fr.* : Nov.-Feb.

Ecology : Common; in hedges and thickets, and also in forests.

Distribution : Throughout tropical parts of India. Bangladesh, Sri Lanka.

Specimens examined : Hunterganj, 928; Barkaganwa, 1279.

Uses : Stem is used in dyspepsia, fever, and urinary diseases. Leaf-decoction is given in gout. Root is emetic and used for visceral obstruction; its watery extract is used in leprosy. Pulverized fruit is used for jaundice and rheumatism.

11. PAPAVERACEAE

Key to the Genera

- 1a. Sepals 2. Petals 4. Stigmas connate as a discoid or pyramidal star with rays.
Capsule globose. Unarmed, with milky sap ... 2. PAPAVER
- 1b. Sepals 3. Petals 6. Stigmas not as above.
Capsule oblong. Armed, with yellow sap ... 1. ARGEMONE

1. ARGEMONE L.

Argemone mexicana L., Sp. Pl, 508. 1753; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1:117. 1872; Prain, Bengal Pl. 1: 216. 1903;

Haines, For. Fl. Chota Nagpur 155. 1910 & Bot. Bihar & Orissa pt. 2: 23. 1921; van Steenis in van Steenis, Fl. Males. ser. 1, 5: 114. 1954; Debnath & Nayar in Nair, Fl. India Fasc. 17: 3. 1984.

Local name : Bharband.

Simple or branched, prickly, 20-80 cm high. Stem with scattered prickles. Lower leaves with distinct petioles, crowded in a rosette; upper ones sessile, sinuate-pinnatifid, semiamplexicaulous at base, spinulose-dentate, glaucous and prickly on both surfaces, specially on nerves, white-pruinose on veins, variegated with glaucous bands, 10-18 cm x 5-9 cm. Flowers 4-5 cm across, sessile or shortly pedicelled. Sepals oblong, prickly outside, to 10 x 7 mm long. Petals obovate, bright yellow, 2-2.5 x 1.2-1.5 cm. Stamens 7-12 mm long. Ovary softly spinous, 8-10 mm long; stigma dark red, 3-6-lobed. Capsule terete, glaucous, green, prickly, to 4 x 2 cm, 3-6 valved. Seeds numerous, brownish-black, globose, 1.5 x 1.8 mm across.

Fl. & Fr. : Feb.-Sept.

Ecology : Common; in river beds, open waste places, along roadsides, railway-yards, etc.

Distribution : Most of the tropical parts of India. Native of West Indies, Mexico, etc., introduced and widely naturalised in other tropical countries.

Specimens examined : Hazaribagh, 20; Ghanghree, 1056; Jhumri Telaiya, 2212.

Uses: Seeds yield a nauseous, bitter, non-edible oil which is used in cutaneous troubles; also used in paint industry and for making soap. Yellow juice of the plant is used in scabies and ophthalmia.

2. PAPAVER L.

Papaver somniferum L., Sp. Pl. 508. 1753; Roxb., Fl. Ind. 2: 571. 1824; Hook. f. & Thomson, in Hook. f., Fl. Brit. India 1:117. 1872; Prain, Bengal Pl. 1: 215. 1903; Haines, Bot. Bihar & Orissa pt. 2: 23. 1921.

Local names : Afim, Posta.

Stout, glaucous, nearly glabrous, usually simple annual, 40-120 cm tall. Leaves ovate-oblong, lower short-petiolate, upper amplexicaul, unequally and coarsely dentate or \pm lobed, 4-20 cm \times 1.5-10 cm. Flowers 7-10 cm across. Pedicels 4-10 cm long. Sepals glabrous. Petals orbicular, entire, undulate or lobed, white, purple or scarlet, 1.5-5.5 cm long. Filaments 5-10 mm long, slightly dilated. Stigmatic rays 5-12. Capsule glabrous, 2-3 cm in diam., stalked. Seeds usually white.

Fl. & Fr. : Apr.-June.

Ecology : Very common; cultivated in gardens, also met with as an escape in waste places, roadsides, etc.

Distribution : Throughout India. Temperate and Warmer regions of Asia, Europe and N. America.

Specimens examined : Hazaribagh, 1273; National Park, 1377; Koderma, 1782.

Uses : This species is cultivated as an ornamental. From the milky juice opium is derived which is used as a narcotic, sedative, antispasmodic and hypnotic. Poppy seed oil is used in diarrhoea and dysentery.

12. FUMARIACEAE

FUMARIA L.

Fumaria indica (Haussk.) Pugsley in J. Linn. Soc. Bot. 44: 313. 1919; Jafri in Nasir & Ali, Fl. W. Pakistan 73: 39. 1974. *F. vaillantii* Loisel var. *indica* Haussk. in Flora 56: 443. 1873.

F. parviflora auct. non Lam. : Wight & Arn. Prodr. Fl. Ind. Orient. 18. 1834; Prain, Bengal Pl. 1: 217. 1903; Haines, Bot. Bihar & Orissa Pt. 2: 23. 1921.

F. parviflora Lam. ssp. *vaillantii* sensu Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 128. 1872, non *F. vaillantii* Loisel. 1809.

Local name: Pit papra.

Diffuse, slender, glaucous, annual herb, 15-50 cm long. Stems grooved, much branched. Leaves membranous, 2-3 pinnatisect, 5-7 cm long; ultimate segments linear-oblongate, acute and mucronate at apex, entire, to 7 x 2 mm; petiole to 0.8 cm long. Racemes leaf-opposed, to 5 cm long, 10-20-flowered; peduncle 0.5-1.5 cm long. Bracts lanceolate, membranous, dentate at apex, x equaling the pedicel. Pedicels 1.5-2 mm long. Sepals 2, minute, ovate-lanceolate, incise-dentate, caducous 0.12-0.15 cm long. Corolla 5-6 mm long, whitish or rose-coloured with purple tips; 2 outer petals dissimilar, one obtusely spurred, 2 inner cucullate-spathulate, coherent apically over anthers. Stamens 3+3; staminal sheath 4 mm long; Ovary ovoid with 1 or 2 ovules on parietal placentae; style filiform, as long as staminal sheath; stigma 2-lobed. Fruit globose, rugose when dry, with 2 pits at top, 2-2.5 mm across.

Fl. & Fr. : Oct.-Mar.

Ecology : Very common; in cultivated fields of wheat, potato, cucumis, etc. and also in waste places.

Distribution : Almost throughout India. W. Asia.

Specimens examined : Ichak, 321; Etkhori, 1449.

Uses : This species is used as astringent, laxative and diuretic; also used for dyspepsia and scrofulous skin affections.

13. ULMACEAE

Key to the Genera

- | | |
|--|-------------------|
| 1a. Fruit a samara, wide-winged: Flowers in clusters, appearing at leaf-scars of previous year's shoot | ... 1. HOLOPTELEA |
| 1b. Fruit a drupe, not winged : Flowers cymose, appearing on young leafy shoots | ... 2. TREMA |

1. HOLOPTELEA Planch.

Holoptelea integrifolia (Roxb.) Planch. in Ann. Sci. Nat. Bot. ser. 3, 10: 266. 1848; Hook. f. in Hook. f., Fl. Brit. India 5: 481. 1888; Prain,

Bengal Pl. 2: 958. 1903; Haines, For. Fl. Chota Nagpur 389. 1910 & Bot. Bihar & Orissa pt. 5: 807. 1924. *Ulmus integrifolia* Roxb., Pl. Corom. 1: 56, t. 78. 1795.

Local name : Kanju.

Large, spreading, deciduous, polygamo-dioecious tree, to 20 m tall; bark grey, fistular; young shoots tomentose. Leaves coriaceous, elliptic or obovate-oblong, unequally rounded or subcordate at base, shortly acuminate at apex, entire or coarsely serrate, glabrescent, or pubescent beneath, 7-15 cm x 4-7 cm; secondary veins 5-7-pairs, raised beneath; petiole 6-8 mm long. Stipules caducous, linear. Flowers 4-5 mm in diam., green, male and hermaphrodite mixed together in same fascicle. Tepals 4, calycine, linear, pubescent, 1.5-2.5 mm long. Stamens usually 6-8, almost biseriate; filaments 1.6-1.8 mm long. Samara obliquely elliptic or roundish, to 2.5 cm across, notched between two stigmas, with reticulately veined membranous wings. Seeds flat, exalbuminous.

Fl. : Mar.-Apr. *Fr.* : May-July.

Ecology : Common; in deciduous forests, banks of rivers, roadsides, etc.

Distribution : India: N. Himalaya, U.P., Bihar, W. Bengal, Orissa, Deccan Peninsula. Sri Lanka, Myanmar, Indo-China.

Specimens examined : Pratappur, 915; National Park, 2058.

Uses : Wood is used for indoor building purpose, furniture, cabinet-work, ploughs, yokes, mathematical instruments, match-box and splints, etc.

Note: The flowers appear before appearance of new leaves and the fruits are found when the tree is full of leaves.

2. TREMA LOUR.

Trema orientalis (L.) Blume, Mus. Bot. 2: 62, 1856; Hook. f. in Hook. f., Fl. Brit. India 5: 484. 1888; Prain, Bengal Pl. 2: 960. 1903; Haines,

For. Fl. Chota Nagpur 390. 1910 & Bot. Bihar & Orissa pt. 5: 809. 1924;
Celtis orientalis L., Sp. Pl. 2 : 1044. 1753.

Local name : Gio.

Evergreen shrub to small tree, to 25 m tall with smooth to finely fissured, lenticellate, greyish-brown bark. Branchlets densely appressed silky-pubescent. Leaves coriaceous, alternate, ovate, ovate-lanceolate to narrowly elliptic-lanceolate, obliquely (sub) cordate at base, acuminate at apex, serrulate to denticulate, scabrid above, white-tomentose beneath with fine silky hairs, 10-15 cm x 2.5-6 cm, 3(-5) nerved from base, with 4-6 pairs of secondary nerves, impressed above, raised below; stipules linear-lanceolate, 3-4 mm long; petiole 7-10 mm long, densely short-pubescent. Flowers minute, 5-merous, borne on separate (male or female) axillary, branched cymes, longer than petiole. Male inflorescence compact, 3-5 cm long, 20-100-flowered. Male flower 1.5-2 mm across; perianth-lobes ciliate, boat-shaped, 0.15-0.2 cm long; stamens introrse; filaments 1-1.2 mm long; pistillode ovoid-conical, compressed, 1-1.2 mm long. Female inflorescence lax, 1.5-2.5 cm long, 5-15 flowered. Female flowers 1-2 mm across; perianth lobes ovate, ciliate and densely short pubescent, 1-1.5 mm long; staminodes absent; ovary ovoid-conical, ca. 1.5 mm long. Style short; stigmatic arms slender, spreading, villous, 1-1.5 mm long. Drupe ovoid, to 4 x 3 mm, turning black when ripe, glabrous. Seeds ovoid, to 3 x 2 mm.

Fl. & Fr. : Nov.-May.

Ecology : Common; in scrub jungles, along streams in hilly forests, etc., also planted along roadsides.

Distribution : Throughout India. Himalaya. Sri Lanka, Tropical Africa, S.E. Asia through Malesia to Queensland, Melanesia, Micronesia and Polynesia.

Specimens examined : Hazaribagh, 1596; Barhi, 1812..

Uses : Wood is used for match-boxes and splints, wooden shoes and fishing floats. Decoction of bark is used for toughening fishing-nets. Bark yields a fibre used for ropes, twine and coarse cloth. Decoction of roots is given in diarrhoea. Leaves are lopped for fodder.

14. CANNABACEAE

CANNABIS L.

***Cannabis sativa* L. ssp *indica* (Lam.) Small & Cronq. var. *indica* (Lam.) Wehmer, Die Pflanzenstoffe 248. 1911; Small & Cronq. in Taxon 25: 428. 1976. *Cannabis indica* Lam., Encycl. 1(2): 695. 1785.**

C. sativa L. var. *indica* Pers., Syn. Pl. 2: 618. 1807, *nom. nud.* (not published with any indication of being based on Lamarck's *indica*).

C. sativa auct. non L.: Roxb., Fl. Ind. 3: 772. 1832; Hook. f. in Hook. f., Fl. Brit. India 5: 487. 1888, *p.p.*; Prain, Bengal Pl. 2: 960. 1903; Haines, Bot. Bihar & Orissa pt. 5: 960. 1924.

Local names : Ganja, Bhang, Charas, Siddhi.

Aromatic herb or undershrub, branched, 1-1.5 m tall. Stems angular, slender, often purple-tinged, appressed-pubescent. Stipules filiform or narrowly subulate, 4-5 mm long. Leaves usually 5-7-foliolate or-partite; upper ones often simple; leaflets or segments sessile, narrowly lanceolate, narrowed at base, long-acuminate at apex, coarsely serrate, scabrid above, appressed-pubescent and glandular beneath, 6-14 cm x 0.3-1.5 cm.; petiole 0.5-8 cm long. Male flowers: pedicels 3-5 mm long; perianth-segments oblong, greenish-white with pellucid-white margins, appressed-pubescent, 4-5 mm long; filaments short; anthers yellow. Female flowers: bracts membranous, glandular hairy, dark green, small during anthesis, afterwards much enlarged. Achenes yellowish or brown, smooth, shining, 4-5 mm long. Seed flattened. Fruiting bracts contracted above broad base, with inrolled margins in upper half.

Fl. & Fr. : Mar.-Nov.

Ecology : Common; in waste places, roadsides and other places; also cultivated on a small scale.

Distribution : Throughout India. Native of Central Asia, cultivated in temperate and tropical regions of the world.

Specimens examined : Ramgar, 1926; Hunterganj, 2165.

Uses : This species is the source of hemp fibre and also of narcotics Bhang, Ganja and Charas. Dried flowering tops of female plants are used as a sedative, analgesic and narcotic. Oil extracted from seeds is used in paints, varnishes and soaps.

15. MORACEAE

Key to the Genera

- 1a. Stamens inflexed in bud; anthers reversed:
 - 2a. Female flowers many, spicate or subcapitate. Female tepals fleshy in fruit, enclosing the achenes ... 3. MORUS
 - 2b. Female flowers solitary or 2-4 together on a common peduncle. Female tepals coriaceous, clasping the ovary ... 4. STREBLUS
- 1b. Stamens straight in bud; anthers erect:
 - 3a. Flowers borne on outside of large receptacle; male flowers monandrous ... 1. ARTOCARPUS
 - 3b. Flowers borne on inner wall of a closed receptacle; male flowers with 1-7 stamens ... 2. FICUS

1. ARTOCARPUS J.R. & G. Forst.

Key to the Species

- 1a. Fruit tubercled, 30-75 cm long. Bracteoles absent ... 1. *A. heterophyllus*
- 1b. Fruit not tubercled, lobulate, irregularly subglobose, 5-8 cm in diam. Bracteoles present, peltate ... 2. *A. lakoocha*

1. **Artocarpus heterophyllus** Lam., Encycl. 3: 209. 1789; Jarrett in J. Arnold Arb. 40: 334. 1959; Corner in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 217. 1981.

A. integrifolia auct. non L. f.: Roxb., Fl. Ind. 3: 522. 1832; Hook. f. in Hook. f., Fl. Brit. India 5: 541. 1888; Prain, Bengal Pl. 2: 971. 1903; Haines, For. Fl. Chota Nagpur 393. 1910 & Bot. Bihar & Orissa pt. 5: 825. 1924.

Local name: Kathal.

Evergreen tree, to 10 m tall; bark reddish-brown. Leaves broadly elliptic to ovate-elliptic, coriaceous, rounded to cuneate at base, obtuse to shortly acute at apex, entire, shining green above, 7-12 cm x 6-10 cm; lateral veins 6-8 pairs; petiole stout, 1.2-3 cm long. Stipules glabrous, sheathing, leaving a scar after falling. Inflorescences on short stout leafy twigs and also from main branches, at first enclosed by 2 yellowish bract-like stipules. Male inflorescence: narrowly clavate or barrel-shaped, 2.5-7 cm x 0.7-2.5 cm; peduncle 1-5 cm x 0.2-0.3 cm, expanded at apex; perianth 2-lobed, puberulous, 0.7 cm long; stamen 1.5-2 mm long; filament somewhat flattened, stout, ca. 0.5 mm long; anthers ovate-oblong. Female inflorescence: same as male but more massive, 3-8 cm x 1.3 cm; perianth strongly projecting; stigma spatulate; ovary globose-ovoid, 0.5 mm across. Syncarp oblong or oblong-globose, 8-15 cm x 5-10 cm when young, 30-75 cm x 20-55 cm with age, green, covered by closely set conical, acute or obtuse tubercles of 4-8 mm long. Fruiting perianth thick, fleshy, yellow or light orange, edible. Seeds elliptic-oblong, 2.5-3.5 cm x 1.5-2.5 cm.

Fl. : Dec.-Feb. *Fr.* : May-Aug.

Ecology : Common; cultivated in gardens, planted along roads; etc.; also wild in village scrub-jungles.

Distribution : Possibly native to S. India, distributed in other hotter parts of the country. Cultivated throughout the Tropics, especially in S.E. Asia and Sri Lanka.

Specimens examined: Patratu, 577; Hazaribagh, 1243.

Uses: Unripe fruits are used as vegetables; ripe ones are eaten fresh or preserved in syrup. Seeds are eaten after roasting or boiling. Wood is used for high class furniture. Leaves are eaten by cattle.

2. *Artocarpus lakoocha* Roxb., Fl. Ind. 3:524. 1832; Hook. f. in Hook. f., Fl. Brit. India 5 : 543. 1888, *p.p.*: Prain, Bengal Pl. 2: 971. 1903; Haines, For. Fl. Chota Nagpur 393. 1910 & Bot. Bihar & Orissa pt. 5: 824. 1924.

Local names : Denyo, Barhal, Barhar.

Deciduous tree, to 15 m tall, with dense crown. Bark grey. Branchlets softly greyish-tomentose. Leaves thinly coriaceous, oblong, elliptic or subobovate, rounded at base, cuspidate at apex, entire, glabrous and shining above, softly pubescent beneath, 10-25 cm x 4-15 cm; secondary veins 8-12 pairs; petiole 1-2.5 cm long. Stipules lanceolate, 1-1.2 cm long. Receptacles shortly peduncled, pubescent. Bracteoles peltate. Male receptacle : oblong or globose, 1-2.5 cm in diam., orange-yellow; male flowers: perianth-segments 2-3, triangular, puberulous. Female receptacle: irregularly subglobose; female flowers: anthocarps completely united. Fruit 5-8 cm in diam., lobulate, velvety, yellow when ripe. Seeds oblong, 1-1.2 cm long.

Fl. : Dec.-Apr. *Fr.* : May-Oct.

Ecology: Common; planted in gardens, along roadsides, also runs wild in village surroundings, forests, etc.

Distribution : Almost throughout India. Myanmar.

Specimens examined : Koderma, 179; Ichak, 1318.

Uses : Fruits are edible. Timber is popular for house construction work and boat-building.

2. FICUS

Key to the Species

- 1a. Male flowers with a rudimentary pistil. Male and gall flowers borne together in one receptacle and fertile female flowers in another. Leaves alternate ...4. *F. tinctoria* ssp. *parasitica*
- 1b. Male flowers without pistil:
 - 2a. Male, gall and fertile female flowers borne in the same receptacle. Leaves alternate:
 - 3a. Leaves obtuse at apex, tomentose or puberulous beneath. Figs orange to bright red when ripe ... 1. *F. benghalensis*
 - 3b. Leaves abruptly acuminate or caudate at apex, glabrous on both surfaces:

- 4a. Leaves 5-7-nerved at base, caudate at apex.
Figs black when ripe ... 3. *F. religiosa*
- 4b. Leaves 3-nerved at base, abruptly acuminate at
apex. Figs whitish or reddish and spotted when ripe ... 5. *F. virens*
- 2b. Male and gall flowers borne in one receptacle and
fertile female flowers in another. Leaves opposite ... 2. *F. hispida*

1. *Ficus benghalensis* L., Sp. Pl. 1059. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 499. 1888; Prain, Bengal Pl. 2: 979. 1903; Haines, For. Fl. Chota Nagpur 401. 1910 & Bot. Bihar & Orissa pt. 5: 834. 1924; Corner in Gard. Bull. Singapore 21: 14. 1965 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 251. 1981.

Local names: Barh, Bargat.

Large tree, to 30 m tall, with numerous aerial roots from branches. Bark grey. New shoots pubescent. Leaves alternate, coriaceous, ovate-elliptic, rounded or subcordate at base, obtuse at apex, entire, glabrous above, puberulous below, 10-17 x 7-12 cm long; lateral nerves 6-8 pairs, arching near margin, flattened above, raised below; petiole 2-4 cm long, with a gland at apex beneath. Stipules ovate-lanceolate, brownish, caducous, leaving a circular scar. Figs monoecious, solitary or in pairs, axillary, globose or depressed-globose, sessile, orange to bright red when ripe, puberulous without 1.5-2 cm across; bracts 3-4, cupular, shortly connate at base, obtuse, persistent. Male flowers: numerous near orifice; tepals 3-5, shortly connate, lanceolate, brownish; stamen 1, filament *ca.* 0.8 mm long, anther oblong, shortly mucronate, *ca.* 1 mm long. Female flowers: sessile; petals as in male, slightly shorter; ovary obovoid-globose, dark-brown, style elongate, tapering, *ca.* 2 mm long. Gall flowers similar to female, pedicellate. Achenes subglobose, scarlet when ripe, to 2 x 1.5 mm.

Fl. & Fr.: Apr. - June and Dec. Feb.

Ecology: Common; along roadsides, near temples; wild in village surroundings and old walls.

Distribution: Planted in the plains of India, wild in the sub-Himalaya and on the lower slopes of Deccan Hills. Sri Lanka, Bangladesh, Pakistan.

Specimens examined: Hazaribagh: 32; Jhumri Telaiya, 656.

Uses: Leaves are lopped for fodder. Latex applied in rheumatism and lumbago by local people. Infusion of bark is used in diarrhoea, dysentery and diabetes.

2. **Ficus hispida** L.f., Suppl. Pl. 442. 1781; Hook. f. in Hook. f., Fl. Brit. India 5: 522. 1888; Prain, Bengal Pl. 2: 981. 1903; Haines, For. Fl. Chota Nagpur 396. 1910 & Bot. Bihar & Orissa pt. 5: 835. 1924.

Local names: Konea-dumbar.

Shrub to small tree, 8-10 m tall; bark grey. Branchlets hispid-pubescent, internodes hollow. Leaves decussate, often in unequal pairs, scabrid, broadly elliptic, ovate-oblong or often obovate, rounded, subcordate or sub-cuneate at base, abruptly and shortly acuminate at apex, entire or minutely toothed along margins, hispid-pubescent on upper surface, hispid-scabrid on lower, 10-25 x 5-15 cm; lateral nerves 3-6 pairs, prominent below; petiole 1.2-3.5 cm long, with a subnodal gland, densely hispid. Stipules ovate-lanceolate, pubescent outside, 0.8-1.2 cm long. Figs dioecious, turbinate, obovoid or subpyriform, yellowish when ripe, narrowed at base, faintly ribbed, sticky pubescent without, 1.2-2.5 cm across; peduncle to 5 mm long; bracts triangular, 2 mm long; orifice or mouth slightly raised, closed by 5-6 apical bracts. Male flowers: numerous, near apex of receptacle; tepals 3, concave, hyaline, ca. 2 mm long; stamen 1, subsessile; anther oblong, unequal, ca. 1 mm long. Gall flowers: distinctly pedicellate; perianth absent; ovary smooth, globose; style sub-terminal, stigma dilated. Female flowers: sessile or minutely stalked; perianth absent; ovary depressed-globose, 0.7-0.8 mm in diam.; style hairy, clavate at tip, ca. 1.5 mm long. Achenes lenticular, keeled, ca. 1.5 mm long.

Fl. & Fr.: Jan. - Mar.

Ecology: Common; in hedges, thickets, river banks, sometimes on old walls, etc.

Distribution: Throughout India; Sri Lanka, S. China to New Guinea and Queensland.

Specimens examined: Patratu, 570; Bishnugarh, 1108.

Uses: Immature fruits are eaten in curries. Ripe fruits are edible and made into jam. Bark yields a fibre.

3. *Ficus religiosa* L., Sp. Pl. 1059. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 513. 1883; Prain, Bengal Pl. 2: 980. 1903; Haines, For. Fl. Chota Nagpur 400. 1910 & Bot. Bihar & Orissa pt. 5: 833. 1924.

Local names: Pipar, Pipal.

Large, glabrous tree, 8-25 m tall, without aerial roots. Bark pale greyish, fairly smooth. Leaves alternate, broadly ovate, rounded, truncate or sub-cordate at base, subcoriaceous, caudate at apex, sinuate along margins, 5-15 × 4-12 cm; lateral nerves 8-10 pairs, raised on either side; petioles 8-12 cm long, articulate, glandular at apex below. Stipules ovate-lanceolate, to 1.5 cm long. Figs monoecious, in pairs, axillary, sessile, depressed-globose or obovoid, silky-puberulous when young, 1-1.5 cm in diam., black when ripe; receptacular bracts broad, rounded, ciliate to 4 mm long, persistent; mouth or orifice umbonate, closed by 3 apical bracts. Male flowers: few, only near mouth of receptacle; tepals 2, broadly ovate-lanceolate, free, ca. 0.8 mm long; stamens 1; filament short, 0.2 mm; anthers ovate-rounded, ca. 0.7 mm in diam. Female flowers: tepals 3-4; linear-lanceolate, brownish, free, 1 mm long; ovary ovoid-oblong, reddish brown, ca. 1 mm in diam.; style dilated above, 1-1.5 mm long; stigma rounded. Gall flowers similar to female flowers. Achenes smooth.

Fl. & Fr.: May - Sept.

Ecology: Common; along roadsides, near temples, wild in village surroundings, river banks, etc. Partly deciduous in hot season in drier parts.

Distribution: India: Wild in the sub-Himalayan forests, U.P., Bihar, West Bengal, Orissa, Central India, also planted in other parts of the country. Pakistan, Yunnan, Bangladesh, Cochin-China, Myanmar, Malesia, Sri Lanka, North Thailand.

Specimens examined: Hazaribagh, 725; Hunterganj, 2133.

Uses: A sacred tree of Hindus and Buddhists. Leaves are lopped for fodder. Latex is used to fill up the cavities in hollow ornaments. Wood is used for packing cases and for making match boxes. Infusion of bark issued for ulcers and skin troubles by tribals.

4. *Ficus tinctoria* Forst. f., ssp. *parasitica* (Willd.) Corner in Gard. Bull. Singapore 17: 476. 1960 & 21: 75. 1965 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 276. 1981.

F. parasitica Koen. ex Willd., Mem. Acad. Roy. Sci. Hist. (Berlin) 2: 102. 1798; Haines, Bot. Bihar & Orissa pt 5: 835. 1924.

F. gibbosa Blume var. *parasitica* (Willd.) King in Ann. Roy. Bot. Gard. (Calcutta) 1: 6, t. 2a-b. 1887; Prain, Bengal Pl. 2: 979. 1903; Hook. f. in Hook. f., Fl. Brit. India 5: 497. 1888.

F. gibbosa Blume ssp. *parasitica* (Willd.) Haines, For. Fl. Chota Nagpur 397. 1910.

Small to medium-sized tree, to 15 m tall, often epiphytic or climbing on other trees, or straggler by rocks or old walls. Leaves alternate, coriaceous, rhomboid or obliquely elliptic-ovate, obliquely rounded or cuneate at base, obtuse, acute or subacuminate at apex, denticulate or sinuate-crenate to serrate, scabrid on both sides; 5-12 x 3-7 cm; petiole 8-10 mm long. Stipules ovate-lanceolate, slightly curved, 1-1.5 cm long. Figs dioecious, pedunculate, solitary, or in pairs or fascicles, axillary, globose, 5-8 mm across, minutely verrucose, yellow when ripe. Peduncles 0.4-0.8 cm long, bracteate at base; bracts minute, ovate, ca. 2 mm long; mouth of figs or orifice circular, surrounded by small scales. Male flowers: near orifice; tepals 3-5, almost free, white, linear, scarious, 0.8-1 mm; stamen 1, filament united to an abortive pistil by its base; anthers oblong, mucronate. Gall flowers: perianth as in male; ovary smooth, globose or 2-lobed, ca. 0.7 mm across; style short with thickened brownish tip. Female flowers: in separate receptacle; tepals 4, slightly hairy; ovary obovoid-globose, ca. 0.8 mm across; style 0.4 mm long. Achenes keeled or not, obliquely ovoid, slightly papillose, 1-1.5 x 1-1.2 mm.

Fl. & Fr.: Feb. - Apr.

Ecology: Common; on trees, sometimes in open places.

Distribution: Widely distributed throughout India. Sri Lanka, Burma, S. China, Indo-China.

Specimens examined: Ramgarh, 528; Chowparan, 1366.

Uses: Leaves are lopped for fodder. Root-bark is stomachic and aperient.

5. *Ficus virens* Ait., Hort. Kew 3: 451. 1789; Corner in Gard. Bull. Singapore 17: 376. 1960 & 21: 9. 1965 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 238. 1981.

F. infectoria Roxb., Fl. Ind. 3: 551. 1832, non Willd. 1806; Hook. f. in Hook. f., Fl. Brit. India 5: 515. 1888; Prain, Bengal Pl. 2: 981. 1903; Haines, For. Fl. Chota Nagpur 398, 1910 & Bot. Bihar & Orissa pt. 5: 830. 1924.

Local name: Pakar.

Medium-sized to large, spreading, deciduous tree, to 15 m tall; bark pale-greyish, smooth, scaly. Leaves alternate, thinly coriaceous, ovate-elliptic or oblong, rounded or truncate at base, abruptly obtusely acuminate at apex, entire, sub-undulate along margins, 7-12 x 4-8 cm; lateral nerves 10-12 pairs, flattened above, raised below; stipules broadly ovate, acute, pubescent, 1-1.2 cm long; petiole 3-6 cm long, articulate, glandular at apex below. Figs monoecious, peduncled, axillary, paired, globose, often obconical 1-1.5 cm across, whitish or reddish and spotted when ripe; bracts 3-5, triangular-ovate, 0.4 cm, acute, persistent. Orifice closed by 3 apical bracts. Male flowers: few, sessile or shortly stalked, near mouth of receptacle; tepals 2-4, lanceolate, scarious, brown, 0.15 cm long; stamens 1; filament 0.6 cm; anther oblong or broadly ovate, 0.7-0.8 cm long. Gall and female flowers: perianth as in male; style of female flowers long, that of gall flowers short; ovary obovoid, reddish-brown, ca. 0.12 cm long; stigma elongate. Achenes smooth.

Fl. & Fr.: Dec. - Jan.

Ecology: Common; as wild in forests, also planted in parks, gardens and villages.

Distribution: India: Throughout the plains and lower hills of India including Sikkim, U.P., Bihar, West Bengla, Assam, Orissa, Deccan Peninsula, Sri Lanka, Bangladesh, Myanmar, Solomon Islands.

Specimens examined: Jhumri Telaiya, 294; Katkamosandi, 1403.

Uses: Leaves are used as a fodder. Young shoots are sometimes eaten in curries by poor people. The timber is used for making charcoal. Fruits are eaten by local people.

3. MORUS L.

Key to the Species

- 1a. Leaves scaberulous, long-acuminate to caudate at apex. Female tepals obovate. Styles long, connate below ... 2. *M. australis*
- 1b. Leaves not scaberulous, acute to sub-acuminate at apex. Female tepals elliptic. Styles short, free ... 1. *M. alba*

1. **Morus alba* L., Sp. Pl. 986. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 492. 1888; Duthie, Fl. Upp. Gang. Pl. 3: 137. 1915. Nakai in J. Arnold. Arb. 8: 236. 1927.

Local names: Tut, Tutri.

Wide-spreading, medium-sized, deciduous tree, to 15 m tall. Branches grey or greyish yellow. Leaves thin, broadly ovate to ovate-suborbicular, subcordate to subtruncate and oblique at base, acute or sub-acuminate at apex, coarsely dentate, sometimes oddly and irregularly lobed, shining above, glabrous, or slightly pubescent on veins beneath, with 3 basal veins, 5-8 x 3-6 cm; petioles 1.2-2.5 cm long. Inflorescences of different sexes borne usually on distinct branches. Male spikes puberulous, ca. 2.5 cm long; flowers not crowded. Female spikes solitary, ovoid, pedunculate. Male tepals elliptic. Outer female tepals elliptic, keeled, inner flat or concave. Styles short, free. Fruits 1-3 cm long, whitish to dark-violet or purple when ripe, sweet.

Fl.: Nov. - Jan. *Fr.:* Mar. - May.

Ecology: Not common; usually cultivated in gardens, roadsides, etc., also found to grow in National Park.

Distribution: Throughout the plains of India and hilly areas of Himalaya. Indigenous to northern and western Asia; also cultivated in Europe and N. America.

Specimens examined: National Park, 1153; Koderma Forest, 1794.

Uses: Leaves are used for feeding silk-worms. Timber is used for building, furniture, boats, agricultural implements; also for making tennis rackets, cricket stumps, etc. Fruit is used medicinally as a cure for sore throat, dyspepsia and melancholia.

2. *Morus australis* Poir. in Lam., *Encycl. Meth.* 4: 380. 1797; Nakai in J. Arnold Arb. 8: 236. 1927; Rehder in J. Arnold Arb. 10: 123. 1929.

M. indica auct. non L.: Hook. f. in Hook. f., *Fl. Brit. India* 5: 492. 1888; Prain, *Bengal Pl.* 2: 968. 1903; Haines, *For. Fl. Chota Nagpur* 392. 1910 & *Bot. Bihar & Orissa* pt. 5: 821. 1924.

Local names: Siah tut.

Shrub to small tree, to 8 m tall. Leaves ovate or broadly ovate, long-acuminate to caudate at apex, sharply serrate, sometimes deeply lobed, scaberulous, with 3 basal veins and 3-4 secondary veins on central one, 5-12 x 3-8 cm; petiole 1.5-3.5 cm long. Male spikes rather lax-flowered, broadly cylindrical or ovoid, 1.2-3.5 cm long, hairy all over; peduncle short, slender; tepals elliptic, 0.2-0.25 cm long; stamens twice as long as tepals. Female spikes shortly ovoid; peduncle slender; tepals obovate, white-margined; styles long, connate below, hairy. Syncarps ovoid or subglobose, 1.5-4 cm long, at first red, afterwards black.

Fl.: Oct. - Jan. *Fr.:* Mar. - May.

Ecology: Common; in forests, slopes of low hilly, etc.; also cultivated in gardens, on railway platforms, roadsides, etc.

Distribution: India: Outer Himalayan ranges and Sub-Himalayan tract eastwards to Sikkim, now largely cultivated almost throughout the plains of India either as an ornamental or for feeding silk-worms. Bangladesh, Myanmar, China and Japan.

Specimens examined: National Park, 1154; Koderma Forest, 1784.

Uses: Ripe fruits are eaten. Leaves are used for feeding silkworms. Timber is used in the same way as in *M. alba* Linn.

4. STREBLUS LOUR.

Shrubs or trees, unarmed or spinous, monoecious or dioecious, usually lactiferous. Leaves distichous, stipulate, short-petiolate, entire or denticulate, penninerved, without glands. Inflorescences axillary, pedunculate, unisexual or bisexual, cymose or racemose, rarely spicate or capitate, or sometimes female flower solitary. Male flower 3-5-merous, with a pistillode; tepals valvate, free or shortly joined; filaments inflexed in bud; anthers reniform; extrorse. Female flowers 4-merous; tepals decussate, imbricate, free or joined; ovary superior. Drupe usually with a thickened fleshy base, invested by tepals or not. Seed round, invested by thin endocarp.

Streblus asper Lour., Fl. Cochinch. 615. 1790; Hook. f. in Hook. f., Fl. Brit. India 5: 489. 1888; Prain, Bengal Pl. 2: 960. 1903; Haines, For. Fl. Chota Nagpur 392. 1910 & Bot. Bihar & Orissa pt. 5: 820. 1924; Corner in Gard. Bull. Singapore 19: 228. 1962 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3: 281. 1981.

Local names: Siora, Khorus.

Unarmed, stiff, evergreen, bushy shrub to small tree to 12 m tall; bark grey, inner bark whitish. Branches densely twiggy, usually drooping or straggling. Twigs brown, roughly pubescent. Stipules lanceolate, hairy, 2-5 mm long, caducous. Leaves elliptic-obovate or rhomboid, cuneate to subattenuate and slightly asymmetrical at base, acute or subacute and shortly mucronate at apex, irregularly dentate, harshly scabrid on both sides, 1.2-13 x 0.6-6.5 cm, rigid to coriaceous and hard, drying brittle; lateral veins 4-7 pairs, raised below; petiole 0.15-0.3 cm long. Male capitula 0.6-1 cm across, 5-15-flowered; peduncle puberulous, with 1-2 small bracts at base and a few small bracts at apex. Male flowers subsessile; perianth ca. 0.15 cm long; stamens white. Female flowers green, solitary; bracteoles 2, ovate, appressed to perianth; tepals ovate, puberulous, 0.18-0.2 cm long; style branching from below, to 0.6 cm long. Drupe globose, yellow to orange, 0.6-0.8 cm across, invested by enlarged reflexed tepals. Seeds greyish-white, 0.4-0.5 cm across.

Fl. & Fr.: Mar.- June.

Ecology: Common; in forests, along roadsides, bank of rivers, etc.

Distribution: Drier parts of India, Andaman Islands. Sri Lanka, Burma, S. China, Hainan, Indo-China, Thailand, Malesia.

Specimen examined: Hunterganj, 926.

Uses: Rough leaves are substituted for sand paper for polishing ivory, horns and wood. Leaves are lopped for fodder for cattle. Twigs are chewed for cleaning teeth and to cure pyorrhoea.

16. URTICACEAE

Key to the Genera

- 1a. Plants with stinging hairs. Female perianth 4-partite or lobed ... 1. LAPORTEA
- 1b. Plants without stinging hairs :
 - 2a. Female perianth tubular, 2-4-dentate. Stigma filiform ... 3. POUZOLZIA
 - 2a. Female perianth 3-partite. Stigma penicillate ... 2. PILEA

1. LAPORTEA Gaud., *nom cons.*

- 1a. Stigma 3-fid, central branch longer than lateral two. Inflorescences bisexual, Perianth segments of male flowers 3-4 ... 2. *L. interrupta*
- 1b. Stigma simple without branches. Inflorescences unisexual. Perianth segments of male flowers 5 ... 1. *L. bulbifera*

1.* *Laportea bulbifera* (Sieb. & Zucc.) Wedd. in Arch. Mus. Hist. Nat. Paris 9: 139. 1856; Chew in Gard. Bull. Singapore 21: 199. 1965 & 25: 121. 1969. *Urtica bulbifera* Sieb. & Zucc. in Abhandl. Math.-Phys. Kl. Baier. Akad. 4(3): 214. 1846.

L. terminalis Wight, Icon. Pl. Ind. Orient. 6: 9, t. 1972. 1853; Hook. f. in Hook. f., Fl. Brit. India 5: 549. 1888.

L. oleracea Wedd., Arch. Mus. Hist. Nat. Paris 9: 141. 1856; Hook. f. in Hook. f., Fl. Brit. India 5: 549. 1888.

Erect or decumbent or ascending, monoecious annual herbs, to 1.5 cm tall. Stems rooting from nodes, slightly woody at base. Leaves broadly ovate, rounded or subcordate at base, acuminate at apex, serrate, thinly pilose, with minutely punctiform cystoliths numerous on upper surface and almost absent from lower surface, 5-15 x 3-8 cm. Petiole 3-8 cm long. Stipules 2-fid, intrapetiolar, ovate-cymbiform, shortly hairy, 5-8 mm long. Inflorescence unisexual, axillary, solitary or paired, the male usually in lower axils, 4-7 cm long, female in upper axils or subterminal, 10-20 cm long. Male flowers: bracts linear-elliptic, ca. 1 mm long; pedicels 1 mm long; perianth-segments 5, ovate, glabrous to pubescent, 1-2 mm long; stamens 5; filaments reflexed, to 0.15 cm long; pistillode 0.4-0.5 mm long. Female flowers: bracts minute; pedicels ca. 1 mm long; perianth-segments 4, unequal, 0.5-1 mm long, lateral 2 asymmetrical, enclosing the ovary; ovary asymmetrically ovoid, ca. 1 mm long; stigma simple, reflexed. Achenes ovoid, 1.5-2 x 1-5 mm.

Fl. & Fr.: Aug. - Dec.

Ecology: Not common; in roadsides, waste places, on old walls, etc.

Distribution: India: Subtropical Himalayas from Kumaon eastwards, N. Bengal, Naga and Aka Hills in Assam, Nilgiri and Palni Hills and Kerala. Japan, Korea, Manchuria, China, Tibet, Nepal, Bhutan, Sri Lanka, Myanmar, Thailand, Vietnam, Sumatra, Java.

Specimens examined: Hazaribagh, 109; Ghanghree, 1033; Patratu, 1331.

Uses: Young shoots are eaten after boiling by poor people in villages.

Note: Not reported by Haines & Prain. Hooker f. reported from Penninsular India. The species is new record from Bihar State.

2. *Laportea interrupta* (L.) Chew in Gard. Bull. Singapore 21: 200. 1965 & 25: 145. 1969. *Urtica interrupta* L., Sp. Pl. 985. 1753.

Fleurya interrupta (L.) Gaud. in Freyc. Bot. Voy. 497, t. 83. 1826; Hook. f. in Hook. f., Fl. Brit. India 5: 548. 1888; Prain, Bengal Pl. 2: 961. 1903; Haines, Bot. Bihar & Orissa pt. 5: 812. 1924.

Local name: Utigun.

Erect or decumbent or ascending, simple or branched, monoecious, annual herbs. Stems sulcate, purple-streaked, subglabrous or pillose towards the apex. Leaves ovate, cordate to subcordate at base, shortly acuminate at apex, coarsely serrate, 3-nerved from base, sparsely hairy, 2-15 x 1.5-10 cm; petiole 3-10 cm long. Stipules 2-fid, intrapetiolar, 4-5 mm long. Inflorescence bisexual, 5-30 cm long; flowers fasciculate at intervals along axis. Male flowers: bracts lanceolate, ca. 1 mm long; pedicels 0.08-0.1 cm long; perianth-segments 3-4, ovate, concave, pubescent outside at top, 1-1.2 mm long; stamens 3-4; filaments reflexed, ca. 1.5 mm long; pistillode obpyramidal, ca. 0.5 mm long and broad. Female flowers: bracts minute, lanceolate; pedicels ca. 0.5 mm long; perianth-segments 4, unequal, lateral 2 almost enclosing the ovary; ovary asymmetrically ovoid, 0.7-0.8 mm long; stigma linear, 3-fid, reflexed, central branch longer than lateral two. Achenes ovoid, tuberculate, 1.2-1.5 x 1-1.2 mm.

Fl. & Fr.: Sept. - Oct.

Ecology: Common; in waste places, on dilapidated walls, way sides, etc.

Distribution: India: Khasi hills, Tavoy, West Bengal, Bihar, Orissa, Malacca, Deccan Peninsula. Sri Lanka, China, Abyssinia, Japan, throughout S.E. Asia to Queensland and Pacific Islands, Africa.

Specimens examined: Hazaribagh, 28; Hunterganj, 2112.

Uses: Bark yields a strong fibre used for cordage and for making coarse cloth. Flowers are used in curries. Juice of roots is used in chronic fevers.

2. *PILEA* Lindl., *nom. cons.*

Pilea microphylla (L.) Liebm. in Vidensk. Selsk. Skr. 5(2): 296. 1851; Prain, Bengal Pl. 2: 962. 1903; Haines, Bot. Bihar & Orissa pt. 5: 813. 1924; *Parietaria microphylla* L., Syst. Nat. ed. 10, 1308. 1759.

P. muscosa Lindl., Coll. Bot. t. 4. 1821; Hook. f. in Hook. f., Fl. Brit. India 5: 551. 1888.

Prostrate or ascending, delicate, somewhat fleshy annual herbs. Stems subterete, ribbed, sometimes red-blotched. Leaves ovate-elliptic or obovate-

elliptic, subcuneate at base, obtuse at apex, entire, glabrous; one of each pair smaller, shortly petioled, 1.5-2.5 x 0.5-1 mm, larger one minutely petioled, 3-6 x 1.5-2.5 mm. Flowers male and female together in sessile clusters. Male flowers: pedicels 0.7-1 mm long; perianth-segments 4, ovate-rounded, 0.3-0.4 mm long. Stamens 4; rudiment of pistil present. Female flowers: perianth segments, 3, 0.5-0.8 mm long, central one boat-shaped, usually longer than lateral ones; staminodes filiform. Achenes brown, ellipsoid, glabrous, to 0.4-0.2 mm.

Fl. & Fr.: Almost throughout the year.

Ecology: Common; on hard or stony places, old walls, etc.; always in humid situations.

Distribution: Almost throughout the tropical parts of India. Native of tropical America, introduced and naturalised in most of the other tropical countries.

Specimen examined: Hazaribagh, 1565.

Uses: Plant is used in gastric and intestinal troubles. Infusion of plant is given as diuretic. Crushed leaves are applied to sores and bruises.

3. *POUZOLZIA* Gaud.

Pouzolzia zeylanica (L.) Benn. in Benn. *et al.*, Pl. Jav. Rar. 67. 1838; Santap. in Rec. Bot. Surv. India (Fl. Khandala, ed. 3) 16: 255. 1967. *Parietaria zeylanica* L., Sp. Pl. 1052. 1753.

Parietaria indica L., Mant. Pl. 128. 1767.

Pouzolzia indica (L.) Gaud. in Gaud., Freyc. Voy. Bot. 503. 1826; Hook. f. in Hook. f., Fl. Brit. India 5: 581. 1888; Prain, Bengal Pl. 2: 965. 1903; Haines, For. Fl. Chota Nagpur 388. 1910 & Bot. Bihar & Orissa pt. 5: 816. 1924.

Erect, or ascending from creeping and rooting basal part, much branched from base, annual herb. Leaves ovate, oblong or lanceolate, entire, rounded, obtuse or cuneate at base, acute or acuminate at apex, hairy or glabrous, 1-5 x 0.5-2.5 cm; basal nerves ending far below apex; petiole

0.2-2 cm long. Stipules ovate, 0.3-0.4 cm long. Flowers male and female together in axillary clusters. Male flowers: pedicels *ca.* 0.1 cm long; perianth-segments ovate, hairy; stamens 4 or rarely 5. Female flowers: sessile; perianth during anthesis tubular, with a 2-fid apex; fruiting perianth 4-5-ribbed or winged, 0.2-0.5 cm long. Achenes black, shining.

Fl. & Fr.: Oct. - Jan.

Ecology: Very common; in humid grassy places, arable lands, open forests, railway-yards, watersides, etc.

Distribution: Throughout tropical and subtropical India. Himalaya, Bangladesh, Sri Lanka, Myanmar, east to China and S. Japan, Malasia.

Specimens examined: Barkattwa, 521; Satgawan, 1984.

Uses: Tuberos roots are eaten raw, boiled or roasted. Leaves are sometimes eaten as vegetable by poor people. Leaf-extract is used as vulnerary and as a cicatrizant for gangrenous ulcers. Poultice of herb is applied to sores and boils.

17. CASUARINACEAE

CASUARINA L. ex Adans.

Casuarina equisetifolia L., *Amoen. Acad.* 4: 143. 1753; Hook. f. in Hook. f., *Fl. Brit. India* 5: 598. 1888; Prain, *Bengal Pl.* 2: 985. 1903; Haines, *For. Fl. Chota Nagpur* 81. 1910 & *Bot. Bihar & Orissa* pt. 5: 840. 1924.

Local names: Jangli saru, Jhau.

Handsome, large, spreading, monoecious tree, to 25 m tall; apical part of plant and branches drooping; branches greyish-green, deeply-grooved; grooves broad, hairy; internodes 2.5-10 mm long; sheaths with 6-9 appressed teeth. Male spikes terete, 1-4 cm long; perianth-segments 2, bracts densely white-hairy; bracteoles 2, mucronulate from emarginate apex; stamen 1; anthers basifixed, longitudinally dehiscing, filaments 2-2.5 mm long; anthers deeply incised at base and apex. Female flowers: in dense heads terminating in short lateral branchlets; each flower is naked,

in axil of a bract and 2 bracteoles; ovary 2-loculed, posterior locule empty, anterior containing 2 ovules; placentation parietal; style deeply bifid. Fruiting heads ellipsoid, truncate, 1.2-2.2 cm long; fruiting bracteoles 5-7 mm long; fruit proper ovoid-ellipsoid, 6-7 x 2-3 mm.

Fl.: Apr. - May. *Fr.*: June - Sept.

Ecology: Very common; planted as an ornamental along roadsides, in gardens, parks, etc.

Distribution: Throughout India. Sri Lanka, Bangladesh, China, Malasia, Australia, Pacific Islands.

Specimens examined: Jhumri Telaiya: 302; Hazaribagh: 749.

Uses: The tree is planted as an ornamental. Wood is used for transmission poles, paper-making and as fuel.

18. NYCTAGINACEAE

Key to the Genera

- 1a. Leaves alternate. Flowers enclosed by showy, large, coloured bracts. Woody vines ... 2. BOUGAINVILLEA
- 1b. Leaves opposite. Bracteoles or involucrel bracts not coloured, small. Herbs:
 - 2a. Perianth above constriction more than 2 cm long. Flowers showy, 1-few together in a green involucre ... 3. MIRABILIS
 - 2b. Perianth above constriction less than 0.5 cm long. Flowers small, in 2-10-flowered umbelliform clusters or head-like cymes, not subtended by a green involucre, but each flower subtended by a small bracteole ... 1. BOERHAVIA

1. BOERHAVIA L.

Boerhavia diffusa L., Sp. Pl. 3. 1753; Haines, Bot. Bihar & Orissa pt. 5: 757.1924.

B. repens L., Sp. Pl. 3, 1753; Hook. f. in Hook. f., Fl. Brit. India 4: 709. 1885; Prain, Bengal Pl. 2: 862. 1903.

B. procumbens Banks ex Roxb., Fl. Ind. 1: 146. 1820, *nom. superfl.*

B. repens L. var. *procumbens* (Banks ex Roxb.) Hook. f. in Hook. f., Fl. Brit. India 4: 709. 1885; Prain, Bengal Pl. 2: 863. 1903.

B. repens L. var. *diffusa* (L.) Hook. f. in Hook. f., Fl. Brit. India 4: 709. 1885; Prain, Bengal Pl. 2: 863. 1903.

Local name: Sant.

Decumbent or ascending or suberect, widely branched, viscid, perennial herbs, with a woody base. Stems usually purple-tinged. Leaves ovate-rounded or ovate-lanceolate, rounded-subcordate at base, obtuse or acute at apex, subentire-undulate, glabrous, usually pale beneath; larger one of a pair 1.5 x 0.8-3.5 cm, smaller one 0.6-3 cm x 0.5-2 cm; petiole 0.3-2.5 cm long. Flower-clusters united into widely branched panicles. Bracts ovate-lanceolate, 1-1.5 mm long. Pedicels articulate, 0.5-2mm long. Perianth constricted below middle during anthesis, bright-purple or pink or white apically, gland-hairy below constriction, 2-2.5 mm long, with \pm 2 mm across limb. Stamens 2-3. Ovary stalked, 1-locular, 1-ovuled; stigma peltate, entire. Anthocarp rounded at apex, 0.25-0.3 cm long, densely viscidly pubescent.

Fl. & Fr. : Feb.-Nov.

Ecology : Very common; in waste places, grassy fields, roadsides, pastures, railway-yards, forest edges, gardens, etc.

Distribution : Throughout India. Sri Lanka, tropical and subtropical Asia, Africa and America.

Specimens examined : Hazaribagh, 246; Ghanghree, 1653; Markachho, 1953.

Uses : Plant-extract is used in dropsy, ascites of liver and chronic peritonitis.

Note: A polymorphic species, varies much in habit, size and shape of leaves, etc.

2. BOUGAINVILLEA Comm. ex Juss.

Bougainvillea spectabilis Willd., Sp. Pl. ed. 2, 348. 1799; Prain, Bengal 2: 864. 1903; Haines, Bot. Bihar & Orissa pt. 5: 756. 1924.

Local name: Baganvilas.

Stems densely tomentose, with stout, usually recurved spines. Leaves ovate or elliptic-lanceolate, acuminate at apex, tapering or wedge-shaped at base, pubescent, 5-10 x 2-5 cm. Flowers \pm glomerate at ends of branches with long ray-like peduncles. Bracts 3, elliptic-ovate, red, white, cream- or salmon-coloured, 2.5-3 cm long, exceeding the flowers when mature. Perianth-tube densely pubescent; limb 5-6-lobed, rose or yellow. Stamens 5-10, pubescent, included; filaments unequal. Ovary stipitate, with lateral style. Achene 5-ribbed.

Fl. & Fr. : Mar.-July.

Ecology : Very common; planted in gardens, adjacent to buildings, etc.

Distribution: Throughout India. Native of Brazil, now planted throughout the tropics and warm countries.

Specimens examined : Hazaribagh, 1488, 2259; Ramgarh, 1913.

Uses : Planted as an ornamental for its handsome bracts.

3. MIRABILIS L.

Mirabilis jalapa L., Sp. Pl. 177. 1753; Prain, Bengal Pl. 2: 862. 1903; Haines, Bot. Bihar & Orissa Pt. 5: 756. 1924.

Local names: Gulabbas, Gulabash.

Erect, usually much-branched, glabrous annual, 50-80 cm tall, with tuberous tap-root. Stems thickened on nodes. Leaves ovate-triangular, rounded, truncate or subcordate at base, acute to acuminate at apex,

subentire-repand, 3-15 x 2-9 cm. Petioles 0.7-2.5 cm long. Flowers crowded in corymbs at branch-apices, shortly-pedicelled, each inside of calyx-like involucre. Involucre 1-1.2 cm long during anthesis, enlarged to 1.6 cm afterwards, 5-cleft half-way down or more; segments ovate, acute. Perianth red, white or variegated; tube 4-5 cm long, constricted above globose base, gradually widened towards apex, pubescent; limb 2.5-3.5 cm in diam. Stamens 5, exserting; anthocarp ribbed and plicate, black, 7-8 mm long.

Fl. & Fr. : July-Nov.

Ecology : Common; usually cultivated in gardens; also found locally as an escape in waste places.

Distribution : Cultivated in almost all parts of India. Native of Mexico, widely cultivated in most tropical countries.

Specimens examined : Hazaribagh, 260; Ramgarh, 1130; Simaria, 1626.

Uses : Seeds are used as an adulterant of black pepper. Bruised leaves are applied to boils and abscesses.

19. AIZOACEAE

TRIANTHEMA L.

Trianthema portulacastrum L., Sp. Pl. 223. 1753; Gamble, Fl. Madras 1: 550 (389). 1919.

T. monogyna L., Mant. Pl. 1: 69. 1767; Clarke in Hook.f. Fl. Brit. India 2:660. 1879; Prain, Bengal Pl. 1:533. 1903; Haines, Bot. Bihar & Orissa Pt. 2: 49. 1921.

Local name: Svet-sabuni.

Prostrate or decumbent-ascending, branched, annual herb, with a firm tap root. Stems subterete or slightly angular, thickened and flattened on nodes, glabrous or finely glandular-pubescent, 15-40 cm long. Leaves decussate, thin-fleshy, unequal, larger ones orbicular-obovate, smaller ones

either of the same size or oblong, obtuse, rounded or retuse at apex, cuneate at base, entire, purple margined, somewhat lucid, 1.5 x 0.5-4.5 cm; petioles 0.5-2.5 cm long, with sheathing membranous bases connate pairwise below into a funnel-shaped pouch. Stipules arising from apex of pouch on right and left 2-2.5 mm long, with an acute red apex, hairy on midrib. Flowers 6-7 mm across, sessile, axillary, solitary, with their lower part hidden in pouch. Perianth gamophyllous, 4-4.5 mm long, pale-pink, often white, adnate to the base of petiole; segments obtuse with a dorsal macro. Stamens 10-20; filaments 2-2.5 mm long, glabrous, white. Ovary turbinate, 0.3 cm glabrous, incompletely divided into 2 superposed cells. Style 1, 0.25 cm long. Capsule turbinate, with a truncate, 2-lobed apex, slightly exserted, 4-5 mm long, operculate, scarious below. Seeds 1-2 in indehiscent fleshy operculum, 3-7 in lower scarious part, reniform, black, with faint wavy ribs, 1.5-2.5 mm long.

Fl. & Fr. : June-Sept.

Ecology : Common; in waste low-lying places, railway embankments, cultivated or fallow fields, roadsides, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Hazaribagh, 245; Raja Rappa, 872.

Uses : Leaves are eaten as a pot-herb. Roots are used as cathartic, irritant, and abortifacient; also used in asthma, amenorrhoea, and obstruction of liver. Leaf-extract is used in dropsy, oedema, ascites and also as antidote to alcohol-poisoning, in rheumatism and as vermifuge.

20. CACTACEAE

OPUNTIA Mill.

Opuntia stricta (Haw.) Haw. var. *dillenii* (Ker-Gawl.) Benson, *Cact. & Succ. J. America* 41: 126. 1969; Saldan. & Nicols., *Fl. Hassan Dist. ed. 2*, 869. 1978. *Cactus dillenii* (Ker-Gawl.) Edward's *Bot. Reg.* 3: t. 255. 1818.

O. dillenii (Ker-Gawl.) Haw., *Suppl. Pl. Succ.* 79. 1819; Clarke in Hook. f., *Fl. Brit. India* 2: 657. 1879; Prain, *Bengal Pl.* 1: 531. 1903; Burkill

in Rec. Bot. Surv. India 4:314.1911; Haines, For. Fl. Chota Nagpur 282. 1910 & Bot. Bihar & Orissa pt. 3:403. 1922.

Local name : Nagphani.

Large, straggling fleshy shrub, to 5 m tall; branches drooping; limbs flat, lower usually longer and corky, median ones 25-35 cm long and 0.8-1.5 cm thick; upper ones oblanceolate; articulations usually with a ring of spines or bristles when young. Young leaves subulate, fleshy, 5-7 mm long, sub-spinulose, seated on a swollen fleshy base. Areoles with 5-6 pale-yellow, spines and numerous yellow barbed bristles. Flowers entirely pale sulphur yellow or greenish-yellow, funnel-shaped. Petaloid tepals to 4.5 cm long. Hypanthium turbinate, with areoles like those on young limbs, white-tomentose, without spines or bristles. Filaments 0.8-2 cm long; anthers 0.15-0.25 cm long. Ovary to 2.5 cm in diam. Berry obovoid-subglobose, areolar and glochidiate. Seeds many.

Fl. & Fr. : June-Sept.

Ecology: Common; in roadsides, waste lands, banks of ponds, rivers, etc.

Distribution : Throughout India: Native of South America, introduced and naturalised throughout the tropics.

Specimens examined : Hazaribagh, 1613; Hunterganj, 2141.

Uses: Fruits are used in whooping cough. Stem in form of poultice is used to allay inflammation and to boils to hasten suppuration.

21. CHENOPODIACEAE

Key to the Genera

- 1a. Flowers bisexual, borne in clusters being arranged in spikes or panicles:
- 2a. Flowers bracteate. Ovary adnate to the disk and base of perianth, the latter becoming hard and woody in fruit

... 1. BETA

- 2b. Flowers ebracteate. Ovary free from disk and perianth, the latter merely x enlarging in fruit, but never becoming hard and woody ... 2. CHENOPODIUM
- 1b. Flowers unisexual; female flowers solitary in leaf-axils, male ones in terminal spikes or panicles .. 3. SPINACIA

1. BETA L.

Beta vulgaris L., Sp. Pl. 222. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 5. 1886; Prain, Bengal Pl. 2: 879.1903; Haines, Bot. Bihar & Orissa . pt. 5:770. 1924.

Local name: Chukandar.

Erect, glabrous, annual-biennial herbs, with a red or yellow or orange tap-root. Stems branched in upper part. Basal leaves long-petiolate, ovate or ovate-oblong, cordate at base, obtuse or subacute at apex; upper ones sessile or shortly petiolate, oblong-lanceolate, gradually becoming smaller and passing into bracts. Panicle widely branched; flowers usually in 2-6-flowered clusters on panicle. Lower bracts longer than flower-clusters, higher ones shorter. Tepals oblong, obtuse, hooded at top, 1.5-2 mm long. Stigmas 2-3. Utricle adnate to disk and base of hard and woody perianth.

Fl. & Fr. : Feb.-Mar.

Ecology: Very common; cultivated in gardens, fields, etc.; sometimes met with as an escape in waste places.

Distribution : Throughout India. Widely cultivated in Asia, Europe and N. Africa.

Specimens examined : Chatra, 1663; Hazaribagh, 2255.

Uses: Tap roots are eaten after cooking or in salads. Leaves are used as spinach.

2. CHENOPODIUM L.

Key to the Species

- 1a. Plants strongly smelling. Stigmas 3-5. Ovary and fruits covered with yellow glands ... 2. *C. ambrosioides*

- 1b. Plants slightly foetid or without smell. Stigmas 2.
Ovary and fruits not covered with glands :
- 2a. Plants slightly foetid. Seeds finely tuberculate,
dull black, sharply keeled ... 3. *C. murale*
- 2b. Plants without smell. Seeds smooth, shining blackish
brown, obtusely keeled ... 1. *C. album*

1. ***Chenopodium album*** L., Sp. Pl. 219. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 3. 1886; Prain, Bengal Pl. 2 : 879. 1903; Haines, Bot. Bihar & Orissa pt. 5 :769. 1924.

Local name: Bethua sag.

Erect or ascending, simple or sometimes much-branched, inodorous, annual herbs, 20-75 cm long; all vegetative parts and perianth, when young, densely clothed with white powdery vesicles; stems angular-ribbed, with longitudinal dark-green, red or purple streaks. Lower leaves long-petioled, ovate-rhomboid, irregularly and coarsely dentate-serrate or lobulate; higher one short-petioled, ovate-elliptic to oblong-lanceolate, acute or obtuse at apex, cuneate at base, entire or incised; all leaves herbaceous, 1-12 x 0.1-9 cm; petioles to 3 cm long, slender. Flowers *ca.* 0.2 mm across, sessile, 5-merous, borne in paniced clusters, often collected in a large terminal leafy paniculate inflorescence to 10 cm long. Tepals 5, connate at base, ovate, concave, with a strong rounded midrib, 1.5-2 mm long. Stamens 5, slightly longer than the perianth. Stigmas 2, *ca.*0.6 mm long. Fruits depressed-globose, finely papillate, 1.5-2 mm across. Seeds obtusely keeled, smooth, blackish-brown, 1.2-1.5 mm across.

Fl. & Fr. : Dec.-Mar.

Ecology : Very common; in cultivated fields, waste places, gardens and roadsides; also cultivated in gardens and fields for vegetables.

Distribution : India: Tropical and temperate Himalaya from Kashmir to Sikkim, Punjab, Khasi hills, plains of Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Deccan Peninsula. America, Africa, Europe, Continental Asia, Malesia and Australia.

Specimens examined : Hazaribagh, 103; Ghanghree, 1050; Markachho, 1955.

Uses : Plant is used as pot-herb; also used as laxative and anthelmintic.

2. **Chenopodium ambrosioides** L., Sp. Pl. 219. 1753; Hook. f. in Hook. f., Fl. Brit. India 5:3. 1886; Prain, Bengal Pl. 2:879. 1903; Haines, Bot. Bihar & Orissa pt. 5: 770. 1924.

Erect or ascending, much-branched, strongly foetid, annual herb, 20-70 cm tall; entire plant without any powdery vesicles; stems angular-ribbed, glabrous or finely pubescent. Leaves herbaceous, oblong-lanceolate, subacute or often obtuse at apex, narrowed at base into a short petiole, larger ones coarsely and shallowly serrate-dentate, smaller ones often incised and upper entire, thinly pilose, gland-dotted on undersurface, 3-15 x 1-3 cm; higher ones smaller, gradually passing into bracts. Flowers *ca.* 2 mm across, sessile, borne in 3-20-flowered clusters in slender, axillary and terminal, lax, simple or paniced spikes combined into a leafy panicle. Tepals 5, light green with a pale base, connate near the base, ovate-triangular, concave, indistinctly keeled, gland-dotted and hairy outside, 1.2-1.5 mm long. Stamens usually 4-5; filaments hyaline, slightly exceeding calyx. Stigmas 3-5; ovary 0.8 mm across, with yellow glands above. Fruit depressed-globose, 1.5 mm across, enclosed entirely by the persistent perianth. Seeds shining, brownish black, 0.8-1 mm across.

Fl. & Fr. : Apr.-Aug.

Ecology : Common; in waste places, cultivated lands, along road-sides and watersides of canals and streams, etc.

Distribution : India: West Bengal, Bihar, Deccan Peninsula. Native of tropical America, introduced in Europe, Asia, Africa, Australia and Malesia.

Specimens examined: Ramgarh Cant., 543; Patratu, 1333.

Use : Plant is used as an anthelmintic.

3. **Chenopodium murale** L., Sp. Pl. 219. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 4. 1886; Haines, Bot. Bihar & Orissa pt. 6: 1257. 1924.

Erect or ascending, usually much-branched, slightly foetid, annual herbs, 10-60 cm tall. Stems angular-ribbed. Leaves herbaceous, ovate-

rhomboid or ovate-deltoid, cuneate at base, subacute to obtuse at apex, irregularly and acutely serrate-incised, 3-10 x 1.5-6 cm. Petioles of lower leaves longer, 3-5 cm long, those of upper ones gradually smaller and of topmost ones very short. Flowers *ca.* 2 mm across, 5-merous, in cymose clusters combined into axillary and terminal dense spikes forming ultimately a 2-4 cm long panicle. Tepals connate at base, oval, faintly keeled, 1.5-2 mm, incurved in fruit. Stamens inserted on base of perianth. Stigmas 2. Utricle depressed-globose, 1.2-1.5 mm in diam. Seeds sharply keeled, dull black, finely tuberculate, 0.7-0.8 mm in diam.

Fl. & Fr. : Nov.-Mar.

Ecology : Not common; as a weed in wheat, potato, brinjal and other Rabi crop-fields and also in gardens.

Distribution : India: Punjab, Uttar Pradesh, Bihar, West Bengal, Deccan Peninsula. Possibly native of Continental Asia, widespread in Europe, America, Africa and Australia.

Specimens examined : Ghanghree, 1022; Hazaribagh, 2262.

Use: Plant is used as a pot-herb.

3. SPINACIA L.

Spinacia oleracea L., Sp. Pl. 1027. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 4. 1886; Prain, Bengal Pl. 2: 879.1903; Haines, Bot. Bihar & Orissa pt. 5: 770. 1924.

Local name : Palak.

Erect, simple or branched, dioecious herbs. Stems angular-ribbed. Radical and middle leaves long-petiolate, ovate-oblong or triangular-hastate, obtuse or acute at apex, entire or with projecting lobes at base on either side, bright green, soft, glabrous; higher ones smaller and becoming lanceolate in inflorescence. Staminate tepals 5, ovate, obtuse, 1.2-2 mm long; stamens 5. Pistillate perianth with 2 spines. Utricle enclosed in perianth and adnate to it, hard, compressed. Seeds dull, obtusely margined.

Fl. & Fr. : Nov.-Jan.

Ecology : Very common, cultivated in fields, gardens, etc., also met with as an escape in waste places, field-borders, etc.

Distribution : Throughout India. Native country unknown, widely cultivated in almost all parts of S.W. Asia.

Specimens examined : Hazaribagh, 1246; Gola, 1528.

Uses: Leaves are used as vegetables; also employed in soups and salads. Fruits are demulcent and diuretic, employed in fevers and bowels.

22. AMARANTHACEAE

Key to the Genera

- 1a. Leaves opposite or whorled:
- 2a. Anthers 2-celled (4-locellate):
- 3a. Utricle indehiscent or bursting irregularly. Leaves not linear-filiform:
- 4a. Pseudo-staminodes short, with a broad apex. Flowers glabrous. Bracteoles pungent ... 1. *ACHYRANTHES*
- 4b. Pseudo-staminodes subulate. Flowers either white -pilose, or short -hairy and strong-nerved. Bracteoles not pungent ... 2. *AERVA*
- 3b. Utricle circumscissile by a minute lid splitting at maturity. Leaves very narrow, linear-filiform ... 9. *TRICHURUS*
- 2b. Anthers 1-celled (2-locellate):
- 5a. Stigma 1, capitate entire. Filaments fused at base only. Bracteoles not dorsally cristate ... 4. *ALTERNANTHERA*
- 5b. Stigmas 2, erect or spreading. Filaments fused almost to top. Bracteoles with a vertical dorsal crest ... 8. *GOMPHRENA*
- 1b. Leaves alternate:
- 6a. Seeds few to many. Utricle circumscissile ... 6. *CELOSIA*

6b. Seed solitary, erect:

7a. Pseudo-staminodes absent:

8a. Flowers hermaphrodite:

9a. Inflorescence capitulate. Utricle circumscissile. Fertile flowers not subtended by modified sterile flowers ... 3. ALLMANIA

9b. Inflorescence spicate. Utricle indehiscent. Fertile flowers each subtended by 2 lateral modified sterile flowers consisting of antr-shaped scales ... 7. DIGERA

8b. Flowers unisexual. Utricle indehiscent or rupturing irregularly or circumscissile ... 5. AMARANTHUS

7b. Pseudo-staminodes present. Utricle rupturing irregularly ... 2. AERVA

1. ACHYRANTHES L.

Achyranthes aspera L., Sp. Pl. 204. 1753; Hook. f. in Hook. f., Fl. Brit. India 4: 730. 1885; Prain, Bengal Pl. 2:875. 1903; Haines, For. Fl. Chota Nagpur 381. 1910 & Bot. Bihar & Orissa pt. 5: 767. 1924.

Local names: Chirchira, Latjira.

Erect, rather stiff, annual perennial herbs, 20-100 cm tall, simple or with obliquely erect or ascending branches. Stems and branches angular-ribbed, thickened above the nodes, densely hairy. Leaves decussate, broadly elliptic-obovate or obovate-suborbicular, gradually or abruptly narrowed at base, acute, shortly acuminate or obtuse at apex, entire or crisy-undulate, glabrous to pubescent, 3-10 cm x 2-6 cm; petiole 0.5-1.5 cm long. Flowers 2.5-3 mm across, borne in erect, terminal spikes of 10-75 cm long. Rachis angular-ribbed, appressedly or patently hairy. Bracts lanceolate or narrowly deltoid-lanceolate, long-acuminate, pale or brownish, 2-3.5 mm long, erect before anthesis, afterwards spreading. Bracteoles ovate, appressed against base of perianth, spinescent, 2-3 mm long. Perianth-segments 5, ovate-lanceolate, green with pale margins, 3 or more-nerved, 3.5-6 mm long, the outer longest. Stamens 5; filaments 2-3.5 mm long, connate at base into a short cup; alternating pseudo-staminodes

truncate or crenulate, with a long-fringed scale just below apex. Style 1-2.5 mm long; stigma capitate. Utricle ellipsoid, rounded at base, 2.5-3 mm long. Seed cylindrical, smooth, 2-5 mm long.

Fl. & Fr. : Sept.-Jan.

Ecology: Very common; along roadsides, waste places, as a weed of gardens, fields, along streams, forest margins, etc.

Distribution : Throughout India. Tropical Asia, Africa, Australia and America.

Specimens examined : Hazaribagh, 33; Patratu, 572; Chouparan, 1672.

Uses : Decotion of leaves is diuretic, used in renal dropsies. Young leaves are served as spinach. Plants are used to prepare green manure.

2. *AERVA* Forsk., *nom. cons.*

Key to the Species

- 1a. Leaves opposite and alternate. Spikes often forming a lax panicle. Tepals 0.2-0.25 cm long. Stigma entire or sometimes obscurely 2-lobed ... 1. *A. sanguinolenta*
- 1b. Leaves alternate. Spikes never forming a panicle. Tepals 0.12-0.15 cm long. Stigmas 2, distinct, shortly linear and obliquely spreading ... 1. *A. lanata*

1. *Aerva lanata* (L.) Juss. ex Schult., Syst. Veg. ed. 15, 5:564. 1819; Hook. f. in Hook. f., Fl. Brit. India 4:728. 1885; Prain, Bengal Pl. 2: 874. 1903; Haines, For. Fl. Chota Nagpur 381. 1910 & Bot. Bihar & Orissa pt. 5: 766. 1924. *Achyranthes lanata* L., Sp. Pl. 204. 1753.

Erect or decumbent to prostrate, perennial herbs branching from base, to 75 cm long. Stem and branches terete, striate, woolly. Leaves alternate, suborbicular-obovate or ovate-elliptic, cuneate or contracted at base, subacute to obtuse, apiculate at apex, entire, densely white-pubescent, 0.6-4 x 0.5-2.5 cm; petiole 0.2-1 cm long. Flowers hermaphrodite, 0.18 cm across, borne in axillary, usually 2-4 together, sessile cylindrical spikes, higher ones often collected into a dense leafless inflorescence; bracts deltoid-ovate, mucronate, white, hairy without; 0.1 cm long, persistent;

bracteoles similar or slightly smaller. Perianth segments 5, oval-oblong, 0.13-0.15 cm long; outer 2 hyaline with a minute mucro and inner 3 slightly shorter and narrower, with green midrib. Stamens 5, alternating with pseudostaminodes. Filaments connate at base into a short cup. Style 0.06-0.08 cm long, bifid nearly half-way down; arms shortly linear, obliquely spreading. Utricle round, compressed, 0.1 cm across. Seeds reniform, black, shining, 0.06-0.08 cm.

Fl. & Fr. : Dec.-Feb.

Ecology : Common; in dry wastelands, roadsides, in arable or fallow fields, etc.

Distribution : Throughout the hotter parts of India. Widespread in hotter parts of tropics and subtropics of the Old World.

Specimens examined : Barhi, 898; Ramgarh, 1120; Chouparan, 1688.

Uses : Leaves are eaten as vegetables by poor people. Decoction of plant is used in cough, sore-throat and diabetes, and also as diuretic.

2. *Aerva sanguinolenta* (L.), Bl., Bijdr. 547. 1825; Backer in Steenis, Fl. Males. ser. 1, 4: 85. 1949. *Achyranthes sanguinolenta* L., Sp. Pl. ed. 2, 294. 1762.

Achyranthes scandens Roxb., Fl. Ind. 2 : 509. 1824.

Aerva scandens (Roxb.) Wall. ex Moq. in DC., Prodr. 13: 302. 1849; Hook. f., in Hook. f. Fl. Brit. India 4: 727. 1885; Prain, Bengal Pl. 2: 874. 1903; Haines For. Fl. Chota Nagpur 381. 1910 & Bot. Bihar & Orissa pt. 5: 765. 1924.

Erect or rambling, perennial branched herbs or undershrubs, woody at base. Stems and branches terete, appressedly or patently white-hairy in upper part, glabrescent gradually downwards. Leaves opposite and alternate, ovate-elliptic, oblong or lanceolate, cuneate or contracted at base, acute, mucronate at apex, entire, densely appressed-white hairy on both surfaces, 1.5-7.5 x 0.5-4 cm; petiole 0.4-1 cm. Flowers bisexual or female, ca. 1.5 mm across, borne in solitary or fascicled, shortly cylindric spikes, often combined into a lax panicle; bracts and bracteoles ovate,

mucronate, pilose outside, 1-1.5 mm long. Tepals 5, lanceolate, pilose outside, 2-2.5 mm long; outer 2 shortly mucronate. Stamens 5; filaments connate into a short cup. Style 0.5 mm long; stigma entire or often slightly 2-lobed. Utricle 1 mm across. Seeds reniform, brownish black, shining, to 0.7 mm in diam.

Fl. & Fr. : Oct.-May.

Ecology : Common; in roadsides, waste places, grassy localities and along forest edges.

Distribution : India: Plains of Upper India from Punjab to West Bengal and Assam, Central and Western India. China, Taiwan and Malesia.

Specimens examined : Hunterganj, 929; Mandu, 1341.

Use : Roots are used in dysentery.

3. ALLMANIA R. Br. ex Wight

Allmania nodiflora (L.) R. Br. ex Wight var. *angustifolia* Hook. f. in Hook. f., Fl. Brit. India 4: 717. 1885.

A. nodiflora auct. non (L.) R. Br. ex Wight: Prain, Bengal Pl. 2: 867. 1903; Haines, Bot. Bihar & Orissa pt. 5: 759. 1924.

Plant 20-70 cm long, spreading, prostrate or ascending, much-branched. Stem usually red, flexuous below; branches \pm angular, sulcate or striate, glabrous or thinly pilose. Leaves linear or linear-oblong, cuneate to subattenuate at base, obtuse or subacute at apex, glabrous or thinly hairy on lower surface, 2-7 x 2-6 mm; petiole to 1 cm long. Inflorescence at first green or reddish, finally stramineous, sessile, terminal and leaf-opposed, subglobose to ovoid, erect, 1-2.5 cm in diam. Bracts membranous, ovate-deltoid, aristate, with an excurrent darker midrib, 3-4 mm long. Bracteoles longer and narrower, 4.5-5 mm long, with a long arista, scabrid on keel. Tepals elliptic-lanceolate, membranous, silvery, with a reddish-green midrib, shortly mucronate, glabrous or thinly pilose dorsally, 4-5 mm long. Filaments subulate, 3-3.5 mm long. Style slender, at first included but finally slightly exerted. Capsule ovoid, 3-4 mm long. Seed lenticular black, 2-2.5 mm in diam.

Fl. & Fr. : Aug.-Oct.

Ecology : Not common; on sandy soil along forest paths within grasses.

Distribution : India: Karnataka, Bihar, West Bengal. Sri Lanka, Java, Sumatra.

Specimens examined : National park, 817, 2040.

4. ALTERNANTHERA Forsk.

Key to the Species

- 1a. Bracts and outer 2 tepals with spinescent tips. Tepals very dissimilar in form and length. Stems trailing or creeping ... 3. *A. pungens*
- 1b. Bracts and tepals not spinescent. Tepals all similar in form, but almost equal or unequal in length:
- 2a. Tepals 1-nerved:
- 3a. Three filaments only antheriferous, other 2 anantheriferous. Heads sessile or very shortly peduncled ... 4. *A. sessilis*
- 3b. Filaments all antheriferous. Heads long-peduncled ... 2. *A. philoxeroides*
- 2b. Tepals 3-nerved:
- 4a. Leaves obovate-oblongate or spatulate, not purple-tinged. Tepals almost equal. Style ca. 0.02 cm long ... 1. *A. paronychioides*
- 4b. Leaves obovate-oblong or obovate-elliptic, usually purple-tinged. Tepals unequal. Style ca. 0.05 cm long ... 5. *A. tenella*

1. **Alternanthera paronychioides* St. Hil., Voy. Distr. Diamans. Bresil 2(2): 439. 1833; Veldk. in Blumea 19: 167. 1971.

Gomphrena polygonoides L., Sp. Pl. 225. 1753, *nom. rejic.* (as the type is confusing).

Alternanthera polygonoides (L.) R. Br. ex Roem. & Schult., Syst. Veg. 5: 557. 1819, *comb. rejic.* (as based on confusing type); Duke in Ann. Miss. Bot. Gard. Edinburgh 48: 40. 1961.

Perennial herb, with a stout vertical rootstock. Branches numerous, prostrate, mat-forming, rooting at nodes, \pm white-villous when young, finally glabrescent and yellowish. Leaves obovate-oblongate or spatulate, narrowed at base into a long, indistinctly demarcate petiole, obtuse or subacute at apex, white-villous on both surfaces when young, finally glabrescent above, 0.6-3 x 0.2-1 cm. Inflorescence sessile, axillary, solitary or 2-3 together, ovoid- subglobose, 4-8 mm in diam. Bracts firm, ovate-acuminate, mucronate, white, 2.5-2.7 mm long; bracteoles similar but smaller and slightly narrower. Tepals subequal, white, oblong-lanceolate, 3-nerved to about middle, mucronate, pilose, 3.5-4.5 mm long. Stamens 5, all fertile, slightly exceeding the ovary and style; alternating pseudo-staminodes much shorter than filaments, dentate near apex. Style very short, ca. 0.2 mm long. Utricle compressed, orbicular-obcordate, 1.8-2 mm across; seed discoid, brownish, 1-1.2mm.

Fl. & Fr. : Almost throughout the year.

Ecology: Very common; on dry sandy grounds, roadsides, banks of ponds, canals, rivers, field-borders, etc.

Distribution : Throughout the tropical parts of India. Native of tropical America, naturalised in USA, Java, Sri Lanka and elsewhere of the Old World.

Specimens examined: Jhumri Telaiya, 171; Ramgarh Cant., 1247; Etkhori, 1861.

Note: According to Townsend (in Dassan. & Fosb., Rev. Handb. Fl. cylon 1: 50.1980) although Linnean specimen *Gomphrena polygonoides* is conspecific with the present species, it cannot be regarded as the type, because it is at variance with description in Linnaeus' ed. 1 of *Species Plantarum*. For this, since Linnaeus' name is impossible to typify satisfactorily, it should be rejected as nomen confusum. Townsend (*l.c.*) also mentioned that the specific epithet was spelt as 'paronichyoides' by St. Hilaire (*l.c.*), but should be used in the corrected form 'paronychioides'.

2. •**Alternanthera philoxeroides** (Mart.) Griseb. in Goett. Abh. 24: 36. 1879; Backer in Steenis, Fl. Males. Ser. 1, 4: 93. 1949; Mahesw. in Bull. Bot. Surv. India 6: 313. 1965. *Bucholzia philoxeroides* Mart. in Nova Acta Acad. Leop. -Carol. 13(1): 315. 1826.

Tilanthera philoxeroides Moq. in DC. Prodr. 13(2): 362. 1849.

Decumbent or ascending from a creeping or floating rooting base, often much-branched and forming dense masses, aquatic, semiaquatic or marshy perennial herbs, to 100 cm long. Stems fistular, striate, with a longitudinal hairy groove on two opposite sides, otherwise glabrous. Leaves opposite, oblong or oblong-obovate, acute or rounded, submucronate at apex, tapering at base into a 3-6 mm long petiole, entire, glabrous or ciliate, with a transverse row of hairs in the axils, 3-10 x 0.6-2.5 cm. Flowers bisexual, borne in solitary, axillary, peduncled, ovoid to globular-ellipsoid, dense heads of 8-15 mm long. Peduncle 1-4.5 cm long, with a longitudinal hairy groove on the adaxial side, otherwise glabrous. Bracts ovate-triangular, white, 1-nerved, glabrous, persistent, 2-3 mm long; bracteoles similar, ovate, acuminate, 2-2.5 mm long. Perianth-segments oblong, dorsally compressed, shining white, 1-nerved, glabrous, 5-7 mm long. Stamens 5, united below into a tube; filaments 3.5-4 mm long; alternating pseudo-staminodes linear-oblong, about as long as stamens, divided at tip into 3-4 narrow strips. Style short; ovary obovate-cuneate, dorsally compressed, rounded at apex; stigma capitate. Fruit not seen.

Fl. & Fr. : Apr.-Sept.

Ecology : Common, in stagnant shallow water, pools, ponds, ditches near railways, marshes, etc.

Distribution : India: Madhya Pradesh, Bihar, West Bengal, Assam Native of Brazil, introduced in Myanmar, Java, Thailand, Malesia, North and South America.

Specimens examined : Jhumri Telaiya, 660; Raingarh, 1901.

Uses : Plant is eaten by cattle; also used as a pot-herb and in salads.

Note: The species has become a trouble-some weed, because it has been spread in all the stagnant water-ways in villages, towns, etc. The

species reproduces by vegetative means of subterranean shoots, and thus under favourable condition it spreads rapidly forming a dense mass.

3. **Alternanthera pungens* Kunth in H.B.K., Nov. Gen. Sp. 2: 206. 1817; Raizada in Ind. For. 76. : 495. 1950; Melville in Kew Bull. 13: 174. 1958.

Achyranthes repens L., Sp. Pl. 205. 1753.

Alternanthera repens (L.) Link, Enum. Pl. Hort. Berol. 1: 154. 1821; non Gmelin 1791; Backer in Steenis, Fl. Males. ser. 1, 4: 91. 1941.

A. echinata auct. non Sm. : Tadulin. & Venkatan., Handb. S. Ind. Weeds 274, t. 114. 1932; Mooney, Suppl. Bot. Bihar & Orissa 128. 1950.

Prostrate, mat-forming, perennial herbs, to 50 cm long, often rooting at the lower nodes. Stems much-branched at base, terete, striate, hard, densely appressed hairy. Leaves of unequal size in a single pair, broadly elliptic-obovate, narrowed at base, obtuse or rounded, minutely mucronate at apex, glabrous or thinly appressed-pilose on both surfaces, specially on the nerves beneath, 1.5-4.5 x 1-3.5 cm. Flowers borne in sessile, globose or oblong heads of 0.5-1.5 cm long, solitary or 2-3 together in the leaf-axils; bracts ovate-lanceolate, membranous, spine-tipped, 3.5-4 mm long; bracteoles similar, slightly smaller, acuminate but not spine-tipped. Perianth-segments 5, very dissimilar; abaxial (outer) two much larger, deltoid-lanceolate, convex, rigid, 5-nerved at base, 4-4.5 mm long; adaxial (inner) one oblong, flat, dentate near tip, not spine-tipped, mucronate, 3-3.5 mm long; the lateral 2 (inner) much smaller, concave below. Stamens 5, all perfect; filaments 0.5-0.7 mm long; the alternating pseudo-staminodes much shorter than filaments, entire or dentate. Style very short. Ovary compressed, narrowed below. Fruit lenticular, much compressed, brown, 1.5-2 mm. Seed discoid, brown, shining, 1-2 mm.

Fl. & Fr. : Sept.-Apr.

Ecology : Common; in waste places, roadsides and other disturbed grounds.

Distribution : Throughout India. Native of America, now widespread as a weed in the Tropics and Sub-tropics of the Old World.

Specimens examined : Simaria, 792; Hunterganj, 1645.

Uses : Plant is used as diuretic. Decoction of leaves and twigs is used in gonorrhoea.

Note: The species can endure and even thrives on prolonged dried situation of the Summer.

4. *Alternanthera sessilis* (L.) DC., Cat. Hort. Monspel. 77. 1813; Hook. f. in Hook. f., Fl. Brit. India 4: 731. 1885; Prain, Bengal Pl. 2: 875. 1903; Haines, Bot. Bihar & Orissa Pt. 5:768. 1924.

Gomphrena sessilis L., Sp., Pl. 225. 1753.

Alternanthera triandra Lam., Encycl. 1: 95. 1783; Gamble, Fl. Madras 2: 1179 (825). 1925.

Erect or prostrate or ascending or sometimes creeping, perennial or sometimes annual herbs, to 80 cm long. Stems 4-angular, often branched from base, green or often tinged with purple, with a longitudinal line of white hairs on two opposite sides and transverse line of white hairs across nodes, otherwise glabrous. Leaves varying from linear-lanceolate, oblong to elliptic, cuneate to attenuate at base, subacute or rounded at apex, glabrous or thinly pilose, entire or obscurely denticulate, 0.8-8 x 0.2-3 cm; petiole 1.5-5 mm long. Flowers *ca.* 1.5 mm across, borne in sessile or sometimes shortly-peduncled, globose heads of 0.4-1 cm long, 1-4 together in axils of present or fallen leaves, becoming cylindrical with age; bracts deltoid-ovate, shortly acuminate, white, persistent, 0.7-10 mm long; bracteoles similar, 1-1.5 mm long. Perianth-segments equal, ovate-elliptic, shortly acuminate to blunt, white or often purple-tinged, 1-nerved, 2-2.5 mm long. Stamens 5 (2 filaments anantheriferous); filaments *ca.* 0.8 mm long; alternating pseudo-staminodes somewhat shorter than filaments. Style very short; ovary roundish, compressed. Fruit obcordate or obreniform, strongly compressed, dark brown, 2-2.2 x 2.5-3 mm. Seeds discoid, brown, shining, 0.7-1 mm.

Fl. & Fr.: June-Dec.

Ecology: Common; in ditches, swampy plots, wet paddy fields and field borders, waste places, roadsides, on old walls, etc.

Distribution: Throughout the hotter parts of India. Widespread in tropics and subtropics of both Old and New Worlds.

Specimens examined: Hazaribagh, 15: Pratappur, 1541.

Uses: The plant is eaten as vegetable by poor people in villages; also used as a good fodder and given to cattle for increasing the flow of milk.

Note: The species extremely varies in habit, size, shape of leaves and flower-heads, degree of hairiness with the habitat conditions.

5. **Alternanthera tenella* Colla in Mem. R. Acad. Sc. Torino 33 : 131, t. 9. 1828; Veldkamp in Taxon 27: 313. 1978.

Gomphrena ficoidea L., Sp. Pl. 225. 1753, *nom. rejic.* (as type is confusing).

Alternanthera ficoidea (L.) R. Br. ex Roem. & Schult., Syst. Veg. 5: 555. 1819, non *A. ficoidea* Beauv. 1818; Backer in Steenis, Fl. Males. ser. 1, 4:93. 1949, *p.p. excl.* Syn. *Gomphrena polygonoides* Linn. and *A. polygonoides* R. Br.; Naithani & Raizada in Ind. For. 102: 679-680. 1976, *p.p.*

Decumbent-ascending, usually caespitose, multicauline, perennial herbs. Stems much-branched from base, rooting at lower nodes, terete in lower part, quadrangular upwards, with a longitudinal furrow on two opposite sides, appressed-pilose towards apex and on nodes. Leaves obovate-oblong or obovate-elliptic, cuneate at base, acute or obtuse and finely mucronate at apex, subentire to \pm crisped-margined, usually purple-tinged, nearly glabrous, 1-6 x 0.5-2 cm; petioles 0.5-3 cm long, hairy. Heads terminal and axillary, usually in dense clusters of 2-8, globose or oblong, 0.5-1 cm long; rachis hairy. Bracts and bracteoles ovate, long-acuminate, hairy on back or glabrous, 1.8-3 mm long. Tepals 5, unequal, ovate-lanceolate, 3-4.5 mm long; outer 3 with close-set strong nerves, finally indurate at base; abaxial 2 concave, densely patent-hairy on back in lower halves and glabrous in upper halves. Stamens 1.2-2 mm long (including basal cup); anthers 5, 1-2 sometimes shorter than others; pseudo-staminodes strap-shaped, cleft into 3-5 narrow strips at apex. Style subconical, 0.5 mm long. Utricle faintly notched, falls off with tepals.

Fl. & Fr.: Dec.-Apr.

Ecology: Rare, as a weed in cultivated fields, field-borders, roadsides, etc..

Distribution: India: Maharashtra, Karnatka, Orissa, West Bengal, Uttar Pradesh and Punjab. Probably native of Brazil, introduced in Malasia, Thailand, West Indies, tropical and sub-tropical S. America.

Specimens examined: Ramgarh Cant., 1227, 1903.

Uses: Plant is used as a remedy for "Weeping Eczema". Fresh juice of young leaves, extracted in water, is applied on weeping spots for 3-7 days. This stops oozing of water and burning sensation.

Note: According to Mears (*Taxon* 29: 89-90, 1980), the name *A. ficoidea* (L.) R. Br. ex Roem. & Schult. (1819) has been a later homonymous orthographic variant of *A. ficoides* Beauv. (1818) and therefore, would be rejected according to the Art. 75.2 for orthographic variants of ICBN (Stafleu *et al.*, 1978). According to the proposal No. 449 by Veldkamp (*Taxon* 27: 310-314, 1978) and recommendation of the Committee for Spermatophyta (Brummitt in *Taxon* 31: 540-541, 1982), the assumed basionym *Gomphrena ficoidea*, L. is rejected due to confusion of the Linnaeus' type implying under the Sydney Code (1982). As such, following the references (Pedersen in *Taxon* 29: 326-328, 1980 and Kanis in *Taxon* 32: 316-319, 1983) the name *A. tenella* Colla would be the correct name.

5. AMARANTHUS L.

Key to the Species

- 1a. Utricle indehiscent or bursting irregularly.
Tepals 3 ... 4. *A. viridis*
- 1b. Utricle dehiscent, circumscissile. Tepals 5 or 3:
 - 2a. Tepals 3, long-awned ... 3. *A. tricolor*
 - 2b. Tepals 5, shortly mucronate:

- 3a. Flower-clusters axillary for a lower part, collected in spikes or panicles for the rest. Bracts and bracteoles shorter than or as long as the perianth. Armed ... 2. *A. spinosus*
- 3b. Flower-clusters collected in terminal and axillary spikes. bracts and bracteoles exceeding the perianth. Unarmed ... 1. *A. caudatus*

1. ***Amaranthus caudatus*** L., Sp. Pl. 990. 1753; Hook. f. in Hook. f., Fl. Brit. India 4: 719. 1885; Prain, Bengal Pl. 2: 870. 1903; Haines, Botany, Bihar & Orissa pt. 5: 761. 1924.

Local name: Ram dana.

Erect, sparingly branched or not, annual herbs, 30-150 cm tall. Stem rather stout, obtuse angular, glabrous or thinly patent-hairy upwards, usually suffused with purple. Leaves long-petioled, rhomboid-ovate, ovate-lanceolate, cuneate to attenuate at base, subacute or obtuse, mucronate at apex, sub-entire-repand, glabrous or often thinly pilose along margins and nerves beneath, green, often bordered with purple, 3-25 x 2-15 cm; petiole 3-10 cm long. Flowers borne in dense clusters collected in axillary and terminal, drooping spikes of to 30 cm or more long, terminal spike much longer than others; male and female flowers intermixed throughout; bracts and bracteoles deltoid-ovate, acuminate and with a long rigid arista, pale-membranous, slightly or much exceeding the perianth. Male flowers: perianth-segments 5, ovate-oblong, mucronate, 2.5-3 mm, purple; stamens 5, filaments *ca.* 1.5 mm long. Female flowers: perianth-segments similar to those of male in number and other characters, oblong-obovate to obovate-spathulate, 2-2.5 mm long; style 3, to 0.8-1 mm long. Utricle ovoid-globose, slightly exceeding the perianth, terminated by persistent styles, circumscissile. Seed subspherical, usually white or yellow, with thick rounded border, 1-1.2 mm in diam.

Fl. & Fr. : June-Aug.

Ecology: Not common; in waste places; sometimes cultivated as an ornamental.

Distribution : Throughout India. Widely cultivated in various parts of the world.

Specimens examined : Ghanghree, 1651; Hazaribagh, 2264.

Uses : Plant is eaten as a pot-herb. Seeds are consumed as food.

2. **Amaranthus spinosus** L., Sp. Pl. 991. 1753; Hook. f. in Hook. f., Fl. Brit. India 4: 718. 1885; Prain, Bengal Pl. 2: 869. 1903; Haines, For. Fl. Chota Nagpur 379. 1910 & Bot. Bihar & Orissa pt. 5: 761. 1924.

Local name: Kataili chaulai.

Erect or slightly decumbent, often much-branched, armed, annual herbs, 15-100 cm tall. Stems terete or obtuseangular, green or sometimes suffused with purple, glabrous or slightly pubescent. Leaves long-petioled, ovate-lanceolate to rhomboid-elliptic, cuneate at base, obtuse, rounded or slightly retuse, shortly mucronate at apex, subentire-repand, glabrous or slightly pubescent on nerves when young, 3-10 × 1.5-4.5 cm. Flowers green, borne in dense clusters; lower clusters axillary, entirely female; higher ones collected into spikes or panicles representing female in lower part and wholly male in upper part. Axillary clusters and those on lower part of spike armed with usually 2 or sometimes more sharp, erecto-patent, straight, 0.5-2 cm long spines. Bracts and bracteoles deltoid-ovate, mucronate, shorter than or as long as perianth. Male flower: perianth-segments 5, ovate-oblong, convex, shortly mucronate, with transparent margins and green and purple median band, 2-2.5 mm long; stamens 5; filaments ± equalling the perianth. Female flowers: perianth-segments oblong-spathulate, 1.5-2.5 mm long, their number and other characters similar to those of male; style 2-3, 1.2-1.5 mm long, recurved. Utricle oblong, circumscissile, 1.5-1.8 mm long, with a 3-lobed apex. Seed compressed, with a thin margin, black, shining, 0.8-1 mm in diam.

Fl. & Fr. : Feb.-Dec.

Ecology: Very common; along roadsides, waste places, vacant plots, fields, gardens, railway-yards, forest margins, etc.

Distribution: Throughout India. Probably of American origin, cosmopolitan in the warmer regions of the World.

Specimens examined: Jhumri Telaiya, 173; Ichak, 1311.

Uses : Plant is used as pot-herb. Plant-extract is used for eruptive fevers; also as lactagogue. Infusion of young shoots is used in eczema.

3. *Amaranthus tricolor* L., Sp. Pl. 989. 1753; Roxb., Backer in Steenis, Fl. Males. ser. 1, 4: 77. 1949; Towns. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1:15. 1980.

A. magnostanus L., Cent. Pl. 1: 32. 1755; Hook. f. in Hook. f., Fl. Brit. India 4: 720. 1885; Prain, Bengal Pl. 2: 871. 1903; Haines, Bot. Bihar & Orissa pt. 5: 763. 1924.

A. gangeticus L., Syst. Nat. ed. 10, 1268. 1759; Hook. f. in Hook. f., Fl. Brit. India 4: 719. 1885; Prain, Bengal Pl. 2: 870. 1903; Haines, For. Fl. Chota Nagpur 380. 1910 & Bot. Bihar & Orissa pt. 5: 762. 1924.

Local name: Lal Sag.

Erect or ascending, usually much-branched, annual herbs, to 1.5 m tall. Stems and branches angular, glabrous or thinly pubescent towards apex. Leaves long-petioled, ovate-rhomboid to ovate-elliptic or ovate-lanceolate, cuneate to sub-attenuate at base, subacute, obtuse, rounded, retuse or slightly emarginate at apex, subentire-crenulate, glabrous or thinly pubescent on nerves below, entirely green or suffused with red or purple, 3-8 × 2-5 cm; petiole 2-5 cm long. Flowers green to crimson, borne in dense clusters; lower clusters axillary; higher ones often collected in spike; male and female flowers intermixed; bracts and bracteoles deltoid-ovate, long-awned, subequalling or shorter than perianth, pale-membranous. Male flowers; perianth-segments 3, oblong-elliptic, long-awned, with broad transparent margins and green or purple median band, 3.5 -6 mm long; stamens 3, free; filaments equalling or shorter than perianth. Female flowers: perianth-segments similar to those of male in number and other characters, 2-3 mm long, accrescent to 5 mm; styles 3, 2-2.5 mm long. Utricle flask-shaped, with a short neck below style base, 2.5-3 mm long, circumscissile, wrinkled. Seeds lenticular, obtusely margined, blackish brown, shining, 1-1.2 mm in diam.

Fl. & Fr.: Oct.-Feb.

Ecology : Not common; along roadsides, waste places, in fields, etc.; sometimes cultivated as a pot-herb.

Distribution : Throughout India. Asia from Pakistan to China and Japan in the north and Malesia in the south; also in New Hebrides and smaller Pacific Island groups (Fiji, etc.). Native area blurred by cultivation. Introduced and/or cultivated in Africa, West Indies, etc.

Specimens examined : Churchu, 686; Markachho, 1476.

Uses : Leaves are eaten as vegetables by poor people in villages. Infusion of tender shoots is given to those having vitamin deficiency.

4. *Amaranthus viridis* L., Sp. Pl. ed. 2, 1405. 1763 (quoad descr. et Herb. Linn. excl. Ref. Bauhin & Tournef.) ; Hook. f. in Hook. f., Fl. Brit. India 4: 720. 1885; Prain, Bengal Pl. 2: 871. 1903; Haines, Bot. Bihar & Orissa pt. 5: 763. 1924.

A. gracilis Desf., Tabl. Ecole Bot. 43. 1804.

Local name : Jangli-chaurai.

Erect or often ascending, usually much-branched, unarmed, annual herbs, 10-75 cm long. Stems terete-obtuseangular, glabrous or thinly pubescent towards the apex. Leaves long-petioled, ovate-rhomboid or oblong, obtuse or shortly cuneate at base, obtuse, rounded or retuse, minutely mucronate at apex, subentire-repand, glabrous or pubescent on nerves beneath, green, 3-10 x 2-6.5 cm; petiole 2-6 cm long. Flowers green, borne in dense clusters; lower clusters axillary, upper ones collected in dense continuous or interrupted spikes and panicles; male and female flowers intermixed with latter more numerous; bracts and bracteoles ovate, minutely mucronate, shorter than perianth. Male flowers: perianth-segments 3, linear-oblong, convex, shortly mucronate, glabrous, with transparent white margins and green median band, 1.2-1.5 mm long; stamens 3, free; filaments 0.1 cm long; rudimentary filiform ovaries often present. Female flowers: perianth-segments narrowly oblong-spathulate, 0.8-1.5 mm long, their number and other characters similar to those in male; stigmas 2-3, short, \pm erect. Utricle subglobose, 1.2-1.5 mm in diam, shortly beaked, corrugated, indehiscent or rupturing irregularly. Seed round, slightly compressed with a blunt margin, brown or black, shining, 1-1.2 mm in diam.

Fl. & Fr.: Sept.-Mar.

Ecology : Very common; as a weed of cultivated areas, waste places, along roadsides, gardens, railway-yards, etc.

Distribution : Throughout India. Cosmopolitan in the tropical and subtropical regions of the World, penetrating more widely into temperate regions of the World.

Specimens examined: Jhumri Telaiya, 162; Ichak, 353; Bark-aganwa, 890.

Use: The leaves are eaten as vegetables by poor people in villages.

6. CELOSIA L.

Celosia argentea L., Sp. Pl. 205. 1753; Hook. f. in Hook. f., Fl. Brit. India 4: 714. 1885; Prain, Bengal Pl. 2: 867. 1903; Haines, Bot. Bihar & Orissa pt. 5:759. 1924.

Key to the Forma

- 1a. Leaves oblong-lanceolate or narrowly linear.
Flowers white, glistening, over 0.75 cm long.
Spikes usually tapering ... 1. f. *argentea*
- 1b. Leaves usually ovate. Flowers pink, rose or yellow,
under 0.6 cm long. Spikes usually fasciated ... 2. f. *cristata*

1. f. **argentea**

Local name : Sufaid murgha.

Plant 20-150 cm tall, simple or with many ascending branches. Stems and branches strongly ridged and sulcate, glabrous. Leaves oblong-lanceolate to narrowly linear, acute on both ends, glabrous, herbaceous, usually tinged with red, 2-15 x 0.1-5 cm; leaf axils usually provided with \pm falcate small leaves.-Spikes solitary or sometimes paired, erect, very dense, conical at first, becoming cylindrical at length in full flower, 2.5-20 x 1.5-3 cm; peduncle sulcate, to 20 cm long, usually lengthening during flowering. Bracts and bracteoles ovate-oblong, pellucid, 1-nerved, mucronate, persistent after fall of perianth, 0.3-0.6 cm long. Perianth-segments narrowly elliptic-oblong, shortly mucronate with an excurrent

midrib, white with pink lip or almost entirely pink, 0.6-1 cm long. Staminal cup 0.15-0.2 cm long; free part of filaments 0.25-0.3 cm long; pseudostaminodes minute, triangular. Style pink, 0.35-0.5 cm long. Utricle obovoid, rounded at apex, included by perianth, 0.3-0.4 cm long. Seeds 4-8, 0.12-0.15 cm in diam.

Fl. & Fr. : Aug.-Oct.

Ecology : Very common; as a weed in open dry localities, cultivated fields, gardens, waste places, dried-up river beds, etc.

Distribution: Throughout India. Pantropical.

Specimens examined : Barkattwa, 507; Churchu, 1285; Ichak. 1836.

Uses: Stems and twigs are used as vegetables by local people in villages. Seeds are useful in blood diseases and mouth sores, and also for diseases of eye.

2. *f. cristata* (L.) Schinz in Pflanzenfam. ed. 2, 16c: 29. 1934; Towns. in Nasir & Ali, Fl. W. Pakistan 71: 6. 1974. *Celosia cristata* L., Sp. Pl. 205.1753; Hook. f. in Hook. f., Fl. Brit. India 4: 715. 1885; Prain, Bengal Pl. 2: 867. 1903.

C. argentea var. *cristata* (L.) Kuntze, Rev. Gen 1: 541. 1891; Haines, Bot. Bihar & Orissa pt. 5: 759. 1924.

Local name : Lal murgha.

Undershrub, to 2.5 m high. Leaves usually ovate, acuminate at apex, to 20 x 5 cm. Spikes usually fasciated, cock's comb-like, variously branched with sterile shoots, excessively developed and monstrous. Flowers 0.5-0.55 cm long.

Fl. & Fr. : Oct.-Jan.

Ecology : Common; cultivated in the gardens; also occurs spontaneously in waste places, roadsides, gardens, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Hazaribagh, 1346, 1809; Chouparan, 1682.

Uses: Plant is grown as an ornamental. Seeds are demulcent, prescribed in painful micturition, cough and dysentery.

7. DIGERA Forsk.

***Digera muricata* (L.) Mart.**, Beitr. Amar. 2: 77. 1825; Backer in Steenis, Fl. Male. ser. 1, 4: 80. 1949; Towns.in Dassan. & Fosb., Rev. Handb. Fl. Ceylon, 1:23. 1980. *Achyranthes muricata* L., Sp. Pl. ed. 2, 295. 1762.

A. alternifolia L., Mant. 50. 1767.

Digera arvensis Forsk., Fl. Aegypt. Arab. 65. 1775; Hook. f. in Hook. f., Fl. Brit. India 4: 717. 1885; Prain Bengal Pl. 2: 868. 1903; Haines, For. Fl. Chota Nagpur 380. 1910.

D. alternifolia (L.) Aschers. in Schweinf. Beitr. Fl. Aethiop. 180. 1867; Haines, Bot. Bihar & Orissa pt. 5: 760. 1924.

Local name : Latmhuria.

Erect or decumbent-ascending, annual herb, to 50 cm long, simple or with ascending branches from near base. Stems and branches flexuous, glabrous or slightly hairy, with pale ridges. Leaves alternate, ovate, ovate-lanceolate to ovate-oblong, subcuneate, rounded or sub-cordate at base, acute or shortly acuminate, apiculate at apex, entire or obscurely crenulate, glabrous, 1.5-7 x 0.7-5 cm; petiole slender, 1-5 cm long. Flowers 3.5 mm across, borne in axillary, solitary, patent -ascending, long-peduncled racemes of 2-25 cm long; bracts deltoid-lanceolate, concave, with a green or brownish midrib, 2.5-3 mm long, persistent, each subtending 3 flowers-central one fertile and 2 lateral ones sterile; pedicels very short; bracteoles oblong, scarious-margined, 2-2.5 mm long. Sterile flowers: appressed against fertile flower, flat, modified into accrescent, antler-shaped scales, in the lower ones, gradually smaller and absent in higher flowers. Fertile flowers: perianth-segments 5, pink, subequal; outer 2 concave, 5-7-nerved, 3.5-4 mm long; inner 3 shorter, narrower, 1-2-nerved. Stamens 5, free; filaments much longer than anthers; style 2-2.5 mm long; stigma, 2, short, recovered. Fruit globose, slightly compressed, muricate, bluntly keeled

along each side, with 2 apical hornlets, 2-2.5 mm in diam. Seed globose, 1.2-1.5 mm across.

Fl. & Fr. : Aug.-Nov.

Ecology : Common; as weed in cultivated lands, gardens, along roadsides, railway embankments, etc.

Distribution : India: N.W. India, West Bengal, Orissa, W. Peninsula. Asia from tropical Arabia and Yemen to Afganistan, Pakistan, Malesia and Indonesia, South, Central and East Tropical Africa and Malagasy.

Specimens examined : Ghanghree, 1042; Barkattwa, 1699.

Uses: Plant is relished by cattle. Tender shoots are eaten as pot herb by poor people. Flowers and seeds are used for urinary disorders.

8. GOMPHRENA L.

Key to the Species

- 1a. Bracteoles with a very distinct, dentate-serrate, dorsal crest extending from apex almost to the extreme base of the midrib. Heads yellowish green ... 1. *G. globosa*
- 1b. Bracteoles with very narrow, inconspicuous, dorsal crest confined to upper one-third of midrib. Heads white ... 2. *G. serrata*

1. ***Gomphrena globosa** L., Sp. Pl. 224. 1753; Hook. f. in Hook. f., Fl. Brit. India 4: 732. 1885.

Erect or decumbent, often much-branched, annual herbs, to 60 cm high, rooting at lower nodes. Stems and branches sub-terete or sulcate, thickened at base of internodes, often tinged with red, densely appressed-pilose on young parts. Leaves oblong to lanceolate or elliptic-oblong, narrowed at base, subacute to obtuse, apiculate at apex, thinly pilose on both surfaces, 5-14 x 2-6 cm; petiole 1-1.5 cm long; the pair of leaves subtending the inflorescence almost sessile. Flowers 4-4.5 mm across, borne in sessile, usually solitary, globose or depressed-globose heads of

1.5-2.5 cm across; bracts deltoid-ovate, acuminate, 3-6 mm long; bracteoles deep-purple, pink white, 0.8-1.2 cm long, with a very distinct, dentate-serrate, dorsal crest. Perianth-segments 5, linear-lanceolate, yellowish green, woolly outside, 5-6.5 mm long. Stamens 5, monadelphous; staminal tube subequalling the perianth, 5-dentate, with deeply bilobed teeth having obtuse lobes subequalling the anthers. Style much shorter than staminal tube, bifid. Stigmas divergent. Fruit oblong-ovoid, compressed, 2.5 mm long. Seeds reniform, brown, shining, *ca.* 2.5 cm long.

Fl. & Fr.: Oct.-Dec.

Ecology: Not common; cultivated in gardens as an ornamental, also found as an escape by roadsides and in waste places.

Distribution : Warmer parts of India. Native of tropical America, introduced and cultivated in the warmer regions of the World.

Specimens examined : Hazaribagh, 747; Chatra, 829.

Uses: Roots are used for coughs. Young leaves and tender shoots are consumed as vegetables by poor people.

2. **Gomphrena serrata* L., Sp. Pl. 224. 1753; Mears in Taxon 29: 86. 1980.

G. decumbens Jacq., Hort. Schoenbr. t. 482. 1805; Gamble, Fl. Pres. Madras 2: 1179 (825). 1925.

G. celosoides auct. non Mart. : Sandw. in Kew Bull. 29. 1946; Backer in Steenis, Fl. Males. ser. 1, 4: 96. 1949; Towns. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 53. 1980.

Erect, prostrate or ascending annual-perennial herbs, 10-25 cm long, much-branched. Stem and branches 4-angular, appressed-pilose. Leaves subsessile or shortly petioled, oblong-lanceolate or oblanceolate-spathulate, narrowed at base, obtuse or subacute, mucronate at apex, glabrescent or thinly appressed-pilose above, densely so beneath, 1.5-8 x 0.5-1.5 cm. Flowers *ca.* 1.5 mm across, borne in sessile heads, subglobose at first, 1-1.2 cm in diam, finally elongating into oblong spikes of 0.4 cm long, rachis

woolly; bracts deltoid-ovate, shortly acuminate, 1-nerved, 3-4 mm long; bracteoles 5.5 -6 mm long, with a dorsal, narrow, entire or irregularly dentate crest. Perianth segments lanceolate, 1-nerved, acutely mucronate, white, 4.5-5 mm long, woolly externally in lower half. Staminal tube subequalling the perianth, shortly 5-dentate with deeply bilobed teeth. Style much shorter than staminal tube, bifid. Stigmas divergent. Utricle compressed, pyriform, 1.7-2 mm across. Seeds compressed-ovoid, brown, shining, to 1.5 mm across.

Fl. & Fr. : Jan.-July.

Ecology: Common; in roadsides, grassy and waste places, gardens, etc., often locally gregarious, tufted in mats; thrive well to hot, dry situations.

Distribution : Warmer parts of India. Native of America, introduced and becoming a widely distributed weed in the warmer regions of the World.

Specimens examined : Hazaribagh, 278; Satgawan, 581; Tandwa, 1431.

Note : According to Mears (*l.c.*), *G. serrata* L. (1753) was renamed by Jacquin (1805) as *G. decumbens* without citing reference to Linnaeus' name. It is most common and much variable non-cultivated species distributed widely in America and different warmer parts of the World. It is usually misidentified as *G. celosiodes* Mart., a closely related species retracted to S. America except in cultivation.

9. TRICHURUS TOWNS.

Trichurus monsoniae (L.f.) Towns. in Kew Bull. 29(3): 466. 1974 & in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 36.1980.

Illecebrum monsoniae L.f., Suppl. 161.1781.

Celosia monsoniae Retz., Obs. 2: 13. 1781. ('monsonia')

Aerva monsoniae (Retz.) Mart. in Nov. Act. Phys. Med. Acad. Caes. Leop.-Carol. Nat. Cur. 13(1): 291. 1826; Hook. f. in Hook. f., Fl.

Brit. India 4 : 728. 1885; Prain, Bengal Pl. 2: 874. 1903; Haines, For. Fl. Chota Nagpur 382. 1910 & Bot. Bihar & Orissa pt. 5: 766. 1924.

Prostrate or ascending, simple to much-branched from the long flexuous tap-root, annual-perennial, hardy, tomentose herbs, to 50 cm long. Stems slender, wiry, angled and furrowed with pale ridges, with opposite or whorled branches, often rooting at nodes. Leaves in pairs or whorls in upper internodes, crowded on lower, linear, setaceous, entire, woolly, 1-2.5 cm long. Flowers hermaphrodite, 4-merous, pink, 1.5 mm across, borne in axillary and terminal, globose to elongate, paired or 3-4 together, dense spikes, 8-15 x 3-5 mm. Bracts lanceolate, hyaline with a green midrib, 2 mm long. Bracteoles similar, smaller. Perianth segments 4, lanceolate-subulate, hyaline with a green midrib, dorsally lanate, 2.2-2.5 mm long. Stamens 4, alternating with pseudostaminodes; filaments connate at base into a cup. Style short with two very short divergent stigmas. Ovary depressed-globose with a single pendulous ovule. Utricle oblong, circumscissile by a minute lid at top enclosed in persistent bracteoles and perianth-segments. Seeds ovoid, reddish-brown, shining, 0.6 mm.

Fl. & Fr. : Dec.-Feb.

Ecology: Common, on open dried sandy river beds in cultivated fields as weeds, etc.

Distribution : India: Bihar, West Bengal, Orissa, Central India and Western Peninsula. Sri Lanka, Bangladesh, Thailand, Myanmar.

Specimens examined : Ghanghree, 1015; Hunterganj, 1644.

Note: Townsend (*l.c.*) after careful examination of the species is convinced that it should not come in the genus *Aerva* Forsk. or in any other genus of the family because of several characters of external morphology. Therefore, he created a new genus *Trichurus* Towns. to accommodate this distinct species. However, Bennet (in J. Ind. For. 8: 86. 1985) established a new genus *Trichuriella* Benn. as substitute for *Trichurus* Towns. (1974) which has been the later homonym of *Trichurus* Clements (1896) belonging to the Fungi.

23. PORTULACACEAE

PORTULACA L.

Key to the Species

- 1a. Leaves all opposite, ovate-lanceolate. Nodal hairs conspicuous. Petals 4 ... 3. *P. quadrifida*
- 1b. Leaves alternate or subopposite, not ovate-lanceolate. Petals 4-6:
- 2a. Largest leaves obovate to spatulate. Nodal hairs absent or inconspicuous. Sepals distinctly carinate. Petals 5 ... 1. *P. oleracea*
- 2b. Largest leaves linear to elliptic. Nodal hairs conspicuous. Sepals not carinate. Petals 4-6 ... 2. *P. pilosa*

1. *Portulaca oleracea* L., Sp. Pl. 445. 1753; Roxb., Fl. Ind. 2: 463. 1832; Dyer in Hook. f., Fl. Brit. India 1: 246. 1874; Prain, Bengal Pl. 1: 240. 1903; Haines, For. Fl. Chota Nagpur 378. 1910 & Bot. Bihar & Orissa pt. 2: 47. 1921; Geesink in Blumea 17: 292. 1969 & in Steenis, Fl. Males. ser. 1, 7: 129. 1971.

Local name: Baralaniya.

Prostrate or decumbent-ascending, branched, glabrous, sub-succulent, annual herb, swollen at nodes, often tinged with copper-brown. Leaves spirally arranged or alternate to subopposite, sessile or short-petioled, obovate or spatulate, attenuate at base, rounded or retuse at apex, entire, glabrous, 0.7-2.5 x 0.4 -1.5 cm. Stipular hairs axillary, scarious, minute, ca. 1.5 mm long, or 0. Flowers sessile, 0.8-1 cm across, in terminal clusters of 2-6, subtended by 3-4 involucreal leaves and inconspicuous hairs. Sepals 2, unequal, distinctly carinate, 2.5-4 mm long, enveloping fruit. Petals 5, oblong-obovate, yellow, retuse, 5-6 mm long. Stamens 7-10 (-12), unequal, to 2.5 mm long. Style 3-5-fid, ca. 3.5 mm long, ovary obovoid, 1-celled. Capsule ovoid, glabrous, 5-7 mm long, dehiscent above base; operculum 3-4 mm long. Seeds tubercled-punctate, black, 0.7-1 mm across.

Fl. & Fr. : June-Sept.

Ecology: Common; in waste places, gardens, near railway tracks, and river beds.

Distribution : Throughout India. Pantropical.

Specimens examined : Ichak, 1319; Ghanghree, 2181.

Uses: Plants are largely used as pot-herbs. Leaves are eaten in scurvy and liver diseases. Plants are consumed as vegetables by poor people.

2. *Portulaca pilosa* L., Sp. Pl. 445, 1753; Poellnitz., Fedde Repert. 37: 240-320. 1934; Geesink in Blumea 17: 294. 1969 & in Steenis, Fl. Males. ser. 1, 7: 131. 1971.

Key to the Subspecies

- 1a. Petals 0.25-1.2 cm long. Cells of testa convex to pyramidal, without a nipple ... 1. ssp. *pilosa*
- 1b. Petals longer, to 2.5 cm long. Cells of testa flat, but at seed-edge nipped ... 2. ssp. *grandiflora*

1. ssp. ***pilosa*** - Geesink in Blumea 17: 295. 1969 & in Steenis, Fl. Males. ser. 1, 7: 131. 1971.

Portulaca tuberosa Roxb., Fl. Ind. 2: 464. 1832; Dyer in Hook. f., Fl. Brit. India 1: 247. 1874; Prain, Bengal Pl. 1: 240. 1903; Haines, Bot. Bihar & Orissa pt. 2:46. 1921.

Leaves spirally arranged, linear to elliptic, 0.4-2.8 x 0.05-0.4 cm; axillary hairs conspicuous, 0.2-1.5 cm long. Capitula 2-10-flowered, \pm congested with adjacent quasi-axillary capituli. Flowers surrounded by 0.7-2.5 mm long bracteoles and 0.4-1.6 cm long hairs. Sepals 2-6 x 1-4 mm, sometimes hooded at base. Petals 4-6, obovate, yellow or pink, 0.25-1.2 x 0.2-1 cm. Stamens 20-30; filaments 2-5 mm long; anthers globose or ellipsoid 0.4-0.7 mm. Style 3-7 mm long, 3-7-fid. Fruit \pm globose 2-3.5 mm across; operculum $\frac{1}{2}$ to $\frac{2}{3}$ as high as fruit, straw-yellow to olive green. Seeds 0.4-0.6 mm across, grey or bluish; testa cells convex to pyramidal, without a nipple.

Fl. & Fr. : July-Oct.

Ecology : Common; in sandy river-beds, roadsides, waste places; also cultivated as an ornamental.

Distribution : Throughout India. Pantropical.

Specimen examined : Ghanghree, 2152.

Uses : Plant is used as febrifuge, aperient and diuretic. Leaves in form of poultice are applied to boils.

2. ssp. **grandiflora** (Hook.) Geesink in *Blumea* 17: 297. 1969 & in Steenis, *Fl. Males. ser. 1*, 7:131. 1971.

Portulaca grandiflora Hook., *Bot. Mag. n.s.* 3, t. 2885. 1829; Haines, *Bot. Bihar & Orissa* pt. 2: 47. 1921.

Leaves spirally arranged, linear, to 2.5 x 0.3 cm; axillary hairs conspicuous, ca. 5 mm long. Flowers in each capitulum to ca. 5, each surrounded by to 5 mm long bracteoles and to 1 cm long hairs. Sepals 7-8 mm long, with a very small apical keel. Petals \pm obovate, pink or orange, to 2.5 cm long. Stamens 40-70; filaments to 6 mm long; anthers elliptic, ca. 1.4 mm long, 2- or 4-celled. Style to 1.2 cm long, with 5-18 arms. Fruit \pm globose, ca. 5 mm across; operculum 1/2 to 2/3 as high as fruit, straw-yellow. Seeds 0.6-0.7 mm long, shining; testa cells flat, but at seed-edge nipped.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; usually planted, also escapes in waste places, roadsides, etc.

Distribution : Almost throughout India. Native of tropical America, now pantropical.

Specimen examined : Ghangree, 2167.

Use : The plant is grown as an ornamental.

3. **Portulaca quadrifida** L., *Mant. Pl.* 1: 73. 1767; Dyer in Hook. f., *Fl. Brit. India* 1: 246. 1874; Prain, *Bengal Pl.* 1: 240. 1903;

Haines, For. Fl. Chota Nagpur 378. 1910 & Bot. Bihar & Orissa pt. 2: 47. 1921.

Local name: Chota laniya.

Slender, prostrate, small annual herb with numerous ascending filiform branches, rooting at nodes. Leaves decussate, shortly petioled, ovate-lanceolate, cuneate at base, acute at apex, entire, glabrous, 4-6 x 1-3 mm. Stipular hairs in a ring, canescent, *ca.* 3 mm long. Flowers subsessile, *ca.* 6 mm across, terminal, solitary, subtended by 4 involucreal leaves and copious white hairs. Sepals 2, hyaline, oblong, *ca.* 3 mm long, united at base. Petals 4, yellow, oblong-obovate, united below, 3-4 mm long. Stamens 8 or 12, to 2.5 mm long; filaments hairy at base. Style filiform, to 3 mm long, 4-fid to middle; ovary ellipsoid, half-embedded in receptacle, 1-celled. Capsule conical, glabrous, 3.5-4 mm long; operculum 2-2.5 mm long. Seeds *ca.* 10, minutely tubercled, 0.6-0.7 mm across.

Fl. & Fr. : July-Sept.

Ecology : Common; in gardens, waste places, arable lands, deforested lands, ruderal places, between gravel or in sand, etc.

Distribution : Throughout the warmer parts of India. Pantropical, except Australia and the Pacific east of Samoa.

Specimens examined : Hazaribagh, 19; Ramgarh, 1920.

Uses : Plant is used as vegetable by poor people, also used in asthma, cough, urinary troubles and inflammations.

24. BASELLACEAE

BASELLA L.

Basella alba L., Sp. Pl. 272. 1753; Steenis in Steenis, Fl. Males. ser. 1,5 :301. 1957.

B. rubra L., Sp. Pl. 272. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 20. 1886; Prain, Bengal Pl. 2: 882. 1903; Haines, For. Fl. Chota Nagpur 382. 1910 & Bot. Bihar & Orissa Pt. 5: 772. 1924.

Local name : Poi.

Winding or creeping, 2-10 m long and to 1 cm thick. Stems and petioles usually red, sometimes green. Leaves broadly ovate to oblong, shallowly cordate to subcuneate at base, obtuse to subacute at apex, green or purplish, 2-12 x 1.2-9 cm; petiole 1-3 cm long. Spikes 3-20 cm long, simple; rachis thick, red or green; flowers at first close together, gradually more spaced; bracts shorter than flower, ovate-triangular; bracteoles shorter than bracts, elliptic. Perianth segments 5, connate, with pale base and white or purple apex, blunt, 3-4 mm long. Stamens 5, epipetalous included; filaments very short, inserted near top of corolla-tube; anthers dorsifixed, versatile. Ovary 1-celled; ovule 1, basal; styles 3; stigmas linear. Pseudoberry depressed-globose, lobed, shining black, 4-7 x 5-10 mm containing a violet juice. Seed globular, with spiral embryo and large, thin cotyledons, 3-5 mm in diam.

Fl. & Fr. : Mar.-Dec.

Ecology : Common; grown by village-people in gardens, fields, etc., also locally naturalised in waste places, settled drier parts and thickets.

Distribution: Throughout India. Probably native of Africa and tropical S.E. Asia, now pantropic in distribution.

Specimens examined: Hazaribagh, 2562; Ghanghree, 2932.

Uses: The plant is used as vegetables. Sap from the fruits is used for colouring food. Mucilaginous leaves are pulped and used as poultice. Juice of leaves are used to remove constipation.

Note: *B. alba* and *B. rubra* are treated as conspecific following the treatments of van Steenis (*l.c.*), Milne Redhead [Fl. Trop. E. Africa (Basellaceae) 2. 1968], Hara *et al* (Enum. Fl. Pl. Nepal 3: 171. 1982), etc. However, Sastry *et al.* (in Ind. J. For. 5: 152. 1982) adopted Stewart's proposal (Punjab Pl. 177. 1869) of considering *B. rubra* L. as a variety of *B. alba* L.

25. MOLLUGINACEAE

Key to the Genera

- 1a. Seeds estrophiolate. Flowers borne in cymes or pseudoracemes ... 2. MOLLUGO
- 1b. Seeds strophiolate. Flowers in axillary fascicles ... 1. GLINUS

1. GLINUS L.

Key to the Species

- 1a. Leaves and tepals stellately hairy. Capsule 5-valved. Stigmas 5. Flowers sessile or subsessile ... 1. *G. lotoides*
- 1b. Leaves and tepals glabrous or thinly hairy. Capsule 3-valved. Stigmas 3. Flowers distinctly pedicelled ... 2. *G. oppositifolius*

1. ***Glinus lotoides* L.**, Sp. Pl. 463. 1753; Backer in Steenis, Fl. Males. ser. 1, 4: 269. 1951.

Mollugo hirta Thunb., Prodr. Fl. Capensis 1: 24. 1794; Clarke in Hook. f., Fl. Brit. India 2: 662. 1879; Prain, Bengal Pl. 1: 533. 1903; Cooke, Fl. Bombay Pres. 1: 557. 1903.

M. lotoides (L.) Kuntze, Rev. Gen. Pl. 214. 1891; Haines, Bot. Bihar & Orissa pt. 2: 48. 1921.

Prostrate or decumbent-ascending, stellately hairy, pluricauline annual herb with a long tap root, greyish-green when young, twining reddish brown with age. Stems much branched, spreading in all directions, terete, with thickened nodes, clothed with white stellate hairs, specially in upper part, 10-60 cm long. Stipules linear, acute. Radical leaves rosulate, fugaceous; higher leaves opposite or 3-nate, unequal, obovate, obtuse or rounded at apex, often shortly apiculate, cuneate at base, entire or often undulate, glabrescent above or clothed with white stellate hairs on both surfaces, 1-2 x 0.6-1.5 cm; petiole slender, 3-6 mm long. Flowers 0.6-1 cm across, sessile or subsessile, borne in fascicles of 3-8; pedicels 1-2 mm long, sometimes becoming to 1.5 cm long, stellate-hairy. Tepals elliptic

or oblong, mucronate, green with one overlapped scarious (white) margin in each, 0.4-0.6 cm long, erecto-patent during anthesis, erect or conniving before and after antheses, stellate-hairy without, glabrous within, persistent. Stamens usually 5; filaments filiform, arising from a minute hypogynous disk alternating with the ridges on the ovary; anthers white. Ovary ovoid, ca. 3 mm, glabrous, 3-5 celled; style short, stigmas 5, linear, spreading. Capsule oblong, 0.7-1 cm long, a little shorter than fruiting calyx, 5-veined. Seeds reniform, brown, finely granular, ca. 0.6 mm.

Fl. & Fr. : Jan.-Apr.

Ecology : Common, in sandy waste places, dried up pools and ditches, on fallow rice fields, by river banks, etc.

Distribution : Pratappur, 907; Bishnugarh, 1107.

Uses : Tender shoots are eaten as pot-herb; also it is used in abdominal disorders.

Note: Haines reported this from Manbhum and Mahanadi river beds of Orissa State.

2. ***Glinus oppositifolius*** (L.) DC. in Bull. Herb. Boiss. ser. 2, 1: 552. 1902; Backer in Steenis, Fl. Males. ser. 1, 4: 270. 1951; *Mollugo oppositifolius* L., Sp. Pl. 89. 1753.

Mollugo spergula L., Syst. ed. 10, 881. 1759; Clarke in Hook. f., Fl. Brit. India 2: 662. 1879; Prain, Bengal Pl. 1: 533. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 48. 1921.

Vern. name : Gima, Jima.

Prostrate, ascending or erect, pluricauline annual herb, with a strong tap root. Stems much-branched, spreading, with thickened nodes, 8-40 cm long. Leaves for greater parts in whorls of 3-5 of which 2 leaves larger than others, oblong-obovate or spatulate, round, obtuse or subacute at apex, apiculate, tapering at base into a 2-5 mm long petiole, entire, glabrous or thinly hairy, 5-25 × 2.5-8 mm. Flowers 3.5-4 mm across, distinctly pedicelled, borne in fascicles of 2-6; pedicels 0.6-1.2 cm long, slender.

Tepals oblong, green with scarious margins or inner almost entirely scarious, erecto-patent during anthesis, erect before and after anthesis, glabrous, 3-5 mm long, persistent. Stamens 5(-10); filaments filiform. Ovary 3-lobed, 2 mm long, 3-celled; stigmas 3, minute, widely patent or recurved. Capsule oblong, 3-3.5 mm long, a little shorter than the fruiting sepals, 3-valved. Seeds reniform, brown finely granular, *ca.*0.5 mm.

Fl. & Fr. : May -July.

Ecology: Common; in sandy places, dried pools and ditches, on rice fields, by river banks, etc.

Distribution : Throughout India except North-West part. Myanmar, Sri Lanka, Tropical Asia, Malesia, North Australia and Tropical Africa.

Specimens examined : Hazaribagh, 491; Ghanghree, 1066; Patraru, 1329.

Uses : Leaves are eaten as vegetables. Plant is used as stomachic, aperient and antiseptic. Plant extract is applied extrenally to itch and other skin troubles.

2. MOLLUGO L.

Mollugo pentaphylla L., Sp. Pl. 89. 1753; Backer in Steenis, Fl. Males. ser. 1.4: 268. 1951.

M. stricta L., Sp. Pl. ed. 2, 131. 1762; Clarke in Hook. f., Fl. Brit. India 2: 6632. 1879; Prain, Bengal Pl. 1: 533. 1903; Haines, Bot. Bihar & Orissa pt. 2: 48. 1921.

Prostrate or ascending or often erect, simple or often widely-branched annual herb, with a thin slender main root, turning tinged brownish red when old. Stems glabrous, angular, spreading. Leaves in pseudowhorls of 3-5, opposite, entire, pale beneath, 1-4 x 0.2-0.8 cm; lower ones rosulate, oblong-obovate or spatulate, distinctly petioled; higher ones sessile or shortly petioled, linear-lanceolate, acute at apex, much narrowed at base, with prominent midrib beneath. Flowers 0.2-0.3 cm across, borne in terminal or leaf-opposed peduncled lax compound cymes with ultimate

branches prolonged as racemes; bracts small, 0.1 cm long, persistent; pedicels 0.2-0.4 cm long, erecto-patent. Tepals obovate-oblong, obtuse, white inside, green outside, 0.15-0.2 cm long, widely patent during anthesis, afterwards conniving together to form a globular form. Stamens 3, filaments short, filiform. Ovary ovoid, 3-celled; styles white. Capsule broadly ellipsoid, faintly 3-lobed, 0.2 cm long. Seeds granulate, reniform dark brown, 0.05-0.06 cm in diam.

Fl. & Fr. : Almost throughout the year, but chiefly during Apr.-Nov.

Ecology : Common, in grassy localities, cultivated and waste lands, on bare areas of forests, on exposed bare slopes of hills, fallow fields, gardens, etc.

Distribution : Throughout tropical and subtropical parts of India: Tropics and subtropics of the Old World, rare in Australia, throughout Malesia, also in New Britain, Micronesia, New Caledonia.

Specimens examined : Hazaribagh, 274; Chatra, 1094.

Uses : Plant is eaten as a pot-herb; also it is used as stomachic, aperient, antiseptic and emmenagogue. Leaves in poultices are used for sore legs.

26. CARYOPHYLLACEAE

Key to the Genera

- 1a. Sepals connate into a tube. Petals long-clawed, inserted on a short gynophore:
 - 2a. Calyx-tube quinquangular to 5-angulate. Epicalyx absent ... 5. VACCARIA
 - 2b. Calyx-tube cylindrical, striate but not angular-angulate. Epicalyx present ... 1. DIANTHUS
- 1b. Sepals free or slightly connate at base. Petals not clawed, inserted on a disk:
 - 3a. Styles 3 or 5, free ... 4. SPERGULA
 - 3b. Style 3-fid or 3-toothed:

- 4a. Sepals keeled, scarious only on margins.
Diffuse ... 3. POLYCARPON
- 4b. Sepals not keeled, scarious entirely.
Erect ... 2. POLYCARPAEA

1. DIANTHUS L.

Dianthus chinensis L., Sp. Pl. 411. 1753; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1: 213. 1874; Haines, Bot. Bihar & Orissa pt. 6: 1235. 1924.

Erect, glabrous, annual herbs, 20-45 cm tall. Stems corymbosely branched in upper part. Leaves opposite, sessile, narrowly lanceolate, entire, glabrous, with smooth margins, light green. Flowers solitary or 2-3 together. Epicalyx-bracts shorter or longer than calyx, 1.5-2 cm long, inner ones form a broad base, narrowed towards apex, or acuminate. Calyx 1.6-2.4 cm long; lobes 5, erect, ciliate, sharply acute. Petals 2-3.5 cm long; limb coarsely dentate, pink, red or white. Stamens 10. Ovary 1-celled; styles 2. Capsule apically 4-valved, 2-2.5 cm long. Seeds smooth.

Fl. & Fr.: Feb.-May.

Ecology : Common; cultivated in gardens; sometimes met with as an escape in roadsides, fields, waste places, etc.

Distribution : Throughout India. Native of E. Asia; now Pantropical.

Specimens examined : Hazaribagh, 1584; Jhumri Telaiya, 1757.

Use : The plant is grown as an ornamental for its flowers.

2. POLYCARPAEA Lam., *nom. cons.*

Polycarphaea corymbosa (L.) Lam., Tab. Encycl. 2: 129. 1797; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1: 245. 1874; Prain, Bengal Pl. 1:239. 1903; Haines, Bot. Bihar & Orissa pt. 2: 46. 1921. *Achyranthes corymbosa* L., Sp. Pl. 205. 1753.

Local name: Dholphuli.

Erect, simple or dichotomously branched, tomentose, annual-perennial small slender herb, to 30 cm long. Leaves pseudo-verticillate at nodes, chartaceous, sessile narrow-linear or subulate, acute, or obtuse, mucronate at apex, cuneate at base, entire, villous or glabrescent, 1-nerved, to 10 x 1.5 mm. Stipules scarious, lanceolate, 1-nerved, 2 mm long. Flowers 4 mm in diam, borne in terminal dense, paniced, dichotomous cymes; pedicels to 0.2 cm long, hoary-pubescent. Sepals 5, lanceolate, 3.5-4 mm long, scarious, white, much exceeding the petals and capsule. Petals 5, minute, ovate-suborbicular, entire, red, less than half the length of sepals. Stamens 5, free or basally cohering with petals. Ovary 1-locular, globose; style 3-fid. Capsule oblong, ca. 1.5 mm, 3-valved, brown. Seeds granular.

Fl. & Fr. : Aug.-Nov.

Ecology: Not common; in open, sandy or rocky grounds, grassy waste lands along roads, cultivated fields, etc.

Distribution : India: Central and North-western and Western India, Deccan Peninsula, Bihar, West Bengal, Orissa. Tropics of both the E. & W. Hemispheres.

Specimens examined : Ghanghree, 1019; Hazaribagh, 1611; Bishnugarh, 1944.

Uses: Leaves used in jaundice and in form of poultice to boils and inflammatory swellings.

3. POLYCARPON Loeffl. ex L.

Polycarpon prostratum (Forsk.) Asch. & Schweinf., in Ost. Bot. Zeitschr. 39: 128. 1889; Milne-Redhead in Kew Bull. 3: 451. 1948. *Alsine prostrata* Forsk., Fl. Aegypt.-Arb. 207. 1775.

Hapalosia loeflingiae Wall. ex Wight & Arn., Prodr. Fl. Ind. Orient. 358. 1834.

Polycarpon loeflingii (Wight & Arn.) Benth. & Hook. f., Gen. Pl. 1: 153. 1862; Edgeworth & Hook. f. in Hook. f., Fl. Brit. India 1: 245. 1874; Prain, Bengal Pl. 1: 238. 1903; Haines, Bot. Bihar & Orissa pt. 2: 45. 1921.

Local name: Sureta.

Prostrate or decumbent, 2-chotomously branched, pubescent or glabrous, annual-biennial herb with a long tap root. Leaves decussate, often pseudo-whorled, sessile, chartaceous, linear-oblong or spatulate, subacute or obtuse at apex, narrowed to the base, ciliate, puberulous, 0.6-1.5 cm long. Stipules scarious, white, 0.15 cm long. Flowers 0.35 cm across, sessile in the fork, borne in crowded, repeatedly forked cymes; bracts scarious. Sepals 5, subequal, linear oblong, with incurved tips and scarious margins, obtusely keeled on the back, 0.25 cm long. Petals 5, linear, white, entire or notched or toothed at tip, 0.12-0.14 cm long. Stamens 3-5, cohering with the petals into a perigynous ring. Ovary 1-celled; style 3-fid. Capsule ovoid or globose, 3-valved, 0.2 cm. Seeds many, ovoid, pale-brownish.

Fl. & Fr. : Nov.-May.

Ecology : Very common; in waste places, along the margins of ponds and ditches, borders of rice fields, dried sandy river beds, etc.

Distribution : Throughout the hotter parts of India. Tropical and subtropical areas of both E. & W. hemispheres.

Specimens examined : Ramgarh Cant, 1237; Hazaribagh, 1597; Hunterganj, 2138.

Uses: Infusion of roasted leaves is given for cough following fever after measles.

4. SPERGULA L.

Spergula fallax (Lowe) Krause in Sturm, Fl. Deutschl. ed. 2, 5: 21. 1901; Milne-Redhead in Kew Bull. 1950: 338. 1950; Burt & Lewis in Kew Bull. 1952: 349. 1952. *Spergularia fallax* Lowe in Hook., J. Bot. & Kew Gard. Misc. 8: 289. 1856; Nair in Bull. Bot. Surv. India 9: 277. 1866.

Arenaria flaccida Roxb., Fl. Ind. 2: 447. 1832, non Clairv. 1811.

Spergula flaccida (Roxb.) Aschers in Verh. Bot. Ver. Brand. 30: 43. 1889, *nom. illegit.*

S. pentandra auct. non L.: Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1: 243. 1874, *p.p.*; Prain, Bengal Pl. 1: 238. 1903; Haines, Bot. Bihar & Orissa pt. 2: 45. 1921.

Local name : Khandidal.

Prostrate or ascending, slender, annual herbs. Stems usually branched from base. Leaves terete or semiterete, rather fleshy, obtuse, glaucous, not grooved beneath, 1.5-3 x 0.05-0.08 cm. Stipules ovate, acute. Flowers greenish-white, 0.4-0.6 cm in diam, in lax terminal cymes; pedicels 0.4-1 cm long. Sepals ovate, subobtuse, 0.35-0.4 cm long. Petals entire ovate-lanceolate, subacute, 0.2-0.25 cm long. Stamens 8. Ovary 1-celled. Styles 3, free. Capsules ovoid-subglobose, 0.3-0.4 cm across, dehiscent by 3 valves. Seeds compressed, black, polished, granulate, broadly winged, all round, 0.1-0.15 cm across including wing.

Fl. & Fr. : Dec.-Feb.

Ecology : Common; as a weed in agricultural fields, gardens, waste places, etc.

Distribution: Almost throughout India. Widespread in Northern Hemisphere.

Specimens examined : Ghanghree, 1021; Ramgarh Cant., 1767.

Uses: Seeds are used in pulmonary tuberculosis.

5. VACCARIA Medik.

Vaccaria pyramidata Medik., Phil. Bot. 1:96. 1789; Nair, Fl. Punjab Pl. 25. 1978.

Saponaria vaccaria L., Sp. Pl. 409. 1753; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1: 217. 1874, *p.p.*; Prain, Bengal Pl. 1: 237. 1903; Haines, Bot. Bihar & Orissa pt. 2: 43. 1921.

Local name: Musna, Sabuni.

Stem glabrous, to 1 m tall, branched in upper part. Leaves 2.5-7.5 x 0.8-1.8 cm; radical leaves oblong-narrowed at base; cauline ones lanceolate to linear-oblong, rounded or cordate at base, acute at apex, usually subsinuate, blue-green. Flowers 1.5-1.8 cm long, in repeatedly forked cymes being combined into a terminal corymbose panicle; pedicels erect, 2-4.5 cm long. Calyx 1.3-1.5 cm long, teeth 5, triangular. Petals 5, obovate or oblong-obovate, pink or bright red, subemarginate, 1.4-1.6 cm long. Stamens 10. Ovary 1-celled. Styles 2. Capsule included within inflated calyx, globose-ovoid. Seeds black, globose, verrucose.

Fl. & Fr. : Jan.-Mar.

Ecology: Not common; in wheat-fields as a weed.

Distribution: Throughout India. Europe, Tibet, Java and Turkey.

Specimens examined : Hazaribagh, 1203; Ramgarh, 1909.

Uses : Roots and leaves contain saponin and used for washing silk and wool; also used in skin troubles. The plant as a whole is employed for rheumatism, jaundice, hepatic eruption and venereal ulcers.

27. POLYGONACEAE

Key to the Genera

- 1a. Climber with flower-bearing tendrils. Ochreae absent ... 1. ANTIGONON
- 1b. Tendrils absent, Ochreae present:
- 2a. Fruiting tepals 6-lobed, 3 inner lobes much longer and broader than 3 outer lobes ... 3. RUMEX
- 2b. Fruiting tepals 5-lobed; lobes subequal or outer ones larger .. 2. POLYGONUM

1. ANTIGONON Endl.

Antigonon leptopus Hook. & Arn., Bot. Beechey Voy. 308, t. 69. 1841; Prain, Bengal Pl. 2: 889. 1903; Haines, For. Fl. Chota Nagpur 383. 1910 & Bot. Bihar & Orissa pt. 5: 783. 1924.

Roots with ellipsoid, tuberous swellings. Stems angular, slightly thickened on nodes, finely pubescent. Leaves ovate-triangular, with broad shallowly cordate base, acute at apex, usually with undulate margins, pubescent specially on nerves beneath, 5-10 × 3-6 cm; petioles 0.7-1.5 cm long. Flowers fascicled; fascicles combined into axillary racemes or panicles; rachilla terminated by a branched tendril. Tepals during anthesis white or pink, 7-9 mm long, after anthesis accrescent to 1.5 cm, becoming ± membranous, greenish and distinctly reticulate-veined. Filaments basally connate into a short ring. Styles 3; stigmas capitate. Fruits rounded at base, acute, 0.8-1 cm long. Seeds deeply longitudinally grooved.

Fl. & Fr.: Aug.-Jan.

Ecology: Very common; planted as a garden ornamental; also met with as an escape in waste places, roadsides, etc.

Distribution : Planted in major parts of India. Native of Mexico, introduced and naturalised in most Tropical and Subtropical parts of World.

Specimens examined : Hazaribagh, 222; Koderma, 1807.

Uses : Tubers are used as vegetable. The plant is grown as an ornamental for its showy flowers.

2. POLYGONUM L., *nom. cons.*

Note: Small (in Mem. Bot. Collumbia Coll. 1: 1-183. 1895), Gross (in Bot. Jahrb. 49: 234-339. 1913 & in Bull. Geogr. Bot. Le Mans. 23: 7-32. 1913) and Nakai (in Rigakkai 24: 1926) recognised Meisner's (Monographiae Generis Polygoni Prodromus, Geneve, 1826 and Polygonaceae in DC., Prodr. 14: 1856) all the 9 Sections of *Polygonum s.l.* into distinct generic status (viz., *Tepis* Adans., *Avicularia* Steud., *Persicaria* Mill., *Amblygonum* Reichb., *Bistorta* Scop., *Cephalophilum* (Meisn.) Borner, *Echinocaulos* (Meisn. ex Endl.) Hassk., *Tiniaria* (Meisn.) Reichb., and *Aconogonum* (Meisn.) Reichb. Some workers, e.g. Hara (in Fl. East. Himalaya, 1966 & in Hara *et al.*, Enum. Fl. Pl. Nepal 3: 1982), Munsri & Javied (Polygon. Kashmir Himalaya, 1986), etc. adopted their treatments with much alterations. Hara placed the materials of *Polygonum L. s.l.* of E. Himalaya under 8 genera, viz. *Polygonum L. s.s.*, *Fagopyrum* Mill., *Koenigia* L., *Bistorta* Scop.,

Aconogonum (Meisn.) Reichb., *Bilderdykia* Dum., *Antinoron* Rafin. and *Persicaria* Mill. and those of Nepal under 7 genera, viz. *Polygonum* L. s.s., *Aconogonum* (Meisn.) Reichb., *Persicaria* Mill., *Bistorta* Scop., *Fallopia* Adans., *Koenigia* L. and *Fagopyrum* Mill. In Munsii and Javied's treatment, the materials of *Polygonum* L. s.l. are placed under 6 genera, viz. *Polygonum* L. s.s., *Bistorta* Scop., *Persicaria* Mill., *Bilderdykia* Dum., *Pleuropteropyrum* Gross and *Koenigia* L. with the exception of *Fagopyrum* Mill., *nom. cons.* which has been placed with different splitted genera of *Rumex* L., s.l. However, most of the workers do not like to follow such splitting. Moreover, recently (ICBN, 1988) the genus *Polygonum* L. has been conserved to avoid such changes in the nomenclature. Here, *Polygonum* L., s.l., *nom. cons.* is followed.

Key to the Species

- 1a. Flowers borne in axillary clusters ... 5. *P. plebeium*
- 1b. Flowers in pseudo-spikes:
- 2a. Ochreae with dilated mouth or a distinct limb. Cotyledons incumbent ... 4. *P. limbatum*
- 2b. Ochreae without dilated mouth or limb. Cotyledons accumbent:
- 3a. Styles 2. Nuts biconvex ... 2. *P. glabrum*
- 3b. Styles 3. Nuts trigonous:
- 4a. Pseudo-spikes lax, usually interrupted at base. Setae on ochreae 0.1-0.25 cm long, much smaller than tube ... 3. *P. hydropiper*
- 4b. Pseudo-spikes dense. Setae 0.8-2 cm long, nearly as long as or slightly exceeding the tube ... 1. *P. barbatum*

1. ***Polygonum barbatum* L.**, Sp. Pl. 362. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 37. 1886; Prain, Bengal Pl. 2: 887. 1903; Haines, Bot. Bihar & Orissa pt. 5: 777. 1924.

Persicaria barbata (L.) Hara in Hara, Fl. E. Himalaya 70. 1966.

Key to the Varieties

- 1a. Leaves cuneate or subattenuate at base.
Upper part of stems and peduncles appressed hairy ... 1. var. *barbatum*
- 1b. Leaves rounded or subcordate at base. Stems and
peduncles glabrous throughout ... 2. var. *gracile*

1. var. **barbatum**: Steward in Contrib. Gray Herb. 5: 52. 1930.

Erect or ascending, \pm pubescent, robust annual-perennial herbs, 40-80 cm tall. Stems terete, thickened on nodes, appressed-hairy upwards; ochreae tubular, appressed-pubescent; setae bristle-like, 1-2 cm long, as long as or slightly exceeding the tube. Leaves oblong or lanceolate, cuneate subattenuate at base, acute or acuminate at apex, usually with a brown blotch on either surface, especially on nerves, appressed-pubescent, or glabrous above, 8-20 \times 1.5-3 cm. Pseudo-spikes 2-8, at top of stems, 3-10 cm long, densely flowered. Peduncle appressed-hairy. Bracts obconical, ciliate, or nearly glabrous, 3-5-flowered. Tepals white, greenish-white or pink, eglandular, 2-3.5 mm long. Styles 3, 1-2 mm long. Nut trigonous, shining, 1.5-1.7 mm long. Cotyledons accumbent.

Fl. & Fr. : Oct.-Jan.

Ecology : Very common; along banks of rivers, streams and other water sources.

Distribution : India: Punjab, Uttar Pradesh, Bihar, Central India, West Bengal, Sikkim, Assam, Orissa, Deccan Peninsula and Western India. Tropics of Eastern Hemisphere.

Specimens examined : Gola, 777; Hazaribagh, 1573; Hunterganj, 1657.

Uses : Plants are relished by cattle. Decoction of shoots is used as a stimulating wash for ulcers. Seeds used as tonic, purgative and emetic.

2. var. **gracile** (Danser) Steward in Contrib. Gray Herb. 5(88): 55. 1930.

Polygonum barbatum ssp. *gracile* Danser in Bull. Jard. Bot. Buit. Ser. 3, 8: 146. 1927.

P. flaccidum Roxb., Fl. Ind. 2: 291. 1832, *non sensu* Meisn. in DC. Prodr. 14: 107. 1856; Gage in Rec. Bot. Surv. India 2: 399. 1903.

P. serrulatum auct. non Lagasc. : Hook. f. in Hook. f., Fl. Brit. India 5: 38. 1886; Prain, Bengal Pl. 2: 887. 1903; Haines, Bot. Bihar & Orissa pt. 5 : 777. 1924.

Decumbent to ascending, annual-perennial herb, 25-50 cm tall. Stems glabrous. Ochreae strigose; setae 0.8-1.8 cm long, nearly as long as tube. Leaves sessile, narrowly lanceolate-oblong, rounded or subcordate at base, acute or acuminate at apex, glabrous or minutely strigillose on margins and veins, 5-13 x 0.8-1.5 cm. Pseudo-spikes erect, slender, 2-5 cm long. Peduncles glabrous. Bracts glabrous, ciliate. Pedicels 2.5 -3 mm long. Tepals obovate-rounded, white, 2.2-2.7 mm long. Stamens 5-8. Styles 0.8-1mm long. Nut trigonous, polished, deep purple, 2-2.2 mm long. Cotyledons accumbent.

Fl. & Fr. : Oct.-Feb.

Ecology : Very common; in marshy localities, along banks of rivers, streams, etc.

Distribution: India: Rajasthan, Uttar Pradesh, Bihar, Orissa, West Bengal, Western Peninsula, N.W. Himalaya, Assam. Bangladesh, Myanmar, Sri Lanka, Malay Peninsula, China, Nepal.

Specimens examined : Hazaribagh, 27; Simaria, 802; Bishnugarh, 1940.

Uses: Same as var. *barbatum*.

2. ***Polygonum glabrum*** Willd., Sp. Pl. 2: 447. 1799; Hook. f. in Hook. f., Fl. Brit. India 5: 34. 1886; Prain, Bengal Pl. 2: 886. 1903; Haines, For. Fl. Chota Nagpur 383. 1910 & Bot. Bihar & Orissa pt. 5: 776. 1924.

Persicaria glabra (Willd.) Gomes de la Maza in Ann. Inst. Sugunda Ensef. Habana 2: 278. 1896.

Local name : Bihagni.

Erect or decumbent-ascending, robust, annual herbs, 60-120 cm long. Stem simple or slightly branched, usually reddish-tinged below, with a reddish-brown ring at each node. Leaves linear-lanceolate, acuminate at apex, narrowed at base, glabrous, gland-dotted, shining, 7-15 × 2-2.5 cm. Ochreae tubular, 2-3 cm long, truncate, glabrous. Inflorescence a few-branched panicle of slender pseudo-spikes. Pseudo-spikes densely flowered, 6-10 cm long. Peduncle glabrous. Pedicels short, 2.5-3 mm long, conspicuous after fall of flowers, with prominent articulation. Bracts 3.5-4 mm long, obliquely rounded, glabrous, obtuse. Bracteoles 2-2.5 mm long. Perianth tubular-campanulate, 2-2.5 mm long; tepals elliptic or oblong, concave, obtuse. Stamens 6-8, slightly exerted. Ovary obovoid, *ca.* 0.6 mm across; styles 2, connate at base, filiform; stigma capitellate. Nuts orbicular-ovoid, compressed, biconvex, brown-black, polished, 2.5-3 mm in diam. Cotyledons accumbent.

Fl. : Sept.-Dec. *Fr.* : Nov.-Feb.

Ecology : Common; in waste places, margins of tanks ditches and other water courses.

Distribution : Throughout India. Africa, Afghanistan, East to S. China, S. Japan and Malesia.

Specimens examined : Jhumri Telaiya, 677; National Park, 1162.

Uses: Young shoots and roots are used as vegetables. Infusion of leaves are used in colic and as febrifuge. Root-stocks are used for piles, jaundice and debility.

3. ***Polygonum hydropiper*** L., Sp. Pl. 361. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 39. 1886; Prain, Bengal Pl. 2: 887. 1903; Haines, Bot. Bihar & Orissa pt. 5: 778. 1924.

Persicaria hydropiper (L.) Spach, Hist. Veg. 10 : 536. 1841.

Key to the Varieties

- | | |
|--|-------------------------------|
| 1a. Ochreae glabrous. Leaves glabrous except scabrid margins | ... 1. var. <i>hydropiper</i> |
| 1b. Ochreae scabrid. Leaves with scabrid veins and margins | ... 2. var. <i>flaccidum</i> |

1. var. **hydropiper**: Steward in Contrib. Gray Herb 5(88): 58. 1930.

Erect or decumbent-ascending, glabrous, annual herb, 30-45 cm tall. Stems branched, slender above, gland-punctate. Leaves sessile or shortly petiolate, linear-lanceolate or oblong-lanceolate, attenuate at base, acuminate at apex, glabrous or scabrous on margins, gland-punctate, 5-12 x 1-2 cm. Ochreae glabrous, gland-dotted, 1-2 cm long, with few and usually deciduous setae of 1-2.5 mm long. Flowers pink in lax, slender or filiform, erect, flexuous or decurved pseudo-spikes of 5-15 cm long, often interrupted at base. Peduncles 2-5 cm long. Bracts glabrous, gland-dotted or not, truncate, ciliate on upper margins, 2.5-3 mm long. Perianth pink, glandular, 2.5-3 mm long; tepals ovate-rounded. Stamens 8. Nuts trigonous, granulate, opaque, brown, 2-3 mm long. Cotyledons accumbent.

Fl. & Fr. : May-Dec.

Ecology: Very common; in margins of ponds, ditches, irrigation canals, along roadsides and agricultural fields.

Distribution : Throughout India. Tropical and subtropical parts of the World.

Specimens examined : Telaiya Dam, 631; Ramgarh Cant., 1896.

Uses : Plant is used as stimulant and diuretic. Liquid extract of herb is used as an oral contraceptive; infusion is used in uterine disorders. Powder of dried herb is used as fish-poison.

Note: Highly variable in habit, size and shape of leaves and fruits.

2. var. **flaccidum** Steward in Contrib. Gray Herb. 5(88): 59. 1930; Santap. & Wagh in Bull. Bot. Surv. India 5: 108. 1964.

Polygonum hydropiper ssp. *microcarpum* Danser var. *triquetrum* Danser in Bull. Jard. Bot. Buit. Ser. 3, 8: 189. 1927.

Persicaria hydropiper (L.) Spach ssp. *flaccida* Munsi & Javied, Polygon. Kashmir Himalaya 76. 1986.

Polygonum flaccidum auct. non Roxb. : Meisn. in DC., Prodr. 14: 107. 1856; Hook. f. in Hook. f., Fl. Brit. India 5: 39. 1886; Prain, Bengal Pl. 2: 887. 1903; Haines, Bot. Bihar & Orissa pt. 5: 778. 1924.

P. glandulosum auct. non R. Br.: Rao in Bull. Bot Surv. India 5: 257. 1963.

P. sarbhanganicum Rao in Bull. Bot. Surv. India 6: 106. 1964, *nom. superfl.*

Differs from type variety in coarser and larger habit, scabrid veins, leaf-margins and ochreae. Leaf-blades lanceolate, with acute or acuminate apex. Ochreae with moderately long cilia, usually less swollen than typical variety. Inflorescence more lax and slender. Tepals reddish, 2-3.5 mm at maturity. Flowers and nuts not included within bracts.

Fl. & Fr. : Sept.-Jan.

Ecology : Same as that of type variety.

Distribution : Throughout India. Tropical and subtropical regions of the world.

Specimens examined : Chatra, 821; Pratappur, 2106.

Uses: Same as those of type variety.

Note: According to Steward (*l.c.*), the characters of size and scabridity of plants, ciliation of ochreae, flowers and fruits being not included within bracts and of triangular nuts are found to vary so as to make sharp limitation of *P. flaccidum sensu auct. pl.* (non Roxb.) impossible.

4. ***Polygonum limbatum*** Meisn. in DC., Prodr. 14: 123. 1856; Hook. f. in Hook. f., Fl. Brit. India 5: 30. 1886; Prain, Bengal Pl. 2: 886. 1903; Haines, Bot. Bihar & Orissa pt. 5: 776. 1924.

Persicaria limbata (Meisn.) Hara in Fl. E. Himalaya 71. 1966.

Local name : Mangalleta.

Erect, stout, annual herb, 60-120 cm tall. Stems usually unbranched, strigosely hairy. Leaves lanceolate, narrowed at base into a short petiole, acuminate at apex, scaberulous on both surfaces, 10-20 x 2.5-4 cm. Ochreae cylindric, loose, strigose, truncate, with a spreading or reflexed, herbaceous, scabrid-ciliate limb. Pseudo-spikes erect, stout, shortly peduncled, paniced, 5-10 cm long. Bracts obovate, crowded, hispid, 3.5-5 mm long, 6-8-flowered. Tepals white, green or pink. Stamens 7-8. Nuts orbicular, flattened with rounded margins and convex faces, black, shining, 2.5-2.8 mm in diam. Cotyledons incumbent.

Fl. & Fr. : Oct.-Mar.

Ecology: Not common; along banks of streams, margins of ponds, rice-fields, etc.

Distribution : India: Subtropical Himalaya, Uttar Pradesh, Bihar, West Bengal, Orissa, Western Peninsula. Nepal, Egypt and Tropical Africa.

Specimens examined : Barkagawan, 1268; Jhumri Telaiya, 2220.

Use: Young leaves are eaten as vegetables by poor people in villages.

5. **Polygonum plebeium** R. Br., Prodr. 420. 1810; Hook. f. in Hook f., Fl. Brit. India 5: 27. 1886; Prain, Bengal Pl. 2: 885. 1903; Haines, For., Fl. Chota Nagpur 383. 1910 & Bot. Bihar & Orissa pt. 5: 775. 1924.

Local name : Raniphul.

Prostrate or decumbent-ascending, diffusely branched, annual herbs, usually with a woody rootstock. Stems and branches terete, grooved, glabrous or scaberulous, often purple-tinged. Leaves linear-lanceolate or linear-oblong, acute or obtuse at apex, with a narrowed base, sessile or shortly petiolate, 1-3 x 0.2-0.4 cm. Ochreae short, membranous, irregularly lacerate to middle, fimbriate, 3-4 mm long. Flowers usually 2-5 together in axils of leaves; pedicels short 2-3 mm long. Perianth pink or white, 2-2.5 mm long, divided nearly to base; segments rounded-oblong, acute or obtuse, with a green median streak. Nuts 3-gonous, somewhat spindle-shaped, brown, smooth, shining, 1.5-2 mm long.

Fl. & Fr. : Nov.-June.

Ecology : Very common; grassy-sandy localities, river beds, agricultural fields, pasture lands.

Distribution : Throughout India. Widely distributed in tropical regions of Old World.

Specimens examined: Hazaribagh, 238; Ghanghree, 1295; Morkachho, 1961.

Uses: Plant is used as vegetable by poor people in villages; also used against complaints and pneumonia.

Note: A polymorphic species, highly variable in habit, size and shape of leaves, number of flowers in the axils, length of pedicels, size, shape and colour of tepals, size of fruits, etc.

3. RUMEX L.

Note : Love & Kapoor (in Taxon 16 : 521. 1961) divided *Rumex* L., *s.l.* into 4 genera, viz. *Rumex* L., *s.s.*, *Acetosella* Fourr., *Acetosa* Mill. and *Bucephalophora* Pau. However, most of the botanists do not like to follow this view. Here, *Rumex* L., *s. l.* is followed.

Key to the Species

- | | |
|--|---|
| 1a. Inner fruiting tepals with broad, much toothed wings | ... 1. <i>R. dentatus</i> ssp. <i>klotzschianus</i> |
| 1b. Inner fruiting tepals with very narrow margins being entire or shortly 1-2-toothed | ... 2. <i>R. nigricans</i> |

1. ***Rumex dentatus* L. ssp. *klotzschianus* (Meisn.) Rech. f.** in Beih. Bot. Centralb. 49: 19. 1932 & in Candollea 12: 119. 1949; Hara in Hara *et al.*, Enum. Fl. Pl. Nepal 3: 179. 1982. *R. klotzschianus* Meisn. in DC., Prodr. 14: 57. 1856.

R. dentatus auct. non L. : Hook. f. in Hook. f., Fl. Brit. India 5: 59. 1886, *p.p.*; Prain, Bengal Pl. 2: 889. 1903; Haines, Bot. Bihar & Orissa pt. 5: 782. 1924.

Local names : Ambavah, Amrule.

Erect, much-branched, glabrous, annual herbs, 35-50 cm tall. Stems greenish, often purple-streaked, grooved, fistular, glabrous. Lower leaves oblong, long-petioled, cordate or truncate at base, rounded at apex, crispy; upper ones lanceolate-oblong, short petioled, rounded or cuneate at base, often contracted above the base, subacute at apex; uppermost ones linear-lanceolate, smaller, sometimes papillose beneath. Flowers pedicellate, in distinct whorls combined into leafy panicles. Pedicels 3-6 mm long, deflexed, jointed near base. Perianth 3-5 mm long; inner tepals broadly ovate, reticulate-veined, with an ovoid-oblong, smooth tubercle at back, irregularly dentate along margins with 0.2 cm long straight teeth, much enlarged in fruits; outer ones 2-2.5 mm long. Fruit to 2.5 x 1.5 mm. Fruiting tepals triangular, acute or obtuse, with broad closely reticulate wings, and strong unequal spreading teeth; tubercle oblong, large, smooth.

Fl. & Fr. : Apr.-June.

Ecology: Common; in agricultural fields, margins of ponds, ditches, irrigational canals and marshy localities.

Distribution : Throughout India. Bangladesh, Nepal, Pakistan.

Specimens examined : Hazaribagh, 712; Mandu, 843; Etkhori, 1875.

Uses : Leaves and tender parts are cooked and consumed as vegetables. Roots are used in cutaneous disorders.

2. *Rumex nigricans* Hook. f. in Hook. f., *Fl. Brit. India* 5: 59. 1886; Prain, *Bengal Pl.* 1: 888. 1903; Haines, *Bot. Bihar & Orissa* pt. 5: 782. 1924.

Erect, slender annual, 15-50 cm tall. Stems angled and grooved. Leaves ± narrowly panduriform, contracted above cordate base, sometimes lower ones linear-oblong, obtuse at apex, thin, 10-20 cm x 3-5 cm. Flowering branches leafy or leafless, rigid, divaricate. Heads distant or confluent, globose, densely flowered. Pedicels short, 0.12-0.15 cm long. Fruiting tepals 0.3-0.45 cm long, lanceolate, venose, turning black when dry, with very large oblong, dark tubercles and lanceolate tips; margins very narrow, entire or with 1-2 short, straight teeth or spines.

Fl. & Fr. : June-Aug.

Ecology : Common; in roadsides, waste places, river-banks, margins of ponds and jheels, railway tracks, etc.

Distribution : West Bengal, Bihar, Uttar Pradesh and Deccan Peninsula.

Specimens examined : Raja Rappa, 873; Chatra, 983; Hazaribagh, 2251.

28. PLUMBAGINACEAE

PLUMBAGO L.

Plumbago zeylanica L., Sp. Pl. 151. 1753; Clarke in Hook. f., Fl. Brit. India 3: 480. 1882; Prain, Bengal Pl. 1: 639. 1903; Haines, For. Fl. Chota Nagpur 403. 1910 & Bot. Bihar & Orissa pt. 4: 505. 1922.

Twigs 1.5-2.5 m long. Leaves well-developed on flowering stem, oblong or ovate-oblong, with rounded base contracted into petiole, acute at apex, glabrous, 3-12 x 2-5 cm. Petiole 0.3-1 cm long, with 2 basal auricles when young. Racemes terminal and in upper leaf-axils, 7-25 cm long; rachis glandular. Calyx 1-1.2 cm long, glandular all over, green; glands with green stalk, purple top. Corolla-tube white, 1.8-2.2 cm long; limb 1.2-1.5 cm across; segments obovate, 6-7 mm long. Anthers blue-purple. Ovary and style glabrous. Capsule oblong, longitudinally 5-furrowed, 7-8 mm long; fruiting calyx patent and recurved.

Fl. & Fr. : Aug.-Feb.

Ecology : Common; in hedges, brushwood and thickets; also cultivated in gardens as ornamental.

Distribution : Throughout India: Tropics of Old World to Hawaii, only indigenous in S.E. Asia.

Specimens examined : Jaynagar, 1518; Koderma, 2005.

Uses: Roots are used in dyspepsia, piles, diarrhoea and skin diseases. Infusion of roots is used in influenza.

29. DILLENACEAE

DILLENIA L.

Key to the Species

- 1a. Leaves persistent. Flowers white, solitary on leaf bearing branches ... 1. *D. indica*.
- 1b. Leaves deciduous. Flowers bright yellow, appearing solitary or in fascicles on leafless branches:
- 2a. Carpels 10-12; flowers solitary, large, 10-12 cm in diam. ... 2. *D. aurea*.
- 2b. Carpels 5; flowers borne in 2-7-flowered fascicles, small, 2.5-3.5 cm in diam. ... 3. *D. pentagyna*.

1. ***Dillenia indica*** L., Sp. Pl. 535. 1753; Hook. f. & Thomson in Hook.f., Fl. Brit. India 1: 36. 1872, *p.p.*; Prain, Bengal Pl. 1: 195. 1903; Haines, For. Fl. Chota Nagpur 175. 1910 & Bot. Bihar & Orissa pt. 2: 6.1921; Majumdar in Jain *et al.*, Fl. India Fasc. 2: 6. 1979.

Local name : Chalta.

Evergreen tree, to 10 m tall with crooked trunk and dense crown. Leaves persistent, fascicled at ends of branches, oblong-lanceolate, acute to sub-acuminate at apex, rounded to subcuneate at base, serrate, glabrous and bright green above, pubescent specially on nerves beneath, 10-30 x 5-12 cm, with 25-40 pairs of close parallel secondary nerves prominent beneath, each running into a serrature; petiole to 5 cm long. Flowers 15-20 cm in diam, solitary, subterminal of leaf-bearing branchlets. Sepals elliptic, thick and fleshy, 4-6 x 3-5 cm. Petals white, obovate, 7-9 x 5-6.5 cm. Stamens yellow, in 2 distinct groups, outer ones many, 1.2-1.5 cm long, straight in bud, inner ones 20-25 in number, 2-2.5 cm long with their apices reflexed in bud, Carpels 14-20, yellowish green. Fruit indehiscent, yellowish green, 8-10 cm in diam., including enclosing sepals. Carpels to 3.5 x 1.5 cm, each embedding 5 or more seeds within its colourless glutinous pulp. Seeds reniform, black, echinate, to 4 x 6 mm.

Fl. : May-June *Fr.* : Sept.-Feb.

Ecology: Common, cultivated frequently in garden, occasionally self-grown in village-surroundings and also grows wildy on river banks.

Distribution : India: Throughout the greater parts of India including the foot-hills of Himalaya, Assam, Meghalaya, West Bengal, Bihar, Orissa, Madhya Pradesh, Andhra Pradesh, Kerala and Tropical forests of Western Peninsula. Sri Lanka, Myanmar, S. China, Siam, Indo-China, Malesia, Cambodia, Vietnam, Java, Sumatra, Borneo.

Specimens examined : Chatra, 825; Hunterganj, 2119.

Uses : Fleshy accrescent calyces on fruits are eaten after cooking and also made into jam and jelly. Fruits are tonic and laxative. Wood is used for tool-handles and furniture.

2. *Dillenia aurea* J.E. Smith in Exot. Bot. 2: 65, t. 92, 93. 1806; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 37.1872, p.p.; Prain, Bengal Pl. 1: 196. 1903; Haines, For, Fl. Chota Nagpur 175. 1910 & Bot. Bihar & Orissa pt. 2:7. 1921; Majumdar in Jain *et al.*, Fl. Ind. Fasc. 2: 5. 1979.

D. pulcherrima Kurz. in J. Asiat. Soc. Bengal 40: 46. 1871.

Deciduous, spreading tree, up to 35 m tall with crooked trunk. Bark light-coloured, smooth. Leaves obovate, acute at apex, gradually narrowing at base, spinulose denticulate and silky above, tomentose beneath when young, subentire to slightly dentate and pubescent or somewhat hairy beneath in adult, 20-40 x 12-20 cm with 30-45 pairs of close strong secondary nerves; petiole 1.5-4 cm long. Flowers 10-12 cm in diam, solitary, at the end of short, leafless side-branches. Peduncle to 4 cm long, with a number of bracts. Sepals elliptic, 3-4 x 2-3 cm. Petals bright yellow, obovate-lanceolate, 6.5-8 cm x 4.5-5.5 cm. Stamens in 2 distinct groups, outer ones many, to 1.2 cm long, straight in bud, inner ones yellowish white, to 50 in number, 2-2.5 cm long with their apex reflexed in bud. Carpels 10-12, with to 2 cm long styles. Fruit indehiscent, nearly globular, yellow or orange, 3.5-4 cm in diam. including the enlarged fleshy sepals. Carpels to 2.5 x 1 cm, 1 to few-seeded. Seeds exarillate, embedded in transparent slime.

Fl. : Apr.-May. *Fr.* : May-June *Deciduous* : Jan.- Feb.

Ecology : Common; in deciduous forests.

Distribution : India: Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Andaman & Nicobar Islands. Myanmar, N.E. Thailand.

Specimen examined : Pratappur, 911.

Uses: Fruits are used as condiments. Wood is used as fuel. Ash made from wood and mixed with clay is used locally for making fire-resistant crockery. A paste made from bark, is given for thrush and weak gums.

Note: The plant is often confused with *D. pentagyna* by their leaves and it is difficult to distinguish them in absence of flowers and fruits.

3. *Dillenia pentagyna* Roxb., Pl. Corom. 1: 21, t.20.1795. Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 38. 1872; Prain, Bengal Pl. 1: 195. 1903; Haines, For. Fl. Chota Nagpur 176. 1910 & Bot. Bihar & Orissa pt. 2:7. 1921. Majumdar in Jain *et al.* Fl. India Fasc. 2: 7. 1979.

D. augusta Roxb., Fl. Ind. 2: 652. 1832.

Local names: Agor, Kallai.

Deciduous, spreading tree, to 25 m tall, with crooked trunk and smooth grey bark, peeling off in thin scales. Branches rough and scarred, young parts very silky. Leaves elliptic-obovate, rounded to obtuse at apex, decurrent along the petiole at base, strongly serrate, younger ones silky pubescent, older ones glabrous, 20-50 x 10-20 cm with 25-50 pairs of close secondary nerves. Flowers 2.5-3 cm in diam, borne in 2-7-flowered umbellate fascicles on leafless lateral branches from old wood. Pedicels 2.5-5 cm long, slender, ebracteolate. Sepals elliptic, glabrous, 0.8-1.2 x 0.5-0.9 cm. Petals bright yellow, obovate, 1.5-2 x 0.5-1 cm. Stamens in 2 distinct groups, outer ones many, 0.25-0.4 cm long, straight in bud, inner ones 8-10 in number, 0.6-0.9 cm long, with their apex reflexed in bud. Carpels 5, with 0.4 cm long styles. Fruit indehiscent, globular, yellow or orange-red, 1.5 cm in diam. including the enlarged fleshy sepals. Carpels to 0.8 x 0.5 cm, 1-seeded. Seeds ovoid, to 0.5 x 0.35 cm.

Fl. : Mar.-Apr. *Fr.* : Apr.-May.

Ecology : Not common; in deciduous Sal forests.

Distribution : Throughout India. Continental Asia., Myanmar, Siam, Yunnan, Indo-China, Hainan and Malesia.

Specimen examined: Pratappur, 922.

Uses: Flower buds and fruits are eaten. Wood is used for house-posts, rafters and planking. Leaves are used to make green manure. Bark yields a fibre used for cordage.

30. OCHNACEAE

OCHNA L.

Ochna obtusa DC. var. **pumila** (Buch.-Ham. ex DC.) Kanis in Blumea 16: 34. 1968.

O.pumila Buch.-Ham. ex DC., Prodr. 1: 736. 1824; Benn. in Hook. f., Fl. Brit. India 1: 524. 1875; Prain, Bengal Pl. 1: 309. 1903; Haines, For. Fl. Chota Nagpur 237. 1910 & Bot. Bihar & Orissa pt. 2: 170.1921.

Local names: Simalkata, Champa-baha.

Undershrubs, 30-60 cm tall, sprouting yearly from woody tuberous roots. Stem slender, branched at base. Stipules 0.8-1.5 cm long. Leaves obovate-oblong, cuneate obtuse to acute, faintly but distinctly denticulate, herbaceous to chartaceous, 4-18 x 2.5-8 cm; petiole 1-5 mm long. Inflorescences 2-3-flowered cymes. Peduncles 3-7 cm long, the lower longer, without scales. Pedicels 1-4 cm long. Torus 0.5-1 mm high and 1.5-3 mm across, in fruit to 5 mm high and 1 cm across. Sepals 5, ovate-oblong, 1-2 x 0.4-1 cm, green at first, enlarging and turning red in fruit. Petals 5, yellow, obovate, tapering at base or subunguiculate, 1.5-2.5 x 0.75-1.5 cm. Stamens 70-120; anthers opening with 2 apical pores, about as long as or a little longer than filaments. Ovaries 5-10, obovoid; ovule anatropous; style 0.8-1.2 cm long, to 2 cm long in fruit. Fruits of 3-5 drupelets, each to 1 x 0.7 cm, green, turning black when ripe.

Fl. & Fr. : Oct.-Dec.

Ecology : Common; in forests, coming up yearly during rainy season and after the forest-fires.

Distribution : Central, N. and N.E. India and foot-hills of Himalaya. Pegu.

Specimens examined : National Park, : 1197, Koderma Forest, 2006.

Uses : Roots are used for leprosy. Leaves in form of poultice are applied on sores and in lumbago. Wood is used for walking-sticks. Bark is used as digestive and tonic.

31. DIPTEROCARPACEAE

SHOREA Roxb. ex Gaertn. f.

Shorea robusta Gaertn. f., Fruct. 3 : 48, t. 186. 1805; Dyer in Hook. f., Fl. Brit. India 1: 306. 1874; Prain, Bengal Pl. 1: 254. 1903; Haines, For. Fl. Chota Nagpur 178. 1910 & Bot. Bihar & Orissa pt. 2: 56. 1921.

Local name: Sal.

Large tree, to 50 m tall and to 3.5 m girth. Bark dark-brown, usually furrowed. Braze red, tough and fibrous. Leaves ovate or ovate-oblong, acuminate at apex, cordate at base, glabrous, 15-25 × 10-15 cm, lateral veins about 12 pairs; petiole 2-2.5 cm long. Stipules falcate, pubescent, 0.7-1.2 cm long, covering the young buds. Panicles lax, on new shoots and direct from old wood, 12-25 cm long, clothed with pale velvety pubescence; branches unilateral, racemose. Flowers subsessile. Sepals 5, lanceolate. Petals 5, cream-coloured, lanceolate-acuminate, 12-13-nerved, 1-1.2 cm long, with a twisted acumen. Stamens numerous, usually around 50, with a very swollen base, but slender below anthers; connective tailed; cells usually apiculate. Ovary 3-celled, pubescent; ovules 2 in each cell, anatropous, pendulous; stigma 3-denticulate. Fruit ovoid, indehiscent, nut-like, 1-1.2 cm long, beaked with style; wings linear-oblong or spatulate, subequal, with 3 rather larger, 5-10 cm long, 10-nerved.

Fl. : Mar.-Apr. *Fr.* : Jun.-Aug.

Ecology : Very common; in forests, roadsides, on railway platforms, etc.

Distribution : Widespread largely in North, East and Central India, also planted elsewhere in other parts of the country.

Specimens examined : National Park, 355; Raja Rappa, 869; Koderma Forest, 1800; Pratappur, 2090.

Uses : Wood is used chiefly for overhead electric, telegraph and telephone lines, railway sleepers and for construction work. Leaves are used for bidi-making, and for preparing platters and cup-like articles for serving food. An oleoresin, obtained on tapping trunk, is used to caulk boats and ships, in paints, varnishes and as an incense.

32. ELATINACEAE

BERGIA L.

Bergia ammann(i)oides Heyne ex Roth, Nov. Sp. Pl. 219, 402. 1821; Dyer in Hook. f., Fl. Brit. India 1: 251. 1874; Prain, Bengal Pl. 1: 243. 1903; Haines, Bot. Bihar & Orissa pt. 2: 50. 1921.

Lechea verticillata Willd., Sp. Pl. 1: 495. 1797, non *Bergia verticillata* Willd. 1799.

Elatine ammann(i)oides (Roth) Wight & Arn., Prodr. Fl. Ind. Orient. 41. 1834.

Prostrate or decumbent-ascending to erect herb, to 50 cm long. Stems terete, glandular-pubescent, often branched from base and suffused with reddish purple, somewhat woody at base. Stipules erect, narrowly triangular, thinny glandular-hairy along margins and on back of midrib, to 2.5 mm long. Leaves elliptic-oblong, oblong or obovate-oblong, tapering at base, acute at apex, glabrous or finely glandular hairy above, 1-2 x 0.4-0.7 cm. Flowers minute, sessile or shortly pedicelled, in few to many-flowered axillary fascicles. Sepals usually 3, often 5, ovate-oblong, concave, shortly ciliate, 3-3.5 mm long. Petals same in number as sepals, oval-oblong, white, 2.5-3 mm long. Stamens as many as the sepals, narrowly subulate. Ovary ovoid, 5-celled; stigma capitate. Capsule ovoid, septicidal, 3-5-valved, to 2 mm across. Seeds numerous, brown, with a scalariform reticulation, to 0.4 mm long.

Fl. & Fr.: Oct.-Jan.

Ecology : Common; on sandy river beds, marshy places, waste places, in fallow rice-fields, etc.

Distribution : Throughout India. Tropical Africa, Afghanistan, Persia, Tropical Asia and Sri Lanka to S. China, Formosa, Australia and Malesia.

Specimens examined: National Park, 463; Raja Rappa, 853.

33. CLUSIACEAE (GUTTIFERAE)

Key to the Genera

- 1a. Flowers usually 4-merous. Leaves petiolate, coriaceous, not gland-dotted. Ovule 1, basal.
Fruit a drupe ... 1. CALOPHYLLUM
- 1b. Flowers usually 5-merous. Leaves sessile, herbaceous, frequently gland-dotted. Ovules many; placentation parietal or axillary.
Fruit a capsule ... 2. HYPERICUM

1. CALOPHYLLUM L.

Calophyllum innophyllum L., Sp.Pl. 513. 1753. Anders. in Hook. f., Fl. Brit. India 1: 273. 1874; Prain, Bengal Pl. 1: 246. 1903; Haines, Bot. Bihar & Orissa pt. 2: 54. 1921. Maheshw. in Bull. Bot. Surv. India 2: 145. 1960.

Local name : Sultan champa.

Glabrous trees, to 15 m tall. Mature bark deeply fissured, grey or blackish, live bark pink with clear yellow exudate. Leaves broadly elliptic or obovate-elliptic, subcuneate at base, rounded or retuse at apex, entire, 8-15 x 4-10 cm; midvein prominent on lower surface, flat or channelled on lower part of upper surface; lateral veins filiform; petiole 1-3 cm long. Flowers 2.5-3 cm in diam., in few-flowered racemes or panicles of 5-12 cm long.; pedicels slender, 2-2.5 cm long. Sepals 4, in 2 opposite pairs; outer sepals concave, 4-6 mm long; inner longer ones reflexed, 6-8 mm long. Petals usually 4, rarely 8, obovate-elliptic, 1.2-1.5 cm long. Stamens many, connate at base only, obscurely fasciculate, 5-6 mm long. Ovary

globose, reddish-purple after pollination, 1-celled; ovule 1, basal; stigma peltate, with irregular margins. Drupe globose, 2.5 - 4 cm in diam., greenish-yellow.

Fl. : May-June & Sept.-Nov. *Fr.* : Oct.-Nov. & Mar.-May.

Ecology : Common; planted in gardens, parks, on railway platforms, etc.

Distribution : Wild on the sea-shores of India and cultivated in other parts of the country as an ornamental. Wild on the sea-shores of Malasia, Pacific, E. Africa, Taiwan and Australia, cultivated in many parts of the World.

Specimens examined: Hazaribagh, 700; Telaiya Dam, 1736.

Uses : Wood is used for posts, beams, furniture etc. Seeds yield an oil which is used for soap-making and as illuminant; also applied externally in rheumatism and skin-affections.

2. HYPERICUM L.

Hypericum japonicum Thunb. ex Murr., Syst. Veg. ed. 14, 702. July, 1784; Dyer in Hook. f., Fl. Brit. India 1: 256. 1874; Prain, Bengal Pl. 1: 244. 1903; Haines, Bot. Bihar & Orissa pt. 2: 52. 1921.

Erect to decumbent or prostrate, slender, annual herb, 5-30 cm long. Stems rooting at the base, 4-angled, dichotomously branched above, glabrous. Leaves herbaceous ovate-elliptic to oblong or suborbicular, obtuse or subacute at apex, cordate-amplexicaul to subcuneate at base, entire, 3-nerved at base, 4-8 x 2-3 mm. Inflorescence cymose, regularly dichasial to monochasial, lax; flowers 5-7 mm across; bracts linear-lanceolate, entire, glandular and pellucid-dotted at apex, 2-4 mm long; pedicels to 5 mm long. Sepals oblong or narrowly elliptic 3-4 mm long. Petals bright-yellow, elliptic or oblong to obovate, as long as sepals, persistent. Stamens 5-20, connate at base; filaments to 2.5 mm long; anthers yellow, gland amber. Ovary ovoid, 3-lobed, 1-locular, ca. 2 mm long; styles 3, shorter than ovary, ovules many on 3 parietal placentae. Capsule ovoid to subcylindric, 3-valved, 4-5 mm long, equalling persistent calyx. Seeds numerous, oblong, minute, longitudinally ribbed with fine transverse striae, yellow-brown, ca. 0.5 mm long.

Fl. & Fr.: Mar.-June.

Ecology: Not common; but grows gregariously in marshy habitats (ditches, rice-fields, etc.), at an altitude of 700 m above sea level.

Distribution : India: Temperate and subtropical Himalaya from Sikkim to Garwal, Khasia Hills, Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, E. & W. Peninsula. Japan, South Korea, South-East China, Sri Lanka, Australia, New Zealand, Hawaii and Malasia.

Specimens examined : Ramgarh Cant, 1244; Telaiya Dam, 1738.

Use : Plant is used in asthma and dysentery.

Note: An extremely variable species in habit, inflorescence, size and shape of leaves, branching pattern and number of stamens.

34. TILIACEACE

Key to the Genera

- 1a. Fruits echinate. Receptacle surrounded by 5 glands ... 3. TRIUMFETTA
- 1b. Fruits not echinate:
 - 2a. Petals inside at foot of claw-bearing gland surrounded by tuft or whorl of hairs. Fruit a drupe. Lowermost leaf-serratures not elongated into acumen ... 2. GREWIA
 - 2b. Petals glandless. Fruit a capsule. Lowermost leaf-serratures usually elongated into long acumen ... 1. CORCHORUS

1. CORCHORUS L.

Key to the Species

- 1a. Capsule depressed-subglobose, not beaked ... 2. *C. capsularis*
- 1b. Capsule elongated, beaked:
 - 2a. Beak 3-fid, lobes spreading:

- 3a. Capsule 6-angled, 3-winged. Leaves broadly ovate or ovate-elliptic ... 1. *C. aestuans*
- 3b. Capsule terete. Leaves linear-oblong or linear-lanceolate ... 5. *C. tridens*
- 2b. Beak undivided, erect:
- 4a. Capsule softly pubescent, 0.6-1.5 cm long, without transverse partitions between seeds. Leaves obtuse or subacute at apex. Stamens 5-10 ... 3. *C. fascicularis*
- 4b. Capsule glabrous, 4-6 cm long, with distinct transverse partitions between seeds. Leaves acuminate at apex. Stamens many ... 4. *C. olitorius*

1. ***Corchorus aestuans*** L., Syst. Nat. ed. 10, 1079. 1759; Fawcett & Rendle in J. Bot. 59: 225. 1921; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2: 71. 1979.

C. acutangulus Lam., Encycl. 2: 104. 1786; Mast. in Hook. f., Fl. Brit. India 1: 398. 1874; Prain, Bengal Pl. 1: 286. 1903; Haines, For. Fl. Chota Nagpur 203. 1910 & Bot. Bihar & Orissa pt. 2: 86. 1929; Chakrav. in Bull. Bot. Soc. Bengal 5: 82. 1951.

Erect or suberect, simple or slightly branched, \pm pubescent, annual herbs, 10-60 cm tall. Leaves broadly ovate or ovate-elliptic, acute-subacuminate at apex, rounded or subcordate at base, basal serratures on each side, usually prolonged with filiform appendages, basally 3- or 4-nerved, 2-5 x 1-3 cm; petiole to 2 cm long, slender, hairy. Stipules subulate-filiform, \pm 1 cm long, hairy. Flowers 6-7 mm across, in 1-3-flowered leaf-opposed cymes; bracts and bracteoles filiform, to 0.4 cm long. Sepals lanceolate-oblong, apiculate, 3-4 mm long. Petals 5, yellow, oblanceolate-spathulate, 5-6 mm long. Stamens ca. 20, to 4 mm long. Ovary angular, 3-celled, 3.5-4 mm long; stigma tri-lobed. Capsule elongated, erect, straight, 6-angled, of which 3 of the angles alate or sub-alate, 2-4 cm long and 3-4 mm in diam, with 3 suberect or spreading beaks or horns; valved 3-4, septate between seeds. Seeds globose-trigonous, with plane faces, dark-brown, 1.2-1.5 mm.

Fl. & Fr.: June-Nov.

Ecology : Common, in sandy, grassy localities of river-beds, roadsides, fallow fields, forest edges, margins of irrigational canals, etc.

Distribution : Throughout India. Pakistan, Sri Lanka, Bangladesh, Myanmar, Malesia, Indo-China, Australia, Tropical Africa, West Indies and Central America.

Specimens examined : Patratu, 579; Hazaribagh, 1603; Jhumri Telaiya, 1753; Hunterganj, 2142.

Use: Seeds are used as stomachic.

Note: Variable in habit, size and shape of leaves and degree of hairiness.

2. **Corchorus capsularis** L., Sp. Pl. 529. 1753; Mast. in Hook. f., Fl. Brit. India 1: 397. 1874; Prain, Bengal Pl. 1 : 286. 1903; Haines, For. Fl. Chota Nagpur 203. 1910 & Bot. Bihar & Orissa pt. 2: 86. 1921.

Local name : Narcha.

Erect, glabrous, simple, or sometimes branched, annual herbs, to 40 cm tall. Leaves narrowly ovate-lanceolate to oblong, chartaceous, acute to subacuminate at apex, subcuneate or rounded at base, the lower serratures on each side prolonged into filiform appendages, glabrous or pubescent along nerves, 5-12 x 1.5-3.5 cm, petiole 0.7-2.5 cm long. Stipules setaceous, to 8 mm long. Flowers 7-9 mm across, in 1-3-flowered, axillary, subsessile, short cymes; pedicels short, 2.5-5 cm long. Sepals 3-3.2 mm long. Petals 4-4.5 mm long, yellow. Stamens ca. 20-30. Style ca. 1.5 mm long. Capsule depressed-subglobose, not beaked, broader than long, ridged and muricated, 5-valved; valves without transverse septa. Seeds few in each cell, wedge-shaped, smooth, brown, 2-2.5 mm long and 1-1.5 mm broad.

Fr. & Fr.: Sept.-Nov.

Ecology: Common; cultivated in fields, also runs wild in waste places, roadsides, near fields, etc.

Distribution : Throughout India. Pakistan, Sri Lanka, Bangladesh, Myanmar, Malaya Peninsula.

Specimens examined : Ramgarh, 525; Ichak, 333.

Uses : Plant is the source of jute fibre which is used for making bags, coarse cloth, twine and carpets. Leaves are consumed as vegetables.

3. *Corchorus fascicularis* Lam., *Encycl.* 2: 104. 1786; Mast. in Hook. f., *Fl. Brit. India* 1:398. 1874; Prain, *Bengal Pl.* 1: 286. 1903; Haines, *For. Fl. Chota Nagpur* 203. 1910 & *Bot. Bihar & Orissa* pt. 2: 87. 1921; Chakrav. in *Bull. Bot. Soc. Bengal* 5. 79. 1951.

Annual, suffruticose herbs, to 60 cm tall. Stem much branched from base, terete, glabrous or with a few hispid hairs above. Leaves narrowly oblong, oblong-lanceolate or elliptic-lanceolate, obtuse or subacute at apex, subcuneate to rounded at base, glabrous, 2-5 x 0.8-1.2 cm, basally 3-nerved; filiform basal appendages absent; petioles 5-8 mm long. Stipules linear-subulate, 3.5-5 mm long. Flowers \pm 4 mm across, in 2-5 cm flowered leaf-opposed cymes; bracts and bracteoles linear-lanceolate, ca. 0.1 cm long. Sepals 5, obovate, apiculate, 1.2 -1.5 mm long. Petals 5, yellow, obovate-oblong, almost of same length and breadth as sepals. Stamens 5-10. Ovary oblong-ovate, hairy; stigma capitate. Capsules fasciculate, cylindrical, straight, densely strigose, with short undivided beak, 3-valved, 6-15 mm long and 2-2.5 mm diam. Seeds 8 in each cell, 3-gonous, black, smooth, 1-1.2 mm.

Fl. & Fr.: Aug.-Nov.

Ecology: Common, in arable low lands, margins of irrigation canals, forest edges, etc.

Distribution : India: Upper Gangetic Plains, Central India, Bihar, Deccan Peninsula. Tropical Africa, N.Australia, Arabia, Myanmar, Pakistan, Sri Lanka.

Specimen examined : Ghanghree, 1018.

Uses: Plant is used as an astringent and restorative.

4. *Corchorus olitorius* L., *Sp. Pl.* 529. 1753; Mast. in Hook. f., *Fl. Brit. India* 1: 397. 1874; Prain, *Bengal Pl.* 1: 286. 1903; Haines, *For. Fl. Chota Nagpur* 203. 1910 & *Bot. Bihar & Orissa* pt. 2: 86. 1921.

Erect, simple or much-branched, annual herb, 60-120 cm tall. Stems glabrous. Leaves elliptic-lanceolate, ovate-lanceolate or ovate-oblong.

basally 3-5 nerved, acuminate at apex, rounded at base, glabrescent, 5-10 x 2.5-4 cm; basal serratures with filiform appendages; petiole 1.5 -2 cm long, pubescent. Stipules 0.6-1 cm long. Flowers 6-8 mm across, in 1-3-flowered leaf-opposed cymes; bracts and bracteoles filiform, 2.5-3 mm long. Sepals 5, oblong, apiculate, 4-5 mm long. Petals 5, yellow, oblong-spathulate, 5-6 mm long. Stamens many; filaments 5-6 mm long. Ovary 4 mm across, 4-6-loculed; style short; stigma minutely papillose. Capsule linear, terete, 10-ribbed, 4-6 cm long, with undivided erect beak, glabrous, 5-valved; valves septate between seeds. Seeds 3-gonous, wedge-shaped, blackish-brown, 1.5-2 mm long and 1-1.2 mm broad.

Fl. & Fr. : July-Sept.

Ecology : Very common; cultivated in fields; also runs wild in waste places.

Distribution : India: Uttar Pradesh, Bihar, West Bengal, Orissa, Central India, Decan Peninsula, North-east India. Native of Indo-Pakistan, now widespread throughout the World in Tropical countries and North Australia either by cultivation or through escape.

Specimen examined : Ichak, 339; Pratapur, 2103.

Uses: Leaves are consumed as vegetable. Infusion of leaves is used as tonic and febrifuge.

5. *C. tridens* L., Mant. pl. 566. 1771; Mast. in Hook. f., Fl. Brit. India 1: 398. 1874; Prain, Bengal Pl. 1: 286. 1903; Haines, Bot. Bihar & Orissa pt. 2: 87. 1921.

Annual herbs. Stems glabrous. Leaves linear-oblong or linear-lanceolate, glabrous, 4-7 x 1-2 cm; basal serratures usually prolonged into filiform appendages; petiole 4-6 mm long. Stipules subulate, 2-3 mm long. Flowers in 1-4-flowered, short, leaf-opposed cymes. Peduncles and pedicels very short. Sepals linear-oblong, apiculate, 5-6 mm long. Petals ovate-oblong, yellow, 6-8 mm long. Stamens 4-5 mm long. Ovary linear, style indistinguishable, stigma capitate, sparsely hairy. Capsule terete, glabrous, 3.5-6 mm long and 1.5-2 mm broad, 3-valved, beaked; beak 3-fid, radially spreading; valves without partition between seeds. Seeds obliquely truncate at both ends, black, 1-1.2 mm long.

Fl. & Fr. : Aug.-Oct.

Ecology : Not common; in waste places, roadsides, railway tracks, etc.

Distribution : India: Himalaya, Central India, Bihar, Orissa, Upper Gangetic plain, Deccan Peninsula. Widespread in Tropical and subtropical countries of Africa, Asia and N. Australia.

Specimens examined : Jhumri Telaiya, 670; Ramgarh, 1922.

2. GREWIA L.

Key to the Species

- 1a. Flowers white. Leaves narrowly lanceolate or oblong. Undershrubs or shrubs ... 1. *G. hirsuta*
- 1b. Flowers yellow. Leaves broadly ovate, obovate-oblong or suborbicular. Trees:
- 2a. Stipules leafy, auricled. Drupe black ... 3. *G. tiliifolia*
- 2b. Stipules linear-lanceolate, not auricled. Drupe red ... 2. *G. subinaequalis*

1. ***Grewia hirsuta*** Vahl, Symb. Bot. 1: 34. 1790; Mast. in Hook. f., Fl. Brit. India 1: 391. 1874; Prain, Bengal 1: 284. 1903; Haines, For. Fl. Chota Nagpur 195. 1910 & Bot. Bihar & Orissa pt. 2 : 94. 1921.

Local names : Gurusukri, Kukurbicha.

Erect to straggling undershrub or shrub, 2-4 m tall. Branchlets softly velvety or woolly. Leaves narrowly lanceolate or oblong, thin-coriaceous, acute to acuminate at apex, obliquely rounded or subcordate at base, basally 3-nerved, serrate, glabrescent above, glaucous and woolly below, 3-8 × 1-2.5 cm; petioles densely hairy, 2-6 mm long. Stipules linear-lanceolate, hairy, 5-6 mm long. Flowers male and bisexual, 1-1.2 cm across, in axillary cymose umbels. Peduncle 1-3, to 7 mm long. Pedicels 0.3 cm long. Bracts linear-subulate, 4-5 mm long. Sepals elliptic, hairy outside, 6-8 mm long. Petals white, oblong, rounded at apex, 2-3 mm long. Stamens more than 40, intermixed with white hairs. Ovary densely villous, grooved, 4-celled;

ovules two per cell. Drupe depressed-globose, obscurely 4-lobed or not, yellow, fleshy, wrinkled, stiff-hairy, 0.8-1 cm across. Seeds globose, 4-5 mm across.

Fl.: July-Sept. *Fr.*: Nov.-Jan.

Ecology: Common; in dry open forests, rocky slopes of low hills, etc.

Distribution : India: Bihar, Orissa, Deccan Peninsula. Nepal, Sri Lanka, Myanmar.

Specimens examined : National Park, 64; Bishnugarh, 1113.

Uses: Fruits are used in diarrhoea and dysentery; also edible. Roots are made into a paste which is applied to hasten suppuration.

2. *Grewia subinaequalis* DC., Prodr. 1: 511. 1824; Narayanaswami & Rao in J. Ind. Bot. Soc. 29: 178. 1950.

G. asiatica auct. non L. : Mast. in Hook. f., Fl. Brit. India 1: 386. 1874; Prain, Bengal Pl. 1: 283. 1903; Haines, For. Fl. Chota Nagpur 199. 1910 & Bot. Bihar & Orissa pt. 2: 94. 1921.

Local name : Phalsa.

Small to moderate-sized tree, to 12 m tall. Bark greyish white or greyish-brown. Branchlets stellate-pubescent. Leaves broadly ovate or obovate-oblong or suborbicular, acute or sub-acuminate at apex, obliquely rounded to subcordate at base, irregularly toothed, subglabrous above, softly tomentose beneath, basally 5-6-nerved, 7-17 x 6-12 cm, petioles thickened at top, 1.2-2 cm long. Stipules 1-1.2 cm long, linear-lanceolate. Flowers in axillary cymose umbels. Peduncles 1.5-5 cm long, 2-10 together, each bearing 3-5 flowers. Pedicels shorter than peduncle. Bracts lanceolate, minute. Sepals linear-oblong, acute, pubescent, 0.8-1 cm long. Petals yellow, oblong or ovate-oblong, subacute, notched, 6-8 mm long; gland ca. 1 mm long. Stamens orange. Style much thickened above; ovary villous. Drupe globose, 1-2-lobed, 1-celled, pilose, 5-6 mm in diam., red.

Fl. & Fr. : Mar.-Jan.

Ecology : Common; cultivated in gardens, along roadsides, etc.; sometimes met with as an escape in waste places near habitational sites.

Distribution: Almost throughout India. Sri Lanka, Subtropical Himalaya, Nepal.

Specimens examined : Hunterganj, 620; Hazaribagh, 1600.

Uses : Fruits are used in preparation of beverages, and pickles; also used as astringent, cooling and stomachic. Wood is used for shoulder poles, spear handles and shingles. Bark yields a fibre which is used as rope.

Note: Narayanaswami and Rao (*l.c.*) suggested that the Indian plant which was once identified as *G. asiatica* L. is *G. subinaequalis* DC. which is quite different in morphology from *G. asiatica* L. They commented that *G. asiatica* L. does not grow in India.

3. *Grewia tillifolia* Vahl, *Symb. Bot.* 1:35. 1790; Mast. in Hook. f., *Fl. Brit. India* 1: 386. 1874, *p.p.*; Prain, *Bengal Pl.* 1: 283. 1903; Haines, *For. Fl. Chota Nagpur* 198. 1910 & *Bot. Bihar & Orissa* pt. 2: 91. 1921.

Local name: Dhamani.

Tree, 9-15 m tall; bark pale brown; young parts densely pubescent. Leaves broadly ovate to obovate, unequal sided, cordate and inequilateral at base, obtuse or shortly cuspidate, crenate-dentate, glabrescent to minutely stellate-hairy above, hoary-tomentose beneath, basally 5-6-nerved, 7-12 x 5-7 cm; petioles 1.2-2.5 cm long, thickened at top. Stipules leafy, falcate, acuminate, auricled, to 1 cm long. Flowers small, umbellate; buds oval-oblong, tomentose. Peduncles 3-10, axillary, much shorter than petioles. Bracts linear-lanceolate. Pedicels 3-5, shorter than peduncles. Sepals 0.6-1.2 cm long, oblong. Petals about half the length of sepals, yellow, oblong, emerginate; gland 0.8-1 mm long, villous. Receptacle ribbed, glabrous. Stamens 3-4 mm long. Ovary villous, 2-celled; ovules 2 per cell. Drupe small, subglobose, 2-4-lobed, black, 8-10 mm across.

Fl. : Apr.-June. *Fr.* : Sept.-Nov.

Ecology : Common; in deciduous forests.

Distribution : India: Throughout Western India, Peninsula, Bihar, Central India. Myanmar, Sri Lanka, East Tropical Africa.

Specimen examined : Hazaribagh, 1215.

Uses : Wood is used for poles, shafts, frames, tool-handles, agricultural implements, etc. Bark is used in dysentery; also yields a cordage fibre.

3. TRIUMFETTA L.

Triumfetta rhomboidea Jacq., Enum. Pl. Carib. 22. 1760; Mast. in Hook. f., Fl. Brit. India 1: 395. 1874; Prain, Bengal Pl. 1: 285. 1903; Haines, For. Fl. Chota Nagpur 203. 1910 & Bot. Bihar & Orissa pt. 2: 85. 1921; Santap. in Bull. Bot. Surv. India 3: 21. 1962.

Bartramia indica L., Sp. Pl. 389. 1753, non. *T. indica* Lam. 1789.

Triumfetta bartramia L., Syst. Nat. ed. 10, 1044. 1759. *nom. superfl. illegit.*; Bernardi in Candollea 18: 282. 1963.

Local name: Chikti.

Erect, simple or branched, stellate-pubescent, annual herbs, 10-100 cm tall. Leaves ovate-rounded to orbicular-rhomboid, chartaceous, lower ones deeply 3-lobed, 5-8 cm in diam, upper ones lobed or entire, rounded or cuneate at base, acute or acuminate at apex, coarsely serrate, stellate-pubescent, basally 5-nerved; petiole to 5 cm long. Stipules 3-3.5 mm long. Flowers yellow, 3.5-4 mm across, fascicled, in terminal and leaf opposed cymes. Peduncle *ca.* 0.2 cm long. Pedicels 1-1.5 mm long. Bracts linear, lanceolate, 2.2-2.5 mm long. Sepals narrowly oblong-lanceolate, stellate-pubescent without, apiculate, 5-6 mm long. Petals yellow, obovate-oblong, ciliate on claw, *ca.* 5 mm long. Stamens 10-15, to 4 mm long. Ovary globose, 4-celled; stigma 2-4-fid. Capsule ellipsoid or subglobose, 4-5 mm across; prickles hooked, *ca.* 1.5 mm long. Seeds 1 per cell, *ca.* 2.5-3 x 2 mm.

Fl. & Fr.: Oct.-Jan.

Ecology: Very common; in waste places, agricultural fields, along railway tracks, roadsides, forest edges and forest clearings.

Distribution: Throughout tropical and subtropical parts of India. Pantropical.

Specimens examined : National Park, 60; Jhumri Telaiya, 665; Chouparan, 1674.

Uses: Bark yields a fibre which is used as substitute for jute. Bark and leaves are used for diarrhoea and roots for dysentery. Pounded roots are used for intestinal ulcers. Leaves and flowers are used in leprosy.

35. STERCULIACEAE

Key to the Genera

- 1a. Flowers unisexual or polygamous. Petals absent:
- 2a. Inflorescence entirely covered with orange-red tomentum. Carpels 2-locular. Follicles papery ... 2. FIRMIANA
- 2b. Inflorescence not covered with orange-red tomentum. Carpels 1-locular. Follicles woody ... 9. STERCULIA
- 1b. Flowers bisexual. Petals present:
- 3a. Androecium tubular at base or throughout, but never dilated above into a cup; anthers only or with staminodes terminating the tube:
- 4a. Perfect anthers 15, in 5 clusters of 3 each, alternating with 5 staminodes:
- 5a. Trees. Petals hooded, terminating in two ligulate appendages ... 3. GUAZUMA
- 5b. Herbs. Petals neither hooded nor appendaged ... 7. PENTAPETES
- 4b. Perfect anthers 5, alternating with 5 staminodes, or staminodes absent:
- 6a. Petals appendaged at apex, clawed at base. Staminodes present. Capsule prickly, septicidal ... 1. BYTTNERIA
- 6b. Petals neither appendaged nor clawed. Staminodes absent. Capsule hairy, loculicidal ... 6. MELOCHIA

- 3b. Androecium tubular below, dilated above into a cup, on margin of which anthers with staminodes present:
- 7a. Fruits membranous, inflated ... 5. KLEINHOVIA
- 7b. Fruits woody, not inflated:
- 8a. Petals dissimilar, clawed. Anther cells divaricate. Seeds not winged ... 4. HELICTERES
- 8b. Petals similar, not clawed. Anther-cells parallel. Seeds winged ... 8. PTEROSPERMUM

1. *BYTTNERIA* Loefl., *nom. cons.*

Byttneria herbacea Roxb., Pl. Corom. 1: 28, 29. 1795; Mast. in Hook. f., Fl. Brit. India 1: 376. 1874; Prain, Bengal Pl. 1: 279. 1903; Haines, For. Fl. Chota Nagpur 208. 1910 & Bot. Bihar & Orissa pt. 2: 83. 1921.

Prostrate fruticose herbs, with a perennial woody rootstock. Branchlets minutely stellate-pubescent. Leaves ovate-lanceolate, thin-coriaceous, acuminate at apex, rounded to subcordate at base, dentate, basally 3-nerved, usually with a linear gland at base on lower side of midrib, puberulous above, glabrous beneath, 2-6.5 x 1-2 cm; petiole 0.5-1.5 cm long, pubescent. Stipules linear-subulate, 1-1.5 mm long. Cymes axillary and/or terminal, umbellate, to 2 cm across. Flowers 6-8 mm across. Peduncle 2-5 mm long. Bracts 1-3, subulate, 0.8-1.2 mm long. Pedicels slender, 2-4 mm long. Sepals oblong-lanceolate, 3.5-4 mm long. Petals purple, ovate-lanceolate, with ca. 4 mm long appendages at apex. Staminal tube terminated by 5 shortly stalked anthers alternating with 5 staminodes. Capsule globose, horned apically, 6-8 mm in diam., septicidally 5-valved. Seeds ovoid, angular, muricate, 4-5 mm in diam.

Fl. & Fr. : June-Oct.

Ecology : Common; hilly forests, on rocky grounds, etc.

Distribution : Western Peninsula, Madhya Pradesh, Bihar, Orissa, Tamilnadu.

Specimens examined : National Park, 1188; Koderma Forest, 1795.

Uses : Pulverised root-stock is used on swellings, also in cholera and diarrhoea in combination with other drugs.

2. FIRMIANA Marsili

Firmiana colorata (Roxb.) R. Br. in Bennett & Brown, Pl. Jav. Rar. 235. 1844; Kosterm. in Reinwardtia 4: 285. 1957 & 5 : 386. 1960.

Sterculia colorata Roxb., Pl. Corom. 1:26, t. 25. 1795. Mast. in Hook. f., Fl. Brit. India 1: 359. 1874; Prain, Bengal Pl. 1: 274. 1903; Haines, For. Fl. Chota Nagpur 205. 1910 & Bot. Bihar & Orissa pt. 2: 76. 1921.

Local names: Bodula, Walena, Samarri.

Trees, to 25 m tall. Branchlets stellate-pubescent to velvety, with many lenticels. Leaves crowded at apex of branchlets, ovate-roundish, 6-25 x 5-20 cm, 3-lobed, coriaceous, cordate or subcordate at base, 5-veined; lobes triangular, entire, acuminate. Panicles from axils of fallen leaves, coralliform, many-flowered. Pedicels covered with orange-red tomentum. Calyx infundibuliform, inflated towards apex, slightly curved, 1.5-2 cm long; teeth triangular, acute, 4-5 mm long, with grey-pilose margins, sparsely stellate hairy inside. Gynandrophore extending 0.5-1 cm beyond calyx, stellate-hairy. Anthers 10, 2-celled; cells curved. Filaments attached to rim of shallow tube at top of gynandrophore. Carpels flask-shaped, glabrous, white, later turning pale green; style short, red, curved; stigma bent outside, peltate, reddish. Follicles to 7 cm long, membranous, veined, opening at an early stage; ovules 2-4, ellipsoid, glossy, black, alternate at margins of follicles.

Fl.: Mar.-May. *Fr.* : Apr.-June.

Ecology : Not common; in forests, valleys and slopes of low hills.

Distribution : India: Deccan Peninsula, West Bengal, Bihar, Central and Western India. Myanmar, Sri Lanka, Siam, Malesia.

Specimens examined: Pratappur, 941; Koderma Forest, 1253.

Uses : The inner bark yields a fibre used for ropes. Twigs and leaves are used as cattle fodder. The roots are eaten by tribals.

3. GUAZUMA Adans.

Guazuma ulmifolia Lam., Encycl. 3: 52. 1789; Robyn in Ann. Missouri Bot. Garden 51: 102. 1964.

Theobroma guazuma L., Sp. Pl. 782. 1753.

Guazuma tomentosa Kunth, Nov. Gen. Sp. 5: 320. 1823; Mast. in Hook. f., Fl. Brit. India 1: 375. 1874; Prain, Bengal Pl. 1: 278. 1903; Haines, Bot. Bihar & Orissa pt. 2: 83. 1921.

Trees, to 15 m tall. Branchlets stellate-tomentose. Leaves oblong-lanceolate, obliquely cordate at base, acuminate at apex, serrulate, scabrid or glabrescent above, pubescent beneath, basally 5-7-veined, 5-12 cm x 2-5 cm. Petiole 0.5-1 cm long. Panicles twice the length of leaves. Bracts and bracteoles subulate, caducous. Calyx 3-partite; sepals 3-4 mm long, elliptic, stellate-tomentose. Petals 5, yellow, obovate, with a long and forked apical appendage, puberulous without, 0.5-0.6 cm long. Staminal tube campanulate, terminated by 5 clusters of 3 anthers alternating with 5 small staminodes; staminal fascicles of 3 anthers hidden by claw of petal. Ovary globose, stellate-tomentose, 5-lobed, 5-celled, many-ovuled, 2-2.2 mm across. Capsule woody, indehiscent, tuberculate, subglobose-oblong, to 2.5 x 2 cm. Seed ovoid, grey, embeded in a fleshy pulp.

Fl. : Apr.-June. *Fr.* : Feb.-June.

Ecology : Common; in forests; also planted in roadsides, parks, etc.

Distribution : Throughout the warmer parts of India. Sri Lanka, Java and tropical America.

Specimens examined : Hazaribagh, 1213; Gola, 1530.

Uses: Leaves are lopped for fodder. Stems yield a fibre used for ropes. Fruits are edible. Bark is a tonic and demulcent. Wood is used for furniture, packing-cases and for making charcoal.

4. HELICTERES L.

Helicteres isora L., Sp. Pl. 963. 1753; Mast. in Hook. f., Fl. Brit. India 1: 365. 1874; Prain, Bengal Pl. 1: 275. 1903; Haines, For. Fl. Chota Nagpur 206. 1910 & Bot. Bihar & Orissa pt. 2: 78. 1921.

Local names : Marorphali, Jonkaphal.

Shrubs or small trees, to 6 m tall. Branchlets softly villous. Leaves bifarious, broadly obovate to orbicular, thin-coriaceous, basally 3- or 5-nerved, shortly acuminate at apex, subcordate or subcuneate at base, irregularly crenate-serrate. Stellate-tomentose, 6-14 x 4-10 cm; petiole 0.6-1 cm long. Stipules 5-6 mm long, subulate. Flowers 2-2.5 cm across, zygomorphic, in axillary 5-8-flowered cymes; pedicels very short, stellately tomentose; bracts and bracteoles small, subulate, hairy, 5 mm long. Calyx 1.2-2 cm long, oblique, laterally compressed stellately pubescent; teeth 5, triangular, unequal, *ca.* 2 mm long. Petals 5, scarlet at first, fading to lead-colour, reflexed; lower pair shortly clawed; upper ones long-clawed. Stamens 10; staminodes 5; anther-cells divaricate. Gynandrophore to 4 cm long. Ovary ovoid, 5-lobed, 5-celled; styles 5, *ca.* 3 mm long, deflexed. Follicles beaked, spirally twisted together in form of a screw, stellately tomentose, 5-7.5 cm long. Seeds wrinkled, angular, *ca.* 2 mm long.

Fl. : Apr.-Dec *Fr.* : Oct.-Jan.

Ecology : Very common; in slopes of low hills, forests, etc.

Distribution : India: Uttar Pradesh, Bihar, Central and Western India, Western Peninsula, Himalaya. Sri Lanka, Java, North Australia.

Specimens examined : Raja Rappa, 370; Ghanghree, 1296.

Uses: Bark yields a fibre used for sacking and cordage. Leaves and tender branches are lopped for fodder. Fruits are used in intestinal complaints, such as diarrhoea, chronic dysentery and flatulence, and to improve appetite. Root-juice is used in stomach affections and in diabetes.

5. KLEINHOVIA L.

Kleinhovia hospita L., Sp. Pl. ed. 2, 1365. 1763; Mast. in Hook. f., Fl. Brit. India 1: 364. 1874; Prain, Bengal Pl. 2: 1272. 1903; Haines, Bot. Bihar & Orissa pt. 2: 78. 1921.

Local name: Bola.

Trees, to 20 m tall. Twigs sparsely short-hairy, glabrescent. Leaves broadly ovate, cordate at base, acuminate at apex, entire or shallowly dentate-serrate, glabrous above, thinly yellow-hairy to nearly glabrous beneath, basally 7-nerved, 8-25 x 5-20 cm. Petiole to 20 cm long, sparsely short-hairy. Stipules pubescent. Panicles finely pubescent, 20-50 cm long. Flowers 1.8-2 cm across, pink. Bracts oval, short-hairy. Pedicels 0.3-1 cm long, pubescent. Sepals lanceolate, pink; stellate-pubescent without, 0.6-1 cm long. 4 petals 0.6-0.7 cm long, pink; posterior one cross-oval, pink, yellow tipped, 0.4-0.5 ca, long. Gynandrophore finely pubescent, 0.4-0.7 cm long. Ovary densely pilose. Capsule 1.5-2.2 x 2-2.5 cm.

Fl. : Sept.-Nov. *Fr.* : Nov.-Jan.

Ecology: Common; planted in roadsides, railway platforms, parks, etc.; also self-grown.

Distribution: Throughout India. Tropical Asia from Mascarene Islands to Polynesia and E. Tropical Africa.

Specimens examined : Hazaribagh, 272; Ramgarh, 1764.

Uses: Young leaves and flowers are eaten as vegetables. Decoction of leaves is used for scabies and skin eruptions. Wood is used for knife-handles. Bark yields a fibre used for ropes.

6. MELOCHIA L.

Melochia corchorifolia L., Sp. Pl. 675. 1753; Mast. in Hook. f., Fl. Brit. India 1:374. 1874; Prain, Bengal Pl. 1: 277. 1903; Haines, For. Fl. Chota Nagpur 209. 1910 & Bot. Bihar & Orissa pt. 2: 82. 1921.

Local name: Bilpat.

Erect, simple or slightly branched, annual herbs or under-shrubs, 15-100 cm tall. Branchlets stellate-tomentose. Leaves ovate-lanceolate, chartaceous, subcordate or rounded at base, acute at apex, serrate, sometimes obscurely 3-lobed, glabrous on both surfaces, often hairy on nerves beneath, basally 3-5-nerved, 3-7 x 1.5-4.5 cm; petiole slender, 1-2.5 cm long. Stipules lanceolate, ciliate, 2.5-3 mm long. Flowers to 1 cm across, in subsessile, terminal, subglobose, many-flowered, head-like cymes, subtended by 1-4 leaves; bracteoles linear-subulate, hairy, 4.5-6

mm long. Calyx-tube cupular, puberulous, *ca.* 2 mm long; segments lanceolate, acuminate, *ca.* 1 mm long. Petals obovate, 4-5 mm long, pink with a yellowish blotch at base. Stamens 5; filaments connate half-way up; staminal tube to 1.5 mm long. Ovary sessile, ovoid-oblong, pubescent, 5-celled; styles 5, united at base. Capsule subglobose, hairy, 4-5 mm across, loculicidally 5-valved. Seeds 3-gonous, 1 per cell, *ca.* 2.5 mm long.

Fl. & Fr. : July-Sept.

Ecology : Very common; in agricultural fields, roadsides, forest edges and waste places.

Distribution : Throughout the hotter parts of India. Pantropical.

Specimens examined : Barkottwa, 523; Hazaribagh, 710.

Uses: The stem yields an invaluable fibres used for fishing-lines. The leaves are eaten as vegetables by poor people. Leaf-extract is used in dysentery.

7. PENTAPETES L.

Pentapetes phoenicea L., Sp. Pl. 698. 1753; Mast. in Hook. f., Fl. Brit. India 1: 371. 1874; Prain, Bengal Pl. 1: 277. 1903; Haines, For. Fl. Chota Nagpur 208. 1910 & Bot. Bihar & Orissa pt. 2: 82. 1921.

Local name: Dopahariya.

Pretty, branched annual herbs, 60-150 cm tall. Branchlets stellate-pubescent. Leaves narrow-lanceolate or oblong, chartaceous, rounded at base, acute to sub-acuminate at apex, sharply toothed or crenate-serrate, glabrescent, 9-12 x 1-1.5 cm. Petiole to 2 cm long. Stipules lanceolate, 4-5 mm long. Flowers 0.3-3.5 cm across, solitary, axillary. Bracteoles 2-3, 3.5-4 mm long. Pedicels 6-8 mm long. Sepals elliptic-lanceolate, appressed-pubescent, 0.8-1 cm long. Petals scarlet, obovate or sub-orbicular, 1.2-1.5 x 1.5-2 cm. Staminal tube cup-like, 4-5 mm long, glabrous, with 5 groups of 3 stamens alternating with 5 staminodes. Staminodes narrowly oblanceolate, petaloid, glabrescent, to 1.5 cm long. Ovary 5-celled, many-ovuled, globose, 4-4.5 mm across. Capsule subglobose, bristly, 6-8 mm across, loculicidally 5-valved. Seeds subglobose, dotted.

Fl.: Aug.-Oct. *Fr.* : Nov.-Dec.

Ecology : Very Common; cultivated in gardens for its showy flowers; also runs wild in waste places, roadsides, etc.

Distribution : Throughout the hotter parts of India. Tropical Asia.

Specimens examined : Hazaribagh, 733; Hunterganj, 2130.

Uses: Extraction of fruits is used as an emollient for diseases of bowels. Roots are antibilious and used for flatulence.

8. PTEROSPERMUM Schreb., *nom. cons.*

Pterospermum acerifolium Willd., Sp. Pl. 3: 729. 1801; Mast. in Hook. f., Fl. Brit. India 1:366. 1874; Prain, Bengal Pl. 1: 276. 1903; Haines, For. Fl. Chota Nagpur 206: 1910 & Bot. Bihar & Orissa pt. 2: 79. 1921.

Local name: Muchokunda.

Tall evergreen trees, to 15 m tall. Bark ash-coloured, smooth. Leaves lobed, entire or coarsely toothed, broadly oblong-obovate to orbicular, often peltate, shortly acute at apex, cordate at base, glabrous above, rusty-tomentose beneath, 25-35 x 15-30 cm. Petioles tomentose, 10-30 cm long. Stipules caducous, multifid. Flowers fragrant, \pm regular, axillary, solitary or 2-few together; involucre bracts multifid, caducous. Calyx segments linear, densely tomentose outside, brownish, to 12 cm long. Petals linear-oblong, thin, pure white, stellately hairy outside, glabrous inside, 9-11 cm long. Stamens 15, shorter than staminodes; filaments filiform; anthers linear; staminodes 5, 8.5-9 cm long, pubescent, slightly clavate. Ovary 5-celled, many-ovuled. Capsule pentagonal, oblong, 10-15 cm long, woody, rough, clothed with brown deciduous tomentum, loculicidally 5-valved. Seeds obliquely ovoid; wing large, thin, brown.

Fl. : Mar.-July *Fr.*: Oct.-Dec.

Ecology : Common; planted near villages, in forests, roadsides, etc.

Distribution : India: Northern and Western Himalaya, Central India, Western Peninsula, Orissa, West Bengal, Bihar. Bangladesh, Myanmar, Java.

Specimens examined : Koderma Forest, 184; Hazaribagh, 756.

Uses: Wood is used for planks, packing-cases, turnery articles, constructional work, bridges, tool-handles, match-boxes, furniture, toys, and mathematical instruments. Flowers are used for inflammations, ulcers, tumours and leprosy. Leaves are employed for thatching.

9. STERCULIA L.

Key to the Species

- 1a. Leaves digitately compound. Follicles glabrous ... 1. *S. foetida*
 1b. Leaves not compound, palmately 3-5-lobed.
 Follicles stiff-hairy ... 2. *S. urens*

1. ***Sterculia foetida*** L., Sp. Pl. 1008. 1753; Mast. in Hook. f., Fl. Brit. India 1 : 354. 1874; Prain, Bengal Pl. 1: 274. 1903; Haines, For. Fl. Chota Nagpur 206. 1910 & Bot. Bihar & Orissa pt. 2 : 75. 1921.

Local name: Jangli badam.

Large trees, to 35 m tall. Branches whorled, horizontal. Leaves digitately compound, crowded at end of branches; leaflets 5-9, elliptic-lanceolate, cuneate at base, acute or acuminate at apex, pubescent when young, 10-15 x 3-5 cm; petiole 15-20 cm long. Stipules ensiform. Panicles erect, spreading, 15-20 cm long. Flowers 2.5-3.5 cm across; pedicels 2-2.5 cm long, jointed above middle; bracteoles minute. Calyx-lobes 5, oblong-lanceolate, villous within, dull-orange, 1-1.2 cm long. Corolla absent. Staminal column curved, hairy; anthers 12-15. Carpels 5, downy; styles deflexed. Follicles scarlet, recurved, boat-shaped, woody, glabrous, shortly beaked, 10-13 cm. Seeds 10-15, ovoid-oblong, black, to 2 cm long.

Fl. : Mar.-Apr. *Fr.* : Ripens following Feb.-Mar.

Ecology: Not common; planted on roadsides, on railway platforms, etc.; also self-grown.

Distribution : India: Deccan Peninsula, Central and Eastern India. N. Australia, E. Tropical Africa, Malesia, Myanmar, Bangladesh, Sri Lanka, Moluccas.

Specimen examined : Hazaribagh, 740.

Uses: Seeds are eaten as such or after roasting. Oil extracted from seeds is used as an illuminant and in soap-making.

2. *Sterculia urens* Roxb., Pl. Corom. 1: 25, t. 24. 1795. Mast. in Hook. f., Fl. Brit. India 1: 355. 1874; Prain, Bengal Pl. 1: 274. 1903; Haines, For. Fl. Chota Nagpur 204. 1910 & Bot. Bihar & Orissa pt. 2: 76. 1921.

Local names: Kulu, Gulu.

Moderate-size trees, to 10 m tall. Bark thin, papery, smooth, white. Branches spreading, more or less pubescent, marked with large leaf-base scars. Leaves palmately 3-5-lobed, crowded at end of branches, orbicular, thin-coriaceous, caudate-acuminate at apex, deeply cordate at base, entire, scabrid above, velvety beneath, 15-25 x 15-25 cm; petiole 12-24 cm long, terete, velvety-tomentose. Panicle terminal, 10-18 cm long, viscidly pubescent. Flowers numerous, small, yellow, 0.6-1 cm across, bisexual and few females mixed with many males; bracts 4-6 mm long; pedicel 3-4 mm long. Calyx campanulate, hairy; tube ca. 2 mm long; lobes oblong, acute, rusty green, with a small gland at base. Corolla absent. Carpels 5; ovary globose, 5-celled; style much reduced; stigmas 5. Follicles 5, 2-3 cm long, ovoid-oblong, yellow, stiff hairy. Seeds 3-6, oblong, black.

Fl. : Dec.-Feb. *Fr.* : Apr.-June.

Ecology : Common; on valleys and slopes of low hills, forests, etc.

Distribution: India: North-Western India, Deccan Peninsula, Bihar, Assam. Sri Lanka.

Specimens examined : National Park, 419; Ganghree, 1309.

Uses : Plant yields a gum, Katila' which is used by Santals in throat affections. Seeds are eaten after roasting or cooking. Bark yields a fibre used for cordage. Wood is used for making guitars, toys, packing cases, etc.

Note: Flower is foetid; panicles appear before the appearance of leaves at the ends of branches. Fruits red at first, then turning green, brittle when young.

36. BOMBACACEAE

Key to the Genera

- 1a. Flowers long-pedicellate (pedicels to 90 cm long).
Stamens united for about 1/2 of their length; anthers
reniform. Capsules indehiscent. Seeds embedded in
a farinaceous pulp ... 1. ADANSONIA
- 1b. Flowers short-pedicellate (pedicels to 2.5 cm
long). Stamens shortly united at base;
anthers hippocrepiform. Capsules loculicidally
5-valved. Seeds embedded in silky fibres ... 2. BOMBAX

1. ADANSONIA L.

Adansonia digitata L., Sp. Pl. 1190 1753; Mast. in Hook. F., fl. Brit. India 1: 348. 1874; Prain, Bengal Pl. 1: 270. 1903; Haines, Bot. Bihar & Orissa pt 2: 74. 1921.

Local name : Gorakh amlī.

Large trees, to 20 m tall; trunk to 10 m in diam., suddenly tapering into thick branches; branchlets pubescent. Leaves crowded towards apex of branchlets, 5-7-foliolate; petioles to 15 cm long, densely pubescent especially when young; leaflets (sub)-sessile, oblong, obovate to obovate-oblong, cuneate and decurrent at base, acuminate to subcaudate at apex, entire, densely pubescent when young, 7-15 x 3-7 cm. Flowers showy, pendulous, 14-18 cm across; pedicels to 90 cm long, tomentose. Calyx-lobes 5, broadly triangular, acute, tomentellous outside, to 9 cm long and 4 cm wide at base. Petals 5, broadly obovate to flabelliform, shortly unguiculate at base, rounded at apex, white, turning brown when dry, glabrescent or sparsely hairy outside, 6-9 x 5-8 cm. Stamens many; staminal tube conical, white, turning brown when dry, glabrous, 3-7 cm long, divided into many slender filaments being \pm equalling the tube; anthers ca. 2 mm long. Ovary hirsute-tomentose, 5-or 10-locular; style exserted, ca. 1-1.5 cm beyond anthers, hirsute-tomentose at base. Capsule oblong or oblong-ovoid, sometimes irregular in shape, \pm longitudinally sulcate, acute or rounded at both ends, 20-40 cm x 6-15 cm. Seeds many, dark brown to black, oleaginous.

Fl. : Mar.-May. *Fr.* : July-Oct.

Ecology : Not common; planted in gardens, roadsides, parks, etc.

Distribution : India: Uttar Pradesh, Bihar, West Bengal, Tamilnadu, Western Peninsula and elsewhere in the country. Native to Tropical Africa, introduced and naturalised in Tropical Asia and Madagascar.

Specimens examined : Hazaribagh, 840; Patratu, 1689.

Uses: Wood yields paper pulp suitable for wrapping as well as writing paper. It is also used for trays, canoes, rafts, etc. Fruit pulp is employed to give bronchial asthma and allergic dermatitis. Dry capsules are used as floats for their nets by fishermen.

2. BOMBAX L.

Bombax ceiba L., Sp. Pl. 311. 1753, *p.p. quoad plantas Asiaticas excl. syn.* Bauhin; Robyns in Taxon 10: 160. 1961; Robyns in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 64. 1980.

B. malabaricum DC., Prodr. 1: 478. 1824; Mast. in Hook. f., Fl. Brit. India 1: 349. 1874; Prain, Bengal Pl. 1: 271. 1903; Brandis, Ind. Trees 77. 1906; Haines, For. Fl. Chota Nagpur 192. 1910 & Bot. Bihar & Orissa pt. 2: 74. 1921.

Salmaalial malabarica (DC.) Schott. & Endl., Melet. Bot. 85. 1832; Nicols. & Saldan. in Saldan. & Nicols., Fl. Hassan Dist. 145. 1976.

Local name : Simal.

Large trees, to 30 m tall; trunk usually unbranched up to considerable height, about 4 m or more girth above large buttresses. Prickles on trunk hard, sharp, conical, usually disappearing with age; petiole 10-25 cm long, pulvinate at base. Stipules triangular, with hairy margins, 0.5-1 cm long.; leaflets 5-7, unequal, elliptic-lanceolate, attenuate at base, acuminate at apex, ± leathery, 5-20 x 2-8 cm; petiohule 1-3 cm long. Flowers large, showy, 6-9 cm long and 1.2-1.5 cm across, solitary, paired, or in fascicles of 3-4, borne at or near end of branches; pedicels thick, 1-2.5 cm long. Calyx ± deeply 2-5 lobed, 1.5-3.5 cm long and 2-5 cm wide, yellowish green when fresh, glabrous or sparsely puberulous outside, sericeous within. Petals 5, obovate or obovate-elliptic to oblong, bright red, tomentellous

outside, puberulous towards apex within, 6-12 x 2-5 cm. Stamens 70-110, 3-7 cm long; filaments reddish towards apex, connate basally into short staminal tube; outer whorl with 5 fascicles of 8-20 stamens each; filaments mostly curved outwards, sparsely pubescent below; inner whorl with 10 stamens, each pair of filaments completely united and usually longer than 10 inner filaments of outer whorl; anthers blackish. Ovary conical, tomentellous-sericeous; style exceeding the stamens, reddish towards apex, glabrescent; stigmatic lobes reddish. Capsule obong, cuneate at both ends, 10-15 cm long, tomentose when young; valves 2-3.5 cm wide, becoming blackish and glabrous at maturity; columella brownish. Seeds brown, smooth, \pm obovoid-pyriform, 0.5-0.6 cm long. Fibres white.

Fl. : Jan.-Mar. *Fr.* : Mar.-June.

Ecology : Very common; in roadsides, river banks, gardens, parks, hilly slopes and valleys, forests, etc.

Distribution : Throughout India. Tropical Asia, extending east-wards to New Guinea.

Specimens examined : National Park, 63; Tondwa, 1443; Chouparan, 1686; Hazaribagh, 2271.

Uses : Wood is used for making match-boxes; also suitable for toys, shingles, bush handles, pencils and pen-holders and frames. Floss is used for stuffing mattresses, life-belts, pillows, upholstery and quilts; also used as an insulating material for refrigerators, sound-proof covers and walls. Tender leaves are lopped for fodder. Flower-buds and fleshy calyces are eaten as vegetables by poor people in villages. Dried valves of fruits are used as fuel. Oil extracted from seeds is used for soap-making and as an illuminant.

Note: The treatments of Robyns (*l.c.*) and Nicolson (*Taxon* 28: 367-73, 1979) are followed in adopting *Bombax ceiba* L., *p.p.*, *excl. syn.* Bauhin as the correct name for this plant. Several workers [e.g., Thw. in Enum. Pl. Zeyl. 28. 1858; Abeyw. in *Ceylon J. Biol. Sci.* 2: 193. 1959; Nicols. & Saldan. (*l.c.*); etc.,] placed this plant under *Salmalia* Schott & Endl., but *Bombax* L. (1753) and *Salmalia* Schott & Endl. (1832) are congeneric.

37. MALVACEAE

Key to the Genera

- 1a. Staminal column at apex 5-toothed, if branched distally into 5 arms (e.g. *Kydia*), then fruits not schizocarpic; filaments projecting from whole surface of column or from a greater part of it:
- 2a. Style-branches the same number as the carpels or the style undivided with lobed or ribbed stigma. Fruit a capsule:
- 3a. Style divided into spreading branches:
- 4a. Calyx splitting on one side during anthesis, minutely 5-toothed at apex, adnate to corolla ... 1. ABELMOSCHUS
- 4b. Calyx not splitting on one side during anthesis, 5-lobed or parted, not adnate to corolla:
- 5a. Style branches 3 ... 6. KYDIA
- 5b. Style branches 5:
- 6a. Capsule winged ... 3. FIORIA
- 6b. Capsule not winged ... 5. HIBISCUS
- 3b. Style undivided with ribbed or lobed stigma:
- 7a. Epicalyx segments large, leaf-like, cordate, persistent. Seeds densely and long-lanate. All parts of plants glandular, black-punctate ... 4. GOSSYPIUM
- 7b. Epicalyx segments small, narrow, caducous. Seeds glabrous or shortly hairy. Not punctate ... 11. THESPESIA
- 2b. Style branches twice the number of carpels. Fruit a schizocarp, breaking up into mericarps at maturity:
- 8a. Flowers in heads with involucrem. Epicalyx absent ... 7. MALACHRA

- 8b. Flowers axillary, solitary or occasionally in clusters. Epicalyx present:
- 9a. Schizocarp glochidiate. Corolla rotate; petals never auricled. Leaves with a nectary on midrib beneath ... 12. URENA
- 9b. Schizocarp smooth and fleshy like a berry. Corolla long-campanulate or fusiform; petals auricled at base. Leaves without any nectary ... 9. MALVAVISCUS
- 1b. Staminal column without teeth, at apex splits up into numerous filaments. Styles or style-branches as many as carpels. Fruit a schizocarp, at maturity breaking up into mericarps:
- 10a. Epicalyx present, segments 3
Seed 1 per mericarp. ... 8. MALVASTRUM
- 10b. Epicalyx absent:
- 11a. Seeds 2 or more per mericarp. ... 2. ABUTILON
- 11b. Seed 1 per mericarp ... 10. SIDA

1. ABELMOSCHUS Medic.

Key to the Species

- 1a. Epicalyx segments 7-10, linear-subulate. Capsule 6-8-ribbed, 15-25 cm long, light hairy or nearly glabrous ... 1. *A. esculentus*
- 1b. Epicalyx segments 4-8, ovate-oblong capsule pentagonous, 3.5-6 cm long, bristly hairy ... 2. *A. manhot* ssp. *tetraphyllus* var. *pungens*

1. **Abelmoschus esculentus** L., Moench, Meth. Pl. 617. 1794; Borss. in Blumea 14: 100, 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 71. 1988.

Hibiscus esculentus L., Sp. Pl. 696. 1753; Mast. in Hook. f., Fl. Brit. India 1: 343. 1874; Prain, Bengal Pl. 1: 265. 1903; Haines, For. Fl. Chota Nagpur 190. 1910 & Bot. Bihar & Orissa pt. 2: 65. 1921.

H. longifolius Willd., Sp. Pl. 3: 827. 1800.

Local name : Bindi.

Erect, stout, annual herbs, to 1.5 m tall, bristly-hairy. Leaves ovate-orbicular in outline, variously 3-9-lobed, cordate at base, scabrous on both surfaces, to 30 cm or more across; lobes broadly or narrowly oblong, acute to sub-acuminate at apex, coarsely toothed; petioles 5-20 cm long, bristly-hairy. Stipules linear-subulate, 2-2.5 cm long, entire or 2-fid. Flowers 5-8 cm across, axillary, solitary; pedicels 0.6-1.5 cm long, accrescent to 4-5 cm; bracteoles 7-10, linear-subulate, 1.2-2.5 cm long, falling from fruits. Calyx 2-3 cm long, stiff-hairy. Corolla yellow with a purple centre; petals obovate, to 5 cm long. Staminal column 2-2.5 cm long. Capsule pyramidal-oblong, 6-8-ribbed, light hairy or nearly glabrous, 15-25 x 2-3 cm, succulent when young, woody at maturity. Seeds striate, hairy, 3-5 mm.

Fl. & Fr. : Throughout the year.

Ecology : Very common; cultivated in fields as garden vegetable for its soft immature edible fruits, also runs as an escape in waste places.

Distribution: Throughout India. Probably native of Africa, widespread in all Tropical Countries.

Specimen examined : Etkhori, 1453.

Uses : Immature fruit is used as vegetables. The mucilage from the fruits and seeds are used medicinally.

2. *Abelmoschus manihot* (L.) Medik. ssp. *tetraphyllus* (Roxb. ex Hornem.) Borss. var. *pungens* (Roxb.) Hochr. in Candollea 2: 87. 1924; Borss. in Blumea 14: 99. 1966; Paul & Nayar in Nayar *et al.*, Fl. Ind. Fasc. 19: 77. 1988. *Hibiscus pungens* Roxb., Fl. Ind. 3: 213. 1832; Mast. in Hook. f., Fl. Brit. India 1: 1: 341. 1874; Prain, Bengal Pl. 1: 266. 1903; Haines, For. Ft. Chota Nagpur 188. 1910 & Bot. Bihar & Orissa pt. 2: 66. 1921.

Erect, branched, perennial herbs or undershrubs, 1-3 m tall. Stems terete, fistular, densely covered with prickly hairs. Leaves extremely variable in shape and size, suborbicular or broadly ovate in outline, cordate or occasionally hastate at base, mostly 3-7-lobed to -parted, ± densely stiff-

hairy on both surfaces, basally 7-9-nerved, 5-25 cm in diam.; segments triangular, ovate, elliptic or lanceolate, entire or \pm coarsely serrate-dentate, sometimes pennilobed or parted; petiole 2.5-15 cm long, hispid. Stipules filiform, linear-lanceolate, acute to acuminate, 0.6-1.2 cm, hairy. Flowers axillary, solitary, or in racemes by reduction or abortion of upper leaves; pedicel 1-5 cm long, accrescent to *ca.* 0.7 cm, hispid. Epicalyx segments 4-8, free, ovate-oblong, acute to acuminate, 1-3 x 0.5-1 cm, hirsute on both surfaces, with hispid margins. Calyx 3-4 cm long, 3-toothed or lobed at top, hirsute outside. Petals white or sulphur-yellow, with a small dark purple centre, obovate-suborbicular, rounded at apex, glabrous, 4-8 x 3-6 cm. Staminal column 1.5-3 cm long, yellow or white, glabrous. Style-arms 3-5 mm long, yellow or white; stigma dark purple, hairy. Capsule oblong-ovoid, pentagonous, acuminate, 3.5-6 x 2-2.5 cm, with 5 prominent costa, bristly hairy; valves shining and yellow inside. Seeds many, globular to subreniform, dark brown to black, 3-4 mm in diam.

Fl. & Fr. : July-Oct.

Ecology : Common; in scrub jungles, forest-edges, etc.

Distribution : India: throughout tropical Himalaya from Kumaon to Sikkim, Uttar Pradesh, Bihar, West Bengal, Assam, Meghalaya, Manipur, Nagaland, Tripura, Orissa, Andhra Pradesh. Pakistan, China, Philippines, Lesser Sunda Islands, Sumatra, Christmas Islands, N. Australia.

Specimens examined : National Park, 966; Koderma Forest, 1774.

Uses : Mucilage from root is used in sizing paper. Stem yields a fibre which is used for cordage, bags, etc., Tender leaves are cooked and eaten.

Note : var. *tetraphyllus* is characterised by the margins of epicalyx segments being densely clothed with soft hairs in contrast to the margins being hispid by stiff hairs in var. *pungens*. Ssp. *tetraphyllus* differs from ssp. *manihot* by prickly hairy stems whereas in latter the stem is glabrous or slightly pubescent.

2. ABUTILON Mill.

Abutilon indicum (L.) Sweet, Hort. Brit ed. 1. 54: 1826; *emend.* Hochr. in Ann. Cons. Jard. Bot. Geneve 6: 19. 1902; Mast. in Hook. f.,

Fl. Brit. India 1: 326. 1874; Prain, Beng. Pl. 1: 260. 1903; Haines, For. Fl. Chota Nagpur 180. 1910 & Bot. Bihar & Orissa pt. 2: 61. 1921; Borss. in Blumea 14: 170. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 87. 1988. *Sida indica* L., Cent. Pl. 2: 26. 1756.

Sida populifolia Lam., Encycl. 1: 7. 1783.

Abutilon indicum (L.) Sweet var. *populifolium* (Lam.) Wight & Arn. ex Mast. in Hook. f., Fl. Brit. India 1: 326. 1874.

Local name : Kanghi.

Erect, annual or perennial undershrubs, to 2.5 m tall. Stems minutely hoary-tomentose, diversely branched. Leaves broadly ovate, chartaceous, cordate at base, acute or acuminate at apex, crenulate-dentate, basally 7- or 9-nerved, woolly tomentose, 2.5-7 × 1.5-6.5 cm; petiole 2-5 cm long. Stipules linear, deflexed, 0.4 cm long. Flowers 2-3 cm across, axillary, solitary or sometimes appearing subpanicked before the leaves; pedicels longer than petiole, 3-8 cm long, jointed very near the top, accrescent; epicalyx absent. Calyx campanulate, slightly accrescent, 0.8-1.2 cm long, divided half-way down; lobes 5, ovate, apiculate, 4-5 mm. Petals yellow, obovate, truncate, rounded or emerginate, *ca.* 1 cm across. Staminal columns glabrous above, pubescent at base, 5-7 mm long. Carpels more than 15; style branches as many as carpels; stigma capitate. Schizocarp subglobose, flat or slightly indented at apex, 1.5-2.5 cm across; mericarps 15-22, densely stellate-hairy, reniform, shortly acuminate at apex, dark brown. Seeds 2-3 per mericarp, brownish-black, 2-2.5 mm in diam.

Fl. & Fr. : Jan.-May.

Ecology : Not common; in waste places, roadsides, hedges, shrubberies, etc.

Distribution : Throughout India. Throughout Tropical and Sub-tropical countries of both the hemispheres.

Specimens examined : Chatra, 978; Jhumri Telaiya, 1721.

Uses : Plant yields a cordage fibre. It is also used as febrifuge, anti-inflammatory and in urinary troubles. Bark is used as astringent and diuretic. Root is used as nerve tonic and in piles.

3. FIORIA Mattei

Fioria vitifolia (L.) Mattei, Bol. R. Orto. Bot. Palermo 2: 71. 1916; Kundu & Biswas in Bul. Bot. Surv. India 16: 125-137, 1977; Paul et Nayar in Nayar *et al.* Fl. India Fasc. 19, 109. 1988. *Hibiscus vitifolius* L. Sp. Pl. 696. 1753; Mast. in Hook. f., Fl. Brit. India 1: 338. 1874; Prain, Bengal Pl. 1: 267. 1903; Haines, For. Fl. Chota Nagpur 190. 1910 & Bot. Bihar & Orissa pt. 2: 68. 1921; Borss. in Blumea 14: 82. 1966; Rakshit & Kundu in Bull. Bot. Surv. India 12: 166 (1970). 1972.

Erect, hispidly hairy, perennial suffruticose herbs or undershrubs, to 2.5 m tall. Branchlets densely stellate-pubescent and glandular-hairy. Lower leaves with 3 large triangular lobes, rounded-subcordate at base and acuminate at apex; upper ones ovate to lanceolate, subcordate at base, acute to acuminate at apex; all more or less crenate-serrate or dentate, chartaceous, basally 7-nerved, minutely stellate-tomentose on both surfaces, gland-hairy on nerves, 4-8 x 3-7.5 cm; petiole 4-8 cm long. Stipules filiform, 0.2-0.4 cm long. Flowers 4-5 cm across, axillary, solitary or in racemes by reduction of upper leaves. Epicalyx segments 8-12, linear, to 1 cm long. Calyx-segments lanceolate, acute, 0.8-1 cm long. Petals yellow, purplish at base inside, obovate, glabrous, 2.5-5 x 1-3 cm. Staminal column 1.5-2 cm long. Ovary 5-celled, ovoid, 5-angular, *ca.* 5 x 4 mm; style arms 5, 3-4 mm long, glandular-hairy; stigmas clavate, hairy. Capsule sub-orbicular, hairy, apiculate, 1.5-2 cm across, shorter than accrescent fruiting calyx. Seeds reniform, brownish black, 2-2.5 mm across.

Fl. : Oct.-Dec. *Fr.* : Nov.-Mar.

Ecology : Rare; grow in the arable lands, canal banks, waste lands, etc.

Distribution : Throughout India. Pakistan, Myanmar, Sri Lanka, Malesia, Australia and Africa.

Specimens examined: Bishnugarh, 1116, Patratu, 1337.

Uses : Stem yields a fibre which is used for cordage, ropes and fishing-lines.

Note: Most workers treated this species under the genus *Hibiscus*. Mattei (*l.c.*) has transferred it under the genus *Fioria* with reasons. The

unique character is the presence of its conspicuous strongly veined wings on the fruit which is absent in the genus *Hibiscus*. Abedin (*l.c.*) and Paul and Nayar (*l.c.*) have supported Mattei's treatment.

The species is highly variable in the lobation of leaf and the degree of indumentum. The latter depends on the habitat condition.

4. GOSSYPIMUM L.

Key to the Species

- 1a. Epicalyx segments united for 1 cm or more, entire or remotely serrate. Corolla mostly campanulate ... 1. *G. arboreum*
- 1b. Epicalyx segments free or united only at very base for not more than 0.5 cm, deeply gashed, with triangular to almost linear teeth. Corolla infundibuliform ... 2. *G. hirsutum*

1. ***Gossypium arboreum* L.**, Sp. Pl. 693. 1753; Mast. in Hook. f., Fl. Brit. India 1:347. 1874; Haines, Bot. Bihar & Orissa pt. 2:71.1821; Bors. in Blumea 14:121.1966; Paul & Nayar in Nayar *et al.* Fl. India Fasc. 19. 112. 1988.

G. arboreum L. var. *neglectum* (Todaro) Watt, Cott. Pl. 95, t. 10, 11, 12. 1907; Haines, Bot Bihar & Orissa pt. 2: 72. 1921, *p.p.*

Local name: Deshi Kapas.

Twigs slender, terete, densely covered with minute stellate hairs and patent simple hairs. Leaves ovate to orbicular in outline, cordate at base, palmilobed to parted, 3-12 cm in diam., 5-7 -nerved, with an oblong nectary on 1-3 nerves, stellate-pubescent and simple hairy; segments 3-7, usually with an extra tooth in sinuses; petioles 1.5-10 cm long. Stipules linear-lanceolate, usually falcate, acuminate, 0.4-1.2 cm long. Pedicels 0.5-2 cm long, mostly without apical nectaries. Epicalyx segments closely embracing the corolla and capsule, \pm deeply cordate at base, acute at apex, 1.5-3.5 x 1.2-3 cm, slightly accrescent, entire or toothed, densely stellate-pubescent and simple hairy. Calyx cupular, *ca.* 5 mm long and *ca.* 7 mm in diam., truncate or inconspicuously 5-dentate, usually with 3 nectaries at base alternating with epicalyx segments, \pm glabrous. Corolla mostly light yellow; petals obovate, stellate-pubescent outside, 3-4 cm long. Staminal column

1.5-2 cm long; filaments 1.5-2 mm long. Capsule ovoid-subglobose, 1.5-2.5 cm in diam., with a 3-5 mm long beak, densely pitted outside, glabrous, 3-4-celled. Seeds 5-8 per cell, ovoid-globular, 5-6 mm in diam., with floss and fuzz; floss copious, fairly long, white.

Fl. & Fr.: Dec.-Mar.

Ecology: Common; cultivated in gardens; sometimes met with as an escape in waste places, gardens, etc.

Distribution : Throughout India. Tropical and subtropical regions of Old World.

Specimens examined : Mandu, 868; Markachho, 1483.

Uses : Cotton fibre is used in the manufacture of woven goods and for stuffing. Cotton seeds are used as demulcent, laxative and expectorant; their decoctions are given in dysentery and intermittent fevers. Cotton seed oil is used in manufacture of soaps, lubricants and protective coatings.

2. *Gossypium hirsutum* L., Sp. Pl. 975. 1753; Haines, Bot. Bihar & Orissa pt. 2: 73. 1921; Borss. in Blumea 14: 123. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 115. 1988.

G. herbaceum L. var. *hirsutum* (L.) Mast. in Hook. f., Fl. Brit. India 1: 347. 1874.

Local name: Kapas, Budhi.

Annual herb or perennial shrubs, 1-3 m tall. Leaves \pm orbicular in outline, usually wider than long, mostly 3-lobed, lower ones sometimes 5-lobed, upper ones occasionally ovate and entire, cordate at base, 5-7-nerved, 3-15 cm in diam.; segments broadly ovate-deltoid, acuminate; sinuses acute, obtuse or rounded; midrib nectary oblong; petiole 3-8 cm long. Stipules ovate to lanceolate, often falcate, 6-12 x 2-5 mm. Flowers on axillary, sympodial shoots; pedicel 1-2.5 cm, with 3 nectaries at apex. Epicalyx-segments free or united only at very base for more than 0.5 cm, closely enveloping the flower and capsule, widely ovate to triangular, deeply cordate and auricled at base, 2-4 x 1.5-3 cm, slightly accrescent, deeply gashed, with usually 7-9 triangular to almost linear, acuminate teeth. Calyx campanulate to cupular, 6-7 mm long and 5-6 mm across; segments 5,

rounded, with usually 3 inconspicuous nectaries on outside. Corolla infundibuliform, pale yellow to white, sometimes tinged purplish when young; petals obovate, stellately puberulous outside, 4-5.5 mm long. Staminal column 1-2 cm long; filaments 3-4 mm long. Capsule ovoid, rostrate, 2-5 x 1-1.5 cm long, coarsely pitted, 3-5-celled. Seeds ovoid, acute at hilum, black or brown, 3.5-5 mm long, with white floss, and fuzz throughout or only at hilum.

Fl. & Fr. : Nov.-Feb.

Ecology : Very common; cultivated in gardens, sometimes met with as an escape in waste places, gardens, roadsides, etc.

Distribution : Throughout India. Tropical and subtropical regions of the Old World.

Specimens examined : Jhumri Telaiya, 290; Hazaribagh, 787.

Uses: Same as *G. arboreum* L.

5. HIBISCUS L. *nom. cons.*

Key to the Species

- 1a. Epicalyx-segments adnate to the calyx for \pm one-third, accrescent. Veins in calyx-lobes prominent. Stems with small prickles ... 4. *H. sabdariffa*
- 1b. Epicalyx-segments neither adnate to calyx, nor accrescent. Veins in calyx-lobes not prominent. Stems without prickles:
 - 2a. Staminal column shorter than petals, antheriferous throughout:
 - 3a. Epicalyx-segments minute, observed in bud but absent in mature flowers. Flowers 1-1.5 cm across. Herbs ... 1. *H. lobatus*
 - 3b. Epicalyx-segments well-developed, present also in mature flowers. Flowers more than 6 cm across. Shrubs ... 2. *H. mutabilis*
 - 2b. Staminal column longer than petals, antheriferous in upper half ... 3. *H. rosa-sinensis*

1. **Hibiscus lobatus** (Murr.) O. Kuntze, Rev. Gen. Pl. ed. 3, 2: 1898; Borss. in Blumea 14: 77. 1966; Rakshit & Kundu in Bull. Bot. Surv. India 12: 169. 1972; Paul & Nayar in Nayar *et al.*, Fl. India Fas. 19: 133. 1988. *Solandra lobata* Murr., Comment. Soc. Regiae. Sci. Gott. 6: 20, t. 1. 1785.

Hibiscus solandra L' Herit, Strip. Nov. 1: 103, t. 49. 1788, *nom. illeg.*; Hook. f., Fl. Brit. India 1: 336. 1874; Prain, Bengal Pl. 1: 267. 1903; Haines, Bot. Bihar & Orissa pt. 2: 66. 1922.

Erect, simple or slightly branched, stellate-pubescent, annual herbs, 25-80 cm tall. Leaves broadly ovate to ovate-orbicular, chartaceous, rounded or acute at apex, cordate at base, crenate-serrate, basally 5-nerved, stellate hairy above, woolly below, 3-5 x 0.7-1.5 cm; upper leaves often palmately 3-lobed; (palmatifid, palmatisect or palmatipartite) with ovate-lanceolate to deltoid, acute or acuminate lobes; petiole slender, 1.5-6 cm long. Stipules subulate, 3-5 mm long. Flowers 1-1.5 cm across, axillary, solitary or in lax terminal racemes by reduction of upper leaves; pedicels jointed below the flower, 0.8-1.5 cm long, accrescent to 5 cm. Epicalyx segments 6-8, *ca.* 1.5 mm long, found in bud, absent in mature flower. Calyx divided half-way down, pubescent; segments ovate, acute, 3-nerved, 5-7 mm long in flower, lanceolate, accrescent to 1 cm in fruit. Corolla white; petals obovate, 8-12 x 4-7 mm, glabrescent. Staminal column *ca.* 6 mm long, antheriferous throughout. Style arms with discoid, hairy stigma. Capsule ovoid, shortly beaked, slightly hairy, wrinkled, slightly exceeding the calyx, 8-10 x 6-8 mm. Seeds many, sub-reniform, black, smooth, to 2 mm across.

Fl. : Sept.-Oct. *Fr.*: Oct.-Dec.

Ecology : Common; in scrub jungles.

Distribution : Throughout India. S., S.E. and C. Asia, Madagascar and adjacent islands and Tropical Africa.

Specimens examined: Ghanghree, 1055; Hunterganj, 2144.

2. **H. mutabilis** L., Sp. Pl. 694. 1753; Mast. in Hook. f., Fl. Brit. India 1: 344. 1874; Prain, Bengal Pl. 1: 268. 1903; Haines, Bot. Bihar & Orissa pt. 2: 69. 1921; Borss. in Blumea 14: 66. 1966; Rakshit & Kundu in Bull.

Bot. Surv. India 12: 167. 1972; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 140.1988.

Local name: Sthal kamal.

Shrubs, to 6 m tall. Younger parts densely stellate-pubescent intermixed with simple glandular hairs. Leaves suborbicular in outline, cordate at base, palmately 3-7-lobed, 10-20 cm in diam, basally 7-11-nerved; lobes triangular, acute to acuminate at apex, crenate or dentate, densely stellate-pubescent beneath, minutely glabrous or sparsely stellate-pubescent above. Petiole 5-12 cm long. Stipules linear-lanceolate. Flowers solitary and axillary or subcorymbose at apex. Pedicels 6-10 cm long, jointed 1-2 cm below flower. Epicalyx-segments 8-12, linear-lanceolate, 1.5-2 cm long. Calyx divided half-way down; lobes ovate-lanceolate, acuminate, stellate-pubescent and glandular hairy outside, only stellate-pubescent inside, 5-nerved, 3-4 cm long. Corolla 7-10 cm across; petals 5 or multiple of 5, suborbicular, shortly clawed, stellate-pubescent outside, 6-8 cm long. Staminal column shorter than corolla, white or yellowish-white, antheriferous throughout. Ovary 5-6 mm long, hairy, 5-locular; ovules many in each locule. Capsule subglobose, emerginate, stellate-pubescent and glandular-hairy, 2-2.5 cm in diam. Seeds reniform, brownish, hairy on dorsal and dorsolateral walls, 2-3 mm long.

Fl. & Fr.: Sept.-Dec.

Ecology: Very common; planted in gardens, parks, etc.

Distribution: Throughout India; native of China, now distributed widely in the Tropical regions.

Specimens examined: Chatra, 1199; Hazaribagh, 1708.

Uses: The plant is grown as an ornamental for its beautiful flowers.

3. *Hibiscus rosa-sinensis* L., Sp. Pl. 694. 1753; Mast. in Hook. f., Fl. Brit. India 1: 334. 1874; Prain, Bengal Pl.1: 268. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 69. 1921; Borss. in Blumea 14: 72. 1966; Rakshit & Kundu in Bull. Bot. Surv. India 12:105. 1972; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19:147. 1988.

Local names : Jasut, Jasum.

Shrubs, to 4 m tall. Leaves ovate, acuminate at apex, subcuneate, truncate or subcordate at base, crenate-serrate to dentate, 3-5 nerved from base, glabrous or minutely stellate-hairy on nerve beneath, 5-11 x 3-6 cm; petioles 1.5-3.5 cm long. Stipules lanceolate-subulate, 3-7 mm long. Flowers solitary, axillary; pedicels mostly longer than petiole, joined above middle. Epicalyx-segments 5-8, lanceolate, connate at base, stellate-pubescent, nearly half the length of calyx. Calyx campanulate; lobes lanceolate, stellate-pubescent and glandular-hairy, 1.5-2 cm long. Corolla blood red in colour, petals obovate, entire, 7-12 cm long. Staminal column exerted beyond corolla, antheriferous in upper half. Capsule rounded.

Fl. & Fr. : Almost throughout the year.

Ecology : Very common; planted in gardens, parks, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Tondwa, 1889; Hazaribagh, 2268.

Uses : The species is planted as an ornamental for its flowers. The extract of flowers are employed for blackening shoes, hairs and eyebrows; also given in bronchial catarrh.

4. **Hibiscus sabdariffa** L., Sp. Pl. 695. 1753; Mast. in Hook. f., Fl. Brit. India 1: 340. 1874; Prain, Bengal Pl. 1: 267. 1903; Haines, For. Fl. Chota Nagpur 191. 1910 & Bot. Bihar & Orissa pt. 2: 67. 1921; Borss. in Blumea 14: 64. 1966; Rakshit & Kundu in Bull. Bot. Surv. India 2: 162. 1972; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 149. 1988.

Local name : Lat-ambari.

Erect, glabrous, annual shrub, to 2 m tall. Stem and branchlets purplish with small prickles. Leaves polymorphic, 3-5-palmatifid to palmatifartite, 4-10 x 1-2 cm, cuneate at base; lower leaves unlobed; lobes of upper leaves oblong-lanceolate, 3-nerved, acute at apex, serrate, glandular beneath, often blotched with purple; petioles to 8 cm long, minutely prickly, reddish-purple. Stipules linear, 1-1.2 cm long. Flowers axillary, solitary, nearly sessile; pedicels purple, jointed near base, 4-7 mm long. Epicalyx-segments 10,

linear, adnate to base of calyx, purple, shorter than the calyx, accrescent. Calyx fleshy, red, muricate or setose; lobes 3-nerved, accrescent in fruit. Petals pink with darker centre. Capsule ovoid, beaked, hairy, 1.2-2 cm long. Seeds large, black-brown, closely covered with stout stellate hairs.

Fl. : July-Sept. *Fr.* : Sept.-Jan.

Ecology: Very common; cultivated; sometimes found as an escape in field-borders, waste places, roadsides, etc.

Distribution : Throughout India. Throughout the Tropical Countries.

Specimens examined : Jhumri Telaiya, 295; Bishnugarh, 1939.

Uses : Stem yields the 'Rozelle help' of commerce which is used for sacking, cordage, etc. Ripe calyces are edible and also used for preparation of jelly.

6. KYDIA Roxb.

Kydia calycina Roxb., Pl. Corom. 3: 11, t. 215. 1819; Mast. in Hook. f., Fl. Brit. India 1: 348. 1874; Prain, Bengal Pl. 1: 262. 1903; Haines, For. Fl. Chota Nagpur 192. 1910 & Bot. Bihar & Orissa pt. 2: 73. 1921; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 160. 1988.

K. fraterna Roxb., Pl. Corom. 3: 12, t. 216. 1819.

Local names : Pula, Baranga.

Medium-sized trees, 10-20 m tall. Bark greyish-white, soft. Younger part of stems and branches densely and minutely greyish stellate-pubescent. Leaves broadly ovate-suborbicular, coriaceous, entire or irregularly serrate or 3-5 lobed with mid-lobe longest, truncate-subcordate at base, obtuse, thinly stellate-pubescent above, densely so beneath, 4-12 x 3.5-14 cm; petiole 2-5 cm long, densely stellate-pubescent. Stipules foliaceous, elliptic, 1-1.2 cm long. Flowers 1.2-1.5 cm across, in many-flowered, axillary and terminal panicles of to 30 cm long; pedicels 0.5-1.5 cm long, jointed. Epicalyx segments 4-6, oblong-spathulate, minutely stellate-pubescent, 6-7mm long, accrescent to 1.2 cm, ultimately spreading. Calyx cup-shaped, persistent, divided almost half-way down; lobes broadly

triangular, 3-4 mm long. Petals 5, white, obovate-obcorate, fimbriate along margins, long clawed, 6-7 mm long. Staminal column shorter than petals, 3.5-4 mm long, hairy at base. Pistillode absent in male flower. Ovary ovoid, trilocular; styles 3 with stigmatos-arms. Capsule small, subglobose, enclosed in calyx, mealy tomentose, 4-4.5 mm in diam. Seeds reniform-ellipsoid, brown, *ca.* 3 x 2 mm.

Fl. : Sept.-Nov. *Fr.* : Dec.-May.

Ecology : Common; in valleys, hill slopes, forests, etc.

Distribution : Throughout India. China, Myanmar, Pakistan.

Specimens examined: National Park, 62; Koderma Forest, 1256; Pratappur, 2088.

Uses : Wood is used for planks, agricultural implements, building construction, match boxes and splints, and light packing cases. Inner bark yields a fibre which is used locally for coarse ropes. Leaves are lopped for fodder.

7. MALACHRA L.

Malachra capitata (L.) L., Syst. Nat. ed. 12, 2: 458. 1767; Mast. in Hook. f., Fl. Brit. India 1: 329. 1874; Prain, Bengal Pl. 1: 262. 1903; Haines, Bot. Bihar & Orissa pt. 2: 62. 1921; Borss. in Blumea 14: 146. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 163. 1988.

Sida capitata L., Sp. Pl. 685. 1753.

Local name: Banbhindi.

Annual or perennial, coarsely stellate-hairy, suffruticose herbs, to 1.2 m tall. Leaves orbicular to ovate, often palmately 3- or 5-lobed or angled, chartaceous, cordate at base, obtuse to rounded at apex, crenate-dentate, basally 7-nerved, sparsely stellate-tomentose, 3-7 cm in diam.; petiole jointed below lamina, 4-6 cm long, stellate-hairy. Stipules linear-lanceolate, 1-1.5 cm long hispid. Heads 3-7 per axil; inflorescence axis 0.5-1.5 long with 2-5 flowers. Bracts 3-4 per head, broadly ovate to orbicular, subcordate to rounded at base, acute at apex with a slightly recurved tip,

entire or crenate-serrate, stellate pubescent and also with stiff bristles on margins and veins beneath, 0.5-2 cm across. Calyx 3-3.5 mm long ; segments oblong to deltoid, acuminate, 3-nerved, stiff-hairy at tips, to 6 x 1.5 mm. Corolla bright yellow, 1.5-2.5 cm across; petals obovate, stellate-hairy outside, ciliate at base, 1.2-1.5 cm across. Staminal column shorter than petal, 0.8-1 cm long, stellate-hairy at base. Schizocarp 0.7-1 cm across; mericarps 5, 3-gonous, prominently nerved, glabrous, ca. 3 x 2 mm. Seeds smooth, ovoid-subreniform, brownish black, minutely stellate-hairy, ca. 2.5 mm long.

Fl. & Fr. : Oct.-Jan.

Ecology : Not common; in waste places, grass-fields near habitations, etc.

Distribution : Throughout the hotter parts of India ; native of Tropical America, now pantropical in distribution.

Specimens examined : Gola, 778; Ghanghree, 1052.

Uses: Bark yields a fibre which is useful for cordage, bags and coarse textiles. Roots are used in rheumatism and lumbago. Leaves are used as anthelmintic.

8. MALVASTRUM A.Gray, *nom. cons.*

Malvastrum coromandellianum (L.) Garcke in Bonplandia 5: 295. 1857. Haines, Bot. Bihar & Orissa pt. 2: 58. 1921; Borss. in Blumea 14: 152. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 180. 1988. *Malva coromandelliana* L., Sp. Pl. 687. 1753.

M. tricuspidata R. Br. in Ait. f., Hort. Kew ed. 2, 4: 210. 1812.

M. tricuspidatum (R. Br.) A. Gray, Pl. Wright 1: 16. 1852; Mast. in Hook. F., Fl. Brit. India 1: 321. 1874; Prain, Bengal Pl. 1: 256. 1903.

Erect or decumbent-ascending, annual or perennial herbs or undershrubs, to 90 cm tall, with a woody base. Branchlets appressed stellate-pubescent. Leaves chartaceous, ovate-oblong to ovate-lanceolate, cuneate or truncate-subcordate, acute to obtuse, crenate-serrate, basally

5-nerved, simple-hairy on both surfaces, stellate-hairy on nerves beneath, 2-10 x 1.5-5 cm; petiole 1-2.5 cm long, densely stellate-hairy. Stipules linear-lanceolate, entire or faintly serrate, caducous, 5-6 mm long. Flowers 1.5-1.8 cm across, axillary, solitary or 2-3 together; pedicels 4-6 mm long, accrescent to 0.8-1 cm, jointed. Epicalyx segments linear-lanceolate, shorter than calyx, 5-7 mm long. Calyx appressed stellate-hairy, 0.8-1 cm long, divided almost half-way down; segments ovate-triangular, acuminate, 4-5 mm long. Petals 5, yellow, obliquely obovate, 7-8 mm long. Staminal column 2-2.5 mm long, glabrous, antheriferous at apex. Schizocarps globular, 5-8 mm across; mericarps 10-14, strongly curved, 3-aristate, with dorsal sharp edges, 2.5-3 mm across. Seeds 1 per mericarp, reniform, compressed, glabrous, brownish black, *ca.* 1.5 mm across.

Fl. & Fr. : July-Nov.

Ecology : Common; in waste lands, fallow fields, arable lands, by waysides, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Hazaribagh, 239; Hunterganj, 2113.

Uses: Decoction of plant is used in dysentery. Flowers are used as pectoral and diaphoretic. Stems yield a fibre.

Note: It is sometimes confused with the species of *Sida* but can be easily distinguished from the latter by the presence of epicalyx segments in the flower and characteristic strigose indumentum on stems and petioles.

9. MALVAVISCUS Cav.

Malvaviscus arboreus Cav., Diss. 3: 131, t. 48. f. 1. 1787; Shery in Ann. Miss. Bot. Gard. 29: 209. 1942; Borss. in Blumea 14:132. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc 19: 179. 1988.

Shrubs, to 2 m tall. Younger parts greyish stellate-tomentose. Leaves broadly ovate to nearly orbicular-ovate in outline, subcordate at base, usually shouldered or angled above, crenate-serrate to nearly entire, stellate-tomentose and velvety-hairy on underside, 6-12 cm in across. Flowers 3-5 cm long, scarlet; Epicalyx segments narrow, almost equalling

the calyx. Corolla erect-connivent, not spreading. Staminal column usually longer than corolla, antheriferous towards apex. Carpels 5; ovule 1 in each carpel. Style-branches 10; stigmas capitate. Schizocarp smooth, berry-like, finally drying and separating into indehiscent mericarps.

Fl. & Fr. : Oct.-Jan.

Ecology : Very common; planted in gardens, parks, etc.

Distribution: Cultivated throughout India. Peru, Northern Brazil to South Tropical America and West Indies.

Specimens examined : Chatra, 820; Telaiya Dam, 1741.

Use: The species is planted as an ornamental for its flowers.

10. SIDA L.

Key to the Species

- 1a. Styles and mericarps 5; mericarps without prominent reticulate ventation, indehiscent. Leaves palminerved ... 2. *S. cordata*
- 1b. Styles and mericarps 6-14; mericarps prominently reticulately veined, dehiscent at apex. Leaves penninerved:
- 2a. Stipules of each pair different, one linear to lanceolate and larger, the other setaceous and shorter. Plants sparsely hairy, soon glabrescent ... 1. *S. acuta*
- 2b. Stipules of each pair not different. Plants densely stellate-hairy:
- 3a. Mericarps with or without awns; awns never retrorsely hairy ... 4. *S. rhombifolia*
- 3b. Mericarps with 2 retrorsely hairy awns ... 3. *S. cordifolia*

1. *Sida acuta* Burm. f., Fl. Ind. 147. 1768; *emend.* K. Schum. in C. Martius, Fl. Bras. 12: 326. 1891; Prain, Bengal Pl. 1: 259. 1903; Haines, For. Fl. Chota Nagpur 184. 1910 & Bot. Bihar & Orissa pt. 2: 61. 1921; Borss. in Blumea 14: 186. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 202. 1988.

S. lanceolata Retz., Obs. 4: 28. 1786.

S. carpinifolia L. f. var. *acuta* (Burm. f.) Kurz. in J. Asiat. Soc. Beng. 45: 119. 1876.

S. carpinifolia auct. non L. f.: Mast. in Hook. f., Fl. Brit. India 1: 323. 1875, p.p.

Local name : Bariara.

Erect or ascending, annual-perennial, suffruticose herbs, 0.5-1.5 m tall. Stems much branched, minutely stellate-pubescent at first, becoming glabrescent later. Leaves oblong-lanceolate to linear-lanceolate, chartaceous, subacute, obtuse or rounded at base, acute or subacuminate at apex, coarsely and remotely serrate, sparsely stellate-hairy, becoming glabrescent soon, basally 3-5-nerved, 2-7 x 0.5-2 cm petiole 4-7 mm long, stellate-pubescent. Stipules 2, different, one linear to lanceolate and larger, the other setaceous and shorter, 0.4-1 cm long. Flowers *ca.* 1.5 cm across, axillary, solitary or 2-3 together in a cluster; pedicels jointed above middle, accrescent to 1.5 cm, stellate-pubescent. Calyx 6-8 mm long, divided almost half-way down; tube *ca.* 4 mm long; lobes triangular, sharply acute, to 3.5 mm long. Petals yellow, obliquely obovate, truncate to emarginate at apex, ciliate at base, as long as calyx. Staminal column to 3 mm long, hispid. Ovary ovoid, 5-6 celled *ca.* 1 mm across; style *ca.* 5 cm long. Schizocarp glabrous, wrinkled, to 5 mm across. Mericarps 5-6, tetrahedral, 2-awned, reticulated, toothed on dorsal margins, to 3 mm long, awns linear, glabrous, about 1/3 the length of mericarps. Seeds 3-gonous, black, smooth, *ca.* 1.5 mm long.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; in waste places, by waysides, forest edges, along railway tracks, etc.

Distribution : Throughout India, Pantropical.

Specimens examined: Ichak, 352; Chouparan, 1382; Tandwa, 1885.

Note: Borsstun (*l.c.*) proposed two subspecies, viz. *ssp. carpinifolia* - a tropical American and African taxon and *ssp. acuta* - a pantropical plant. Our specimen relates with *ssp. acuta* which differs from subsp.

carpinifolia in having lanceolate-linear leaves with cuneate base, flowers 2-3 together in clusters and indumentum of few simple hairs. He distinguished ssp. *acuta* by ovate-oblong leaves with a rounded base, flowers in clusters of 8 and indumentum of many simple hairs.

2. *Sida cordata* (Burm. f.) Borss. in Blumea 14: 182. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19. 206. 1988. *Melochia cordata* Burm. f., Fl. Ind. 143. 1768.

S. veronicifolia Lam., Encycl. 1: 5. 1783 (*Veronicaefolia*); Prain, Bengal Pl. 1: 258. 1903; Haines, For. Fl. Chota Nagpur 182. 1910 & Bot. Bihar & Orissa pt. 2: 59. 1921.

S. humilis Cav., Diss. 5: 270, t. 134. f. 2. 1788; Mast. in Hook. f., Fl. Brit. India 1:322. 1875.

S. humilis Cav. var. *veronicifolia* (Lam.) Mast. in Hook. f., Fl. Brit. India 1: 322. 1874.

S. beddomei Jacobe in J. Bomb. Nat. Hist. Soc. 47: 50. 1950.

Local names : Bhiunli, Bananiyar.

Prostrate or ascending, slender herbs, ca. 1m long, branched especially at base. Stems, petioles and pedicels with scattered patent long simple and minute stellate hairs. Leaves ovate-orbicular, shallowly cordate, acute to acuminate, crenate to serrate, palmately 5-7-nerved at base, appressed simple and stellate hairy on both surfaces, 1-5(-8) x 0.8-4 (-6) cm; petiole 0.6-3 cm long. Stipules linear or filiform, 0.1-0.2 cm long. Flowers 1-1.2 cm across, axillary, initially solitary, afterwards in few-flowered racemes or loose panicles; pedicels 0.8-2.5 cm long, slightly accrescent, jointed somewhat above the middle. Calyx 5-6 mm across, campanulate, slightly accrescent, patent-hairy outside, glabrous inside except for the margin, 5-fid; segments triangular, acuminate, 3-4 mm long. Petals 5, yellow, obovate, ciliate at base. Staminal column 2-3 mm long, glabrous or patently hairy. Schizocarp subglobose, 3.5 -4 mm across, enclosed within the persistent calyx; mericarps 5, tetrahedral with rounded angles, glabrous or short-hairy at apex, awn-less. Seeds ovoid, brown-black, glabrous, 1.8-2 mm long.

Fl. & Fr. : Throughout the year, chiefly during June to Aug.

Ecology : Very common; in roadsides, waste places, gardens, scrub jungles and forest edges.

Distribution : Throughout India. Tropical and subtropical regions of the World.

Specimens examined : Jhumri Telaiya, 316; Ghanghree, 1058; Katkamosandi, 1713.

Uses : Stems, leaves and root-barks are used in fevers and urinary complaints. Root-bark is used in leucorrhoea, micturition and gonorrhoea. Leaves in form of poultice are applied to cuts and bruises.

3. *Sida cordifolia* L., Sp. Pl. 684. 1753; Mast. in Hook. f., Fl. Brit. India 1: 324. 1874; Prain, Bengal Pl. 1: 258. 1903; Haines, For. Fl. Chota Nagpur 182. 1910 & Bot. Bihar & Orissa pt. 2: 58. 1921; Borss. in Blumes 14:199. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 207. 1988.

Local names : Bariala, Kungyi.

Erect, much-branched undershrubs, to 1 m tall. Stems, petioles and pedicels stellate-tomentose, intermingled with patent simple hairs. Leaves ovate to ovate-oblong, rarely orbicular, shallowly cordate, rounded or truncate at base, obtuse to acute at apex, serrate to crenate, penninerved, 5-7-nerved at base, softly stellate-tomentose on both surfaces, 1-7 x 0.6-5 cm; petiole 0.3-1 cm long. Stipules filiform, 0.3-1 cm long. Flowers 1.2-1.5 cm across, axillary, mostly solitary, sometimes in clusters of 2-5 especially towards ends of stems; pedicel 1-3 mm, accrescent to 2 cm, jointed near apex. Calyx 5-9 mm across, ± accrescent, campanulate, stellate-pubescent and simple hairy outside; segments triangular, acute to acuminate, 2-4 mm long. Petals 5, yellow or nearly white, obliquely obovate, truncate at apex, ciliate at base, 7-8 mm long. Staminal column 2.5-3 mm long, with simple hairs or glabrous. Ovary conical, stellate-hairy. Schizocarp 7-8 mm across; mericarps 8-10, flattened-trigonous, 3-3.5 x 2-2.5 mm stellate-hairy dorsally and at apical part, with 2 retrorsely hispid awns of 3-3.5 mm long at apex. Seeds flattened-reniform, 2-2.5 mm across, brown or black, glabrous except hairy hilum.

Fl. : Aug.-Dec. *Fr.* : Oct.-Jan.

Ecology: Common; in the fields and way-sides.

Distribution: Throughout India. Tropics and subtropics of the World.

Specimens examined : Hazaribagh, 845; Chatra, 1668.

Uses: Stem yields a cordage fibre. Leaves are used as demulcent, febrifuge and in dysentery. Infusion of roots is given in urinary troubles. Powdered root is used with milk in leucorrhoea and frequent micturition.

4. *Sida rhombifolia* L., Sp. Pl. 684. 1753; emend. Mast. in Hook. f., Fl. Brit. India 1: 323. 1874; Prain, Bengal 1:259. 1903; Haines, For. Fl. Chota Nagpur 183. 1910 & Bot. Bihar & Orissa pt. 2: 60. 1921; Borss. in Blumea 14: 195. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 212. 1988.

Erect, much branched, woody annual or perennial herbs or undershrubs, glabrous or with scattered stellate hairs, to 75 cm tall. Leaves highly variable, obovate, rhomboid or sometimes lanceolate, cuneate, acute, subacuminate, obtuse or truncate at apex, bidentate-biserrate, glabrate or sparsely stellate hairy above, woolly beneath, 3-10 x 1-5 cm; petiole 3-6 mm long. Stipules linear-setaceous, longer than petiole, 0.5-1.2 cm long. Flowers 1.5-2 cm across, axillary, solitary or in 5-7-flowered cymose clusters on short branchlets. Pedicels jointed above middle, 5-7 mm long, accrescent to 1.5 cm. Calyx 6-7 mm long, prominently 10-nerved, 5-lobed or -fid; segments ovate to triangular, acuminate. Petals yellow to pale-orange, obliquely rhomboid, emerginate, to 1 cm long. Staminal column 4-5 mm long, hairy. Ovary conical, stellate-hairy, ca. 1.5 mm across. Style-branches 9-12. Mericarps 9-12, 2.5-3.5 x 2-2.5 mm, mucicous, with short mucro or awns. Seeds flattened-reniform, dark-brown or black, ca. 2 mm across.

Key to the Subspecies

- 1a. Erect undershrubs. Leaves ovate-oblong, rhomboid or lanceolate. Pedicels longer than petioles.
Corolla 1.2 -1.6 cm across ... 1. ssp. *rhombifolia*
- 1b. Prostrate or ascending undershrubs. Leaves obovate to orbicular. Pedicels as long as petioles.
Corolla 2-2.5 cm across ... 2. ssp. *retusa*

1. ssp. *rhombifolia* - Borss. in *Blumea* 14: 195. 1966; Paul & Nayar in Nayar *et al.* *Fl. India Fasc.* 19: 214. 1988.

Sida rhombifolia L., *Sp. Pl.* 684. 1753.

S. rhombifolia L. var. *typica* K. Sch. in *Fl. Bras.* 12, 3: 324, t. 63. 1891; Prain, *Bengal Pl.* 1: 258. 1903.

S. rhomboidea Roxb. ex Fleming in *As. Res.* 6: 178. 1810.

S. rhombifolia L. var. *rhomboidea* (DC.) Mast. in Hook. f., *Fl. Brit. India* 1: 324. 1875; Prain, *Bengal Pl.* 1: 259. 1903; Haines, *Bot. Bihar & Orissa pt.* 2: 60. 1921.

S. rhombifolia L. var. *obovata* Wall. ex Mast. in Hook. f., *Fl. Brit. India* 1: 324. 1824; Prain, *Bengal Pl.* 1: 259. 1903; Haines, *Bot. Bihar & Orissa pt.* 2: 60. 1921.

S. microphylla Cav., *Diss.* 1: 22, t. 12. f. 2. 1785.

S. rhombifolia L. var. *microphylla* (Cav.) Mast. in Hook. f., *Fl. Brit. India* 1: 324. 1874.

Local names : Lal berela, Bhiunli.

Stout, erect undershrubs, 50-150 cm tall, with many erect to erecto-patent branches. Stems and other parts usually tinged red. Leaves usually ovate to oblong, sometimes \pm rhomboid, rarely lanceolate or obovate, acute to obtuse or rounded at apex, usually subcordate at base, 0.5-10 x 0.4-5 cm. Pedicels usually much longer than petiole, to 4 cm long, jointed at 1/3-1/4 from apex. Calyx 4-5 mm long during flowering, after anthesis to 7 mm long. Corolla 1.5-1.8 cm across; petals very oblique. Mericarps mostly mucous, or with 2 short mucros, rarely with 2 awns of 1-2 mm long.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common; in waste places, roadsides, railway tracks, fallow-fields, forest edges and forest clearings.

Distribution : Throughout India. Tropical and subtropical regions of both Old and New World.

Specimens examined : National Park, 444; Hazaribagh, 846.

Uses : Plant is used in tuberculosis and rheumatism. Leaves are pounded and applied on swellings. Stem-extract is used as demulcent and emollient. Roots are used in rheumatism.

2. ssp. *retusa* (L.) Borss. in Blumea 14: 198. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fas. 19, 216. 1988.

Sida retusa L., Sp. Pl. ed. 2, 961. 1763.

S. rhombifolia var. *retusa* (L.) Mast. in Hook. f., Fl. Brit. India 1: 324. 1874.

Usually low, dense, prostrate or ascending undershrub, to 50 cm high. Branches erecto-patent. Stems and other green part not tinged-red. Leaves shortly obovate or orbicular, cuneate to attenuate at base, rounded or truncate and mostly retuse at apex, 0.5-5 × 0.5-4.5 cm. Pedicels as long as slightly longer than petiole, to 3 cm long, jointed near base. Calyx 7-8 mm long in fruit. Corolla 2-2.5 cm across; petals slightly oblique. Mericarps mostly with 2 awns of 1-2.5 mm long.

Fl. & Fr. : Aug.-Dec.

Ecology: Common; in roadsides, waste places, railway tracks, etc.

Distribution : Throughout India. Tropical and subtropical regions of Old and New World.

Specimens examined : National Park, 446; Jhumri Telaiya, 680.

Uses: Same as ssp. *rhombifolia*.

11. THESPESIA Sol. ex Corr., *nom. cons.*

Key to the Species

- | | |
|--|---------------------------|
| 1a. Leaves with a linear nectary on midrib beneath, usually 3-5-lobed. Seeds 8-14 per locule | ... 1. <i>T. lampas</i> |
| 1b. Leaves without nectary on midrib beneath, not lobed. Seeds 4 per locule | ... 2. <i>T. populnea</i> |

1. *Thespesia lampas* (Cav.) Dalz. & Gibs., Bombay Fl. 19. 1861; Mast. in Hook. f., Fl. Brit. India 1:345. 1874; Prain, Bengal Pl. 1: 270. 1903; Haines, For. Fl. Chota Nagpur 191. 1910 & Bot. Bihar & Orissa pt. 2: 70. 1921; Borss. in Blumea 14: 116. 1966; Paul & Nayar in Nayar *et al.*, Fl. Ind. Fasc. 19:222. 1988; *Hibiscus lampas* Cav., Diss. 3: 154, t. 56, f. 2. 1787.

Azanza lampas (Cav.) Alef., Bot. Zeit. 19: 298. 1861; Babu, Herb. Fl. Dehradun 84. 1977.

Thespesia macrophylla auct. non Bl. Bijdr. : Cooke, Fl. Pres. Bombay 1: 114. 1901; Duthie, Fl. Upp. Gang. Pl. 1: 93. 1903; Kanjilal *et al.*, Fl. Assam 1: 145. 1934.

Local names: Jangli-bhendi, Bankapasi.

Shrubs, 0.5-2.5 m tall. Twigs densely stellate-tomentose, glabrescent. Lower leaves large, 6-12 cm across, orbicular, cordate at base, deeply 3-5-lobed; lobes deltoid, acuminate; upper leaves smaller, 5-20 x 2-22 cm, broadly ovate to oblong, shallowly cordate to rounded at base, acute to acuminate at apex, entire, 5-7-nerved at base, stellate-hairy above, densely stellate-tomentose beneath, with a 0.3-0.7 cm long linear nectary on base of midrib beneath; petiole 0.5-1.5 cm long. Stipules linear to subulate, stellate-hairy, 0.5-1 cm long. Flowers solitary, axillary, or by reduction of upper leaves in axillary long-stalked racemes of 1-5 flowers; pedicels 4-8 mm long, slightly accrescent, jointed above middle; hypanthium obconic 2.5-6 x 5-7 mm. Epicalyx segments 4-6, free, subulate, 0.4-1 cm long, stellate-hairy. Calyx 6-8 mm long, slightly accrescent, with 5 small subulate-triangular segments, stellate-hairy outside, sericeous inside on bottom. Corolla campanulate to infundibuliform; petals obovate, rounded at apex, 6-7 cm x 5-6 cm, stellate - and glandular-hairy outside. Staminal column 1.5-2 cm long. Ovary conical, densely hairy, 5-celled. Capsule globose to ovoid, 5-angular, stellate-hairy, black, 1.8-3 x 1.8-2 cm, usually dehiscent. Seeds 8-14 per cell, obovoid, angular, densely hairy, black, 3.5-4 mm long.

Fl. & Fr. : Aug.-Dec.

Ecology : Common; in forests throughout.

Distribution : Throughout India. South to Southeast Asia and East Africa.

Specimens examined : National Park, 957; Pratappur, 1548.

Uses: Stems yield a fibre which is useful for fabrics, cordage and fishing nets. Roots and fruits are used for treating gonorrhoea and syphilis. Floral parts are beneficial against cutaneous diseases.

2. *Thespesia populnea* (L.) Sol. ex Corr. in Ann. Mus. Herb. Paris 9: 290, t. 8. f. 1. 1807; Mast. in Hook. f., Fl. Brit. India 1: 345. 1874; Prain, Bengal Pl. 1: 270. 1903; Haines, Bot. Bihar & Orissa pt. 2: 70. 1921; Borss. in Blumea 14: 106. 1966; Paul & Nayar in Nayar *et. al.*, Fl. India Fasc. 19: 225. 1988. *Hibiscus populneus* L., Sp. Pl. 694. 1753.

Local name : Paras-pipal.

Small to moderate-sized trees, to 10 m tall. Young shoots densely covered with minute scales, glabrescent. Leaves broadly ovate-orbicular, deeply cordate at base, acuminate at apex, entire, densely covered with minute scales, glabrescent, 7-nerved at base, bearing domatia beneath in between the bases of main veins, 6-12 x 4-9 cm; petiole 5-15 cm long, scaly. Stipules lanceolate to subulate, scaly, 0.4-1 cm long. Flowers 6-8 cm across, axillary, solitary or rarely 2 together; pedicels 3-5 cm long, accrescent to 6-8 cm, jointed near base. Epicalyx segments 3, linear-oblong or lanceolate, 0.5-1.5 cm long, scaly. Calyx with 5 minute teeth or entire, 0.8-1.2 cm long, densely scaly outside, sericeous inside, accrescent and flattened in fruit. Corolla broadly campanulate; petals obliquely obovate, rounded at apex, densely scaly outside, ciliate at base, 5-7 x 4-5.5 cm. Staminal column 1.5-2.5 cm long. Ovary globose to ovoid, scaly, 0.8-1 cm across, 10-celled; stigmas connate to a clavate 5-sulcate body. Capsule ± globose, obtuse at apex or slightly depressed, 2-4.5 cm across, initially scaly, indehiscent, 5-loculed, black when ripe. Seeds 4 per locule, obovoid, angular, densely hairy, 0.8-1.5 x 0.6-0.9 cm.

Fl. & Fr. : Throughout the year, but chiefly during July-Dec.

Ecology : Common; along roadsides, railway platforms, near habitations, etc., usually planted as an avenue tree.

Distribution : Throughout India. Asia, Pacific Islands and Africa.

Specimens examined : Hazaribagh, 264; Ghanghree, 1052.

Uses : Wood is used for agricultural implements, cabinets, tool-handles, furniture, etc. Bark, leaves, flowers and fruits are applied in cutaneous affections. Bark, roots and fruits are useful in dysentery and haemorrhoids. Leaves are lopped for fodder. Bark yields a strong fibre which is used for cordage, fishing lines, etc.

12. URENA L.

Urena lobata L., Sp. Pl. 692. 1753, *sens. lat.*; Borss. in Blumea 14: 138. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 228. 1988.

Erect, much-branched, stellate-tomentose and hairy, perennial, suffruticose herbs or undershrubs, to 1.5 m high. Leaves variable; upper ones ovate to oblong-lanceolate, sometimes rhomboid, rounded at base, obtuse or acute at apex, pennilobed, pennifid or penniparted, crenate-serrate, 3-9 nerved at base, stellate-hairy on both surfaces, 1-12 × 0.5-1.3 cm; middle ones orbicular in outline, cordate at base, angular, palmilobed, palmifid or palmiparted; lower ones orbicular, shallowly incised; petiole 0.6-1.2 cm long. Stipules lanceolate, 2-4 mm long. Flowers axillary, solitary or 2-3 together in a cluster; pedicel not jointed, 1-3 mm long in flower, accrescent to 4-5 mm in fruit. Epicalyx 7-8 mm long, enveloping the calyx and shortly adnate to it; segments linear-lanceolate, 3-5 mm long, minutely stellate-hairy outside. Calyx 5-6 mm long, divided half-way down; lobes ovate to 3 mm long. Petals obovate, irregularly toothed or entire, stellate-hairy without, 1.5-1.8 cm long. Staminal column usually curved; anthers purple. Stigmas dark purple. Mericarps with a short acumen, stellate-hairy and reticulately veined, 4-5 × 3-4 mm. Seeds reniform, glabrescent, brown 2.5-3.5 mm across.

Key to the Subspecies

- 1a. Leaves angular or shallowly lobed. Epicalyx capular in fruit, stiff, appressed to mericarps; segments long-triangular, 0.45-0.5 cm × 0.25-0.3 cm ... 1. ssp *lobata*
- 1b. Leaves deeply palmilobed and usually doubly incised. Epicalyx spreading or reflexed in fruit; segments linear-lanceolate, 0.3-0.4 × 0.1-0.15 cm ... 2. ssp *sinuata*

1. ssp. **lobata** - Borss. in Blumea 14: 138. 1966; Paul & Nayar in Nayar *et al.* Fl. India Fasc. 19: 228. 1988.

Urena lobata L.: Mast. in Hook. f., Fl. Brit. India 1: 329. 1874; Prain, Bengal Pl. 1: 261. 1903; Haines, For. Fl. Chota Nagpur 184. 1910 & Bot. Bihar & Orissa pt. 2: 62. 1921.

Fl. & Fr. : Oct.-Dec.

Ecology : Very common; in thickets, roadsides, waste places, along railway tracks, river-banks, etc.

Distribution : Throughout the hotter parts of India. Tropics of both hemispheres.

Specimens examined : Jhumri Telaiya, 152; National Park, 464.

Uses: Stem yields a fibre which is used for ropes, cordage, carpets, linoleum, netting and fishing-lines. Roots are used as diuretic. Decoction of stem and root is used for flatulent colic. Infusion of flowers is used in sore throat.

Note: Borssum (*l.c.*) followed by Paul & Nayar (*l.c.*) distinguished two varieties under *ssp. lobata*, viz. *var. lobata* and *var. viminea*. According to him, the former is characterised by densely tomentose green part whereas the latter by densely pubescent, usually slightly scabrous green parts. Specimens of this area are referable to *var. lobata*.

2. *ssp. sinuata* (L.) Borss. in Blumea 14: 142. 1966; Paul & Nayar in Nayar *et al.*, Fl. India Fasc. 19: 230. 1988.

U. sinuata L., Sp. Pl. 692. 1753; Mast. in Hook. f., Fl. Brit. India 1; 329. 1875; Prain, Bengal Pl. 1: 261. 1903; Haines, For. Fl. Chota Nagpur 185. 1910 & Bot. Bihar & Orissa pt. 2: 63. 1921.

Local names : Kunjuya, Lotlothi.

Fl. & Fr. : Sept.-Jan.

Ecology: Very common; in waste lands, thickets, roadsides, village surroundings, etc.

Distribution : Throughout the hotter parts of India. Tropics of both hemispheres.

Specimens examined : National Park, 453; Mandu, 1344.

Uses : Stem yields a fibre which is used in similar way to that of *ssp. lobata*. Root is externally applied to lumbago. Leaves are used in inflammation of intestines and bladder. Infusion of flowers is given in bronchitis.

Note: Borssum (*l.c.*) followed by Paul & Nayar (*l.c.*) distinguished two varieties under *ssp. sinuata*, viz. var. *sinuata* and var. *glauca*. The former is characterised by palmifid to palmiparted leaves having serrate or pennilobed to penniparted segments, whereas the latter by angular or palmilobed segments. Specimens of this area are referable to var. *sinuata*.

38. LECYTHIDACEAE

Key to the Genera

- 1a. Flowers borne in spikes. Fruits spherical, fleshy.
Seeds numerous ... 2. CAREYA
- 1b. Flowers in racemes. Fruits angular, fibrous. Seed
solitary ... 1. BARRINGTONIA

1. BARRINGTONIA J.R. & G. Forst., *nom. cons.*

Barringtonia acutangula (L.) Gaertn., *Fruct.* 2: 97, t. 101, 1791; Clarke in Hook. f., *Fl. Brit. India* 2 : 508. 1879; Prain, *Bengal Pl.* 1: 493. 1903; Haines, *For. Fl. Chota Nagpur* 353. 1910 & *Bot. Bihar & Orissa* pt. 3: 368. 1922. Payens in *Blumea* 15: 226. 1967; Macnae & Fosb. in *Dassan. & Fosb., Rev. Handb. Fl. Ceylon* 3: 199. 1981. *Eugenia acutangula* L., *Sp. Pl.* 471. 1753.

Local names: Hyal, Hyar.

Small to medium-sized trees, 8-20 m tall. Young branches densely tomentose. Leaves oblanceolate or oblong-obovate, thin-coriaceous, attenuate at base, rounded or subacute at apex, denticulate-crenulate glossy above, 7-14 x 4-8 cm; petiole to 0.6 cm long. Racemes pendulous, axillary, to 40 cm long; peduncle to 3 cm long. Flowers 2-2.5 cm across; pedicels 0.15-0.3 cm long; bracteoles acute, caducous, to 0.05 cm long. Sepals 4,

ovate-oblong, rounded, 0.4-0.5 cm long. Petals 4, scarlet, ovate-oblong, basally connate, 0.8 x 0.3 cm long. Disc annular. Stamens many, bright-red, in 3 whorls. Ovary 2-celled; ovules 6-8 per cell. Fruit ellipsoid, bluntly quadrangular, indehiscent, 1-celled, 2-5 x 1-2.2 cm. Seed 1, ovoid.

Fl.: May-June *Fr.* : Sept.-Oct.

Ecology : Common; on banks of streams, rivers and swampy regions.

Distribution : Throughout India, Himalaya, Sri Lanka, Afghanistan, Malesia and North Australia.

Specimen examined: Markachho, 1487; Ramgarh Cant., 1919.

Uses : Tender leaves are consumed as vegetable. Bark, roots and seeds are employed as fish-poison. Powdered seeds are used as emetic and expectorant. Wood is used for cabinet work.

2. CAREYA Roxb.

2. *Careya arborea* Roxb., Pl. Corom. 3: 14, t. 218. 1811; Clarke in Hook. f., Fl. Brit. India 2: 511. 1879; Prain, Bengal Pl. 1: 492. 1903; Haines, For. Fl. Chota Nagpur 353. 1910 & Bot. Bihar & Orissa pt. 3: 367. 1922.

Local name : Kambi.

Medium-sized to large trees, to 17 m tall with rounded crown; bark thick, dark brown, rough with exfoliating scales. Leaves broadly oblong-obovate, thin-coriaceous, cuneate-subacute at base, shortly acuminate at apex, slightly crenate-denticulate along margins, glossy above, old leaves often red or purple, 10-17 x 4.5-9.5 cm; petiole short, to 0.7 cm long. Flowers sessile, 6.5-8.5 cm across; bracts elliptic-lanceolate, to 1.5 x 0.8 cm; bracteoles 2, to 1.2 x 0.7 cm. Calyx 2.5-3 mm long; tube campanulate, glabrous; segments 4, ovate-oblong, persistent. Petals 4, cream or white, elliptic-oblong, concave, revolute along margins, caducous, 3-5 x 2-3.5 cm. Stamens equalling or exceeding the petals; filaments 2-6 cm long, inner and outer ones not antheriferous. Ovary inferior, 4-celled; ovules numerous, in 2 rows; style long, simple. Berry green, glabrous, somewhat an apple in appearance, 5-8 cm diam.

Fl. : Mar.-May. *Fr.*: June-July. Deciduous: Feb.-Mar.

Ecology : Common; in moist parts of the district.

Distribution : Throughout India. Sri Lanka, and east to Thailand.

Specimen examined ; National Park, 1157; Pratappur, 2096.

Uses : Timber is used for agricultural implements, cabinet, house posts and planks. Bark is used for cordage and paper-making.

39. DROSERACEAE

DROSERA L.

Drosera burmannii Vahl, *Symb. Bot.* 3: 50. 1794; Clarke in Hook. f., *Fl. Brit. India* 2: 424. 1878; Prain, *Bengal Pl.* 1: 472. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 344. 1922.

Local name : Mukha-jali.

Acaulescent herbs. Leaves rosulate, green or red, appressed to soil, spatulate or obovate, attenuate at base, with glandular, irritable, capitate tentacles, 0.7-1.5 x 0.4-0.6 cm, with flat to 6 mm long petiole. Stipules scarious, 3-partite, nearly as long as petioles. Flowers to 7 mm across, in terminal few-many (*ca.* 20) -flowered circinate scape, to 20 cm long; pedicel 2-4 mm long; erect in fruit. Calyx-lobes 5, elliptic, acute, to 0.35 cm long, minutely papillose. Corolla-lobes 5, pinkish to white, obovate, slightly longer than sepals. Stamens 5, alternating with petals; filaments *ca.* 3.5 mm long. Carpels 5; ovary 1-loculed with many ovules on parietal placentae. Style 5, shortly lobed. Capsule 1.5-2 mm long, 5-valved. Seeds numerous, minute, black, reticulate.

Fl. & Fr. : Nov.-Apr.

Ecology: Not common; in damp sandy or peaty grounds between grasses.

Distribution : Throughout the plains of India, Himalaya. Myanmar, China, Taiwan, Malesia, Australia, Western Africa.

Specimens examined : Hazaribagh, 1587; Ghanghree, 2174.

Use: Plant is used as strongly rubefacient.

40. FLACOURTIACEAE

Key to the Genera

- 1a. Unarmed. Flowers bisexual. Stamens 6-10, alternating and fused basally with staminodes to form a short tube. Ovary 1-celled with few to many ovules on parietal placentae; style solitary. Fruit a 2-3-valved capsule ... 1. CASEARIA
- 1b. Armed. Flowers unisexual. Stamens many. Ovary incompletely 2-8-celled with many ovules in each cell on axile placentae. Style as many as cells, free or slightly united at base. Fruit an indehiscent berry-like drupe ... 2. FLACOURTIA

1. CASEARIA Jacq.

Key to the Species

- 1a. Stipules 0.6-0.8 cm long, lanceolate-subulate. Leaves elliptic, glabrous ... 2. *C. graveolens*
- 1b. Stipules minute, scale-like. Leaves oblong, tomentose ... 1. *C. elliptica*

1. *Casearia elliptica* Willd., Sp. Pl. 2: 628. 1800; Raizada in Ind. For. 92: 304. 1966.

C. tomentosa Roxb., Fl. Ind. 2: 421. 1832; Hook. f. & Thomson in Hook. f., Fl. Brit. India 2 : 593. 1879; Prain, Bengal Pl. 1: 509. 1903; Haines, For. Fl. Chota Nagpur 161. 1910 & Bot. Bihar & Orissa pt. 2: 39. 1921.

Local name : Churchu.

Large shrubs or small trees, 2-10 m tall. Branchlets densely tomentose. Leaves thin-coriaceous, oblong, acute to subacuminate at apex, obliquely subcuneate to rounded at base, serrulate or often nearly entire, densely tomentose beneath, minutely tomentose and densely so on midrib

above, 7-17 x 2-5 cm; petiole to 1.5 cm long. Stipules minute; scale densely tomentose, caducous. Flowers 7-8 mm across, greenish-white, borne in axillary clusters on new shoots; pedicel jointed below, 3-4 mm long; buds tomentose. Sepals 5, green, pubescent, broadly ovate to elliptic, *ca.* 3 mm long, persistent. Petals absent. Stamens 6-10, alternating and basally connate with staminodes to form a short tube; staminodes 1.2-1.5 mm long, pubescent at apex; ovary 1-celled; ovules many, parietal; style *ca.* 1.5 mm long; stigma subglobose. Capsules broadly ellipsoid, 6-angular, green, 2-2.5 cm long, 3-angled. Seeds numerous.

Fl. : Mar.-May. *Fr.* : Apr.-May.

Ecology : Common; in scrub jungles, waste lands, along roadsides, banks of rivers, etc.

Distribution : Throughout India. Sri Lanka, Malesia, North Australia.

Specimens examined : Pratappur, 979; National Park, 2062.

Uses : Root bark is used as tonic in anaemic conditions. Decoction of root is a remedy for diabetes. Powdered bark is applied to dropsy. Fruits are used as a fish-poison.

2. *Casearia graveolens* Dalz. in Kew J. Bot. 4: 107. 1852; Hook. f. & Thomson in Hook. f., Fl. Brit. India 2: 592. 1879; Prain, Bengal Pl. 1: 509. 1903; Haines, For. Fl. Chota Nagpur 161. 1910 & Bot. Bihar & Orissa pt. 2: 39. 1921.

Local name: Chilla.

Shrubs or small trees, to 8 m tall; young branches obtusely angular, glabrous. Leaves broadly elliptic or elliptic-oblong, coriaceous and hard with age, rounded at base, obtuse or shortly acuminate at apex, entire or crenate-serrate, finely reticulately veined, 10-20 x 5-8 cm; secondary veins 8-12 pairs, prominent beneath. Petioles 0.6-1.2 cm long. Stipules lanceolate-subulate, caducous, 6-8 mm long. Flowers greenish, in dense clusters from leafless axils. Sepals 5, oblong, gland-dotted, 3-4 mm long. Petals absent. Stamen 6-8, equalling the calyx, alternating with linear-oblong villous staminodes; filaments glabrous. Ovary 1-celled; ovules few, parietal; style as long as stamens; stigma large, discoid. Fruits ellipsoid or

broadly oblong, yellow, smooth, shining, 3-valved, 1.8-2.5 cm long. Seeds about 12, ovoid, compressed.

Fl. : May-June. *Fr.* : June-Aug.

Ecology : Common; in slopes of low hills, forests, etc.

Distribution : India: Bihar, Orissa, Uttar Pradesh, Sikkim Himalaya, Western Peninsula. Myanmar.

Specimens examined : Hazaribagh, 1562; Koderma Forest, 1798.

Uses: Wood is suitable for carving. Fruits are used as a fish-poison.

2. FLACOURTIA L 'Heritier

Flacourtia indica (Burm. f.) Merrill, Interpr. Rumph. Herb. Amb. 377. 1917; Sleumer in Steenis, Fl. Males. Ser. 1, 5: 76. 1954; Santapu. in Bull. Bot. Surv. India 3: 16. 1962. *Gmelina indica* Burm. f., Fl. Ind. 132, t. 39. f. 5. 1768.

F. ramontchi L 'Herit., Strip. Nov. 3: 59. t. 30 & 30B. 1785; Hook. f., & Thomson in Hook. f., Fl. Brit. India 1: 193. 1872, (incl. vars.); Prain, Bengal Pl. 1: 231. 1903; Haines, For. Fl. Chota Nagpur 159. 1910 & Bot. Bihar & Orissa pt. 2: 36. 1921.

F. sepiaria Roxb., Pl. Corom. 1: 48, t. 68. 1796; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1: 194. 1872; Prain, Bengal Pl. 1: 231. 1903; Haines, Bot. Bihar & Orissa pt. 2: 36. 1921.

Local names : Bilangra, Kanju, Kondai.

Much-branched, deciduous, polymorphic, bushy shrubs or small trees, to 15 m high. Trunk and big branches often provided with branched thorns. Leaves obovate, elliptic-oblong to suborbicular, cuneate to rounded at base, obtuse or rounded, often subacute or retuse at apex, crenate-serrate, glabrous to softly tomentose on both sides, 2-12 x 1-5 cm; petiole slender, puberulous, 0.3-1 cm long. Racemes puberulous, few-flowered, axillary or terminating on short branchlets. Flowers unisexual; pedicels 0.3-0.5 cm long, puberulous. Tepals 4-6, ovate, nearly glabrous on back, densely hairy inside and on the margins, 0.12-0.15 cm long. Male Flowers: disk slightly

lobulate; stamens many, free; filaments 0.2-0.25 cm long, hairy at base. Female flowers: disk entire; ovary globose, somewhat attenuate at apex; styles 5-6, radiate, ca. 0.1 cm long; stigmas slightly 2-lobed. Berry globose to ellipsoid, solitary or small clusters on short lateral twigs, 0.8-1 cm across, turning dull to blackish red when ripe. Seeds 5-8, obovoid.

Fl. : Dec.-Mar. *Fr.* : Apr.-May.

Ecology: Very common; in jungles of the valleys and hills and in forests; also cultivated in villages.

Distribution : Throughout India. Tropical and subtropical countries in Africa, S.E. Asia, Polynesia and Malasia.

Specimens examined : National Park, 85; Tandwa, 1428; Pratappur, 2098.

Uses: Fruits are edible, appetising and digestive, used in jaundice and enlargement of spleen. Bark is used as astringent and diuretic. Wood is used for turnery, agricultural implements, ploughs, beams and posts. Leaves are lopped for fodder.

Note : Here, the treatments of Merrill (*l.c.*), Sleumer (*l.c.*) and Santapau (*l.c.*) are followed in keeping *F. sepiaria* and *F. ramontchi* under *F. indica*. However, Raizada (in *Ind. For.* 79: 503. 1953) treated *F. sepiaria* and *F. ramontchi* as two distinct species and Fosberg (in *Kew Bull.* 29: 254. 1974) treated *F. ramontchi* as distinct from *F. indica*.

41. BIXACEAE

COCHLOSPERMUM Kunth

***Cochlospermum religiosum* (L.) Alston** in Trimen, *Handb. Fl. Ceylon* 6: 14. 1931; Steenis in Steenis, *Fl. Males. Ser. 1*, 4: 62. 1949; Paul & Nayar in Nayar *et al.*, *Fl. India Fasc.* 19 : 16. 1988.

Bombax religiosum L., *Sp. Pl.* 552. 1753.

B. gossypium L., *Syst. Nat.* ed. 12, 457. 1767.

Cochlospermum gossypium (L.) DC., Prodr. 1: 527. 1824; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 190. 1874; Prain, Bengal Pl. 1: 229. 1903; Haines, For. Fl. Chota Nagpur 158. 1910 & Bot. Bihar & Orissa pt. 2: 34. 1921.

Local names : Kumbi, Galgal.

Medium-sized trees, to 8 m high, with crooked branches. Branchlets tomentose. Bark smooth, ash-coloured. Leaves scattered near end of branchlets, alternate, 6-15 cm in diam, palmately 3-5-lobed, cordate at base, dark green, glabrous above, tomentose beneath; lobes acute to subacuminate at apex, entire to undulate. Petiole 10-15 cm long. Stipules linear-subulate, 6-8 mm long. Inflorescence terminal, a simple raceme or loosely branched panicle. Pedicel 2-3 cm long, tomentose. Bracts deltoid-arcuate, caducous, 3 mm long. Sepals 5, unequal, deltoid-ovate, concave, silky outside, 1-2 x 0.6-1.5 cm. Petals 5, golden yellow, subequal, spreading, obovate, 3-5 x 2-3 cm. Stamens many in 8-10 clusters; filaments 1.2-2 cm long, curved; anthers orange-coloured, falcate, 4-5 mm long. Ovary 1-celled, with 3-5 parietal placentae; ovules many; style simple; stigma punctiform, papillose. Capsule obovoid, longitudinally ribbed, 8-14 cm long; valves of endocarp slightly keeled down the middle. Seeds dark brown 7-8 mm x 5-6 mm.

Fl. : Jan.-Mar. *Fr.* : Mar.-June.

Ecology : Very common; along slopes of dry hills in gravelly soil in dry deciduous forests, often planted near temples and gardens as an ornamental plant for its handsome flower, also along roads, etc.

Distribution : India: Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Orissa, Maharashtra and throughout South India. Sri Lanka, Malesia.

Specimens examined : National Park, 1151, 2017; Pratappur, 2079.

Uses : An insoluble gum, originating from stem injuries, is used in cigar paste, calico printing, leather dressing and ice-cream industry.

42. VIOLACEAE

HYBANTHUS Jacq.

Hybanthus enneaspermus (L.) F.V. Muell., *Fragm. Phyt. Austr.* 10: 81. 1876; Banerjee & Pramanik in Panigr., *Fl. India Fasc.* 12: 2. 1983. *Viola enneaspermum* L., *Sp. Pl.* 937. 1753.

Viola suffruticosa L., *Sp. Pl.* 937. 1753.

Ionidium suffruticosum (L.) Roem. & Schultz, *Syst. Veg.* 5: 394. 1819; Hook. f. & Thoms. in Hook. f., *Fl. Brit. India* 1: 185. 1872; Prain, *Bengal Pl.* 1: 228 1903; Haines, *Bot. Bihar & Orissa pt. 2* : 33. 1921.

Local name : Ratanpuras.

Annual-perennial diffuse or half-erect herbs, 15-30 cm tall, branched, woody at base. Young stems angular, more or less pubescent. Leaves linear-lanceolate, with decurrent base, acute at apex, entire to remotely serrate, glabrous 1.5-2.5 x 0.5-0.8 cm. Stipules triangular to subulate, gland-tipped, 0.1-0.2 cm long. Flowers 0.6-0.8 cm across, axillary, solitary; pedicels filiform, shorter than leaves, to 1.5 cm long. Sepals subequal, triangular to lanceolate, glabrous or ciliate, 2-4 mm long. Petals red or rose; posterior pair 2.5-3.5 mm long; middle pair 2.8-4 mm long; anterior one 5-15 mm long with a 3.5 mm long claw and ovate or orbicular limb 1.5-5 mm across. Stamens 2-3 mm long; anterior stamens with a small recurved appendage, glabrous or hairy. Ovary to 1.2 mm across. Fruit 4-5 mm across. Seeds ribbed, straw-coloured, ca. 2 mm long.

Fl. & Fr. : Sept.-Dec.

Ecology : common; along roadsides, arable pastures, grass lands, waste lands, railway embankments, sometimes on sandy soils.

Distribution : India: Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Kerala, Maharashtra, Rajasthan. Tropical Asia, Australia, Africa, America.

Specimens examined : Jhumri Telaiya, 169; Ramgarh, 544.

Uses : Plant is diuretic, demulcent and tonic. Root is used in urinary affections and bowel complaints of children.

43. TAMARICACEAE

TAMARIX L.

Tamarix ericoides Rottl., Ges. Naturf. Freunde Berlin Neue Schr. 4: 214. 1803; Dyer in Hook. f., Fl. Brit. India 1: 249. 1874; Prain, Bengal Pl. 1: 242. 1903; Haines, For. Fl. Chota Nagpur 162. 1910 & Bot. Bihar & Orissa pt. 2: 51. 1921.

Local name: Jhau.

Shrubs, 1-1.5 m tall. Branchlets fastigate. Leaves alternate, exstipulate, minute, scale-like ovate-lanceolate, sheathing at base, shortly acuminate at apex, glaucous. Flowers 5-6 mm in diam., pale rose-pink, in terminal dense, erect racemes of 10-15 cm long. Bracts ovate-acuminate. Sepals half as long as corolla, macrescent. Glands of disk separating the filaments. Stamens not exceeding the petals, alternately long and short. Ovary 1-celled, narrowed upwards; ovules many, on basal placentae; styles 2-4, dilated into stigma. Capsule pyramidal, 1-1.2 cm long, 2-3-valved. Seeds 0.1-0.15 cm long with 0.05 cm long coma.

Fl. & Fr. : Oct.-Apr.

Ecology: Common; along river-beds, on their banks, margins of streams, etc.

Distribution : India: Rajasthan, Central India, Bihar, Orissa, Western Peninsula. Sri Lanka.

Specimens examined : National Park, 77, 2031.

Uses : Leaves are cooked with rice and given to children to relieve cough. Decoction of leaves is used in enlargement of spleen.

44. TURNERACEAE

TURNERA L.

Turnera ulmifolia L., Sp. Pl. 271. 1753, s.s.; Prain, Bengal Pl. 1: 511. 1903; Haines, Bot. Bihar & Orissa pt. 3: 384. 1922.

Perennial herbs, 40-150 cm tall. Stems terete, leafy in upper part, branched above, pubescent. Leaves lanceolate or ovate-lanceolate, cuneate at base, acute at apex, coarsely dentate-serrate, densely clothed with white hairs on both surfaces, 4-12 x 1-3 cm, leaving a knob-like scar on stem; midrib strongly prominent beneath; petiole 1-2 cm long. Flowers homostylous, in higher leaf-axils on petioles; pedicel free at top for a length of 3-5 mm long; bracteoles lanceolate, broader above middle, serrate, with 2 large marginal glands, 1-3.5 x 0.25-0.6 cm. Calyx 2-2.5 cm long; segments lanceolate, acuminate. Petals uniformly yellow, obovate, with a truncate, \pm dentate top, not overlapping at base, 2-2.5 x 1-1.5 cm. Stamens inserted above base of calyx-tube; margins of filaments at their base cohering with calyx-tube. Ovary with 6 small apical tubercles and between them 3 minute style-scars, densely hairy. Capsule 0.8-1 cm long. Seeds cylindric-clavate, brown, 0.2-0.25 x 0.1-0.2 cm; aril white.

Fl. & Fr. : Nov.-Jan.

Ecology : Common; planted in gardens as an ornamental; also met with as an escape in waste places, roadsides, etc.

Distribution : India: West Bengal, Orissa, Deccan Peninsula, particularly on the coast, planted as an ornamental in other parts of the country. Native of West Indies, introduced in all the warm countries of the World.

Specimens examined : Telaiya Dam, 1740; Hazaribagh, 2256.

Uses : Plant is used in ailments of chest, indigestion, biliousness and rheumatism. Infusion of leaves is given in dysentery.

45. PASSIFLORACEAE

PASSIFLORA L.

- 1a. Bracts and bracteoles conspicuous, forming an involucre. Flowers provided with petals:
- 2a. Involucral bracts finely and deeply divided.
Petals white ... 2. *P. foetida*
- 2b. Involucral bracts not divided. Petals pale pink ... 1. *P. caerulea*

1b. Bracts and bracteoles inconspicuous, or caducous before anthesis. Involucre O. Flowers apetalous

... 3. *P. suberosa*

1. **Passiflora caerulea* L., Sp. Pl. 959. 1753; Chakrav. in Bull. Bot. Soc. Bengal 3: 63. 1949.

Stems subangular, striate, grooved. Stipules ovate, aristate or mucronate, obscurely denticulate or subentire, 1-2 x 0.5-1 cm. Leaves palmately 5-lobed, cordate at base; petiole 1.5-4 cm long, bearing 2-4 stipitate glands. Peduncles 3-7 cm long. Involucral bracts not divided, ovate to ovate-oblong, rounded at apex, 1.5-2.5 x 1-1.5 cm. Flowers 8-10 cm in diam. Calyx tube cupuliform; sepals lanceolate-oblong, keeled, 1.5-2 x 1-1.5 cm; keel terminating in a slender awn. Petals oblong, pale pink, 1.5-2.5 x 1-1.5 cm. Coronal filaments 4-seriate, 2 outer series 5-6 mm long, inner series 1-2 mm long; nectar ring fleshy. Fruit ovoid, orange or yellow, 0.5-7 cm long; nectar ring fleshy. Fruit ovoid, orange or yellow, 0.5-7 cm long. Seeds obcordate, reticulate, to 5 x 3.5 mm.

Fl. & Fr. : Apr.-Oct.

Ecology: Not common; cultivated in gardens, sometimes found as an escape in waste places.

Distribution : India: Tamilnadu, Gangetic plains, Western Himalaya. East Tropical South America, Central America, Madagascar Islands, South Africa and China.

Specimens examined : Hazaribagh, 217: Ramgarh, 1925.

Use : Cultivated as an ornamental for its handsome flowers.

2. *P. foetida* L., Sp. Pl. 959. 1753; Mast. in Hook. f., Fl. Brit. India 2: 599. 1879; Prain, Bengal Pl. 1: 512. 1903; Haines, Bot. Bihar & Orissa pt. 3: 384. 1922; Chakrav. in Bull. Bot. Soc. Bengal 3: 57. 1949.

Foetid annual herbs. Leaves broadly ovate-suborbicular in outline, 3-lobed, obliquely acute and glandular tipped at apex, cordate at base, denticulate to glandular hairy on margins, glandular-pubescent on both surfaces, basally 3-5-nerved, 5-10 x 4-9 cm.; petiole to 6 cm long, glandular-pubescent. Stipules semi-auriculate, divided into filiform segments with glandular apices, 3-5 mm across. Flowers 3-5 cm across, axillary,

solitary or sometimes 2 together. Peduncle to 5 cm long. Involucral bracts 3, bi-pinnatifid with glandular-tipped segments, to 3.5 cm long. Sepals ovate-lanceolate, acuminate, 7-9 mm long. Petals oblong, white, shorter than calyx-lobes. Corona in many series; 2 outer series filiform, \pm 1 cm long, inner series 2-3 mm long. Gynophore 5-6 mm long. Stamens to 8 mm long with flat filaments. Styles 3.5 - 4 mm long. Fruit subglobose, smooth, yellow or red, to 3.5 x 3 cm. Seeds ellipsoid, reticulate, 6-7 mm long.

Fl. & Fr. : Nov.-Jan. and June-Aug.

Ecology : Common; in hedges, waste places, roadsides, scrub jungles, etc.

Distribution : India : Throughout India. Native of Tropical and South America, naturalised in Tropical Africa through South -East Asia to Pakistan, China and Sri Lanka.

Specimens examined : Tandwa, 1426; Jhumri Telaiya, 2213.

Uses: Ripe fruits are edible. Decoction of fruit is used in asthma and biliousness. Decoction of leaves and roots is used in hysteria.

3. **Passiflora suberosa* L., Sp. Pl. 958. 1753; Mast. in Hook. f., Fl. Brit. India 2: 599. 1879; Prain, Bengal Pl. 1: 512.1903; Chakrav. in Bull. Bot. Soc. Bengal 3: 54. 1949.

Glabrous or densely pubescent perennial climbers. Leaves membranous, polymorphous, broadly ovate to ovate-suborbicular or ovate-lanceolate, entire or 2-3-lobed, rarely sub-peltate, acute-sub-acuminate and apiculate at apex, subcordate at base, glabrous or nearly so, prominently 5-nerved at base, 4-8 x 3-5 cm; petiole 1.5-2.5 cm long, with 2 stalked glands above middle. Stipules linear-subulate, 4-6 mm long. Flowers 2-2.5 cm across, axillary, solitary or 2 together, apetalous; pedicels 1.5-2 cm long, jointed about the middle; bracts and bracteoles minute, deciduous; involucre 0. Sepals oblong-lanceolate, 0.8-1 cm long. Coronal filaments in 2 series; outer series green, recurved, 4-5 mm long; inner ones much shorter, clavate. Gynophore 4-5 mm long. Fruit ellipsoid-globose, 0.8-1 cm across, black. Seeds compressed, reticulate, 3-3.5 x 2-2.5 mm.

Fl. & Fr.: Apr.-Nov.

Ecology: Very common; in waste places, roadsides, forest edges, hedges, etc.

Distribution : Major parts of India. Sri Lanka, East and West Tropical South America, Central America, South Tropical Africa, Java, Australia, Polynesia, Mascarene Islands.

Specimens examined : Barhi, 1398; Ghanghree, 2186.

46. CARICACEAE

CARICA L.

Carica papaya L., Sp. Pl. 1036. 1753; Mast. in Hook. f., Fl. Brit. India 2: 599. 1879; Prain, Bengal Pl. 1: 514. 1903; Haines, Bot. Bihar & Orissa pt. 3: 385. 1922.

Local name: Papita.

Stem 2-10 m high, not or little branched, with large leaf-scars, hollow. Leaves 25-75 cm wide, glabrous; lobes pinnatifid- pinnatifid; petiole hollow, 25-100 cm long. Male or polygamous panicles 25-110 cm long; ultimate branches pubescent. Sepals free or shortly connate, corolla fleshy, yellow-white to light yellow. Male flowers: corolla-tube 1.7-2.5 cm long, narrow, glabrous outside, pubescent inside; lobes patent recurved, contorted, 1.2-1.5 x 0.4-0.5 cm. Bisexual flowers: corolla 3-3.5 cm long; filaments 0.7-1 cm long; stigmas shortly forked apically. Female flowers: in 1-3-flowered inflorescences; calyx almost flat; petals obtuse, 4-5 x 1.4-1.7 cm, ovary 2-3 cm long, glabrous; stigmas spreading, lobed, yellow. Berry ellipsoid or pyriform, yellow-green, orange inside, 10-25 x 7-15 cm. Seeds black.

Fl. & Fr. : Almost throughout the year, but chiefly during July-February.

Ecology: Very common; widely cultivated near habitations, in gardens, etc., also met with as an escape in undisturbed waste places.

Distribution : Throughout India. Native of Tropical America, now widely cultivated in Tropics and Subtropics.

Specimens examined : Hazaribagh, 759; National Park, 2061; Pratappur: 2095.

Uses : Unripe fruits are used as vegetables; mature ones are eaten and also employed in preparation of candies, marmalades and soft drinks. Milky juice of unripe fruits is used as a cosmetic to remove freckles and other blemishes from skin. Dessicated latex is used as a digestant.

47. CUCURBITACEAE

Key to the Genera

- 1a. Anther-loculi sigmoid, flexuous or conduplicate:
- 2a. Corolla campanulate, divided not more than half-way down:
- 3a. Tendrils simple. Flowers white ... 3. COCCINIA
- 3b. Tendrils 2 to many-fid. Flowers yellow ... 5. CUCURBITA
- 2b. Corolla rotate, if campanulate then divided to the base:
- 4a. Corolla-lobes fimbriate ... 11. TRICHOSANTHES
- 4b. Corolla-lobes entire or eroded:
- 5a. Calyx-tube of male flowers elongate ... 7. LAGENARIA
- 5b. Calyx-tube of male flowers short:
- 6a. Stamens inserted at mouth of calyx-tube, anthers free:
- 7a. Fruits dry, fibrous inside, dehiscent usually by stopple ... 8. LUFFA
- 7b. Fruits soft, fleshy inside, indehiscent ... 1. BENINCASA
- 6b. Stamens inserted below mouth of calyx-tube; anthers± coherent:
- 8a. Calyx-tube with 2-3 incurved, oblong scales at bottom. Male flowers with large enveloping bract ... 9. MOMORDICA

- 8b. Calyx-tube without scales at bottom. Flowers not bracteate:
- 9a. Connective produced beyond anther-loculi.
Tendrils simple ... 4. CUCUMIS
- 9b. Connective not produced. Tendrils usually 2-3-fid, rarely simple ... 2. CITRULLUS
- 1b. Anther-loculi straight or curved:
- 10a. Pistillode in male flowers and annular stylar-disk in female flowers present. Flowers greenish-white ... 10. MUKIA
- 10b. Pistillode in male flowers and stylar-disk in female flowers absent. Flowers yellow. ... 6. DIPLOCYCLOS

1. BENINCASA Savi

Benincasa hispida (Thunb.) Cogn. in A. & C. DC., Monogr. Phan. 3: 513. 1881; Chakrav. in Rec. Bot. Surv. India 17: 84. 1959; Jeffrey in Kew Bull. 34: 790 & 801. 1980; Chakrav. in Thoth. Fl. India Fasc. 11: 9. 1982. *Cucurbita hispida* Thunb., Fl. Jap. 322. 1784.

B. cerifera Savi in Bibl. Ital. 9: 158. 1818; Clarke in Hook. f., Fl. Brit. India 2: 616. 1879; Prain, Bengal Pl. 1: 521. 1903; Haines, For. Fl. Chota Nagpur 169. 1910 & Bot. Bihar & Orissa pt. 3: 395. 1922.

Local names : Gol-kaddu, Petha.

Monoecious, annual climbers, softly hairy. Leaves broadly ovate-reniform, deeply cordate at base, sinuate, dentate, scabrous above, shortly hispid below, 10-25 cm long and broad. Tendrils 2-fid. Flowers large, yellow, axillary, solitary. Male flowers: peduncles 5-15 cm long; probracts ovate, foliaceous, 0.6-1.5 x 0.5-1 cm; calyx-tube densely villous, 1.2-1.5 cm broad; lobes lanceolate; petals spreading, 3-5 cm long; stamens 3, free, inserted at mouth of corolla tube, filaments hispid; anthers subtrilobate. Female flowers: calyx and corolla as in male; staminodes 3; ovary triplacentiferous, softly hairy; stigmas 3, undulate; ovules many, horizontal. Fruit cylindric or ellipsoid, dark-green, white-pruinose when young, covered with waxy bloom at maturity, 30-45 cm long; seeds oblong, white, marginate, 1-1.2 x 0.5-0.7 cm.

Fl. & Fr. : Sept.- Dec.

Ecology : Common; cultivated; also met with as an escape in waste places and roadsides near village surroundings.

Distribution : Throughout India, China, Japan, Malesia, Tropical Africa.

Specimens examined : Pratappur, 601; Hazaribagh, 2270.

Uses: Fruits used as vegetable; pulp is used to prepare sweetmeats by local people. Decoction of unripe fruits is given for respiratory troubles.

2. *CITRULLUS* Schrad., *nom. cons.*

Citrullus lanatus (Thunb.) Mats. & Nakai in Cat. Sem. Spor. Hort. Bot. Univ. Imp. Tokyo 1916: 30. 1916 & 1920:38.1920; Jeffrey in Kew Bull. 34: 791 & 801. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 22. 1982. *Momordica lanata* Thunb., Prodr. Fl. Cap. 13. 1794.

Cucurbita citrullus L., Sp. Pl. 1010. 1753.

Colocynthis citrullus (L.) O. Kuntze, Rev. Gen. Pl. 1: 256. 1891; Chakrav. in Rec. Bot. Surv. India 17: 114. 1959.

Citrullus vulgaris Schrad. ex Eckl. & Zeyh., Enum. Pl. Afr. -Austr. 279. 1836 & in Linnaea 12: 412. 1838; Clarke in Hook. f., Fl. Brit. India 2: 621. 1879; Prain, Bengal Pl. 1: 523. 1903; Haines, For. Fl. Chota Nagpur 171. 1910 & Bot. Bihar & Orissa pt. 3: 393. 1922.

Monoecious, prostrate and trailing annuals. Stems angular, scabrous. Leaves ovate in outline, deeply 3-5-partite, cordate at base, \pm scabrid, 8-20 x 5-15 cm; segments pinnatifid or lobed, obovate, oblong, lanceolate or sometimes linear, denticulate or nearly entire, dotted beneath; petiole 6-12 cm long. Tendrils 2-3-fid. Bracts cochleariform, 8-10 x 3-4 mm. Flowers solitary. Male flowers: peduncles elongate, 2-5 cm long; calyx-lobes lanceolate, 5-6 mm long; corolla yellow, puberulous; lobes ovate-oblong, 1-1.5 x 0.3-0.4 cm; Stamens 3; filaments free; one anther unilocular, others bilocular; loculi sigmoid-flexuose. Pistillode glanduliform. Female flowers: peduncles 2-6 cm long; calyx and corolla as in male; staminodes 3; ovary

oblong; style 4-5 mm long. Fruits large, 10-25 cm in diam., subglobose or ellipsoid, green or variegated; pulp sweet, red or yellow. Seeds black or red, 3-5 x 2.5-3.5 mm.

Fl. & Fr. : Feb.-May.

Ecology : Very common; cultivated in fields and sandy river-beds; sometimes met with as an escape in waste places, agricultural fields, railway tracks, etc.

Distribution: Almost throughout India. Indigenous in tropical and West Africa; in other warmer regions cultivated or spontaneous, now cultivated all over the Old and New World.

Specimens examined : Jhumri Telaiya, 313; Ramgarh, 1917.

Uses: Ripe fruits are widely eaten fresh; fruit-juice forms a cooling and refreshing beverage; rind is sometimes preserved in sugar.

3. COCCINIA Wight & Arn.

Coccinia grandis (L.) Voigt, Hort. Suburb. Calc. 59. 1845; Bhandari in Ann. Arid Zone 4: 229. 1965 & Fl. Ind. Des. 163. 1978; Jeffrey in Kew Bull. 34: 794 & 801. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 24. 1982. *Bryonia grandis* L., Mant. Pl. 1: 126. 1767.

C. indica Wight & Arn., Prodr. Fl. Ind. 1: 347. 1834.

Cephalandra indica (Wight & Arn.) Naud. in Ann. Sci. Nat. ser. 5, 5: 16. 1859; Clarke in Hook. f., Fl. Brit. India 2: 621. 1879, *p.p. excl. syn.*; Prain, Bengal Pl. 1: 523. 1903; Haines, For. Fl. Chota Nagpur 174. 1910 & Bot. Bihar & Orissa pt. 3: 399. 1922.

Coccinia cordifolia auct. non (L.) Cogn. : Chakrav. in Rec. Bot. Surv. India 17: 117. 1959.

Local name: Bhimba.

Stems angular, glabrous. Leaves ovate or orbicular in outline, 5-angular or lobed, deeply cordate at base, distantly denticulate, with few glistening glands on lower surface towards base, 3.5-9 cm across; main

costs ending in glandular denticulations; petiole 1-3.5 cm long. Flowers white, ebracteate. Male flowers: peduncles striate, 1.5-5 cm long; calyx-tube campanulate, 4-5 mm long; lobes spreading, subulate-oblong; corolla white, 2.5-3 cm long and 3-4 cm in diam; lobes spreading, ovate-oblong, papillose hairy within; staminal column 2-3 mm long; pistillode 0. Female flowers: peduncles 0.5-1.5 cm long; staminodes 3, subulate, to 3 mm long; stigma densely papillose. Fruit ellipsoid-oblong, rounded at both ends, green with white streaks when unripe, bright scarlet when ripe, to 5 x 2.5 cm. Seeds ovoid, yellowish, 5-6 x 2.5-3 mm.

Fl. : Aug.-Dec. *Fr.* : Dec.-Feb.

Ecology : Very common; in hedges, waste places, roadsides, etc.

Distribution : Almost throughout India except eastern and western Himalayan regions, China, Japan, Myanmar, Sri Lanka, Malesia and Africa.

Specimens examined : Keredari, 646; Barkattwa, 1701; Hunterganj: 2117.

Uses: Plant is used against skin-diseases, bronchitis and diabetes. Raw fruits are largely used as vegetable and ripen ones are eaten by poor people in villages.

Note : According to Jeffrey (*l.c.*), *C. cordifolia* (L.) Cogn. is a synonym of *Mukia maderaspatana* (L.) M.J. Roem., but widely misapplied to *C. grandis* (L.) Voigt.

4. CUCUMIS L.

- 1a. Fruit tuberculate. Leaves hispidulous, or sometimes softly hairy, but never scabrous ... 2. *C. sativus*
- 1b. Fruit not tuberculate. Leaves harshly scabrous:
- 2a. Leaves deeply palmately 3-5-lobed. Fruit usually ellipsoid. Root capable of persisting more than a season ... 3. *C. trigonus*
- 2b. Fruit faintly 5-7-lobed. Fruit usually spherical. Root annual ... 1. *C. melo*

1. *Cucumis melo* L., Sp. Pl. 1011. 1753; Clarke in Hook. f., Fl. Brit. India 2: 620. 1879; Prain, Bengal Pl. 1:522. 1903; Haines, For. Fl. Chota Nagpur 173. 1910 & Bot. Bihar & Orissa pt. 3: 392. 1922; Chakrav. in Rec. Bot. Surv. India 17: 102. 1959; Jeffrey in Kew Bull. 34: 793 & 802. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 34. 1982.

Bryonia callosa Roettl. in Neue Schrift. Ges. Nat. Freunde Berlin 4: 210. 1803 (as 'collosa').

Cucumis melo L. var. *agrestis* Naud. in Ann. Sci. Nat. IV, 11: 73. 1859; Chakrav. in Rec. Bot. Surv. India 17: 103. 1959 & in Thothathri, Fl. India Fasc. 11: 35. 1982.

C. melo L. var. *cultus* Kurz in J. Asiat. Soc. Bengal 46: 102. 1877, *nom. illegit.*; Chakrav. in Rec. Bot. Surv. India 17: 103. 1959.

C. callosus (Roettl.) Cogn. in Engl., Das. Pflanzenr. 88 (iv. 275.2): 129. 1924; Chakrav. in Rec. Bot. Surv. India 17: 100. 1959 & in Thothathri, Fl. India Fasc. 11: 31. 1982, *p.p. excl. C. trigonus* Roxb.

Local name: Kharbuja.

Root annual. Stems trailing, angular, slender, scabrous. Leaves ovate-suborbicular, cordate at base, faintly palmately 5-7-lobed, scabrous on both sides, 3.5-7 cm in diam; lobes rounded or ovate-oblong, dilated at tips or again sub-lobed; basal sinus usually very shallow; petiole 3-8 cm long. Male flowers: axillary, usually 5-6 together; peduncles 0.5-1 cm long; calyx-tube campanulate, villous, to 5-8 mm long; lobes distant, linear-subulate, 1.5-1.8 mm long; corolla 1.5-3 cm in diam; lobes ovate-oblong, obtuse; staminal filament short; appendage of connective shorter than anthers; pistillode 1.2-1.5 mm long. Female flowers: solitary; peduncles 1-2 cm long; ovary densely hairy; stigmas converging. Fruit usually spherical, sometimes ovoid or elongated, 5-15 cm in diam, striped with green and white, finally yellowish, smooth. Seeds white, oblong, 6-10 x 3-6 mm.

Fl. & Fr.: July-Oct.

Ecology: Very common; on open dry sandy places.

Distribution: Throughout India. Malesia, China, North Africa, Australia.

Specimens examined : Jhumri Telaiya, 307; Patratu, 1339.

Uses : Pulp of fruit is used as purgative. Seeds are useful in bilious disorders.

Note: Here, the treatment of Jeffrey (*l.c.*) is being followed in merging *C. callosus* and *C. melo* var. *agrestis* under *C. melo*. He regarded it as a highly variable species. However, Chakravarty (1982) treated *C. callosus* and *C. melo* as two distinct species and *C. melo* var. *agrestis* as a distinct variety.

2. *Cucumis sativus* L., Sp. Pl. 1012. 1753; Clarke in Hook. f., Fl. Brit. India 2: 620. 1879; Prain, Bengal Pl. 1: 523. 1903; Haines, For. Fl. Chota Nagpur 173. 1910 & Bot. Bihar & Orissa pt. 3: 293. 1922; Chakrav. in Rec. Bot. Surv. India 17: 105. 1959; Jeffrey in Kew Bull. 34: 794 & 802. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 36. 1982.

C. sativus L. var. *sikkimensis* Hook. f. in Bot. Mag. 102, t. 6206. 1871; Clarke in Hook. f., Fl. Brit. India 2: 620. 1879; Chakrav. in Rec. Bot. Surv. India 17: 106. 1959 & in Thothathri, Fl. India Fasc. 11: 37. 1982.

Local name: Khira.

Monoecious annual. Leaves broadly ovate-cordate, palmately 3-5-lobed, hispidulous or softly hairy, 12-20 cm long and broad, basally 5-7-veined; lobes triangular, acute, dentate; petioles 8-20 cm long, hispid. Male flowers clustered; peduncles slender, 0.6-2 cm long; calyx-tube narrowly campanulate, villose-hirsute, 0.8-1 cm long; lobes subulate, spreading; corolla 2-3 cm long, with acute lobes; staminal filaments very short; anthers 3-4 mm long; appendix of connective *ca.* 1 mm long. Female flowers solitary or fasciculate; peduncle robust, 1-2 cm long; ovary \pm fusiform, muricate, aculeate, tumid, covered with pungent hairs. Fruits oblong, yellowish-green, sparsely tuberculate, glabrous, to 30 cm long. Seeds oblong-elliptic, whitish, 8-10 x 3-5 mm.

Fl. & Fr.: June-Oct.

Ecology: Very common; cultivated in gardens, fields, etc., also met with as an escape in waste places, near cultivated lands, roadsides, jungles, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Ichak, 1323; Gola, 1535; Hunterganj, 2147.

Uses: Fruits are much used in salads; also eaten raw or in cooking condition. Seeds are used as diuretic, tonic and refrigerant.

Note: Chakravarty (*l.c.*) treated *C. sativus* L. var. *sikkimensis* Hook. f. as a distinct variety, although Jeffrey (*l.c.*) merged it under *C. sativus* L. and commented that it is the synonym of *C. sativus* L. and best considered as a group of local cultivar or land-races thereof.

3. ***Cucumis trigonus*** Roxb., Fl. Ind. 3: 722. 1832; Clarke in Hook. f., Fl. Brit. India 2: 619. 1879; Prain, Bengal Pl. 1: 552. 1903; Haines, For. Fl. Chota Nagpur 172. 1910 & Bot. Bihar & Orissa pt. 3: 392. 1922; Jeffrey in Kew Bull. 34. 48. 1980.

C. callosus sensu Chakrav. in Rec. Bot. Surv. India 17: 100. 1959 & in Thothathri, Fl. India Fasc. 11: 31. 1982, *p.p. quoad syn. cit.*, non (Roettl.) Cogn.

Local names: Bhakura, Bislanabhi.

Trailing plant, with root being capable of persisting for more than a season. Stems slender, angled, scabrous. Leaves suborbicular in outline, deeply palmately 3-5-lobed, cordate at base, scabrous on both surfaces, 2.5-5 cm in diam.; lobes dilated at tip or again sublobed; petioles slender, striate, scabrous, 1.5-4 cm long. Male flowers: usually in fascicles of 2-5, sometimes solitary; peduncles slender, 0.5-1 cm long; calyx narrowly campanulate, densely hairy; tube 5-7 mm long; lobes very small, subulate; corolla 1-1.3 cm in diam., yellow, pubescent; lobes elliptic, acute, 0.9-1.2 cm long; appendage of connective of anthers a little shorter than antherlobes. Female flowers: solitary; peduncles slender, 1-2.5 cm long in fruit; calyx and corolla same as in male flowers; ovary densely hairy. Fruit usually ellipsoid, rarely ovoid-globose, 2-3.5 in diam., stripped green and white or green and paler green, finally yellowish, quite smooth. Seeds white, ellipsoid, 5 x 2 mm.

Fl. & Fr. : Aug.-Oct.

Ecology: Very common; in roadsides, waste places, open grounds, forest glades, railway tracks, etc.

Distribution : Throughout India. Bangladesh, Sri Lanka, Malesia, Australia, Afghanistan, Persia.

Specimens examined: Jhumri Telaiya, 625; Ramgarh, 1915; Pratappur, 2089.

Uses: Fruit-pulp is used as purgative. Seeds are used in bilious disorders.

Note: Chakrabarty (*l.c.*) merged this taxon under *C. callosus* (Roettl.) Cogn. which is also distinct from *C. melo* L. According to Jeffrey (*l.c.*), the species may be no more than perennating variants of wild tropical *C. melo*.

5. CUCURBITA L.

Key to the Species

- 1a. Leaves soft. Calyx-lobes usually foliaceous, fruiting peduncles 5-gonal. Corolla lobes reflexed ... 2. *C. moschata*
- 1b. Leaves hard and rigid. Calyx -lobes not foliaceous:
- 2a. Leaves with acute lobes. Fruiting peduncles sulcate. Corolla lobes erect ... 3. *C. pepo*
- 2b. Leaves with rounded lobes. Fruiting peduncles not sulcate, corolla lobes reflexed upwards ... 1. *C. maxima*

1. ***Cucurbita maxima*** Duch. ex Lam., *Encycl.* 2: 151, 1786; Clarke in Hook. f., *Fl. Brit. India* 2: 622, 1879; Prain, *Bengal Pl.* 1: 524, 1903; Haines, *For. Fl. Chota Nagpur* 173, 1910 & *Bot. Bihar & Orissa* pt. 3: 379, 1922; Chakrav. in *Rec. Bot. Surv. India* 17: 120, 1959; Jeffrey in *Kew Bull.* 799 & 802, 1980; Chakrav. in Thothathri, *Fl. India Fasc.* 11: 40, 1982.

Local name : Lal Kumra.

Hispid annual. Stems grooved. Leaves reniform-suborbicular, shallowly 5-lobed, coarsely hispid, denticulate on margins, 6-20 x 7-30 cm; lobes rounded. Petioles nearly as long as blade, hairy. Tendrils 2-6-fid. Corolla-lobes reflexed upwards. Fruits usually large, of various shapes; pulp usually reddish; fruiting peduncles striated, not sulcate. Seeds obscurely marginate.

Fl. : Mar.-June. *Fr.* : May.-Aug.

Ecology: Very common; cultivated; also found to escape in waste places near habitations.

Distribution : Cultivated throughout India and all other tropical and temperate regions of the World.

Specimens examined : Hunterganj, 609; Barkagawan, 891.

Uses: Tender shoots, leaves, flowers and mature fruits are cooked as vegetable. Fruit pulp in poultice is used on boils, burns and inflammations.

2. **Cucurbita moschata** (Duch. ex Lam.) Duch. ex Poir., Dict. Sci. Nat. 11: 234. 1818; Clarke in Hook. f., Fl. Brit. India 2: 622. 1879; Prain, Bengal Pl. 1: 524. 1903; Haines, For. Fl. Chota Nagpur 173. 1910 & Bot. Bihar & Orissa pt. 3: 399. 1922; Chakrav. in Rec. Bot. Surv. India 17: 123. 1959; Jeffrey in Kew Bull. 34: 799 & 802 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 41. 1982.

Local names : Mitha-Kadu, Kadu.

Hispid annual. Leaves reniform-orbicular, 5-6-lobed, soft, denticulate, to 16 x 24 cm; lobes acute or obtuse at apex, with whitish blotches on upper surface. Petioles 8-20 cm long, with pungent hairs. Tendrils many-fid. Calyx-lobes usually foliaceous. Corolla lobes reflexed. Fruits various, usually oblong; pulp yellowish; fruiting peduncle 5-gonal, enlarged beneath fruit. Seeds distinctly marginate.

Fl. : Mar.-June. *Fr.* : Oct.-Dec.

Ecology : Common, cultivated in fields, sometimes met with as escape in roadsides, waste places, grassy vacant plots, etc.

Distribution : Throughout India and all Tropical and Subtropical Countries.

Specimens examined : Katkamosandi, 1408; Satgawan, 1974.

Use : Fruits are cooked and eaten as vegetable.

3. **Cucurbita pepo** L., Sp. Pl. 1010. 1753; Roxb., Fl. Ind. 3: 718. 1832; Clarke in Hook. f., Fl. Brit. India 2: 622. 1879; Prain, Bengal Pl. 1: 524. 1903; Haines, For. Fl. Chota Nagpur 173. 1910 & Bot. Bihar & Orissa pt. 3: 398. 1922; Chakrav. in Rec. Bot. Surv. India 17: 120. 1959; Jeffrey in Kew Bull. 798 & 802, 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 43. 1982.

Local names: Safed-Kadu, Kumra.

Hispid annual. Stems angular, sulcate. Leaves suborbicular, 5-lobed, dentate, scabridly hairy above, glandular hairy below, 10-20 cm in diam; lobes acute. Petiole 10-20 cm long, rigidly prickly hairy. Tendrils branched. Corolla lobes erect. Fruits variable, small or large; pulp usually pale; fruiting peduncles sulcate. Seeds marginate.

Fl. : May-Aug. *Fr.*: July-Oct.

Ecology: Very common; cultivated; sometimes found to grow wildly in agricultural fields, village roadsides, waste places, etc.

Distribution : Throughout India. Tropical and temperate parts of the world.

Specimens examined : Ichak, 1320; Gola, 1531.

Uses : Fruits are cooked as vegetable before they are fully ripen.

6. **DIPLOCYCLOS** (Endl.) von Post & Kuntze

Diplocyclos palmatus (L.) Jeffrey in Kew Bull. 15: 352. 1962 & 34: 800 & 801. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 48. 1982. *Bryonia palmata* L., Sp. Pl. 1012, 1753, *p.p.*, *excl. syn.*

Bryonia laciniosa auct. non L.: Clarke in Hook. f., Fl. Brit. India 2: 622. 1879. p.p.; Prain, Bengal Pl. 1: 526. 1903; Haines, For. Fl. Chota Nagpur 171. 1910.

Bryonopsis laciniosa auct. non (L.) Naud.: Haines, Bot. Bihar & Orissa pt. 3: 391. 1922; Chakrav. in Rec. Bot. Surv. India 17: 135. 1959 & in Thothathri, Fl. India Fasc. 11: 16. 1982.

B. laciniosa (L.) Naud. var. *walkerii* Chakrav in Rec. Bot. Surv. India 17: 138. 1959.

Diplocyclos palmatus (L.) Jeffrey var. *walkerii* (Chakrav.) Bhandari & Singh in Bull. Bot. Surv. India 6 : 327. 1965.

Local name: Bon-Kakra.

Tuberous, slender, annuals. Stems much branched, glabrous. Leaves broadly ovate-suborbicular in outline, 5-7 palmatipartite, cordate at base, membranous, 8-15 cm in diam.; lobes elliptic-lanceolate, acuminate, denticulate-subcrenulate, scabrid above, glabrous and smooth beneath; petiole 2.5-7 cm long, striate, slender. Male flowers: 3-6 in the fascicle. Peduncles 0.5-2 cm long, slender, glabrous. Calyx glabrous, 2.5-3 mm long; lobes subulate. Corolla greenish-yellow, 4-5 mm long, hairy within; lobes ovate-oblong, acute. Staminal filaments 1-1.5 mm long, anthers 2 mm long. Female flowers: solitary or few; peduncles 0.5-2 cm long, ovary globose. Fruit globose, yellowish-green with white stripes, 1.2-1.5 cm across. Seeds yellowish brown, ovate, 5-6 × 2.5-3 mm.

Fl. & Fr. : Apr.-Dec.

Ecology: Very common; on hedges and bushes in low jungles.

Distribution : Almost throughout India, China, Myanmar, Sri Lanka, Malesia, Australia and Africa.

Specimens examined : Pratappur, 910; Barhi, 1393; Keredari, 1702.

Uses: Paste of leaves is used in boils. Plant is used as tonic and febrifuge.

Note: According to Jeffrey (*l.c.*), *Bryonopsis laciniosa* (L.) Naud. is a synonym of *Cayaponia laciniosa* (L.) Jeffrey, endemic to Jamaica, but widely misapplied to *Diplocyclos palmatus* (L.) Jeffrey. However, Chakravarty (*l.c.*) did not agree with the above idea. He viewed that the plant identified in Indian literature is not a misidentification but a separate species which is distributed throughout India, Burma, Sri Lanka, Malasia, China, Africa and Australia. *Diplocyclos palmatus* (L.) Jeffrey is another distinct species distributed in India and Sri Lanka only.

7. LAGENARIA Ser.

Lagenaria siceraria (Molina) Standl. in Publ. Field Mus. Nat. Hist. Chicago Bot. Ser. 3: 435. 1930; Jeffrey in Kew Bull. 34: 801. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 65. 1982. *Cucurbita siceraria* Molina, Sagg. Storia Nat. Chile 133. 1782.

L. vulgaris Seringe in Mem. Soc. Phys. Hist. Nat. Geneve 3: 25, t. 2. 1825; Clarke in Hook. f., Fl. Brit. India 2: 613. 1879; Prain, Bengal Pl. 1: 519. 1903; Haines, For. Fl. Chota Nagpur 167. 1910 & Bot. Bihar & Orissa pt. 3: 387. 1922.

L. leucantha (Duchesne) Rusby in Mem. Torrey Bot. Club. 6: 43. 1896; Chakrav. in Rec. Bot. Surv. India 17: 66. 1959.

Local name: Kadu.

Stems thick, angular or grooved. Leaves soft, angular or shortly 3-lobed, acute or shortly acuminate at apex, denticulate, 12-35 cm long and broad, 5-7-nerved; basal sinus broad and deep; petioles 6-20 cm long, subcylindrical, hollow. Male flowers: peduncles almost as long as petiole; calyx-tube 2-3 cm long; sepals narrow; petals obovate-oblong, emarginate, tomentose, 5-nerved, 3-5 x 2-3 cm; staminal filaments 3-4 mm long; anthers 0.7-1 cm long. Female flowers: peduncles shorter than male, 2-5 cm long; calyx tube as long as in male; ovary ovoid-cylindric, villose. Fruits variously shaped, usually bottle -or dumbbell-shaped, 40-70 cm long. Seeds obovate-oblong, truncate or bidentate at apex, white, 0.7-1.5 x 0.5-1 cm.

Fl. & Fr. : Aug.-Dec.

Ecology : Very common; cultivated in gardens, fields, etc., also met with as an escape near habitations.

Distribution : Throughout India. Tropical and Warm Temperate Zones of whole world.

Specimens examined : Keredari, 652; Barkagaon, 1275.

Uses: Young and tender fruits are eaten after cooking. Hard ripen fruit-shells are used as bowels, ladles, snuff-boxes, etc.; also used for musical instruments like 'Sitar' and 'Bina'. Fruit Juice is used in indigenous medicine against pimples, rheumatism, etc.

8. LUFFA Mill.

Key to the Species

- 1a. Fruit acutely 10-angular, clavate-oblong.
Ovary glabrous. Stamens 3 ... 1. *L. acutangula*
- 1b. Fruits not angular, cylindrical. Ovary softly
hairy. Stamens usually 3, sometimes 5 ... 2. *L. cylindrica*

1. *Luffa acutangula* (L.) Roxb., Hort. Beng. 70. 1814, *nom. valid.* & Fl. Ind. 3: 713. 1832; Clarke in Hook. f., Fl. Brit. India 2: 615. 1879; Prain, Bengal Pl. 1: 520. 1903; Haines, For. Fl. Chota Nagpur 169. 1910 & Bot. Bihar & Orissa pt. 3: 396. 1922; Chakrav. in Rec. Bot. Surv. India 17: 79. 1959; Jeffrey in Kew Bull. 34: 792 & 801. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 67. 1982. *Cucumis acutangula* L., Sp. Pl. 1011. 1753.

L. umbellata (Klein ex Willd.) M.J. Roem., Syn. Monogr. 2: 63. 1846; Chakrav. in Rec. Bot. Surv. India 17: 79. 1959 & in Thothathri, Fl. India Fasc. 11: 75. 1982.

L. acutangula (L.) Roxb. var. *amara* (Roxb.) Clarke in Hook. f., Fl. Brit. India 2: 615. 1879; Chakrav. in Rec. Bot. Surv. India 17: 81. 1959 & in Thothathri, Fl. India Fasc. 11: 70. 1982.

Local names : Kali tori, Jhinga tori.

Stems glabrous, angular. Leaves reniform-suborbicular, 5-7-angled or slightly lobed, deeply cordate at base, dentate, scabrous above, softly so beneath, 8-20 cm long and broad; petiole 8-12 cm long, scabrous. Tendrils

usually 3-fid. Male racemes 25-45 cm long, 17-20-flowered. Male flowers: pedicels 1-4 cm; probract ovate, fleshy, 3-7 × 2-4 mm, with 3-10 glands on upper surface; calyx-tube pentagonous; lobes lanceolate, carinate, 6-8 mm long; petals pale yellow, obcordate, 2-2.5 × 1.8-2 cm; stamens 3, one unilocular, two bilocular; filaments bearded at base. Female flowers : peduncles 5-10 cm long; ovary 10-angular, glabrous. Fruits acutely 10-angular, clavate-oblong, not warty, obtuse or slightly acute, 15-30 × 6-10 cm. Seeds black, elliptic, 1-1.2 × 0.6-0.7 cm.

Fl. : July-Sept. *Fr.*: Aug.-Nov.

Ecology : Very common; cultivated in fields, gardens, etc.; also established in waste places, roadsides, open grassy localities, etc.

Distribution: Almost throughout India, Myanmar, Sri Lanka, Malesia, Indonesia, China, South Africa.

Specimens examined : Jhumri Telaiya, 304; Churchu, 695.

Uses: Tender fruits are used as vegetable. Leaves are used as poultice in leprosy, hemorrhoids and splenitis. Leaf-juice is used by local poor people in granular conjunctivities. Ripe seeds are used as emetic and purgative.

Note: Here, the treatment of Jeffrey (*l.c.*) is being followed in merging *L. acutangula* (L.) Roxb. var. *amara* (Roxb.) Clarke and *L. umbellata* (Klein ex Willd.) M.J. Roem. under *L. acutangula* (L.) Roxb. However, Chakravarty (*l.c.*) regarded *L. acutangula* (L.) Roxb. var. *amara* (Roxb.) Clarke as a distinct variety and *L. umbellata* (Klein ex Willd.) M.J. Roem. as a distinct species.

2. *Luffa cylindrica* (L.) M.J. Roem., Syn. Monogr. 2: 63. 1846; Chakrav. in Rec. Bot. Surv. India 17: 75. 1959; Jeffrey in Kew Bull. 15: 355. 1962 & 34: 791 & 801. 1980; Chakrav. in Thothathri, Fl. India Fasc. 11: 70. 1982. *Momordica cylindrica* L. Sp. Pl. 1009. 1753.

L. aegyptiaca Mill., Dict. ed. 4, 500. 1785; Clarke in Hook. f., Fl. Brit. India 2: 614. 1879; Prain, Bengal Pl. 1: 520. 1903; Haines, For. Fl. Chota Nagpur 168. 1910 & Bot. Bihar & Orissa pt. 3: 396. 1922.

Local name : Ghiya tori.

Stem glabrous, angular. Leaves reniform-suborbicular, 5-angled or palmately 5-lobed, with very deep basal sinus, denticulate, scabrous, punctate on both surfaces, 15-25 cm long and broad; lobes acuminate; petioles 7-13 cm long. Tendrils bifid. Probracts ovate, fleshy, with 3-7 glands on upper surface, 3-7 x 2-4 mm. Male racemes 30-45 cm long; 15-20-flowered. Male flowers: pedicels 1-2 cm long; calyx-tube short; lobes oblong-cuneiform, rounded at apex, 1-2 x 0.7-1.2 cm; petals bright yellow, 2-2.5 cm long, usually with elevated hairy green veins; stamens 3, one unilocular, two bilocular or 5, all unilocular; filaments shortly villose at base. Female flowers: peduncles 2-8 cm long; staminodes usually 5; ovary softly hairy. Fruit cylindrical, not angular, with 10 dark-coloured stripes, 15-20 x 6-10 cm. Seeds usually black, narrowly winged on margin, smooth or sparingly tubercled, ca. 1.2 x 0.7 cm.

Fl. : July-Sept. *Fr.*: Aug.-Nov.

Ecology : common; cultivated in fields, gardens, etc.; sometimes grows wildy in hedges, roadsides, waste places, etc.

Distribution : Tropical parts of India. Tropical countries of the World.

Specimens examined : Jhumri Telaiya, 303; Joyanagar, 1495.

Uses: Tender fruits are used as vegetable. Ripe fruits are used as carminative and anthelmintic. Fibrovascular bundles of ripe fruits produce the best kind of bath-sponge which is used for scrubbing and cleaning purposes.

Note: Here the treatments of Jeffrey (*l.c.*) and Chakravarty (*l.c.*) are being followed in adopting *L. cylindrica* (L.) M.J. Roem. as the correct name and *L. aegyptica* Mill. as its synonym. However, several workers (e.g., Exell in *J. Bot.* 15:355. 1962; Babu, *Herb. Fl. Dehra Dun* 200. 1977; Bennet, *Fl. Howra* 358. 1979, and others) accepted *L. aegyptica* Mill. as the correct name and *L. cylindrica* L. as a misidentification. Babu commented, "since specimens of *Momordica cylindrica* L. - the basionym of the controversial binomial *Luffa cylindrica* - in Linnaean Herbarium belong to *Cucumis melo*, the correct name for this taxon should be *L. aegyptiaca* Mill." But, according to Jeffrey, "the no. Linn. 1150/9, although annotated '*M. cylindrica*' by Linnaeus, is a specimen of *Cucumis melo* L., and there is no evidence that this specimen was the basis of the

Linnaean description." On this ground Jeffrey suggested that the correct name for this taxon will be *L. cylindrica* (L.) M.J. Roem. after exclusion of the type.

9. MOMORDICA L.

Key to the Species

- 1a. Plants monoecious. Bracts of male flowers inserted near middle of peduncle ... 1. *M. charantia*
- 1b. Plants dioecious. Bracts of male flowers inserted at top of peduncle and embracing the flower:
- 2a. Petioles eglandular. Flowers yellow. Fruit muricate ... 3. *M. dioica*
- 2b. Petioles with 2-5 glands. Flowers white. Fruit densely aculeate ... 2. *M. cochinchinensis*

1. **Momordica charantia** L., Sp. Pl. 1009. 1753; Clarke in Hook. f. Fl. Brit. India 2: 616. 1879; Prain, Bengal Pl. 1: 521. 1903; Haines, For. Fl. Chota Nagpur 170. 1910 & Bot. Bihar & Orissa pt. 3: 394. 1922; Chakrav. in Rec. Bot. Surv. India 17: 88. 1959; Jeffrey in Kew Bull. 34: 789 & 801. 1980; Chakrav. in Fl. India Fasc. 11. 89. 1982.

Local name : Karela.

Monoecious, annual. Stems slender, thinly hairy, much branched, angled and grooved. Leaves orbicular, cordate at base, sparsely villous above, densely so beneath, dentate-lobulate along margins, deeply 5-7-lobed, 4-8.5 x 3.5-8.5 cm, acuminate and mucronate at apex; petiole 2.5-5 cm long, channelled, pubescent. Tendrils simple, slender, pubescent. Male flowers solitary; peduncles slender, glabrous or slightly villous, foliaceous bracteate near middle, 5-15 cm long; bracts reniform or orbicular-cordate, mucronate, entire, shortly pubescent, 0.5-1.5 cm; calyx-tube pubescent., 0.8-2 cm long; lobes elliptic, subacute, 5-6 mm long; corolla slightly-irregular, lemon-yellow, 2.5-3 cm across; lobes obovate, pubescent; pistillodes 3, lobed. Female flowers: peduncles 4-8 cm long; bracts as in male; staminodes 3; ovary fusiform, muricate; stigmas bifid. Fruits ovoid or oblong-fusiform to cylindric.

Key to the Varieties

- 1a. Leaves prominently veined. Fruits large, oblong-fusiform to cylindrical, not tapering at both ends ... 1 var. *charantia*
- 1b. Leaves faintly veined. Fruits small, ovoid, tapering at both ends ... 2. var. *muricata*

1. var. **charantia** - Chakrav. in Fl. India Fasc. 11: 91. 1982.

Local name : Karela.

Fl.: July-Sept. *Fr.*: Aug.-Nov.

Ecology: Common; cultivated in fields, sometimes runs wild in waste places, hedges, roadsides, etc.

Distribution : Throughout India. All over the World but dominates in Indo-Malayan regions.

Specimens examined : Simaria, 794; Pratappur, 2085.

Uses : Fruits are used as vegetable; also used against rheumatism, gout and diseases of liver and spleen. Tender shoots, leaves are eaten as vegetable. Juice of leaves are given in bilious affections.

2. var. **muricata** (Willd.) Chakrav. in Fl. India Fasc. 11: 92. 1982.
M. muricata Willd., Sp. Pl. 4: 602. 1805.

M. charantia L. var. β . L. Sp. Pl 1: 1009. 1753.

Local name : Uchchhe.

Fl. : Aug.-Oct. *Fr.* : Sept.-Dec.

Ecology : Very common; widely cultivated in the fields, also runs wild in waste places, fields, roadsides, hedges, etc.

Distribution : Same as of typical variety but it has widespread occurrence.

Specimens examined : Hunterganj, 942; Pratappur, 2086.

Use: Fruits are used as vegetable.

2. ***Momordica cochinchinensis** (Lour.) Spreng., Syst. Veg. 3: 14. 1826; Clarke in Hook. f., Fl. Brit. India 2: 618. 1879; Prain, Bengal Pl. 1: 522. 1903; Chakrav. in Rec. Bot. Surv. India 17: 95. 1959; Jeffrey in Kew Bull. 34: 790 & 801. 1980; Chakrav. in Fl. India Fasc. 11: 92. 1982. *Muricia cochinchinensis* Lour., Fl. Cochinch. 596. 1790.

Local names : Golkakra, Gangema.

Dioecious. Roots perennial, tuberous. Stems robust, angular. Leaves suborbicular in outline, cordate at base, divided to middle or almost to base into 3(-5) lobes, glabrous, with 2-5 glands on margins near base, 10-18 cm in diam.; lobes ovate or oblong-lanceolate; petioles 5-7 cm long, glandular at middle and apex. Tendrils simple. Male flowers solitary; peduncles 6-15 cm long, robust; bracts at top of peduncle, pubescent, embracing the flower, 3-3.5 x 4-5 cm; calyx-lobes narrow, 1.5-1.6 cm long; corolla white, tinged with yellow, pubescent; segments obovate-oblong, 5-6 cm long; filament with black and white marks. Female flowers: peduncles 2.5-5 cm long, bracteate at middle. Fruits ovoid, bright red, fleshy, densely aculeate, 10-15 cm long. Seeds ovoid, compressed, black, sculptured.

Fl. : Aug.-Oct. *Fr.*: Sept.-Nov.

Ecology : Common; cultivated in fields, gardens, etc.; sometimes met with as an escape in roadsides, near habitations, waste places, etc.

Distribution : Almost throughout India, Myanmar, Malesia, China, Formosa and Philippines.

Specimens examined : Chatra, 833; Bishnugarh, 1942.

Uses : Plant is used as stomachic and stimulant. Tender fruit is cooked and eaten as vegetable. Seeds are used in treatment of ulcers. Fruits and leaves are used externally for lumbago, fractures and ulceration.

3. **Momordica dioica** Roxb. ex Willd., Sp. Pl. 4: 605. 1805; Clarke in Hook. f., Fl. Brit. India 2: 617. 1879; Prain Bengal Pl. 1: 521. 1903; Haines, For. Fl. Chota Nagpur 170. 1910 & Bot. Bihar & Orissa pt. 3:

394. 1922; Chakrav. in Rec. Bot. Surv. India 17. 91. 1959; Jeffrey in Kew Bull. 34: 790 & 801. 1980; Chakrav. in Fl. India Fasc. 11: 94. 1982.

Local name : Kaksa.

Dioecious, perennial, with a tuberous rootstock. Stems slender, glabrescent. Leaves broadly ovate-triangular in outline, cordate at base, glabrous, entire to 3-5-angular or lobed, 5-10 cm across; lobes triangular, ovate or oblong, distantly denticulate, obtuse or acute at apex; petioles 1.5-3.5 cm long, channelled above, pubescent, eglandular. Tendrils filiform, glabrous, simple. Male flowers solitary; peduncle 6-10 cm long; bract orbicular-reniform, cucullate, inserted at top of peduncle and enclosing the flowers, 1.5-2 x 2-2.5 cm; calyx-lobes 3-4 mm long, lanceolate, acute; corolla yellow, 2.5-3 cm long; lobes oblong-lanceolate, acuminate. Female flowers: peduncle somewhat shorter or as long as male, ebracteate or minutely bracteate at base; ovary ovoid-oblong, densely long-papillose. Fruits ovoid, narrowed towards both ends, muricate, 2.5-5 x 2-3.5 cm. Seeds pale yellow, broadly ovate, corrugate, 6-7 x 5-6 mm.

Fl. & Fr.: Sept.-Nov.

Ecology: Common; in hedges, waste places, roadsides, open jungles, river banks, etc.; also cultivated in fields.

Distribution : Throughout India, Myanmar, Sri Lanka, China.

Specimens examined : Barkagawan, 885; Markachho, 1959; Ghanghree, 2179.

Uses: Young fruits are used as vegetable. Root is used in bleeding piles, bowel affections and urinary complaints. Powder of infusion of dry fruits, if introduced into nostrils, produces copious discharge from Schneiderian mucous membrane.

10. MUKIA Arn.

Mukia maderaspatana (L.) M.J. Roem., Syn. Monogr. 2: 47. 1846; Haines, Bot. Bihar & Orissa pt. 3: 391. 1922; Jeffrey in Kew Bull. 34: 795 & 802. 1980. *Cucumis maderaspatanus* L., Sp. Pl. 1012. 1753.

Bryonia scabrella L. f., Suppl. Pl. 424. 1781.

Mukia scabrella (L. f.) Arn. in Hook., J. Bot. 3: 276. 1841; Clarke in Hook. f., Fl. Brit. India 2: 623. 1879, *p.p. excl. syn.*; Prain, Bengal Pl. 1: 525. 1903; Haines, For. Fl. Chota Nagpur 171. 1910.

Melothria maderaspatana (L.) Cogn. in A. & C. DC., Monogr. Phan. 3: 623. 1881; Chakrav. in Rec. Bot. Surv. India 17: 141. 1959 & in Fl. India Fasc. 11 : 83. 1982.

Local names : Bilari, Agumaki.

Annual. Stems sulcate. Leaves broadly ovate-subreniform, 3-5 (-7)-angular or lobed, serrulate, scabrous above, roughly hispid beneath, 4-15 x 3-13 cm; basal sinus 1-2 cm deep; petiole 1-5 cm long. Male flowers: calyx-tube *ca.* 2 x 1.5 mm, villose-hirsute. Corolla yellow, 2-4 mm long; lobes ovate-oblong, rounded at apex; staminal filaments minutely pilose; anthers ciliate, bifid at base, distinctly appendiculate. Female flowers: ovary hispid. Fruits ovoid-globose, 3-4 mm in diam., green with white bands when immature, turning scarlet on maturity, smooth and shining or sparsely white-echinate. Seeds ovoid-oblong, grey, turgid, scrobiculate, to 4 x 2.5 mm.

Fl. & Fr. : Sept. -Dec.

Ecology: Very common; in waste places, roadsides, open grassy places, low jungles, etc.

Distribution : Throughout India. Myanmar, Malesia, Australia, New Zealand and Africa.

Specimens examined : Pratappur, 906: Hazaribagh, 2272.

Uses : Tender shoots and leaves are used for vertigo and biliousness. Root masticated for relief from tooth-ache. Decoction of root is given in flatulence.

Note: Chakravarty (*l.c.*) treated *Mukia* Arn. as congeneric with *Melothria* L. while Jeffrey (*l.c.*) treated them as distinct.

11. TRICHOSANTHES L.

Key to the Species

- 1a. Perennial. Male racemes with large bracts.
Tendrils robust ... 2. *T. tricuspidata*
- 1b. Annual. Male racemes ebracteate or minutely
bracteate. Tendrils slender ... 1. *T. cucumerina*

1. *Trichosanthes cucumerina* L., Sp. Pl. 1008. 1753; Clarke in Hook. f., Fl. Brit. India 2:609. 1879; Prain, Bengal Pl. 1: 518. 1903; Haines, For. Fl. Chota Nagpur 166. 1910 & Bot. Bihar & Orissa pt. 3: 388. 1922; Chakrav. in Rec. Bot. Surv. India 17: 31. 1959; Jeffrey in Kew Bull. 34: 796 & 803. 1980; Chakrav. in Thothathri, Fl. India, Fasc. 11: 112. 1982.

T. anguina L., Sp. Pl. 1008. 1753; Clarke in Hook. f., Fl. Brit. India 2: 610. 1879; Prain, Bengal Pl. 1: 518. 1903; Chakrav. in Rec. Bot. Surv. India 17:31. 1959 & in Thothathri Fl. India Fasc. 11: 108. 1982.

T. cucumerina L. var. *anguina* (L.) Haines, Bot. Bihar & Orissa pt. 3: 388. 1922.

T. pachyrrhachis Kundu in J. Bot. 77: 9. 1939; Razi in Rec. Bot. Surv. India 18: 53. 1959.

T. brevibracteata Kundu in J. Bot. 77. 10. 1939 (incl. vars.); Razi in Rec. Bot. Surv. India 18: 53. 1959.

Local name : Chachinga.

Annual. Stems slender, sulcate, pubescent. Leaves reniform-suborbicular in outline. 5-7-angular or lobed, deeply cordate at base, puberulous above, pubescent or somewhat scabrous beneath, 5-10 x 7-12 cm; lobes obovate, distantly denticulate, obtuse or subacute; petiole 2-7 cm long. Tendrils slender, 2-3-fid. Male peduncles in pairs, the earlier one-flowered, the later laxly racemed, 8-15-flowered, ebracteate or minutely bracteate; occasionally in place of the earlier found a female. Male flowers : pedicels erect, filiform, 1-2 cm long; calyx-tube 2-2.5 cm long, ca. 2.5 cm broad at apex; lobes lanceolate, erect or spreading, 1.2-1.5mm long; corolla white, 2-3 cm in diam.; staminal filaments slender, ca. 1.5 mm long.

Female flowers: peduncles 0.3-1 cm long; style 1.5-1.7 mm long, filiform. Fruits ovoid-conical, rostrate, 3-7 x 2.5-4.5 cm, 8-10-seeded, at first green with white stripes, ultimately red. Seeds ovate-oblong, corrugate, 1-1.2 x 0.6-0.65 cm.

Fl. : Sept.-Dec. *Fr.* : Oct.-Jan.

Ecology : Very common; in waste places, roadsides, scrub jungles, hill slopes, etc.

Distribution : Throughout India, Indo-Malaya, Bangladesh, Sri Lanka, Myanmar, Malesia, Australia.

Specimens examined : Simaria, 818; Markochho, 1479.

Note: Here, the treatment of Jeffrey (*l.c.*) is being followed in merging *T. anguina* L. under *T. cucumerina* L. However, Chakravarty (*l.c.*) treated them as two distinct species.

2. ***Trichosanthes tricuspидatus*** Lour., Fl. Cochinch. 589. 1790, *sens. lat.*; Cong. in DC., Monogr. Phan. 3: 374. 1881; Jeffrey in Kew Bull. 34: 797 & 802. 1980.

Modecea bracteata Lam., Encycl. 4: 210. 1796.

Trichosanthes palmata Roxb., Fl. Ind. 3: 704. 1832; Clarke in Hook. f., Fl. Brit. India 2: 606. 1879; Prain, Bengal Pl. 1: 518. 1903; Haines, For. Fl. Chota Nagpur 166. 1910 & Bot. Bihar & Orissa pt. 3: 387. 1922; Kundu in J. Bomb. Nat. Hist. Soc. 43: 379. 1943.

T. wallichiana (Ser.) Wight in Ann. & Mag. Nat. Hist. 8: 270. 1842; Chakrav. in Rec. Bot. Surv. India 17: 41. 1959 & in Thothathri, Fl. India Fasc. 11:109. 1982.

T. bracteata (Lam.) Voigt. Hort. Suburb. Calc. 58. 1845; Chakrav. in Rec. Bot. Surv. India 17: 44. 1959 & in Thothathri, Fl. India Fasc. 11: 109. 1982.

T. palmata Roxb. var. *scotanthus* Clarke in Hook. f., Fl. Brit. India 2: 607. 1879.

T. lepiliana (Naud.) Cogn. in A. & C. DC., Mon. Phan. 3: 377. 1881; Chakrav. in Rec. Bot. Surv. India 17: 48. 1959 & in Thothathri, Fl. India Fasc. 11: 116. 1982.

T. majuscula (Clarke) Kundu in J. Bot. 77: 12. 1939; Chakrav. in Rec. Bot. Surv. India 17: 44. 1959 & in Thothathri, Fl. India Fasc. 11: 118. 1982.

T. khasiana Kundu in J. Bot. 77: 11. 1939.

T. multiloba auct. non. Miq. : Clarke in Hook. f., Fl. Brit. India 2: 607. 1879.

Local names : Makai, Lal indrayan.

Dioecious perennials. Stems robust, branched, grooved; branchlets lepidote, glabrescent at length. Leaves broadly ovate-orbicular in outline, membranous, 5-7-lobed or partite, cordate at base, acuminate at apex, glabrous beneath, scabrid with white tubercles on upper surface, 5-12 cm across; petioles 2.5-7 cm long, striate, puberulous. Tendrils robust, 3-fid. Male flowers : peduncles robust, sulcate, puberulous, 5-10-flowered, 12-20 cm long; pedicels thick, erect, very short; bracts large, ovate, acutely laciniate, 3-6 cm long; calyx-tube shortly villose, longitudinally striate, 4-6 cm long; lobes ovate, acuminate, laciniate, 1-1.5 cm long ; corolla white, 4.5-5 cm across; lobes ovate, to 2 x 1 cm; staminal filament 1.5-2 mm long, villose; anthers 1 cm, ciliate; connective slightly produced at the apex. Female flowers; axillary, solitary, ebracteate; peduncle 1-2 cm long during anthesis, 2-4 cm long in fruiting, red with 10 longitudinal orange streaks. Fruits ovoid, beaked, smooth, scarlet, 4-5 cm across. Seeds 1-1.2 cm long, ellipsoid, smooth, slightly attenuate at base.

Fl. : Aug.-Sept.

Fr. : Nov.-Dec.

Ecology : Very common; in scrub jungles, forest-edges, forest-clearings and waste places.

Distribution : Throughout India, Eastern Himalaya. China, Japan, Malesia, Tropical Australia.

Specimens examined : Ramgarh, 556; National Park, 1167.

Uses: Fruits and roots, are boiled with mustard oil and used for headache. Roots are used for inflammation of lungs.

Note: Here, the treatment of Jeffrey (*l.c.*) is followed in adopting *T. tricuspidatus* Lour. as the correct name for this plant and in merging *T. bracteata* (Lam.) Voight, *T. lepiliana* (Naud.) Cogn., *T. wallichiana* (Ser.) Wight, *T. majuscula* (Clarke) Kundu, *T. khasiana* Kundu and *T. multiloba* sensu auct. (non Miq.) as synonyms of it. However, Chakravarty (*l.c.*) regarded *T. bracteata*, *T. lepiliana*, *T. wallichiana* and *T. majuscula* as separate species.

48. CAPPARACEAE

Key to the Genera

- 1a. Annual herbs. Fruit a cylindrical capsule ... 2. CLEOME
 1b. Climbing or rambling shrubs. Fruit a globose or ellipsoid berry ... 1. CAPPARIS

1. CAPPARIS Tourn. ex L.

Capparis zeylanica L., Sp. Pl. ed. 2, 720. 1762, non sensu Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 174. 1872; Gamble, Fl. Madras 1: 46(33). 1915; Jacobs in Steenis, Fl. Males. ser. 1, 6: 87. 1960.

C. horrida L. f., Suppl. Pl. 264. 1781; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 178. 1872; Prain, Bengal Pl. 1: 226. 1903; Haines, For. Fl. Chota Nagpur 157. 1910 & Bot. Bihar & Orissa pt. 2: 31. 1921.

Plant armed with recurved stipular thorns. Branchlets densely brown-tomentose. Leaves coriaceous, variable, elliptic, obovate or oblong, obtuse, or retuse and strongly mucronate at apex, sub-cuneate to obtuse at base, entire, shining above, glabrous, 2-6 x 1.5-4.5 cm; petiole to 8 mm long. Flowers to 5 cm across, borne in serial clusters on shoots; pedicels 1.2-1.5 cm long. Sepals 4 (2+2); outer 2 ovate-rounded, fulvous-tomentose, to 1.5 x 1 cm; inner 2 elliptic or oblong, to 1 x 0.7 cm. Petals oblong, white or purplish, to 2 cm long. Stamens 30-45; filaments to 3.5 cm long, pinkish. Gynophore pubescent at base, 3-4 mm long. Ovary ellipsoid, 1-locular, to 2 mm long; placentae 4, with numerous ovules; stigma sessile, small. Berry subglobose to ellipsoid, reddish, smooth, to 5 x 4 cm. Seeds many, ca. 5 mm long, obliquely reniform, embedded in pulp.

Fl. : Mar.-May. *Fr.*: Sept.-Oct.

Ecology : Very common; in roadsides, villages surroundings, hedges, forest edges, sometimes climbing over trees.

Distribution : Almost throughout India, Myanmar to Hainan and southwards to Sri Lanka, Indo-Chinese Peninsula and Malesia.

Specimens examined: Pratappur, 606; Ramgarh, 1137.

Uses : Fruits are pickled. Root-bark is sedative and stomachic.

2. CLEOME

Key to the Species

- 1a. Leaves simple, penninerved. Flowers pink.
Stamens 6 ... 2. *C. monophylla*
- 1b. Leaves digitately 3-7-foliolate:
- 2a. Flowers yellow. Stamens more than 10,
borne on a short receptacle ... 3. *C. viscosa*
- 2b. Flowers white or purple. Stamens 6, borne
on elongated androgynophore ... 1. *C. gynandra*

1. *Cleome gynandra* L., Sp. Pl. 671. 1753; Jacobs in Steenis, Fl. Males. ser. 1, 6: 101. 1960.

C. pentaphylla L., Sp. Pl. ed. 2, 938. 1763, *nom. illeg.* based on *C. gynandra*.

Gynandropsis pentaphylla DC., Prodr. 1: 238. 1824; Hook. f. & Thomson in Hook. f., Fl. Brit., India 1: 171. 1872; Prain, Bengal Pl. 1: 225. 1903; Haines, For. Fl. Chota Nagpur 157. 1910 & Bot. Bihar & Orissa pt. 2: 30. 1921.

G. gynandra (L.) Briq. in Annuaire Conserv. Jard. Bot. Geneve 17: 382. 1914.

Local name : Sada hurhuria.

Erect, glandular-viscid, aromatic, striate, annual herbs, to 80 cm long. Leaves digitately 3-5(-7)-foliolate; leaflets sessile, chartaceous, inequilateral, broadly obovate, acute or obtuse at apex, cuneate at base, entire or serrulate, glandular-viscid, central one the longest, 2.5-5.5(-7) x 1.5-2.5 (-3.5) cm, lateral ones 1-3 x 0.5-1.5 cm; petiole 3-17 cm long. Flowers 1-2 cm across, borne in corymbs to 25 cm long. Bracts 3-foliolate; pedicel to 3 cm long. Sepals ovate or lanceolate to 4 mm long. Corolla white or purple; petals obovate with a narrow claw, to 1.5 cm long. Androphore 1.5-2.5 cm long. Stamens 6; filaments 1.5-2 cm long; anthers purple, *ca.* 3 mm long. Gynophore to 1 cm long. Ovary glandular, to 1.5 cm long. Capsule narrowed at tip, striate, glandular, 7-10 cm long. Seeds numerous, reniform, black, *ca.* 1 mm across.

Fl. : July-Aug. *Fr.* : Aug.-Sept.

Ecology : Not common; in waste places, along railway tracks, in cultivated lands, etc.

Distribution : Throughout the warmer parts of India. Sri Lanka, throughout S.E. and E. Asia to Peiping, widely introduced in New World.

Specimens examined : Ghanghree, 1053; Ramgarh, 1119.

Uses : Leaves or the plant as a whole are eaten as a pot-herb by the Santals and Kols. Bruished leaves are used in headache, neuralgia and rheumatism. Seeds are rubefacient and anthelmintic; also used as fish-poison.

2. *Cleome monophylla* L., Sp. Pl. 1753; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 171. 1872; Prain, Bengal Pl. 1: 225. 1903; Haines, For. Fl. Chota Nagpur 157. 1910 & Bot. Bihar and Orissa pt. 2: 29. 1921.

Erect small, glandular-pubescent, simple or branched annual herbs, to 60 cm long. Leaves simple, oblong-lanceolate, acute at apex, truncate at base, ciliate, glandular-pubescent, 2.5-6 x 1-2 cm long, penninerved, passing gradually into bracts above; petiole 1-3.5 cm long. Flowers to 1.5 cm across, solitary, in axils of leafy bracts, forming a terminal raceme to 20 cm long. Sepals linear or lanceolate, to 5 mm long, glandular-pubescent. Petals pink, oblong, long-clawed to 8 mm long. Stamens 6, filaments to 1

cm long; anthers *ca.* 2 mm long. Gynophore to 1.5 cm long. Ovary glandular, 0.8-1 cm long. Capsule striate, with pointed tip, 5-10 cm long. Seeds transversely rugose, *ca.* 1 mm across.

Fl. & Fr. : July-Sept.

Ecology: Rare; in cultivated fields.

Distribution : Uttar Pradesh, Bihar, West Bengal, Orissa, Deccan Peninsula, Sri Lanka, Tropical Africa.

Specimens examined : Ghanghree, 1022; Ramgarh, 1914.

3. **Cleome viscosa** L., Sp. Pl. 672. 1753; Hook. f. & Thomson in Hook. f., Fl. Brit. India 1: 170. 1872; Prain, Bengal Pl. 1: 225. 1903; Haines, For. Fl. Chota Nagpur 157. 1910 & Bot. Bihar & Orissa pt. 2: 29. 1921; Jacobs in Steenis, Fl. Males. ser. 1, 6: 103. 1960.

Local name: Hurhuria.

Erect, simple or sparsely branched, pubescent to glandular-hairy annual herbs, to 1 m high. Leaves digitately 3-5 foliolate; leaflets subsessile, elliptic-obovate, acute or obtuse at apex, cuneate at base, inequilateral, ciliate on margins, softly pubescent, central one the longest, 2-4.5 x 1-2 cm, lateral ones 1.5-3.5 x 0.8-1.5 cm; petiole to 4.5 cm long. Flowers 0.8-1.5 cm across, solitary in axils of reduced leaves, forming a terminal raceme to 30 cm long; pedicel to 1 cm long in flower, ascending. Calyx-tube oblong, 5-8 mm long. Corolla yellow; petals oblong or obovate-oblong, 1-1.4 cm long. Stamens 10-20, filaments unequal, slightly dilated at top, 0.6-1 cm long; anthers bluish, *ca.* 2 mm long. Ovary glandular, *ca.* 8 mm long. Capsule narrowed to tip, striate, glandular-pubescent, 6-12 cm long. Seeds brown, small, granular.

Fl. & Fr.: July-Oct.

Ecology : Very common; in waste places, agricultural fields, railway tracks, roadsides, vacant shady plots, gardens and forest edges.

Distribution : Throughout the tropical and warmer parts of India. Native to the Old World from Tropical Africa and S. Arabia to Tropical Australia and Malesia; commonly adventive in the New World.

Specimens examined : National Park, 224; Ramgarh, 549.

Uses : Seeds are anthelmintic, carminative and stimulant. Poultice of seeds is efficaceous in chronic painful joints. Leaves are rubifacient, vesicant and sudorific. Plant is used as vegetable by poor people.

49. BRASSICACEAE (CRUCIFERAE)

Key to the Genera

- 1a. Fruit dehisced longitudinally exposing the seeds:
- 2a. Lateral sepals gibbous at base. Siliqua with an indehiscent beak:
- 3a. Siliquae tetragonal with flat, sabre-shaped beak. Seeds regularly 2-seriate ... 3. ERUCA
- 3b. Siliquae subcylindrical or angled, with terete beak. Seeds 1-seriate, or rarely irregularly 2-seriate ... 1. BRASSICA
- 2b. Sepals not gibbous at base. Siliqua not beaked. ... 5. RORIPPA
- 1b. Fruit divided into indehiscent 1-seeded compartments or lobes:
- 3a. Fruit a silicula, small, didymous. Sepals not gibbous at base ... 2. CORONOPUS
- 3b. Fruit a siliqua, large, terete. Lateral sepals gibbous at base ... 4. RAPHANUS

1. BRASSICA L.

Key to the Species

- 1a. Upper cauline leaves with amplexicaul base :
- 2a. Leaves hispid or hairy, upper ones covered with glaucous, grey bloom on both surfaces. Open flowers overtopping the floral buds ... 3. *B. rapa* var. *campestris*
- 2b. Leaves quite glabrous, with a faint glaucous bloom beneath only. Open flowers not overtopping the floral buds ... 2. *B. napus* ssp. *napus* var. *dichotoma*

- 1b. Upper cauline leaves narrowed to base in a short petiole ... 1. *B. juncea*

1. ***Brassica juncea*** (L.) Czern., Consp. Pl. Charc. 8. 1859; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 157. 1872; Prain, Bengal Pl. 1: 220. 1903; Haines, Bot. Bihar & Orissa pt. 2: 25. 1921. *Sinapis juncea* L., Sp. Pl. 668. 1753.

Key to the Variety

- 1a. Leaves mostly lyrato-pannatifid to pinnatipartite ... 1. var. *juncea*
- 1b. Leaves smaller, subentire to remotely serrate-dentate, very rarely lyrate ... 2. var. *integrifolia*

1. var. ***juncea***

Local name : Rai.

Erect, annual herbs, 30-100 cm tall. Stem glabrous or hairy near base. Basal and lower cauline leaves lyrato-pinnatifid to pinnatipartite, to ca. 30 cm long; upper cauline leaves lobate, narrowed to base in a short petiole; higher ones lanceolate, subentire-dentate; petioles to 1 cm long. Racemes terminal, to 20 cm long. Flowers 6-8 mm across. Pedicels 0.5-1 cm long during anthesis, to 1.5 cm long in fruit. Sepals 4-5 mm long, petals bright-yellow, 7-9 mm long. Pods erecto-patent, 3-5 cm long including 4-8 mm long beak and 1.5-2 mm wide, seeds dark-brown, reticulate, 0.8-1 mm in diam.

Fl. & Fr.: Oct.-Apr.

Ecology : Very common; cultivated in fields; also escapes in damp grassy places, roadsides, agricultural fields and field-borders, etc.

Distribution: Throughout India. Native of continental Asia, now cultivated throughout Tropical and Temperate regions of the World.

Specimens examined: Jhumri Telaiya, 165; Simaria, 805; Ichak, 1837; Pratappur, 2105.

Uses: Seeds yield an oil which is used as cooking medium. Leaves are dried and pickled; also used as antidysenteric, diaphoretic and anthelmintic. Decoction of seeds is used in lumbago.

2. *var. **integrifolia** (West) Sinskaja in Bull. Appl. B. Pl. Breed. 19: 339. 1928; Hara in Hara & Williams, Enum. Fl. Pl. Nepal 2: 39. 1979. *Sinapis integrifolia* West, Bidr. St. Croix 296. 1793.

Brassica juncea (L.) Czern. var. *agrestis* Prain in Agricult. Ledger 1: 47, t. 2. 1898 and Bengal Pl. 1: 223. 1903.

Local names : Rai, Badshahirai.

Slender herb, to 30 cm high, sparsely hairy. Leaves much smaller than type variety, oblong or ovate-oblong, subentire to remotely serrate-dentate, very rarely lyrate. Characters of flowers and pods are same as in type variety.

Fl. & Fr.: Dec.-May.

Ecology : Common; cultivated in fields, also found to escape in roadsides, damp grassy waste localities, etc.

Distribution : Throughout major parts of India, particularly in Punjab, Uttar Pradesh, Bihar, West Bengal, Assam and Central India. Nepal, Myanmar, Indo-China, China and Japan.

Specimens examined : Hazaribagh, 123; Gola, 1536; Etkhori, 1872.

Uses: Leaves are eaten as such or pickled in brine. Seeds are used in spasmodic, neuralgic and rheumatic affections. Oils extracted from seeds is applied to skin in eruption and ulcers.

2. **Brassica napus** L. ssp. **napus** var. **dichotoma** (Roxb.) Prain in Agri. Ledger 5: 36, t. 8. 1898 & Bengal Pl. 1: 221. 1903; Haines, For. Fl. Chota Nagpur 155. 1910 & Bot. Bihar & Orissa pt. 2: 25. 1921. *Sinapis dichotoma* Roxb., Fl. Ind. 3: 117. 1832.

Brassica rapa L. var. *dichotoma* (Roxb.) Kitamura in Acta Phyt. Geobot. 16: 62. 1955.

B. campestris L. ssp. *napus* (L.) Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 156. 1872.

B. campestris sensu Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 156. 1872, p.p. *quoad* syn.

Local name : Latni, Tori.

Erect, glaucous, annual herbs. Leaves quite glabrous, with a faint, glaucous gloom beneath; radical and lower cauline ones lyrato-pinnatifid, long-petioled, to 8 cm long; upper leaves entire, ovate-lanceolate, rounded at apex. Flowers 0.8-1 cm across; pedicels during anthesis 4-6 mm long, 1-1.8 cm long in fruit. Sepals erect or erecto-patent, 3-3.5 mm long. Petals obovate, golden-yellow, 0.7-1 cm long. Siliqua 3.5-5 cm long (including a 0.8-1.2 cm long beak) and 1.5-2.5 mm broad; beak seedless. Seeds 6-10 in each locule, yellow-brown, 1.2-1.5 mm in diam.

Fl. & Fr. : Dec.-May.

Ecology : Common; cultivated in fields; also found as an escape in agricultural fields and field-borders, gardens, roadsides, waste places, etc.

Distribution : Almost throughout India, particularly in Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa and Madhya Pradesh. Nepal.

Specimens examined: Koderma, 305; Chatra, 1082.

Uses: Seeds yields an edible oil which is used in various purposes. Leaves are used in salads. Seeds are used for exacerbations, cancer and tumours; also used as bird feed. Juice of root is used in chronic cough and bronchial catarrh.

3. *Brassica rapa* L. ssp. *campestris* (L.) Clapham in Fl. Brit. Isles ed. 2, 124. 1962; Jafri in Nasir & Ali, Fl. W. Pakistan 55: 25. 1973. *B. campestris* L., Sp. Pl. 666. 1753; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 156. 1872, p.p.; Haines, Bot. Bihar & Orissa pt. 2: 25. 1921.

Local name: Kali sarson.

Erect, glaucous, annual herbs, 10-100 cm tall, with slender, non-tuberous tap root. Basal leaves lyrato-pinnatifid, dentate, hispid or hairy, 10-30 x 5-10 cm; upper ones oblong-lanceolate, amplexicaul and auricled, hispid or hairy covered with glaucous, grey bloom. Racemes corymbose above, lengthening later so that the open flowers overtop the buds. Flowers 0.7-1 cm across; pedicels during anthesis 0.7-1.5 cm long, increasing to 3 cm long in fruit. Sepals 4-6 mm long. Petals yellow, 0.8-1 cm long. Stamens to 4-6 mm long. Siliquae erecto-patent, 4-6 cm long (including 0.6-1.2 cm long beak) and 2-3 mm broad; valves glabrous, with a prominent mid-vein; beak seedless. Seeds 8-12 in each locule, pale yellowish-brown, 1.5-1.8 mm in diam.

Fl. & Fr. : Dec.-Feb.

Ecology : Common; cultivated in fields, also met with as an escape in fields and field-borders, waste places, roadsides, etc.

Distribution : Throughout India. Grow as a weed in C. Asia and Europe; may be introduced elsewhere for cultivation.

Specimens examined : Hazaribagh, 114; Tondwa, 1440.

Uses: Leaves are consumed as vegetable and also used as cattle feed. Oil extracted from seeds is mixed with camphor and used in muscular rheumatism, stiff neck, etc.; also used in Dengu fever, and is rubbed on the chest in bronchitis.

2. CORONOPUS Zinn, *nom. cons.*

Coronopus didymus (L.) J.E. Smith, Fl. Brit. 2: 691. 1800; Maheshwari, Fl. Delhi 57. 1962; Jafri in Nasir & Ali, Fl. W. Pakistan 55: 62. 1973; *Lepidium didymum* L. Syst. 2: 433. 1754.

Senebiera didyma (L.) Pers., Syn. Pl. 2: 185. 1807; Gamble, Fl. Madras 1: 39(28). 1915.

Senebiera pinnatifida DC., Mem. Soc. Hist. Nat. Paris 144, t. 9. 1799; Prain, Bengal Pl. 1: 223. 1903; Haines, Bot. Bihar & Orissa pt. 2: 28. 1921.

Diffuse or procumbent, foetid, annual herbs. Stems much-branched from base, hispid, 15-40 cm long. Leaves somewhat fleshy, glabrous or sparsely pubescent; basal and lower ones rosulate, 1-2-pinnatipartite to pinnatifid, stalked, 10-20 cm long; upper cauline ones simple, pinnatisect to pinnatifid, 1.5-2.5 cm long; ultimate segments oblanceolate, apiculate, entire. Racemes 2-8 cm long, many-flowered. Pedicels filiform, 2-4 mm long. Sepals ovate-rounded, 0.4-0.5 mm long. Petals usually absent, when present linear or spatulate, as long as sepals. Fertile stamens 2, rest 4 staminodial. Ovary sub-globose-bilobed, 2-celled; cells 1-ovuled; stigma minute, almost sessile. Pods close didymous, reticulately rugose when dry, glabrous, 1.5 x 2.5 mm. Seeds reniform, 1-1.2 mm across, reddish-brown.

Fl. & Fr. : Nov.-Feb.

Ecology: Common; as a weed of cultivated fields and field borders, roadsides, waste lands, etc.

Distribution: Throughout India. Native of Tropical America, introduced and naturalised almost throughout the World.

Specimens examined : Ramgarh Cant., 1232; Gola, 1525; Etkhori, 1874.

Use: Plant is used as cattle feed.

3. ERUCA Mill.

Eruca sativa Mill., Gard. Dict. ed. 8, no. 1. 1768; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 158. 1872; Prain, Bengal Pl. 1: 221. 1903; Haines, Bot. Bihar & Orissa pt. 2: 26. 1921.

Brassica eruca L., Sp. Pl. 667. 1753.

Eruca vesicaria (L.) Cav. var. *sativa* (Mill.) Thell. in Hegi., Ill. Fl. Mittlaur. 4(1): 201. 1918; Bhandari, Fl. Ind. Desert 32. 1978.

Local names : Taranuri, Seoha.

Annual, 25-100 cm high. Stems and branches glabrous or with few scattered hairs. Leaves \pm fleshy; lower subrosulate, 7-15 x 3-5 cm, lobes sinuate-dentate to subentire, terminal lobe larger, ovate, obtuse, lateral lobes

ovate-oblong; upper smaller. Racemes 15-50-flowered, lax, to 30 cm long in fruit. Flowers 1.5-2 cm across; pedicels during anthesis 2-3 mm long, in fruit 0.4-0.7 cm long, becoming somewhat thick and subappressed to axis. Sepals oblong, acute, 0.8-1 cm long, hairy at tip. Petals obovate, dull yellow, turning to white after anthesis, 1.5-2 x 0.5-0.7 cm. Stamens 1-1.5 cm long. Siliqua 1.5-3 x 0.35-0.45 cm, erect and closely appressed to axis; beak 6-8 x 2-3 mm, with \pm 5 parallel veins; valves with a prominent mid-vein only. Seeds 6-12 in each locule, ovoid-subglobose, pale-brown, 1.5-2 mm in diam.

Fl. & Fr.: Aug.-Sept.

Ecology: Common; in agricultural fields, waste places, banks of rivers; also widely cultivated.

Distribution : India : Western Himalaya, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Central and Western India. S.W. Asia, Europe and North Africa.

Specimens examined : Hazaribagh, 110; Jaynagar, 1509; Patratu, 1750.

Uses : Seeds yield a pungent oil which is used in pickles. Seeds are vesicant and acrid. Leaves are stimulant, stomachic, diuretic and antiscorbutic. Oil-cake is used as cattle feed. Young plant is used as vegetable and in salads.

4. RAPHANUS L.

Raphanus sativus L., Sp. Pl. 669. 1753; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 166. 1872; Prain, Bengal Pl. 1: 224. 1903; Haines, Bot. Bihar & Orissa pt. 2: 28. 1921.

Local names : Muli, Purabi sarish, Tora.

Erect, 30-100 cm tall. Stem fistular, corymbosely branched in upper part. Leaves sparingly hispid or subglabrous or entirely glabrous; Lower ones 5-30 cm long; higher ones short-petioled, elliptic-spathulate to linear. Racemes to 30 cm long, usually flexuous, glabrous; highest expanded flowers raised above flower-buds. Pedicels 1-2 cm long. Sepals linear-oblong, 0.6-1 cm long. Claw of petals \pm as long as calyx; blade violet,

rarely white, green-veined, obovate, emarginate, 0.7-1.2 cm long. Stamens 6-10. Ovary 2 to many-ovuled; gradually passing into long style. Pods erect or erecto-patent, thick, lengthwise striate, 2-5 x 0.3-0.4 cm, 2-8-seeded. Seeds 1-seriate, brown, reticulate, ca. 2 mm in diam.

Fl. & Fr. : Oct.-Mar.

Ecology : Common; cultivated; also met with as an escape in waste places, on refuse heaps, roadsides, field borders, etc.

Distribution : Throughout India. Centre of origin Mediterranean region, widely cultivated in temperate and warm zones.

Specimens examined : Ramgarh, 527; Etkhori, 1460.

Uses : Fleshy roots are eaten in salads or cooked as vegetable. Root-extract is used as diuretic in urinary troubles, piles and gastro-dynia. Leaf-juice is diuretic and laxative. Seeds yield a oil which is used for soap-making, edible purposes and as an illuminant.

5. RORIPPA Scop.

Rorippa indica (L.) Hiern, Cat. Afr. Pl. Welw. 26. 1896; Jafri in Nasir & Ali, Fl. W. Pakistan 55: 189. 1973. *Sisymbrium indicum* L., Mant. Pl. 93. 1767.

Nasturtium indicum (L.) DC., Prodr. 1: 139. 1824; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 134. 1872; *p. maj. p.*; Prain, Bengal Pl. 1: 219. 1903; Haines, Bot. Bihar & Orissa pt. 2: 26. 1921.

N. montanum Wall. ex Hook. f. & Thomson in J. Linn. Soc. Bot. 5: 139. 1861; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1: 134. 1872.

Annual-biennial herbs, 10-50 cm tall, usually branched above. Leaves 4-10 x 2-4 cm; lower ones closely approximate, rather long-petioled, elliptic-oval or elliptic-spathulate, obtuse, entire or irregularly lyrate-pinnatifid to pinnatipartite, on either side with 1-4-segments; higher leaves short-petioled or sessile, narrowed or amplexicaul at base, acute at apex. Pedicels during anthesis 2-3 mm long, in fruit 5-8 mm long. Sepals greenish-yellow, erecto-patent or upcurved, 2.5-3 mm long. Petals bright yellow, longer

than calyx, 3-4 mm long. Stamens 6. Disk-glands 6 on outer side of stamens, one larger gland on either side of each shorter stamen, one smaller one between longer stamens of each pair. Ovary (sub) sessile, many-ovuled, glabrous; style \pm obvious; stigma slightly bilobed. Pods on widely patent or erecto-patent stalks, slightly curved, 1-2.5 x 0.12-0.15 cm. Seeds at least in middle of pod biseriate in each cell, subreniform, minute, 0.4-0.5 mm in diam.

Fl. & Fr. : Oct.-Apr.

Ecology : Common; in moist agricultural fields, water-sides, gardens, roadsides, etc.

Distribution : Throughout India including Himalaya. Bangladesh, Pakistan, Indonesia, China and Africa.

Specimens examined: Hazaribagh, 732; Mandu, 1349; Bishnugarh, 1950.

Uses : Plant is stimulant, antiscorbutic and diuretic; Also used in diarrhoea, dysentery and fevers, young plant is used by local people in curries and salads.

50. MORINGACEAE

MORINGA Juss.

Moringa pterygosperma Gaertn., Fruct. 2: 314. 1791; Hook. f. in Hook. f., Fl. Brit. India 2: 45. 1876; Prain, Bengal Pl. 1: 357. 1903; Haines, For. Fl. Chota Nagpur 174. 1910 & Bot. Bihar & Orissa pt. 3: 225. 1922.

Hyperanthera moringa Vahl., Symb. Bot. 1: 30. 1790.

Moringa oleifera Lam., Encycl. 1: 398. 1785, *nom. illegit.*

Local names : Mungna, Shajna.

Small tree, 3-8 m tall with grey corky bark and soft wood. Young parts tomentose. Leaves alternate, usually impari-3-pinnate, 30-60 cm long. Rachis slender, thickened at base. Pinnae 4-6 pairs; pinnules 6-9 pairs,

both pinnae and pinnules opposite, deciduous with their rachises slender, articulated and provided with stipitate linear glands; ultimate leaflets 7-9 per pinnule, elliptic, ovate or obovate, rounded or slightly emerginate at apex, entire, paler beneath, 1-1.8 x 0.5-1.2 cm, terminal one slightly larger than lateral ones. Flowers borne in erect, spreading panicles of 10-30 cm long. Bracts small. Pedicels 0.7-1 cm long, articulated below their tips. Calyx tube short, 3-4 mm long; lobes linear-lanceolate, reflexed, puberulous outside, the posterior one 0.7-1 cm long, the anterior one 1-1.4 cm long. Petals narrowly spatulate, hairy at base, the anterior one 1.4-1.7 cm long, the posterior ones 1-1.3 cm long. Perfect stamens alternating with staminodes, both stamens and staminodes hairy at base, directed to largest petals. Gynophore 2-2.5 mm long. Ovary oblong, hairy 3-4 mm long. Style glabrous above with hollow stigma. Capsule pendulous, dragger-shaped, 20-40 cm long, 3-valved, each valve with 3 strong blunt ribs. Seeds 3-gonous, to 1 cm diam., winged at angles.

Fl. : Jan.-Mar. *Fr.* : Apr.-June.

Ecology : Very common; usually cultivated; occasionally met with as an escape in waste places.

Distribution : Throughout India. Indigenous in N.W. India; cultivated in various tropical countries.

Specimens examined : Hazaribagh, 76; Chatra, 1519.

Uses : Leaves, flowers and fruits are eaten as vegetables. Twigs are lopped for fodder. All parts of the tree is used in treatment of ascites, venomous bites, rheumatism, and as cardiac and circulatory stimulants. Leaf extract is useful in scurvey and catarrhal affections.

51. SAPOTACEAE

Key to the Genera

- 1a. Sepals in 2 whorls of 4. Corolla-segments seemingly 24, in really 8, but each of them with 2 dorsal petaloid appendages of same shape and size as segments itself. Stamens 8, Staminodes 8 ... 3. MIMUSOPS
- 1b. Sepals in 2 whorls of 2 or 3:

- 2a. Sepals in 2 whorls of 2. Corolla generally 8-lobed;
petaloid appendages absent. Stamens 16-40, staminodes ... 1. MADHUCA
- 2b. Sepals in 2 whorls of 3. Corolla-segments 6;
petaloid appendages present or absent.
Stamens 6, staminodes 6 ... 2. MANILKARA

1. MADHUCA Gmelin

Madhuca longifolia (Koenig) MacBride in Contr. Gray Herb. Univ. NS 53: 17. 1918; van Royen in Blumea 10: 53. 1960. *Bassia longifolia* Koenig in L., Mant. 2: 563. 1771; Clarke in Hook. f., Fl. Brit. India 3: 544. 1882.

M. indica Gmelin, Syst. 799. 1791.

Bassia latifolia Roxb., Pl. Corom. 1: 20, t. 19. 1795; Clarke in Hook. f., Fl. Brit. India 3: 544. 1882; Prain, Bengal Pl. 1: 649. 1903; Haines, For. Fl. Chota Nagpur 407. 1910 & Bot. Bihar & Orissa pt. 4: 511. 1922.

Local name : Mahua.

Tree, to 40 m high; branchlets usually thickened in nodes, sericeous or tomentose. leaves conferted at apex of branchlets sometimes seemingly in whorls, broadly elliptic, elliptic-obovate, oblong or oblanceolate, coriaceous, cuneate or rounded at base, acute or obtusely acuminate at apex, entire, tomentose on both sides when young, becoming glabrous soon, 7-25 x 2-9 cm; secondary veins 9-18 pairs, ascending. Petioles 1.5-4 cm long, flat or grooved above, thickened in basal part. Flowers 3-many in each fascicle, erect when young, later becoming pendulous. Pedicels angular, tomentose, 2.5-7.5 cm long. Sepals ovate-lanceolate or elliptic, woolly-pubescent, 1.2-1.7 x 0.6-0.9 cm. Corolla 1-2 cm long, glabrous; lobes ovate-elliptic, irregularly serrate at apex, obtuse, 6-12 x 2-5 mm. Stamens 16-30, in 2-3 whorls, 4.5-9 cm long; filaments subulate, ca. 1 mm long; anthers ovate-lanceolate; connective prolonged with 1-3 teeth. Ovary 8-11-celled. Berry obovoid-ellipsoid or subglobose, 2-5 x 1.8-4 cm, with a remnant of style at apex, 1-4-seeded, woolly; pericarp fleshy. Seeds ellipsoid, 2-3.5 x 1.2-1.5 cm, with ovate scar.

Fl. : Feb.-May. *Fr.* : June-Aug.

Ecology : Very common; in forests, hills, along roadsides, etc.

Distribution : India : West Bengal, Bihar, Orissa, Madhya Pradesh, Deccan Peninsula. Myanmar, Sri Lanka.

Specimens examined : Hazaribagh, 23; National Park, 211; Koderma Forest, 1768; Pratappur, 2173.

Uses : The corollas of flowers are eaten raw or cooked and a spirit is distilled from them. An oil is extracted from seeds which is eaten and also used for soap-making. The wood is very hard and proper for naves of wheels.

2. MANILKARA Adans., *nom. cons.*

Manilkara zapota (L.) van Royen in Blumea 7: 410. 1953; Moore & Stern in Taxon 16: 383. 1967. *Achras zapota* L., Sp. Pl. 1190. 1753, quoad. typum excl. syn. Soloanei & Plukenetii; Clarke in Hook. f., Fl. Brit. India 3: 534. 1882; Prain, Bengal Pl. 1: 648. 1903; Haines, Bot. Bihar & Orissa pt. 4: 514. 1922.

Local name : Sapota.

Tree, 5-15 m tall. Leaves close-approximate at tops of branches, oblong-lanceolate, cuneate at base, acute or obtuse at apex, dark-green, densely brown-hairy beneath when young, soon becoming glabrous, 3.5-15 x 1.5-7 cm; petiole 1-3.5 cm long. Flowers solitary, axillary, usually pendulous. Peduncle thickened at top, 1.8-2.2 cm long. Sepals in 2 whorls of 3, ovate, densely brown-hairy, 0.8-1 cm long. Corolla white, turning brown, tubular-campanulate, divided almost half-way down into 6 lobes, 0.8-1.2 cm long; appendages of corolla-lobes absent. Stamens 6; staminodes 6. Disk absent. Ovary 6-14-celled; ovule 1 in middle of each cell. Berry ellipsoid, globose or depressed-globose, yellowish brown or reddish-brown, lepidote, 3-8 x 2.8-6.5 cm; pulp juicy, soft, sweet. Seeds shining black-brown.

Fl. : Mar.-Apr.; *Fr.* : Jan.-Mar. of the next year.

Ecology: Common; cultivated in orchards, gardens, etc.

Distribution: India: Gujarat, Maharashtra, Tamil Nadu, Andhra Pradesh, Karnataka, Orissa, West Bengal, Bihar, Uttar Pradesh and Punjab. Native of Tropical America, cultivated throughout the Tropics.

Specimens examined : Hazaribagh, 1587; Koderma, 1994.

Uses : Ripe fruits are edible. Bark is used by fisherman for colouring sails and fishing tackles. Bark contains latex which is used as a base for chewing gum.

3. MIMUSOPS L.

Mimusops elengi L., Sp. Pl. 349. 1753; Clarke in Hook. f., Fl. Brit. India 3: 548. 1882; Prain, Bengal Pl. 1: 649. 1903; Haines, For. Fl. Chota Nagpur 407, 1910 & Bot. Bihar & Orissa pt. 4: 513. 1922.

Local names : Molsuri, Bakul.

Small tree, to 20 m high. Leaves not closely approximate, thinly coriaceous, ovate or elliptic, cuneate at base, obtusely acuminate at apex, 4-12 x 2.5-6 cm. Petiole 2-4 cm long. Flowers solitary or 2-6 in upper leaf-axils. Pedicels 0.4-1.2 cm long, usually recurved. Flower-buds ovoid, acute, grey-hairy. Sepals in 2 whorls of 4; outer sepals lanceolate, concave, valvate, to 7 x 3 mm; inner ones alternating with outer, linear-lanceolate, flat, imbricate, to 9 x 2.5 mm. Corolla white, turning brown, 1-1.5 cm in diam.; segments 8, each on back with 2 collateral petaloid appendages of same shape and size as segment itself, hence apparently 24. Stamens 8, short; staminodes 8, hairy on back. Ovary 8-celled pubescent; ovule 1 at base of cell; style shortly exerted from flower. Berry ovoid, yellow or orange-coloured, 2-3 x 1.6-2.5 cm; epicarp thin. Seeds 1-2, dark brown, oblong-ellipsoid.

Fl. : Mar.-May. *Fr.:* July-Sept.

Ecology : Very common; usually planted in gardens, roadsides, near temples, etc.

Distribution: Throughout India. Hawaii, N. Australia, New Caledonia.

Specimens examined : Ramgarh, 543; Hazaribagh, 1588.

Uses : Flowers are fragrant and held sacred. They yield a volatile oil used as a stimulant medicine and perfume. The unripe fruit is very astringent and recommended for loose teeth. Bark and fruits are used in diarrhoea and dysentery.

52. EBENACEAE

DIOSPYROS L.

Key to the Species

- 1a. Style one, bifid at apex. Corolla glabrous externally ... 2. *D. montana*
- 1b. Styles 2, each bifid at apex. Corolla densely sericeous or silky-hairy externally ... 1. *D. melanoxylon*

1. ***Diospyros melanoxylon*** Roxb., Pl. Corom. 1: 36, t. 36. 1795; Clarke in Hook. f., Fl. Brit. India 3: 564. 1882; Haines, For. Fl. Chota Nagpur 412. 1910 & Bot. Bihar & Orissa pt. 4: 519. 1922, *p.p.*

D. melanoxylon Roxb. var. *beddomei* Clarke in Hook. f., Fl. Brit. India 3: 564. 1882.

Local names: Kend, Kendu.

Small to medium-sized tree, to 8 m high, dioecious or polygamous. Bark dark-grey or black. Branchlets densely and minutely grey to light rusty-woolly. Leaves opposite, subopposite or alternate, chartaceous, subcuneate at base, obtuse or rounded at apex, younger ones minutely light brown woolly on both surfaces, adult ones glabrous, conspicuously reticulate, to 15 x 10 cm. Petioles 0.6-2 cm long. Male inflorescence: usually a dichasial cyme of 3-7 flowers; peduncle densely woolly, 0.4-1 cm long; pedicels 1-1.5 cm long; bracts and bracteoles woolly, gradually decreasing in size upwards; calyx yellowish-green, campanulate, 5-8 mm long; lobes 4-6, acute, 2-3 mm long; corolla yellowish-white, densely sericeous, 1-1.5 cm long; lobes 4-6, rounded, 2-2.5 mm; stamens 8-20 on central disc, single or in groups of 2's or 3's; anthers linear-oblong, apiculate; pistil a rudiment or a bunch of hairs or none. Female flowers: axillary,

solitary. Pedicel short, stout, 1-2 mm long; calyx green to brown, woolly, 7-8 mm long, deeply lobed; lobes 4-6 (-7), with reflexed undulate margins; corolla yellow, silky hairy, 0.8-1 cm long; lobes 5, tapered, 2.5-3 mm long; staminodes 8-12; ovary 4-8-celled; ovule solitary in each cell; styles 2, each bifid at apex; stigmas 4, fleshy. Fruit globose, yellowish, densely hairy when young, to 3 cm in diam. Seeds oval to wedge-shaped, compressed, 1.5-2 cm long. Fruiting calyx to 2.5 cm in diam.

Fl. : Apr.-May. *Fr.* : Nov.-Apr.

Ecology : Common; in forests.

Distribution : India: Deccan Peninsula, West Bengal, Bihar, Chota Nagpur. Sri Lanka.

Specimens examined : National Park, 962, 2041; Pratappur Forest, 1556; Koderma Forest, 1777.

Uses : Leaves are used for wrapping 'bidis'. Leaves are diuretic, laxative, carminative and styptic. Dried flowers are used in urinary and skin troubles. Bark-decoction is used in diarrhoea and dyspepsia.

2. **Diospyros montana** Roxb., Pl. Corom. 1: 37, t. 48. 1795 (excl. Fruit) Clarke in Hook. f., Fl. Brit. India 3: 555. 1882; Prain, Bengal Pl. 1: 653. 1903; Haines, For. Fl. Chota Nagpur 409. 1910 & Bot. Bihar & Orissa pt. 4: 516. 1922.

Local name: Bis tendu.

Small or medium-sized tree, to 12 m tall. Bark grey to yellowish grey. Branches stiff, divaricate; branchlets softly pubescent. Leaves alternate, ovate-oblong, elliptic or ovate-elliptic, rounded-truncate to subcordate at base, shortly acuminate, pubescent beneath, 3-10 x 2-5 cm. Petiole 5-8 mm long, flattish above. Male inflorescence: cyme 3-flowered or paniced in axils of small, narrow, caducous bracts or leaves. Calyx-lobes 4, rounded or deltoid-ovate, 3-4 mm long. Corolla white, urceolate, glabrous, 1.2-1.5 cm long; lobes 4. Stamens many or 16 in equal or unequal pairs, usually united to form 8 pairs. Rudimentary ovary with 4 teeth at apex. Female flower: solitary, axillary. Pedicel 4-5 mm long, with 2 small, ovate, caducous bracts. Calyx-lobes 4, ovate-suborbicular, pilose, 2-5 mm long. Corolla white, glabrous outside, 1-1.2 cm long; lobes 4, rotate. Ovary 8-celled;

ovule solitary in each cell; style distinct, bifid at apex. Fruit globose or ovoid, glabrous, smooth, first yellow, turning to red, ultimately brown, 0.8-2 cm in diam. Seeds 2-8, semilunar wedge-shaped, black, to 8 mm long.

Fl. : Apr.-June. *Fr.* : Dec.-Feb.

Ecology : Common; in forests of drier parts.

Distribution : Throughout India. Sri Lanka, Myanmar, Malesia, Tropical Australia.

Specimens examined : National Park, 952, 2018; Koderma Forest, 1796.

Uses: Wood is used for carts, agricultural implements, indoor work and small articles of furniture. Crushed leaves and fruits are used for stupefying fish.

53. SYMPLOCACEAE

SYMPLOCOS Jacq.

Symplocos racemosa Roxb., Fl. Ind.2: 539. 1832; Clarke in Hook. f., Fl. Brit. India 3: 576. 1882; Prain, Bengal Pl. 1: 655. 1903; Haines, For. Fl. Chota Nagpur 413. 1910. & Bot. Bihar & Orissa pt. 4: 521. 1922.

Symplocos beddomei Clarke in Hook. f., Fl. Brit. India 3: 582. 1882.

Local names : Lodh, Lodhra.

Small tree, to 15 m tall. Leaves oblong, elliptic or elliptic-lanceolate, coriaceous, cuneate at base, acute or acuminate at apex, subentire or crenate or serrulate, glabrous, or slightly pilose on midrib, 4-12 x 2.5-6 cm; secondary veins distant, irregularly curved; petiole 0.6-1.2 cm long. Racemes 5-10 cm long, hairy. Bracts ovate, deciduous, 3.5-4 mm long. Pedicels 1.5-4 mm long. bracteoles ovate, 1.5-2 mm long. Flowers 1-1.2 cm across. Sepals 5, broadly oblong-ovate, connate below, 2-2.5 mm long, glabrous or minutely pubescent. Petals 5, white, turning yellow with age, 3.5-4 mm long. Stamens many, several-seriate, epipetalous; anthers as long as broad, with very short connective. Ovary inferior, 3-locular; ovules 2

per locule on axile placentae. Epigynous disk finely pilose. Drupe oblong, smooth, 5-8 x 3-5 mm, 1-2-seeded, crowned by calyx; calyx rim nearly as wide as fruit, with erect teeth. Seed straight.

Fl. : Oct.-Jan. *Fr.*: Dec.-May.

Ecology : Very common; in forests.

Distribution : India: North-eastern India, Chota Nagpur, Orissa, Karnataka, Myanmar, China.

Specimens examined : National Park, 82; Raja Rapa, 366; Pratappur, 2094.

Uses: Bark and leaves are used as mordants. Bark is used in diarrhoea, dysentery, liver complaints, dropsy and for conjunctivitis. Decoction of bark is used to stop bleeding of gums and also for uterine disorders.

54. MYRSINACEAE

ARDISIA Sw., *nom. cons.*

Ardisia solanacea Roxb., Pl. Corom. 1: 27, t. 27. 1795 ; Haines, For. Fl. Chota Nagpur 405. 1910 & Bot. Bihar & Orissa pt. 4: 509. 1922.

Ardisia humilis auct. non Vahl: Clarke in Hook. f., Fl. Brit. India, 3: 529. 1882, *p.p.*; Prain, Bengal Pl. 1: 645. 1903.

Local name: Bisi.

Large shrub to small tree, to 8 m tall; branchlets marked with scars of fallen leaves. Leaves fleshy, clustered towards end of branchlets, obovate-oblong or oblanceolate, attenuate at base, obtuse or shortly acuminate at apex, glabrous, 10-15 x 5-7 cm; secondary veins numerous, obscure; petiole 0.5-1 cm long, stout, channelled. Flowers bisexual, 5-merous, in axillary peduncled, simple or sometimes compound umbels or corymbose racemes of 5-8 cm long. Peduncles 2.5-8 cm long, stout, divaricate or ascending, ± compressed. Pedicels 1-2.5 cm long. Flower-buds 7-8 x 4-5 mm. Flowers 2-2.5 cm across. Sepals in flower elliptic, 3-

4 mm long, densely gland-dotted; in fruit orbicular, concave, with membranous margins. Corolla rose-coloured, waxy; petals ovate-elliptic, gland-dotted, 0.8-1 cm long. Stamens 5, connivent around style, exserted; filaments short, *ca.* 1 mm long; anthers 4-5 mm long. Ovary superior, narrowed upwards; ovules few; style thick, cylindrical; stigma pointed. Berry depressed-globose, 0.8-1.2 cm in diam., black when ripe.

Fl. : Apr.-June. *Fr.* : Nov.-Jan.

Ecology : Common; along banks of rivers, streams, in thickets, forests, etc; also planted in gardens as ornamental.

Distribution : Throughout India including Himalaya. Nepal, West China, Myanmar, Sri Lanka, Malesia.

Specimens examined : Hazaribagh, 1885; Jhumri Telaiya, 2221.

Uses : Leaves are eaten in salads. Roots are used in fever, diarrhoea, dysentery and rheumatism.

55. PRIMULACEAE

ANAGALLIS L.

Key to the Species

- 1a. Leaves decussate, sometimes whorled above, basally 3-5-nerved. Corolla blue, rotate, glandular-hairy, longer than calyx. Filaments hairy ... 1. *A. arvensis* ssp. *arvensis* var. *caerulea*
- 1b. Leaves alternate above, opposite below, 1-nerved. Corolla white, campanulate, eglandular, shorter than calyx. Filaments glabrous ... 2 *A. pumila*

1. *Anagallis arvensis* L. ssp. *arvensis* var. *caerulea* (L.) Gouan, Fl. Monspel. 29-30. 1765; Kollmann & Feinburn in Notes Roy. Bot. Gard. Edinburgh 28: 176. 1968; *Anagallis caerulea* L., Amoen. Acad. 4: 479. 1759.

A. arvensis auct. non. L. : Hook. f. in Hook. f., Fl. Brit. India 3: 506. 1882, *p. p.*; Prain, Bengal Pl. 1: 640. 1903; Haines, Bot. Bihar & Orissa pt. 4: 506. 1922.

Local name: Jonkmari.

Erect or decumbent-ascending, annual herbs, 12-30 cm tall. Stems branched from base. 4-angular, narrowly winged, glabrous. Leaves sessile, decussate or sometimes whorled above, elliptic-ovate, membranous, obtuse or subacute at apex, rounded or sub-cordate at base, glabrous, entire, gland-dotted on upper surface, 3-5 nerved from base, 1-2 x 0.8-1.5 cm. Flowers axillary, solitary. Peduncle slender, erect in flower, recurved in fruit, 1-3 (-4) cm long. Calyx 5-6 mm long, divided nearly to the base; segments lanceolate, shortly acuminate, crenulate on margins, 4 mm long, with a prominent midrib. Corolla blue, rotate, 0.8-1.2 cm across; lobes ovate, glandular-hairy, obtuse, 4-5 mm. Filaments hairy, 2 mm long; anthers 1 mm long. Ovary 8 mm in diam. Capsule globose, 2.5-4 mm across. Seeds minute, flattened, subtrigonus.

Fl. & Fr.: Jan.-Mar.

Ecology: Very common; in cultivated fields, roadsides, waste places, etc.

Distribution: Almost throughout India. Native in Mediterranean region and W. Europe but now very wide-spread in temperate regions of both hemispheres, and at higher altitudes in the tropics.

Specimens examined: Hazaribagh, 102; Ghanghree, 1300.

Uses: Plant is accredited with expectorant, stimulant, diaphoretic and vulnerary properties; also used for dropsy, leprosy, hydro-phobia and other cerebral affections. Plant is also used to intoxicate fish.

Note: Kollmann and Feinburn (*l.c.*) after carrying out a thorough cytotaxonomic study corroborated *Anagallis arvensis* into 2 subspecies on the basis of a series of macro and micro-morphological characters of leaves and flowers. The most significant diagnostic differences between the two taxa are the number of cells in glands found on petal-margin, and shape of terminal cell of each gland, as well as no. of glands on petal. In ssp. *arvensis*, glands are numerous, 3-celled, with a globular terminal cell, whereas in ssp. *foemina* the glands are few, 4-celled and with an elongate terminal cell. These differences are found to be constant. Within ssp. *arvensis* they maintained 3 varieties, viz., var. *arvensis*, var. *caerulea*,

and var. *latifolia*. The type variety i.e. var. *arvensis* is characterised by scarlet-coloured petals, whereas var. *caerulea* and var. *latifolia* are by blue-coloured petals. In var. *caerulea*, the leaf-size never exceeds 1.5 x 1 cm. In var. *latifolia* the size of leaf is 2-3 x 1.5-2 cm and the plant is much robust than var. *caerulea*. The specimen of this area is referable to var. *caerulea*. var. *arvensis* and var. *latifolia* do not occur in India.

2. *Anagallis pumila* Sw., Prodr. Veg. Ind. Occ. 1: 40. 1788; Knuth, Pflanzl. 22: 331. 1905; Bentvel. in Steenis, Fl. Males. ser. 1, 6: 176. 1962.

Centunculus pentandrus R. Br., Prodr. 427. 1810; Duthie, Fl. Up. Gang. Pl. 2: 6. 1915.

C. tenellus Duby in DC., Prodr. 8. 72. 1844; Hook. f. in Hook. f., Fl. Brit. India 3: 506. 1882; Prain, Bengal Pl. 1: 641. 1903; Haines, Bot. Bihar and Orissa Pt. 4: 507. 1922.

C. pumilus (Sw.) Kuntze, Rev. Gen. Pl. 3: 193. 1891.

Erect, simple or much-branched, glabrous, annual herbs, 5-10 cm tall. Stems terete, scarcely winged. Leaves sessile, alternate above, opposite below, broadly obovate-rounded, subacute to obtuse, apiculate, acute or cuneate at base, glabrous, entire, 1-nerved, 4-8 x 2-4 mm. Flowers axillary, solitary. Peduncle filiform 5-7 mm long. Calyx 2.5-3 mm long, divided near to the base; segments lanceolate-oblong, acute, mucronate, 1.5-2.5 mm long. Corolla white, campanulate, deciduous, shorter than calyx; segments ovate-lanceolate, apiculate, 1.5-2 mm long. Filaments flattened, glabrous. Ovary ca. 0.7 mm across; style 1 mm long. Capsule subglobose, membranous, 8 mm across, *circumscissily* dividing in middle. Seeds solid, subtrigonal.

Fl. & Fr.: Oct.-Dec.

Ecology : Common; in agricultural fields, roadsides, damp, grassy localities and sometimes in forest edges.

Distribution : India: Central and Western Himalaya, Central India, Chota Nagpur, Western Peninsula. Tropical America and Australia.

Specimens examined : Hazaribagh, 720; Barhi, 1399; Jhumri Telaiya, 1759.

56. CRASSULACEAE

KALANCHOE ADAIS.

Kalanchoe pinnata (Lam.) Pers., Syn. Pl. 1: 446. 1805; Backer in Steenis, Fl. Males. ser. 1, 4: 199. 1951. *Cotyledon pinnata* Lam., Dict. Bot. 2: 141. 1786.

Bryophyllum calycinum Salisb. in DC., Prodr. 3: 396. 1828; Clarke in Hook. f., Fl. Brit. India 2: 413. 1878; Prain, Bengal Pl. 1: 470. 1903; Haines, Bot. Bihar & Orissa pt. 3: 342. 1922.

Local names : Pathar kuchi, Zakhm-haiyat.

Robust, ascending from a rooting base or often quite erect, usually unbranched, perennial herbs, 30-150 cm tall. Stems sub-terete with swollen nodes and hollow internodes, glabrous, purple-blotched. Leaves decussate, thickly fleshy, crowded in younger shoots, remote in older ones; lower ones not deeply divided, middle ones usually palmately 3-foliolate or often pinnately 5-foliolate; higher ones small, simple, narrow, blades of leaves or leaflets oval, oblong or elliptic, obtuse at apex, with oblique base in lateral ones, crenate or twice crenate, bordered with purple, 5-20 x 2.5-5 cm; petioles semi-amplexicaule with broadened base, 2-10 cm long; petiolules short. Cymes paniced, lax, 10-50 cm long. Flowers 2-3 cm across, pendulous. Pedicels 1-1.5 cm long. Calyx inflated campanulate, rounded and slightly intruded in centre at base, greenish or yellowish white and often purple tinged, 2.5-3.5 cm long; lobes 4, ovate-triangular, sharply acute, to 1 cm long. Corolla green in lower half, reddish in upper exerted half; tube constricted above the 8-folded glandular pubescent globose base, gradually passing into slightly ventricose obtusely quadrangular upper part; segments 4, lanceolate, recurved. Stamens 8, 2-seriate, inserted on corolla-tube; filaments to 3.5 cm long, green at base, pinkish above. Hypogynous scales adherent to ovary base, sub-rectangular, yellow, 2-2.5 mm long. Ovaries 4, each narrowed into a filiform style, many-ovuled. Follicles 4, enclosed by withered calyx and corolla. Seeds small, oblong-ellipsoid, longitudinally striate.

Fl.: Dec.-Feb. *Fr.* : Jan.-Mar.

Ecology : Common; in shady localities and water courses, in scrub jungles under shade, etc., often cultivated in gardens.

Distribution : Throughout the tropical parts of India. Probably native from tropical Africa, now pantropical.

Specimens examined : Hazaribagh, 518; National Park, 2072.

Uses : Toasted leaves are applied to wounds, boils and bites of venomous insects. Leaves, in form of poultice and powder, are applied to sloughing ulcers.

Note: The plant propagates vegetatively from young buds developed from the crenatures of the detached and even fallen leaves.

57. ROSACEAE

POTENTILLA L.

Potentilla supina L., Sp. Pl. 497. 1753; Hook. f. in Hook. f., Fl. Brit. India 2: 359. 1878; Prain, Bengal Pl. 1: 465. 1903; Haines, Bot. Bihar & Orissa pt. 3: 340. 1922.

Prostrate or decumbent annual. Stems many from root, spreading, dichotomously branched, hairy, 15-45 cm long. Leaves imparipinnate, 1-7 cm long. Basal and lower cauline leaves 4-7 cm long, flaccid, long-petioled, usually absent when flowering, with 5-9 leaflets; upper cauline ones sessile or short-petioled, 1-3 cm long, with 3-5 leaflets; leaflets opposite and alternate, obovate-oblong, with 3-5 leaflets; leaflets opposite and alternate, obovate-oblong, crenate, inciso-serrate or lobulate, hairy on both surfaces, 4-8 mm long; petioles of basal and lower cauline leaves 1-3 cm long, of upper cauline ones 2-5 mm long. Stipules ovate, entire, hairy, 2.5-3 mm long. Flowers solitary, axillary, 5-7 mm in diam. Pedicels 2-4 mm long. Bracteoles 5, ovate-oblong, entire, 1.5-2.5 mm long. Calyx 2.5-3 mm long; sepals 5, ovate-oblong, subacute, as long as calyx-tube. Petals 5, yellow, oblong, smaller than calyx. Stamens many. Ovaries many, free, on small convex receptacle; style subterminal. Achenes numerous, minute, ovoid, smooth, ca. 0.4 mm long.

Fl. & Fr.: Dec.-Apr.

Ecology: Very common; in grassy localities, roadside, dry low lands, rice fields, puddles and pools, waste places, etc.

Distribution : Throughout warmer parts of India. Tibet, Afghanistan and westward to the Atlantic, North Asia and North Africa.

Specimens examined : Hunterganj 985; Rajderwa (National Park), 1168.

Uses: Root-stocks are used as astringent, tonic and febrifuge.

58. MIMOSACEAE

Key to the Genera

- 1a. Stamens definite, as many or twice as many as petals:
 - 2a. Flowers in spikes or spiciform racemes. Anthers gland-tipped ... 6. PROSOPIS
 - 2b. Flowers in globose heads. Anthers not gland-tipped:
 - 3a. Pods breaking up into 1-seeded joints at maturity ... 4. MIMOSA
 - 3b. Pods not jointed, dehiscing along both sutures ... 3. LEUCAENA
- 1b. Stamens indefinite, more than twice the number of petals:
 - 4a. Filaments free ... 1. ACACIA
 - 4b. Filaments connate, at least at base, into a tube:
 - 5a. Pods septate between seeds, indehiscent ... 7. SAMANEA
 - 5b. Pods not septate between seeds:
 - 6a. Unarmed. Pods straight with thin flat valves. Seeds with filiform funicle ... 2. ALBIZIA
 - 6b. Armed. Pods circinate or spirally twisted. Seeds with fleshy arillate funicle ... 5. PITHECELLOBIUM

1. ACACIA Mill.

Key to the species

- 1a. Leaves converted into phyllodes. Flowers in spikes ... 1. *A. auriculiformis*
- 1b. Leaves not converted into phyllodes:
- 2a. Flowers in globose heads:
- 3a. Stipules spinescent. Spines long, straight ... 3. *A. nilotica* ssp. *indica*
- 3b. Stipules not spinescent. Plant with scattered curved prickles:
- 4a. Leaf-rachis with foliar glands opposite to uppermost pinnae. Flowers pedicellate. Leaflets overlapping ... 4. *A. pennata*
- 4b. Leaf-rachis with foliar glands opposite to 4 uppermost pinnae. Flowers sessile. Leaflets not overlapping ... 5. *A. torta*
- 2b. Flowers in spikes. Stipules spinescent ... 2. *A. eatechu*

1. *Acacia auriculiformis* A. Cunn. ex Benth. in Hook., J. Bot. Gard. Misc. 1: 377. 1842; Haines, Bot. Bihar & Orissa pt. 3: 330. 1922; Chatterjee in Bull. Bot. Soc. Bengal 12: 107. 1958.

Tall straight tree; bark smooth, white; branchlets slightly angular, glabrous and glaucous. Phyllodes alternate, laterally compressed, falcate-oblong, 10-17 × 1.2-3.5 cm, with 4-6 sub-parallel principal nerves. Spikes slender, axillary, 3.5-7 cm long. Flowers yellow, 2.2-2.5 mm across. Calyx 0.5-0.6 mm long, minutely toothed. Petals lanceolate, spreading, 1.5-2 mm long. Staminal filaments basally united. Pods hard, woody, spirally twisted, 3-3.5 cm long. Seeds 4-6.

Fl. & Fr. : Almost throughout the year.

Ecology: Very common; planted in roadsides, parks, gardens, extensively on barren lands for afforestation; also self-sown in waste places, roadsides, etc.

Distribution : Throughout the tropical parts of India. Native of North Australia and Queensland, planted widely in all tropical countries.

Specimens examined : National Park, 80; Gola, 788; Telaiya Dam, 1959.

Uses : The tree is cultivated as an avenue tree for its graceful pendant phyllodes and beautiful yellow flowers. Wood is suitable for preparing writing and printing paper.

2. *Acacia catechu* (L. f.) Willd., Sp. Pl. 4: 1079. 1806; Baker in Hook. f., Fl. Brit. India 2: 295. 1878; Prain, Bengal Pl. 1: 458. 1903; Haines, Bot. Bihar & Orissa pt. 3: 329. 1922; *Mimosa catechu* L. f., Suppl. Pl. Syst. Veg. 439. 1781.

Local name : Khair.

Small tree, to 12 m tall; bark dark-coloured, rough; branches slender, dark-brown or purple, glabrous, armed with hooked spines. Leaves 2-pinnate, 10-15 cm long; rachis pubescent, with a conspicuous gland near middle of petiole and a few glands between pairs of pinnae; stipular thorns hooked, arising from a broad triangular base, polished, short; pinnae 7-24 pairs, 3.5-5 cm long; leaflets 12-25 pairs, linear, subacute, ciliate, 4.5-6 mm long. Flowers sessile, crowded in 1-4-nate axillary, pubescent spikes of 5-10 cm long. Peduncle 1-1.5 cm long. Calyx 1.2-1.5 mm long, hairy without; teeth deltoid, ciliate. Corolla 2.5-3 mm long, white or pale-yellow; lobes ovate-oblong, pubescent. Stamens in 5 bundles; filaments sparsely hairy. Pods stipitate, flat, irregularly constricted, with a triangular beak at apex and narrowed at base, 4-8 x 1-1.5 cm. Seeds 3-10.

Fl.: Mar.-May. *Fr.*: July-Oct.

Ecology: Very common; in dry forests, usually mixed with Sal.

Distribution : Throughout the drier part of India, particularly in Punjab, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Sikkim, Assam, Orissa, Andhra Pradesh, Tamil Nadu, Maharashtra and Rajasthan. Pakistan, Nepal, Bangladesh, Myanmar.

Specimens examined : National Park, 137; Raja Rappa, 864; Pratappur, 1543; Koderma Forest, 1785.

Uses : Wood is largely used for house posts, agricultural implements, oil and sugarcane crushers, ploughs, furniture, stocks and felloes of wheels, bedpost legs, tool-handles, etc. Wood yields, after boiling the chips, the kath which is used for chewing with betel and also for printing and dyeing purposes.

3. *Acacia nilotica* (L.) Del. ssp. *indica* (Benth.) Brenan in Kew Bull. 12:84. 1957; Ali in Nasir & Ali, Fl. W. Pakistan 36:11. 1973; *Acacia arabica* (Lam.) Willd. var. *indica* Benth. in Hook., Lond. J. Bot. 1: 500. 1842. Kosterm. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 488. 1980.

A. nilotica (L.) Del. var. *indica* (Benth.) Hill in Bot. Mus. Leaflet. Harvard Univ. 8: 99. 1940.

A. arabica auct. non (Lam.) Willd.: Baker in Hook. f., Fl. Brit. India 2: 293. 1878, *p. maj. p.*; Prain, Bengal Pl 1: 458. 1903; Haines, Bot. Bihar & Orissa pt. 3: 324. 1922.

Local name: Babul.

Small tree, to 10 m tall, with black longitudinally fissured bark; branchlets grey-pubescent when young. Leaves alternate, 2-pinnate, 5-10 cm long; main rachis downy, with several glands; petiole 2.5-5 cm long; stipular thorns straight, 0.6-1 cm long, sharp, white; pinnae 4-7 pairs, 3.5-5 cm long; leaflets 18-25 pairs, overlapping, linear-oblong, rounded at apex, obliquely obtuse at base, entire, glabrous, 4-5 mm long. Flowers yellow, in usually solitary globose head of 1 cm across; sometimes 2 or 3 together in an axillary cluster. Peduncle pubescent, 1.5-3 cm long. Bracteoles 2, broadly ovate, acute, near or above mid-peduncle. Calyx ca. 1.5 mm long; teeth very short. Corolla 2.2 -2.5 mm long; lobes short, triangular. Stamens basally connate. Ovary stipitate. Pods stipitate, moniliform, compressed, constricted at sutures between seeds, grey-pubescent, 8-16 x 1.2-1.5 cm, horned at apex. Seeds 10-12.

Fl. : Aug.-Dec. *Fr.* : Jan.-Apr.

Ecology: Common; in river-banks, waste lands, along roadsides, etc.

Distribution : India: Punjab, Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, Deccan Peninsula; Pakistan, Arab, Egypt, Tropical Africa.

Specimens examined : Hazaribagh, 511; Chowparan, 1367.

Uses: The gum is used medicinally and by the calico-printer, and also form an inferior substitute for true-Gum-Arabic. The bark and the pods supply a valuable tanning material. The green pods, young shoots and leaves form an excellent fodder. The timber is hard and durable and extensively used for wheels, well-curbs and fuel.

4. *Acacia pennata* (L.) Willd., Sp. Pl. 4: 1090. 1806; Baker in Hook. f., Fl. Brit. India 2: 297. 1878, *p.p.* excl. *A. megaladana* Desv. & *Mimosa torta* Roxb.; Prain, Bengal Pl. 1: 458. 1903; Haines, Bot. Bihar & Orissa pt. 3: 327. 1922; *Mimosa pennata* L., Sp. Pl. 522. 1753.

Local name: Biswul.

Scandent shrub, armed with numerous stout straight or slightly hooked prickles; branches \pm angled with prickles on angles; branchlets yellowish-tomentose. Leaves 2-pinnate, alternate, 7-14 cm; main rachis densely pubescent, prickly; petiole 1.5-2 cm, with a gland near middle or base; pinnae 8-14 pairs, 3-6 cm long, sub-sessile, usually curved; leaflets 40-50 pairs, overlapping, sessile, linear, obtuse, unequal sided, obliquely round or truncate at base, 5-8 mm long. Flowers white or pale-yellow, in globose heads of 1-1.2 cm across, 1-3 together in a cluster in terminal or axillary panicles. Bracts linear-lanceolate, to 8 mm long. Bracteoles *ca.* 1 mm long. Calyx glabrous, to 2.5 mm long; lobes linear-lanceolate, acute. Petals creamish, *ca.* 4 mm long. Stamens basally connate. Pods stipitate, flat, thin, obtuse at apices, horned, suture undulate or straight, obscurely nerved, 15-20 \times 1.8-3 cm. Seeds 8-14, ovoid-oblong, compressed, dark-brown.

Fl. : June-Aug. *Fr.*: Nov.-Feb.

Ecology : Common; in forests, along roadsides, etc.

Distribution : India: Central and Eastern Himalaya, Bihar, Peninsula; Sri Lanka, S.E. Asia, China, Myanmar, Malesia, Tropical Africa.

Specimens examined : National Park, 480; Ghanghree, 1655; Koderma Forest, 1991.

Uses: Wood is used for agricultural implements. Bark-extract is used tanning fishing-nets. Decoction of leaves is used as a febrifuge.

5. *Acacia torta* (Roxb.) Craib in Kew Bull. 1915: 410. 1915; Haines, Bot. Bihar & Orissa pt. 3: 327. 1922; *Mimosa torta* Roxb., Fl. Ind. 2: 566. 1832.

A. pennata auct. non (L.) Willd. : Baker in Hook. f., Fl. Brit. India 2: 297. 1878, *p.p.*; Prain, Bengal Pl. 1: 459. 1903.

Local name : Aila.

Large scramble or straggler, to 6 m tall. Stems and branches 5-angled with 5 lines of prickles. Branchlets yellowish-pubescent; thorns straight, to 5 mm long. Leaves alternate, 2-pinnate, to 20 cm long; main rachis pubescent, grooved, prickled; petiole prickled, with a gland at base, 3-4 cm long. Pinnae 10-14 pairs, 4.5-9 cm; leaflets 30-40 pairs, not overlapping, elliptic, sub-acute at apex, truncate at base, entire, glabrous, inequilateral, 4-8 x 2 mm. Stipular thorns absent. Flowers white, crowded in head of *ca.* 1 cm across, 1-3 together in a cluster in terminal panicles. Peduncle 1.5 cm long. Bracts lanceolate, 0.5-1 cm long. Calyx-tube to 1 mm long, pubescent. Petals 1.8-2 mm long. Stamens basally connate. Ovary stipitate. Pods stipitate, flat, attenuate at base, obtuse at apex, prominently nerved, 8-14 x 2-3 cm, rusty-tomentose when young. Seeds 4-6.

Fl. : May-July. *Fr.*: Dec.-Mar.

Ecology: Common, in forests, roadsides, etc.

Distribution : India: Punjab, Bihar, Bengal, Madhya Pradesh, Maharashtra and Tamil Nadu. Pakistan.

Specimens examined: National Park, 402; Pratappur, 598; Koderma Forest, 2001.

Uses : Bark is used as a substitute for soap for washing hair. Bark-extract is employed as protective coating for fishing nets.

2. ALBIZIA Durazz.

Key to the Species

- | | |
|--|----------------------------|
| 1a. Heads panicled. Flowers sessile | ... 2. <i>A. procera</i> . |
| 1b. Heads not panicled, 1-4 together in axils of leaves. Flowers pedicellate | ... 1. <i>A. lebbeck</i> |

1. *Albizia lebbek* (L.) Benth. in Hook., Lond. J. Bot. 3: 87. 1844 ('lebbek'); Baker in Hook. f., Fl. Brit. India 2 : 298. 1878; Prain, Bengal Pl. 1 : 461. 1903; Haines, Bot. Bihar & Orissa pt 3: 332. 1922; *Mimosa lebbek* L., Sp. Pl. 516. 1753.

Local name : Siris.

Large tree, to 25 m tall. Branchlets glabrescent. Stipules small. Rachis to 20 cm long, sparsely pilose, with usually a gland near its base and smaller ones between bases of 1 to 2 terminal pinnae; pinnae 2-4 pairs, 5-10 cm long; leaflets sessile, 4-9 pairs, elliptic to oblong, apical ones usually obovate-elliptic, obliquely rounded or subcuneate at base, obtuse or retuse at apex, glabrous above, pubescent beneath, 1.5-6 × 1-2.5 cm, terminal ones larger. Heads to 4 cm across, 1-4 together in axils of leaves of young shoots; peduncle 5-10 cm long. Flowers pedicellate. Calyx funnel-shaped 2-3 mm long, pubescent. Corolla 5-7 mm long, infundibuliform puberulous; lobes ovate-lanceolate. Filament-tube shorter than Corolla-tube. Pod glabrous, glossy, pale straw, oblong, obtuse at both ends, 10-30 × 2.5-5 cm. Seeds 4-12, oval, to 1.5 × 0.75 cm.

Fl. : Apr.-June. *Fr.* : Nov.-Mar.

Ecology : Very common; planted along roadsides, gardens, etc.; also self-sown in village surrounding.

Distribution : Throughout India, Tropical Asia, Africa and North Australia.

Specimens examined: Hazaribagh, 2; Simaria, 1622; Joynagar, 1803.

Uses : Wood is used for building and furniture; also for construction purposes, agricultural implements, etc. Bark is applied for tanning fishing nets. Leaves and seeds are useful in eye troubles.

2. *Albizia procera* (Roxb.) Benth. in Hook., Lond. J. Bot. 3: 89. 1844; Baker in Hook. f., Fl. Brit. India 2: 299. 1878; Prain, Bengal Pl. 1: 461. 1903; Haines, Bot. Bihar & Orissa pt. 3: 331. 1922; *Mimosa procera* Roxb., Pl. Corom. 2: 12, t. 121. 1798.

Local name : Safed siris.

Large tree, to 30 m tall. Rachis 30-45 cm long, glabrescent, with a large gland near base of petiole; pinnae 2-6 pairs, 12-15 cm long, with usually a gland between upper 1-3 pairs of leaflets; leaflets 4-12 pairs, shortly petioluled, oblong or rhomboid-oblong, obliquely truncate at base, obtuse at apex, glabrous, grey beneath, 2.5-5 x 1.2-3 cm. Heads conspicuously paniced. Flowers sessile, 5-6 mm long. Calyx funnel-shaped, 2-2.5 mm long, glabrous; teeth minute. Corolla greenish white, twice the length of calyx, deeply cleft. Pods shortly stalked, thin, strap-shaped, brown, 10-20 x 1.2-2.5 cm. Seeds 8-12.

Fl.: Aug.-Sept. *Fr.*: Dec.-May.

Ecology : Common; in forests near streams, roadsides, etc.

Distribution : India: Central and Eastern Himalayas, Central India, Bihar, West Bengal, Orissa, Western Peninsula. Myanmar, Malesia, Pakistan, etc.

Specimens examined : Hazaribagh, 1205; Etkhori, 1862.

Uses: Wood is useful for similar purposes like that of *A. lebbeck*.

3. LEUCAENA Benth.

Leucaena leucocephala (Lam.) de Wit in *Taxon* 1: 54. 1961 & 24: 352. 1975; Ali in Nasir & Ali, *Fl. W. Pakistan* 36: 1973; *Mimosa leucocephala* Lam., *Encycl.* 1: 12. 1783.

L. glauca Benth. in *Hook., J. Bot.* 4: 416. 1842; Baker in *Hook. f., Fl. Brit. India* 2: 290. 1878; Prain, *Bengal Pl.* 1: 455. 1903; Haines, *Bot. Bihar & Orissa pt.* 3: 321. 1922.

Local names : Subaval, Vilatibaval.

Large shrub or small tree, to 8 m high. Branchlets finely pubescent. Stipules very small, caducous. Rachis to 20 cm long; petiole to 7.5 cm long, swollen at base, with a large, oval gland above base; pinnae 4-8 pairs, 2-10 cm long; leaflets 10-20 (-30) pairs, subsessile, linear-oblong, obliquely cuneate at base, acute at apex, glabrous above, pubescent and glaucous beneath, 10-15 x 3-4 mm lowest and terminal ones smallest. Heads solitary

or in pairs, 1.5-2.5 cm in diam. Bracts ovate, as long as calyx. Calyx with triangular ciliate teeth. Corolla whitish, 3.5-4 mm long; petals finely pubescent. Stamens twice the length of corolla; anthers hairy; connective granular on back. Ovary shortly stipitate, pubescent. Pod straight, to 20 x 1.5 cm. Seeds 15-20, narrowly oval, brown, to 8 x 4 mm.

Fl. May-Aug. *Fr.:* July-Oct.

Ecology: Very common; planted in roadsides, gardens, vacant lands for afforestation; also self-grown.

Distribution: Throughout India. Native of Tropical America, now Pantropical.

Specimens examined: Ramgarh, 1122; Hazaribagh, 1567.

Uses: Plant is used as a good fodder. Wood is used as pestles, handles, etc.

4. MIMOSA L.

Key to the Species

- 1a. Pinnae digitately arranged; stamens as many as petals. Woody herbs to undershrubs ... 2. *M. pudica*
- 1b. Pinnae pinnately arranged. Stamens twice the number of petals. Large shrubs to small trees ... 1. *M. intsia*

1. *Mimosa intsia* L. Sp. Pl. 522. 1753; Ali in Taxon 16: 237. 1967.

M. rubicaulis Lam., Encycl. 1: 20. 1784; Baker in Hook. f., Fl. Brit. India 2: 291. 1878, *p.p.*; Prain, Bengal Pl. 1: 456. 1903; Haines, Bot. Bihar & Orissa 3: 323. 1922.

M. octandra Roxb., Pl. Corom. 2: 55, t. 200. 1805.

Local name: Shia kanta.

Straggling shrubs to small tree, to 8 m tall. Branches angular, densely tomentose when young, with close scattered slightly curved prickles.

Leaves 2-pinnate, 7-20 cm long, partially sensitive to touch; rachis slender, very prickly. Pinnae 8-12 pairs, shortly stalked, 2-4 cm long; leaflets 10-20 pairs, overlapping, oblong-elliptic, unequal sided, obliquely rounded at base, obtuse and mucronate at apex, glabrous above, slightly pubescent beneath, 6-15 x 3-4 mm. Stipules linear, 5-6 mm long. Stipels very minute. Flowers in globose heads of 1.5 cm across 3-5 together in a cluster on thyriform, axillary, 7-10 cm long racemes. Peduncle 2.5-3.5 cm long, densely pubescent. Bracteoles solitary, linear-spathulate, ciliate at apex. Calyx minute, *ca.* 1 mm long, with 4 very short teeth. Petals 4, rose to pink, ovate-oblong, 2.5-3 mm long. Stamens 8, in 2 whorls, 5-6 mm long. Pods stipitate, falcate, obtuse, shortly horned, 5-7-jointed, with slightly aculeate or unarmed sutures, 7-10 x 1-1.5 cm. Seeds ovoid, to 7 x 6 mm.

Fl.: July.-Oct. *Fr.* : Jan.-Apr.

Ecology : Very common; in forests, along roadsides, etc.

Distribution : Almost throughout India. Bhutan, Afghanistan.

Specimens examined : Raja Rappa, 363; Chatra, 1100.

Use: Wood is suitable for making charcoal.

2. **Mimosa pudica** L., Sp. Pl. 518. 1753; Baker in Hook. f., Fl. Brit. India 2: 291. 1878; Prain, Bengal Pl. 1: 456. 1903; Gamble in Kew Bull. 1920: 4. 1920; Haines, Bot. Bihar & Orissa pt. 3: 322. 1922.

Local name: Lajwati.

Prostrate, scandent or decumbent, annual-perennial, diffuse, woody herbs or undershrubs, to 1 m long. Stems and branches prickly and bristly. Leaves digitate; pinnae 1-4 pairs, subsessile, 4-9 cm long, sensitive to touch. Petiole and rachis bristly; leaflets 6-25 pairs, sessile, linear-oblong, truncate at base, obtuse and mucronate at apex, glabrous above, with bristles underneath and on margins, 6-10 x 1.5-2 mm. Stipules linear-lanceolate, bristly, 6-8 mm long. Flowers in globose heads of to 1 cm across, 1-4 together in axillary fascicles. Peduncles slender, prickly, 2-4 mm long. Bracteoles solitary, linear, carinate, denticulate at margin, mucronate, 1.5-2 mm long. Calyx very minute, hardly toothed. Corolla pinkish, 2-2.5 mm long; lobes 4, ovate-oblong, pilose. Stamens 4, much-exserted, 5-6 mm long.

Pods clustered, falcate-oblong, 3-5-jointed, glabrous, bristly on sutures, 1-2 x 0.3-0.4 cm. Seeds obovate, to 2 x 1.5 mm.

Fl. & Fr. : July-Dec.

Ecology : Very common; along roadsides, waste places, agricultural fields, etc.

Distribution : Throughout the hotter parts of India. Native of South America, now Pantropical.

Specimens examined : Hazaribagh, 257; Ghanghree, 1304; Jhumri Telaiya, 1760.

Uses : Decoction of root is used in urinary complaints. Juice of leaves is used for sinus, sores and piles.

5. PITHECELLOBIUM Mart., *nom. cons.*

Pithecellobium dulce (Roxb.) Benth. in Hook., Lond. J. Bot. 3: 199. 1844; Baker in Hook. f., Fl. Brit. India 2: 302. 1878; Prain, Bengal Pl. 1: 402. 1903; Haines, Bot. Bihar & Orissa pt. 3: 335. 1922.

Mimosa dulcis Roxb., Pl. Corom. 1: 67, t. 99. 1795.

Local name : Vilayati babul.

Tree, to 10 m tall. Stipular spines 0.5-1 cm long, pointing upwards. Rachis 0.5-2 cm long, glabrous, glandless; pinnae 2, with a small, cupped gland between their bases and a similar gland between bases of petiolules; leaflets 1-jugate, oblique, obovate-oblong, obtuse to subacute, rigidly coriaceous, glabrous, 2-5 x 1-2 cm. Panicle narrow, terminal, 10-20 cm long and 1.8-2 cm in diam.; heads in panicle densely arranged, shortly peduncled, 1-1.2 cm broad, solitary or 2-3 together in axils of small, lanceolate bracts of 1-2 mm long; calyx sub-campanulate, grey-downy, to 1.2 mm long, shortly toothed. Corolla white, densely puberulous, to 3 cm long; tube funnel-shaped, wide, longer than ovate, acute lobes. Staminal tube longer than to as long as corolla-tube. Ovary puberulous, shortly stipitate. Pod turgid, usually curved into a circle, to 5 cm diam., sometimes

falcate, slightly lobed between seed-bearing parts, 10-15 x 0.8-1 cm. Seeds 6-8, obovate-oblong, enveloped in pink to white aril.

Fl. : Jan.-Mar. *Fr.* : Apr.-June.

Ecology : Common; planted in roadsides, gardens, parks, etc., also self-grown.

Distribution : Almost throughout India. Native of Mexico, naturalised in all Tropical Countries.

Specimens examined : Jhumri Telaiya, 286; Patratu, 1328.

Uses : Pods used as a cattle fodder. Seeds are eaten raw, or in curries. Plant is useful for hedges and as fuel. Wood is used for construction purposes.

6. PROSOPIS L.

Prosopis cineraria (L.) Druce in Rep. Bot. Exch. Club. Brit. Isles 1913, 3 : 422. 1914; Ali in Nasir & Ali, Fl. W. Pakistan 36: 29. 1973. *Mimosa cineraria* L., Sp. Pl. ed. 2, 1500. 1763.

P. spicigera L., Mant. Pl. 1: 68. 1767; Baker in Hook. f., Fl. Brit. India 2: 288. 1878; Prain, Bengal Pl. 1: 453. 1903; Haines, Bot. Bihar & Orissa pt. 3: 320. 1922.

Local name : Jhand.

Small thorny tree, to 10 m high. Branches spreading, slender, grey pubescent. Prickles nearly straight, straw-coloured, 4-6 mm long. Rachis 1.2-5 cm long; pinnae mostly 2 pairs, 2.5-5 cm long; leaflets 7-12 pairs, sessile, ligulate, with an ascending cusp, grey, glabrous, 0.6-1.2 cm long. Spikes axillary, short-peduncled, 5-7 cm long. Flowers small, 5-merous; bracts and bracteoles absent. Calyx truncate. Corolla 2-2.3 mm long. Stamens 10, free, slightly exserted; anthers with apical gland. Ovary stipitate, many-ovuled. Pod straight, cylindric, torulose, glabrous, narrowed gradually at base into a short stalk, 10-15 x 0.5-0.6 cm. Seeds 10-15, oblong, dull brown.

Fl. : Feb.-Apr. *Fr.* : May-Aug.

Ecology : Not common; in drier forests, roadsides, etc.

Distribution : India: Punjab, Rajasthan, Gujarat, Maharashtra, Tamil Nadu, Bihar. Pakistan, Afghanistan, Persia, Arabia.

Specimens examined : Bishnugarh, 1112; Koderma, 1995.

Uses : Wood is suitable for construction work, agricultural implements, tool-handles, turnery articles and well-crubs; also used as fuel. Pods are used as fodder.

7. SAMANEA (Benth.) Merr.

Samanea saman (Jacq.) Merr. in J. Wash. Acad. Sci. 6: 47. 1916; Kosterm. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 1: 123. 1980. *Mimosa saman* Jacq., Fragm. 15, t. 9. 1800.

Pithecolobium saman Benth. in Hook., Lond. J. Bot. 3: 101. 1844.

Enterolobium saman (Jacq.) Prain in J. Asiat. Soc. Bengal 66: 252. 1857 & Bengal Pl. 1: 463. 1903; Haines, Bot. Bihar & Orissa pt. 3: 335. 1922.

Local name : Vilaiti siris.

Tree, to 25 m tall, with spreading crown. Branchlets pubescent. Stipules small, lanceolate, caducous. Rachis 20-25 cm long, with no gland at base but with glands between bases of pinnae; petiole 1-1.5 cm long, swollen at base; pinnae 3-7 pairs, 3.5-15 cm long; leaflets 12-16 pairs in upper pinnae and 6-10 pairs in lower, trapezoid to ovate-oblong, truncate to cuneate at base, glossy and glabrous above, softly pubescent beneath, 2.5 x 1-3 cm. Heads solitary or 2-3 together in axils of upper leaves; peduncle 4-8 cm long. Flowers subsessile. Bracts lanceolate, pilose, to 2.5-mm long. Calyx funnel-shaped, pilose, 3-5 mm long; teeth triangular. Corolla pinkish, funnel-shaped, 0.8-1.2 cm long; lobes ovate, half as long as tube. Filaments pink, to 3 cm long, connate at base in a short tube. Ovary sessile. Pods straight, depressed between seeds, with thickened sutures; epicarp thin, glossy brown, mesocarp light brown. Seeds 16-20, ovate, brown, to 1 x 0.6 cm.

Fl. : May-June.

Ecology: Common; planted in roadsides, gardens, railway stations; also self-sown in villages.

Distribution : Throughout the tropical parts of India. Native of South America, now Pantropical.

Specimens examined: Hunterganj, 949; Tandwa, 1882.

Uses: Leaves and pods are eaten by cattle. Wood is used for making furniture.

59. CAESALPINIACEAE

Key to the Genera

- 1a. Leaves 1-pinnate or simple:
 - 2a. Leaves 1-pinnate:
 - 3a. Petals absent. Receptacle elongated.
Sepals petaloid ... 7. SARACA
 - 3b. Petals present:
 - 4a. Petals 3. Stamens 3; anthers
opening lengthwise by slit ... 8. TAMARINDUS
 - 4b. Petals 5. Stamens 5-10; anthers
opening by terminal pore or short slit ... 3. CASSIA
 - 2b. Leaves simple, emerginate or 2-lobed,
rarely entire ... 1. BAUHINIA
- 1b. Leaves 2-pinnate:
 - 5a. Sepals valvate in bud:
 - 6a. Unarmed trees. Leaf-rachis distinct.
Pods compressed, very large ... 4. DELONIX
 - 6b. Armed small trees. Leaf-rachis very
abbreviated. Pods linear, torulose .. 5. PARKINSONIA
 - 5b. Sepals imbricate in bud:

- 7a. Stigma peltate. Pods winged lengthwise along margins, indehiscent ... 6. PELTOPHORUM
- 7b. Stigma not peltate. Pods not winged, or winged only along upper margins, dehiscent or indehiscent ... 2. CAESALPINIA

1. BAUHINIA L.

Key to the Species

- 1a. Trees or erect shrubs without tendrils. Pods glabrous:
- 2a. Fertile stamens 10. Flowers whitish-yellow ... 2. *B. racemosa*
- 2b. Fertile stamens 3 or 5:
- 3a. Fertile stamens 3:
- 4a. Leaves deeply lobed. Flowers pink to purple. Flower-buds sharply angled, or winged ... 1. *B. purpurea*
- 4b. Leaves entire or scarcely divided. Flowers yellow. Flower-buds neither angled nor winged ... 3. *B. semla*
- 3b. Fertile stamens 5. Flowers white or purple. Flower-buds not angled ... 5. *B. variegata*
- 1b. Large climber with circinate tendrils. Fertile stamens 3. Pods velvety ... 4. *B. vahlii*

1. **Bauhinia purpurea** L., Sp. Pl. 375. 1753; Baker in Hook. f., Fl. Brit. India 2: 284. 1878; Prain, Bengal Pl. 1: 442. 1903; Haines, Bot. Bihar & Orissa pt. 3: 310. 1922.

Local names : Sona, Khairwal.

Large erect shrub to medium-sized tree, to 15 m tall. Twigs glabrous. Leaves ovate, usually broader than long, rigidly chartaceous, splitting 1/3-1/2 way down, broadly cordate to rounded at base, glabrous or sparsely puberulous on nerves beneath, 8-16 cm across; lobes rounded to subacute; sinus wide; petiole 2.5-3.5 cm long. Stipules 2.5-3 mm long. Racemes paniced, terminal or lateral, short-peduncled, few-flowered. Bracts and bracteoles ovate, 1-2 mm long, olivaceous tomentose. Buds fusiform,

sharply 4-5-angled, or winged. Receptacle 0.7-1.2 cm long. Sepals coherent to a spathaceous limb, 2-2.5 cm long. Petals pink to purple, oblanceolate, obtuse, glabrous, long-clawed, 3-4 cm long including claw; limb narrowly decurrent on claw. Perfect stamens 3; filaments 4-4.5 cm long, shortly connate at base, puberulous; staminodes 5-6, capillary, 0.6-1 cm long. Ovary olivaceous tomentose on sutures; stalk long; stigma broad, oblique. Pod strap-shaped, flat, glabrous, not septate, 20-25 x 2-2.5 cm. Seeds 12-20, orbicular, 4.5-5 mm across.

Fl. : Sept.-Dec. *Fr.* Jan.-Mar.

Ecology : Common; in valleys, villages, roadsides, etc.

Distribution: Almost throughout India Paleotropic.

Specimens examined : Hazaribagh, 106; National Park, 413.

Uses : Bark is used in diarrhoea. Flower-buds are used as laxative and anthelmintic, also eaten as pot-herb. Leaves are used as fodder. Wood is used for agricultural implements, rafters and scantlings.

2. ***Bauhinia racemosa*** Lam., *Encycl.* 1: 390. 1785; Baker in Hook. f., *Fl. Brit. India* 2: 276. 1878; Prain, *Bengal Pl.* 1: 441. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 308. 1922.

B. parviflora Vahl, *Symb. Bot.* 3: 55. 1794.

Local names : Kachnal, Ashta.

Small tree, to 15 m high. Branches drooping, velvety when young, later nearly glabrous. Leaves reniform, broader than long, rigidly coriaceous, splitting 1/3-1/2-way down, shallowly cordate at base, 7-9-nerved, glabrous above, greyish velvety to sub-glabrous beneath, 3-6 x 4-8 cm; lobes rounded at tip; petioles 1-3 cm long, pubescent. Stipules minute, triangular, early caducous. Racemes short-peduncled, lax, terminal and leaf-opposed, 8-15 cm long, with densely greyish pubescent rachis. Bracts minute; bracteoles diminutive, linear-subulate, inserted near base and as long as pedicels. Buds fusiform, ± falcate, with curved, pointed apex, 5-7 mm long. Receptacle turbinate, 2-3 mm long. Calyx spathaceous, 6-8 mm long. Petals white-yellow, linear-oblanceolate, as long as calyx. Stamens

10, all perfect, 5 outer longer, 6-7 mm long, 5 inner shorter; filaments densely hairy at base; anthers densely villous, 3-4 mm long. Ovary on *ca.* 2 mm long stipe; stigma inconspicuous. Pods \pm falcate, firm, turgid, glabrous, indehiscent, sometimes slightly torulose, septate, 15-30 x 1.2-2.5 cm. Seeds 12-20, oval, *ca.* 1 cm in diam.

Fl.: Apr.-June. *Fr.*: Oct.-Feb.

Ecology: Very common; in dry deciduous forests. Also planted in gardens.

Distribution: Throughout India. Sri Lanka, China, Pegu, Malay Isles, Timor, Myanmar, Thailand.

Specimens examined: Chatra, 555; Hazaribagh, 757; National Park, 2065.

Uses: Bark yields a strong cordate fibre. It is also used in dysentery. Leaves are used in diarrhoea and as anthelmintic. Decoction of leaves is given in malaria.

3. **Bauhinia semla** Wunderlin in *Taxon* 25: 362. 1976, *p.p. excl. syn.*; Panigr. in *Taxon* 35: 162. 1986.

B. retusa Roxb., *Fl. Ind.* 3: 322. 1832, non Poir. 1811, *nec* Roxb. ex DC. 1825; Baker in Hook. f., *Fl. Brit. India* 2: 279. 1878; Prain, *Bengal Pl.* 1: 441. 1903; Haines, *Bot. Bihar & Orissa* pt. 2: 322. 1922.

Local names: Kandla, Semla.

Moderate-sized tree, to 5 m tall. Branches grey-pubescent. Leaves subrotund, rather broader than long, rigidly coriaceous, entire or cleft only at very tip, cordate at base, 9-nerved, glabrous, 10-17 cm. Flowers in corymbose racemes arranged in ample terminal panicles of about 30 cm long and broad; rachis and branches grey-pubescent. Lower pedicels ascending, 1.2-2 cm long. Bracts and bracteoles minute, caducous. Buds ovoid. Receptacle turbinate, very short. Calyx 4-4.5 mm long, irregularly cleft. Petals yellow, subrhomboid above, long claw, twice as long as calyx. Perfect stamens 3. Stigma large. Pods straight, flat, suboblong, hard, glabrous, shortly stalked, 12-15 x 3-4 cm. Seeds 6-8.

Fl. : Sept.-Dec. *Fr.* : Feb.-Mar.

Ecology: Common; in valleys and slopes of low hills.

Distribution : India: Punjab, Uttar Pradesh, Himachal Pradesh, Bihar and Orissa. Pakistan, Nepal and Thailand.

Specimens examined: National Park, 92; Hunterganj, 1646.

Uses: Plant yields a gum which is used for sizing cloth and paper and as binder for charcoal briquettes. Wood is used for rafters and scantlings.

Note: According to Panigrahi (*l.c.*), "*Bauhinia roxburghiana* Voight (Hort. Suburb. Calcutt. 254. 1845), proposed as nom. nov. for *B. emerginata* Roxb. ex G. Don (Gen Syst. 2: 462. 1832), non P. Miller (1768), nec. Jacq. (1822), is established as taxonomically and nomenclaturally distinct from *B. semla* Wunderlin, 1976 (= *B. retusa* Roxb. 1832, non Poir. 1811), notwithstanding Larsen & Larsen (in Taxon 28: 591. 1979) who treated *B. semla* Wunderlin as a superfluous illegitimate name for *B. roxburghiana* Voight. Since *B. retusa* Roxb. ex DC. (1825) is conspecific with *B. retusa* Roxb. (1832) (although heterotypic), *B. retusa* DC., non Poir. is reduced as a taxonomic synonym of *B. semla* Wunderlin."

4. *Bauhinia vahlii*, Wight & Arn, Prodr. 297. 1834; Baker in Hook. f., Fl. Brit. India 2: 279. 1878; Prain, Bengal Pl. 1: 441. 1903; Haines, Bot. Bihar & Orissa pt. 3: 310. 1922.

Local names : Maljan, Mahul.

Enormous climber with abundant, mostly leaf-opposed, simple, circinate tendrils. Shoots and young parts clothed with fulvous or rusty tomentum. Leaves suborbicular, rather broader than long, 10-25 cm in diam., rigidly subcoriaceous, deeply cordate at base, glabrous or nearly so above, persistently densely tomentose beneath, splitted 1/3 -1/4 way down with a very stout point from the sinus; lobes, obtuse, entire. Racemes long-peduncled, terminal dense, subcorymbose. Bracts linear-spathulate, ferruginous-hairy, 3-4 mm long. Pedicels variable in length, reaching up to 5 cm long. Bracteoles 2, linear, sub-opposite, densely ferruginous-hairy,

persistent. Receptacle slender, tubular, densely villous, 6-8 mm long. Calyx 1-1.2 cm long, splitting into 2 ovate lobes. Petals white, 1.5-2 cm long, obovate, densely villous on back, with crisped margins. Fertile stamens 3; filaments densely villous at base; staminodes 3-7. Ovary densely tomentose; style hairy. Pods woody, velvety, 22-30 x 5-6 cm, shortly stalked, flat, finally splitting open. Seeds 8-12, oblong-ellipsoid, dark brown, polished, to 3 x 2 cm.

Fl. : Apr.-June. *Fr.* : Dec.-Mar.

Ecology : Very common; in hilly forests, ravines, etc.

Distribution : Throughout India, Himalaya.

Specimens examined : Raja Rappa, 415, 465; National Park, 2028.

Uses: Bark yields a strong fibre used for ropes. Leaves are used as plates and cups. Bark contains a quantity of tannins. Seeds are eaten raw or roasted. Young pods are used as a vegetable by tribals.

5. *Bauhinia variegata* L., Sp. Pl. 375. 1753; Roxb., Fl. Ind.-2: 319. 1832; Baker in Hook. f., Fl Brit. India 2 : 284. 1878; Prain, Bengal Pl. 1: 442. 1903; Haines, Bot. Bihar & Orissa pt. 3: 309. 1922.

B. candida Ait., Hort. Kew. 2: 49. 1789.

Local name: Kachnar.

Small to medium-sized tree, 5-10 m tall; younger parts grey puberulous. Leaves broadly ovate to usually broader than long, coriaceous, splitting about 1/4-1/3 way down, cordate at base, smooth and dull above, glaucescent and finely puberulous beneath, 6-14 x 7-16 cm; lobes broadly rounded; petioles 2.5-3.5 cm long. Stipules small, early caducous. Racemes lateral, sessile or short-peduncled, few-flowered, grey tomentose. Bracts and bracteoles ovate, minute, early caducous. Buds fusiform, turgid, minutely crested at top. Receptacle striate, 1-2.5 cm long, usually glandular-hairy. Sepals coherent to a spathaceous, 2.5-3 cm long limb. Petals pure white or purple, with one petal variegated-yellow, obovate, glabrous, ± clawed, to 5 x 3 cm. Perfect stamens 5; filaments 3.5-4 cm long; staminodes 5, capillary, 1-1.3 cm long. Ovary woolly pubescent on sutures; stipe 1.2-1.5 cm long; stigma knob-shaped. Pod strap-shaped, flat, glabrous,

rather decurved, to 15-30 x 2-2.5 cm. Seeds 12-26, orbicular, brown, 1.2-1.5 cm across.

Fl. : Feb.-Apr. *Fr.* : Apr.-June.

Ecology : Very common; in dry deciduous forests, dry rocky hills, gardens, etc.

Distribution : Throughout India. S. China, Myanmar, Laos, North Vietnam, Thailand.

Specimens examined : National Park, 406; Koderma, 658.

Uses : Bark is tonic and anthelmintic, used in scrofula and cutaneous troubles; also used for ulcers and leprosy. Young leaves and pods are eaten as vegetable. Dried buds are used for diarrhoea, dysentery and piles. Wood is used for agricultural implements.

2. CAESALPINIA L.

Key to the Species

- 1a. Pods bristly. Stipules foliaceous, pinnate, consisting of 3-5 small leaflets, persistent. Seeds 1-2. Climbing or scrambling shrubs, armed with prickles ... 1. *C. bonduc*
- 1b. Pods not bristly. Stipules simple, caducous. Seeds 4-8:
- 2a. Shrubs or small trees, unarmed. Pods prolonged at apex into a 0.4-0.5 long beak. Seeds obovoid ... 3. *C. pulcherrima*
- 2b. Climbing shrubs, armed with recurved prickles. Pods prolonged at apex into a 1.5-3 cm long beak. Seeds oblong-globose ... 2. *C. decapetala*

1. *Caesalpinia bonduc* (L.) Roxb., Fl. Ind. 2: 362. 1832, *p.p.* excl. *pl. descr.*; Larsen *et al.* in Smitinand & Larsen, Fl. Thailand 4(1): 72. 1984, non sensu Baker in Hook. f., Fl. Brit. India 2: 255. 1878. *Guilandina bonduc* L., Sp. Pl. 381. 1753.

C. crista L., Sp. Pl. 380. 1753, *p. min. p.*; Haines, Bot. Bihar & Orissa pt. 3: 317. 1922.

Guilandina bonducella L., Sp. Pl. 1:545. 1762, *nom. illeg.*

Caesalpinia bonducella (L.) Fleming in Asiat. Res. 11: 159. 1810, *nom. illeg.*; Baker in Hook. f., Fl. Brit. Ind. 2: 254. 1878; Prain, Bengal Pl. 1: 449. 1903.

Local name : Katkaranj.

Climbing or scrambling shrub, armed with straight or recurved prickles. Branches fulvous-hairy. Stipules persistent, foliaceous, pinnate, consisting of 3-5 leaflets of 1.5-2 cm long; leaf-rachis 30-50 cm; pinnae 3-9 pairs; petiolules 0.8-1 mm long; leaflets 8-12 pairs, opposite or subopposite, ovate-oblong, rounded and unequal at base, subacute or obtuse and mucronulate at apex, slightly downy beneath, 2-4 x 1-2 cm. Racemes supra-axillary, simple, sometimes branched, dense at top, lax downwards. Bracts linear, reflexed over buds, lately caducous, 1-2 cm long. Pedicels 5-7 mm long, pubescent, jointed near top. Sepals pubescent, 6-8 mm long. Petals yellow, oblanceolate, standard constricted and hairy inside towards middle. Filaments hairy. Pods shortly stalked above 0.5-1 cm long receptacle, broadly oblong, prickly, dehiscent, 5-8 x 3-5 cm. Seeds 1-2, oblong-subglobular, grey, 1.5-2 cm.

Fl. : Aug.-Oct. *Fr.* : Dec.-Apr.

Ecology: Common; in scrub jungles, hedges, etc.

Distribution: Throughout India. Pantropical.

Specimens examined : Katkamosandhi, 1404; Bishnugarh, 1933.

Uses: Fruits are used as tonic and antipyretic. Seeds yield an oil which is used as cosmetic and for discharges from ear. Leaves and bark used as febrifuge, emmenagogue and anthelmintic.

2. *Caesalpinia decapetala* (Roth.) Alston in Trim. & Hook. f., Fl. Ceylon suppl. 6: 89. 1931; Larsen *et al.* in Smitinand & Larsen, Fl. Thailand 4(1): 67. 1984. *Reichardia decapetala* Roth., Nov. Pl. Spec. 212. 1821.

C. sepiaria Roxb., Fl. Ind. 2: 360. 1832; Baker in Hook. f., Fl. Brit. India 2: 256. 1878; Prain, Bengal Pl. 1: 449. 1903; Haines, Bot. Bihar & Orissa pt. 3: 317. 1922.

Local names : Uri, Relu, Kando.

Climbing shrub, to 10 m tall, armed with strong yellowish recurved prickles. Branches rusty-pubescent. Leaves 20-35 m long; stipules foliaceous, obliquely ovate, with crisped margins, acuminate, auricled, lately caducous, 5-15 x 2-8 mm; rachis prickly; petiole to 3.5 cm long; pinnae 6-10 pairs; petiolule very short, to 1 mm long; leaflets 6-10 pairs, close, subequal, (sub) opposite, oblong, rounded or retuse at apex, subcuneate and unequal at base, entire, nearly glabrous above, puberulous beneath, 1-15 x 4-7 mm. Racemes simple, axillary and terminal, 15-30 cm long. Peduncle to 5 cm long, prickled. Bract ovate-lanceolate, densely pubescent, caducous, 6-8 mm long. Pedicels densely pubescent, jointed near top, prickled, to 3 cm long. Sepals oblong, obtuse, pubescent on both sides, 1-1.2 cm long. Petals golden yellow; the standard smaller, spathulate, constricted near middle into a claw, 7-8 mm long; lateral ones equal to lower ones, orbicular, clawed, 1-1.2 cm long. Filaments 0.8-1.2 cm long, densely woolly in lower half. Pods oblong, subtergic, straight or slightly curved, tomentose, keeled or winged in upper side, 6-10 x 2-3 cm, tipped with straight hardened style of 1.5-3 cm long; fruiting pedicel stout, woody, 2-3 cm long. Seeds 4-8, oblong-globose, greenish, to 8 x 6.5 mm.

Fl. : Dec.-May. *Fr.* : June-Sept.

Ecology : Common; in hedges, forests, etc.

Distribution : Throughout India. Sri Lanka, Nepal, Bhutan, Myanmar, Laos, S. & N. Vietnam, China, Korea, Japan, Malay Peninsula and Archipelago.

Specimens examined : Hazaribagh, 1209; Etkhori, 1455.

Uses: Bark is used for tanning. Root is used as purgative.

3. *Caesalpinia pulcherrima* (L.)Sw., Obs. Bot. 166. 1791; Baker in Hook. f., Fl. Brit. India 2: 255. 1878; Prain, Bengal Pl. 1: 449. 1903; Haines, Bot. Bihar & Orissa pt. 3: 316. 1922.

Poinciana pulcherrima L., Sp. Pl. 380. 1753.

- *Local names* : Krishnacharan, Gultorah.

Shrub or small tree, to 6 m high, glabrous, unarmed or nearly so. Stipules caducous, ca. 2 mm long; leaf-rachis 15-35 cm long, smooth; pinnae 6-9 pairs; petiolule 1-2 mm long; leaflets 6-12 pairs, opposite, close, broadly oblong to obovate-elliptic, rounded-emarginate and apiculate at apex, rounded or cuneate and very unequal at base, entire, glabrous, 1-2 x 0.6-1 cm. Racemes axillary and terminal, 15-30 cm long or more. Bracts linear, caducous, 3-7 mm long. Pedicels 5-10 cm long, jointed near top. Sepals glabrous, 1.2-1.8 cm long. Petals red or yellow, the standard smaller, with longer claw and much-crisped rounded blade, others 4 subequal, transversely oblong, to 2.5 cm long. Filaments bright red, 5-6 cm long, hairy in basal part. Pods shortly stalked above 2-5 mm long receptacle, flat, nearly straight, narrower and thinner, 7-12 x 1.5-2 cm prolonged at apex into a 4-5 mm long beak. Seeds 6-8, obovoid, to 9 x 7 mm.

Fl. : Mar.-May.

Fr. : July-Oct.

Ecology : Very common; planted in gardens, roadsides, etc., sometimes self-grown.

Distribution : Throughout India. Probably native of South America, widely cultivated throughout the Tropics.

Specimens examined: Hazaribagh, 490; Hunterganj, 2121.

Uses : Infusion of flowers is used as a pectoral and febrifuge. Bark is used as an abortifacient. Leaves are useful as purgative, tonic and emmenagogue.

3. CASSIA L.

Key to the Species

1a. Foliar glands present:

2b. Leaflets 10-60-pairs, usually within 0.3 cm broad:

- 3a. Gland on petiole stipitate. Stamens 5 ... 6. *C. pumila*
- 3b. Gland on petiole sessile. Stamens 10 ... 4. *C. mimosoides*
- 2b. Leaflets usually less than 10 pairs, exceeding 0.8 cm broad :
 - 4a. Gland near base of petiole:
 - 5a. Gland ovoid, just above base of petiole. Leaflets \pm ovate or ovate-oblong ... 5. *C. occidentalis*
 - 5b. Gland subulate, 0.5-1 cm above base of petiole. Leaflets oblong-lanceolate ... 8. *C. sophera*
 - 4b. Lowermost gland between lowest pair of leaflets:
 - 6a. Leaflets 2 pairs. Plant viscous-hairy ... 1. *C. absus*
 - 6b. Leaflets more than 2 pairs. Plant glabrous to puberulous, but never viscous-hairy:
 - 7a. Leaflets 4 pairs or more. Stamens 10, all perfect. Pods flat ... 9. *C. surattensis* ssp. *glauca*
 - 7b. Leaflets 3 pairs. Stamens 10, 7 perfect, upper 3 reduced to staminodes. Pods terete or sub-tetragonous ... 10. *C. tora*
- 1b. Foliar glands absent:
 - 8a. Stamens 10, all perfect, 2-3 lower anthers different from others. Pods terete, indehiscent:
 - 9a. Inflorescences pendulous. Flowers yellow ... 2. *C. fistula*
 - 9b. Inflorescences erect. Flowers bright rose to pink ... 3. *C. javanica*
 - 8b. Stamens 10, 7 only perfect of which 2-3 lower larger, upper 3 reduced to staminodes. Pods flat, dehiscent ... 7. *C. siamea*

1. **Cassia absus** L., Sp. Pl. 376. 1753; Baker in Hook. f., Fl. Brit. India 2: 265. 1878; Prain, Bengal Pl. 1: 438. 1903; Haines, Bot. Bihar & Orissa pt. 3: 305. 1922.

Senna exigua Roxb., Fl. Ind. 2: 339. 1832.

S. absus (L.) Roxb., l.c. 340.

Local name : Chaksu.

Erect, widely branched, viscous-hairy, annual herbs, 15-45 cm tall. Leaves long-petiolate, to 4 cm long; stipules linear, persistent, 2-4 mm long; petioles 2.5-3.5 cm long; leaflets 2 pairs, usually with a ligulate, acute gland between each pair, subsessile, very unequal-sided, obovate, elliptic-oblong or elliptic-obovate, obtuse or subacute at both ends, entire, pubescent on both surfaces, 2-3 x 1-2 cm. Racemes terminal and/or leaf-opposed, 3-8 cm long, few-flowered. Peduncle 1.5-2.5 cm long. Bracteoles linear, to 0.15 cm long, inserted near middle. Pedicels 3-4 mm long. Sepals narrowly ovate-lanceolate, viscous-hairy outside, 3-4 mm long. Petals yellow to orange-red, broadly obovate, 5-7 mm long, shortly clawed. Stamens 5, all perfect; filaments unequal, 1-2 mm long; anthers of different sizes, opening by apical slits. Ovary strigose; style glabrous; stigma spathulate, recurved, ciliate. Pods flat, strap-shaped, ligulate, short-stipitate, 3-5 x 0.7-1 cm, with oblique depressions between seeds, glandular-hairy; valves thin. Seeds 4-6 trapezoid-ovoid, black, shining, to 4.5 x 3 mm.

Fl. & Fr. : Aug.-Nov.

Ecology: Common; in open hilly jungles, waste places, etc.

Distribution : Throughout India, Palaeotropical.

Specimens examined : Ghanghree, 1205; National Park, 2019.

Uses : Seeds are used in ophthalmia and skin troubles and also as cathartic. Leaves are used in coughs.

2. **Cassia fistula** L., Sp. Pl. 377. 1753; Baker in Hook. f., Fl. Brit. India 2: 261. 1878; Prain, Bengal Pl. 1: 437. 1903; Haines, Bot. Bihar & Orissa pt. 3: 302. 1922.

Cassia rhombifolia Roxb., Fl. Ind. 2: 334. 1832.

Local names : Sundaraj, Amaltas.

Deciduous trees, to 8 m tall. Branches spreading; branchlets often drooping, glabrous. Leaves 25-40 cm long, eglandular; stipules linear, caducous, pubescent; rachis pubescent; petiole 3-6 cm long, with swollen base; petiolule 0.5-1 cm long; leaflets 4-8 pairs, (sub) opposite, broadly ovate or ovate-oblong, rigidly subcoriaceous, cuneate at base, acute or subacuminate at apex, entire, glabrous above, pubescent below, 5-13 x 2-7 cm; lateral veins many, close, prominent beneath. Petiole 3-6 cm long. Petiolule 0.5-1 cm long. Racemes few together, pendulous, lax, 20-40 cm long. Peduncle 2-5 cm long. Bracts ovate, caducous, 7-9 mm long. Pedicels 1.5-4 cm long, elongating in fruit. Sepals ovate-elliptic, velutinous outside; caducous, 7-10 x 5-6 mm. Petals bright yellow, veined, subequal, obovate, shortly clawed, 3-3.5 x 1.5 cm. Stamens 10, all antheriferous; lower 3 largers with curved 2.5-3 cm long filaments and 4-5 mm long anthers; upper 3 short with ca. 5 mm long straight filaments and minute anthers; median 4 with 0.8-1 cm long straight filaments and 3-4 mm long anthers; anthers opening by apical pores or basal slits. Ovary appressed-pubescent. Pod shortly-stipitate, pendulous, terete nearly straight, smooth, shining, brown-black, 30-60 cm long and 1-2.5 cm diam., indehiscent, with numerous (40-100) seeds horizontally immersed in a dark coloured pulp and completely separated by transverse dissepiments. Seeds broadly ovate, brownish, to 8 x 7 mm.

Fl. : Mar.-May. *Fr.* : Oct.-Apr.

Ecology: Very common; in deciduous forests, also planted in roadsides, gardens, etc.

Distribution : Throughout India. Sri Lanka, Malesia, China, Egypt and other parts of Tropics.

Specimens examined: Hazaribagh, 499; Mandu, 1347; Patratu, 1734.

Uses: Wood is much in demand for making carts and agricultural implements. Decoction of leaves and fruits are used as laxatives. Root-bark extract is applied to treatment of black-water fever.

3. *Cassia javanica* L., Sp. Pl. 379. 1753; Baker in Hook. f., Fl. Brit. India 2: 267. 1878; Haines, Bot. Bihar & Orissa pt. 3: 302. 1922.

Key to the Subspecies

- 1a. Leaflets rounded to obtuse at apex. Rachis of inflorescence stout. Calyx dark red. Petals at first pink, later dark-red, finally pale, 2.5-3.5 cm long ... 1. ssp. *javanica*
- 1b. Leaflets acute at apex. Rachis of inflorescence slender. Calyx green. Petals at first pink to nearly white, later yellowish pink, 1.5-2 cm long ... 2. ssp. *nodosa*

1. ssp. *javanica* : Larsen *et al.* in Smitinand & Larsen, Fl. Thailand 4(1) : 107. 1984.

Local name : Java-ki-rani.

Small deciduous tree, to 15 m tall; young plants with trunk armed with stumps of branches; branches numerous, spreading, glabrous. Leaves bifarious; rachis 20-30 cm long; stipules lunate, caducous, lower horn lanceolate, upper horn broader, rounded or emarginate; leaflets 5-15 pairs, short-petioled, elliptic-ovate to oblong, rounded to obtuse at apex, broadly rounded at base, dull below, appressed pubescent, 2.5-5 x 1.5-2.5 cm. Racemes erect, arising laterally from branches, forming a corymb, 5-16 cm long. Peduncle 2-3 cm long. Bracts ovate, 1-1.5 cm long. Pedicels 3-5 cm long. Bracteoles linear-oblong, 4-5 mm long. Sepals ovate, dark red to reddish brown, 0.7-1 cm long. Petals first bright rose to pink, later dark red, finally pale, obovate, shortly clawed, 2.5-3.5 x 0.7-0.8 cm. Stamens 10; upper 3 reduced to staminodes; remaining 7 perfect, of which 3 longer with 1.5-2 cm long filament and 3.5-4 mm long anthers, others 4 shorter, 0.8-1 cm long; anthers opening by basal pores. Ovary pubescent, recurved. Pods terete, glabrous, black, indehiscent, 20-60 cm long and 1-2 cm diam. Seeds 50-80, brown, flat, glossy, ± orbicular, embedded in a flat disc.

Fl. : Mar.-May. *Fr.* : Aug.-Feb.

Ecology: Common; planted in gardens, parks, forests, roadsides, etc.

Distribution : Major parts of India. Native of Malasia, Indonesia to Philippines, now widespread throughout the Tropics.

Specimens examined : Hazaribagh, 515: National Park, 974.

Use: The plant is grown as an ornamental for its beautiful pink flowers.

2. ssp. **nodosa** (Buch.-Ham. ex Roxb.) K. & S.S. Larsen in Nat. Hist. Bull. Siam. Soc. 25: 205. 1974; Larsen *et al.* in Smitinand & Larsen, Fl. Thailand 4(1) : 108. 1984. *Cassia nodosa* Buch.-Ham. ex Roxb., Fl. Ind. 2: 336. 1832; Baker in Hook. f., Fl. Brit. India 2: 261. 1878; Prain, Bengal Pl. 1: 437. 1903; Haines, Bot. Bihar & Orissa pt. 3: 303. 1922.

Deciduous tree, to 20 m high, always with an unarmed trunk. Branches spreading, younger ones downy. Leaves bifarious; rachis 22-35 cm long; stipules same as type subspecies; leaflets 6-12 pairs, oblong, acute at apex, 4-8 x 2-3 cm. Rachis of inflorescence slender. Sepals green, 4-5 mm long. Petals at first pink to nearly white, later yellowish-pink, 1.5-2 cm long. Other floral characters and characters of pod similar to type subspecies.

Fl. & Fr.: Most of the year, but chiefly during Mar.-June.

Ecology: Common; planted in forests, roadsides, gardens, parks etc.

Distribution: Major parts of India. Native of Malesia, Myanmar, Thailand and Chittagong hills, now wide-spread throughout the Tropics.

Specimens examined: National Park, 479; Raja Rappa, 877.

Use: The plant is grown as an ornamental for its beautiful flowers.

4. **Cassia mimosoides** L., Sp. Pl. 379. 1753; Baker in Hook. f., Fl. Brit. India 2: 266. 1878; Prain, Bengal Pl. 1: 439. 1903; Haines, Bot. Bihar & Orissa pt. 3: 305. 1922; de Wit in Webbia 11: 283. 1955; Larsen *et al.* in Smitinand & Larsen, Fl. Thailand 4(1): 122. 1984.

C. angustifolia Lam., Encycl. 1: 650. 1785.

Senna sensitiva Roxb., Fl. Ind. 2: 353. 1832.

S. tenella Roxb., l.c. 354.

Erect or decumbent, slender, much-branched, annual herbs, 30-60 cm high, with woody base; branches appressed pubescent. Leaves 5-10 cm long; stipules linear, persistent, 6-8 mm long; rachis slender, curved, not canaliculate, serrate or crenate-crested along upper side, sparsely pubescent; petiole 0.4-1 cm long, with a flat discoid sessile gland just below lower pairs of leaflets; leaflets 30-60 pairs, sessile, very unequal-sides, crowded and overlapping, linear-oblong, obliquely obtuse at base, acute and mucronate at apex, glabrous, sparsely ciliate along margins, 3-6 x 1-1.2 mm. Flowers axillary, mostly solitary, sometimes 2-3 together in a very short raceme. Bracts like stipules. Pedicels slender, pubescent, 0.5-1.2 cm long. Bracteoles 2, linear-lanceolate, 1.2-1.5 mm long, inserted a little below calyx. Sepals unequal, linear-lanceolate, acuminate, sparsely pilose on back, 4-7 mm long. Petals bright yellow, obovate to orbicular, short-clawed, equal to or slightly longer than sepals. Stamens 10, all antheriferous, alternately longer and shorter; filaments 1-2 mm long; anthers straight, varying in length, opening by apical pores. Ovary covered with short, stiff, appressed hairs; style recurved; stigma flat, ciliate. Pods flat, strap-shaped, shortly stipitate, linear, nearly straight, glabrescent to appressed pubescent, with more or less oblique partitions between seeds, dehiscent, 3-6 x 0.3-0.5 cm. Seeds 10-20, brown, smooth, obliquely obovoid to 4 x 2 mm

Fl. & Fr. : Aug.-Oct.

Ecology: Very common; in agricultural fields, roadsides, open grasslands, forest edges and forest clearings.

Distribution : Throughout India. Probably indigenous to continental South-East Asia; now Pantropical.

Specimens examined : National Park, 956; Ghanghree, 1306; Koderma Forest, 1760.

Use: Roots are given in spasms of stomach.

5. *Cassia occidentalis* L., Sp. Pl. 377. 1753; Baker in Hook. f., Fl. Brit. India 2: 262. 1878; Prain, Bengal Pl. 1: 437. 1903; Haines, Bot. Bihar & Orissa pt. 3: 304. 1922.

Senna occidentalis (L.) Roxb., Fl. Ind. 2: 343. 1832.

Local name : Kasondi.

Erect, diffuse, \pm glabrous, annual-perennial herbs or under-shrubs, 1-2 cm high. Stems and branches angular, striated with reddish purple. Leaves 15-25 cm long; stipules ovate, acuminate, caducous, 0.8-2 cm long; rachis glabrous; petiole 4-5 cm long, with a large ovoid gland near base of petiole; petiole *ca.* 2 mm long; leaflets 3-5 pairs, ovate or ovate-oblong, \pm unequal-sided, obliquely rounded at base, acuminate at apex, glabrous above finely pubescent beneath, 4-12 x 2.5-4.5 cm. Racemes short-peduncled, axillary and terminal, sometimes paniced, few-flowered. Peduncle 1-2 cm long. Bracts ovate-lanceolate, acuminate, caducous, 1-1.2 cm long. Pedicel 1-1.5 cm long. Sepals unequal, ovate, obtuse, mucronate, slightly tinged with pink 7-10 x 4.5-5 mm. Petals subequal, bright-yellow with violet veins, oblong-obovate, shortly clawed, 1-1.5 x 0.7-1.2 cm. Stamens 10, lower 2-3 longer with 5-6 mm long filaments and 5-7 mm long anthers; lateral 4 shorter with 2-3 mm long filaments and 5-6 mm long anthers; upper 3-4 reduced to staminodes; fertile anthers opening by terminal pores. Ovary tomentose. Pods flattened, slightly upcurved, glabrous, brown with pale margins, transversely septate, 10-15 x 0.8-1 cm. Seeds 15-30, flat, ovoid-suborbicular, 3.5-4 mm diam.

Fl. & Fr.: Sept.-Jan.

Ecology: Very common; in waste places, roadsides, grassy localities, agricultural fields, forest clearings, etc.

Distribution : Throughout India. Native of South America, now Pantropical.

Specimens examined: Hunterganj, 924; Chatra, 1081.

Uses : Leaves, roots and seeds are used medicinally against cough and whooping-cough. Plant is used in skin disease.

6. **Cassia pumila** Lam., *Encycl.* 1: 651. 1785; Baker in Hook. f., *Fl. Brit. India* 2: 266. 1878; Prain, *Bengal Pl.* 1: 439. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 306. 1922.

Senna prostrata Roxb., *Fl. Ind.* 2: 352. 1832.

Local name: Chota aura.

Prostrate or procumbent, usually branched from base, annual herbs, to 5 cm long; branches appressed-pubescent. Leaves 2.5-5 cm long; stipules linear, persistent, 0.5-1 cm long; rachis pubescent; petioles 3-7 mm long, with a *ca.* 1.5 mm long stipitate gland just above base; leaflets 10-25 pairs, subsessile, very unequal-sided, linear-oblong, cuneate at base, rounded and mucronate at apex, ciliate on margins, glabrous above, sparsely villous beneath, 4-10 x 2-3 mm with a dark purple stipitate gland between each pair. Flowers supra-axillary, solitary or more often 2-3 together in very short raceme. Bracts linear-lanceolate, 2.5-3.5 mm long. Pedicels 3-5 mm long, pubescent. Bracteoles 2, lanceolate, as long as bracts, sepals oblong-lanceolate, 3.5-5 mm long. Petals pale-yellow, unequal, oblong-obovate, 3.5-4 mm long, shortly clawed. Stamens 5, all perfect; filaments subequal, 1-1.5 mm long; anthers equal, opening by apical pores, enlarging into a short slit. Ovary appressed-pubescent; style glabrous, recurved; stigma peltate, small. Pods flat, strap-shaped, shortly stipitate, straight or slightly curved, appressed-pubescent, with oblique partition between seeds and thickened sutures, 2-4 x 0.35-0.5 cm. Seeds 6-12, subrhomboidal, flat, dark-brown, to 3 x 1.8 mm.

Fl. & Fr.: Sept.-Nov.

Ecology: Very common; along roadsides, in forests, pasture lands, sandy soil near river-banks, etc.

Distribution: Throughout India. Pakistan, Tropical Africa and Australia.

Specimens examined : National Park, 965; Pratappur, 1551.

Use: Seeds are used as purgative.

7. *Cassia siamea* Lam., *Encycl.* 1: 648. 1785; Baker in Hook. f., *Fl. Brit. India* 2: 264. 1878; Prain, *Bengal Pl.* 1: 438. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 303. 1922.

Senna sumatrana (DC.) Roxb., *Fl. Ind.* 2 : 347. 1832.

Trees, to 10 m tall; young branches striate, finely pubescent. Leaves 15-30 cm long, without glands; stipules subulate, caducous, *ca.* 1 mm long;

petiole 1.5-3 cm long; petiolule 2.5-3 mm long; leaflets 6-14 pairs, elliptic-oblong, obtuse or rounded at base, rounded or emerginate at apex with a short mucronate tip, entire, subcoriaceous, glaucous, glabrous above, finely pubescent beneath, strongly veined, 2.5-6 x 1.5-2 cm. Racemes corymbose forming a crowded terminal 15-30 cm long panicle. Penduncle 5-7 cm long. Bracts obovate, appendiculate on back, 5-6 mm long. Pedicels 2-3 cm long, grey-pubescent. Bracteole absent. Sepals ovate, concave, hairy on outer side, unequal; outer 2 smaller, 0.4-0.5 cm long; inner 3 larger, 7-9 mm long. Petals bright yellow, elliptic-obovate, shortly clawed, 1.2-1.8 x 6-8 mm. Stamens 10, unequal; upper 3 reduced to staminodes, 2-4 mm long; remaining 7 perfect of which lower 2-3 larger with 0.9-1 cm long filaments and 6-7 mm long anthers, one median and other 3-4 with 2-4 mm long filaments and 5-6 mm long anthers; anthers opening by apical pores. Ovary finely pubescent. Pods flat, nearly straight, strap-shaped, long-stipitate, dehiscent, longitudinally waved with raised suture, 15-25 x 1-1.5 cm. Seeds 20-30, flat, oval, brown, 1-1.5 x 0.5-0.6 cm.

Fl. : Sept.-Dec. *Fr.* : Jan.-June.

Ecology : Very common; planted along roadsides, in waste forest lands for afforestation, also self-grown.

Distribution : Throughout India. Native of South-East Asia, widely cultivated in the Tropics.

Specimens examined : Raja Rappa, 361; Hazaribagh, 1604.

Uses : Old wood is used for furniture. Flowers are used as vegetable. Leaves are used as green manure.

8. *C. sophora* L., Sp. Pl. 379. 1753; Baker in Hook. f., Fl. Brit. India 2: 262. 1878 [incl. var. *purpurea* (Roxb.) Baker]; Prain, Bengal Pl. 1: 438. 1903; Haines, Bot. Bihar & Orissa pt. 3: 305. 1922.

Senna purpurea Roxb., Fl. Ind. 2: 342. 1832.

S. esculenta Roxb., l.c. 346.

S. sophora (L.) Roxb., l.c. 347.

Local name: Bas-ki-Kasunda.

Erect, nearly glabrous, annual herbs or undershrubs, 1-2 m high. Leaves 10-18 cm long; stipules ovate, caducous, 4-5 mm long; petiole 3-5 cm long, with a thin subulate gland 0.5-1 cm above petiole-joint; leaflets 6-12 pairs, oblong-lanceolate, rounded at base, finely acute or acuminate at apex, 2-8 x 1-2 cm, upper ones largest. Flowers in short axillary and terminal few-flowered panicles. Bracts ovate-lanceolate, 4.5-5 mm long. Peduncle 1-2 cm long. Pedicels 1-1.5 cm long. Bracteoles absent. Sepals ovate-rounded, ca. 5-mm long. Petals yellow, obovate, shortly clawed, 1-1.2 x 0.6-0.7 cm. Stamens 10; upper 3-4 reduced to staminodes, 2-2.5 mm long, remaining 6-7 perfect of which lower 2-3 larger with 5-7 mm long filament and 5-6 mm long curved anthers, other 4 smaller, with 2-2.5 mm long filaments and 4-5 mm long anthers; anthers opening by apical pores. Ovary finely pubescent; stigma slightly swollen. Pods \pm swollen, straight or slightly curved, glabrous, 8-10 x 6-10 mm. Seeds 30-40, ovoid, compressed, 3.5-4 mm long.

Fl. & Fr. : Aug.-Dec.

Ecology: Very common; in waste places, roadsides, along railway tracks, gardens, forest glades, etc.

Distribution: Throughout India. Pantropical.

Specimens examined: Ichak, 335; Raja Rappa, 405.

Uses: Leaves, bark and seeds are used as cathartic. Juice of leaves is useful against ring-worm.

9. *Cassia surattensis* Burm. f. ssp. *glauca* (Lam.) K & S.S. Larsen in Fl. C.L.V. 18: 102. 1980; Larsen *et al.* in Smitinand & Larsen, Fl. Thailand 4(1): 120. 1984. *C. glauca* Lam., Encycl. 1: 647. 1785; Backer in Hook. f., Fl. Brit. India 2: 265. 1878, excl., var. *suffruticosa* (Heyne ex Roth) Baker; Prain, Bengal Pl. 1: 437. 1903; Haines, Bot. Bihar & Orissa pt. 3: 303. 1922.

Cassia arborescens Vahl, Symb. Bot. 3: 56. 1794.

Senna arborescens (Vahl) Roxb., Fl. Ind. 2: 345. 1832.

Moderate-sized tree, to 10 m high. Branches numerous, spreading, glabrous. Leaves 13-25 cm long; rachis pale, puberulous, with a clavate

gland between each of the 2-3 lower pairs of leaflets; stipules linear, falcate, caducous, 0.5-1 cm long; petioles 1.5-3 cm long; petiolule 1.5-2 mm long; leaflets 4-8 pairs, elliptic-oblong, cuneate at base, obtuse or subacute at apex, entire, pale green and glabrous above, glaucous and slightly pubescent beneath, 5-10 x 2.5-5 cm. Racemes corymbose, from upper leaf-axils. Bracts linear-lanceolate, acuminate, reflexed, 4-5 mm long. Pedicels 1.5-2 cm long. Sepals broadly ovate or suborbicular, unequal; outer 2 smaller, 3-4 mm long; inner 3 increasing to 6-8 cm in length. Petals yellow, broadly oblong, obtuse, shortly clawed, to 2 x 1.5 cm. Stamens 10, all antheriferous; anthers similar, opening by longitudinal slits, 5-7 mm long; lower 2 filaments longer, 3-4 mm long; others 1-2 mm long. Ovary appressed-puberulous. Pods long-stipitate, flat, straight, thin-valved, tapering to both ends, dehiscent, 15-20 x 1.2-1 cm. Seeds 20-30, oblong-ellipsoid, flattened, smooth, shining dark-brown, 6-8 x 3-4 mm.

Fl. : Nov.-Mar. *Fr.* : May-Oct.

Ecology: Common; planted in roadsides, gardens, parks, forests, etc.; also self-grown.

Distribution: Throughout India. Native to S.E. Asia, Malaya Peninsula, Malesia, etc., and distributed in Australia, Polynesia.

Specimens examined : Ghanghree, 1027; Pratappur, 1508; Telaiya Dam, 2223.

Uses: The plant is grown as an ornamental for its beautiful yellow flowers. Bark and leaves are used in diabetes and gonorrhoea.

10. *Cassia tora* L., Sp. Pl. 376. 1753; Baker in Hook. f., Fl. Brit. India 2: 263. 1878, *p.p.*; Prain, Bengal Pl. 1: 438. 1903; Haines, Bot. Bihar & Orissa pt. 3: 304. 1922, *p.p.*

Senna tora (L.) Roxb., Fl. Ind. 2: 340. 1832.

Local name : Chakunda.

Erect, nearly glabrous, annual herbs or undershrubs, 15-100 cm tall. Stems and branches grooved. Leaves 7-10 cm long; stipules linear-subulate, 1-1.5 cm long, caducous; rachis grooved, 2.5-4 cm long, with a subulate

ca. 2 mm long, gland between each of 2 lower pairs of leaflets; petiole 1.5-4 mm long; petiolule 1.5-2 mm long; leaflets 3 pairs, obovate-oblong, obtuse, broadly rounded or retuse and apiculate at apex, obliquely cuneate-rounded at base, entire, glaucous, glabrous above, appressed-pubescent beneath, 2-5 x 1.5-2.5 cm. Flowers usually in subsessile pairs in axils of leaves, , upper crowded. Peduncle 0.5-1 cm long. Bracts linear, 2-3 mm long. Pedicels 4-10 mm long. Sepals subequal, ovate, 4.5-5 x 2-4 mm. Petals unequal, bright yellow, obovate, obtuse or rounded at apex, shortly clawed, 8-10 x 5-6 mm. Stamens 10, upper 3 reduced to minute staminodes, remaining 7 perfect, subequal, with 0.15-2 cm long filaments and 1.5-2.5 mm long anthers; anthers opening by apical pores. Ovary densely pubescent. Pods terete or subtetragonous, linear, shortly stipitate, much-curved when young, obliquely septate, 12-20 x 0.4-0.5 cm. Seeds 15-30, brown, rhombohedral, uniseriate, 3-4 mm long.

Fl. & Fr.: Sept.-Dec.

Ecology : Very common; in waste places, roadsides, agricultural fields, forest glades, etc.

Distribution: Throughout India. Probably of South American origin, now Pantropical.

Specimens examined: Raja Rappa, 407; Telaiya Dam, 1845.

Uses: Leaves and seeds are used against ringworm and itch. Leaves are used as aperient.

4. DELONIX Raf.

Delonix regia (Boj. ex Hook.) Raf., Fl. Tell. 2: 92. 1837; Ali in Nasir & Ali, Fl. W. Pakistan 54: 43. 1973.

Poinciana regia Boj. ex Hook., Bot. Mag. 56, t. 2884. 1826; Baker in Hook. f., Fl. Brit. India 2: 260. 1878; Prain, Bengal Pl. 1: 446. 1903; Haines, Bot. Bihar & Orissa pt. 3: 313. 1922.

Local name : Gulmohur.

Deciduous trees, to 15 m high. Main rachis 50-60 cm long; pinnae 9-24 pairs, opposite, to 10 cm long; leaflets 14-30, sessile, oblong, rounded

at apex, with slightly oblique base, glabrous, 8-10 x 3-4 cm. Stipules pectinate caducous, \pm 2 mm long; segments linear. Inflorescence 10-15 cm long, glabrous. Pedicels 5-8 mm long. Buds obovate. Receptacle campanulate. Sepals oblong, acuminate, reddish inside. Petals unequal, orange-red, with orbicular blade and 2-3 cm long reddish claw, 5th one lined with red and orange. Stamens equal; filaments to 4 cm long, red with white base. Ovary green, velutinous. Pods slightly curved, pendulous, terminated by persistent style, 30-60 x 4-5 cm. Seeds 20-90, compressed, to 2.5 x 0.6 cm.

Fl. : Apr.-June. *Fr.* : Aug.-May.

Ecology: Common; planted as an ornamental tree in roadsides, near houses, railway platforms, etc.; also self-grown.

Distribution: Throughout India. Native of Madagascar, now widely cultivated in Tropics.

Specimens examined: Hazaribagh, 752; Koderma, 1998.

Uses: Seeds contain a gum which is used in textile and food industries.

5. PARKINSONIA L.

Parkinsonia aculeata L., Sp. Pl. 375, 1753; Baker in Hook. f., Fl. Brit. India 2: 260, 1878; Prain, Bengal Pl. 1: 446, 1903; Haines, Bot. Bihar & Orissa pt. 3: 313, 1922.

Local name : Bilaiti-kikar.

Small tree, 3-4 m tall. Young shoots glabrous, prickly. Common petiole very short, ending with a spine; pinnae 2-4; rachis broad, flattened, rigid, phylloclade-like; leaflets numerous, very small, obovate, subopposite to alternate, 2-5 x 0.8-1 mm; stipular spines 2, very short. Racemes glabrous, to 20 cm long. Bracts caducous. Pedicels to 1.5 cm long. Sepals ovate-oblong, reflexed, 5-7 mm long. Petals yellow, 1.2-1.4 cm long, with hairy claw; median one with suborbicular lamina and 6 mm long claw, lateral ones with rhomboidal lamina and short claw. Stamens subequal; filaments hairy below middle, widened towards base. Ovary sessile, hairy; stigma indistinct. Pods narrow-cylindric, glabrous, yellowish, 5-15 x 0.5-0.7 cm; seeds 6 or more, to 1 x 0.4 cm.

Fl. : Mar.-June. *Fr.* : June-Oct.

Ecology: Common; planted along roadsides, railway platforms, etc.; also self-grown.

Distribution : Tropical parts of India. Native of Tropical America, introduced and cultivated all over Tropics.

Specimens examined: Bishnugarh, 1111; Mandu, 1345.

Uses: Plant is lopped for fodder. Seeds are edible. Bark yields a fibre which is suitable for mixing with paper-pulp. Wood yields a good charcoal, also used as fuel.

6. PELTOPHORUM Benth., *nom. cons.*

Peltophorum pterocarpum (DC.) Back. ex K. Heyne., Nutt. Pl. ed. 2: 755, 1927; Ali in Nasir & Ali, Fl. W. Pakistan 54: 42.1973. *Inga pterocarpa* DC., Prod. 2: 441. 1825.

Caesalpinia inermis Roxb., Fl. Ind. 2: 367. 1832.

C. ferruginea Dcne., Nouv. Ann. Mus. 3: 462. 1834.

Peltophorum ferrugineum (Dcne.) Benth., Fl. Austral. 2: 279. 1864; Baker in Hook. f., Fl. Brit. India 2: 257. 1878; Haines, Bot. Bihar & Orissa pt. 3: 314. 1922.

Peltophorum inerme (Roxb.) Llanos in Blanco, Fl. Filip. t. 335. 1877-83.

Local name: Radhachura.

Deciduous tree, to 25 m tall; young shoots at first ferrugineous pubescent, later becoming glabrous. Leaves 25-30 cm long; stipules small, 0.1-0.2 cm long; pinnae 4-13 pairs, opposite, 8-16 cm long; leaflets 10-22 pairs, close, oblong, sessile, rounded to emerginate at apex, unequally attenuate at base, glabrous above, finely pubescent beneath, 1.2-1.8 cm x 0.5-0.7 cm. Panicle terminal, pyramidal, densely ferrugineous pubescent, 20-40 cm long. Bracts caducous, pedicels 5-7 mm long. Buds spherical.

Sepals ferruginous-pubescent outside, 5-8 mm long. Petals yellow, obovate, to 2 x 1 cm, densely hairy towards short claw. Filaments 1.2-1.5 cm long. Ovary shortly stipitate, hairy; ovules 3-4. Pods oblong, acute at apex, tapering towards base, glabrous or longitudinally veined when ripe, to 9 x 2.5 cm; wings 4-5 mm broad. Seeds 1-4, flat, brown, oblong, to 1 x 0.5 cm.

Fl. : Mar.-May. *Fr.* : Aug.-Jan.

Ecology: Common; planted along roadsides, railway platforms, etc.; also found wildy.

Distribution : Coastal forests of Andamans, grown almost throughout India. Native of South-East Asia, Cambodia, South Vietnam, Malesia, North Australia; widely cultivated in Tropics.

Specimens examined : Hazaribagh, 484; Simaria, 797.

Uses : Plant is used as shade tree in plantations and as ornamental in parks and along roadsides. Bark is used for dysentery. It is also used as constituent of gargles and tooth-powders, and lotions used for eye-troubles, muscular pains and sores. Wood is used for planks and cabinet-work.

7. SARACA L.

Saraca asoca (Roxb.) De Wilde in Blumea 15: 393. 1967; Zuijderhoudt in Blumea 15: 422. 1967. *Jonesia asoca* Roxb., Asiat. Res. 4. 355, f. 252-253. 1799.

Saraca indica auct. non L.: Baker in Hook. f., Fl. Brit. India 2: 271. 1878, *p.p.*; Prain, Bengal Pl. 1: 444. 1903, *p.p.*; Haines, Bot. Bihar & Orissa pt. 3: 312. 1922.

Local name : Asok.

Low tree, to 15 m tall. Leaves sessile, rachis 10-50 cm long; leaflets 3-7 pairs, rigidly subcoriaceous, oblong or oblong-lanceolate, rounded cordate or subcuneate at base, acute to obtuse at apex, glabrous, 5-30 x 1.5-10 cm; petiolules 0.3-0.5 cm long. Corymbs dense, 6-15 cm in

diam. Bracts ovate, 0.2-0.8 cm long. Pedicels stout, 0.6-1.5 cm long. Bracteoles similar to bracts, amplexicaul, orange-coloured. Receptacle 0.7-1.5 cm long. Sepals 4, ovate-oblong, obtuse or rounded at apex, orange-reddish, 5-12 x 2-7 cm, resembling a zygomorphic corolla, true corolla absent. Filaments long-exserted. Ovary pubescent on margins; ovules 6-8. Pods oblong-lanceolate, beaked at apex, 10-25 x 3-6 cm. Seeds 4-8, oblong, compressed, 3-3.5 cm long.

Fl. : Mar.-May. *Fr.* : Aug.-Oct.

Ecology: Common; planted in gardens, also found in forests, valleys of ravines, etc.

Distribution : Throughout India. Bangladesh, Sri Lanka, Myanmar, West of Irrawaddy River.

Specimens examined : Koderma Forest, 175; Hazaribagh, 751.

Uses: Bark is used in uterine affections, also useful in menorrhagia, leucorrhoea, internal bleeding hemorrhoids and hemorrhagic dysentery. Flowers are used in biliousness, hemorrhagic dysentery and diabetes. Wood is used for ploughs and shafts.

Note: There has been a considerable confusion in literature about the name of this plant which has been always referred to as *S. indica* L. The Indian specimens will be referred to *S. asoca* (Roxb.) De Wilde which is distinct from *S. indica* L. The basionym *Jonesia asoca* Roxb. of the name *S. asoca* (Roxb.) De Wilde is typified by a plant from Botanical Garden in Calcutta, whereas the type specimen of *S. indica* L. collected from Java. In *S. asoca*, bracteoles erect, persistent, clasping the pedicel and the species occurs in India, Bangladesh, Sri Lanka, Myanmar, west of the Irrawaddy River and cultivated elsewhere. In *S. indica*, bracteoles spreading, persistent or fugaceous and the species occurs in Thailand, Malaya Peninsula, Sumatra, Java but not west of Irrawaddy River.

8. TAMARINDUS L.

Tamarindus indica L., Sp. Pl. 34. 1753; Baker in Hook. f., Fl. Brit. India 2: 273. 1878; Prain, Bengal Pl. 1: 444. 1903; Haines, Bot. Bihar & Orissa pt. 3: 311. 1922.

Local names : Amli, Imli.

Tree, to 20 m or more tall. Petioles and rachis 5-12 cm long, glabrescent; stipules minute, caducous; leaflets opposite, oblong, rounded at base, obtuse and mucronate at apex, glabrescent, 0.8-2 x 0.3-0.9 cm. Racemes lax, terminal, 2-6 cm long, with \pm puberulous axis. Bracts ovate-lanceolate, to 5 x 3 mm long, caducous. Pedicels to 1 cm long, articulate at base of calyx. Bracteoles similar to bracts, ciliate. Receptacle 4-4.5 mm long; sepals oblong-elliptic, yellowish, hairy at base, to 1.2 cm long. Petals unequal, yellow, striped with red, 1-12 x 5-6 mm. Ovary pubescent. Pod oblong, incurved, thick, light-brown, 5-15 x 1-2.5 cm. Seeds 3-10, glossy, dark-brown, compressed, obovate-orbicular, ca. 1 cm.

Fl.: Apr.-June. *Fr.*: Dec.-Feb.

Ecology : Very common; in villages, along roadsides, etc.

Distribution : Throughout India. Probably native to Tropical Africa, now Pantropical.

Specimens examined : Koderma Forest, 144; Churchu, 1283.

Uses: Fruit-pulp is principal souring agent for sauces, chutneys and beverages. It is also used as refrigerant, carminative and laxative, its infusion is given in biliousness and fabrile conditions; also employed for polishing and cleaning metal ware. Kernels are used as food alone or mixing with cereal flour. Wood is used for agricultural implements, tool handles, wheels, rice pounders, oil mills, constructional purposes, etc.

60. FABACEAE

Key to the Genera

- 1a. Plants with hairs medi-fixed. Connective of anthers mucronate ... 17. INDIGOFERA
- 1b. Plant with hairs basi-fixed. or glabrous. Anthers not mucronate :
 - 2a. Pods indehiscent, but if dehiscent then opening along ventral suture:
 - 3a. Pods Jointed:

- 4a. Stipels present:
- 5a. Trees. Stamens dimorphous ... 26. *OUGEINIA*
- 5b. Herbs or undershrubs. Stamens uniform:
- 6a. Joints of pods turgid : ... 3. *ALYSICARPUS*
- 6b. Joints of pods flattened ... 12. *DESMODIUM*
- 4b. Stipels absent:
- 7a. Stamens monadelphous; anthers dimorphous.
Leaves digitately 2-4-foliolate ... 40. *ZORNIA*
- 7b. Stamens diadelphous, 5 in each bundle;
anthers uniform. Leaves pinnae:
- 8a. Leaves paripinnate, terminal leaflet
replaced by a bristle. Pods folded
up inside the calyx ... 33. *SMITHIA*
- 8b. Leaves imparipinnate.
Pods straight, exserted ... 2. *AESCHYNOMENE*
- 3b. Pods not jointed:
- 9a. Leaves imparipinnate:
- 10a. Trees, or sometimes woody climbers.
Leaflets entire:
- 11a. Leaflets opposite ... 28. *PONGAMIA*
- 11b. Leaflets alternate:
- 12a. Pods narrow, unwinged ... 11. *DALBERGIA*
- 12b. Pods orbicular, with a broad wing
all round ... 29. *PTEROCARPUS*
- 10b. Herbs. Leaflets toothed:
- 13a. Petals persistent, claws of wings and
keels adnate to staminal tube. Base of
stipules encircling the stem ... 36. *TRIFOLIUM*
- 13b. Petals caducous, not adnate to staminal
tube. Base of stipules not encircling the stem:

- 14a. Pods subglobose, hardly exceeding the calyx ... 23. MELILOIUS
- 14b. Pods flattened, much longer than calyx:
 - 15a. Pods spirally coiled ... 22. MEDICAGO
 - 15b. Pods straight or curved, but never coiled ... 37. TRIGONELLA
- 9b. Leaves paripinnate; rachis ending in a bristle. Herbs with hypogeal fruits ... 4. ARACHIS
- 2b. Pods dehiscent by both sutures:
 - 16a. Leaves paripinnate; leaf rachis ending in a tendril or point or bristle:
 - 17a. Stamens 9, monadelphous; vexillary stamen absent. Stipules narrow, not oblique at base ... 1. ABRUS
 - 17b. Stamens 10, diadelphous when vexillary stamen free, or monadelphous when vexillary stamen jointed to sheath. Stipules foliaceous, oblique at base:
 - 18a. Style bearded. Winged petals united to staminal tube. Leaflets entire:
 - 19a. Staminal tube with oblique mouth:
 - 20a. Ovary 1-2 ovuled; style longitudinally bearded along inner face ... 20 LENS
 - 20b. Ovary 3-many-ovuled, style with dorsal tuft of hairs; if 2-ovuled, then style with annular beard below top ... 38. VICIA
 - 19b. Staminal tube truncate at mouth:
 - 21a. Style dilated upwards throughout with margins recurved to form a channel beneath ... 27. PISUM
 - 21b. Style dilated at tip only, without recurved margins ... 19. LATHYRUS

- 18b. Style not bearded. Wing petals free from
staminal tube. Leaflets toothed ... 8. Cicer
- 16b. Leaves imparipinnate, 1-foliolate or digitately
3-7-foliolate:
- 25a. Leaves 1-foliolate or digitally 3-7-foliolate:
- 26a. Leaflets gland-dotted beneath.
Stamens diadelphous, 9+1:
- 27a. Ovary 1-2-ovuled ... 14. FLEMINGIA
- 27b. Ovary 3-more-ovuled ... 5. ATYLOSIA
- 26b. Leaflets not gland-dotted.
Stamens monadelphous, 10:
- 28a. Anthers uniform. Pods linear, compressed ... 31. ROTHIA
- 28b. Anthers dimorphous, alternately long
and short. Pods turgid or inflated ... 10. CROTALARIA
- 25b. Leaves pinnately compound:
- 29a. Leaves pinnately 3-foliolate:
- 30a. Pods dehiscing at seed-bearing apical
part only, seedless lower part
remaining indehiscent ... 6. BUTEA
- 30b. Pods dehiscing from apex to base:
- 31a. Leaflets conspicuously gland-
dotted beneath:
- 32a. Ovary 1-2-ovuled ... 30. RHYNCHOSIA
- 32b. Ovary 3-more-ovuled:
- 33a. Erect undershrubs. Stigma dilated,
oblique. Seeds exarillate ... 7. CAJANUS
- 33b. Twining or trailing herbs.
Stigma small, terminal.
Seeds with a large grooved aril ... 5. ATYLOSIA
- 31b. Leaflets not gland-dotted beneath:

- 34a. Style beardless:
- 35a. Nodes of racemes tumid.
Petals very unequal in length:
- 36a. Anthers uniform. Vexillum exceeding the wings and keel.
Armed trees or erect shrubs ... 13. ERYTHRINA
- 36b. Anthers dimorphous, alternately long and short. Vexillum shorter than wings and keel. Unarmed climbers ... 25. MUCUNA
- 35b. Nodes of racemes not tumid. Petals \pm equal in length:
- 37a. Anthers all fertile ... 16. GLYCINE
- 37b. Anthers alternately fertile and abortive ... 35. TERAMNUS
- 34b. Style bearded below stigma:
- 38a. Stigma completely lateral, oblique. Style divided into a thin basal part and thickened upper part ... 39. VIGNA
- 38b. Stigma terminal. Style uniformly flattened or thickened:
- 39a. Petals very unequal, vexillum much longer, without appendages ... 9. CLITORIA
- 39b. Petals \pm equal in length, vexillum appendaged:
- 40a. Stigma penicillate. Pods not septate ... 21. MACROTYLOMA
- 40b. Stigma not penicillate. Pods with spongy septa ... 18. LABLAB
- 29b. Leaves pinnately 5-many foliolate:
- 41a. Style beardless. Petals \pm equal in length:
- 42a. Erect or diffuse herbs, or erect shrubs:
- 43a. Racemes leaf-opposed or terminal ... 34. TEPHROSIA

- 43b. Racemes axillary or from leafless branches or older stems:
- 44a. Pods not septate; valves usually coiling in dehiscence ... 15. GLIRICIDIA
- 44b. Pods transversely septate; valves not coiling in dehiscence ... 32. SESBANIA
- 42b. Woody climbing shrubs or trees:
- 45a. Racemes axillary and leaf-opposed. Valves not coiled in dehiscence of pods ... 24. MILLETTIA
- 45b. Racemes axillary, or from leafless branches or older stems. Valves coiled in dehiscence of pods ... 15. GLIRICIDIA
- 41b. Style bearded:
- 46a. Petals very unequal in length, Vexillum much longer. Flowers axillary, solitary or paired, or in axillary racemes ... 9. CLITORIA
- 46b. Petals \pm equal in length. Flowers in terminal or leaf-opposed racemes ... 34. TEPHROSIA

1. ABRUS Adans.

Abrus precatorius L., Syst. Nat. ed. 12, 2: 472. 1767; Baker in Hook. f., Fl Brit. Ind. 2: 175. 1876; Prain, Bengal Pl. 1: 369. 1903; Haines, For. Fl. Chota Nagpur 333. 1910 & Bot. Bihar & Orissa pt. 3: 247. 1922.

Local name: Gunchi, Rati.

Slender, glabrous or appressed-hairy, deciduous, perennial twinner; stems terete, much-branched. Leaves 5-10 cm long; petioles 0.6-1.2 cm long, thickened and hairy at base; stipules linear-subulate, pubescent, deciduous, 2.5-3.5 mm long; leaflets 10-20 pairs, oblong, rounded-truncate and mucronate, rounded at base, entire, glabrous above, appressed hairy beneath, 5-15 \times 3-5 mm; petiolule to 1.5 mm long. Flowers in many-flowered terminal and/or axillary dense racemes of 2.5-15 cm long. Peduncle 5-15 cm long. Pedicels 1-1.5 mm long. Calyx 2-3 mm long, appressed-hairy outside; lobes obscure. Corolla exserted, to 1 cm long; petals clawed, rose to pink; vexillum broadly obovate, to 1.5 \times 0.8 cm;

wings narrowly oblong-falcate, to 8 x 3 mm; keels curved, to 1 x 0.2 cm. Stamens 9; staminal sheath 7-8 mm long. Ovary subsessile, pubescent. Pod oblong, appressed-hairy, truncate at base, with a sharp deflexed beak, silky pubescent, 2.5-4 x 1-1.4 cm. Seeds 3-5, subglobose, blood red, with a black lateral blotch around the hilum, 5-6.5 x 4-5 mm.

Fl. : Aug. -Sept.; *Fr.* : Jan.-Mar.

Ecology: Very common; in hedges, scrub jungles, etc.

Distribution : Throughout India. Pakistan, Sri Lanka, Bangladesh, tropical Africa; introduced and widely cultivated in New and Old World.

Specimens examined : Hazaribagh, 488; Kodema Forest, 1255.

Uses: Decoction of root and leaves is given for coughs and cold. Root is used as diuretic, tonic and emetic. Seeds are used as weights by goldsmiths and for making rosaries and ornaments. They are also used in affections of nervous system and their paste is applied locally in sciatica, stiffness of shoulder joints and paralysis.

2. Aeschynomene L.

Key to the Species

- | | |
|---|-------------------------|
| 1a. Stem spongy. Flowers 1.2-1.6 cm long. Calyx hispid. Joints of pod echinate | ... 1. <i>A. aspera</i> |
| 1b. Stem woody. Flowers 0.5-0.6 cm long. Calyx glabrous. Joints of pod muricate | ... 2. <i>A. indica</i> |

1. ***Aeschynomene aspera*** L., Sp. Pl. 713. 1753; Baker in Hook. f., Fl. Brit. India 2: 151. 1876; Prain, Bengal Pl. 1: 418. 1903; Haines, For. Fl. Chota Nagpur 343. 1910 & Bot. Bihar & Orissa pt. 3: 254. 1922.

Hedysarum lagenarium Roxb., Fl. Ind. 3: 365. 1832.

Local name : Shola.

Erect, perennial shrub, to 3 m tall. Stem glabrescent, often horizontal below, then erect, spongy, to 7 cm or more in diam. Leaves \pm sessile, 3-9 cm long; stipules setaceous, prolonged below their insertion into short

auricles, deciduous, 1.2-1.5 cm long; leaflets 50-100, alternate or opposite, sessile, oblong, obtuse and apiculate at apex, obliquely obtuse at base, glabrous, 1-nerved, 6-10 × 1-2 mm. Racemes 3-4 cm long, 2-6-flowered. Peduncle hispid, to 1.5 cm long. Pedicel to 1 cm long. Calyx 0.8-1 cm long, hispid; upper lip rounded, lower 3-lobed. Corolla yellow; vexillum glabrous, to 1.2 × 1.5 cm; wings to 8 × 4 mm; keels 1.8 × 0.8 cm, hairy outside. Staminal sheath 6-7 mm long. Ovary tomentose, to 1 cm long. Pods woody, nearly straight, 5-7 × 0.6-0.8 cm; joints 4-8, glabrous, echinate over seeds, indented along both sutures. Seeds to 6 × 5 mm.

Fl.: July-Sept. *Fr.*: Oct.-Nov.

Ecology: Very common; in tanks, jheels and other low-lying marshy areas, banks of ponds, etc.

Distribution: Southern and Eastern India. Sri Lanka, Pakistan, Myanmar, Malay peninsula, Siam, Java.

Specimens examined : Hazaribagh, 431; Ramgarh, 2304.

Uses: Soft spongy stems yields pith having high insulating properties; used for making sun-hats, toys, artificial flowers, ear-tops and other decorations; also employed for bottle-corks, swimming jackets, life-belts and paper. Leaves are used as a pot herb.

2. *Aeschynomene indica* L., Sp.Pl. 713. 1753; Baker in Hook. f., Fl. Brit. India 2: 151. 1876; Prain, Bengal Pl. 1: 418. 1903; Haines, For. Fl. Chota Nagpur 343. 1910 & Bot. Bihar & Orissa pt. 3: 254. 1922.

A. pumila L., Sp. Pl. ed. 2, 1061, 1763.

Hedysarum Neli-Tali Roxb., Fl. Ind. 3: 365. 1832.

Smithia aspera Roxb., Fl. Ind. 3: 343. 1832.

Local name : Kath-Shola, Laughauni.

Erect, often much-branched, slender, annual undershrub, 30-90 cm tall. Stem fistular, warty, hairy on younger parts, pale-green. Leaves 2-8 cm long; stipules lanceolate, acuminate, prolonged below their insertion into acute auricles, to 1 cm long; leaflets 20-70, alternate, sub-sessile,

lanceolate-oblong to elliptic, obtuse and apiculate at apex, obliquely rounded-subcordate at base, somewhat glaucous beneath, 3-9 x 1.5-2.5 mm. Racemes 2-3 cm long, 1-4-flowered. Peduncle glabrous, to 1.5 cm long. Pedicels 2.5-3 mm long. Bracts foliaceous, bristle-toothed, 1-2 mm long. Bracteoles linear-oblong, acute, 3-4 mm long. Calyx 5-6 mm long, glabrous; upper lip retuse or bifid, punctate; lower lip shortly 3-toothed. Corolla yellowish-pink; vexillum to 6 x 6 mm, streaked with purple; wings to 6 x 3 mm; keels 7 x 3 mm. Staminal sheath 3.5-4 mm. Pods straight or slightly curved, shallowly incised along the 3 lower suture, 6 to 10-jointed, 2.5-5 x 0.5 cm, muricated on both faces. Seeds 1.5-2 x 1.5-1.8 mm.

Fl. & Fr.: Sept.-Nov.

Ecology: Very common; in low lying moist places, fallow fields, banks of ponds, rice-fields, agricultural fields, etc.

Distribution: Throughout India. Native of S.E. United States, now pantropical.

Specimens examined: Hazaribagh, 128; Ghanghree, 2172.

Uses: Almost similar to *A. aspera*.

3. ALYSICARPUS Neck. ex Desv., *nom. cons.*

Key to the Species

- 1a. Calyx not exceeding the first joint of pod:
- 2a. Pod moniliform, veinless, turgid, stem clothed with fine spreading hairs ... 2. *A. monilifer*
- 2b. Pod not moniliform, reticulato-venose:
- 3a. Pod compressed, shallowly indented along both sutures. Calyx shorter than first joint of pod. Stem densely clothed with brownish, spreading hairs. ... 1. *A. hamosus*
- 3b. Pod subterete, not or hardly indented. Calyx equalling the first joint of pod. Stem glabrescent. ... 4. *A. vaginalis*
- 1b. Calyx much longer than first joint of pod. Raceme dense. Pod-joints transversely ribbed. ... 3. *A. rugosus*.

1. *Alysicarpus hamosus* Edgew. in J. Asiat. Soc. Bengal 21: 171. 1853; Baker in Hook. f., Fl. Brit. India 2: 157. 1876; Prain, Bengal Pl. 1: 427. 1903; Haines, Bot. Bihar & Orissa pt. 3: 259. 1922.

Hedysarum procumbens Roxb., Fl. Ind. 3: 345, 1832, non Mill. 1768.

Alysicarpus procumbens (Roxb.) Schindl. in Fedde Repert. 21: 11. 1925; Raizada in Ind. For. 92: 301. 1966; Bhandari, Fl. Ind. Desert 108. 1978.

Prostrate, procumbent or ascending, diffuse, hirsute, annual herbs. Stems numerous, slender, rooting at lower nodes. Leaves 1-foliolate; petioles 3-6 mm long, hairy; stipules 6-7 mm long, linear, acute, striate; leaflets 1.2-3 x 0.8-1 cm, broadly ovate or suborbicular, obtuse and mucronate at apex, rounded or subcordate at base, entire, appressed-hairy on both surfaces; petiolules short, hairy; stipels minute, scarious. Racemes lax, axillary. Flowers 3-4 mm long; rachis filiform, hirsute; pedicels 2-2.5 mm long. Bracts scarious, ovate, ciliate. Calyx 2.5-3 mm long; lower 3 segments linear-lanceolate, acute, ciliate. Pods 1.2-1.5 x 0.3-0.5 cm, falcate-oblong, compressed 3-7-jointed, appressed-hairy on faces, with hooked hairs along sutures, reticulatovenose.

Fl. & Fr. : Aug. -Nov.

Ecology: Common; in open grassy places, sandy river-beds, roadsides, etc.

Distribution : Western Peninsula, Madhya Pradesh, Rajasthan, Uttar Pradesh, Bihar. Pakistan.

Specimens examined : Satgawan, 583; National Park, 986.

2. *A. monilifer* (L.) DC., Prodr. 2: 353. 1825; Baker in Hook. f., Fl. Brit. India 2: 157. 1876; Prain, Bengal Pl. 1: 427. 1903; Haines, Bot. Bihar & Orissa pt. 3: 258. 1922; Ali in Biologia 12: 34. 1966 & in Nasir & Ali, Fl. W. Pakistan 100: 345. 1977.

Hedysarum moniliferum L., Mant. Pl. 102. 1767.

Slender, much-branched, tufted, procumbent, perennial herbs, often with a woody base. Branches to 50 cm long, patent-hairy when young,

later glabrescent. Leaves 1-foliolate; petiole 2-4 mm long, hairy; stipules 3-4 mm long, lanceolate, acute, striate; leaflet oblong-elliptic, chartaceous, rounded and mucronate, obtuse-subcordate at base, entire, glabrous above, slightly hairy on nerves beneath, 0.6-3 x 0.4-2 cm; petiolule ca. 1 mm long; stipels minute, filiform, ca. 0.5 mm long. Racemes axillary, 3-10-flowered. Pedicels ca. 1.5 mm long. Calyx obscurely hairy, 2-3 mm long; segments narrow-lanceolate, acute, striate. Corolla pinkish; vexillum to 6 x 2 mm; wings to 5 x 2 mm; keels to 6 mm. Staminal sheath 4-6 mm long. Ovary ca. 4 mm long. Pods moniliform, turgid, 1-8 jointed, to 2.5 x 0.25 cm, with downy and hooked hairs; joints subglobose, not reticulately veined. Seeds ovoid, to 2 mm long.

Fl. & Fr.: Apr. -Oct.

Ecology: Very common; in dry waste lands, waysides, grassy places, railway tracks, etc.

Distribution: Throughout India. Myanmar, Pakistan, Sudan, Ethiopia.

Spicimens examined: Jhumri Telaiya, 661; Gola, 777; Simaria, 1621.

3. *Alysicarpus rugosus* (Willd.) DC., Prodr. 2: 353. 1825; Baker in Hook. f., Fl. Brit. India 2: 159. 1876; Prain, Bengal Pl. 1: 428. 1903; Haines, Bot. Bihar & Orissa pt. 3: 258. 1922. *Hedysarum rugosum* Willd., Sp. Pl. 3: 1172. 1802.

Erect or ascending, annual herb, 30-60 cm long. Stems pilose, rooting at nodes. Leaves 1-foliolate, lanceolate-oblong or linear-lanceolate, acute or obtuse and apiculate at apex, rounded-subcordate at base, with ciliate margins, glabrous above, shortly appressed hairy especially on nerves beneath, 4-5 x 0.5-1.5 cm.; petiole 3-4 mm long; stipules 1.2-1.5 cm long, linear-lanceolate, striate; petiolule to 1 mm long; stipels minute, caducous. Racemes 3-8 cm long. Flowers 0.6-0.7 cm long. Pedicels 2.5-3 mm long, slender, glabrous. Bracts ovate, acuminate, 4-7 mm long. Calyx 0.8-1.1 cm long, segments lanceolate, minutely ciliate. Corolla purple to pink; vexillum to 4.5 x 2.5 mm; wings to 4 x 0.5 mm; keels 3.5-4 mm long. Staminal sheath 3.5-4 mm long. Style glabrous, filiform, to 3 mm long. Ovary 3-5 mm long. Pods included in calyx, 1-1.2 cm long, 3 to 6 jointed, apiculate; joints broader than long, 1.2-1.3 x 2-2.2 mm, closely transversely ribbed, glabrous. Seeds to 1 x 1.2 mm.

Fl. & Fr.: Sept.-Nov.

Ecology: Common; in grassy places, way sides, grazing grounds, forest clearings and forest edges.

Distribution : Throughout India. Bangladesh, Myanmar, Sri Lanka, Vietnam, Thailand, Cambodia, Malesia, China, Pakistan, Madagascar, Tropical Africa.

Specimens examined : National Park, 424; Ghanghree, 1659.

Uses: Plants, both green and dried, are used as a good fodder.

4. *Alysicarpus vaginalis* (L.) DC., Prodr. 2: 353. 1825; Baker in Hook. f., Fl. Brit. India 2: 158. 1876; Prain, Bengal Pl. 1: 428. 1903; Haines, Bot. Bihar & Orissa pt. 3: 259. 1922. *Hedysarum vaginale* L., Sp. Pl. 746. 1753.

A. vaginalis (L.) DC. var. *nummularifolius* (Willd.) Miq., Fl. Ind. Bot. 1: 232. 1855; Baker in Hook. f., Fl. Brit. India 2: 158. 1876; Prain, Bengal Pl. 1: 428. 1903; Haines, Bot. Bihar & Orissa pt. 3: 259. 1922.

Erect or ascending, diffuse, perennial herbs, with a woody base. Stems numerous, glabrescent or with a few scattered hairs. Leaves 1-foliolate; petioles 6-8 mm long; stipules scarious, ovate, acuminate, striate, straw-coloured, closely appressed to stem, persistent; leaflets lanceolate, oblong or oblong-ovate, rounded or acute and apiculate at apex, obtuse-cordate at base, entire, glabrous above, minutely pubescent beneath, 1.2-5 x 0.6-2.5 cm; petiolules very short, ca. 1 mm long; stipels minute, caducous. Racemes 6-12-flowered, 2-6 cm long. Pedicel 1-1.5 mm long. Calyx to 4 mm long, glabrescent, segments linear, acute, striate. Corolla pinkish, small, included; vexillum 5-5.5 mm long; wings 4.5-5.0 mm long; keels 3.5-4 mm long. Staminal sheath 4.5-5 mm long. Ovary 3.5-4 mm long. Pod 1.2-1.8 x 0.2 cm, subterete, not or very obscurely moniliform, apiculate, downy-pubescent, reticulately veined; joints 4-8, 4-gonous, longer than broad, to 2 x 3 mm. Seeds ca. 1.7 x 2 mm.

Fl. & Fr.: Oct.-Dec.

Ecology : Very common in moist grazing fields, roadsides, grassfields, cultivated lands, etc.

Distribution : Throughout India. Tropics of Old World, introduced in tropical America.

Specimens examined: Hazaribagh, 280; Simaria, 811; Jhumri Telaiya, 1754.

Use: Plant is used as a good forage.

4. ARACHIS L.

Arachis hypogea L., Sp. Pl. 741. 1753; Baker in Hook. f., Fl. Brit. India 2: 161. 1876; Prain, Bengal Pl. 1: 415. 1903; Haines, Bot. Bihar & Orissa pt. 3 : 252. 1922.

Local name : Mung-phali.

Prostrate or decumbent-ascending branched, lightly hairy annual, 25-50 cm long. Leaflets opposite, obovate, obtuse and mucronate at apex, cuneate at base, entire, 2-5 x 1-3 cm. Petiole to 5 cm long. Stipules linear, pointed, 2.5 cm or more long. Flowers *ca.* 1.5 cm across, solitary, axillary. Corolla yellow; standard *ca.* 1.3 x 1.4 cm; wings obovate, auricled, *ca.* 1 x 0.5 cm; keels *ca.* 1 x 0.4 cm. Stamens 9, monadelphous; staminal sheath *ca.* 6 mm long; longer anthers *ca.* 1.2 mm long and shorter ones *ca.* 0.6 mm long. Pods oblong, 1-5 x 0.9 - 2 cm. Seeds ovoid or oblong.

Fl. : Dec.-Jan. *Fr.*: Jan.-Feb.

Ecology: Very common; cultivated as an economic crop in fields, gardens, etc; sometimes met with as escape in waste places, vacant fields, roadsides, etc.

Distribution : India. Most of the tropical parts of India particularly in Uttar Pradesh, Bihar, Madhya Pradesh, S. India. Native of tropical America, now widely cultivated throughout the tropics.

Specimens examined : Ghanghre, 1131; Hazariabagh, 2303.

Uses: Kernels are rich source of protein and oil and are consumed as such or after roasting; also used in various food and confectionery. Oil

obtained from the kernels is used in manufacture of vegetable ghee (Vanaspati) by hydrogenation. Oil-cake is used as feed for cattle and other farm animals.

5. *ATYLOSIA* Wight & Arn.

Atylosia scarabaeoides (L.) Benth. in Miq., Pl. Jungh. 243. 1852; Baker in Hook. f., Fl. Brit. India 2: 215. 1876; Prain, Bengal Pl. 1: 383. 1903; Haines, For. Fl. Chota Nagpur 320. 1910 & Bot. Bihar & Orissa, pt. 3: 274. 1922. *Dolichos scarabaeoides* L., Sp. Pl. 726. 1753.

Slender, twining or trailing, rusty reddish-pubescent, annual-perennial herbs. Stem and branches slender, striate, leaves 3-foliolate; petioles 1-2.5 cm long; stipules 1.2-1.5 mm long, triangular, acute; leaflets elliptic-obovate to oblong, obtuse or rounded, mucronate, cuneate, entire, thinly pubescent above, 2-4 x 1.5-2.5 cm; lateral leaflets subsessile; terminal one on 0.5-0.7 cm long petiolule. Flowers in 1-2 cm long, 2-6-flowered, corymbose racemes. Peduncle to 3 mm long. Bracts small, 1-5 mm long. Calyx 5-6 mm long, fulvous-pubescent; teeth linear, acute. Corolla yellow, 0.8-1 cm long; vexillum to 7 x 4 mm wings to 0.65 cm long; keels to 7 x 2 mm. Staminal sheath to 7 mm long. Ovary densely woolly, 4.5-5 mm long. Pods oblong, straight, apiculate, 2-6 seeded, densely clothed with appressed hairs, 1.5-2.5 cm x 0.6-0.7 cm. Seeds oblong-rounded, grey-brown, 3-4 mm.

Fl. : Aug.-Dec. *Fr.*: Oct. -Apr.

Ecology: Very common; in grassy fields, way-sides, forest clearings and scrub jungles.

Distribution : Throughout the plains of India. Nepal, Pakistan, Bangladesh, Sri Lanka, Myanmar, Malaya, China, Madagascar, introduced in Africa.

Specimens examined : National Park, 87; Keredari, 645; Pratappur, 1546.

Uses: The plant is used in goats and cattle to cure dysentery.

6. BUTEA Roxb. ex Willd., *nom. cons.**Key to the Species*

- 1a. Erect tree. Lower calyx-teeth deltoid ... 1. *B. monosperma*
 1b. Woody climber. Lower calyx-teeth lanceolate ... 2. *B. superba*

1. ***Butea monosperma*** (Lam.) Taub. in Engler & Prantl., Nat. Pflanzenfam. 3(3): 365. 1894; Santap. in Bull. Bot. Surv. India 3: 12. 1962; Ali in Nasir & Ali, Fl. W. Pakistan 100: 237. 1977; Sanjappa in Bull. Bot. Surv. India 29: 204. 1987. *Erythrina monosperma* Lam., Encycl. 2: 391. 1790.

B. frondosa Roxb. ex Willd., Sp. Pl. 3: 917. 1802; Baker in Hook. f., Fl. Brit. India 2: 194. 1876; Prain, Bengal Pl. 1: 401. 1903; Haines, For. Fl. Chota Nagpur 330. 1910 & Bot. Bihar & Orissa pt. 3: 279. 1922.

Local names: Dhak, Palas.

Deciduous, erect, small or medium-sized tree, to 8 m tall; branchlets densely tomentose. Leaf-petiole 10-15 cm long; stipules linear-lanceolate; leaflets coriaceous, rounded and retuse at apex, glabrous above, finely silky and conspicuously veined beneath; terminal one rhomboid or broadly obovate, cuneate at base, 10-20 x 8-17 cm; lateral ones smaller than terminal one, obliquely ovate, rounded at base, 7-15 x 6-12 cm; petiolule 4-5 mm long, stout; stipels subulate. Racemes 8-15 cm long. Flower 3 together on nodes of olive-green rachis. Pedicels densely pubescent. Bracts and bracteoles small, velvety. Calyx 1.2-1.5 cm long, dark olive-green, densely velvety outside, silky hairy within; upper lip 4.5-5 mm long; lobes of lower lip equal, deltoid, 3.5-4 mm long. Corolla flame-coloured, silky-pubescent; standard lanceolate, 5.5 x 2.5 cm. Staminal sheath curved, 5.5-6 mm long. Pods thickened at sutures, rounded at base, velvety-brown, 12-16 x 5-6 cm. Seed oval, compressed, brown, 2-3.5 cm long.

Fl. : Feb.-Apr. *Fr.* : May-July.

Ecology: Very common; in forests, scrub jungles, waste lands, roadsides, etc.

Distribution : Throughout India including tropical Himalaya, Pakistan, Nepal, Myanmar, Sri Lanka, Indonesia, Thailand, Indo-China, Malaysia, New Guinea.

Specimens examined : Koderma Forest, 143; Mandu, 838; Simaria: 1636.

Uses: Leaves are used by local people for making platters, cups, etc. Bark is used for piles, tumours and menstrual disorders. Wood is used for well-curbs, water-scoops and structural work, also as fuel.

2. **Butea superba** Roxb. ex Willd., Sp. Pl. 3: 917. 1802; Baker in Hook. f., Fl. Brit. India 2: 195. 1876; Prain, Bengal Pl. 1: 401. 1903; Haines, For. Fl. Chota Nagpur 330. 1910 & Bot. Bihar & Orissa pt. 3 : 280. 1922; Sanjappa in Bull. Bot. Surv. India 29; 214. 1987.

Local names : Palas lata, Chihunt.

Large, woody climber; branches angular and grey-tomentose when young, terete and glabrescent with age. Leaflets subrugose and dull above, green and thinly hairy especially on veins beneath, 10-50 x 7-40 cm; terminal one largest, subrhomboid, obtuse at apex; lateral ones obliquely ovoid, rounded at apex; stipels 3-5 mm long. Racemes 15-30 cm long; rachis angular, pubescent; fascicles 2-4-flowered. Flowers 5-10 cm long. Pedicels 2.5-3 cm long, velvety. Bracts 0.7- 1.2 cm long, velvety without, puberulous within. Calyx-teeth of lower lip lanceolate. Corolla orange-scarlet; vexillum 5-7 x 4-5.5 cm; wings reflexed from middle, white pubescent, to 2 x 1.2 cm; keel-petals united along ventral margin. Staminal tube 6-8 cm long; ovary densely grey-pubescent, 1.2-1.5 cm long. Pods 13-16 x 2-5 cm, curved and slightly narrowed at seed bearing apex, densely brown-velvety. Seed to 3 x 2.5 cm.

Fl.: Mar.-May. *Fr.*: June -Aug.

Ecology: Common ; in deciduous forests.

Distribution : India: West Bengal, Bihar, Orissa, Uttar Pradesh, Western Peninsula, Tamil Nadu, Andhra Pradesh. Myanmar, Sri Lanka, Thailand, Indo-China.

Specimens examined : National Park, 963, 2052; Pratappur, 2093.

Uses: Plant exudes a gum which is used in tonic and poultice. Decoction of shoot is used in piles. Seeds are used as sedative and anthelmintic.

7. CAJANUS DC., *nom. cons.*

Cajanus cajan (L.) Huth in Helios 11: 133. 1893; Millsp. in Publ. Field Columb. Mus. Nat. Hist. Bot. Ser. 2: 53. 1900; Merrill in Philipp. J. Sci. Bot. 5: 126. 1910; Verdc. in Milne-Redhead & Polhill, Fl. Trop. E. Africa (Leguminosae 4) 709. 1971; Ali in Nasir & Ali, Fl. W. Pakistan 100 : 218. 1977; *Cytisus cajan* L., Sp. Pl. 734. 1753.

C. indicus Spreng., Syst. Veg. 3: 248. 1826; *nom. illegit.*; Baker in Hook. f., Fl. Brit. India 2: 217. 1876; Prain, Bengal pl. 1: 383. 1903; Haines, For. Fl. Chota Nagpur 321. 1910 & Bot. Bihar & Orissa pt. 3: 275. 1922.

C. obcordifolius Singh in Ind. J. Agric. Sci. 12: 783. 1942; Kazi in Rec. Bot. Surv. India 18: 9, 1959.

Local names: Arhi, Arhar.

Much-branched, grey or white-silky, annual-perennial shrub, 1-4 m high. Leaf-petiole 1.5-5 cm long; rachis 1-1.5 cm long; stipules lanceolate, 0.3-0.5 cm long; leaflets oblong-lanceolate, subcoriaceous, acute or subacuminate at apex, cuneate at base, entire, thinly silky above, densely so beneath 2-10 x 1-3 cm; petiolule 0.6-2 cm long in terminal leaflet, 0.2-0.4 cm long in lateral ones; stipels 0.1-0.2 cm long. Panicle terminal, composed of sparse, distinctly peduncled, densely silky, corymbose racemes of 6-10 cm long. Bracts 0.4-0.5 cm long. Pedicels 0.6-1.2 cm long. Calyx 1-1.2 cm long, velvety pubescent and glandular; teeth nearly as long as tube. Corolla yellow, with reddish-brown tinges; vexillum 1.2-1.8 cm in diam. Stamens diadelphous, 9+1; vexillary stamen free; anthers uniform. Ovary 0.5-0.6 cm long, velvety. Pods 4-10 x 0.6-1 cm, pubescent and glandular, tipped with lower part of style. Seeds 4-6, 0.6-0.8 cm in diam.

Fl. : Aug.-Oct. *Fr.*: Nov. -Jan.

Ecology : Very common; cultivated in the fields; also self-grown in waste places, agricultural fields, roadsides, etc.

Distribution : Almost throughout India. Native of tropical Africa, widely cultivated throughout the Tropics.

Specimens examined : Ramgarh, 537; Hazaribagh, 724; Chowparan, 1685.

Uses: Seeds are eaten as 'dal'. Green pods are used as vegetable. Husk is useful as fodder. Green leaves and tops are used as fodder and also as green manure.

8. CICER L.

Cicer arletinum L., Sp. Pl. 738. 1753; Baker in Hook. f., Fl. Brit. India 2: 176. 1876; Prain, Bengal Pl. 1: 366. 1903; Haines, For. Fl. Chota Nagpur 332. 1910 & Bot. Bihar & Orissa pt. 3: 248. 1922.

Local name: Chana.

Erect, much-branched, viscous hairy annual herbs, to 1 m tall. Stems tetragonous. Leaf-rachis 3-5 cm long; leaflets 7-17, mostly elliptic, or oblanceolate-oblong, acute and mucronate at apex, strongly nerved, 0.7-1.5 x 0.3-0.8 cm; stipules ovate, spreading, 2-5-fid, 3-5 mm long. Flowers axillary, solitary; peduncle 0.5-2 cm long; pedicel 0.5-1 cm long. Calyx 0.7-1 cm long, glandular-hairy on out-side; teeth as long as or longer than tube. Corolla bluish or pink, slightly exceeding the calyx; vexillum narrowed into a broad claw; stamens diadelphous, 9+1; vexillary stamen free; anthers uniform. Pod oblong, nodding, 2-3.5 x 1-1.5 cm, 1-4-seeded, glandular-hairy. Seeds ovoid.

Fl. : Jan.-Feb. *Fr.* : Feb.-Apr.

Ecology: Common; cultivated in the fields; also found as an escape in waste places, agricultural fields and field-borders.

Distribution : Throughout India. Widely cultivated in Mediterranean countries and Asia, also introduced in America, Africa and Orient.

Specimens examined : Gola, 771; Hunterganj, 2118.

Uses: Seeds are consumed widely as 'dal' and in various other preparations; also eaten after roasting or in form of flour. Germinated seeds are used as prophylactic against scurvey. Seeds are also fed to cattle.

9. CLITORIA L.

Clitoria ternatea L., Sp. Pl. 2: 753. 1753; Baker in Hook. f., Fl. Brit. India 2: 208. 1876; Prain, Bengal Pl. 1: 402. 1903; Haines, For. Fl. Chota Nagpur 332. 1910 & Bot. Bihar & Orissa pt. 3: 293. 1922.

Local name: Aparajit.

Perennial, twining herbs, to 6 m long. Stems and branches terete, pubescent. Leaves 7-9 cm long; stipule, striate, linear, acute, persistent, 2.2-2.5 mm long; petiole 1.5-2.5 cm long; leaflets 5-7, opposite, elliptic-oblong, subacute or obtuse and apiculate at apex, obtuse at base, entire, glabrous or with short spreading hairs, 2.5-5 x 1.5-3 cm; petiolule 2.5-3 mm long; stipels subulate, 0.8-1 mm long. Flowers axillary, solitary. Bracts linear, small, 1.2 -1.5 mm long. Bracteoles 0.6-1 cm, roundish. Calyx 1.2-1.8 cm long; upper subconnate lobes 5-6 mm long; lower lobes 0.8-1 cm long. Corolla deep blue or sometimes white, with an orange centre; petals clawed; vexillum obovate, to 4.5 x 2.5 cm; wings oblong, to 2.5 x 1 cm; keels obovate, to 2 x 0.5 cm. Stamens diadelphous, 9+1; filaments unequal. Ovary tomentose. Pods linear-oblong, flattened, straight, apically beaked, sparsely appressed-hairy, 5-10 x 0.8-1.5 cm. Seeds 6-10, reniform, yellowish-brown, smooth, 6-7 x 5 mm.

Fl. : Aug.-Oct. *Fr.* : Nov. -Dec.

Ecology: Very common; planted in gardens, also escapes in waste places, vacant plots, roadsides, etc.

Distribution : Throughout the tropical parts of India. Widely cultivated in Tropics.

Specimens examined : Hazaribagh, 242; Chatra, 826.

Uses: Roots are used as cathartic and diuretic. Both seeds and root-bark contain tannin. Leaves are used as fodder.

10. CROTALARIA L.

Key to the Species

- 1a. Leaves digitately 3-foliolate, long-petiolate ... 6. *C. pallida*
- 1b. Leaves 1-foliolate, sessile or subsessile:
- 2a. Stems alate by decurrent stipules ... 2. *C. bialata*
- 2b. Stems exalate. Stipules not decurrent:
- 3a. Pods densely pubescent ... 4. *C. juncea*
- 3b. Pods glabrous:
- 4a. Stipules present:
- 5a. Pods as long as or shorter than calyx ... 3. *C. calycina*
- 5b. Pods much exceeding the calyx:
- 6a. Stipules and bracts foliaceous ... 9. *C. spectabilis*
- 6b. Stipules and bracts minute, subulate ... 8. *C. retusa*
- 4b. Stipules absent:
- 7a. Pods as long as calyx ... 5. *C. linifolia*
- 7b. Pods exceeding the calyx:
- 8a. Plant prostrate or decumbent. Leaves rounded at base ... 7. *C. prostrata*
- 8b. Plant erect. Leaves cuneate at base. ... 1. *C. albida*

1. *Crotalaria albida* Heyne ex Roth. , Nov. Pl. Sp. 333. 1821; Baker in Hook. f., Fl. Brit. India 2: 71. 1876; Prain, Bengal Pl. 1: 374. 1903; Haines, For. Fl. Chota Nagpur 313. 1910. & Bot. Bihar & Orissa pt. 3: 230. 1922.

Local name: Ban-methi.

Profusely branched, erect herb or undershrub, 30-60 cm tall. Branches slender, terete, appressed-silky-pubescent. Leaves 1-foliolate, leaflet linear-oblong or oblanceolate or oblong-elliptic, obtuse and apiculate at apex, cuneate at base, chartaceous, glabrous above, appressed silky-pubescent beneath, 6-15 x 2-4 mm cm; petiole 1.2-1.5 mm long; stipules 0. Racemes 5-12.5 cm long, 6-20-flowered. Pedicels 3-5 mm long. Bracts *ca.* 1.5 mm long, linear. Bracteoles linear, appressed to calyx, 0.2-0.25 cm long. Calyx 5-6 mm long; 3 lower teeth linear, acuminate; 2 upper teeth oblong, obtuse. Corolla shortly exserted, 7-8 mm long, pale yellow; vexillum ovate-oblong or suborbicular, sparsely pubescent on back, obtuse-rounded at apex, 8-1 x 6-7 mm; wings oblong, obtuse, to 7 x 2.5 mm; keels ovate or oblong, to 8 x 4.5 mm with twisted beak. Staminal sheath *ca.* 2 mm long. Ovary glabrous, oblong, *ca.* 4 mm long. Style geniculate, pubescent on both sides, 6-6.5 mm long. Pods glabrous, oblong-cylindric, prominently veined, apiculate, slightly exserted, 1.2-1.5 x 0.6, 6-12-seeded. Seeds *ca.* 1 mm brown.

Fl. & Fr. : Sept. -Jan.

Ecology: Common; on open dry soil, along railway tracks, on hard soil of hilly ground, etc.

Distribution: Throughout India. China, Myanmar, Sri Lanka, S.E. Asia and Malesia.

Specimens examined : Raja Rappa, 374; Jaynagar, 1493; Katkamosandi, 1716.

Use: Root is used as purgative.

2. *Crotalaria bialata* Schrank, Pl. Rar. Hort. Monac. t. 13. 1819; Babu, Herb. Fl. Dehra Dun 125. 1977.

C. alata Buch.-Ham. ex D. Don, Prodr. 241. 1825; Baker in Hook. f., Fl. Brit. India. 2: 69. 1876; Prain, Bengal Pl. 1: 373. 1903; Haines, For. Fl. Chota Nagpur 314. 1910 & Bot. Bihar & Orissa pt. 3: 230. 1922.

Sub-erect, simple or often branched from base, annual-perennial herbs. Stems winged, often erect-ascending; the lowermost ones clothed with erecto-patent long hairs; wings with obliquely erect acute tips, *ca.* 5 mm broad on each side. Leaves 1-foliolate; leaflet sessile, elliptic-oblong

or elliptic-rounded or obovate, inequilateral, chartaceous, obtuse or retuse and mucronate at apex, slightly oblique at base, shortly silky beneath, 3-10 x 1-5 cm. Racemes 7.5-10 cm long. Bracts lanceolate, 5-6 mm long. Bracteoles inserted on the calyx, linear, 3-4 mm long. Pedicels 3-5 mm long. Calyx 1.5-1.7 cm long, appressed-hairy. Corolla scarcely exerted, pale yellow, as long as calyx. Pods shortly stipitate, oblong, black, 4.5-5 cm long, 30-50 seeded. Seeds to 4 x 3 mm brownish.

Fl. & Fr. : Aug.-Dec.

Ecology: Common; in Sal forests, forest clearings and forest edges.

Distribution: India: Uttar Pradesh, Bihar, West Bengal, Orissa, Assam, Meghalaya. Myanmar, Malesia, Java.

Specimens examined: National Park, 456; Ramgarh, 2303.

Use: Plant is useful for green manure and contour fences.

3. ***Crotalaria calycina*** Schrank, Pl. Rar. Hort. Monac. t. 12. 1817; Baker in Hook. f., Fl. Brit. India 2: 72. 1876; Prain, Bengal Pl. 1: 375. 1903; Haines, For. Fl. Chota Nagpur 313. 1910 & Bot. Bihar & Orissa pt. 3: 232. 1922.

Erect herb, 30-60 cm tall. Stem simple or branched, densely clothed with appressed silky hairs. Leaves 1-foliolate; leaflet linear or elliptic-oblong, ± glabrous above, silky with appressed hairs beneath, obtuse and apiculate at apex, obtuse-cuneate at base, 2.5-5 x 1-2 cm; petiole to 2 mm long; stipules in pair, minute, subulate, hairy. Racemes lax, 10-25 cm long. Pedicels stout, 5-6 mm long, deflexed in fruit. Bracts foliaceous, lanceolate, 7-8 mm long. Bracteoles linear-lanceolate, acute, appressed to calyx, 5-6 mm long, hairy; lobes free, lanceolate, acuminate. Corolla exerted, yellow; vexillum ovate-oblong, obtuse, with a tuft of long hairs at back, to 2 x 1.5 cm; wings obovate, to 1.5 x 0.5 cm; keels to 1.6 x 0.5 cm, with spirally twisted beak. Staminal sheath 0.6-0.7 cm long. Ovary hairy, 5-6 mm long; pubescent on inner side, to 1 cm long. Pods sessile, oblong, black when ripe, glabrous, to 2.5 x 0.8 cm, equal to or slightly shorter than calyx, 20-30-seeded. Seeds pale yellow.

Fl. : July-Sept. *Fr.* : Oct.-Dec.

Ecology : Common; on waste grounds, along roadsides, river banks, railway tracks, forests, etc.

Distribution: Throughout the tropical parts of India. Nepal, China, Sri Lanka, S.E. Asia through Malasia to Australia, Africa.

Specimens examined: National Park, 480; Gola, 764.

4. *Crotalaria juncea* L., Sp. Pl. 714. 1753; Baker in Hook. f., Fl. Brit. India 2: 79. 1876; Prain, Bengal Pl. 1: 374. 1903; Haines, For. Fl. Chota Nagpur 312. 1910 & Bot. Bihar & Orissa pt. 3: 233. 1922.

Local name: San.

Erect, simple or branched, appressed-hairy, annual herbs, 1-2.5 m tall; branches ascending, striate. Leaves 1-foliolate; leaflet linear or oblong, cuneate at base, subacute-obtuse and apiculate at apex, appressed-silky-hairy, 2.5-10 x 0.6-2 cm. Petiole 1.5-2.5 mm long. Stipules minute or 0. Racemes lax, 5-25 cm long, 8-20-flowered. Pedicels 3-6 mm long, pubescent. Bracts linear-subulate, minute; bracteoles 2, inserted on calyx, linear. Calyx 1.8-2 cm long, pubescent; teeth linear-lanceolate. Corolla bright yellow, slightly exserted; vexillum ovate, appressed hairy on back, to 3 x 2.5 cm; wings obovate, to 2 x 0.7 cm; keels to 2.3 x 1 cm, spirally beaked. Ovary sessile, villous, 0.8-1 cm long; style geniculate, 1.5-1.8 cm long. Pods oblong, densely pubescent, 2.5-3.5 x 0.8-1 cm, 6-15-seeded. Seeds *ca.* 6 mm.

Fl. & Fr. : Sept.-Feb.

Ecology: Common; usually cultivated; also found as an escape in agricultural fields, field borders, roadsides, waste places, etc.

Distribution : Throughout the plains of India. Pakistan, Bangladesh, Myanmar, Malaya, Australia, U.S.S.R., Tropical Africa.

Specimens examined : National Park, 273; Hazaribagh, 736; Ramgarh Cant., 1901.

Uses : Bark yields a strong fibre commercially important and used for cordage, canvas and fishing nets. Plant is also employed as green manure.

5. **Crotalaria linifolia** L. f., Suppl. 322. 1781; Baker in Hook. f., Fl. Brit. India 2: 72. 1876; Prain, Bengal Pl. 1: 374. 1903; Haines, For. Fl. Chota Nagpur 313. 1910 & Bot. Bihar & Orissa pt. 3: 231. 1922.

Erect, usually much-branched, annual herbs, 30-50 cm tall. Branches appressed-silky-hairy. Leaves 1-foliolate; leaflet oblanceolate-oblong, subcuneate at base, rounded and apiculate at apex, slightly hairy above, densely appressed silky-hairy beneath, 2.5-5 x 0.6-1.2 cm. Stipules 0. Racemes terminal, 10-30 cm long, 6-20-flowered. Pedicels 1.5-3 mm long. Bracts and bracteoles subulate. Calyx densely silky; upper 2 segments connate, lower 3 triangular, acuminate. Corolla pale-yellow, hardly exerted; vexillum oblong, rounded or emerginate, hairy on back, 0.7-1 cm long. Pods sessile, ovoid-oblong, glabrous, as long as calyx, black when ripe, 4-10-seeded.

Fl. & Fr. : Sept. -Nov.

Ecology: Common; in open grassy places, waste lands, roadsides, etc.

Distribution : India: Western Peninsula, Madhya Pradesh, Uttar Pradesh, Bihar, Orissa, West Bengal, Sikkim. Myanmar, Sri Lanka, Philippines, N. Australia, Pegu, China.

Specimens examined : Patratu, 576; Chowparan, 1365; Bishnugarh, 1943.

6. **Crotalaria pallida** W. Ait., Hort. Kew ed. 1, 3: 20. 1789; Polhill in Kew Bull. 22: 262. 1968.

C. mucronata Desv. in J. Bot. 3: 76. 1814; Backer & Bakh. f., Fl. Java 1: 584. 1963; de Munk in Reinwardtia 6: 209. 1962.

C. striata DC., Prodr. 2: 131. 1825; Baker in Hook. f., Fl. Brit. India 2: 84. 1876; Haines, For. Fl. Chota Nagpur 312. 1910 & Bot. Bihar & Orissa pt. 3: 233. 1922.

C. saltiana auct. non Andrews: Prain, Bengal Pl. 1: 373. 1903; Raizada in Ind. For. 76: 492. 1950.

Local name: San.

Erect, suffruticose herbs, 60-120 cm tall. Branches thinly silky, striate. Leaves palmately 3-foliolate; petiole 5-10 cm long, stout, slightly pubescent; stipules minute, deciduous; leaflets obovate, rounded or emarginate at apex, cuneate at base, glabrous above, minutely puberulous and glaucous beneath, 5-7.5 x 2.5-4 cm. Racemes 15-60 cm long, 20-50-flowered. Bracts setaceous, minute. Calyx 5-6 mm long, slightly pubescent outside; teeth lanceolate. Corolla yellow, purple-veined; 1-1.2 cm long; vexillum oblong-elliptic, to 1.2 x 0.8 cm, glabrous, obtuse-retuse at apex; wings elliptic, to 1 x 0.3 cm; keels falcate, to 1.2 x 0.5 cm, with untwisted beak. Staminal sheath 7-8 mm long. Ovary shortly stipitate, densely pubescent, 5-6 mm long. Pods oblong, much deflexed, glabrescent, 4-5 cm long, shortly stalked, 20 to 50-seeded. Seeds 2.5-3 mm, dark brown.

Fl. & Fr.: Nov. -Apr.

Ecology: Very common; in waste grounds, open dry lands, along road-sides, etc.

Distribution: Almost throughout India. Native of Central and tropical America; widely naturalised in Tropical Africa, Asia, Malesia, Queensland.

Specimens examined: Hazaribagh, 256; Patratu, 1330.

Uses: Plants yields a fibre used for cordage, canvas and fishing nets.

7. *Crotalaria prostrata* Rottl. in Willd., Enum. Hort. Berol. 2: 747. 1809; Ali in Nasir & Ali, Fl. W. Pakistan 100: 49. 1977.

C. prostrata Roxb., Fl. Ind. 3: 270. 1832; Baker in Hook. f., Fl. Brit. India 2: 67. 1876; Prain, Bengal Pl. 1: 373. 1903; Haines, For. Fl. Chota Nagpur 314. 1910 & Bot. Bihar & Orissa pt. 3: 229. 1922.

Prostrate or decumbent, spreading, annual-perennial herbs. Stems slender, clothed with silky yellowish hairs. Leaves 1-foliolate; leaflets subsessile, oblong-elliptic or oblong-obovate, inequilateral, chartaceous, subacute, obtuse or rounded, and mucronate, rounded and oblique at base, silky yellowish-hairy on both surfaces, paler beneath, 1.5-2.5 x 0.6-1 cm. Racemes lax, 3-10 cm long, 2-5-flowered. Bracts subulate, persistent, 1.2-

1.5 mm long. Pedicels 3-4 mm long. Bracteoles linear, 1-2 mm long. Calyx 5-6 mm long, densely hairy; lobes linear-lanceolate, 2-2.5 mm long. Corolla scarcely exerted, yellow; vexillum broadly oblong, glabrous, deeply emerginate, to 4 x 2 mm; wings oblong, obtuse, to 3 x 1 mm; keels to 4 x 1 mm with spirally twisted beak. Staminal sheath *ca.* 1 mm long. Ovary sessile, 1.2-1.5 mm long. Pods oblong-terete, glabrous, 1.2-1.5 x 0.5 cm, much exceeding the calyx, 15 to 20-seeded. Seeds 1.2-1.5 mm across, highly polished.

Fl. & Fr.: Sept. -Dec.

Ecology: Common; grassy fields, roadsides, agricultural fields, etc.

Distribution: Drier parts of India. S.E, Asia, Malasia.

Specimens examined: National Park, 958; Ghanghree, 2163.

*8. *Crotalaria retusa* L., Sp. Pl. 715. 1753; Baker in Hook. f., Fl. Brit. India 2: 75. 1876; Prain, Bengal Pl. 1: 374. 1903.

Local name: Ghunghunian.

Erect, robust undershrub, 60-120 cm tall. Branches striate, glabrous or appressedly pubescent. Leaves 1-foliolate; leaflet oblanceolate or oblong-obovate, chartaceous, obtuse or retuse and mucronate at apex, attenuate at base, glabrous above, silky-pubescent beneath, 3.5-9 x 1-2.5 cm; stipules subulate, *ca.* 0.1 cm long. Racemes 15-30 cm long. Pedicels 0.6-7.5 cm long. Bracts subulate, to 0.4 cm long. Bracteoles scarious, appressed to calyx, *ca.* 0.1 cm long. Calyx 1-1.2 cm long, \pm glabrous; upper 2 teeth ovate, acute, divaricate, connate near base only; lower 3 teeth much narrower, triangular, acuminate, connate about half the way up. Corolla much exerted, golden yellow; vexillum suborbicular, conspicuously veined, to 1.8 x 1.6 cm; wings obovate, to 1.6 x 0.8 cm; keels ovate, to 1.8 x 1 cm, with spirally twisted beak. Staminal sheath 0.7-0.8 cm long. Pods shortly stipitate, linear-oblong, to 4.5 x 1.5 cm. glabrous, much exceeding the calyx, 15-25 seeded.

Fl. & Fr. : Dec. - Apr.

Ecology: Common; in pasture grounds, river-banks, etc.

Distribution : Throughout India. Sri Lanka, China, Malesia, Pakistan, N. Australia, Tropical Africa.

Specimens examined : Mandu, 850; Chatra, 980; Tandwa, 1419.

Uses: Stem yields a fibre, used in admixture with sun-hemp for cordage and canvas. Plant-extract is used in scabies and impetigo.

9. ***Crotalaria spectabilis*** Roth., Nov. Pl. Sp. 341. 1821; Ali in Nasir & Ali, Fl. W. Pakistan 100: 46. 1977.

C. sericea Retz., Obs. Bot. 5: 26. 1789, non Burm. f. 1768; Baker in Hook. f., Fl. Brit. India 2: 75. 1876; Prain, Bengal Pl. 1: 374. 1903; Haines, For. Fl. Chota Nagpur 312. 1910 & Bot. Bihar & Orissa pt. 3: 232. 1922.

C. leschenaultii DC., Prodr. 2: 125. 1825; Baker in Hook. f., Fl. Brit. India 2: 76. 1876.

Local name: Jhunjhunja.

Erect, annual-biennial undershrub, 1-2 m high; branches stout, striate, sub-glabrous. Leaves 1-foliolate; leaflet obovate or oblanceolate-oblong, chartaceous, glabrous above, appressed-hairy beneath, obtuse or rounded and mucronate, cuneate, 6-20 cm x 1.5-10 cm; petiole 4-6 mm long; stipules ovate, acuminate, with a cordate base, leafy, persistent, 5-10 x 5-7 mm. Racemes terminal, 15-60 cm long, lax, 30-40-flowered. Bracts 1-2 cm long, ovate-cordate. Pedicels 1.5-2 cm long. Bracteole 2-3 mm long, subulate, inserted subapically on pedicel. Calyx 1-1.2 cm long, almost glabrous outside; upper 2 lobes large, triangular, acute, 5-6 mm long; lower 3 lobes smaller, less deeply cut than upper, linear-lanceolate, acute, corolla yellow with a purple tinge, 2.2-2.5 cm long; vexillum broadly ovate, obtuse, with a strong midrib on back, to 2 x 1 cm; wings obovate, to 1.8 cm x 0.8 cm; keels falcate, spirally beaked to 1.6 x 0.6 cm. Staminal sheath 7-8 mm long. Ovary glabrous, 6-7 mm long; style geniculate, pubescent on both sides, 7-8 mm long. Pods linear-oblong, glabrous, short-stalked, 5-6 cm long, 20-30 seeded. Seeds to 5 x 4 mm.

Fl.: Sept. -Feb. *Fr.* : Dec. -May.

Ecology : Common; in agricultural fields and field-borders, road-sides, pasture grounds, etc.

Distribution : Throughout India. Widespread in Old World and Polynesia.

Specimens examined : Raja Rappa, 403; National Park, 2120.

Uses: Plants yield a strong fibre used for ropes, canvas and fishing-nets. Plant is used in scabies and impetigo.

11. DALBERGIA L.f., *nom. cons.*

- 1a. Leaflets 3-5, abruptly acuminate at apex,
puberulous when young; rachis zig-zag. Corolla
yellowish ... 2. *D. sissoo*
- 1b. Leaflets 5-9, rounded or emerginate at apex,
glabrous; rachis straight. Corolla pure white ... 1. *D. latifolia*

1. *Dalbergia latifolia* Roxb., Pl. Corom. 2: 7, t. 113. 1799; Baker in Hook. f., Fl. Brit. India 2: 231. 1876; Prain, Bengal Pl. 1: 411. 1903; Haines, Bot. Bihar & Orissa pt. 3: 294. 1922; Ali in Nasir & Ali, Fl. W. Pakistan 100 : 57. 1977.

Local name : Pahari-Sissu.

Deciduous tree, 8-20 m tall; branchlets glabrous. Leaves imparipinnate, 10-16 cm long; rachis straight; leaflets 5-9, broadly elliptic to orbicular, shortly cuneate at base, rounded or sometimes emerginate at apex, glabrous on both surfaces, pale or glaucous beneath, subcoriaceous, 4-6.5 x 3.5-6 cm. Petiolule 0.6-1 cm long. Inflorescence an axillary lax panicle, usually shorter than leaves; & branches subcorymbose. Pedicels 3-4 mm long. Calyx as long as pedicel, glabrous; teeth obtuse, shorter than tube. Corolla pure white, twice the length of calyx. Stamens 9, monadelphous. Pod strap-shaped, firm, narrowed at both ends, glabrous, brown, 4-8 x 1.5-2 cm, 1-4-seeded.

Fl.: Aug.-Sept. *Fr.*: Jan.-Feb.

Ecology: Common; in forests, margins of hilly streams, ravines, etc.

Distribution : India: Western Peninsula, Madhya Pradesh, Uttar Pradesh, Bihar, Sikkim, Nepal, Pakistan.

Specimens examined : National Park, 1185, 2034.

Uses: Black heart-wood is much valued for cabinets and furniture; also used for making mathematical instruments, agricultural implements, floor-boards, doors and window frames. Leaves are used as fodder.

2. *Dalbergia sissoo* Roxb., Fl. Ind. 3: 223. 1832; Baker in Hook. f., Fl Brit. India 2: 231. 1876; Prain, Bengal Pl. 1: 411. 1903; Haines, Bot. Bihar & Orissa pt. 3: 293. 1922.

Local names: Shisham, Sissu.

Semi-deciduous tree, to 15 m tall; branchlets pubescent. Leaves imparipinnate; rachis 4-7.5 cm long, zig-zag; leaflets 3-5, broadly elliptic, obovate to orbicular, cuneate at base, abruptly acuminate at apex, puberulous when young, soon glabrescent, 3.5-6.5 x 3-6 cm; petiolule 5-8 mm long; stipules 5-6 mm long. Inflorescence an axillary panicle, shorter than leaves; branches erecto-patent, densely pubescent. Bracts small, pubescent, caducous. Calyx 4-5 mm long, hairy; teeth very short, the lowest longest, lanceolate. Corolla yellowish, twice the length of calyx; vexillum obovate, long-clawed. Stamens 9, monadelphous; anthers uniform. Ovary pubescent, 2-4-ovuled. Pod strap-shaped, glabrous, pale brown, narrowed at base into a stalk, twice as long as calyx, 3.5-10 x 0.6-1.2 cm, 1-4-seeded.

Fl. : Mar. -May. *Fr.* : Dec.-Mar.

Ecology: Very common; along river-banks, forests; also widely planted along roadsides, canals, fields and in forests.

Distribution : Throughout India, Pakistan, Afgansitan, Persia, Iraq, Beluchistan, Nepal.

Specimens examined : Hazaribagh, 1; Koderma, 312.

Uses: Wood which is hard and durable, is commonly used for furniture, carts, boats, wheels, etc.; also used as fuel. Leaves are used as fodder.

12. *Desmodium* Desv., *nom. cons.**Key to the Species*

- 1a. Pods indistinctly jointed, dehiscent along the central suture in a continuous line. Leaves 1- and 3-foliolate intermixed ... 3. *D. motorium*
- 1b. Pods distinctly divided into several, separating, 1-seeded joints. Leaves 1- or 3-foliolate:
- 2a. Leaves 3-foliolate:
- 3a. Bracts persistent, foliaceous, stalked, green, bifarious, hiding the flowers ... 4. *D. pulchellum*
- 3b. Bracts caducous, not foliaceous, sessile, not green:
- 4a. Trailing herbs. Flowers in 1-5-flowered axillary or leaf-opposed fascicles ... 6. *D. triflorum*
- 4b. Erect herbs or shrubs:
- 5a. Flowers in dense, short-peduncled, axillary umbels. Pods corky ... 5. *D. triangulare*
- 5b. Flowers in lax, elongated racemes or panicles. Pods not corky ... 2. *D. heterocarpon*
- 2b. Leaves 1-foliolate:
- 6a. Stem angled. Pods incised over more than half its breadth; lower suture of the pods deeply undulate, upper straight ... 1. *D. gangeticum*
- 6b. Stem terete. Pods incised less than half its breadth; lower suture of the pods not undulate, upper indented ... 7. *D. velutinum*

1. *Desmodium gangeticum* (L.) DC., Prodr. 2: 327. 1825; Baker in Hook. f., Fl. Brit. India 2: 168. 1876; Prain, Bengal Pl. 1: 425. 1903; Haines, For. Fl. Chota Nagpur 348. 1910 & Bot. Bihar & Orissa pt. 3: 264. 1922. *Hedysarum gangeticum* L., Sp. Pl. 746. 1753.

H. maculatum L., Sp. Pl. 746. 1753.

Desmodium gangeticum (L.) DC. var. *maculatum* (L.) Baker in Hook. f., Fl. Brit. India 2: 168. 1876; Prain, Bengal Pl. 1: 425. 1903; Haines, Bot. Bihar & Orissa pt. 3: 264. 1922.

D. gangeticum (L.) DC. var. *ramnagari* Haines, Bot. Bihar & Orissa pt. 3: 265. 1922.

Local names: Sarivan, Salpan.

Erect, ascending or prostrate, suffruticose perennial, 70-130 cm tall. Stems glabrous, or hairy and angular at top. Leaves 1-foliolate; petioles 1.2-2 cm long; stipules scarious, 6-8 mm long, linear-subulate, striate at base; leaflets membranous, 2-18 x 1.5-6 cm, ovate-oblong or lanceolate or rounded, subacute at apex, rounded-cordate at base, repand, glabrous and green above, appressed pubescent beneath; secondary veins 8-12 pairs; petioles to 1.5 mm long, hairy; stipels subulate, 3 mm long. Flowers in lax, 10-45 cm long terminal and axillary racemes. Peduncle 4-5 cm long. Bracts subulate, 1.5- 3 mm long; bracteoles minute. Pedicel filiform, pubescent, 2.5-4 mm long, 5-6 mm long in fruiting. Calyx 4-5 mm long, hairy; teeth triangular. Corolla white or violet; vexillum broadly obovate, 5-6 mm long; wings *ca.* 3 mm long; keels *ca.* 4 mm long. Staminal sheath 3-3.5 mm long. Ovary sessile, to 3 mm long, style *ca.* 1.5 mm long. Pods curved, moniliform, 1.2-2.5 x 0.2-0.25 cm, 6-8-jointed, hooked-hairy; joints indehiscent, with rounded lower edge and straight upper edge, longer than broad, 2.8-3 x 2.5-3 mm.

Fl. & Fr. : Mar.-Dec.

Ecology : Very common; in forests, grassy waste places, roadsides, etc.

Distribution : Throughout India. Sri Lanka, Pakistan, Tropical Africa, Malesia, China, West Indies.

Specimens examined : Hazaribagh, 493; Markachho, 1468; Hunterganj, 2119.

Uses: Roots are used as febrifuge, expectorant and diuretic.

Note: Very variable in habit, size and shape of leaves.

2. **Desmodium heterocarpon** (L.) DC., Prodr. 2: 337. 1825; van Meeuwen in Reinwardtia 6: 95. 1961 & 251. 1962; *Hedysarum heterocarpon* L., Sp. Pl. 747. 1753.

H. polycarpum Poir. in Lam., Encycl. 6: 413. 1805.

Desmodium polycarpum (Poir.) DC., Prodr. 2: 334. 1825, *s.l.*: Baker in Hook. f., Fl. Brit. India 2: 171. 1876; Prain, Bengal Pl. 1: 425. 1903; Haines, For. Fl. Chota Nagpur 347. 1910 & Bot. Bihar & Orissa pt. 3: 264. 1922.

Erect or decumbent or ascending, perennial herbs, to 50 cm tall, with creeping root-stock. Branches woody, slender, slightly angular, glabrous downwards, patently densely hairy towards apex. leaves 3-foliolate; petioles 1.5-2.5 cm long, angular, appressed hairy; stipules 0.8-1.2 cm long, lanceolate-subulate; leaflets obovate-elliptic or elliptic-oblong, subcoriaceous, rounded at base, rounded, obtuse or retuse at apex; glabrate or thinly hairy above, appressed-pubescent beneath, entire, 1-8 × 0.8-4 cm; petiolules 1.5-2 mm long; stipels 2.5-3 mm long, filiform. Flowers in lax, 5-15 cm long racemes. Pedicels 3-5 mm long, filiform, ascending. Bracts ovate-cuspidate, 3-4 mm long, ciliate. Calyx 2.2-2.5 mm long, glabrescent; teeth triangular, acute. Corolla violet-bluish; vexillum obovate-orbicular, to 1 × 0.8 cm; wings to 6 × 4 mm; keels to 1 × 4 mm. Staminal sheath 7-8 mm long. Ovary 7-8 mm long. Pods 1.2-1.8 cm long, 2 to 8-jointed, hooked-hairy; joints 2.5-3 × 2.5-3 mm. with straight upper edge and rounded lower edge.

Fl. : Apr. -Oct. *Fr.*: May-Nov.

Ecology: Common; in forests, forest-clearings and grassy localities.

Distribution : Throughout India, Nepal, Indo-China, China, Myanmar, Sri Lanka, Malesia, Japan, Formosa, Polynesia.

Specimens examined : National Park, 450; Pratappur, 1558; Koderma Forest, 1992.

Uses : Decoction of plant is used for coughs and convulsions.

3. *Desmodium motorium* (Houtt.) Merr. in J. Arnold Arb. 19: 345, 1938; van Meeuwen in Reinwardtia 6: 254. 1962. *Hedysarum motorium* Houtt. in Nat. Hist. 2(10): 246. 1779.

H. gyrans L. f., Suppl. 332. 1781.

Desmodium gyrans (L.f.) DC., Prodr. 2: 326. 1825; Baker in Hook. f., Fl. Brit. India 2: 174. 1876; Prain, Bengal Pl. 1: 426. 1903; Haines, For. Fl. Chota Nagpur 348. 1910 & Bot. Bihar & Orissa pt. 3: 266. 1922.

D. gyrans (L.f.) DC. var. *roylei* (Wight & Arn.) Baker in Hook f., Fl. Brit. India 2: 175. 1876.

Erect, suffruticose perennial undershrubs, 60-120 cm high. Stems slender, grooved, nearly glabrous except appressed-hairy angles. Leaves 1 to 3-foliolate; petioles 0.9-2.5 cm long, sparsely hairy; stipules scarious, lanceolate, caducous, 5-6 mm long; terminal leaflets lanceolate-oblong, obtuse or rounded, mucronate at apex, rounded or acute at base, glabrous and with a glaucous median band above, appressed hairy beneath, 2.5-15 x 0.7-4 cm; later ones much smaller, 0.5-3.5 x 0.15-0.6 cm, lanceolate-oblong, on patently hairy petiolules moving by little jerks; stipels linear-subulate, 1.5-2 mm long. Flowers 1.2-1.5 cm long, in lax terminal and axillary racemes often combined into a terminal panicle; rachis glabrous or thinly patently hairy; bracts broadly ovate, acuminate, striate, caducous, to 1 cm long; pedicels 5-7 mm long. Calyx to 3 mm long, appressed hairy; teeth deltoid. Corolla purplish at first, changing to bluish or violet afterwards; vexillum broadly obovate or suborbicular, to 8 mm long and broad, short-clawed. Pods slightly curved indented on one suture only, 8 to 10-jointed, glabrous or thinly hooked-hairy along suture, 4-4.5 cm long; joints ca. 4 x 5 mm, reticulately veined, with straight upper suture and rounded lower suture.

Fl.: Aug. -Nov. *Fr.* : Oct.-Dec.

Ecology : Common; in damper parts of forests, on moist banks of rivers, etc.

Distribution : Throughout India. Pakistan, Nepal, Sri Lanka, Malesia.

Specimens examined : Raja Rappa, 468; National Park, 2014.

Use: Leaves are lopped for fodder.

Note: Much variable in habit, size and shape of leaves and degree of indumentum on inflorescence-rachis and pods.

4. **Desmodium pulchellum** (L.) Benth., Fl. Hongk. 83. 1861; Baker in Hook. f., Fl. Brit. India 2: 162. 1876; Prain, Bengal Pl. 1: 424. 1903; Haines, For. Fl. Chota Nagpur 346. 1910 & Bot. Bihar & Orissa pt. 3: 261. 1922; *Hedysarum pulchellum* L., Sp. Pl 747. 1753.

Erect, much-branched, bushy undershrub, 1-1.5 m tall. Branches 3-gonous, slender, appressed-pubescent. Leaves 3-foliolate; petioles 0.3-1.5 cm long, channelled above, densely downy; stipules ovate, acuminate, 4-5 mm long; leaflets coriaceous, ovate-elliptic, obtuse, mucronate, rounded at base, sinuate-repand, glabrescent above appressed hairy beneath, 2.5-15 x 1-7 cm, lateral ones smaller than terminal ones; secondary veins 8-10 pairs, prominent beneath; petiolules 1.5-3 mm long; stipels subulate. Racemes 10-30 cm long, composed of 12-50 umbels; umbels in long continuous rows, and each hidden by a pair of persistent bracts; rachis ending in a long subulate tip. Bracts 2-foliolate, orbicular, stipellate, glabrous above, appressed-pubescent on the lower side, placed back to back, 1-1.5 cm across. Calyx ca. 2 mm long, puberulous; teeth lanceolate. Corolla 5-6 mm long, yellow. Pods shallowly incised along both sutures, 1 to 2-jointed, appressed hairy along sutures, glabrous on both lateral faces, 7-8 mm long; joints reticulately veined, to 4 x 4 mm.

Fl. : Sept. -Nov. *Fr.* : Jan.-Feb.

Ecology: Common; in forests.

Distribution : Throughout India. Sri Lanka, Myanmar, Malesia, China.

Specimens examined : National Park, 1155; Pratappur, 1544; Satgawan, 1988.

Use: Leaves are used as pot herb.

5. **Desmodium triangulare** (Retz.) Merr. in J. Arnold Arb. 23: 170. 1942; Santap. in Kew Bull. 1948: 276. 1948; van Meeuwen in

Reinwardtia 6: 261. 1962; Ali in Nasir & Ali, Fl. W. Pakistan 100: 348. 1977. *Hedysarum triangulare* Retz., Obs. Bot. 3: 40. 1783.

H. cephalotes Roxb., Fl. Ind. 3: 360. 1832.

Desmodium cephalotes (Roxb.) Wight & Arn., Prodr. Ind. Orient. 224. 1834; Baker in Hook. f., Fl. Brit. India 2: 161. 1876; Prain, Beng. Pl. 1: 424. 1903; Haines, For. Fl. Chota Nagpur 346. 1910 & Bot. Bihar & Orissa pt. 3: 261. 1922.

Erect, perennial, suffruticose, undershrubs, up to 150 cm tall. Stems appressedly silky, triquetrous, zig-zag when young, much branched. Leaves 3-foliolate; petioles appressedly silky, 2-2.5 cm long; stipules linear-lanceolate, bristle-pointed, striate, glabrous; leaflets elliptic-obovate, rounded at base, acuminate and mucronate at apex, entire, chartaceous, glabrous above, appressed-pubescent particularly on nerves beneath, 7-12 x 3-6 cm; petiole 2.5-3 mm long; stipels 2.5-3 mm long, filiform. Flowers 20 or more, crowded in dense axillary peduncled umbellate heads; peduncles 3-4 mm long, stout, silky. Pedicels 2-2.5 mm long, silky. Bracts 3-4 mm long, linear-subulate, ciliate, caducous; bracteoles 3.5-4 mm long, linear-subulate, ciliate, caducous, inserted below calyx. Calyx 4.5-5 mm long, campanulate, densely silky; teeth lanceolate, acute. Corolla violet-white, 4.5-5 mm long; vexillum obovate-orbicular, to 1 x 0.8 cm; wings to 6 x 4 mm; keels to 10 x 4 mm. Staminal sheath 7-8 mm long. Ovary 7-8 mm long. Pods 1.5-2.5 cm long, slightly curved, incised along both sutures, 3-jointed, appressedly white-hairy; joints as broad as long. Seeds broadly ellipsoid, 1.2-1.5 mm long.

Fl.: Aug,-Sept. *Fr.* : Oct.-Jan.

Ecology: Common; in scrub jungles, forest clearings and secondary forests.

Distribution : Throughout India. Nepal, Indo-China, Japan, Formosa, Malesia.

Specimens examined : National Park, 438; Chatra, 1078; Chowparan, 1362.

Use: Plant is used as green-manure.

6. **Desmodium triflorum** (L.) DC., Prodr. 2: 334. 1825, *p.p. excl.* syn. *D. biflorum*; Baker in Hook. f., Fl. Brit. India 2: 173. 1876; Prain, Bengal Pl. 1: 424. 1903; Haines, For. Fl. Chota Nagpur 345. 1910 & Bot. Bihar & Orissa pt. 3: 266. 1922. *Hedysarum triflorum* L., Sp. Pl. 749. 1753.

Local name: Kudaliya

Creeping or prostrate, caespitose, much-branched, perennial herbs. Stems up to 30 cm long, rooting from nodes, appressed hairy with white spreading hairs. Leaves 3-foliolate or lower sometimes, 1-foliolate; petioles 5-6 mm long; stipules obliquely ovate, acuminate, persistent, 3-4 mm long; leaflets membranous, obcordate-obovate, cuneate at base, shallowly retuse and mucronate at apex, entire, glabrous above, appressed hairy beneath, 4-10 x 3.5-8 mm; petiolules to 1.5 mm long, hairy; stipels 2-2.5 mm long, subulate. Flowers in 1-5-flowered fascicles in axils of leaves. Bracts ovate-lanceolate, ciliate, persistent; bracteoles minute. Pedicels 3-10 mm long. Calyx 4.5-5 mm long, appressed hairy; teeth lanceolate, ciliate. Corolla pink to violet; vexillum broadly obovate, cuneate, to 3 mm long; wings to 2 mm long; keels 4 mm long. Staminal sheath 3.5-4 mm long. Ovary 0.35-0.4 cm long; style *ca.* 0.2 cm long; incurved. Pods 0.5-1.3 cm long, reticulately veined, nearly glabrous except hairy sutures, 2-5-jointed; joints *ca.* 0.25 x 0.2 cm, with straight upper edge and rounded lower edge, indehiscent.

Fl. & Fr.: Mar.-Jan.

Ecology: Very common; in open grassy places, roadsides, agricultural fields and scrub jungles.

Distribution: Throughout India. Pakistan, Myanmar, Indo-China, S. China, Hongkong, Formosa, Malesia to N. Australia, New Caledonia and Polynesia.

Specimens examined: Jhumri Telaiya, 311; Barkaganwa, 894; Chatra, 1661.

Uses: Plants are used for lawns and pastures, and also as fodder. Leaves are used in dysentery, diarrhoea and convulsions.

7. *Desmodium velutinum* (Willd.) DC., Prodr. 2: 328. 1825; Schindl. in Fedde Repert. 21: 6. 1925; van Meeuwen in Reinwardtia 6: 264. 1962; *Hedysarum velutinum* Willd., Sp. Pl. 3: 117. 1803.

H. latifolium Roxb., Fl. Ind. 3: 350. 1832.

Desmodium latifolium (Roxb.) DC., Prodr. 2: 328. 1825. Baker in Hook. f., Fl. Brit. India 2: 168. 1876; Prain, Bengal Pl. 1 : 425. 1903; Haines, For. Fl. Chota Nagpur 348. 1910 & Bot. Bihar & Orissa pt. 3.265.1922.

Erect, suffruticose herbs or undershrubs, up to 1 m tall. Stems densely patently brown-hairy, much-branched. Leaves 1-foliolate; petioles 1-1.5 cm long, densely fulvous-hairy; stipules cordate-ovate, long acuminate, hairy, ciliate, deciduous, 4-4.5 mm long; leaflets broadly ovate-rounded, obtuse or sometimes retuse and mucronate at apex, subcordate or truncate at base, sinuate repand, inequilateral, hairy above, softly pubescent beneath, 4-13 x 3-11 cm; petiolules 2-2.5 mm long, densely fulvous-hairy; stipels subulate, hairy, 2-2.5 mm long. Flowers in lax, terminal and axillary, 1-45 cm long racemes; rachis densely patently brown-hairy. Bracts ovate, acuminate, hairy, 1.5-2 mm long. Pedicels patently brown-hairy, 1.5-2 mm long. Bracteoles minute. Calyx 3-3.5 mm long, densely brown-hairy; teeth triangular. Corolla purple; vexillum orbicular-obovate, retuse, 5-6 x 4 mm; wings oblong, ca. 6 x 2 mm; keels slightly incurved, ca. 6 x 2 mm. Staminal sheath 3.5-4 mm. Pods 3-6 jointed, straight or slightly curved, slightly incised on the upper, more deeply so on the lower suture, densely clothed with brown hooked hairs; joints as long as broad, 3 x 3 mm. Seeds ca. 1 mm.

Fl. & Fr.: Aug.-Jan.

Ecology: Common; in forests.

Distribution: Throughout India. Sri Lanka, Tropical Africa, Malasia, Myanmar, Siam, Indo-China.

Specimens examined: National Park, 964; Pratappur, 2075.

Use: Plants are used as cattle-feed.

13. ERYTHRINA L.

Key to the Species

- 1a. Calyx splitting down to base, spathaceous, 5-toothed at tip. Keel-petals connate. Pods seedless at base. Seeds brownish-red ... 2. *E. variegata*
- 1b. Calyx not splitting down to base, distinctly 2-lipped. Keel-petals separate. Pods seed-bearing throughout. Seeds not red ... 1. *E. suberosa*

1. ***Erythrina suberosa*** Roxb., Fl. Ind. 3: 253. 1832; Baker in Hook. f., Fl. Brit. India 2: 189. 1876; Haines, For. Fl. Chota Nagpur 326. 1910 & Bot. Bihar & Orissa pt. 3: 285. 1922.

E. sublobata Roxb., Fl. Ind. 3: 254. 1832.

E. suberosa Roxb. var. *sublobata* (Roxb.) Baker in Hook. f., Fl. Brit. India 2: 190. 1878; Prain, Bengal Pl. 1: 398. 1903; Haines, Bot. Bihar & Orissa pt. 3: 285. 1922.

Local name: Dauldhak.

Small, very prickly tree, to 15 m tall; bark corky, deeply cracked. Prickles yellowish or straw-coloured; branchlets densely tomentose. Leaflets as long as broad, entire or lobulate, green and glabrous above, with white-brown tomentum beneath, 8-20 cm broad; terminal one with usually rhomboid or subcuneate base; petiole 12-20 cm long. Racemes densely subcapitate, 4-8 cm long. Calyx campanulate, distinctly 2-lipped, but not splitting down to base, 1-1.2 cm long, faintly downy. Corolla scarlet; standard 3.5-5 cm long; blade 1.2-1.5 cm broad; keel petals connate, less than half as long as the standard. Upper stamen free from low down. Pods turgid, narrowly spindle-shaped, seed-bearing throughout, 10-15 cm long including the scarlet stipes, 2-4-seeded.

Fl.: Mar.-May. *Fr.:* Apr.-June.

Ecology: Common; in forests, slopes of hills, etc.

Distribution: Throughout India including Himalaya. Sri Lanka, Nepal.

Specimens examined: Hazaribagh, 1580.

Uses: Wood is used for scabbards, boxes, packing-cases, match-boxes and match-splints. Cork made from bark is useful as bottle stoppers. Bark yields a fibre suitable for cordage.

2. ***Erythrina variegata*** L., Herb. Amb. 10. 1754; Bullock in Kew Bull. 20: 294. 1966; Krukoff in J. Arnold Arb. 53: 132. 1972.

E. mysorensis Gamble in Kew Bull. 222. 1912; Calder *et al.* in Rec. Bot. Surv. India 11: 52. 1926.

E. indica Lam., Encycl. 2: 391. 1788; Baker in Hook. f., Fl. Brit. India 2: 188. 1876; Prain, Bengal Pl. 1: 398. 1903; Haines, For. Fl. Chota Nagpur 326. 1910 & Bot. Bihar & Orissa pt. 3: 284. 1922.

E. variegata L. var. *orientalis* (L.) Merr. Interpr. Herb. Amb. 276. 1917; Mahesw. in Bull. Bot. Surv. India 3: 47-48. 1962 (incl. all 6 forma).

Local names : Pharad, Pangra.

Tree, to 20 m tall; bark thin, grey, armed with small conical dark-coloured prickles. Leaf-petioles 10-15 cm long, unarmed, readily disarticulating; stipules lanceolate, 0.8-1 cm long; leaflets membranous, broadly rhomboid-ovate, truncate or subrhomboid at base, acute or acuminate at apex, entire, \pm stellate-tomentose when young, glabrescent when mature, 10-15 x 8-12 cm, terminal one the largest; petiolules 0.8-1.2 cm long. Racemes dense, 10-22 cm long appearing before leaves; flowers 1-3 together from nodes of puberulous rachis. Peduncle stout, to 15 cm long. Pedicels 6-8 mm long. Bracts small, triangular; bracteoles subulate, 3.5-4 mm long. Calyx split to base, spathaceous, 2.5-3 cm long, tomentose, 5-toothed at tip; mouth very oblique. Corolla brilliant scarlet, 5-7 cm long; vexillum oblong-elliptic; 5-6.5 x 2.2-2.5 cm; wings and keel-petals subequal, 1.2-1.5 x 0.8-1 cm. Staminal sheath 3-3.5 cm long. Pods many, 15-25 cm long, beaked, narrowed into a seedless base and stout 2-2.5 cm long stipe, glabrescent, 6-12-seeded. Seeds subreniform, purple, to 2 x 1.2 cm.

Fl.: Feb.-Apr. *Fr.*: May-July.

Ecology : Common; planted in roadsides, gardens, etc.; also self-grown and found wild.

Distribution : Throughout India. Sri Lanka, Myanmar, Thailand, Cambodia, Laos, Vietnam, China, Malesia, Madagascar, Africa.

Specimens examined : Patratu, 575; Satgawan, 1975.

Uses: Leaves and tender shoot are edible. Leaves are used as cattle fodder; also as laxative, anthelmintic and galactagogue. Bark yields a fibre used for cordage. Wood is used for rafts, floats and canoes.

14. FLEMINGIA Roxb. ex W. Ait. & W.T.Ait., *nom. cons.*

Key to the Species

- 1a. Leaves suborbicular, with cordate base and cuspidate apex ... 1. *F. chappar*
- 1b. Leaves obovate-oblong or oblong-lanceolate, with rounded-subcordate base, not cuspidate at apex ... 2. *F. strobilifera*

1. **Flemingia chappar** Buch.-Ham. ex Benth. in Miq., Pl. Jungh. 244. 1852; Baker in Hook. f., Fl. Brit. India 2: 227. 1876; Prain, Bengal Pl. 1: 377. 1903; Haines, For. Fl. Chota Nagpur 317. 1910 & Bot. Bihar & Orissa pt. 3: 267. 1922.

Moghania chappar (Buch. -Ham. ex Benth.) O. Kuntze, Rev. Gen. Pl. 1: 199. 1891; Mukerjee in Bull. Bot. Soc. Bengal 6: 13. 1962.

Local name: Salpan.

Erect, much-branched, undershrubs, 1-2 m tall. Stems terete, appressed-hairy. Leaves suborbicular, subcoriaceous, cordate at base, acute and mucronate, appressed-hairy beneath, 5-10 x 4.5 -9 cm; petiole 2-3 cm long, thickened on both ends. Flowers in axillary racemes often combined into a panicle; bracts cordate, deeply emerginate, 2-2.5 x 3-4 cm when unfolded, short-stalked, membranous, persistent, conspicuously reticulately veined, glabrescent. Calyx lobes lanceolate, as long as tube. Corolla white, twice as long as calyx. Pods oblong, densely hairy, 6-10 x 3.5 -6 mm, completely concealed by bracts.

Fl. : Jan.-Mar. *Fr.*: Mar.-May.

Ecology : Common; in forests.

Distribution : India: Eastern Himalaya, Bihar, Orissa, West Bengal. Nepal.

Specimens examined : National Park, 448; Pratappur, 618.

Uses: Wood is used by local people as tooth-brushes. Root is used in epilepsy and hysteria.

2. ***Flemingia strobilifera*** (L.) Ait., Hort. Kew. ed. 2, 4: 350. 1812; Baker in Hook. f., Fl. Brit. India 2: 227. 1876; Prain, Bengal Pl. 1: 377. 1903; Haines, Bot. Bihar & Orissa pt. 3: 268. 1922. *Hedysarum strobiliferum* L., Sp. Pl. 764. 1753.

Moghania strobilifera (L.) St. Hil. ex O. Kuntze, Rev. Gen. 1: 199. 1891; Jackson, Index Kew. 2: 252. 1894; Mukerjee in Bull. Bot. Soc. Bengal 6: 10. 1952.

Local name: Kussunt.

Erect or decumbent-ascending, much-branched, herbs or undershrubs, 1-1.5 m tall, often with a woody base. Stems slender, 3-gonous, zig-zag, hairy upwards. Leaves 1-foliolate; petiole 0.6-2 cm long, pubescent; stipules scarious, 6-8 mm long, lanceolate. Leaflets subcoriaceous, ovate-oblong to oblong-lanceolate, obtuse or subacute at apex, rounded-subcordate at base, subentire-repand, glabrate or hairy, 2.5-15 x 1.5-7 cm; secondary veins 8-10 pairs, very conspicuous on lower surface. Flowers in axillary or terminal 1 to 3-nate cyme enveloped by foliaceous bracts and arranged in simple raceme or panicle of 7-15 cm long. Bracts short-stalked, suborbicular-rounded, folded, membranous, retuse and mucronate at apex, cordate at base, persistent, reticulately veined, glabrescent, usually broader than long, 1.2-1.5 x 2-3 cm. Calyx 4-4.5 mm long, pubescent; lobes setaceous, acute, veined. Corolla white, 7-10 mm long; vexillum obovate, to 6 x 4.5 mm; wings oblong, ca. 4.5 mm long; keels incurved, ca. 6 x 2 mm. Staminal sheath 6-6.5 mm long. Ovary woolly, 2 mm long. Pods oblong, turgid, mucronate, densely short-hairy, 8-10 cm x 4-5 mm, completely concealed by bracts. Seeds dark-brown, ca. 2.5 mm across.

Fl. : Feb.-Mar. *Fr.* : Mar.-Apr.

Ecology: Common; in forests, forest-clearings, scrub jungles, etc.

Distribution: Throughout India. Tropical and subtropical Asia and America.

Specimens examined: Raja Rappa, 357; National Park, 447.

Uses: Root is used in epilepsy and hysteria; also used to induce sleep and relieve pain.

Note: Much variable in habit, size and shape of leaves, length of inflorescence and degree of hairiness.

15. GLIRICIDIA H.B.K.

**Gliricidia sepium* (Jacq.) Walp., *Repert. Bot. Syst.* 1: 679. 1842; Blatter *et al.*, *Beautif. Ind. Trees* ed. 2, 87. 1954; White in Dwyer *et al.* in *Ann. Missouri Bot. Gard. (Fl. Panama)* 67: 703. 1980. *Robinia sepium* Jacq., *Enum. Pl. Carib.* 28. 1760, non *Robinia sepium* Sw. 1788.

R. maculata H.B.K., *Nov. Gen. Sp. Pl.* 6: 393. 1824.

Gliricidia maculata (H.B.K.) Walp., *Repert. Bot. Syst.* 1: 679. 1842.

Large shrub or tree, to 10 m tall. Leaves to 25 cm long; rachis and petiole pubescent; leaflets 5-19, lateral one opposite, oval to elliptic, thin-coriaceous, obtuse at base, acute to acuminate, glabrous above, sparsely pubescent beneath, purple mottled beneath when dry, 2-7 x 1-3 cm; petiolule 2.5-3 mm long. Racemes clustered from branches or older stem, 5-15 cm long; flowers borne singly and uniformly distributed along rachis. Pedicels 0.5-1 cm long. Calyx-tube 4-5 mm long; teeth obscure. Corolla pink or lilac to white; petals with yellow tinge towards base; vexillum erect, to 2 cm in diam., emerginate; wings oblong, to 2 x 0.5 cm; keel petals obovate, to 1.8 x 0.5 cm. Staminal sheath 1-1.2 cm long; free filaments alternately long and short. Ovary 0.8-1 cm long. Pod oblong, 10-15 x 1.52 cm, brown, faintly wrinkled or striate, 3-10-seeded. Seeds round to oblong, compressed, 0.8-1 cm long.

Fl. : Feb.-May. *Fr.* : Apr.-Aug.

Ecology: Common; planted in gardens, roadsides, etc., also self-grown.

Distribution : India: Grown as an ornamental and for green manure in major parts of India, particularly in Karnataka, Maharashtra, Kerala and Tamil Nadu. Native of Mexico to Columbia and West Indies, also widely cultivated in New World and introduced into old World tropics.

Specimens examined : Koderma Forest, 1781.

Uses: The ground bark, leaves and seeds are used for poisoning rats and mice. Poultices of fresh leaves are used to treat skin affections.

16. GLYCINE Willd., *nom. cons.*

Glycine max (L.) Merrill, *Interp. Rumph. Herb. Amboin.* 274. 1917; *Verdc. in Kew Bull.* 24: 256. 1970; Ali in Nasir & Ali, *Fl. W. Pakistan* 100: 255. 1977. *Phaseolus max* L., *Sp. Pl.* 725. 1753.

Dolichos soja L., *Sp. Pl.* 727. 1753.

Soja hispida Moench., *Meth.* 153. 1794.

Glycine hispida (Moench.) Maxim. in *Bull. Acad. Sci. St.-Petersb.* 18: 398. 1873; Prain, *Bengal Pl.* 1: 392. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 276. 1922.

G. soja auct. non Sieb. & Zucc. : Baker in Hook. f., *Fl. Brit. India* 2: 184. 1876.

Local names: Ramkurthi, Bhat.

Annual. Branches patently brown-hairy. Leaves 3-foliolate; stipules ovate-lanceolate, 5-7 mm long; leaflets membranous, ovate-elliptic, rounded at base, acute at apex, nearly glabrous above, appressed-hairy beneath, 5-15 x 3-6 cm; stipels 1.5-2 mm long. Racemes short, sessile, to 3.5 cm long, hirsute. Pedicels 3-5 mm long. Bracteoles subulate. Calyx 0.7-0.8 cm long, brown-hairy, upper 2 teeth almost united. Corolla slightly exerted,

pinkish, 0.5-0.7 cm long; vexillum slightly auriculate at base; wings adhering to keels. Anthers all fertile, uniform. Pods slightly curved, narrowed at base, hairy, 2.5-5 × 0.8-1.2 cm, 2-4 seeded. Seeds deep-brown or black, ellipsoid, 0.9-1 cm long.

Fl. & Fr. : Sept.-Dec.

Ecology: Common; cultivated in fields; also met with as an escape in waste places, agricultural fields and field-borders, vacant places, etc.

Distribution: Major parts of India particularly in Kashmir, Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Bihar, Meghalaya, Manipur, Maharashtra, Tamil Nadu, Gujarat, etc. Native of S. China, now cultivated in Pakistan, Nepal, Myanmar, E. Asia.

Specimens examined : Ramgarh, 1129; Etkhori, 1459.

Uses: Beans are consumed as vegetable, in salads and canned. Soysprouts, Soy-milk and Soybean oil are made from seeds. Soybean meal is used as fertilizer.

17. INDIGOFERA L.

Key to the Species

1a. Leaves 1-foliolate:

- 2a. Leaflets linear or linear-oblong, cuneate at base.
Pods ovoid-globose, 1-seeded ... 5. *I. linifolia*
- 2b. Leaflets ovate, cordate at base. Pods oblong,
terete, 2-seeded ... 3. *I. cordifolia*

1b. Leaves 3-many-foliolate:

- 3a. Leaflets alternate. Flowers in dense racemes.
Pods 2-seeded ... 6. *I. linnaei*
- 3b. Leaflets opposite. Pods 4-12-seeded:
- 4a. Pods tetragonal, deflexed, covered
with stiff spreading hairs ... 1. *I. astragalina*
- 4b. Pods not tetragonal, straight, glabrous:

- 5a. Inflorescence lax, with sterile scales at base ... 2. *I. cassioides*
 5b. Inflorescence dense, without sterile scales at base ... 4. *I. glabra*

1. **Indigofera astragalina** DC., Prodr. 2: 228. 1825; Ali in Nasir & Ali, Fl. W. Pakistan 100: 79. 1977.

Indigofera hirsuta auct. non L. : Baker in Hook. f., Fl. Brit. India 2: 98. 1876; Prain, Bengal Pl. 1: 431. 1903; Haines, Bot. Bihar & Orissa pt. 3: 239. 1922; Ali in Bot. Not. 111: 559. 1958.

Erect or spreading, much-branched, annual herbs, to 1.5 m tall. Stems and branches densely covered with soft, spreading copper-brown hairs. Leaves imparipinnate, 10-12 cm long; petiole 2-4 cm long, pilose; rachis 7-10 cm long, pilose; leaflets 5-11, opposite, elliptic-oblong to obovate-rounded, cuneate, obtuse or retuse and mucronate, appressed-hairy on both surfaces, 2.5-5 x 1-3 cm, terminal one larger, long petioluled; petiolule 3-10 mm long; stipules linear, 1.2-1.5 cm long; stipels small, subulate. Inflorescence a dense raceme, patently brown-hairy, 5-15 cm long. Peduncle 2-2.5 cm long. Bracts linear, acuminate, deciduous, 3-4 mm long. Pedicels very short, ca. 1 mm long. Calyx 3-4 mm long, brown-hirsute; segments linear-setaceous. Vexillum 4-5 mm long. Pods tetragonal densely hairy, 10-20 x 2.5-3 mm, 4-6-seeded. Seeds cubical.

Fl. & Fr. : July-Nov.

Ecology: Common; in agricultural fields, grassy places, roadsides, forest glades, etc.

Distribution: Almost throughout the plains of India. Pakistan, Bangladesh, Sri Lanka, Myanmar, Indo-China, Australia, New Guinea, Tropical Africa, S. Africa, Madagascar, W. Indies.

Specimens examined : Hazaribagh, 29; National Park, 445; Chowparan, 1673.

Uses: Decoction of leaves is stomachic and used in diarrhoea and yaws.

2. **Indigofera cassioides** Rottl. ex DC., Prodr. 2: 225. 1825; Ali in Bot. Not. 111: 569. 1958 & in Nasir & Ali, Fl. W. Pakistan 100: 83. 1977

I. leptostachya DC., Prodr. 2: 225. 1825, non sensu Baker in Hook. f., Fl. Brit. India 2: 100. 1876.

I. pulchella auct. non Roxb.: Baker in Hook. f., Fl. Brit. India 2: 101. 1876, *p.p.* excl. syn. *I. arborea* Roxb. & *I. purpurescence* Roxb.; Prain, Bengal pl. 2: 1274. 1903; Haines, Bot. Bihar & Orissa pt. 3: 240. 1922, *p.p.* excl. syn. *I. arborea* Roxb. & *I. purpurescence* Roxb.

Local names : Hirul, Jirahul.

Erect shrub, 1-2 m tall. Branches alternate, striate, hairy when young. Leaves odd-pinnate; rachis 7-15 cm long, hairy; leaflets 11-21, opposite or rarely a few alternate, oblong to elliptic, obtuse, truncate to slightly retuse and apiculate at apex, subcuneate at base, appressed-hairy, 1.2-2.5 x 0.8-1.5 cm; stipules lateral, free, linear, deciduous, 2-4 mm long; petiolule 1-2 mm long. Inflorescence a dense raceme, 5-15 cm long; axis covered with sterile scales at base. Bract ovate, 3-6 mm long, caducous, appressed-hairy. Pedicel 1-2 mm long. Calyx pilose, 2.5-3.5 mm long; teeth subequal, deltoid, 0.8-1.2 mm long. Corolla purple, 1-1.2 cm long, hairy at margin; standard 12-16 x 8-10 mm; wing 10-13 x 3-4 mm; keel 13-15 x 2-3 mm with *ca.* 2 mm long apicula. Stamens diadelphous, staminal tube 1-1.5 cm long. Ovary 6-7 mm long; style curved; stigma capitate. Pod straight, glabrous, 2.5-4.5 cm long; each valve curling spirally after dehiscence. Seeds 8-12, angular, dark brown-blackish, as long as broad and high, *ca.* 2 mm.

Fl. : Dec.-Apr. *Fr.* : Feb.-May.

Ecology: Common; in forests, scrub jungles, hill-slopes, etc.

Distribution : Throughout the hilly parts of India. Pakistan, Indo-China, China, Myanmar, Yunnan, Siam.

Specimens examined : National Park, 429, 2037.

Uses: Flowers are eaten as vegetable by poor people in villages. Loppings are used as fodder. Decoction of leaves and young shoots is used for cough.

3. **Indigofera cordifolia** Heyne ex Roth, Nov. Pl. Sp. 357. 1821; Baker in Hook. f., Fl. Brit. India 2: 93. 1876; Prain, Bengal Pl. 1: 431. 1903; Haines, Bot. Bihar & Orissa pt. 3: 237. 1922.

Prostrate, diffuse, annual herb. Stems much-branched, densely white-tomentose. Leaves 1-foliolate; leaflets, sub-sessile, broadly ovate-cordate, sub-obtuse, mucronate, white-tomentose on both surfaces, very densely so beneath, 6-8 x 4-5 mm; stipules minute, setaceous. Flowers in dense subsessile 3-8-flowered clustered heads. Calyx 2.5- 3 mm long, hairy outside; tube very short; segments linear, acute. Corolla bright red, exserted; petals clawed; vexillum ovate-spathulate, 3.5-4 mm long, densely tomentose without, gradually tapering towards base; wings oblong, *ca.* 3 mm long; keels *ca.* 3.5 mm long. Ovary to 1 mm long, tomentose; style *ca.* 1.5 mm long. Pods oblong, cylindric, beaked, pubescent, 4-4.5 mm long. Seeds 2, cuboid, yellow.

Fl. & Fr. : Sept. -Dec.

Ecology: Rare; on overgrazed pastures.

Distribution : Throughout the plains of India. Afganistan, Beluchistan, N. Australia, Pakistan, Indonesia, Timor, Ethiopia, Sudan, W. Tropical Africa.

Specimens examined : Ghanghree, 1034; Pratappur, 2092.

Uses: Seeds are used by poor people in mixture with 'bajra' or 'jowar' for making bread. Plant is also used as good fodder.

4. **Indigofera glabra** L., Sp. Pl. 751. 1753; Prain, Bengal Pl. 1: 432. 1903; Haines For. Fl. Chota Nagpur 341. 1910.

I. pentaphylla Murr., Syst. Veg. ed. 13, 564. 1774; Baker in Hook. f., Fl. Brit. India 2: 95. 1876; Haines, Bot. Bihar & Orissa pt. 3: 238. 1922.

Prostrate, diffuse, annual herb. Stems much-branched, glabrous or with a few spreading deciduous hairs. Leaves short-petioled, 1.8-3 cm long, odd-pinnate; stipules 4-5 mm long, lanceolate, very acute, hairy, persistent; leaflets 3-7, opposite, shortly petioluled, ovate-elliptic, obtuse, apiculate, appressed-hairy on both surfaces, 5-12 x 3-10 mm. Flowers small, in 2-4-

flowered, lax, axillary racemes. Peduncles slender. Pedicels *ca.* 1 mm long. Calyx to 2.5 mm long, hairy outside, segment subulate. Corolla bright red, 3-3.5 mm long. Pods slender, straight, subcylindric, glabrous, 1.8-2.5 cm long, tipped with persistent hardened style-base. Seeds 10-12, cubical.

Fl. & Fr. : July-Nov.

Ecology : Rare; on grassy waste places.

Distribution: Throughout plains of India and Sri Lanka.

Specimen examined : Ghanghree, 1004.

Uses : Leaves are used as tonic and febrifuge; also used as emollient in external applications.

5. *Indigofera linifolia* (L.f.) Retz., Obs. Bot. 4: 29. 1786; Baker in Hook. f., Fl. Brit. India 2: 92. 1876; Prain, Bengal Pl. 1: 431. 1903; Haines, Bot. Bihar & Orissa pt. 3: 237. 1922. *Hedysarum linifolium* L. f., Suppl. 331. 1781.

Local name : Torki.

Prostrate, annual herb. Stems silvery-canescant, much branched, 15-45 cm long. Leaves simple, sub-sessile, linear or linear-oblong, acute at both ends, mucronate, silvery-hairy, 5-30 x 2-4 mm. Stipules subulate, *ca.* 2 mm long. Flowers in sessile, 0.5-2.5 cm long, axillary racemes; bracts ovate-lanceolate, 1.3-1.5 mm long; pedicels 0.5-0.8 mm long. Calyx 2.2-2.5 mm long, deeply cut, appressed-hairy; segments linear-subulate, to 1.5 mm long. Corolla bright red. Petals clawed; vexillum ovate, appressed-hairy on back, mucronate, to 3 x 3 mm; wings oblong, glabrous, to 2 mm; keels 2.5-3 mm long with *ca.* 1 mm long spur. Staminal sheath *ca.* 2 mm long. Ovary *ca.* 1 mm long; style *ca.* 2 mm long. Pods ovoid-globose, 1-seeded, appressedly silvery-pubescent, 2.5-3 x 2 mm. Seed globose, *ca.* 1.5 mm across.

Fl. & Fr.: Aug.-Jan.

Ecology: Very common; on grassy places, sandy river beds, pasture lands, fallow fields waysides, field-borders and forest clearings.

Distribution : Throughout India. Pakistan, Bangladesh, China, Afganistan, Sri Lanka, South-East Asia, Australia, East African countries.

Specimens examined : Hazaribagh, 378; Jhumri Telaiya, 657; Ghanghree, 2183.

Uses: Plant is given in febrile eruptions, also used as febrifuge.

6. *Indigofera linnaei* Ali in Bot. Not. 111: 549. 1958; Ali in Nasir & Ali, Fl. W. Pakistan 100: 75. 1977.

Hedysarum prostratum L., Mant. Pl. 102. 1767.

H. prostratum Burm. f., Fl. Ind. 168, t. 55. f. 1. 1768.

Indigofera enneaphylla L., Mant. Pl. 2: 272. 1771, Append. 571., 1771, *nom. illeg.*; Baker in Hook. f., Fl. Brit. India 2: 94. 1876; Prain, Bengal Pl. 1: 431. 1903; Haines, For. Fl. Chota Nagpur 340. 1910 & Bot. Bihar & Orissa pt. 3: 238. 1922.

I. prostrata (Burm. f.) Domin in Bibl. Stuttgart 187. 1926, non Willd. 1803.

Local name : Latahai.

Prostrate or decumbent or ascending, annual-biennial herbs, usually with a woody base. Stems appressed-hairy, much branched, terete or somewhat angled. Leaves 1.5-2 cm long, odd-pinnate; leaflets 5 to 7, subsessile, alternate, oblanceolate-oblong, obtuse, retuse and mucronate, appressed-hairy, 10-12 mm x 2-3 mm; stipules lanceolate, long-cuspidate, scarious, 5-6 mm long. Flowers in short-peduncle, dense, globose, axillary racemes of 4-7 mm long. Peduncles 1-2 mm long. Bracts ovate, acuminate, persistent. Pedicels 0.6-0.8 mm long. Calyx 3-4 mm long, appressed-hairy; segments setaceous. Corolla reddish, 5-6 mm long, glabrous; petals clawed; vexillum obovate, 4.5-5 mm long; wings 4-4.5 mm long; keels to 4 mm long with *ca.* 1 mm long spur. Staminal sheath to 3 mm. Ovary stipitate, *ca.* 2 mm long; ovules 2; style apically incurved. Pods 5-7 mm long, ellipsoid, 2-seeded, appressed-hairy. Seeds cuboid, *ca.* 3 mm.

Fl. & Fr. : Aug.-Nov.

Ecology : Common; in grassy sandy localities, river-beds and agricultural fields.

Distribution: Throughout the plains of India. Bangladesh, Sri Lanka, Myanmar, Siam, Indo-China, Indonesia, Australia, Pakistan.

Specimens examined : Hazaribagh, 277; Simaria, 796; Markachho, 1952.

Uses: Plant is used as green manure. Plant-extract is diuretic and antiscorbutic, used in chronic venereal diseases. Decoction is given in epilepsy and insanity.

Note: Ali (*l.c.*) considered *Indigofera enneaphylla* L. (1771) as a nomenclaturally superfluous name, since Linnaeus adopted it as a new name, instead of taking up the then available epithet 'prostratum' from *Hedysarum prostratum* Burm. f. (1768). According to Art. 63 of the ICBN, Ali rejected *I. enneaphylla* L. and proposed a new name, *I. linnaei* Ali as there is no other legitimate binomial for this plant.

18. LABLAB Adans.

Lablab purpureus (L.) Sweet, Hort. Brit. 1: 481. 1927; Verdc. in Kew Bull. 24: 410. 1970; Ali in Nasir & Ali, Fl. W. Pakistan 100: 251. 1977. *Dolichos purpureus* L. Sp. Pl. ed. 2, 1021. 1763.

Dolichos lablab L., Sp.Pl. 725. 1753; Baker in Hook. f., Fl. Brit. India 2: 209. 1876, *p.p.*; Prain, Bengal Pl. 1: 391. 1903; Haines, For. Fl. Chota Nagpur 329. 1910 & Bot. Bihar & Orissa pt. 3: 291. 1922, *p.p.*

Local name : Sem.

Twining, annual -perennial herbs. Leaf-petiole 2-10 cm long; rachis 1-4 cm long; stipules ovate-lanceolate, 4-6 mm long, leaflets broadly ovate, rounded-subcuneate at base, acuminate at apex, entire-repand, glabrous, or sometimes pubescent beneath, 3-15 x 2-10 cm; petiolule 3-4 mm long; stipels linear-subulate, 4-5 mm long. Racemes 10-20 cm long. Bracts ovate, 3-4 mm long; bracteoles 4-6 mm long. Pedicels 3-5 mm long. Calyx 6-8 mm long. Corolla purplish or whitish, 1.2-1.8 cm long. Vexillum oblate or round, glabrous, 1.4-1.6 cm long and broad; wings obovate, to 1.5 x 0.8

cm. Staminal sheath to 1 cm long. Ovary stipitate, 6-8 mm long, pubescent. Pod to 10 x 4 cm, 2-5-seeded. Seeds oblong, 6-15 x 3-5 mm.

Fl. & Fr. : Nov.-May.

Ecology: Very common; cultivated in gardens, fields, etc.; also found as an escape in waste places, roadsides, gardens, etc.

Distribution: Throughout India. Widespread in tropical countries.

Specimens examined : Patratu, 571; Pratappur, 599; Jayanagar, 1502.

Uses: Pods are used as vegetable. Seeds are used as febrifuge, stomachic, antispasmodic and aphrodisiac.

19. LATHYRUS L.

Lathyrus sativus L., Sp. Pl. 730. 1753; Baker in Hook. f., Fl. Brit. India 2: 179. 1876; Prain, Bengal Pl. 1: 368. 1903; Haines, For. Fl. Chota Nagpur 332. 1910 & Bot. Bihar & Orissa pt. 3: 249. 1922.

Local names: Khesari, Latri.

Glabrous, much-branched annual. Leaflets 2, rarely 4, linear or lanceolate, sharply acute at apex, 4-8 x 0.5-0.8 cm; stipules lanceolate, semisagittate at base, 5-6 mm long. Flowers solitary, axillary. Peduncle 2-4 cm long. Bracts minute, subulate. Calyx 7-10 mm long; teeth subequal, twice as long as tube. Corolla blue, 1.2-2 cm long. Stamens diadelphous, 9+1; anthers uniform. Ovary many-ovuled; style inflexed, flattened upwards, hairy beneath capitate stigma. Pods 2.5-3.5 x 0.9-1.2 cm, 3-5-seeded, winged along dorsal suture.

Fl. & Fr. : Dec.-Mar.

Ecology: Common; usually cultivated in fields; also self-grown in grassy localities, agricultural fields and field-borders, roadsides, etc.

Distribution : India: Northern India, Uttar Pradesh, Bihar, Orissa, West Bengal, Madhya Pradesh. Pakistan, Bangladesh, S.W. Asia, U.S.S.R., Europe, N. Africa.

Specimens examined : Hazaribagh, 112; Etkhori, 1866.

Uses: Seeds are consumed as pulse. Mixed with oil-cake seeds are used as feed for cattle. Young leaves are eaten as vegetable.

20. LENS Mill., *nom. cons.*

Lens culinaris Medic. in Vorles Churpf. Phys. Ges. 2: 361. 1787; Ali in Nasir & Ali, Fl. W. Pakistan 10: 263. 1977.

Evrum lens L., Sp. Pl. 738. 1753; Baker in Hook. f., Fl. Brit. India 2: 179. 1876.

Lens esculenta Moench, Meth. Pl. 131. 1794; Prain, Bengal Pl. 1: 367. 1903; Haines, For. Fl. Chota Nagpur 332. 1910 & Bot. Bihar & Orissa pt. 3: 249. 1922.

Local names: Masur, Masuri dal.

Suberect, small, annual herbs, 10-40 cm tall. Stems usually branched from base, covered with dense spreading hairs. Stipules lateral, free, entire, 3-5 mm long; leaf-rachis 1.5-3.5 cm long, ending in a short bristle; leaflets 4-7 pairs, oblanceolate-oblong, truncate or retuse and mucronate, entire, pilose on both surfaces, 5-12 x 2-4 mm. Flowers 1-4, on slender, 2-5 cm long peduncle. Calyx 5-6 mm long, pilose. Corolla pale-blue, as long as or slightly longer than calyx. Pod glabrous, 2-seeded, 8-14 x 5-8 mm. Seeds compressed, grey, with minute spots; cotyledons orange-red.

Fl. & Fr. : Dec.-Mar.

Ecology: Common; cultivated in fields; also met with as an escape in waste places, agricultural fields and field borders, grassy localities.

Distribution : Almost throughout India. Widely cultivated in Europe and Asia.

Specimens examined: Hazaribagh, 728; Ramgarh Cant., 1893.

Uses: Seeds are used as 'dal'. Young pods are eaten as vegetable. Husk is used as feed for livestock. Plant is used as fodder.

21. *MACROTYLOMA* (Wight & Arn.) Verdc.

Macrotyloma uniflorum (Lam.) Verdc. in Kew Bull. 24: 322. 1970; Ali in Nasir & Ali, Fl. W. Pakistan 100: 252. 1977. *Dolichos uniflorus* Lam., Encycl. Meth. 2: 299. 1786; Hutchin., Gen. Fl. Pl. 1: 441. 1964.

Dolichos biflorus auct. non L. : Baker in Hook. f., Fl. Brit. India 2: 210. 1876, *p.p.*; Prain, Bengal Pl. 1: 391. 1903; Haines, For. Fl. Chota Nagpur 329. 1910 & Bot. Bihar & Orissa pt. 3: 292. 1922.

Local names : Kurti, Kulti.

Twining, annual herbs. Stems glabrescent or densely hairy. Leaves 3-foliolate; petiole 1-5 cm long; stipules lanceolate, 5-8 mm long; leaflets ovate-elliptic or rhomboid, rounded-cuneate at base, acute to subacuminate at apex, softly pubescent, 2-5 × 1-3 cm; stipels 2.5-3 mm long; petiolule 1-2 mm long. Flowers 1.2-1.5 cm long, in 1-5-flowered fascicles. Pedicels 3-5 mm long. Bracts 1.8-2 mm long; bracteoles 2-3 mm long. Calyx 6-8 mm long, densely hairy; teeth lanceolate-setaceous, much exceeding the tube. Corolla pale yellow or cream; vexillum usually with crimson spot inside; keel shorter than vexillum. Pods linear-oblong, much recurved, densely hairy, 3.5-6 × 0.6-0.8 cm, tipped with persistent style, 5-6-seeded. Seeds reniform, grey.

Fl. & Fr. : Sept.-Dec.

Ecology: Common; cultivated in the fields; also met with as an escape in waste places, roadsides, cultivated fields and field borders, open grassy places, etc.

Distribution : Throughout India. Tropics of Old World.

Specimens examined: Pratappur, 614; Hazaribagh, 1586; Bishnugarh, 1945.

Uses: Plant is used as cattle-feed. Seeds are consumed after cooking or frying by poor people. They are also used as astringent, diuretic and tonic.

22. *MEDICAGO* L.*Key to the Species*

- 1a. Suberect perennial. Flowers purple or pale lavender. Pods not echinulate ... 3. *M. sativa*
- 1b. Diffuse annual. Flowers yellow:
- 2a. Pods minute, shell-like, not echinulate, 1-seeded ... 1. *M. lupulina*
- 2b. Pods subglobose, spiral, echinulate on margin, 3-4-seeded ... 2. *M. polymorpha*

1. ***Medicago lupulina* L.**, Sp. Pl. 779. 1753; Baker in Hook. f., Fl. Brit. India 2: 90. 1876; Prain, Bengal Pl. 1: 415. 1903; Haines, Bot. Bihar & Orissa pt. 3: 235. 1922; Ali in Nasir & Ali, Fl. W. Pakistan 100: 306. 1977.

Prostrate or ascending, slender, annual or biennial herbs. Branches grooved, patently hairy. Leaf-petiole 1.5-2.5 cm long; stipules lanceolate, acuminate, entire or dentate, 2.5-3 mm long; leaflets obovate, cuneate at base, slightly retuse and mucronate, faintly inciso-crenate in upper part, glabrous, or hairy beneath, 0.6-2 x 0.4-1.2 cm. Racemes dense, capitate, 10-20-flowered. Peduncle 1.5-3.5 cm long. Bracts subulate, 0.5-0.8-mm long. Pedicels 1-1.2 mm long. Calyx 1.2-1.5 mm long, hairy; teeth linear-lanceolate, acute. Corolla yellow, slightly exerted. Pods very small, subglobose, reniform, shell-like, reticulato-venose, glabrescent or sparsely pubescent, black when ripe, 1-seeded, to 2 x 1.8 mm.

Fl. & Fr.: Jan.-Mar.

Ecology: Very common; in agricultural fields, gardens, roadsides, etc.

Distribution : India: Tropical and temperate parts of N.W. India, Uttar Pradesh, Bihar, West Bengal, Orissa. Pakistan, Afganistan, Iran, Syria, Turkey, USSR, Europe, Ethiopia, Somali Republic, Tanganyika, Kenya.

Specimens examined : Ramgarh Cant, 553; Chatra, 1092; Jaynagar, 1501.

Uses: Plant is grown in pastures as a cattle-feed; also used as green manure.

2. **Medicago polymorpha** L., Sp. Pl. 779. 1753, emend. Shinnars in Rhodora 58: 310. 1956; Ali in Nasir & Ali, Fl. W. Pakistan 100: 302. 1977.

M. denticulata Willd., Sp. Pl. 3: 1414. 1802; Baker in Hook. f., Fl. Brit. India 2: 90. 1876; Prain, Bengal Pl. 1: 415. 1903; Haines, Bot. Bihar & Orissa pt. 3: 236. 1922.

Prostrate or ascending, spreading annual herbs. Branches glabrous. Leaf-petiole 1.5-4 cm long; stipules laciniate, with linear, 3-4 mm long segments; leaflets obovate, cuneate at base, deeply emerginate and mucronate, slightly denticulate in upper part, glabrous, 0.8-2 x 0.6-1.2 cm; terminal leaflet on 2.5-3 mm long petiolule. Racemes closely 2-8-flowered; peduncle 0.6-1.5 cm long. Pedicels 5-6 mm long Calyx 2.2-2.5 mm long, hairy in upper part; teeth lanceolate, as long as tube. Corolla yellow, 3-4 mm long. Pods with 2-4 spirals, subglobose, with spiny margins and reticulatovenose outer face, 3-4-seeded, 5-6 mm across.

Fl. & Fr. : Dec.-May.

Ecology: Common; in agricultural fields, gardens, open grassy lands, waste places, etc.

Distribution : India: Tropical parts of N.W. India, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa. Throughout the World except desert.

Specimens examined : Ghanghree, 1307; Simaria, 1635.

Uses: Plant is used as green fodders; also eaten as leafy-vegetable. Plant is used as green manure.

3. **Medicago sativa** L., Sp. Pl. 778. 1753; Baker in Hook. f., Fl. Brit. India 2: 90. 1876; Prain, Bengal Pl. 1: 414. 1903; Haines, Bot. Bihar & Orissa Pt. 3: 235. 1922.

Local name: Vilayti-gawuth, Lasunghas.

Suberect perennial, 30-60 cm tall; stems slightly hairy; stipules 0.6-1 cm long, leaf-petiole 1.5-2.5 cm long; leaflets obovate-oblongate, cuneate at base, obtuse, dentate in upper part, appressed-pubescent, 0.6-2 x 0.3-1 cm; petiolule *ca.* 1 mm long. Racemes 3.5-7 cm long including peduncle. Calyx-teeth as long as tube. Corolla purple to pale lavender, 0.6-1.2 cm long. Pods forming a complete loop or a loose spiral of 2-4 turns, glabrous or pilose, venose, to 8 mm, 10-20-seeded.

Fl. & Fr.: Dec.-Apr.

Ecology: Common; cultivated in gardens, fields, etc; also escapes in waste places, roadsides, agricultural fields and field-borders, etc.

Distribution : Throughout India. Probably native of Mediterranean and W. Asia, now widely naturalised in temperate regions of the world.

Specimens examined : Hazaribagh, 512; Barhi, 1390; Patratu, 1327.

Uses: Tender leaves are consumed as vegetable. Plant is used as fodder for cattle.

23. MELILOTUS JUSS.

Key to the Species

- 1a. Corolla yellow, 0.2-0.3 cm long ... 2. *M. indica*
 1b. Corolla white, 0.45-0.6 cm long ... 1. *M. alba*

1. **Melilotus alba** Medic. ex Desr. in Lam., *Encycl.* 4: 63. 1796; Baker in Hook. f., *Fl. Brit. India* 2: 89. 1876; Prain, *Bengal pl.* 1: 413. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 235. 1922.

Local name: Safed senji.

Erect, annual herbs, to 60 cm tall. Stems much-branched, glabrous. Leaves 3-foliolate; petioles 1.5-2 cm long, slender; stipules adnate to petiole in their lower halves; lanceolate to linear, 0.4-0.5 cm long; leaflets oblanceolate or narrowly oblong or elliptic oblong, truncate or rounded at apex, rounded or cuneate at base, acutely toothed, 2.5-3 x 0.8-1.5 cm; petiolule 3-6 mm long. Racemes 4-7 cm long, peduncle 2-2.5 cm long.

Bracts subulate, 1.2-2 mm long. Pedicels short, 1-2 mm long. Calyx 2.5-3 mm long. Corolla white, 4.5-6 mm long, vexillum retuse, longer than wings. Pods glabrous, 1-seeded, ovoid-ellipsoid, reticulately veined, 3.5-4 mm long.

Fl. & Fr. : Jan.-Apr.

Ecology: Very common; in grassy and shady localities, agricultural fields, field-borders, waste places, roadsides, etc.

Distribution : Almost throughout India. Pakistan, Sri Lanka, Bangladesh, Tibet, Persia, Afganistan, Central Asia, Turkey, Arabia, Europe; introduced in America and Australia.

Specimens examined: Hazaribagh, 517; Ghanghree, 1970; Ramgarh, 1143.

Uses: Plant is useful for fodder. Seeds yield a fatty oil suitable for use in paints and varnishes. Seed meal forms a useful protein supplement in cattle feed.

2. *Melilotus indica* (L.) All., Fl. Pedem. 1: 308. 1785; Schulz in Bot. Jahrb. 29: 713. 1900; Prain, Bengal pl. 1: 413. 1903; Haines, Bot. Bihar & Orissa pt. 3: 235. 1922. *Trifolium indica* L., Sp. Pl. 765. 1753.

Melilotus parviflora Desf., Fl. Atlant. 2: 192. 1798; Baker in Hook. f., Fl. Brit. India 2: 89. 1876.

Local name: Banmethi.

Erect or ascending, annual herbs, 25-40 cm tall. Stems much branched, ± glabrous, striate. Leaves 3-foliolate; petioles 1.5-3.5 cm. long, slender; stipules 0.5-0.6 cm long, lanceolate, very acute; leaflets obovate-oblongate, rounded, truncate or retuse at apex, cuneate at base, glabrous except hairy midrib beneath, 1.5-2.5 × 1-1.2 cm; petiolule very short; stipules with an oblique base, 0.4-0.6 cm long. Racemes 4-5 cm long. Peduncle 2.5-3.5 cm long. Bracts minute, subulate. Pedicels short, 0.1-0.15 cm long. Calyx 0.1-0.15 cm long; teeth triangular. Corolla yellow, 0.2-0.3 cm long. Pods ovoid-ellipsoid, 1-seeded apiculate, reticulately veined, 0.25-0.4 cm long.

Fl. & Fr. : Jan.-Apr.

Ecology: Very common; in agricultural fields, roadsides, grassy localities, field-borders and water courses.

Distribution : Almost throughout India. Pakistan, Iran, Iraq, Europe, C. Asia, Africa, China, Japan, Australia and America.

Specimens examined : Hazaribagh, 516; Chatra, 554; Ramgarh, 1140.

Uses: Plant is used as fodder and green manure. Seeds are used in bowel complaints and infantile diarrhoea.

24. MILLETTIA Wight & Arn.

Millettia extensa (Benth.) Baker in Hook. f., Fl. Brit. India 2: 109. 1876; Ali in Nasir & Ali, Fl. W. Pakistan 100: 52. 1977. *Otosema extensa* Benth. in Miq., Pl. Jungh. 249. 1852.

Robinia macrophylla Roxb., Fl. Ind. 3: 329. 1832.

Millettia macrophylla (Roxb.) Kurz in J. Asiat. Soc. Bengal 45(2): 276. 1876, non Hook. f. 1848.

M. auriculata Baker ex Brandis, For. Fl. Ind. 138. 1874; Baker in Hook. f., Fl. Brit. Ind. 2: 108. 1876; Prain, Bengal Pl. 1: 407. 1903; Haines, For. Fl. Chota Nagpur 339. 1910 & Bot. Bihar & Orissa pt. 3: 246. 1922.

Local name : Gaj.

Large woody climber; branchlets downy-pubescent. Leaves 25-50 cm long; petiole 10-15 cm long; stipules persistent, 6-7 mm long; leaflets 7-9, obovate-oblong, obtuse or cuspidate at apex, glabrescent above, thinly silky beneath, 8-20 x 5-12 cm; secondary veins 8-12, strong; stipels deciduous. Racemes 10-25 cm long, densely silky, numerous, usually clustered on short stout axillary peduncles. Flowers 1-1.2 cm long, fascicled on rachis. Pedicels 2.5-3 mm long. Bracts linear, minute. Calyx densely silky, 2.5-3 mm long; teeth very short. Corolla cream-coloured, densely silky; vexillum 1-1.2 cm long. Ovary appressedly silky, pod straight, hard and woody, velvety, 10-15 x 2-2.5 cm, tardily dehiscent, about 8-seeded.

Fr.: Mar.-May. *Fr.*: Dec.-Mar.

Ecology : Common; in forests, slopes of low hills, etc.

Distribution : India.: Punjab, Uttar Pradesh, Bihar, Madhya Pradesh, Andhra Pradesh. Nepal, Myanmar, Siam, Pakistan.

Specimens examined : National Park, 90, 2050.

Uses: Root is used for killing fish, insects on cattle sores, etc. by local people. Infusion of powdered root is rubbed on cattle and horses to keep off flies. Leaves are lopped for fodder. Bark yields a fibre used for rough cordage.

25. MUCUNA Adans., *nom. cons.*

Mucuna pruriens (L.) DC., Prodr. 2: 405. 1825; Baker in Hook. f., Fl. Brit. India 2: 187. 1876; Prain, Bengal Pl. 1: 400. 1903; Haines, For. Fl. Chota Nagpur 324. 1910. *Dolichos pruriens* L. in Stickman, Diss. Herb. Amb. 23. 1754.

Stizolobium pruriens (L.) Medic., Vorles Chrurpfalz. Phys. Ocon. Ges. 2:399. 1787.

Mucuna prurita Hook., Bot. Misc. 2: 348. 1831, *nom. superfl.*; Haines, Bot. Bihar & Orissa pt. 3: 283. 1922.

Local names : Kivach, Alkusi.

Annual twinner; young branches densely pubescent. Leaf-petioles 7-15 cm long; leaflets ovate-elliptic or ovate-rhomboid, truncate or rounded at base, obtuse or retuse and mucronate at apex, finely grey-pubescent beneath, 8-15 x 5-7 cm; lateral veins 6-7, strong; petiolule 2-3 mm long; stipels subulate, 2-5 mm long. Racemes axillary, 15-30 cm long. Flowers single or 2-3 together. Bracts 1-1.2 cm long, lanceolate. Pedicels 4-6 mm long. Calyx 8-10 cm long, with few irritating bristles; teeth as long as or slightly longer than tube. Corolla purple, 2.5-4 cm long; vexillum ovate, to 2.5 x 1.5 cm; wings to 3.5 x 1 cm; keels to 4 x 0.5 cm. Stamens diadelphous, 9+1; anthers dimorphous, alternately long, basifixed and short, versatile, staminal sheath 2-2.5 cm long. Ovary 1-1.2 cm long; style 3-3.5

cm long. Pods turgid, with ends curved in opposite directions, 5-10 x 1.2-1.5 cm, 5-6-seeded, densely clothed with irritating bristles. Seeds transversely oblong.

Fl. : Sept.-Dec. *Fr.*: Nov.-Apr.

Ecology: Very common; in hedges, slopes of low hills, along river-banks, dry jungles, etc.

Distribution : Throughout India including Himalaya. Pakistan, Nepal, Sri Lanka, Myanmar, Indo-China, Indonesia, Philippines.

Specimens examined : Raja Rappa, 409; Ramgarh Cant., 1895.

Uses: Pods are eaten by local people after boiling. Roots are used for diseases of nervous system, renal affections and dropsy. An ointment prepared from roots is used in elephantiasis.

26. OUGEINIA Benth.

Ougeinia oojeinensis (Roxb.) Hochr. in Ann. Cons. Jard. Bot. Geneve 13 & 14: 51. 1909; Ali in Nasir & Ali, Fl. W. Pakistan 100: 341. 1977. *Dalbergia oogeinensis* Roxb., Fl. Ind. 3:220. 1832.

O. dalbergioides Benth. in Miq., Pl. Jungh. 216. 1852; Baker in Hook. f., Fl. Brit. India 2: 161. 1876; Prain, Bengal Pl. 1: 421. 1903; Haines, For. Fl. Chota Nagpur 349. 1910 & Bot. Bihar & Orissa pt. 3: 259. 1922.

Desmodium oojeinense (Roxb.) H. Ohashi in Ginkgoana 1: 117. 1973.

Local name: Sandan, Panjan, Panan.

Small, crooked tree, 6-14 m tall; bark dark-brown, deeply cracked. Branches slender, terete, grey. Leaves pinnately 3-foliolate, 15-25 cm long; petiole 3-5 cm long; stipules 5-6 mm long, lanceolate, acute, caducous; leaflets rigidly coriaceous, glabrous above, sub-tomentose beneath, shallowly crenate, bluntly pointed, terminal one broadly ovate, orbicular or obovate, sometimes trapezoidal, 7-15 x 5-10 cm, lateral ones opposite, obliquely ovate, rounded at base, inequilateral, subacute or obtuse at apex,

2-10 × 3.5-7.5 cm; stipules subulate. Racemes short, arising from nodes of old branches. Pedicels coloured, 1.2-2 cm long, filiform. Bracts ovate, acuminate, villous outside, 1.2-1.5 mm long. Bracteole minute, villous. Calyx 4-6 mm long, pubescent; teeth short, triangular. Corolla white or rose-coloured, 0.8-1.2 cm long, somewhat fragrant. Pods 5-7.5 cm long; joints reticulately veined, 2-3 times as long as broad.

Fl. : Feb. -Apr. *Fr.*: May-June.

Ecology : Common; in forests, slopes of low hills, forests of hilly regions, etc.

Distribution : India: Kashmir, Kumaon, Punjab, Uttar Pradesh, Maharashtra, Tamilnadu, West Bengal, Bihar, Central India, Orissa. Pakistan, Nepal.

Specimens examined : Pratappur, 917; National Park, 1190.

Uses: Wood is used for furniture, building, agricultural implements, etc. Leaves are largely used for fodder. Bark is used medicinally.

27. PISUM L.

Pisum sativum L., Sp. Pl. 727. 1753; Baker in Hook. f., Fl. Brit. India 2 : 181. 1876; Prain, Bengal Pl. 1 : 369. 1903; Haines, Bot. Bihar & Orissa pt. 3 : 250. 1922.

Key to the Varieties

- 1a. Standard white or pale-violet; wings and keel purple. Seeds depressed-angular, mottled ... 2. var. *arvensis*
- 1b. Standard, wings and keel white. Seeds globose, unmottled ... 1. var. *sativum*

1. var. **sativum**; Ali in Nasir & Ali, Fl. W. Pakistan 100: 264. 1977.

Local name: Matar.

Climbing annual; stems glaucescent. Leaf rachis ending in a branched tendril; stipules obliquely ovate, semi-amplexicaul at base, dentate at base

of outer margin, 2-7 x 1-4 cm; leaflets 1-4 pairs, ovate-elliptic or ovate-oblong, obtuse or truncate and mucronate at apex, entire or dentate in upper part, 2.5-5 x 1.8-3.5 cm. Flowers 1-3 in leaf-axil. Peduncle 1.5-5 cm long. Calyx 0.8-1.2 cm long; teeth longer than tube, subequal. Corolla 1.5-2.5 cm long; vexillum white or pale violet; wings and keel white. Pods 4-8 x 1.2-1.6 cm. Seeds globose, unmottled.

Fl. & Fr. : Dec.-Apr.

Ecology: Common; cultivated in gardens, fields; also escapes in agricultural fields, waste places, roadsides, vacant plots, etc.

Distribution : Throughout India. Native of W. Asia, now cosmopolitan.

Specimens examined : Churchu, 687; Etkhori, 1860.

Uses: Seeds are consumed in fresh form as vegetable and in dried form as pulse. Pea-oil is used for preventing pregnancy.

2. var. *arvensis* (L.) Poir. in Lam., *Encycl. Meth. Bot.* 5: 456. 1804; Ali in Nasir & Ali, *Fl. W. Pakistan* 100: 264. 1977. *Pisum arvensis* L., *Sp. Pl.* 727. 1753; Baker in Hook. f., *Fl. Brit. India* 2: 181. 1876; Prain, *Bengal Pl.* 1: 369. 1903; Haines, *For. Fl. Chota Nagpur* 332. 1910 & *Bot. Bihar & Orissa* pt. 3: 250. 1922.

Local name: Matar.

Fl. & Fr.: Dec.-May.

Ecology: Very common; cultivated in fields, also found as an escape in waste places, agricultural fields, field-borders, roadsides, etc.

Distribution : Throughout India. Native of Europe and S.W. Asia, now cosmopolitan.

Specimens examined : Barhi, 1392; Bishnugarh, 1948.

Use: Same as var. *sativum*.

28. PONGAMIA Vent., *nom. cons.*

Pongamia pinnata (L.) Pierre, For. Fl. Cochinch. t. 385. 1899; Thoth. in Bull. Bot. Surv. India 3:418. 1962; Ali in Nasir & Ali, Fl. W. Pakistan 100: 55. 1977; Thoth. & Nair in Taxon 30: 44. 1981. *Cytisus pinnatus* L., Sp. Pl. 741. 1753.

Galedupa indica Lam., Encycl. 2: 594. 1788.

Pongamia glabra Vent., Jard. Malm. 28, t. 28. 1803; Baker in Hook. f., Fl. Brit. India 2: 240. 1876; Prain, Bengal Pl. 1: 407. 1903; Haines, For. Fl. Chota Nagpur 333. 1910 & Bot. Bihar & Orissa pt. 3: 299. 1922.

Derris indica (Lam.) Bennet in J. Bombay Nat. Hist. Soc. 68: 303. 1971.

Local name: Karanj.

Much-branched, glabrous tree, up to 18 m high; bark soft, greyish-green. Leaves 13-25 cm long; petiole 3.5-6 cm long; stipules oblong, obtuse, caducous, 1.8-2 mm long; leaflets 5-7, ovate-oblong or elliptic, acuminate at apex, obtuse-cuneate at base, entire, thin-coriaceous, glabrous, glossy above, 5-12 x 3-8 cm; petiolule 0.6-1 cm long. Racemes lax, shorter than leaves. Pedicels 5-8 mm long. Bracteoles very small, ovate, 2-2.5 mm long. Calyx 2.5-3 mm long, brown-pubescent. Corolla pinkish-white, 1-1.2 cm long; vexillum orbicular, emerginate, 1-2 x 1 cm; wings oblong, to 12 x 4 mm; keels to 10 x 3 mm. Pods 4-7 cm x 2-3 cm, obliquely oblong or obovoid, with slightly curved tip, glabrous. Seeds reddish-brown, reniform.

Fl. : Apr.-May. *Fr.* : Oct. -Jan.

Ecology : Common; usually planted along roadsides, parks, etc., also self-grown in village surroundings, along banks of rivers, etc.

Distribution : India: Central and Eastern Himalayas, Western, Central and Eastern India, Deccan Peninsula especially near coast. Pakistan, Bangladesh, Sri Lanka, Myanmar, Malesia, N. Australia, Polynesia and Mascarenes.

Specimens examined : Mandu, 841; Barhi, 1394; Hunterganj, 1642.

Uses: An oil extracted from seeds is largely used for burning, in preparation of washing soaps and candles; also used to cure skin diseases and in rheumatism. Oil-cake is used as manure. Wood is used for yokes of bullock carts, ploughs, cart-wheels, thatched cottages, oil mills, furniture and small turnery articles. Juice of leaves is used in flatulence, dyspepsia, diarrhoea, cough, leprosy and gonorrhoea.

29. *PTEROCARPUS* Jacq., *nom. cons.*

Pterocarpus marsupium Roxb., Pl. Corom. 2: 9, t. 116. 1798 Baker in Hook. f., Fl. Brit. India 2: 239. 1876; Prain, Bengal Pl. 1: 412. 1903; Haines, For. Fl. Chota Nagpur 334. 1910 & Bot. Bihar & Orissa pt. 3: 297. 1922.

Local names : Piasal, Bijasal.

Large deciduous tree, to 20 m tall; bark thick, yellowish-grey; branches widely spreading. Leaves 15-24 cm long; rachis glabrous, prolonged 2-2.5 cm beyond the insertion of upper lateral leaflet; leaflets 5-7, ovate-elliptic, coriaceous, subcuneate at base, obtuse, rounded or retuse at apex, glabrous on both surfaces, shining above, slightly glaucous beneath, 6.1 x 3.5-5 cm; secondary veins numerous, close, prominent; petiolule 0.6-1 cm long. Panicles terminal, 15-25 cm long, brown-pubescent. Flowers 1.3-1.5 cm long. Pedicels 1.2-1.5 mm long. Calyx 5-6 mm long, brown-pubescent; teeth deltoid, upper 2 the largest. Corolla yellow; vexillum 1-1.2 cm. Stamens monadelphous, or staminal sheath finally split on both sides making them isodelphous. Ovary 2-ovuled. Pods 3-5 cm in diam., glabrous; wing veined; stipe 4-5 mm long. Seed 1, oblong-subreniform.

Fl. : Sept. -Oct. *Fr.* : Dec.-Feb.

Ecology: Not common; in deciduous forests.

Distribution : India: Western Peninsula, Karnataka, Bihar, Orissa. Sri Lanka.

Specimen examined : Koderma forest, 1254.

Uses: Wood is used chiefly for building purposes, such as doors, windows' frames, rafters, beams and posts; also used in railway carriages, as electric transmission poles, agricultural implements, tool-handles,

mathematical instruments, picture frames, etc. Mixed with other woods, it is used for manufacture of wrapping papers. Bark is used in diarrhoea and dysentery. Aqueous extract of wood is given in diabetes.

30. RHYNCHOSIA Lour., *nom. cons.*

Rhynchosia minima (L.) DC., Prodr. 2: 385. 1825; Baker in Hook. f., Fl. Brit. India 2: 223. 1876, *p.p.*: Prain, Bengal Pl. 1: 380. 1903; Haines, Bot. Bihar & Orissa pt. 3: 272. 1922. *Dolichos minimus* L., Sp. Pl. 726. 1753.

R. laxiflora Camb. in Jacq., Voy. Bot. 44, t. 54. 1844.

R. minima (L.) DC. var. *laxiflora* (Camb.) Baker in Hook. f., Fl. Brit. India 2: 223. 1876; Haines, For. Fl. Chota Nagpur 319. 1910 & Bot. Bihar & Orissa pt. 3: 272. 1922.

Slender, trailing or twining annual-perennial herb. Stems nearly glabrous or downy-pubescent when young, much-branched. Leaves 3-foliolate, 1.5-3 cm long; petioles 2-3 cm long, striate, pubescent; stipules 3.5-4 mm long, linear-lanceolate; leaflets ovate-elliptic or ovate-rhomboid or rhomboid-obovate, acute at apex, cuneate at base, entire, glabrous above, pubescent on veins and conspicuously gland-dotted beneath, 2.5-5 × 1.5-3 cm; stipels minute, subulate, sub-persistent, *ca.* 1 mm long. Racemes lax, 5-10 cm long, 6-12-flowered. Peduncle 3-5 cm long. Bracts ovate, 0.18-0.2 cm long. Pedicels *ca.* 1.5 mm long. Calyx 4-5 mm long, pubescent; lobes linear-subulate. Corolla yellow, 5.5-6 mm long; vexillum oblong-ovate, hairy on back, with 2 distinct auricles, to 6 × 4 mm; wings to 6 × 3.5 mm, slightly exceeding keel; staminal sheath 4.5-5 mm long. Ovary glandular-pubescent; style 3.2-3.5 mm long. Pods oblong-falcate, with a short beak, gland-hairy, 1.2-1.8 × 0.6-0.7 cm, 2-seeded. Seeds compressed, black, to 3 × 2 mm.

Fl. & Fr. : Sept. -Nov.

Ecology : Common; in forest edges, forest clearings, waste places, etc.

Distribution : Throughout India. Pakistan, Afganistan, Nepal, Myanmar, Bangladesh, Sri Lanka, Australia, Arabia, Palestine, Tropical Africa, West Indies, U.S.A.

Specimens examined : Ghanghree, 1026; Barhi, 1395.

Uses : Plant is used as fodder for cattle and horses. Leaves are used as an abortifacient.

31. ROTHIA Pers., *nom. cons.*

* **Rothia indica** (L.) Druce in Rep. Bot. Exch. Club Soc. Brit. Isles 3: 423. 1914; Gandhi in Saldan. & Nicols., Fl. Hassan. Dist. 263. 1976; Britto in Matthew, Fl. Tamilnadu Carnatic pt. 1: 456. 1983. *Trigonella indica* L., Sp. Pl. 778. 1753.

R. trifoliata Pers., Syn. Pl. 2: 302. 1807; Baker in Hook. f., Fl. Brit. India 2: 63. 1876.

Stems much-branched, hirsute, slightly woody at base. Leaf petiole 8-10 mm long; leaflets oblanceolate, 8-12 x 4-6 mm, thin-coriaceous, obtuse, mucronate, attenuate at base, ciliate on margins, hirsute below. Stipules elliptic-oblong, acute, hairy, 3.5-4 mm long; petiolules very short, ca. 0.8 mm long. Flowers in axils of leaves; pedicels ca. 2 mm long. Calyx silky-hairy, 4-6 mm long; segments subequal, lanceolate, acute. Corolla yellow; vexillum ovate-oblong, to 6 x 2 mm; wings narrow; keels cohering, falcate. Staminal sheath 3.5-4 mm long. Ovary densely hirsute. Pods 3-5 x 0.18-0.2 cm, silky, pointed by persistent style. Seeds 20 or more, reniform, purple.

Fl. & Fr.: Aug.-Nov.

Ecology: Rare; in fallow fields, waste places, etc.

Distribution : Plains of India. Sri Lanka, Australia.

Specimens examined: Ghanghree, 1010.

Uses: Leaves and pods are boiled and eaten as a vegetable by poor people in villages.

32. SESBANIA Scop., *nom. cons.*

Sesbania grandiflora (L.) Poir. in Lam., Encycl. 7: 127. 1806; Baker in Hook. f., Fl. Brit. Ind. 2: 115. 1876; Prain, Bengal Pl. 1: 404. 1903;

Haines, For. Fl. Chota Nagpur 343. 1910 & Bot. Bihar & Orissa pt. 3: 245. 1922. *Robinia grandiflora* L., Sp. Pl. 722. 1753.

Local names : Basna, Agati.

Soft-wooded small tree, 7-10 m tall; branchlets pubescent. Leaves 15-30 cm long; petiole 1.5-3 cm long; stipules lanceolate, 0.8-1 cm long; leaflets 10-25 pairs, linear-oblong, chartaceous, emerginate at apex, obtuse at base, 1.5-3.5 x 0.5-1 cm; petiole 1.5-2 mm long. Racemes 2-5 flowered, to 10 cm long. Flowers pendulous, 8-10 cm long. Calyx 2-2.5 cm long; lobes triangular. Corolla white; standard reflexed, 9-10 x 5-6 cm; wings to 10 x 3 cm; keels to 11 x 3.5 cm. Staminal sheath 10-12 cm long. Pods 30-50 x 0.6-0.8 cm, slender, curved, with thickened sutures. Seeds 20-30, to 8 mm long.

Fl. & Fr.: Nov.-Feb.

Ecology: Very common; planted in gardens, along roadsides, etc.; also self-grown.

Distribution : Almost throughout India. Probably a native of Indonesia, cultivated and naturalised in Asia, tropical Africa and N. Australia.

Specimens examined : Gola, 766; Katkamosandi, 1402.

Uses: Tender leaves, pods and flowers are eaten as vegetable. Bark yields a fibre used for cords. Wood is used for toys. Juice of bark is used for toughening nets and for colouring mats. Bark-decoction is used in diarrhoea and dysentery.

33. SMITHIA W. Ait., *nom. cons.*

Key to the Species

- 1a. Bracteoles and calyx-lip not ciliate, glabrous or with few long hairs on back, densely parallel-veined with unbranched free nerves. Flowers bright-yellow ... 1. *S. conferta*
- 1b. Bracteoles and calyx-lip long-ciliate, long-hairy on midvein. Calyx-lip not very densely parallel-veined with nerves branched near their tops. Flowers white or whitish-blue ... 2. *S. ciliata*

1. *Smithia conferta* Sm. in Rees, Cycl. 33, No. 2. 1819; Haines, Bot. Bihar & Orissa, pt. 3: 253. 1922; van Meeuwen in Reinwardtia 5: 445. 1961.

S. geminiflora Roth., Nov. Pl. Sp. 352. 1821; Baker in Hook. f., Fl. Brit. India 2: 149. 1876.

S. geminiflora Roth. var. *conferta* (Sm.) Baker in Hook. f., Fl. Brit. India 2: 149. 1876; Prain, Bengal Pl. 1: 417. 1903.

Prostrate or decumbent-ascending, annual or perennial, much branched herbs. Leaves 1-3 cm long; leaflets 3-8 pairs, oblong, acute or obtuse at apex, long-ciliate along margins, glabrous except appressed-long-hairy beneath especially on midvein, gland-dotted on lower surface, 5-12 x 1.5-4 mm. Stipules 6-10 mm long. Pedicels 1.2-1.5 mm long. Bracteoles ovate-lanceolate, long-hairy on mid-vein and at top, 3-3.5 mm long. Calyx 6-7 mm long; lower lip long-hairy; upper glabrous or long-hairy at top. Corolla bright-yellow, 8-10 mm long. Pod 8-10-jointed, glabrous; joints connected by dorsal sutures.

Fl. Sept. Oct. *Fr.*: Oct. -Nov.

Ecology: Very common; along borders of cultivated lands, margins of ponds, lakes, forest edges, marshy grassy localities, etc.

Distribution : Throughout India. Sri Lanka, S.E. Asia, China, N. Australia.

Specimen examined : Hazaribagh, 2303; Ramgarh, 2390.

2. *Smithia sensitiva* W. Ait., Hort. Kew, ed. 1, 3: 496. 1789; Baker in Hook. f., Fl. Brit. India 2: 148. 1876; Prain, Bengal Pl. 1: 417. 1903; Haines, Bot. Bihar & Orissa pt. 3: 253. 1922.

Local name: Odabrini.

Erect or decumbent or ascending, much-branched, diffuse annual herbs. Stems slender, 30-90 cm long. Leaves abruptly-pinnate, 1-2.5 cm long; rachis bristly; petioles 2-3 mm long; stipules lanceolate; leaflets 3-10 pairs, linear-oblong, obtuse, bristle-pointed, glabrous above, long-hairy on

midrib beneath, 7-10 × 3-4 mm. Racemes capitate, 8-10 mm long, 2-6-flowered. Peduncles 1.2-1.5 cm long, glabrous or with a few scattered bristles. Pedicels filiform, ascending. Bracteoles long-hairy on back, 4-5 mm long, ovate, acute. Calyx 5-6 mm long, with a few scattered bristles. Corolla yellow, 8-10 mm long. Pods flattened, 4-6 jointed; joints orbicular, densely papillose on faces.

Fl. & Fr. : Oct.-Nov.

Ecology : Very common; in humid or swampy grassy localities, agricultural fields, field-borders, waste places, etc.

Distribution : Throughout India. Tropical Africa, Madagascar, Java, China.

Specimens examined: Hazaribagh, 497; Jhumri Telaiya, 668.

Uses: Leaves are used as cattle feed. Whole plant is boiled and consumed for difficulty in passing urine and gravel.

34. TEPHROSIA Pers.

Key to the Species

- 1a. Leaves 1-foliolate ... 3. *T. strigosa*
- 1b. Leaves imparipinnate:
 - 2a. Stems procumbent, densely hairy or sericeous ... 1. *T. pumila*
 - 2b. Stems suberect, glabrous or sparsely pilose ... 2. *T. purpurea*

1. ***Tephrosia pumila*** (Lam.) Pers., Syn. Pl. 2: 330. 1807; Prain in J. Asiat. Soc. Bengal 66: 366. 1897 & Bengal Pl 1: 405. 1903; Haines, Bot. Bihar & Orissa pt. 3: 244. 1922. *Galega pumila* Lam., Encycl. 2: 599. 1786.

T. purpurea (L.) Pers. var. *pumila* (Lam.) Baker in Hook. f., Fl. Brit. India 2: 113. 1876; Haines, For. Fl. Chota Nagpur 340. 1910.

Decumbent or ascending, much-branched, annual herbs; branchlets flexuous, angled, hairy or sericeous. Leaves to 5 cm long; petiole 2-3 mm

long; stipules linear-subulate, 3-4 mm long; leaflets 9-15, oblong or oblanceolate, cuneate, truncate to emerginate and mucronate, glabrous above, appressed-hairy beneath, 1-1.5 x 0.6-0.8 cm. Racemes terminal or leaf-opposed, 1-3-flowered, sessile or short-peduncled. Bracts 2-3 mm long. Pedicels 2-4 mm long. Calyx 3-4.5 mm long, appressed-hairy; lobes longer than tube, setaceous, acuminate. Corolla red; vexillum 0.7-1 cm, suborbicular, appressed-hairy on back. Staminal sheath 4-4.5 mm long. Ovary densely tomentose, 4-4.5 mm long. Pods slightly curved, 2-4 x 0.3-0.4 cm, 6-10-seeded. Seeds *ca.* 2 mm.

Fl. & Fr. : July. -Dec.

Ecology : Common; in waste grounds, open grassy localities, field-borders, river-beds, etc.

Distribution : Throughout India. Africa, S. Asia, Mauritius, C. America, W. Indies.

Specimens examined : Patratu, 569; Ichak, 1317.

Use: Plant possesses insecticidal properties.

2. *Tephrosia purpurea* (L.) Pers., Syn. Pl. 2: 329. 1807; Baker in Hook. f., Fl. Brit. India 2: 112. 1876; Prain, Bengal Pl. 1: 405. 1903; Haines, For. Fl. Chota Nagpur 340. 1910 & Bot. Bihar & Orissa pt. 3: 244. 1922. *Cracca purpurea* L., Sp. Pl. 752. 1753.

Tephrosia hamiltonii Drumm. ex Gamble, Fl. Madras 1: 317 (320). 1918; Calder *et al.* in Rec. Bot. Surv. India 11: 146. 1926.

Local name: Sarphuka.

Sub-erect, perennial, suffruticose herb, 30-70 cm tall. Stems much-branched, spreading, glabrous or sparsely pilose. Leaves 5-10 cm long; petioles 0.6-1.2 cm long; stipules linear-subulate, 4-5 mm long; leaflets 5-10 pairs, oblanceolate, obtuse, mucronate, cuneate at base, entire, glabrous above, appressed-silky-hairy beneath, 1.5-3 x 0.7-1.2 cm; petiolule 1.5-3 mm long. Flowers in leaf-opposed, lax, 7-13 cm long raceme, lower flowers usually fascicled. Pedicels slender, 2.5-4 mm long. Bracts subulate, 1-2 mm long. Calyx 3.5-4 mm long, thinly silky; teeth triangular-subulate, *ca.*

2.5 mm long. Corolla bluish-pink to purple; vexillum orbicular, to 8.5 x 8 mm, sericeous; wings to 7.5 x 3 mm; keels to 6.5 x 2.5 mm. Staminal sheath 4.5-5 mm long. Ovary appressed-pubescent; style glabrescent, ca. 3 mm long. Pods 4-6 x 0.4-0.5 cm, slightly curved, mucronate, at first thinly hairy, finally glabrescent, seeds 6-10, ovoid, 3-3.5 mm long.

Fl. & Fr. : July. -Dec.

Ecology: Very common; in open waste lands, fallow fields, roadsides, etc.

Distribution: Tropical parts of India. Sri Lanka, Pakistan, Bangladesh, S.E. Asia, Malesia, introduced into Africa, Australia and America.

Specimens examined : Raja Rappa, 367; Barkattwa, 521; Simaria, 1628.

Uses: Plant is used in bronchitis and bilious febrile attacks; also for boils pimples and bleeding piles. Roots and seeds are insecticidal and piscidal. Decoction of roots is given in dyspepsia, diarrhoea, rheumatism, asthma and urinary disorders. Decoction of pods is used as vermifuge and to stop vomiting. Oil extracted from seeds, is used against scabies, itch, eczema and other skin eruptions.

3. **Tephrosia strigosa* (Dalz.) Santap. & Maheshw. in J. Bombay Nat. Hist. Soc. 54: 804. 1957; Ali in Biologia 10: 24. 1964; *Macronyx strigosum* Dalz. in Hook., Kew J. Bot. 2: 35. 1850.

T. tenuis Wall. ex Dalz. & Gibs., Bombay Fl. 61. 1861; Baker in Hook. f., Fl. Brit. India 2: 111. 1876.

Erect, spreading, annual herbs, Stems thinly appressed-hairy, slender, terete, much branched. Leaves 1-foliolate; leaflet linear-oblong, obtuse at both base and apex, apiculate, entire, chartaceous, glabrous above, appressed-pubescent beneath, 2.5-5 x 0.3-0.6 cm; petiole 2-3 mm long; stipules subulate, 2.2-2.5 mm long. Flowers axillary, solitary or 2 together. Pedicels 0.6-1.2 cm long, filiform. Calyx 2.2-2.5 mm long, silky; teeth lanceolate-subulate. Corolla pink; vexillum ovate, 3-3.5 cm long, pubescent, with an elongate claw; wings oblong, ca. 3 mm long; keels ca. 4 mm long.

Ovary 2.8-3 mm long, pubescent. Pods 1.2-2.5 x 0.3-0.45 cm, appressed-pubescent. Seeds 6-10, oblong-ellipsoid, 0.9-1 mm long.

Fl. & Fr. : July. -Oct.

Ecology: Common; in sandy grassy localities.

Distribution : India: Punjab, Uttar Pradesh, Central India, Deccan Peninsula, Laccadives. Pakistan, Myanmar.

Specimens examined : Ghanghree, 1026; Tandwa, 1637.

35. TERAMNUS P. Browne

Teramnus labialis (L.f.) Spreng., Syst. Veg. 3. 235. 1826; Baker in Hook. f., Fl Brit. India 2: 184. 1876; Prain, Bengal Pl. 1: 393. 1903; Haines, For. Fl. Chota Nagpur 321. 1910 & Bot. Bihar & Orissa pt. 3: 276. 1922. *Glycine labialis* L. f., Suppl. Pl. 325. 1781.

Local name: Mashoni, Mashparui.

Slender, widely spreading, twining herbs. Stems terete, spreadingly hairy. Leaves 3-foliolate, 5-7 cm long. Petiole 1.5-3.5 cm long, hairy. Stipules deciduous, ovate-lanceolate, acute, 3 mm long. Terminal leaflet ovate-lanceolate; laterals inequilateral, thin-coriaceous, obovate-oblong or oblong-lanceolate, acute or obtuse, apiculate at apex, rounded or cuneate at base, entire, glabrous above, slightly appressed hairy beneath, 3.5-8 x 2-2.5 cm. Stipels subulate, 1-1.5 mm long. Flowers in axillary few-flowered lax racemes of 5-15 cm long. Pedicel to 4 mm long. Bracts to 2 mm long, linear-lanceolate; bracteoles subulate, ca. 1.5 mm long. Calyx 3-4 mm long, silky; tube campanulate; lobes lanceolate, as long as tube. Corolla 5-6 mm long, pinkish. Petals clawed; vexillum obovate, to 6 x 4 mm. Wings oblong, adherent to keel. Stamens monadelphous; anthers alternately fertile, small and sterile. Ovary tomentose. Pods narrowly linear, compressed, straight or slightly incurved, hairy when young, nearly glabrous when mature, with a short stout beak bent upwards at more or less right angle to the pod, 4-5 x 0.25-0.3 cm. Seeds 8-12, oblong, smooth, dark brown, ca. 4 mm.

Fl. : July.-Sept. *Fr.*: Oct.-Dec.

Ecology: Very common; in hedges, village-thickets, roadsides, etc.

Distribution : Throughout India. Sri Lanka, Bangladesh, Myanmar, Penang, Thailand, Indo-China, Vietnam, Indonesia, Philippines, New Guinea, Micronesia, Madagascar.

Specimens examined : National Park, 442; Ghanghree, 1299.

Uses: Plant is used in rheumatism, tuberculosis and nervous affections. Fruits are used as astringent, stomachic and febrifuge. Plant is also used as green manure.

36. TRIFOLIUM L.

Key to the Species

- 1a. Calyx becoming inflated, reticulate and papery in fruit. Inflorescence without an involucre. Corolla pink to reddish-purple, resupinate ... 2. *T. resupinatum*
- 1b. Calyx not becoming inflated, and papery in fruit. Inflorescence with few bracts forming an involucre. Corolla yellowish-white or cream-coloured, not resupinate ... 1. *T. alexandrinum*

*1. ***Trifolium alexandrinum*** L., Cent.Pl.1: 25. 1755; Ali in Nasir & Ali, Fl. W. Pakistan 100: 288. 1977.

Erect or ascending, sparingly branched, sparsely pubescent, annual herbs. Leaflets broadly elliptic to oblong-lanceolate, faintly dentate at top, truncate or rounded or sometimes emarginate, appressed-hairy, 2-3.5 x 1-1.5 cm; petiole 2-3.5 cm long; stipules oblong, free portion lanceolate, ciliate, 1.2-2 cm long. Inflorescence on ovoid or oblong-conical head, 1-2.5 cm long. Peduncle 2-5 cm long. Bracts few, forming a minute involucre. Calyx 5-6 mm long, pubescent; teeth unequal, subulate, 1-3-nerved. Corolla 1-1.2 cm long, yellowish-white or cream-coloured. Pods slightly exserted.

Fl. & Fr. : Mar. -May.

Ecology : Rare; cultivated, also grows wildy in agricultural fields and field borders.

Distribution : India: North-Western India, Uttar Pradesh. Turkey, Iraq, Syria, Lebanon, Palestine, Egypt, Caucasus, Pakistan.

Specimens examined : Ramgarh Cant., 1234.

Uses : Plant is used as a green fodder, silage, hay and pasture; also used for green manure. Seeds yield a fatty oil used for making soaps.

2. **T. resupinatum* L., Sp. Pl. 771. 1753; Hossain in Notes Roy. Bot. Gard. Edinburgh 23: 451. 1961; Baker in Hook. f., Fl. Brit. India 2: 86. 1876.

Local name: Shaftal.

Procumbent, ascending or erect, glabrous, annual herbs. Leaflets obovate, cuneate at base, rounded, truncate or emarginate at apex, sharply dentate, glabrous, 1-2.5 x 0.8-1.8 cm. Petioles 2-8 cm long, those of lower leaves longer. Stipules 1.2-1.5 cm long. Inflorescence a globose peduncled-head, 1-1.4 cm across, without an involucre. Peduncle 1-3 cm long or sometimes more. Calyx 3-4 mm long, in fruit inflated, reticulate and 5-8 mm long, appressed-villous on back; teeth subulate. Corolla pink to reddish-purple, resupinate, 5-8 mm long. Pods shortly ovoid.

Fl. & Fr.: Mar. -May.

Ecology: Rare; in agricultural fields and field-borders.

Distribution : India: North-Western India, Uttar Pradesh. Probably native of S. Europe, introduced and naturalised in W.& C. Europe, Pakistan, Afganistan, Syria, Iraq, Turkey, Egypt, N. Africa, S. USSR.

Specimen examined : Ramgarh Cant., 1229.

Use: Plant is used as fodder.

37. TRIGONELLA L.

Key to the Species

- 1a. Flowers 1-2 in leaf-axils. Pods 5-10 cm long, turgid, beaked, lengthwise reticulately veined ... 2. *T. foenum-graecum*

- 1b. Flowers in 10-20-flowered dense racemes. Pods
1-2 cm long, flattened, not beaked, with
transverse reticulate veins

... 1. *T. corniculata*

1. ***Trigonella corniculata*** (L.) L., Syst. Nat. ed. 10, 1180. 1759; Baker in Hook. f., Fl. Brit. India 2: 88. 1876, *p.p.*; Prain, Bengal Pl. 1: 414. 1903; Haines, Bot Bihar & Orissa pt. 3: 234. 1922. *Trifolium corniculatum* L., Sp. Pl. 766. 1753.

Local name: Kasuri, Methi.

Erect or procumbent, glabrous or sparingly pubescent herbs. Leaf-petiole 1-1.5 cm long; stipules lanceolate, deeply or faintly toothed; leaflets obovate, cuneate at base, rounded, truncate or emarginate at apex, glabrous above, sparsely hairy along nerves beneath, 1-1.8 x 0.7-1.2 cm. Flowers in 10-20-flowered dense racemes. Peduncle 2-7 cm long, with a subulate tip. Pedicels 2.5-3 mm long; Calyx 3-4 mm long; teeth shorter than tube. Corolla yellow, 5-7 mm long; wings shorter than tube. Corolla yellow 5-7 mm long; wings shorter than keel. Pods flattened, linear-oblong, curved, glabrous, with transverse raised veins, 1-2 x 0.2-0.3 cm, 4-8-seeded.

Fl. & Fr. : Feb.-Apr.

Ecology: Common; cultivated in fields; also escapes in waste places, roadsides, etc.

Distribution: India: Kashmir, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh and elsewhere in the country. Pakistan, Afganistan, Europe, Western Mediterranean countries, etc.

Specimens examined : Raja Rappa, 874; Ghanghree, 1652.

Uses: Plants are grown as vegetable and for flavouring. Fruits are used as astringent.

2. ***Trigonella foenum-graecum*** L., Sp. Pl. 777. 1753; Baker in Hook. f., Fl. Brit. India 2: 87. 1876; Prain, Bengal Pl. 1: 414. 1903; Haines, Bot. Bihar & Orissa pt. 3: 234. 1922.

Local name : Methi.

Erect, annual herbs, 10-40 cm tall; branches glabrous or sparingly pubescent. Leaf-petioles 5-7 mm long; stipules lanceolate, entire 3-3.5 mm long; leaflets obovate-oblongate, cuncate-subattenuate at base, rounded, truncate or emarginate at apex, glabrescent, glaucous beneath, 1-3.5 x 0.5-1.5 cm; petiolule 4-5 mm long. Flowers 1-2 in leaf-axils. Calyx 6-8 mm long; teeth linear, as long as tube. Corolla yellowish, 1-1.5 cm long. Pods turgid, oblong, straight or slightly curved, lengthwise reticulately veined, glabrous, 5-10 x 0.3-0.5 cm, beaked, 10-20-seeded.

Fl & Fr.: Feb.-May.

Ecology: Common; cultivated in gardens, fields, etc.; also met with as an escape in agricultural fields, waste places, roadsides, etc.

Distribution : India: Kashmir, Punjab, Gangetic Plains, Orissa, Deccan Peninsula, Madhya Pradesh. Pakistan, S. Europe, Orient, Arabia, Ethiopia.

Specimens examined : Chatra, 824; Mandu, 1343; Jaynagar, 1801.

Uses: Leaves are consumed as pot-herb. Seeds are used as condiment; also eaten raw or cooked. Seeds are also used in poultices for boils and ulcers and given internally in intestinal inflammation.

38. VICIA L.

Key to the Species

- 1a. Plant erect. Rachis of leaf ending in simple point ... 1. *V. faba*
- 1b. Plant diffuse, climbing or trailing. Rachis of leaf ending in a tendril:
 - 2a. Flowers 1-2, subsessile. Pods glabrous, 6-18-seeded ... 3. *V. sativa*
 - 2b. Flowers several in a peduncled raceme. Pods hairy, 2-seeded ... 2. *V. hirsuta*

1. *Vicia faba* L., Sp. Pl. 737. 1753; Baker in Hook. f., Fl. Brit. India 2: 179. 1876; Prain, Bengal Pl. 1: 367. 1903; Haines, Bot. Bihar & Orissa pt. 3: 249. 1922.

Local names : Bakla, Anhuri, Kala matar.

Erect, somewhat flaccid, annual, 60-120 cm tall. Stems acutely tetragonous, glabrous, simple or branched. Leaflets 2-6, elliptic-oblong, subcuneate at base, obtuse or emarginate and mucronate, glabrous, 4-10 x 1-4 cm; rachis ending in a simple point; stipules triangular-ovate, with broad dentate auricles. Inflorescence a raceme, 2-7-flowered. Flowers subsessile, 2-3 cm long. Calyx 1-1.2 cm long; lower teeth longer, 4-6 mm long. Corolla white; vexillum retuse, purple-streaked; wings with large, dark-violet blotch at base. Pods linear, pubescent, 10-20 x 1-2 cm.

Fl. & Fr. : Dec.-Apr.

Ecology : Very common; cultivated in fields; also escapes in waste places, etc.

Distribution : Almost throughout India, particularly in N.W. India, Uttar Pradesh, Bihar, Madhya Pradesh, West Bengal and Orissa. Pakistan, Europe and other countries.

Specimens examined : National Park, 101; Chatra, 823.

Uses: Pods are used as vegetable. Decoction of leafy shoot is used as diuretic.

2. *Vicia hirsuta* (L.) S. F. Gray, Nat. Arr. Brit. Pl. 2: 614. 1821; Baker in Hook. f., Fl. Brit. India 2: 177. 1876; Prain, Bengal Pl. 1: 367. 1903; Haines, Bot. Bihar & Orissa pt. 3: 248. 1922. *Ervum hirsutum* L., Sp. Pl. 738. 1753.

Local names: Jhunjhuni, Munmuna.

Trailing or climbing annual. Stems pubescent or glabrescent. Leaflets alternate or opposite, 5-8 pairs, linear or linear-oblong, obtuse, truncate or emarginate and mucronate, rounded at base, sparsely pubescent when young, 5-12 x 1.5-3 mm. Tendrils mostly branched. Inflorescence a raceme, 2-7-flowered. Peduncle to 4 cm long. Calyx 1.5-3 mm long, pubescent; teeth equal to slightly longer than tube. Corolla pale blue; vexillum 3-4 mm long. Pods oblong or rhomboid-oblong, hairy, 2-seeded, 6-8 x 3-4 mm, finally black.

Fl. & Fr.: Dec.-Mar.

Ecology: Very common; in agricultural fields.

Distribution : India: Punjab, Uttar Pradesh, Madhya Pradesh, Bihar, Orissa, West Bengal. Pakistan, Nepal, U.S.S.R, N. Africa, Europe, Congo, Ethiopia, Angola.

Specimens examined : Ramgarh Cant., 1242; Hazaribagh, 1602.

Uses: Seeds are consumed as pulse. Leaves are eaten as pot-herb.

3. *Vicia sativa* L., Sp. Pl. 736. 1753; Baker in Hook. f., Fl. Brit. India 2: 178. 1876; Prain, Bengal Pl. 1: 366. 1903; Haines, Bot. Bihar & Orissa pt. 3: 249. 1922.

Local names : Ankari, Akra.

Diffuse or climbing annual. Stems angular, glabrous or minutely pubescent. Leaflets 4-6 pairs, obovate or oblong or linear-ligulate, cuneate at base, obtuse, truncate or emarginate and mucronate, glabrous or hairy when young, 0.5-4 x 0.2-1.5 cm; stipules ovate-lanceolate, acuminate, 3-6 mm long; auricle divided into segments; tendrils mostly branched. Flowers 1-2, subsessile. Calyx 0.7-1.2 cm long, pubescent; teeth nearly as long as tube. Corolla pale purple; 0.8-0.2 cm long. Style bearded on lower side near tip. Pod linear-oblong, glabrous when mature, 3-4 x 0.5-0.6 cm, 6-12-seeded.

Fl. & Fr. : Dec.-Apr.

Ecology: Common; cultivated; also self-sown in grassy localities, waste places, roadsides, agricultural fields and field borders, scrub jungles, etc.

Distribution: India: Punjab, Uttar Pradesh, Bihar, Madhya Pradesh, West Bengal, Orissa. Pakistan, Europe, U.S.S.R.

Specimens examined : Chatra, 558; Jaynagar, 1517.

Uses: Plant is cultivated for hay, silage, forage and green manure. Seeds are used in diarrhoea.

39. VIGNA Savi

Key to the Species

- 1a. Leaflets definitely lobed. Pods glabrescent:
- 2a. Leaflets 2-3-lobed; lobes obovate-spathulate or oblong ... 4. *V. trilobatus*
- 2b. Leaflets more than 3-lobed; lobes lanceolate-elliptic ... 1. *V. aconitifolius*
- 1b. Leaflets entire, or rarely faintly lobed; Pods Hairy:
- 3a. Pods erect or suberect. Seeds dirty-green or black, aril round the seed distinctly raised ... 2. *V. mungo*
- 3b. Pods reflexed. Seeds light green, aril round the seed not or less raised ... 3. *V. radiata*

1. ***Vigna aconitifolia*** (Jacq.) Marechal in Bull. Jard. Bot. Nat. Belge 39: 160. 1969; Verdc. in Kew Bull. 23: 464. 1969; Ali in Nasir & Ali, Fl. W. Pakistan 100: 244. 1977. *Phaseolus aconitifolius* Jacq., Obs. Bot. 3, 52. 1766; Baker in Hook. f., Fl. Brit. India 2: 202. 1876; Prain, Bengal Pl. 1: 387. 1903; Haines, For. Fl. Chota Nagpur 327. 1910 & Bot. Bihar & Orissa pt. 3: 288. 1922.

Local names: Moth, Bhringga.

Sub-erect or decumbent or ascending, annual herbs. Stems clothed with patent to reflexed, brown hairs. Leaves trifoliolate, to 6 cm.; leaflets palmately 3- or more-lobed; lobes lanceolate-elliptic, chartaceous, appressed-pilose, entire, acute, 2-4 x 0.4-0.6 cm; petiole 3.5-7 cm.; petiolule to 1 mm long; stipules lanceolate, 5-7 mm long; stipels linear, 2.2-2.5 mm long. Flowers in dense axillary racemes. Peduncle 2-5 cm long. Bracteoles linear-setaceous, far exceeding the minute calyx, 3.5-4 mm long. Pedicel 5-8 mm long. Calyx 1.3-1.5 mm long, pubescent. Corolla yellow; vexillum suborbicular, 2-fid at apex, to 7 x 8 mm; wings obliquely obovate, to 6 x 5 mm; keels deeply falcate, to 6.5 x 2 mm, with basal spur. Filaments subequal, 1.5-2.5 mm long. Ovary terete, 3.5-4 mm long. Pods cylindrical, indented on sutures, glabrescent, 3-5 cm long. Seeds 7-8, oblong, 2.5-3 mm long.

Fl. & Fr.: Sept.-Nov.

Ecology: Common; cultivated in the gardens, fields, etc; also met with as an escape in fields, field-borders, waste places, roadsides, etc.

Distribution : Tropical parts of India. Pakistan, Sri Lanka.

Specimens examined : Chatra, 827; Ghanghree, 1301.

Uses: Tender pods are consumed as vegetable. Seeds are eaten as pulse. Pulse is given as diet to cases of flatulence and fever. Plant is used as fodder for livestock.

2. *Vigna mungo* (L.) Hepper in Kew Bull. 11: 128. 1956; Verdc. in Kew Bull. 24: 558. 1970; Ali in Nasir & Ali, Fl. W. Pakistan 100: 250. 1977. *Phaseolus mungo* L., Mant. 1: 101. 1767; Baker in Hook. f., Fl. Brit. India 2: 203. 1876, *pp.*; Prain, Bengal Pl. 1: 387. 1903; Haines, For. Fl. Chota Nagpur 328. 1910 & Bot. Bihar & Orissa pt. 3: 287. 1922.

P. roxburghii Wight & Arn., Prodr. Fl. Ind. Orient. 246. 1834.

P. mungo L. var. *roxburghii* (Wight & Arn.) Prain in J. Asiat. Soc. Bengal 66: 422. 1898 & Bengal Pl. 1: 387. 1903.

Local names: Mashkalai, Tikari-Kalai.

Sub-erect, densely strigose, annual herbs, to 30 cm high. Stems copiously branched from base, flexuous. Stipules ovate, 0.6-1 cm long. Leaflets membranous, ovate or oblong-lanceolate, entire, rarely faintly lobed, obtuse at base, subacute at apex, appressed hairy, 4-8 x 0.25-0.5 cm; petiolule 3-5 mm long; stipels linear, 2.5-3.5 mm long. Racemes axillary or leaf-opposed, short-peduncled. Pedicels very short. Bracteoles ovate-lanceolate. Calyx 3-4 mm long; lower tooth deltoid or lanceolate. Corolla yellow, 1-1.2 cm long. Pods subcylindrical, slightly curved, silky-hairy, 3.5-6.5 x 0.4-0.5 cm, 10-15-seeded.

Fl. & Fr. : Dec.-Feb.

Ecology : Common; usually cultivated; also met with as an escape in waste grassy localities, agricultural fields and field-borders, railway tracks, etc.

Distribution: Throughout India. Widespread in Tropics.

Specimens examined : Churchu, 688; Hunterganj, 2131.

Uses : Pulses are consumed as 'dal'; also used in rheumatism, nervous and hepatic diseases and in dropsy. Root is used for aching bones.

3. ***Vigna radiata* (L.) R. Wilczek**, Fl. Congo Belge 6: 386. 1954; Townsend in Kew Bull. 21: 455. 1967; Ali in Nasir & Ali, F. W. Pakistan 100: 248. 1977. *Phaseolus radiatus* L., Sp. Pl. 725. 1753; Prain, Bengal Pl 1: 387. 1903; Haines, Bot. Bihar & Orissa pt. 3: 287. 1922.

P. aureus Roxb., Fl. Ind. 3: 297. 1832.

P. mungo L. var. *radiatus* (L.) Baker in Hook. f., Fl. Brit. India 2: 203. 1876.

P. radiata (L.) R. Wilczek, var. *aureus* (Roxb.) Prain in J. Asiat. Soc. Bengal 66: 222. 1898 & Bengal Pl. 1: 388. 1903.

Local names: Pessara, Mung.

Twining or suberect herb, to 30 cm tall. Stems and branches covered with stiff spreading hairs. Leaf-petiole 5-12 cm long; stipules ovate; acuminate, ciliate, 0.8-1 cm long; leaflets oblong-lanceolate, elliptic-ovate or somewhat rhomboid, chartaceous, acuminate at apex, obliquely rounded or cuneate at base, inequilateral, sparsely hispidulous along nerves, ciliate on margins, 6.5-8 x 3-4.5 cm; petiolule 3.5-4 mm long; stipels 2.5-3 mm long. Flowers in axillary sub-umbellate clusters. Peduncle 4-8 cm long. Bracts stipule-like, narrow; bracteoles setaceous, linear, ciliate, appressed to calyx, 7-8 mm long. Pedicel, 2.5-3 mm long. Calyx 2.5-3 mm long, glabrous; upper lobe subconnate. Corolla yellow; petals clawed; vexillum suborbicular, to 1.6 x 1.2 cm.; keel curled upwards. Staminal sheath curved, to 1 cm long. Pods straight, cylindrical, compressed, puberulous, 4-8 x 0.5-0.6 cm, 8-14 seeded. Seeds green, smooth.

Fl. & Fr. : Nov.-Feb.

Ecology : Common, usually cultivated; sometimes met with as an escape in waste places, agricultural fields, field-borders, sandy river-beds, grassy open places, etc.

Distribution : Throughout India, Tropics and subtropics of both hemispheres.

Specimens examined : Ghanghree, 1068; Bishnugarh, 1110.

Uses: Tender pods are consumed as vegetable. Sprouted seeds are eaten. Decoction of seeds is given in beri-beri; also in polyneuritis gallinarum. After harvesting of pods, plant is fed to cattle.

4. *Vigna trilobatus* (L.) Verdc. in Taxon 17: 172. 1968 & Kew Bull. 24: 560. 1970; Ali in Nasir & Ali, Fl. W. Pakistan 100: 244. 1977. *Dolichos trilobatus* L., Mant 1: 101. 1767.

Phaseolus trilobatus (L.) Schreb., Nova Acta Acad. Caes. Leop.-Carol. Germ. Nat. Curios 4: 132. 1770.

P. trilobus sensu Ait. f., Hort. Kew. 3: 30. 1789, non *Dolichos trilobus* L.; Baker in Hook. f., Fl. Brit. India 2: 201. 1876; Prain, Bengal Pl. 1: 387. 1903; Haines, For. Fl. Chota Nagpur 327. 1910 & Bot. Bihar & Orissa pt. 3: 287. 1922.

Local name: Mugam, Trianguli.

Prostrate or trailing, annual herbs, with a woody root-stock. Stems wiry, angular, glabrous, or \pm hairy when young. Leaf-petiole 4-7.5 cm long; stipules 0.5-1.5 cm long, ovate-oblong, ciliate; leaflets 1.2-2.5 cm long and broad, rounded-subcuneate at base, thinly hairy, usually 3-lobed; middle lobe the largest, oblong or broadly spatulate, obtuse, lateral lobes oblique, oblong-obovate, subacute; petiolule 2-2.5 mm long; stipels ovate, 1.5-2.5 mm long. Racemes axillary, 0.5-1 cm long, dense, few-flowered. Peduncles 0.8-4 cm long. Bracts deciduous, ovate, 6-7 mm long; bracteoles lanceolate, 2.5-3 mm long. Pedicels 2-2.5 mm long. Calyx 2.2-2.5 mm long, glabrous; teeth minute. Corolla yellow; vexillum orbicular, emarginate, 3.5-4 mm in diam; wings falcate, to 5 x 2 mm; keels obovate, to 6 x 3 mm. Staminal sheath 3.5-4 mm long. Ovary 4.5-5 mm long, pubescent. Pods straight, sub-cylindrical, sparsely hairy, 3-5 x 0.3-0.4 cm, 6-12-seeded.

Fl. & Fr. : July-Oct.

Ecology : Common; in cultivated fields, along railway tracks, river beds, grassy waste places, etc.

Distribution : Throughout India. Widespread in all tropical countries.

Specimens examined : Jumri Telaiya, 672; Ramgarh, 1121.

Uses: Pulses are consumed by poor people. Leaves are sedative, used in cataplasm for weak eyes. Decoction of leaves is used in irregular fever.

40. ZORNIA J.F. Gmel.

Zornia gibbosa Span. in *Linnaea* 15: 192. 1841; Mohlenbr. in *Webbia* 16: 112. 1961; Dandy & Milne-Redhead in *Kew Bull.* 17: 74. 1963; Ali in Nasir & Ali, *Fl. W. Pakistan* 100: 356. 1977.

Zornia diphylla auct. non (L.) Pers.: Baker in Hook. f., *Fl. Brit. India* 2: 147. 1867, *p.p.*; Prain, *Bengal Pl.* 1: 416. 1903; Haines, *Bot. Bihar & Orissa* pt. 3: 251. 1922.

Much-branched, annual herbs, 20-35 cm long. Branches glabrous, terete. Leaves 2-foliolate; petioles 0.6-1.8 cm long; stipules 0.8-1 cm long, lanceolate, acute, strongly nerved, produced below insertion into a triangular spur; leaflets sessile, often unequal-sided, lanceolate, linear-lanceolate or occasionally linear, obtuse at both base and apex, apiculate, entire, dotted with black glands beneath, glabrous, rigid, 1.2-2.5 x 0.3-1.5 cm. Spikes 4-8 cm long, 3-12-flowered, lax. Peduncle slender, terete, 4-5 cm long. Bracts ovate-lanceolate, acute, ciliate, black-dotted, 1.2-1.5 cm long, strongly nerved from the base. Calyx membranous, 2.5-3 mm long, ciliate. Corolla yellow; vexillum suborbicular, to 8 x 5 mm with a long claw; wings 6 x 2 mm; keel to 7 x 2 mm. Staminal sheath 4-5 mm long. Ovary to 2 mm long, pubescent. Pods 1-6-jointed, either enclosed by bracts or exserted, 8-12 x 1.8-2 mm; joints reticulate-venose, 2.2-2.5 mm, covered with numerous, straight, glochidiate spines.

Fl. & Fr. : July-Sept.

Ecology : Common; in open grassy places.

Distribution : Plains of India, Himalaya, Nepal, China, Pakistan, Myanmar, Celebes, Australia, Malesia, New Guinea, Philippines, Thailand.

Specimens examined : National Park, 950; Pratappur, 619.

Uses: Plant is used for dysentery and root is given to children as soporific; also cultivated as cover-crop and for green manure.

61. PROTEACEAE

GREVILLEA R.Br. ex Knight, *nom. cons*

Grevillea robusta A. Cunn. in R. Br., Prod. Fl. Nov. Holl. Suppl. 1, 24. 1830; Haines, For. Fl. Chota Nagpur 385. 1910 & Bot. Bihar & Orissa pt. 5: 800. 1924.

Handsome tree, to 25 m tall. Young branches hoary or rusty-tomentose. Leaves 2-pinnatifid, fern-like; secondary lobes entire or again lobed, lanceolate, with recurved margins, silky beneath, 1-4 cm long, terminal one much longer; whole leaf 15-20 cm long including 2-7 cm long petiole and nearly as wide. Racemes secund, many-flowered, 7-10 cm long, solitary or several together on short leafless branches of old wood. Pedicels slender, to 1 cm long, dilated at apex into an oblique torus. Perianth glabrous, orange to golden yellow; tube 5-8 mm long, straight or dilated at base, with *ca.* 3 mm long, ovoid limb. Anthers cordate-ovate, 1.2 cm long. Ovary glabrous, stipitate; style 1.2 cm long; stigmatic disk oblique with a central cone. Fruit broad, very oblique, boat-shaped, blackish-purple, \pm 1.5 cm long. Seeds elliptic, \pm 1.2 cm long.

Fl.: Mar.-May. *Fr.*: July - Nov.

Ecology: Common; planted extensively as a roadside tree for shade.

Distribution : Almost throughout India. Native of E. Australia, commonly planted all over the tropics and subtropics.

Specimens used : Hazaribagh, 263, 1560; Ramgarh, 1890.

Uses: Wood is used for cabinet-works, furniture, toys, plywood, etc.

62. LYTHRACEAE

Key to the Genera

1a. Herbs:

- | | |
|---|-----------------|
| 2a. Capsule septicidally 2-4-valved; capsule,
wall thinly cross-striate | ... 4. ROTALA |
| 2b. Capsule circumscissile or irregularly
dehiscent; capsule-wall smooth | ... 1. AMMANNIA |

1b. Tree or shrubs:

3a. Flowers distinctly zygomorphic. Stamens 12, declinate. Hypanthium coloured. ... 5. WOODFORDIA

3b. Flowers regular:

4a. Stamens 4 or 8. Capsule irregularly dehiscent. Seeds angular, not winged ... 3. LAWSONIA

4b. Stamens many. Capsule 3-6-valved. Seeds winged ... 2. LAGERSTROEMIA

I. AMMANNIA L.

Key to the Species

1a. Cymes subsessile, compact. Capsule slightly exceeding the calyx-tube, 0.15-0.2 cm in diam. ... 2. *A. baccifera*

1b. Cymes distinctly peduncled, lax:

2a. Capsule much exceeding the calyx-tube, 0.2-0.25 cm in diam. ... 1. *A. auriculata*

2b. Capsule never exceeding the calyx-tube, 0.1-0.12 cm in diam. ... 3. *A. multiflora*

1. ***Ammannia auriculata*** Willd., Enum. Pl. Hort. Berol. 1: 7, t. 7, 1803; Blatt. & Hallb. in J. Bomb. Nat. Hist. Soc. 26: 211, 1918; Nair in Bull. Bot. Surv. India 10: 238, 1969; Dar in Nasir & Ali, Fl. W. Pakistan 78: 8, f. 2(A), 1975.

Ammannia senegalensis auct. non Lam. : Clarke in Hook. f., Fl. Brit. India 2: 570, 1879, *p.p.*; Blatt. & Hallb. in J. Bomb. Nat. Hist. Soc. 26: 214, 1918; Prain, Bengal Pl. 1: 501, 1903; Haines, Bot. Bihar & Orissa pt. 3: 379, 1922.

Erect, glabrous herb, 15-60 cm tall; branches sharply 4-angled. Leaves opposite, sessile, linear-oblong or linear-lanceolate, with a broad subauriculate or subhastate base, subacute or obtuse at apex, 1-6 × 0.2-0.8 cm. Flowers in axillary distinctly peduncled, lax, compound cymes of 1-1.5 cm long. Peduncle 2-4 mm long. Bracteoles on cyme-branches linear, minute. Calyx-tube campanulate, with green ribs becoming indistinct in fruit; sepals 4, broadly triangular; intermediate teeth minute or obscure.

Petals obovate-cuneate, caducous, or sometimes absent. Stamens 6 or 8, inserted above middle of calyx-tube. Capsule globose, 2-2.5 mm in diam., much exceeding the calyx-tube, ultimately becoming red. Seeds semi-ellipsoid, excavated on plane face.

Fl. & Fr. : Aug.-Jan.

Ecology: Common; in wet places, rice-fields, etc.

Distribution: India: Kashmir, Punjab, Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Orissa. Bangladesh, Afghanistan, Persia, Egypt, Tropical Africa and Australa.

Specimens examined : Hazaribagh, 734; Chowparan, 1356; Tandwa, 1423.

Uses: Plant is used in weakness caused due to low blood pressure.

2. ***Ammannia baccifera*** L., Sp. Pl. 120. 1753; Clarke in Hook. f., Fl. Brit. India 2: 569. 1879; Koehne in Engler, Pfl.-reich 17: 53. 1904; Prain, Bengal Pl. 1: 500. 1903; Blatt. & Hallb. in J. Bombay Nat. Hist. Soc. 26: 215. 1918; Haines, Bot. Bihar & Orissa pt. 3: 379. 1922; S.G. Panigrahi in Bull. Bot. Surv. India 18: 178-193. 1979.

A. vasicatoria Roxb., Fl. Ind. 1: 426. 1832.

Key to the Subspecies

- 1a. Leaves narrowed at base ... 1. ssp. *baccifera*
 1b. Leaves rounded to (sub) cordate and sometimes auricled at base ... 2. ssp. *aegyptiaca*

1. ssp. ***baccifera***.

Local name: Dadmari.

Erect, much-branched herbs, to 60 cm tall, with woody base. Leaves opposite or sometimes alternate above, sessile, linear-oblong or oblong-lanceolate, subacute or obtuse at apex, narrowed at base, glabrous, 1.5-7 x 0.5-1.5 cm. Flowers 4(-5)-merous, minute, in dense axillary, subsessile,

cymose clusters. Pedicels short, *ca.* 1 mm long. Bracts filiform, shorter than pedicels. Flower-buds 4 or 8-angled, usually like two equal pyramids placed base to base. Hypanthium broadly campanulate or obconic, 1.2-1.5 mm long. Sepals broadly triangular, acute, 0.8-1mm long. Petals 0. Stamens 4(5); filaments *ca.* 0.5 mm long. Capsule slightly longer than calyx-tube, brownish-red, depressed-globose, imperfectly circumscissile above middle, 1.5-2 mm across. Seeds red, sub-hemispherical, excavated on plane face, *ca.* 0.3 mm long.

Fl. & Fr. : June-Aug. and Nov.-Feb.

Ecology : Common; in paddy fields and field-borders, moist lands, wet waste places, etc.

Distribution : Throughout the tropical parts of India. Nepal, China, C. Asia, Japan, Malesia, Australia, S. Europe, Tropical Africa.

Specimens examined: Hazaribagh, 136; Simaria, 801; Markachho, 1469.

Uses: Leaves are bruised and used for ringworm and other parasitic skin affections. Plant-extract is used by local people against typhoid and bronchial tuberculosis.

2. *ssp. aegyptiaca* (Willd.) Koehne, *Engl. Bot. Jahrb. Syst.* 1: 260. 1880; Gamble, *Fl. Madras* 1: 510 (360). 1919 ('var'); Panigr. & Murti, *Fl. Bilaspur* 1: 254. 1989. *A. aegyptiaca* Willd., *Enum. Hort. Berol.* 167. 1809.

A. salicifolia *sensu* Hiern in Oliver, *Fl. Trop. Africa* 2: 278. 1871, *p.p. excl. syn.*, non Monti 1767; Clarke in Hook. f., *Fl. Brit. India* 2: 569. 1879; Prain, *Bengl Pl.* 2: 501. 1903; Haines, *Bot. Bihar & Orissa* pt.3: 379. 1922.

Local name: Same as *ssp. baccifera*.

Erect, annual-perennial herbs, 10-40 cm high. Stems 4-angled, robust; lower branches usually spreading, rarely simple. Leaves narrowly oblong, oblanceolate or linear-lanceolate, moderately thick, rounded to (sub) cordate and sometimes auricled at base, usually deflected when fruits mature, 1-4 cm long. Flowers in dense axillary subsessile, cymose clusters.

Calyx 1.2-2 mm long; tube campanulate in flower and hemispherical in fruit; lobes 4, deltoid, incurved. Petals wanting or caducous. Stamens 4, arising from near base of calyx-tube. Capsule depressed-globose, red, slightly longer than calyx-tube, 1.5-2 mm in diam.

Fl. & Fr. : July. - Jan.

Ecology: Very common; in paddy fields, river-banks, wet waste places, etc.

Distribution: Throughout India. Bangladesh, Nepal, China, Australia and Tropical Africa.

Specimens examined : Hazaribagh, 746; Barkaganwa, 1265.

Uses: Same as *ssp. baccifera*.

Note: Although, Blatt. & Hallb. (*l.c.*) reduced *A. salicifolia* sensu Hiern (non Monti, 1764) to the synonymy of *A. baccifera* L., the characters viz., rounded to cordate and sometimes auricled leaf-bases and robust habit are so constant and diagnostic that it should be treated as a subspecies of *A. baccifera* under the name *aegyptiaca* (Willd.) Koehne, as has been done by Koehne (*l.c.*).

3. ***Ammannia multiflora*** Roxb., Fl. Ind. 1: 447. 1820; Clarke in Hook. f., Fl. Brit. India 2: 570. 1879; Prain, Bengal Pl 1: 501. 1903; Blatt. & Hallb. in J. Bombay Nat. Hist. Soc. 26: 212. 1918; Haines, Bot. Bihar & Orissa pt. 3: 380. 1922.

Erect, much-branched annual herbs, 20-60 cm tall; branches erecto-patent, with sharp angles. Leaves opposite, sessile, linear or linear-oblong, with very broad, sub-hastate or subauricled base, obtuse or subacute at apex, 1-3.5 x 0.1-0.4 cm. Flowers in axillary, 3-several-flowered, distinctly peduncled, lax, compound cymes. Peduncle slender, 3-5 mm long, pedicels 2-2.5 mm long. Bracteoles on cyme branches minute, linear, 0.8-1 mm long. Hypanthium campanulate-hemispheric or tubular, with 8 green ribs, 1.2-1.5 mm long. Sepals 4, broadly triangular, mucronulate, shorter than hypanthium. Petals 4, very minute, red, obovate, 0.6-0.7 mm long, sometimes wanting. Stamens 4, 6 or 8; filaments slender, exceeding the sepals. Capsule globose, red, 1-1.2 mm in diam. Seeds half-ellipsoid, excavate on plane-face.

Fl. & Fr. : Aug. - Jan.

Ecology : Very Common; in rice-fields, wet waste places, etc.

Distribution : Throughout the plains of India. Nepal, Pakistan, Afghanistan, Iran and Australia.

Specimens examined : Ramgarh, 535; Patratu, 580.

Use: Same as *A. baccifera*.

2. LAGERSTROEMIA L.

- 1a. Calyx-ridges as many as sepals, slightly developed, usually disappear later in calyx-tube without any warts or auricles:
- 2a. Leaves oblong or obovate, not glaucous beneath. Flower buds 0.5-0.6 cm in diam., ridged. Capsule to 1 x 0.8 cm ... 2. *L. indica*
- 2b. Leaves ellipsoid, oblong or ovate-oblong, glaucous beneath. Flower-buds 0.2-0.3 cm in diam., not ridged. Capsule to 3 x 1.5 cm ... 3. *L. parviflora*
- 1b. Calyx-ridges twice the number of sepals, distinct:
- 3a. Capsule 1.8-2.5 x 1.3-2.2 cm size. Seeds 1.2-1.6 cm long. Petals dark mauve-purple, not fading to white ... 4. *L. reginae*
- 3b. Capsule 1-1.2 cm x 0.8-1 cm size. Seeds 0.7-0.8 cm long. Petals light mauve, fading to white ... 1. *L. druperreana*

1. **Lagerstroemia druperreana* Pierre ex Gagnep. in Lec. Nat. Syst. 3: 358. 1918 & Fl. Indoch. 2: 948. 1921; Furt. & Srisuko in Gard. Bull. Singapore 24: 285. 1969.

L. thorellii Gagnep. in Nat. Syst. 3: 362. 1918.

A medium-sized tree; leaves opposite, elliptic, or elliptic-oblong, obtuse at apex, 6-10 x 3-5 cm, glabrous. Petiole 0.5-0.7 cm long. Flowers 2.5-3.5 cm across, in copious axillary panicles. Calyx-tube 12-ribbed, stellately

tomentose; lobes 6, short, recurved. Petals 6, undulate, orbicular, narrowed to a short claw, 1-1.2 cm across, mauve, fading to white. Fruit ovoid, brown, 1-1.2 x 0.8-1 cm. Seeds many, winged, 7-8 mm long.

Fl. & Fr. : Apr. - June.

Ecology: Common; cultivated as an avenue tree along roadsides, on railway platforms, etc., also self-sown in different places.

Distribution : Major parts of India. Native of Cochin-China, introduced in different tropical and subtropical countries of the World.

Specimens examined : Hazaribagh, 991; Barkattwa, 1695.

Uses: The species is planted in roadsides, or as an ornamental in gardens. Wood is used in constructional purposes, for making boxes, match-boxes and splints, agricultural implements, etc.

2. *Lagerstroemia indica* L., Syst. Nat. ed. 10, 2: 1076. 1759; Clarke in Hook. f., Fl. Brit. India 2: 575. 1879; Prain, Bengal Pl. 1: 504. 1903; Haines, For. Fl. Chota Nagpur 356. 1910 & Bot. Bihar and Orissa pt. 3: 375. 1922.

Local name: Pharash.

Beautiful shrub, to 4 m tall. Leaves subcoriaceous, sub-sessile, elliptic or obovate-oblong, acute or sub-obtuse at apex, cuneate at base, minutely pubescent on both surfaces when young, 2.5-7.5 x 1.5-4.5 cm. Panicle subpyramidal, few-to many-flowered, 6-20 cm long; branchlets angled, puberulous. Flower-buds subglobose, 5-6 mm in diam., superficially 5-6-ridged. Calyx campanulate; lobes 4-6, erect, triangular, annulate inside, 3-4 mm long. Petals suborbicular, with undulate and crispate margins, to 1.6 x 1.2 cm. Stamens many, 4-6 stouter and longer, others subequal. Ovary subglobose, glabrous; style long, slender. Capsule to 1 x 0.8 cm, 4-6-valved; fruiting calyx with about 7 mm long pedicelliform base.

Fl. & Fr. : May - Aug.

Ecology : Very common; cultivated in the gardens.

Distribution : Throughout India. Native of Himalayan regions, China, Indo-China and Japan; widely cultivated all over the World.

Specimens examined : Hazaribagh, 733; Chatra, 831.

Uses: Bark is stimulant and febrifuge. Root is astringent. Fruits are used for local application of aphthae of mouth.

3. **Lagerstroemia parviflora** Roxb., Pl. Corom. 1: 47. t. 66. 1796; Clarke in Hook. f., Fl. Brit. India 2: 575. 1879; Prain, Bengal Pl. 1: 503. 1903; Haines, For. Fl. Chota Nagpur 355. 1910 & Bot. Bihar and Orissa pt. 3: 375. 1922; Furt. & Srisuko in Gard. Bull. Singapore 24: 195. 1969.

L. parviflora Roxb. var. *benghalensis* Clarke in Hook. f., Fl. Brit. India 2: 576. 1879.

L. parviflora Roxb. var. *majuscula* Clarke in Hook. f., Fl. Brit. India 2: 575. 1879.

Local names: Dhaura, Lendia.

Large tree, 10-20 m tall; younger branches slightly pubescent. Leaves broadly elliptic-oblong, thin-coriaceous, cuneate at base, obtuse or retuse and apiculate at apex, entire, shining above, glaucous beneath, 3-8 x 1.5-3.5 cm; petiole 4-5 mm long. Flowers in axillary raceme or panicle of 6-20 cm long. Bracts elliptic-oblong, leafy; bracteoles 2. Pedicels 0.5-1.5 cm long. Buds globose, puberulent, without ribs, 2-3 cm in diam. Calyx cup-shaped, minutely puberulent; lobes 6, triangular, 4-5 mm long, equal to tube. Petals orbicular, undulate, 4-6 mm long, white. Stamens many, inserted at base of calyx-tube. Ovary globose, glabrous; style bent 6-7 mm long. Capsule oblong-ellipsoid, glabrous, 1.5-3 x 0.8-1.5 cm; stalks 2.5-5 cm long, rounded at apex; fruiting calyx 0.7-1 cm long. Seeds 1.2-1.6 cm long.

Fl.: Apr. - May. *Fr.*: Dec. Jan.

Ecology: Very common; in forests, slopes of hills, roadsides, etc.

Distribution : Almost throughout India including Tropical Himalaya. Myanmar.

Specimens examined: National Park, 421; Jhumri Telaiya, 667; Raja Rappa, 859.

Uses : Wood is used for building construction, agricultural implements, boxes, carts, tool-handles, and furniture. Plant is lopped for fodder; also yield an edible gum.

4. *Lagerstroemia reginae* Roxb., Pl. Corom. 1: 46, t. 65. 1796; Furt. & Srisuko in Gard. Bull. Singapore 24: 261. 1969.

L. flos-reginae Retz. var. *angusta* Clarke in Hook. f., Fl. Brit. India 2: 577. 1879.

L. flos-reginae auct. non Retz.: Clarke in Hook. f., Fl. Brit. India 2: 577. 1879, *p.p.*; Prain, Bengal Pl. 1: 504. 1903; *p.p.*; Haines, For. Fl. Chota Nagpur 355. 1910 & Bot. Bihar & Orissa pt. 3: 375. 1922, *p.p.*

Local name: Jarul.

Large or medium-sized tree, 8-18 m tall; branches widely spreading; bark pale, smooth, flaking off in irregular pieces. Leaves oblong-lanceolate or elliptic, subacute at apex, cuneate or rounded at base, glabrous, finely reticulate on both surfaces, 10-22 x 4-8 cm; petioles 0.6-1 cm long, stout. Panicle greyish or brown, pyramidal, 10-40 cm long. Flower bud subglobose, grey, 0.8-1.4 x 0.7-1 cm. Pedicels stout, thickened upwards, 0.4-1 cm long. Calyx cup-shaped; lobes 6, thickened in margin, erect or spreading. Petals dark mauve-purple, suborbicular, to 3 x 2.5 cm, undulated on margins. Stamens numerous, subequal. Ovary subglobose, glabrous; style long, slender. Capsule subglobose, 1.8-2.5 x 1.3-2.2 cm, 6-valved, woody; fruiting calyx saucer shaped; lobes thickened at margins, spreading. Seeds brown, 1.2-1.4 x 0.6-1 cm.

Fl. : Apr.-June. *Fr.*: May - Aug.

Ecology : Common; cultivated as an avenue tree along roadsides, on railway platforms, etc., also self-grown wildy along river-banks and muddy side-nalas.

Distribution: India: Northern and North-eastern India, West Bengal, Bihar, Orissa, Deccan Peninsula. Pakistan, Myanmar, Guinea, China, Indonesia.

Specimens examined : National Park, 398.

Uses : Timber is used in constructional purpose, for making boats, railway carriages, transport bodies, rice pounders, boxes, match-boxes and splints. Decoction of fruits and leaves are used in diabetes.

3. LAWSONIA L.

Lawsonia inermis L., Sp. Pl. 349. 1753; Haines, Bot. Bihar and Orissa, pt. 3: 374. 1922.

L. alba Lam., Encycl. 3: 106. 1789; Clarke in Hook. f., Fl. Brit India 2: 573. 1879; Prain, Bengal Pl. 1: 502. 1903; Haines, For. Fl. Chota Nagpur 356. 1910.

Local name: Mehndi.

Large shrub to small tree, much-branched, to 6 m tall. Lateral branches often ending in thorns. Leaves lanceolate or narrow-rhomboid, chartaceous, attenuate at base, acute, 1.2-3 x 0.6-1.5 cm. Petioles very short. Flowers numerous, 4-merous, to 1 cm across. Peduncle to 5 cm long. Pedicels short, slender, jointed, 2.5-3 mm long. Hypanthium 2-2.5 mm long. Sepals ovate, spreading, 2.5-3 mm long. Petals cream-coloured, obovate-suborbicular, 3.5-4 mm long. Stamens 8, inserted in pairs on rim of hypanthium; filaments inflexed in buds, 3.5-4 mm long; anthers oblong; connective thick. Fruits slightly veined, supported by persistent calyx, crowned with style, 6-8 mm in diam. Seeds trigono-pyramidal, 2.5-3 mm long.

Fl.: Oct.-Nov. *Fr.*: Nov.-Dec.

Ecology : Common; cultivated as hedge plant; sometimes found as semi-wild along river-banks.

Distribution : Throughout India. Tropical and warm temperate regions of the world.

Specimens examined : Hazaribagh, 212; Ichak, 340.

Uses: Leaves contain a dye which is used for colouring palms of hands, soles, nails, hair, beard and eyebrows. Wood is used for tool-handies.

4. ROTALA L.

Key to the Species

- 1a. Capsule opening by 4 valves ... 3. *R. rotundifolia*
- 1b. Capsule opening by 2 or 3 valves:
- 2a. Capsule opening by 2 valves. Style 0.05-0.1 cm long ... 1. *R. indica*
- 2b. Capsule opening by 3 valves. Style less than 0.025 cm long ... 2. *R. rosea*

1. ***Rotala indica*** (Willd.) Koehne in Bot. Jahrb. 1:172. 1880 & in Engl. Pfl.-reich IV. 17: 40. 1903; Blatt. & Hallb. in J. Bombay Nat. Hist. Soc. 25: 711. 1918; Cook in Boissiera 29: 108. 1979. *Peplis indica* Willd., Sp. Pl. 2: 244. 1799.

Ammannia peploides Spreng., Syst. Veg. 1: 444. 1835; *nom. illegit.*; Clarke in Hook. f., Fl. Brit. India 2: 566. 1875; Prain, Bengal Pl. 1: 500. 1903.

A. indica sensu Haines, Bot. Bihar & Orissa pt. 3: 377. 1922, *p.p.* non Lam. which is *A. baccifera* L.

Erect or decumbent annual, 10-30 cm tall; stems quadrangular, sometimes rooting at lower nodes, with ascending branches. Leaves decussate, elliptic or elliptic-obovate, cuneate to obtuse at base, rounded or obtuse at apex, with cartilaginous white margins, 0.5-2 × 0.2-0.7 cm; mid-vein and secondary veins prominent beneath. Flowers usually approximate, solitary, in axils of reduced, linear-oblong, leafy bracts on short spiciform axillary branches. Bracteoles linear, scarious, 1.5-2 mm long. Calyx-tube narrowly campanulate, 1.8-2 mm long; lobes 4, triangular or deltoid, acute, usually pink; accessory appendages minute or absent. Petals 4, linear or narrowly ovate, very minute, pink, persistent in fruit, sometimes absent. Stamens 4; filaments inserted about half-way up the calyx-tube. Ovary ellipsoid; style 0.5-1 mm long, persisting in fruit. Capsule ellipsoid, longer than broad, 2-valved, 1.8-2 mm long. Seeds minute, pink, narrowed-oblong, 0.3-0.4 mm long.

Fl. & Fr. : Oct. - Feb.

Ecology: Very common; in rice-fields, wet or damp places, river-banks, margins of ponds, streams, ditches, etc.

Distribution : India: Kashmir, Punjab, Uttar Pradesh, Bihar, West Bengal, Assam, Nagaland, Orissa, Madhya Pradesh, Tamilnadu, Kerala, Karnataka, Maharashtra, Andaman and Nicobar Islands. Bangladesh, Sri Lanka, Malesia, Pakistan, Afghanistan, China, Persia to W. Asia.

Specimens examined : Hazaribagh, 706; Chatra, 1077.

2. ***Rotala rosea*** (Poir.) Cook in Boissiera 29: 86. 1979. *Ammannia rosea* Poir in Lam., Encycl. Meth. Bot. Suppl. 1: 329. 1810.

Ammannia pentandra Roxb., Fl. Ind. 1: 448. 1820; Clarke in Hook. f., Fl. Brit. India 2: 568. 1879, *p.p. excl. syn. A. densiflora* Roth ex Roem. & Schult. & *A. rubra* Buch.-Ham. ex D. Don; Prain, Bengal Pl. 1: 500. 1903; Haines, Bot. Bihar & Orissa pt. 3: 378. 1922, *p.p. excl. syn. Rotala densiflora* (Roth ex Roem. & Schult.) Koehne.

Rotala pentandra (Roxb.) Blatt. & Hallb. in J. Bombay Nat. Hist. Soc. 25 : 707. 1918, *p. p. pro basionym & Syn. R. leptopetala*; Leeuwen in Blumea 19: 55. 1971; Panigr. in Bull. Bot. Surv. India 18: 185. 1974.

Erect or ascending annual herb, 15-30 cm tall. Stems 4-gonous, rooting at base; branches many, opposite, divergent at right angles. Leaves decussate, elliptic-oblong to ovate, obtuse or cuneate at base, obtuse or subacute at apex, 1-2 cm x 0.6-1 cm; upper ones becoming smaller and bractiform. Flowers 1.8-2.2 mm long, sessile, usually approximate, solitary in every axil of leafy bracts of axillary short spicate branches. Bracteoles narrowly lanceolate, nearly as long as calyx. Calyx 1.8-2.5 mm long, broadly campanulate, becoming subglobose as fruit ripens; lobes 5, or rarely 4, triangular, acuminate; accessory appendages subulate, nearly as long as calyx-lobes. Petals 5 or rarely 4, pink, obovate-elliptic, 2.2-2.5 mm long, not persisting in fruit. Stamens 5, or rarely less; filaments inserted just below middle of calyx-tube; anthers included. Ovary globose; style absent to 0.25 mm long. Stigma capitate. Capsule globose, 2-2.5 mm in diam, 3-valved, usually red above. Seeds semi-ovoid, *ca.* 0.4 mm long, straw-coloured.

Fl. & Fr.: Oct. Jan.

Ecology : Very common; in paddy fields, wet grounds, river-banks, margins of ditches, etc.

Distribution : India: Punjab, Rajasthan, Karnataka, Kerala, Tamilnadu, Orissa, Madhya Pradesh, West Bengal, Bihar, Assam. S.E. Asia to Malasia, C. China, Korea and Japan.

Specimens examined : Hazaribagh, 135; Gola, 1529; Joynagar, 1804.

3. ***Rotala rotundifolia*** (Buch.-Ham. ex Roxb.) Koehne, Bot. Jahrb. 1: 175. 1880 & in Engler, Pfl.-reich. IV. 17: 41. 1903; Blatt. & Hallb. in J. Bombay Nat. Hist. Soc. 25: 718. 1918; Cook in Boissiera 29: 49. 1979. *Ammannia rotundifolia* Buch.-Ham. ex Roxb., Fl. Ind. 1: 446. 1820; Clarke in Hook. f., Fl. Brit. India 2: 566. 1879; Prain, Bengal Pl. 1: 500. 1903; Haines, Bot. Bihar & Orissa pt. 3: 377. 1922.

Creeping or decumbent, annual-perennial herb, 15-90 cm tall. Stem branched at base, 4-gonous, rooting at nodes. Leaves \pm sessile, decussate, orbicular or broadly obovate, subcordate at base, rotund at apex, entire, strongly nerved beneath, 0.6-1.2 cm in diam. Flowers 0.2-0.25 cm across, in dense, terminal, often 3-nate cylindric spikes. Pedicels very short, 1-1.5 mm long. Flowers crowded towards apex of spike, lax in fruit. Bracts cordate, orbicular, sessile, adnate to pedicel by a short claw, ca. 2.5 mm diam. Bracteoles minute, linear-lanceolate, equalling calyx-tube. Calyx 0.18-0.2 cm long; tube campanulate, 1.3-1.5 mm long; lobes 4, triangular. Petals 4, obovate, larger than calyx-lobes, bright rose-coloured; accessory appendages and interjacent folds absent. Stamens 4, inserted near base of calyx-tube. Ovary globose, ca. 0.5 mm. Capsule ellipsoid, equal to calyx-tube, slightly longer than broad, dehiscent by 4 valves. Seeds brownish yellow, ellipsoid, ca. 0.5 mm long.

Fl. & Fr.: Oct. - Dec.

Ecology : Very common; in rice-fields, marshy places, margins of ponds, etc.

Distribution : India: Punjab, Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Andhra Pradesh, Tamilnadu, Kerala, Karnataka, Madhya Pradesh. S. & S.E. Asia, China, Japan, mostly in the mountainous regions.

Specimens examined : Hazaribagh, 106; Bishnugar, 1115; Etkhori, 1873.

5. WOODFORDIA Salisb.

Woodfordia fruticosa (L.) Kurz in J. Asiat. Soc. Bengal 40: 56. 1871; Koehne in Engler Pfl.-reich. IV. 17: 53. 1903; Haines, Bot. Bihar & Orissa pt. 3: 374. 1922. *Lythrum fruticosum* L., Syst. ed. 10, 1045. 1759.

W. floribunda Salisb., Parad. Lond. t. 42. 1806; Clarke in Hook. f. Fl. Brit. India 2: 572. 1879; Prain, Bengal Pl. 1: 502. 1903; Haines, For. Fl. Chota Nagpur 354. 1910.

Local name: Dawi, Santha.

Straggling shrub, to 3.5 m tall; branches long, spreading; bark smooth, cinnamon-brown, peeling off in fibres; young shoots terete, finely white-pubescent. Leaves opposite or subopposite, linear-lanceolate, rounded or sub-cordate at base, acute or sub-acuminate at apex, finely grey-pubescent beneath, 5-9 x 1.2-2.5 cm. Flowers numerous, brilliantly scarlet, 1.2-2 cm long; pedicels short, glandular-pubescent. Hypanthium striate, long-tubular, dotted, 1.2-1.5 cm long. Calyx-teeth 6, triangular, 0.2-0.25 cm long. Petals 6, narrow-linear, slightly longer than calyx-teeth. Stamens 12, inserted below middle of hypanthium, declinate, of two different lengths. Ovary sessile, oblong, 2-celled; ovules many, on axile placentae; style filiform. Fruit ellipsoid, dry, thin-walled, irregularly breaking, included within calyx, to 1 cm long. Seeds narrowly cuneate-obovate, brown, minute, smooth.

Fl. : Jan.-Apr. *Fr.*: Apr.-May.

Ecology : Very common; in open forests, usually grows gregariously.

Distribution : Throughout India. Sri Lanka, Nepal, China, Japan, Sumatra, Java, Beluchistan, Malagasy, Tropical Africa.

Specimens examined : Pokharia (National Park), 188; Raja Rappa, 360.

Uses: Leaves and twigs are used in dyeing. Dried flowers are given in dysentery. Dried fruits and flower-buds are much used in bowel

complaints, hemorrhages and seminal weakness. Wood is used for making axe-handles; also as fuel.

63. TRAPACEAE

TRAPA L.

***Trapa natans* L. var. *bispinosa* (Roxb.) Makino** in Inuma, Somoku-Dzusetzu ed. 3, 1: 137. 1907; Santap. & Wagh in Bull. Bot. Surv. Ind. 5: 109. 1963.

Trapa bispinosa Roxb., Pl. Corom. 3: 29, t. 234. 1815; Clarke in Hook. f., Fl. Brit. India 2: 590. 1879, *p.p.*; Prain, Bengal Pl. 1: 508. 1903; Haines, For. Fl. Chota Nagpur 357. 1910 & Bot. Bihar & Orissa pt. 3: 383. 1922; Subram., Aquat. Ang. 21, f. 15, 1962.

Local name: Singara, Pani-Phal.

Stems flexuous, furnished with numerous opposite pairs of green root-like pectinate organs. Submerged leaves to 3 cm long; floating ones 2-6 cm in diam., broader than long, entire in lower part, irregularly incisedentate-serrate in upper part, reddish and densely pubescent or villous beneath; petiole 8-15 cm long, hairy or woolly; inflated part 1.5-2.5 cm long; stipules minute. Flowers bisexual, solitary, axillary, 4-merous. Calyx pubescent; segments 4, lanceolate, acute, 2 of which turning to thorns in fruit. Petals 4, white, obovate, crenulate, about twice as long as calyx-segments. Stamens 4, alternating with petals, surrounding the cupular crenate disk. Ovary semi-inferior, with a conical apex, 2-locular; ovule 1 in each locule, pendulous; style 1, filiform; stigma capitate. Drupe somewhat urn-shaped, 2-2.5 cm long and broad, with a short beak in centre at apex and a flattened very sharp thorn at either side; shell bone-hard; thorns barbed at apex.

Fl. : Aug.-Sept. *Fr.*: Nov.-Dec.

Ecology: Common; in ponds and jheels.

Distribution: Throughout India, Pakistan, Bangladesh, Sri Lanka, S.E. Asia, Malesia, Tropical Africa.

Specimens examined: Jhumri Telaiya, 664; Ramgarh, 1916.

Uses: Fresh tender kernels are eaten fresh, or after boiling or roasting. Meal prepared by grinding the kernels is used as substitute for cereal flour.

Note: Subramanyam (*l.c.*), Ghazanfar (in Nasir & Ali, Fl. W. Pakistan 97: 1. 1976), Khan & Halim (in Salar Khan, Fl. Bangladesh 27: 1. 1984) and others, however, adopted *T. bispinosa* Roxb. as a distinct species.

64. MYRTACEAE

Key to the Genera

- 1a. Fruit dry, loculicidally dehiscent at top:
- 2a. Flowers capitate or umbelled. Petals calyprate ... 2. EUCALYPTUS
- 2b. Flowers in spikes:
- 3a. Stamens in 5 bundles opposite the petals. Spikes axillary ... 3. MELALEUCA
- 3b. Stamens free or shortly connate at base. Spikes proliferous ... 1. CALLISTEMON
- 1b. Fruit not dehiscent:
- 4a. Limb of calyx closed in bud, deeply divided when in flower. Seeds numerous ... 4. PSIDIUM
- 4b. Limb of calyx not further divided when in flower. Seeds 1 to few ... 5. SYZYGIUM

1. CALLISTEMON R. Br.

***Callistemon citrinus** (Curtis) Skeels in U.S.D.A. Bur. Pl. Industr. Bull. 282: 49. 1913; Matthew in Rec. Bot. Surv. India 20: 104. 1969. *Metrosideros citrina* Curtis in Curtis, Bot. Mag. t. 260. 1794.

M. lanceolata Smith in Trans. Linn. Soc. London 3: 272. 1797.

Callistemon lanceolatus (Smith) Sweet, Fl. Austral. Sub. t. 29. 1828; DC., Prodr. 3: 323. 1828; Benth., Tr. Calcutta 249. 1946.

Large shrub to small tree, 3-10 m tall. Young branchlets densely covered with patent, long, thin hairs. Leaves rather crowded, linear-

lanceolate, cuneate at base, acute at apex, pubescent when young, 2-12 x 0.5-1.2 cm, 3-nerved, two lowest nerves close to margins; petiole 5-8 mm long. Calyx-tube campanulate, green, finely pilose, 2-3 mm high; lobes 5, broadly ovate to semiorbicular, erect, obtuse-rounded at apex, broadly pellucid-rimmed, 1-1.2 mm long. Petals 5, broadly oval-obovate, strongly concave, with a pale-green heavily punctate central area and transparent margins, sparsely pilose without, 4-6 mm long. Stamens numerous, much exserting; filaments free or shortly connate at base, red, 1.2-2.5 cm long. Ovary with a pubescent apex, 3-4-celled; ovules α , ascending on peltate placentae. Fruit campanulate, loculicidally dehiscent at apex.

Fl.: Feb. - Apr. *Fr.* : June - Sept.

Ecology : Very common; planted in gardens.

Distribution : Throughout India. Native of Australia, now widespread in all the tropical, subtropical and warm-temperate countries of the world.

Specimens examined: Hazaribagh, 101; Ramgarh, 529.

Use: The species is planted as an ornamental for its beautiful flower.

2. EUCALYPTUS L' Her.

Eucalyptus globulus Labill., Rel. Voy. Rech. Perouse 1: 153. 1799; Maiden, Crit. revis. *Eucalyptus* 2: 249. 1913; Duthie in Hook. f., Fl. Brit. India 2: 462. 1878; Haines, Bot. Bihar & Orissa pt. 3: 365. 1922.

Local name: Eucalyptus.

Medium-sized to large tree, to 20 m tall. Bark greyish-or bluish-white. Branchlets robust, 4-angular. Juvenile leaves ovate-cordate to ovate-lanceolate, bluish green, 6-15 x 2.5-9 cm; intermediate ones broad-lanceolate, green, concolorous; adult ones lanceolate-falcate, acuminate, dark-green and lustrous, 10-30 x 3-4 cm. Flowers to 4 cm across, usually solitary, rarely 2-3-nate, axillary. Peduncle much reduced. Buds sessile, turbinate, glaucous, 2-3 x 1.5-2 cm. Hypanthium ribbed, to 1 cm long. Calyx quadrangular, verrucose; operculum umbonate, verrucose, shorter than calyx-tube. Stamens 1-1.5 cm long; anthers obovate, versatile, 0.08-

0.15 cm long. Fruit sessile, depressed-globose to broadly turbinate, 4-ribbed, verrucose, 1-1.5 x 1.5-3 cm, with broad rim and depressed or convex crown.

Fl. : Mar.-May *Fr.* : July-Nov.

Ecology : Very common; in gardens, parks, roadsides, forests, etc.

Distribution : Throughout India. Native to Australia; introduced in Sri Lanka.

Specimens examined : Hazaribagh, 5, 740.

Uses: Wood is used for agricultural implements, spokes and rims of wheels, plough-bars, axe-handle and also as fuel. Oil derived from leaves is used as antiseptic, febrifuge, mosquito and vermin-repellent, and also in diseases of respiratory tract.

3. MELALEUCA L.

Melaleuca leucadendron L., Mant. Pl. 1: 105. 1771; Duthie in Hook. f., Fl. Brit. India 2: 465. 1878; Prain, Bengal Pl. 1: 486. 1903; Haines, Bot. Bihar & Orissa pt. 3: 366. 1922.

Local name: Kayaputi.

Medium sized tree, to 20 m tall. Bark almost white or ashy, peeling off in large papery flakes. Branches pedulous. Leaves elliptic or narrow-lanceolate, oblique, coriaceous, tapering to a short petiole, 5-12 cm long, with 3-7 longitudinal veins. Flowers yellowish-white, sessile, in erect axillary spikes of 5-15 cm long; the rachis usually prolonged and leaf-bearing. Calyx 3-3.5 mm long, cylindric and 5-6 mm long in fruit. Petals 5, spreading, 3-3.5 mm long. Staminal bundles exserted, 6-8 mm long. Ovary 3-celled. Capsule nearly hemispherical, with deep depression at top, 3-4 mm across.

Fl. : Apr.-Aug. *Fr.* : June-Nov.

Ecology : Common; planted in parks and gardens, along roadsides, etc.

Distribution : Almost throughout the tropical parts of India. Native of Myanmar, Malay Islands and Australia, now widely cultivated in the Tropics.

Specimens examined : National Park, 392; Hazaribagh, 502.

Uses: Young leaves and branchlets yield an oil which is used in rheumatism, chronic laryngitis and bronchitis, and also as anthelmintic. Wood is used in constructional purposes.

4. PSIDIUM L.

Psidium guajava L., Sp. Pl. 470. 1753; Duthie in Hook. f., Fl. Brit. India 2: 468. 1878; Prain, Bengal Pl. 1: 487. 1903; Haines, For. Fl. Chota Nagpur 353. 1910 & Bot. Bihar and Orissa pt. 3: 363. 1922.

Local names: Amrud, Safed safari.

Large shrub to small tree, to 18 m tall, pubescent on younger branches. Bark scroll-marked, smooth, grey and rust-brown. Leaves elliptic-oblong, cuneate at base, acute to sub-acuminate at apex, subglabrous above, pubescent beneath, 4-10 x 2.5-6 cm, with prominent nerves beneath; petiole 0.4-0.6 cm long, short. Cymes axillary, 1-3-flowered. Flowers 2.5-3.5 cm across. Petals 4 or 5, 1-1.2 cm in diam. Ovary 4-5-locular; ovules many, multiseriate. Berry globose or pyriform, to 4 cm or more in diam., yellow when ripe.

Fl.: Apr.-June. *Fr.*: June-Dec.

Ecology : Common; planted in gardens, also quite naturalised in village jungles.

Distribution : Throughout India. Native of Tropical America, now widely cultivated and naturalised in Old World Tropics.

Specimens examined: Koderma, 144; Ramgarh, 533.

Uses: Fruits are eaten as such, canned, preserved or made into jam, marmalades, etc. Leaves are used as an astringent for bowel troubles. Decoction of bark is given in diarrhoea.

5. SYZYGIVM R. Br. ex Gaertn., *nom. cons.**Key to the Species*

- 1a. Stamens inserted on a thickened disk. Petals not calyptrate:
- 2a. Flower 5-8 cm in diam. Fruit subglobose ... 3. *S. jambos*
- 2b. Flowers 2.5-3.5 in diam. Fruit turbinate ... 5. *S. samarangense*
- 1b. Stamens not inserted on a thickened disk. Petals calyptrate:
- 3a. Secondary veins 8-15 pairs, distinct and raised beneath ... 4. *S. operculatum*
- 3b. Secondary veins and intermediate ones very fine, close and numerous:
- 4a. Branches of cymes sharply 4-angled. Fruit globose ... 2. *S. fruticosum*
- 4b. Branches of cymes rounded in cross-section. Fruit oblong or ellipsoid. ... 1. *S. cumini*

1. *Syzygium cumini* (L.) Skeels in U.S.D.A. Bur. Pl. Industr. Bull. 248: 25. 1912; Merr. and Perry in J. Arnold Arb. 19: 108. 1938; Mooney, Suppl. Bot. Bihar & Orissa 65. 1950; *Myrtus cumini* L., Sp. Pl. 471.1753.

Eugenia jambolana Lam., Encycl. 3: 198. 1789; Duthie in Hook. f., Fl. Brit. India 2: 499. 1879; Prain, Bengal Pl. 1: 491. 1903; Haines, For. Fl. Chota Nagpur 351. 1910. & Bot. Bihar and Orissa pt. 3 : 360. 1922.

Local names: Jamun, Jam.

Evergreen tree, to 15 m tall; bark grey, smooth, cracked when old. Leaves coriaceous, elliptic, oblong or ovate-oblong, cuneate at base, abruptly acuminate or acute at apex, glabrous, shining, 7-12 cm x 3-6 cm, secondary veins and intermediate ones fine, close and numerous; petiole 0.8-1.5 cm long. Cymes terminal or axillary, ramiflorous, to 10 cm long; branches rounded in cross-section. Calyx goblet-shaped, tapering towards base, obscurely 4-5-segmented, 3-5 mm long. Petals calyptrate, elliptic, fugaceous, 3-5 mm long. Stamens many, as long as calyx-tube, white; filaments very slender. Berry oblong or broadly ellipsoid, shining black when

ripe, juicy, crowned with truncate calyx-limb, 1-seeded, 1-3 cm x 0.7-1.8 cm.

Fl.: May - June. *Fr.*: June - Jul.

Ecology: Common; along margins of rivers, streams and tanks; also cultivated in gardens.

Distribution : Throughout India including subtropical Himalaya. Sri Lanka, Malesia and Australia.

Specimens examined : Hunterganj, 972; Ghanghree, 1974; Ramgarh Cant., 1240.

Uses: Ripe fruits are edible ; also used for making preserves, jams and jellies. Wood is used for construction purposes, agricultural implements, tool-handles, cart-wheels, furniture, etc. Leaves are used as palatable fodder for cattle, sheep and goats. Bark is used for colouring fishing-nets. Decoction of bark is used in diabetes.

2. *Syzygium fruticosum* DC., Prodr. 3: 260. 1828; Merr. & Perry in J. Arnold Arb. 19: 109. 1938; Mooney, Suppl. Bot. Bihar & Orissa 65. 1950.

Eugenia fruticosa (DC.) Roxb., Fl. Ind. ed. 2, 2: 487. 1832; Duthie in Hook. f., Fl. Brit. India 2: 499. 1879; Prain, Bengal Pl. 1: 491. 1903; Haines, Bot. Bihar and Orissa pt. 3: 361. 1922.

Local name: Jangli jamun.

Tree, to 10 m tall, branched from base; bark pale-grey in young trees and dark-grey and somewhat cracked in old trees. Leaves narrow-elliptic or elliptic-oblong, acute or shortly acuminate at apex, cuneate at base, coriaceous, entire, smooth, dark green, distinctly glandular, with dots conspicuous beneath when dry, 8-12 x 3-5 cm; secondary veins and intermediate ones very fine, close and numerous; petiole 1.2-2 cm, divaricate. Cymes short, borne from old branches; branches divaricate, acutely 4-angled. Bracts minute, caducous. Hypanthium turbinate or broadly campanulate. Sepals 0. Petals calyptrate. Stamens ca. 5 mm long. Berry globose, 0.6-0.9 cm in diam.

Fl.: May - June *Fr.*: July. - Aug.

Ecology : Not common, planted in gardens; also self-grown in hilly parts of the district.

Distribution: Major parts of India. Bangladesh.

Specimens examined: Tondwa, 1430; Gola, 1521.

3. *Syzygium jambos* (L.) Alston in Trimen, Handb. Fl. Ceylon 6: 116. 1931; Mooney, Suppl. Bot. Bihar & Orissa 66. 1950; Ashton in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 2: 427. 1981.

Eugenia jambos L., Sp. Pl. 175, 470. 1753; Duthie in Hook. f., Fl. Brit. India 2: 474. 1878; Prain, Bengal Pl. 1: 490. 1903; Haines, For. Fl. Chota Nagpur 351. 1910 & Bot. Bihar & Orissa pt. 3: 363. 1922.

Myrtus jambos (L.) H.B.K., Nov. Gen. Sp. 6: 144. 1823.

Jambosa vulgaris DC., Prodr. 3: 286. 1828; Gamble, Fl. Madras 474 (336). 1919.

Local name: Gulab Jamun.

A small evergreen tree, to 10 m tall, with diffuse branching. Bark grey-brown, smooth. Branches glabrous, red-brown, terete, smooth. Leaves narrowly lanceolate, thinly coriaceous, semi-pendant, cuneate at base, acute-subacuminate at apex, entire, glabrous, 9-20 x 1.5-4.5 cm. Petiole to 1 cm long, drying black. Flowers greenish white, 5-8 cm across. Peduncle to 3 cm. Pedicel to 2 cm. Calyx-tube obconical, 1.2 cm long; lobes subequal, 4, ovate-orbicular, persistent, 8 x 6 mm. Petals 4, white, free, orbicular, concave, 1.5 x 1.8 cm. Stamens numerous, basally subconnate, unequal, 2-4 cm long, inserted on a thickened disk. Style prominently protruding, 3.4-4.5 cm long. Ovary 8 mm, 2-celled. Fruit subglobose, smooth, yellowish or pink, 2-3.5 x 1.5-2 cm, crowned by a ring of persistent sepals. Seeds 1 or 2, grey.

Fl.: Mar. - Apr. *Fr.*: June - Aug.

Ecology: Common; cultivated, also escapes in village jungles.

Distribution : Throughout India. Native of Malaya and Myanmar, cultivated in Tropical Himalayas, Asia and Australia.

Specimen examined : Patratu, 574.

Uses: Fruits are eaten as such and used as tonic for brain and liver complaints. Bark is used as a remedy for asthma and bronchitis. Leaves are boiled and applied to sore-eyes.

4. *Syzygium operculatum* (Roxb.) Niedz. in Pflanzenfam. 31, 7: 85. 1893; Ashton in Dassan. & Fosb., Rev. Handb. Fl Ceylon 3: 446. 1981. *Eugenia operculata* Roxb., Fl. Ind. 2: 486. 1824; Duthie in Hook. f., Fl. Brit. India 2: 498. 1879; Prain, Bengal Pl. 1: 490. 1903; Haines, For. Fl. Chota Nagpur 352. 1910 & Bot. Bihar & Orissa pt. 3: 362. 1922.

Cleistocalyx operculatus (Roxb.) Merr. & Perry in J. Arnold Arb. 19: 246. 1938; Mooney, Suppl. Bot. Bihar & Orissa 66. 1950.

Local name: Paiman.

Large tree, to 20 m tall; bark grey-brown, becoming flaky on trunk; branches spreading, at first green, later becoming whitish. Leaves elliptic-obovate, chartaceous, attenuate at base, with to 1 cm long downcurved acumen and undulate margins, pink when young, yellow-brown when becoming old, 6-12 x 3-5 cm; secondary veins 8-15 pairs, distinct and elevated beneath; intramarginal nerve prominently looped; petiole 6-10 cm long. Cymes lax, to 8 cm long, ramiflorous. Flower buds obovoid, to 5 x 3 mm. Flowers 0.8-1.2 cm in diam. Calyx campanulate; segments obscure. Petals oblong, calyptrate, 3-5 mm long. Stamens exceeding petals, 6-8 mm long. Fruit ellipsoid, purple, succulent, 7-8 x 5-6 mm, crowned by persistent calyx and style-remnant.

Fl.: Apr.-May. *Fr.*: May-June.

Distribution : Almost throughout India. South-East Asia and Sri Lanka.

Specimens examined : Hazaribagh, 486; Pratappur, 607.

Uses: The wood is used for house building. Bark is used in dysentery, biliousness and bronchitis. Fruits are given in rheumatism and root-infusion is rubbed over painful joints.

5. *Syzygium samarangense* (Blume) Merr. and Perry in J. Arnold Arb. 19: 115. 1938; Mooney, Suppl. Bot. Bihar & Orissa 66. 1950. *Myrtus samarangensis* Blume, Bijdr. 1084. 1826.

Jambos samarangensis (Blume) DC., Prod. 3: 286. 1828.

Eugenia javanica Lam., Encycl. 3: 200. 1789, non *Syzygium javanicum* Miq. 1855; Duthie in Hook. f., Fl. Brit. India 2: 474. 1878; Prain in Rec. Bot. Surv. India 3: 212. 1905; Haines, Bot. Bihar and Orissa pt. 3: 363. 1922.

Local name : Jamrul.

Small tree, to 7 m tall, with dense crown. Bark grey, smooth. Twigs glabrous, yellow-brown, terete. Leaves subsessile, thin coriaceous, broadly elliptic-oblong, cordate at base, obtuse or shortly acuminate at apex, applanate along margins, glabrous, 8-14 x 4-8 cm; secondary nerves 8-16 pairs, elevated beneath; petiole 1-2 mm long. Cymes slender, lax, terminal and axillary, to 6 cm long. Flowers 2.5-3.5 cm across. Calyx-tube turbinate, slender below; lobes 4, unequal, membranous at edges, to 4 mm long, accrescent. Petals 4, free, elliptic, obtuse, cupped, caducous. Stamens numerous, slender, to 6 mm long. Fruit shining, turbinate, almost flat above, to 5 cm long and diam., crowned by fleshy incurved calyx-lobes, white or pinkish-white.

Fl.: Apr. - May. *Fr.*: May - June.

Ecology: Common; in rural and urban areas in large numbers, particularly in moisture parts.

Distribution : Almost throughout India. Native of Malesia, widely distributed in Old World Tropics.

Specimens examined: Hazaribagh, 745; Gola, 778.

Uses: Fruits are eaten. Wood is used for building huts.

65. PUNICACEAE

PUNICA L.

Punica granatum L., Sp. Pl. 472. 1753; Clarke in Hook. f., Fl. Brit. India 2: 581. 1879; Prain, Bengal Pl. 1: 505. 1903; Haines, For Fl. Chota Nagpur 356. 1910 & Bot. Bihar & Orissa pt. 3: 380. 1922.

Local name: Anar.

Plant 1-5 m tall, usually much-branched from base; branches usually ending in a spine, moreover frequently with axillary leaf-bearing or leafless spines, when very young tetragonous or narrowly tetrapterous, afterwards subterete. Leaves mostly opposite, oblong-lanceolate, cuneate or obtuse at base, acute, obtuse or emarginate at apex, entire, shining above, 1-9 x 0.5-2.5 cm; petiole 2-6 mm long. Flowers 1-5 at top of branchlets, one of them terminal, others solitary in highest leaf-axils. Calyx (including receptacle) 2-3 cm long, red or pale-yellow; segments thick, ovate-triangular, papillose along margin, with a gland at apex on back, 0.8-1.2 cm long. Petals obovate, rounded or obtuse at apex, red or white, 1.5-3 x 0.5-1 cm. Stamens 0.5-1 cm long. Style 0.7-1.2 cm long. Berry 5-12 cm in diam., variously coloured (yellowish-green, white, reddish, brown or blackish-purple). Seeds obtusangular, red, pink or yellowish-white.

Fl. : Apr.-June. *Fr.* : Aug. - Oct.

Ecology: Common; planted for fruits or medicinal purposes in gardens.

Distribution: Throughout India. Probably native from Persia and some adjoining countries, introduced into S. Europe, N. Africa, Orient, S.E. Asia, Malayasia, China, Nepal.

Specimens examined: Hazaribagh, 207; Tondwa, 1432.

Uses: Fleshy testa is edible. Seeds are used as condiment. Seed-juice is used for making wine. Fruit-rind is used as a tanning material. Bark-decoction is used to expel tapeworms. Rind is used in diarrhoea and dysentery.

66. ONAGRACEAE

LUDWIGIA L.

Key to the Species

- 1a. Stamens as many as sepals. Flowers ca. 1 cm across, yellow. Stems erect, without aerophores. Seeds pluriseriate in each cell of capsule, free ... 3. *L. perennis*
- 1b. Stamens twice as many as sepals. Flowers more than 2 cm across:
- 2a. Stems floating or creeping, bearing clusters of spongy aerophores at nodes. Flowers cream or white, 5-merous. Seeds uniseriate in each cell of capsule, embedded in endocarp ... 1. *L. adscendens*
- 2b. Stems erect, without aerophores. Flowers yellow, 4-merous. Seeds pluriseriate in each cell of capsule, free ... 2. *L. octovalvis*

1. *Ludwigia adscendens* (L.) Hara in J. Jap. Bot. 28: 290. 1953; Sreemadhavan in Bull. Bot. Surv. India 8: 79. 1966; Raven in Steenis, Fl. Males. ser. 1, 8: 104. 1977. *Jussiaea adscendens* L. Mant. Pl. 1: 69. 1771.

Jussiaea repens L., Sp. Pl. 388. 1753, non *Ludwigia repens* Forst. 1771; Clarke in Hook f. Fl. Brit. India 2: 587. 1879; Prain, Bengal Pl. 1: 507. 1903; Haines, For. Fl. Chota Nagpur 357. 1910 & Bot. Bihar & Orissa pt. 3: 381. 1922; Subram., Aquat. Ang. 10, f. 14. 1962.

Local names: Dhabni, Kersariba.

Aquatic or semiaquatic herbs. Stems prostrate or ascending from a floating or creeping base, rooting at nodes, sustained by means of white spindle-shaped, spongy bodies, arising in clusters at nodes of floating stems. Leaves alternate, obovate or oblanceolate, rounded at apex, narrowed into a 0.8-1.5 cm long petiole, glabrous or slightly pubescent, 2.5-5 x 1.2-2 cm. Flowers 3.5-4.5 cm across, solitary, in upper leaf axils; pedicels 1.2-3 cm long, slightly pubescent; bracteoles present near base of capsule, deltoid, ca. 1.2 x 1.4 cm. Sepals 5, ovate-lanceolate, acuminate, 0.6-1.2 cm long. Petals 5, obovate, rounded at apex, cream or white with yellowish veins, 0.8-1.5 x 0.6-0.9 cm. Stamens 10, epipetalous, one slightly shorter; filaments white, 2.5-4 mm. Style white, 4-8 mm long, densely long-hairy

in lower half; stigma globose, green. Capsule 1.2-3 cm long, terete, glabrous or sparsely clothed with scattered hairs, light brown with 10 darker ribs, thick-walled. Seeds many, uniseriate in each cell, embedded in endocarp, pale brown, 1-1.3 mm long.

Fl. & Fr. : June - Sept.

Ecology: Very common; in fresh water pools, ditches, ponds, swamps, fallow and wet fields.

Distribution : Throughout India. Continental Asia and Malesia.

Specimens examined : Hazaribagh, 261; Jhumri Telaiya, 297; Chowparan, 1385.

Uses: Plant, in poultice, is used for ulcers and skin complaints.

Note: Terrestrial form also occurs on desiccated muddy or dry soil, marked by very small crowded leaves, long tap root, devoid of spongy vesicles, and a stronger pubescens. In aquatic form, the submerged underground part of stem is covered by cottony spongy aerenchyma. The fruits are persistent and dehisce loculicidally in irregular way.

2. *Ludwigia octovalvis* (Jacq.) Raven in Kew. Bull. 15: 476. 1962 & in Reinwardtia 6: 356. 1963 & in Steenis, Fl. Males. ser. 1, 8: 101. 1977. *Oenothera octovalvis* Jacq., Enum. Syst. Pl. 19. 1760.

Jussiaea suffruticosa L., Sp. Pl. 388. 1753, non *Ludwigia suffruticosa* Walt., Fl. Carolin. 90. 1788; Clarke in Hook. f., Fl. Brit. India 2: 587. 1879; Prain, Bengal Pl. 1: 507. 1903; Haines, For. Fl. Chota Nagpur 357. 1910 & Bot. Bihar & Orissa pt. 3. 381. 1922.

J. exaltata Roxb., Fl. Ind. 2: 401. 1832.

Local name: Banlunga.

Suffruticose, erect, annual-perennial herb, to 3 m tall. Stem much-branched, with woody base, subglabrous to densely pubescent, striate. Leaves sessile or sub-sessile, lanceolate to ovate-lanceolate, acute to subacuminate at apex, narrowed to base, entire, glabrous or slightly

pubescent, 5-7 x 0.6-1.5 cm. Flowers *ca.* 2.5 cm across, shortly-pedicelled, axillary, solitary; pedicels shorter than the calyx, pubescent; bracteoles reduced, or to 1 mm long. Sepals 4, ovate-lanceolate, acute or subacuminate, 0.8-1.2 cm long. Petals 4, yellow, broadly obovate, cuneate at base, rounded or emarginate, pinnately veined, to 1.2 x 0.8 cm. Stamens 8, epipetalous ones shortest; filaments 1.5-4 mm long. Style 1.5-3.5 mm long; stigma shallowly 4-lobed. Capsule terete, thin-walled, pale brown with 8 darker ribs, minutely pubescent, 2-4.5 x 0.3-0.8 cm. Pedicel to 1 cm long. Seeds pluriseriate in each cell, free, rounded, brown, 0.6-0.7 mm wide; raphe inflated, ridged, equal in size to the seed.

Fl. & Fr. : Oct. - Mar.

Ecology : Common; in wet, marshy places, near paddy fields, along ditches and water courses, in lakes, pools and drains, especially river-banks, etc.

Distribution: All parts of India except Western Desert region. Throughout the Tropics.

Specimens examined : Bishnugarh, 1107; Tondwa, 1416; Hunterganj, 1658.

Uses: Plant is considered astringent, anthelmintic, carminative and diuretic; decoction is used in diarrhoea and dysentery, flatulence and leucorrhoea. Leaves are used in poultice in orchitis and glands in neck.

Note: The fruits are persistent. They dehisces loculicidally in irregular way. The lower part of the stem is cottony aerenchyma.

3. **Ludwigia perennis** L., Sp. Pl. 119. 1753; Raven in Reinwardtia 6: 367. 1963; Sreemadhavan in Bull. Bot. Surv. India 8: 80. 1966. Raven in Steenis, Fl. Males. ser. 1, 8: 103. 1977.

L. parviflora Roxb., Fl. Ind. 1: 440. 1820; Clarke in Hook. f., Fl. Brit. India 2:588. 1879; Prain, Bengal Pl. 1: 507. 1903; Haines, Bot. Bihar & Orissa pt. 3: 382. 1922.

Erect, annual herbs, to 1 m tall. Stem somewhat angular, much-branched, subglabrous or minutely puberulous on younger parts. Leaves

alternate, variable in shape and size, lanceolate, linear-lanceolate or oblanceolate, subacute at apex, narrowed down at base, entire, glabrous, 2.5-7 × 0.6-2 cm. Flowers small, sessile or shortly-pedicelled, ca. 1 cm across solitary, axillary. Sepals 4, rarely 5, deltoid, glabrous or minutely puberulent, 2-3 mm long. Petals 4, yellow, elliptic, 2-2.5 × 1-1.5 mm. Stamens 4, sometimes 5 or more; filaments 0.1 cm long. Style 0.8-1.2 mm long; stigma globose. Capsule terete, thin-walled, pale-brown, glabrous or puberulent, 0.5-1.3 cm long. Fruiting pedicel 0 to 5 mm long. Seeds pluriseriate in each cell, free, ellipsoid-round, brown 0.4-0.5 × 0.25 mm; raphe inconspicuous.

Fl.: Oct. Nov. *Fr.*: Nov. - Dec.

Ecology: Common; in humid waste places, marshy situations, rice-fields, along ditches, rivers and water courses, often dried river-beds, etc.

Distribution: Throughout India. Tropical Africa, Madagascar, through Continental S.E. Asia and Malesia to Tropical Australia and New Caledonia.

Specimens examined: National Park, 88; Hazaribagh, 748; Simaria, 806.

Uses: Plant is boiled in oil which is applied to the body externally to bring down fever.

Note: Fruits are persistent and dehisce loculicidally in irregular way.

67. MELASTOMATACEAE

SONERILA Roxb.

Sonerila tenera Royle, III. 215, t. 45. f. 2. 1834; Clarke in Hook. f., Fl. Brit. India 2: 530. 1879; Prain, Bengal Pl. 1: 496. 1903; Haines, Bot. Bihar & Orissa pt. 3: 372. 1922; Babu, Herb. Fl. Dehra Dun 184. 1977.

Slender, delicate, annual herbs, 3-10 cm tall. Stems mostly simple, often suffused with pink, pubescent and gland-hairy. Leaves membranous, ovate or ovate-oblong or rhomboid, obliquely cuneate at base, obtuse at

apex, serrulate, sparsely hairy above, glabrous beneath except on nerves, basally 3-5 nerved, 1-3 x 0.5-1.5 cm. Petiole 3-8 mm long. Flowers 4-7 mm long, in terminal scorpioid spikes or racemes to 1.5 cm long. Peduncle 0.5-2 cm long. Pedicel 0-2 mm long. Calyx 4-6 mm long, puberulous or with few scattered hairs; tube 3-4.5 mm long; lobes ovate-triangular, acute, *ca.* 1 mm long. Petals rose-purple, ovate-oblong, clawed, *ca.* 3 mm long. Anthers short, oblong, narrowed and truncate at apex, *ca.* 2 mm long. Ovary sparsely gland-hairy. Style *ca.* 5 mm long, puberulous. Capsule trigonous, oblong, 5-6 mm long, sparsely gland-hairy, narrowed at base; ribs obscure. Seeds ovoid, smooth, brown, *ca.* 0.4 mm long.

Fl. & Fr.: Oct. - Nov.

Ecology: Not common; moist slopes of hills, along margins of canals, etc.

Distribution: India: Subtropical Western Himalaya, Uttar Pradesh, Chota Nagpur, Orissa, Sikkim. Nepal, Indo-China, South China, Philippines.

Specimens examined : National Park: 955, 2009.

Use: Root is used for diseases of throat.

68. COMBRETACEAE

Key to the Genera

- 1a. Petals present:
- 2a. Style adnate for lower part to inner wall of upper receptacle ... 3. QUISQUALIS
 - 2b. Style not adnate to inner wall of upper receptacle ... 2. COMBRETUM
- 1b. Petals absent:
- 3a. Flowers borne in capitate inflorescence. Fruit 2-winged ... 1. ANOGEISSUS
 - 3b. Flowers in simple or compound spikes or racemes. Fruit smooth or angular or 2 to 5-winged ... 4. TERMINALIA

1. ANOGEISSUS (DC.) Guill. & Perr.

Anogeissus latifolia (Roxb. ex DC.) Wall. ex Guill. & Perr., Fl. Seneg. Tent. 1: 280. 1832; Clarke in Hook. f., Fl. Brit. India 2: 450. 1878; Prain, Bengal Pl. 1: 479. 1903; Haines, For. Fl. Chota Nagpur 363. 1910 & Bot. Bihar & Orissa pt. 3: 355. 1922; *Conocarpus latifolia* Roxb. ex DC., Prodr. 3: 16. 1828.

A. latifolia (Roxb. ex DC.) Wall. ex Guill. & Perr. var. *glabra* Clarke in Hook. f., Fl. Brit. India 2: 450. 1878.

A. latifolia (Roxb. ex DC.) Wall. ex Guill. & Perr. var. *villosa* Clarke in Hook. f., Fl. Brit. India 2: 450. 1878.

A. latifolia (Roxb. ex DC.) Wall. ex Guill. & Perr. var. *tomentosa* Haines, For. Fl. Chota Nagpur 364. 1910 & Bot. Bihar & Orissa pt. 3: 355. 1922.

Local name: Dhaura.

Small to medium-sized tree, to 20 m tall. Branchlets silky-pubescent. Bark smooth, light-coloured. Leaves alternate or sub-opposite, broadly elliptic or oblong-elliptic, obtuse-rounded or shortly cuspidate at apex, rounded or cuneate at base, glabrous, rusty below, chartaceous, 4-10 x 2.5-6 cm; petiole 1.5-2 cm long. Heads to 1.5 cm across. Flowers 3.5-4 mm across. Peduncles 1 or more from same axil, branched, slightly longer than petiole. Calyx pubescent, 3-4 mm long; lobes yellow, persistent, triangular, 1.5-2 mm long. Stamens exserted. Ovary densely tomentose; style thickened at base. Fruits plano-convex, 4-6 x 3-4 mm yellowish-brown, ending in persistent calyx-tube. Seed 2.5-3 mm long.

Fl.: June - Sept. *Fr.:* Dec. Jan.

Ecology: Very common; in dry forests, slopes of hills, etc.

Distribution: Throughout India. Sri Lanka, Pakistan, Nepal.

Specimens examined: Telaiya Dam, 638; National Park, 2060.

Uses: The gum from stem is a good substitute for Gum Arabic in Pharmacy. Wood is used for making axles, poles, batons, different agricultural implements and stool-handles.

2. COMBRETUM L.

Key to the Species

- 1a. Flowers 5-merous. Fruit with 5 membranous wings ... 2. *C. roxburghii*
 1b. Flowers 4-merous. Fruit with 4 papery wings ... 1. *C. nanum*

1. **Combretum nanum** Buch.-Ham ex D. Don, Prodr. Fl. Nepal 219. 1825; Clarke in Hook. f., Fl. Brit. India 2: 457. 1878; Prain, Bengal Pl. 1: 483. 1903; Haines, For. Fl Chota Nagpur 366. 1910 & Bot. Bihar & Orissa pt. 3: 357. 1922.

Decumbent undershrub, with woody rootstock. Stems or branches numerous, erect, 30-60 cm tall, glabrous. Leaves opposite or alternate, orbicular, obovate or lanceolate, coriaceous, glabrous, shining, with scattered points on both surfaces, 5-10 x 4-8.5 cm; petioles 1-1.2 cm long. Racemes dense, usually subterminal and solitary, sometimes few with one greatly elongated, 10-20 cm long. Flowers 4-merous. Peduncle 2.5-5 cm long. Bracteoles 4-5 mm long, linear-spathulate. Receptacle obconic. Calyx-tube funnel-shaped; teeth triangular, erect. Petals narrow-obovate, far exceeding sepals. Disk and base of calyx within covered with long fulvous hairs. Ovary glandular-punctate. Fruit 2.5-4 cm x 2-2.5 cm, pink or crimson, with 4 papery wings.

Fl.: Mar.-May. *Fr.*: Apr.-July.

Ecology : Common; in forests especially along fire-lines and grass lands.

Distribution : India: Himalaya from Punjab to Sikkim, Uttar Pradesh, Bihar, Chota Nagpur and West Bengal. Nepal.

Specimens examined : National Park, 1164; Pratappur, 2107.

Uses: The plant is used medicinally in various ways.

2. **Combretum roxburghii** Spreng., Syst. 2: 231. 1825; Santap. & Wagh in Bull. Bot. Surv. India 5: 106. 1964.

Combretum decandrum Roxb., Pl. Corom. 11: 43, t. 59. 1796, non Jacq. 1760; Roxb., Fl. Ind. 2: 232. 1832; Clarke in Hook. f., Fl. Brit. India 2: 452. 1878; Prain, Bengal Pl. 1: 482. 1903; Haines, For. Fl. Chota Nagpur 365. 1910 & Bot. Bihar & Orissa pt. 3: 1922; Rao in Ind. For. 93: 47. 1967.

Local name: Punk.

Large shrub; branches pendent and subscandent. Leaves opposite, coriaceous, oblong, suddenly acuminate at apex, shining above, glabrous or somewhat appressed hairy beneath, 7-12 x 4-8 cm; petiole 7-8 mm long. Spikes many, rusty villous, 1.2-3 cm long, in large axillary and terminal panicles. Flowers 5-merous; bracteoles linear, 5-6 mm long., subsistent. Calyx densely villous within and without; tube urceolate; segments lanceolate-subulate, suberect. Petals ovate-oblong, acuminate, hairy, not much longer than calyx. Disk short-hairy. Fruit oblong or elliptic, subquadrate, nearly smooth, 1.8-3 cm long, with 5 membranous wings.

Fl.: Nov.-Mar. *Fr.:* Apr.-June.

Ecology: Very common; in forests, along nalas, etc. forming dense low masses.

Distribution : India: North-western India, West Bengal, Bihar, Deccan Peninsula, Andaman Islands. Nepal, Indo-China, China, Myanmar.

Specimens examined : Satgawan, 592; Mandu, 842; National Park, 2016.

Uses: Stems are locally used for making baskets. Leaves are used as febrifuge.

3. **QUISQUALIS** L.

Quisqualis indica L., Sp. Pl. ed. 2, 556. 1762; Clarke in Hook. f., Fl. Brit. India 2: 459. 1878; Prain, Bengal Pl. 1: 484. 1903; Haines, For. Fl. Chota Nagpur 366. 1910 & Bot. Bihar and Orissa pt. 3: 359, 1922.

Local name: Rangoon-ki-bel.

Scandent shrub. Young branchlets rusty-tomentose. Leaves opposite, papyraceous, broadly elliptic or elliptic-oblong, acuminate or often subcaudate at apex, rounded or subcordate at base, tomentose to nearly glabrous, 7-12 x 3.5-9 cm; petiole 0.5-1.1 cm long, persistent and often transformed into recurved spines after the fall of lamina. Flowers showy, fragrant, pendulous, borne in terminal and axillary spikes, 2-10 cm long; bracts lanceolate, acuminate, 6-10 cm long. Lower receptacle 3-4 mm long, sericeous. Upper receptacle narrowly tubular, slightly expanded at apex, tomentose to nearly glabrous, 2.5-3 cm long. Calyx lobes 5, shortly triangular, 1.5-2 mm long. Petals oblong, at first white, then orange and finally turning red, sparsely pubescent, 1-1.5 cm long. Stamens 10, biseriate, inserted; filaments 7-7.5 mm long. Style adnate for lower part to the inner wall of the upper receptacle, upper part free. Fruit narrowly ellipsoid, appressed-pubescent, 2-3 cm long, 5-angled.

Fl.: Mar.-May. *Fr.:* Apr.-July.

Ecology: Very common; planted in gardens as an ornamental, also found as escapes along banks of rivers.

Distribution: Throughout India. Widely distributed in Tropics of Old World and widely planted in many Tropical and Sub-tropical countries.

Specimens examined: National Park, 393; Chatra, 1662.

Uses: Bark is used as febrifuge. Juice of bark is used for skin affections. Infusion of wood is used locally as a stomachic and emmenagogue.

4. TERMINALIA L., *nom. cons.*

Key to the Species

1a. Fruit winged:

2a. Leaves glabrous beneath, wings of fruit marked with ascending striations. Bark pale, smooth, flaky ... 2. *T. arjuna*

2b. Leaves persistently softly tomentose beneath. Wings of fruit marked with horizontal striations. Bark dark-grey, rough, corrugated ... 1. *T. alata*

1b. Fruit not winged:

- 3a. Leaves crowded at ends of branchlets, alternate; spikes simple, axillary:
- 4a. Leaves eglandular. Fruit subglobose, faintly 5-ridged when dry, fulvous-tomentose ... 3. *T. bellirica*
- 4b. Leaves with 2 sessile glands at base of blade. Fruit ellipsoid, slightly compressed laterally, markedly 2-ridged when dry, glabrous ... 4. *T. catappa*
- 3b. Leaves not crowded at ends of branchlets, ± (sub)opposite. Spikes paniculate:
- 5a. Leaves subacute. Fruits oblong-ellipsoid or obovoid, 2-3.5 cm long ... 5. *T. chebula*
- 5b. Leaves acuminate. Fruits oblong-lanceolate, 4-5 cm long ... 6. *T. citrina*

1. ***Terminalia alata*** Heyne ex Roth, Nov. Pl. Sp. 379. 1821; Rao in Bull. Bot. Surv. India 10 (Suppl.2) : 33. 1969.

Pentaptera tomentosa Roxb. ex DC., Prodr. 3: 14. 1828.

Terminalia tomentosa (Roxb. ex DC.) Wight & Arn., Prodr. Fl. Ind. Orient. 314. 1834; Clarke in Hook. f., Fl. Brit. India 2: 447. 1878; Prain, Bengal Pl. 1: 481. 1903; Haines, For. Fl. Chota Nagpur 362. 1910 & Bot. Bihar & Orissa pt. 3: 352. 1922; Rao in Ind. For. 93: 42. 1967.

Local names : Saj, Asan.

Erect tree, to 25 m tall. Bark rough, dark grey, corrugated. Branchlets yellowish-pubescent. Leaves sub-opposite or uppermost alternate, hard, coriaceous, broadly ovate-oblong or elliptic-oblong, obtuse or sub-acute at apex, truncate-sub-cordate at base, crenulate, glabrous above, persistently softly tomentose below, 7-20 × 5-7 cm; secondary veins 10-20 pairs, parallel, arcuate, prominent; petiole 0.5-1.5 cm long; glands sub-sessile, turbinate, present on midrib at base of leaf-blade. Spikes paniced, fulvous-pubescent. Flowers 4-5 mm across. Bracteoles 3.5-4 mm long, linear-lanceolate, hairy, caducous. Calyx 3.5-4 mm long, hairy or glabrous outside; lobes slightly hairy within, ca. 1.5 mm long. Ovary terete. Drupe ovoid, glabrous, with 5 broad, coriaceous, brown, glabrous wings, 3.5-5 × 2.5-3.5 cm. Wings equal, ca. 1.5 cm thick, marked with horizontal striations.

Fl.: May-June. *Fr.*: Feb. - Mar.

Ecology : Very common; in mixed deciduous forests.

Distribution: Throughout the moisture parts of India, Himalaya, Nepal, Indo-China, Myanmar, Thailand, Sri Lanka.

Specimens examined : National Park, 704: Raja Rappa, 852; Pratappur, 1549.

Uses: Wood is used for making beams, joints, rafters, door and window frames, in construction of carts, toys, engine brake blocks, oil mills furniture and different agricultural implements. Bark contains tannin and is used for tanning and dyeing.

2. *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn., Prodr. Fl. Ind. Orient. 314. 1834; Clarke in Hook. f., Fl. Brit. India 2: 447. 1878; Prain, Bengal Pl. 1: 481. 1903; Haines, For. Fl. Chota Nagpur 362. 1910 & Bot. Bihar & Orissa pt. 3: 353. 1922. *Pentaptera arjuna* Roxb. ex DC., Prodr. 3: 14. 1828.

Local name: Arjun.

Large tree, to 30 m tall. Bark pale, smooth, flaky. Branches long, horizontally spreading or inclined; branchlets pubescent. Leaves alternate or sub-opposite, oblong or elliptic-oblong, obtuse or subacute at apex, obtuse-subcordate at base, crenate-serrate, thick coriaceous, glabrous, pale dull green above, pale brown beneath, 10-15 x 3.5-7 cm; petiole 0.8-1 cm long, with two glands close to base of leaf-blade. Spikes paniced, to 10 cm long. Flowers 4 mm across, sessile. Peduncle to 5 cm long. Bracteoles linear, ca. 1 mm long. Calyx glabrous, 3.5-4 mm long; lobes triangular. Stamens much exserted. Ovary covered with crisped hairs. Drupe 5-angled, 5-winged, ovoid-or obovoid-oblong, glabrous, dark-brown, 4.5-6 x 2-3 cm; wings oblique and curving upwards, marked with ascending striations.

Fl.: May-July. *Fr.*: Mar. - Apr.

Ecology : Common; in drier hilly regions; also planted along roadsides, in forests, etc.

Distribution : Almost throughout India, particularly in sub-Himalayan tract, Chota Nagpur, Madhya Pradesh, Deccan Peninsula and North-western India. Sri Lanka.

Specimens examined : Hazaribagh, 262; National Park, 422; Telaiya Dam, 637.

Uses: Wood is used for carts, agricultural implements, and boat-building; also used for house-building and electric poles. Bark is used for tanning and dyeing. Powdered bark is used to relieve hypertension and also has diuretic and tonic effect in cirrhosis of liver.

3. ***Terminalia bellirica*** (Gaertn.) Roxb., Pl. Corom. 2: 54, t. 198. 1805 ('bellerica'); Clarke in Hook. f., Fl. Brit. India 2: 445. 1878; Prain, Bengal Pl. 1: 481. 1903; Haines, For. Fl. Chota Nagpur 361. 1910 & Bot. Bihar & Orissa pt. 3: 352. 1922. *Myrobalanus bellirica* Gaertn., Fruct. 2: 90, t. 97. f. a-d. 1791 ('bellirina').

Terminalia bellirica (Gaertn.) Roxb. var. *laurinoides* Clarke in Hook.f., Fl. Brit. India 2: 445. 1878.

Local names: Behra, Bahera.

Large tree, 25-50 m tall, with large butteresses. Young branchlets thick, at first densely, later sparsely rufous-appressed-pubescent, with persistent leaf-scars. Leaves alternate, crowded at end of branchlets, broadly elliptic or obovate-elliptic, coriaceous, subacute-obtuse or shortly acuminate at apex, obtuse or cuneate at base, entire, rufoussericeous when very young, becoming glabrous when mature, pellucid-punctate above for a time, but eventually opaque, 8-20 x 4-13 cm, with 6-8 pairs of widely spaced secondary veins; petioles 3-8 cm long, pubescent at first, becoming glabrescent soon. Spikes solitary, simple, axillary, 4-10 cm long. Flowers 3.5-4 mm across, sessile, upper ones of spikes male, lower hermaphrodite; bracteoles minute, early caducous. Lower receptacle (ovary) 1.5-2 mm long, sericeous; upper receptacles ca. 1 x 3 mm, shallow-cupuliform, sericeous. Calyx-lobes triangular, recurved, ca. 1.5 mm long. Staminal filaments glabrous, 2.5-3 mm long. Style glabrous, 3-3.5 cm long. Drupes subglobose, or broadly ellipsoid when dried, finely and densely fulvous-tomentose, 2-3 x 1.8-2.5 cm, with 5 obscure longitudinal ridges.

Fl.: Mar.-May. *Fr.*: Jan. -Feb.

Ecology: Very common; in mixed forests.

Distribution: Throughout India. Sri Lanka, Nepal, Myanmar, Thailand, Indo-China, Malesia.

Specimens examined: Raja Rappa, 857; National Park, 1191; Koderma Forest, 1766.

Uses: The fruits are used in tanning and dyeing. As a constituent of 'Triphala' or the three myrobalans, they are used in numerous diseases by Hindu physicians, especially in hoarseness and cough. Fruit-pulp is used in dropsy, diarrhoea and leprosy.

4. *Terminalia catappa*, L., Syst. Nat. ed. 12, 2: 674. 1767; Clarke in Hook. f., Fl. Brit. India 2: 444. 1878; Prain, Bengal Pl. 1: 481. 1903; Haines, For. Fl. Chota Nagpur 361. 1910 & Bot. Bihar & Orissa pt. 3: 352. 1922.

Local names: Deshi-Badam, Bangla-badam.

Deciduous, large tree, to 30 m tall, with branches in horizontal whorls and buttressed trunk. Bark cracked, but less-deeply furrowed. Branchlets with persistent leaf-scars, at first densely sericeous-tomentose, becoming fairly glabrescent quickly. Leaves alternate, clustered towards the ends of branchlets, obovate or elliptic-obovate, rounded-obtuse, retuse at apex, cuneate-sub-cordate at base, entire along margins, chartaceous, shiny and glabrous above, tomentose especially on nerves beneath, 15-30 x 10-15 cm; petiole 0.8-1 cm long, with 2 sessile glands at base of leaf-blade. Spikes simple, axillary, 8-15 cm long. Flowers to 0.4 cm across, sessile, majority ones in upper part of spike male, lower few hermaphrodite; bracteoles 0.8-1 mm long, triangular, early caducous. Lower receptacle (ovary) 2-4 mm long, sericeous or glabrous; upper receptacle *ca* 1.5 x 2.5 mm, shallow-cupuliform, nearly glabrous. Calyx-lobes ovate-triangular, 1-1.5 mm long. Staminal filaments *ca*. 2 mm long, glabrous. Drupe ellipsoid, slightly compressed laterally, glabrous, reddish, and 2-ridged when dry, 3.5-7 x 2-5 cm.

Fl.: Mar.-May. *Fr.*: Apr. - June.

Ecology: Not common; planted as avenue tree along roadsides; also self-grown.

Distribution : Almost throughout India. Tropical Asia, North Australia, Malesia, Polynesia; introduced and widely planted in all tropical countries.

Specimens examined: Pratappur, 905; Hazaribagh, 1676.

Uses: Kernels of fruits are edible. The timber is used for house-construction, wheel-wrights, etc. Bark is diuretic and cardiotoxic, also used in dysentery.

Note: The tree sheds its leaves usually twice a year (i.e. during January-February and July-August). The leaves turn first yellow, then red before falling.

5. *Terminalia chebula* Retz., Obs. Bot. 5: 31. 1788; Clarke in Hook. f., Fl. Brit. India 2: 446. 1878, *p.p.*: Prain, Bengal Pl. 1: 481. 1903; Haines, For. Fl. Chota Nagpur 361. 1910 & Bot. Bihar & Orissa pt. 3: 352. 1922.

Myrobalanus chebula (Retz.) Gaertn., Fruct. Sem. Pl. 2: 91, t. 97. f. 2. 1790.

Local name: Harara.

Small to medium-sized tree, to 25 m tall. Branchlets rusty-villous or glabrescent. Leaves \pm sub-opposite, elliptic-oblong or elliptic-obovate, sub-acute at apex, attenuate to rounded at base, entire, glabrous or nearly so above, densely woolly below, 7-20 x 4-12 cm; secondary veins 7-9 pairs; petiole 1.5-2.5 cm long, pubescent, with usually 2-4, rarely 6, sessile glands on petiole at base of leaf-blade. Spikes usually branched, 5-7 cm long. Flowers to 0.4-cm across. Peduncle to 1.5 cm long. Bracteoles linear, hairy, 0.3-0.4 cm long, conspicuous in buds but soon deciduous before blooming. Calyx 0.3-0.4 cm long, glabrous without hairy within; lobes triangular, *ca.* 0.15 cm long. Ovary *ca.* 0.2 cm across. Drupe obovoid or oblong-ellipsoid, glossy, glabrous, horned, faintly angled, yellowish-green, 2-3.5 cm across.

Fl.: Apr.-May. *Fr.*: Nov. - Feb.

Ecology: Common; in Sal forests, valleys of low hills; also planted along roadsides.

Distribution : Throughout India. All other Tropical countries.

Specimens examined : Raja Rappa, 856; Koderma Forest, 1257.

Uses: The fruit is the chief myrobalan in Hindu medicines and is highly priced as an alternative and tonic. Ripe fruits are used for tanning and dyeing. Bark is diuretic and cardiotoxic.

6. **Terminalia citrina* (Gaertn.) Roxb. ex Flem. in As. Res. 11: 183. 1810; Clarke in Hook. f., Fl. Brit. Ind. 2: 446. 1878; Prain, Bengal Pl. 1: 481. 1903. *Myrobalanus citrina* Gaertn., Fruct. 2: 91, t. 97. 1791.

Terminalia citrina (Gaertn.) Roxb. ex Flem. var *malayana* Clarke in Hook. f., Fl. Brit. India 2: 447. 1878.

Local name: Harira.

Tree, 20-30 m tall with rufous-pubescent to glabrescent young branchlets. Leaves chartaceous, opposite, or sub-opposite, elliptic or oblong, usually acutely acuminate at apex, rounded to broadly sub-cuneate at base, rufous-pubescent to almost glabrous, 6-15 x 3.5-6.5 cm with closely spaced 10-30 pairs of secondary nerves. Petiole 0.5-1.5 cm long, appressed-pubescent or glabrous, often with 2 glands at or near apex. Flowers sessile, yellow, all hermaphrodite, borne in terminal panicles. Rachides rufous-pubescent. Bracts linear, caducous, 2 mm long. Lower receptacle (ovary) sericeous or almost glabrous, 1-1.5 mm long; upper receptacle ca. 0.5 x 2 mm, shallow-cupuliform, glabrous. Calyx-lobes 5, glabrous outside, hairy. Stamens 10; filaments glabrous, 0.25-0.3 cm long. Disc barbate. Style 1.5-2.5 mm long. Fruit usually oblong-lanceolate, obscurely 5-angled when fresh, glabrous, 4-5 x 0.8-2 cm.

Fl. : Apr.-May. *Fr.* : Oct.-Feb.

Ecology: Not common; found to grow in forest, also planted in roadsides, gardens, etc.

Distribution: India : Foot hills of Himalaya from Nepal to Assam, Khasi Hills and West Bengal. Bangladesh, Myanmar, Indo-China, Siam, Malesia, New Guinea.

Specimens examined: Koderma Forest, 142; Katkamosandhi, 1711.

Uses: Wood is used for construction purposes, tool-handles, etc. Fruits are used nearly in same way as those of *T. chebula*. Bark is diuretic and cardiotoxic.

69. ALANGIACEAE

ALANGIUM Lam., *nom. cons.*

Alangium salvifolium (L.f.) Wangerin, in Engl. Pflanzenr. IV. 220b, Heft 41: 9. 1910; Gamble, Fl. Pres. Madras 1: 572 (404). 1919; Mukerjee in Bull. Bot. Surv. India 10: 330. 1969; Matthew in Nayar *et al.*, Fl. India Fas. 19: 4. 1988. *Grewia salvifolia* L. f., Suppl. Pl. 409. 1781.

A. lamarckii Thwaites, Enum. Pl. Zeyl. 133. 1859; Clarke in Hook. f., Fl. Brit. India 2: 741. 1879; Prain, Bengal Pl. 1: 545. 1903; Haines, For. Fl. Chota Nagpur 370. 1910 & Bot. Bihar & Orissa pt. 3: 418. 1922.

Local names : Kharw, Akola.

Deciduous shrubs or trees, to 15 m tall. Branchlets appressed-tomentose to glabrescent. Leaves variable, oblong, oblong-lanceolate to elliptic, chartaceous to subcoriaceous, obtuse or subacute at apex, obliquely rounded to subcuneate at base, entire, glabrescent, 6-15 x 2.5-5 cm; petiole to 1 cm long, hairy. Inflorescence sessile, rusty-tomentose, usually in clusters, 4-8-flowered, sometimes fewer and even single. Flowers 1.5-3 cm long; bracts ovate, deciduous, to 1.5 mm long; pedicels 3-5 mm long; buds terete, velvety. Calyx-tube 0.2-0.25 cm long, cupular, lobes 5-10, triangular, 3-3.5 mm long, toothed. Petals 4-10, usually 6-7, cream, oblong, basally swollen and apically obtuse, densely pubescent outside, reflexed, 1.5-2.5 cm long. Stamens 10-30; filaments 0.6-1 cm long. Ovary 1-celled with one ovule. Style glabrous, 1-2 cm long; stigma large, subglobose. Drupes subglobose, black, to 2 x 1.5 cm. Seed ovoid, to 1 cm long.

Fl.: Mar.-May. *Fr.:* June - Aug.

Ecology: Very common; along roads, in deciduous forests, waste places, sides of nalas, etc.

Distribution: Mainly in deciduous forests of India. Africa (Comoro Isls.), Sri Lanka, China, Vietnam, Thailand.

Specimens examined : Simaria, 799; Etkhori, 1450; Barkattwa, 1692.

Uses: Bark and roots are used in Jaundice. Root bark is purgative, anthelmintic, useful in fever, and skin diseases.

Note: The plant becoming leafless at time of flowering. New leaves appear during May-June.

70. OLACACEAE

OLAX L.

Olax scandens Roxb., Pl. Corom. 2: 2, t. 102. 1798. Mast. in Hook. f., Fl. Brit. India 1: 575. 1875; Prain, Bengal Pl. 1: 324. 1903; Haines, For. Fl. Chota Nagpur 371. 1910 & Bot. Bihar & Orissa pt. 2: 183. 1921.

Local name: Dheniani.

Shrub with pendent branches, or generally scandent, 2-20 m, occasionally armed with strong thorns on old branches. Branchlets horizontally spreading, puberulous at younger parts, striate-wrinkled longitudinally in dry specimens. Leaves distichous, ovate-elliptic, ovate-oblong or elliptic-oblong, subcuneate to obtuse and slightly inequilateral at base, broadly acute to rounded at apex, entire, thin-coriaceous, dark to yellowish green, shining and glabrous above, short-pubescent on midrib beneath, 3-9 x 1-3.5 cm; petiole 4-7 mm long, short-pubescent. Racemes simple or branched, obliquely ascending, 1-3 together per axil. Flowers 4-4.5 mm across; pedicels 1-1.5 mm long, thickened at base; bracteoles distichous, keeled, ca. 0.2 cm long, caducous. Calyx ciliolate, truncate, 0.5-1 mm long and 1.5 mm across, much accrescent in fruit. Petals linear-oblong, acute and incurved at apex, white, 7-9 mm long. Filaments free for a short part; staminodes 6-8 mm long, with narrow, deeply bifid cells. Style either long (5-6 mm) or short (1.5-2 mm). Drupe broadly ovoid or subglobose, apiculate, orange to yellow, enclosed in accrescent calyx for lower two-third.

Fl.: Apr.-June *Fr.*: Oct.-Dec.

Ecology: Common; in dry deciduous forests.

Distribution: India: Western Himalaya, Bihar, Central and Southern India. Sri Lanka, Myanmar, Indo-China, Thailand and Malesia.

Specimens examined : Pratappur, 918; National Park, 2029.

Uses: Leaves and young shoots are used as pot-herb or as green vegetable. Fruits are eaten raw or used in preparation of sherbet. Bark-extract is used in anaemia due to fever.

71. SANTALACEAE

SANTALUM L.

***Santalum album* L.**, Sp. Pl. 349. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 231. 1886; Prain, Bengal Pl. 2: 914. 1903; Haines, For. Fl. Chota Nagpur 377. 1910 & Bot. Bihar & Orissa pt. 5: 805. 1924.

Sirium myrtifolium L., Mant. Pl. 2: 200. 1771.

Santalum myrtifolium (L.) Roxb., Fl. Ind. 1: 444. 1832.

Local names: Safed-chandan, Sandal.

Small, evergreen, glabrous tree, to 8 m tall. Branches slender, drooping. Leaves elliptic-ovate to lanceolate, subcoriaceous, thin, rounded to subcuneate at base, acute at apex, entire, pale green beneath, 4-7 x 2.5-4 cm; petioles 1-1.2 cm long. Flowers brownish purple, 5-merous, to 0.6-cm across, in terminal and axillary paniculate cymes, shorter than leaves. Tepals equal, ca. 2 mm long, shortly connate to basal part of ovary, lobes triangular, thinly fleshy, glaucent without, minutely ciliate, to 2.5 x 1.5 mm. Stamens 5, exserted, alternating with 5 rounded obtuse scales. Ovary globose, to 1.5 mm across; style ca. 1.5 mm. Drupe globose, 1-1.5 cm across, purple-black, annulate above, beaked with basal part of style.

Fl.: Sept.-Dec. *Fr.*: Mar.-May.

Ecology: Common; in dry deciduous forests.

Distribution : India: Drier regions of Peninsular India from Vindhya mountains southwards especially in Maharashtra, Karnatka and Tamilnadu to Andhra Pradesh, Orissa, West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan and elsewhere in the country. Java.

Specimens examined : National Park, 91; Koderma, 1770.

Uses: Sandal wood is employed for making curios of exquisite beauty. Sandal wood oil is used in perfumery, particularly for production of attars. Both wood and oil is diuretic, diaphoretic and expectorant.

72. LORANTHACEAE

Key to the Genera

- | | |
|---|---------------------|
| 1a. Flowers 5-merous. Fruits drupaceous | ... 1. DENDROPHTHOE |
| 1b. Flowers 4-merous. Fruits baccate | ... 2. LORANTHUS |

1. DENDROPHTHOE Mart.

Dendrophthoe falcata (L.f.) Ettingh. in Denkschr. Kaiserl. Akad. Wissen. Math-Naturwiss. Kl. 32: 52. 1872; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6: 134. 1987. *Loranthus falcatus* L. f., Suppl. Pl. 211. 1781.

L. longiflorus Desr. in Lam., Encycl. 3: 598. 1789; Hook. f. in Hook. f., Fl. Brit. India 5: 214. 1886; Prain, Bengal Pl. 2: 911. 1903; Haines, For. Fl. Chota Nagpur 375. 1910 & Bot. Bihar & Orissa pt. 5: 801. 1924.

L. bicolor Roxb., Pl. Corom. 2: 20, t. 139. 1798.

Local name: Banda.

Aerial parasite on trees, large shrubby, with haustoria bearing surface runners. Branches usually greyish-brown, glabrous. Leaves subopposite site, thickly coriaceous, orbicular, oblong-elliptic or ovate--oblong, obtuse at both ends, with minutely white calloused margins, glabrous, 6-15 x 3-8 cm; petioles short, 2-3 mm long or 0. Inflorescence of stout, curved,

solitary, axillary racemes, to 7 cm long, bearing to 50- flowers. Pedicels 2-3 mm long. Bracts rounded, Flowers 5-merous. Mature floral buds pink or bright red, with a dark green band below constriction. Calyx minute, lobed, to 1 mm long. Corolla tube during anthesis to 5 cm long, tube split to 1.2 cm deep; margin of sinuses between lobes and split tuberculate; lobes white or red, sublinear, reflexed, to 8 mm long. Filaments bright red, free from corolla-lobes, to 0.4 cm long; anthers yellow, to 5 mm long; style reddish-brown, exerted to 6 cm long, slightly enlarged below stigma. Fruit drupaceous, pink, oblong, to 1.6 cm long, crowned by persistent calyx.

Fl. & Fr.: Nov. - Mar.

Ecology: Very common; on branches of *Shorea robusta*, *Diospyros melanoxylon*, *D. montana*, *Croton roxburghii*, *Terminalia alata*, *Flacourtia indica*, etc.

Distribution : Throughout India, including Tropical and temperate Himalaya. Bhutan, Malacca, Sri Lanka, Myanmar and Tropical Australia.

Specimens examined: National Park, 68. 418, Pratappur, 1559.

Uses: Bark is narcotic, astringent, used for menstrual troubles, asthma and mania.

2. LORANTHUS Jacq., *nom. cons*

Key to the Species

- 1a. Leaves subcordate-subtruncate and slightly oblique at base, densely white-tomentose when young, suborbicular. Fruits densely white-tomentose ... 1. *L. cordifolius*
- 1b. Leaves cuneate-obtuse at base, rusty-tomentose when young, ovate-oblong, elliptic or obovate. Fruits puberulent ... 2. *L. scurrula*

Note: Several workers (viz., Ramamoor. in Saldan. & Nicols., Fl. Hassan Dist. 309. 1976; Tebs in Hara *et al.*, Enum. Fl. Pl. Nepal Vol. 3, 1982, Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 146-147. 1987, and others) placed the above two taxa under *Scurrula* Linn. (1753). But, *Loranthus* Jacq. (1762) is conserved (ICBN, 1983, 1988) against *Loranthus* L. (1753) (= *Pistacanthus* Mart.) and *Scurrula* L. (1753).

1. *Loranthus cordifolius* Wall. in Roxb., Fl. Ind. 2 : 222. 1824; Hook. f. in Hook. f., Fl. Brit. India 5 : 209. 1886; Prain, Bengal Pl. 2: 911. 1903; Haines, For. Fl. Chota Nagpur 375. 1910 & Bot. Bihar & Orissa pt. 5 : 802. 1924.

Dendrophthoe cordifolia (Wall.) Mart. in Flora 1 : 110. 1830.

Scurrula cordifolia (Wall.) G. Don, Syst. Gen. 421. 1834.

Local name : Banda.

Aerial semiparasite forming large shrub. Young branches whitish-tomentose, older ones brown; runners ill-developed or absent. Leaves subopposite, suborbicular, with subcordate or subtruncate and slightly oblique base, rounded at apex, pale green above, white-tomentose beneath specially when young, 3.5-8 cm in diam. Racemes white-tomentose, to 6-flowered, peduncle 2.5-3 mm long. Flower characters similar to *L. scurrula* Linn. Fruit densely white-tomentose, 0.9-1.2 cm long.

Fl. & Fr. : Oct. Jan.

Ecology : Common; on stout branches of *Woodfordia fruticosa*, *Diospyros melanoxylon*, etc. in dry forests.

Distribution : Subtropical Himalaya, Kashmir, Central India, Bihar and South India. Nepal, Sri Lanka.

Specimens examined : National Park, 1196; Koderma Forest, 1797.

Note : Some authors [e.g., Hook. f. (*l.c.*), Haines (*l.c.*), etc.] remarked that this is scarcely more than a variety of *L. scurrula* and have questioned the separation of this species from the latter. According to Weins (*l.c.*), as there are no obvious intermediate forms between the two, and as *L. cordifolius* is characterised by comparatively larger size, suborbicular leaves with subcordate-truncate base and dense white-tomentum, the two taxa should be retained in separate specific status.

2. *Loranthus scurrula* L., Sp. Pl. ed. 2, 1 : 472. 1762; Hook. f. in Hook. f., Fl. Brit. India 5: 208. 1886; Prain, Bengal Pl. 2 : 911. 1903; Haines, For. Fl. Chota Nagpur 375. 1910 & Bot. Bihar & Orissa pt. 5: 802. 1924.

Scurrula parasitica L., Sp. Pl. 110. 1753.

Local name : Banda.

Aerial semiparasite forming large shrub. Younger branches with brown or hoary tomentum; runners ill-developed or absent. Leaves subopposite, dark-green, ovate-oblong, elliptic or obovate, cuneate-obtuse at base, obtuse-rounded at apex, rusty-tomentose when young, glabrous when mature, 4-8 x 2-5 cm; secondary veins 4-5 pairs, faint, purplish beneath; petiole 5-8 mm long. Racemes short, to 6-flowered; peduncle 0.2-0.3 cm long, brownish tomentose. Mature floral buds 1-1.2 cm long, green or pale green at or near constriction, brownish green at clavate tip. Bracts subulate, 1-1.2 mm long. Calyx rudimentary. Corolla yellowish-green at flowering; tube narrow, curved, 7-8 mm long; lobes linear-oblong, 3-4 mm long, turning pale red with age. Filaments maroon where united with corolla, free part subligulate and bright red. Style bright red; stigma deep maroon. Fruit pale green, with light reddish band near summit, puberulent, 7-8 mm long.

Fl. & Fr. : Dec. - Jan.

Ecology : Very common; on branches of *Woodfordia fruticosa*, *Wendlandia tinctoria*, *W. exserta*, *Diospyros montana*, *Flacourtia indica*, etc. in forests.

Distribution : Throughout India and Indo-Malayan countries.

Specimens examined: National Park, 458; Pratappur, 1558; Koderma Forest, 1996.

Note : The genus *Scurrula* L. was typified by *S. parasitica* L. in 1753. In 1762, Linnaeus, while merging the *Scurrula* L. in *Loranthus* L., made error in naming the species *L. scurrula* L. instead of renaming it as *Loranthus parasitica*(L.) L.

73. VISCACEAE

VISCUM L.

Key to the Species

- | | |
|---|------------------------------|
| 1a. Branches leafless. Internodes flattened | ... 1. <i>V. articulatum</i> |
| 1b. Branches leafy. Internodes terete | ... 2. <i>V. orientale</i> |

1. *Viscum articulatum* Burm. f., Fl. Ind. 311. 1768; Hook. f. in Hook. f., Fl. Brit. India 5 : 226. 1886; Prain, Bengal Pl. 2 : 913. 1903; Haines, For. Fl. Chota Nagpur 377. 1910 & Bot. Bihar & Orissa pt. 5 : 804. 1924.

Viscum nepalense Spreng., Syst. Cur.-Post. 47. 1827; Danser in Blumea 4 : 283. 1936.

Local names : Budu, Vadaka.

Aerial parasite on plants, small shrub, monoecious. Plants usually becoming pendulous; branches leafless, sometimes whorled, yellowish-green; basal internodes usually rounded; succeeding internodes decussately flattened, although appearing in a single plane because of a 90° twist just above nodes, 3-5 cm long and 3-6 mm wide, longitudinally striate. Flowers subtended by two coalescent bracteoles, originating at nodes; pistillate flowers usually solitary, but common; staminate flowers smaller and less prevalent. Staminate flower : perianth-segments short, triangular, 5-6 mm long. Pistillate flower : perianth-segments shorter than tube, thick, 6-7 mm long. Fruit suborbicular, 4-5mm in diam., yellow.

Fl. & Fr. : Dec. Jan.

Ecology : Common; on branch of *Diospyros melanoxylon*, *D. montana*, *Shorea robusta*, *Madhuca longifolia*, etc.

Distribution : India: Throughout Himalaya, Pujab, Uttar Pradesh, Bihar, West Bengal, North-east India, Orissa, Central India and Western Peninsula. Widely distributed in S.E. Asia.

Specimens examined : National Park, 66; Koderma Forest, 1788.

Uses: Plant is used as febrifuge and aphrodisiac. Paste made from plant is applied to cuts.

2. *Viscum orientale* Willd., Sp. Pl. ed. 4, 737. 1805; Hook. f. in Hook. f., Fl. Brit. India 5 : 224. 1886; Prain, Bengal Pl. 2 : 912. 1903; Haines, For. Fl. Chota Nagpur 376. 1910 & Bot. Bihar & Orissa pt. 5 : 803. 1924; Danser in Blumea 4 : 299. 1941; Wiens in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 419. 1987.

Local name : Banda.

Aerial parasite on plants, small shrubs, monoecious. Densely branched shrub; branches dark-green, leafy, usually decussately arranged basally, 3-4-nately whorled apically; internodes generally terete, but younger internodes usually minutely ridged, 2-4 cm long and 0.2-0.35 cm wide. Leaves sessile, ovate to ovate-elliptic, subcuneate or obtuse at base, acute or rounded at apex, curvilinear, usually with 3 conspicuous veins, 3-6 x 1-2.5 cm. Inflorescence axillary, 3-5 per node; dichasia with 3-5 mm long peduncle, 3-5-flowered, usually central pistillate and lateral staminate, subtended by 2 coalesced bracts forming a naviculate involucre of 2-3 mm long. Perianth-segments triangular. Fruit ovate-orbicular, smooth, to 6 x 4.5 mm.

Fl. & Fr. : Almost throughout the year, but chiefly during Nov.-Feb.

Ecology : Common; on branches of *Ziziphus mauritiana*, *Croton roxburghii*, *Terminalia alata*, *Strychnos nux-vomica*, etc.

Distribution : India : West Bengal, Orissa, Bihar, Uttar Pradesh, Central and Western India and Western Peninsula. China, Bangladesh, Myanmar, Malaya Islands, New Guinea, Australia.

Specimens examined : National Park, 475; Pratappur, 2102.

Uses : Leaves in form of poultice are used in neuralgia. Ashes of plant are rubbed on the body for treatment of itch.

74. CELASTRACEAE

Key to the Genera

- 1a. Ovary-locules \pm 10, each divided horizontally into 2 loculi, each containing 1 ovule. Fruit a drupe.
Leaves alternate ... 4. SIPHONODON
- 1b. Ovary-locules 2-5, undivided; ovules 2 in each cell:
 - 2a. Fruit drupaceous. Leaves opposite ... 1. CASSINE
 - 2b. Fruit capsular:

- 3a. Leaves alternate. Ovary not immersed in disk ... 2. CELASTRUS
- 3b. Leaves opposite. Ovary partly or wholly immersed in disk ... 3. EUONYMUS

1. CASSINE L.

Cassine glauca (Rottb.) O. Kuntze, Rev. Gen. Pl. 1: 114. 1891; Ding Hou in Steenis, Fl. Males. ser. 1, 6: 286. 1962. *Mangifera glauca* Rottb. in Nye Samml. Kongel. Danske Vid. Selsk. Skrift. 2: 534, t. 4. f. 1. 1783.

Elaeodendron glaucum (Rottb.) Pers. Syn. Pl. 1: 241. 1805; Lawson in Hook. f., Fl. Brit. India 1: 623. 1875; Prain, Bengal Pl. 1: 329. 1903; Haines, for. Fl. Chota Nagpur 266: 1910 & Bot. Bihar & Orissa pt. 2: 189. 1921.

Local names: Jamrassi, Bakra.

Small tree, to 20 m tall. Leaves sub-coriaceous, broadly elliptic to elliptic-oblong, ovovate or ovate-oblong, obtuse, rounded or sub-acute at apex, subcuneate or obtuse at base, crenulate or subentire, glabrous, deep green, 6-15 x 3-8 cm; petiole to 2 cm long. Flowers 7-8 mm across, hermaphrodite, or sometimes polygamous, borne in axillary dichotomous few-flowered cymes of 4.5-7 cm long. Calyx-lobes 5, unequal, orbicular. Petals 5, greenish-white or brownish, oblong, spreading, reflexed, 4-4.5 mm long. Stamens 5, inserted under the edge of cushion-like disk. Filaments 1.5 cm long recurved; anthers roundish. Ovary conical, angular, 2-locular; ovules 2 in each locule, basal; stigma not lobed. Drupe obovoid, 1 cm long, 1-seeded, tipped at apex with persistent style.

Fl.: Sept.-Dec. *Fr.:* Jan. - Apr.

Ecology: Common; in hilly forests.

Distribution: Throughout the hotter parts of India including Tropical Himalaya. Indo-China, Nepal, Malesia.

Specimens examined: National Park, 73; Telaiya Dam, 628; Pratappur, 2097.

Uses : Wood is useful for cabinet work, picture frames, etc. Powdered leaves are employed as snuff. Bark and leaves are used for tanning purposes.

2. CELASTRUS L.

Celastrus paniculatus Willd., Sp. Pl. 1: 1125. 1797; Lawson in Hook. f., Fl. Brit. India 1: 617. 1875; Prain, Bengal Pl. 1: 329. 1903; Haines, For. Fl. Chota Nagpur 265. 1910 & Bot. Bihar & Orissa pt. 2: 188. 1921.

Local names: Malkamni, Malkangni.

Scrambling or scandent shrub, to 10 m long. Innovations usually pubescent. Branchlets terete, glabrous, or sometimes pubescent, lenticellate. Leaves thin-coriaceous, elliptic to elliptic-oblong, broadly obovate or suborbicular, cuneate, obtuse or rounded at base, acute or suddenly acuminate at apex, serrate, glabrous, or pubescent beneath on nerves, 5-10 cm x 3-8 cm. Inflorescence terminal, drooping, to 20 cm long, puberulous when young. Flowers polygamous; pedicels 2-3.5 mm long, accrescent to 6 mm in fruit. Calyx-tube cupular, pubescent; lobes 5, semi-orbicular, short-ciliate, 0.8-1 mm long. Petals 5, greenish-white, oblong or obovate-oblong, obtuse, 2.5-3 mm long. Disk-lobes obscure or slightly triangular. Male flowers: 3.5-4 mm across; stamens 5, inserted on margin of disk, 2.5-3 mm long; filaments subulate; sterile pistil 1.2-1.5 mm long. Female flowers: 4.5-5 mm across; sterile stamens 1.2-1.4 mm long; pistil 2-2.5 mm long; ovary globose, glabrous, ca. 1.5 mm across, 3-celled; stigmatic-lobes sometimes bifid. Capsule subglobose, yellow, 3-valved; valves elliptic, 0.6-1 cm long, 3-6 seeded. Seeds ellipsoid, 4-5 mm long, yellow to reddish-brown, enclosed in a fleshy red aril.

Fl.: Apr.-June. *Fr.*: Oct.-Jan.

Ecology: Very common; in hedges along forest borders.

Distribution: India : Tropical and Subtropical Himalaya, Punjab and throughout the other hilly parts of India. Myanmar, Nepal, Siam, Indo-China, Southern China, Malesia to Australia and New Caledonia.

Specimens examined : Bishnugarh, 1109; National Park, 1192. Pratappur, 1398.

Uses : Bark is abortifacient. Seeds yield a fatty oil which is useful as a nerve stimulant and brain tonic and also used for rheumatic pains.

3. EUONYMUS Tournef. ex L.

Euonymus glaber Roxb., Fl. Ind. 2 : 403. 1824; Lawson in Hook. f., Fl. Brit. India 1 : 609. 1875; Haines, Bot. Bihar & Orissa pt. 2 : 186. 1921.

Small tree, to 5 m tall. Branchlets terete. Leaves chartaceous, elliptic or elliptic-oblong, narrowly cuneate at base, acute to short-acuminate at apex, with usually crenate-dentate margins in upper half, 7-8 x 3-4.5 cm, petiole 5-7 mm long. Cymes axillary or slightly extra-axillary, usually at base of a new shoot, to 4 cm long. Peduncles to 2.5 cm long. Bracts ovate, short-ciliate. Pedicels 2-3.5 mm long. Flowers usually 5-merous. Calyx lobes unequal, outer two usually smaller, suborbicular or broadly obovate, slightly erose, shortly ciliate. Petals cream-coloured, suborbicular, usually minutely denticulate, 2-2.5 mm across. Disk orbicular, 1.2-1.5 mm in diam. Stamens short, inserted near margin of disk. Pistil 5-angular at base, narrowed into a short style. Capsule depressed-globose, deeply 5-lobed, concave at apex, narrowed towards base, 8-12 x 1.2-1.7 mm. Seeds 1 in each cell.

Fl. & Fr.: Apr. - May.

Ecology : Rare; in forests.

Distribution : India: Orissa. Bangladesh, Bhutan, Malay Peninsula, Siam.

Specimen examined : National Park, 2023.

Uses : Wood suitable for carving and turnery; also used for making different small articles.

4. SIPHONODON Griff.

Siphonodon celastrineus Griff. in Calc. J. Nat. Hist. 4 : 247, t. 14. 1844; Lawson in Hook. f., Fl. Brit. India 1 : 629. 1875; Haines, For Fl. Chota Nagpur 267. 1910 & Bot. Bihar & Orissa pt. 2 : 190. 1921.

Small Tree, to 6 m tall. Bark grey, slightly rough; blaze light grey, then yellow, white on wood. Leaves coriaceous, distichous, oblong or oblong-elliptic, round at base, acute or subacuminate at apex, crenate, 10-20 x 5-

6.5 cm; secondary veins about 8, depressed above; petioles 5-7 mm long. Cymes 3-7-flowered, mostly from old wood or trunk; peduncle *ca.* 2.5 cm long. Flowers 1.2-1.5 cm across when spreading, 5-merous. Calyx-segments 2.2-2.5 mm long. Petals obovate, yellowish, with reddish brown lines or spots, \pm 5 mm long. Filaments inserted between disk-lobes, flattened, arching over pistil; connective very broad; anthers forming a 5-rayed star at apex; anther-cells oblique, laterally dehiscent on margin. Ovary 5-ribbed with ribs alternating with petals at first inferior, subsequently half-inferior, \pm 10-loculed; each locule divided horizontally into 2 superposed 1-ovulate locelli. Drupe broadly pyriform, 3-5 x 2.5-3.5 cm.

Fl. : Apr.-June. *Fr.*: Aug.-Jan.

Ecology: Rare; in hilly forests.

Distribution: India: Bihar, Sikkim, Orissa. Pegu, Mayanmar, Java.

Specimen examined : Pratappur, 2083.

Uses : Wood is used for posts and frames.

75. EUPHORBIACEAE

Key to the Genera

- 1a. Male flowers reduced to single-pedicelled stamens, many of which surround a single reduced female flower consisting of a solitary pedicelled tricarpellary pistil; all enclosed in a pseudo-calycine involucre (cyathia) :
 - 2a. Involucre \pm actinomorphic, campanulate or turbinate; glands free, alternating with lobes of involucre ... 8. EUPHORBIA
 - 2b. Involucre oblique, zygomorphic, slipper-shaped, declinate, produced into a spur, glandular within ... 12. PEDILANTHUS
- 1b. Flowers distinct, neither reduced nor enclosed in an involucre :

- 3a. Cells of ovary 1-ovuled
- 4a. Petals absent in both male and female;
- 5a. Calyx of male closed in bud, splitting valvately into 3-5 concave sepals :
- 6a. Styles connate at base, spreading above. Twining herbs with pungent or stinging hairs ... 16. TRAGIA
- 6b. Styles distinct, entire, 2-fid or lacinate fimbriate. Trees, erect herbs or shrubs, never twinningers :
- 7a. Filaments free:
- 8a. Anther-cells united only by their bases, free above. Female flowers at base of large leafy bracts. Styles lacinate ... 1. ACALYPHA
- 8b. Anther-cells attached laterally to connective:
- 9a. Leaves opposite. Fruit drupaceous, indehiscent. Dioecious ... 17 TREWIA
- 9b. Leaves alternate or opposite. Fruit a schizocarp or capsule. Dioecious, or sometimes monoecious ... 11. MALLOTUS
- 7b. Filaments variously connate in bundles :
- 10a. Monoecious. Flowers in large terminal panicles. Leaves broad, palmi-lobed and -nerved ... 14. RICINUS
- 10b. Dioecious. Flowers in axillary, unbranched spikes or racemes. Leaves narrow, not lobed, penninerved ... 9. HOMONOIA
- 5b. Calyx of male open in bud. Stamens 3. Flowers in extra-axillary spikes each bearing a single female flower at base ... 15. SEBASTIANIA

- 4b. Petals present in both male and female, or sometimes absent in female only :
- 11a. Flowers in 2-3-chotomous corymbose cymes, main branches of which terminate by one female flower, other flowers male ... 10. JATROPHA
- 11b. Flowers in androgynous racemes :
- 12a. Racemes terminal. Stamens inflexed in bud with reversed anthers ... 6. CROTON
- 12b. Racemes axillary. Stamens straight in bud and anthers erect ... 4. CHROZOPHORA
- 3b. Cells of ovary 2-ovuled:
- 13a. Petals present, minute. Sepals valvate in bud. Filaments united in a column :
- 14a. Ovary 2-celled. Fruit a drupe ... 3. BRIDELIA
- 14b. Ovary 3-celled. Fruit a schizocarp ... 5. CLEISTANTHUS
- 13b. Petals absent. Sepals imbricate in bud :
- 15a. Flowers in spikes or racemes ... 2. ANTIDESMA
- 15b. Flowers in axillary fascicles or solitary axillary :
- 16a. Styles or style-arms slender. Mostly monoecious herbs, shrubs or trees ... 13. PHYLLANTHUS
- 16b. Styles flabellate. Dioecious trees ... 7. DRYPETES

1. ACALYPHA L.

Key to the Species

- 1a. Bracts crowded, 1-2-flowered, with many nerves ending in long subulate hispid teeth ... 1. *A. ciliata*
- 1b. Bracts distant, 3-5-flowered, truncate, crenate ... 2. *A. indica*

1. *Acalypha ciliata* Forsk., Fl. Aegypt.-Arab. 162. 1775; Hook. f. in Hook. f., Fl. Brit. India 5: 417. 1887; Prain, Bengal Pl. 2: 948. 1903; Haines, Bot. Bihar & Orissa pt. 2: 113. 1921

Monoecious, erect, annual herb, 30-70 cm tall; stems striate, hairy. Leaves ovate or ovate-rhomboid, caudate-acuminate at apex, rounded-subcordate or subcuneate at base, crenate-serrate, thin, hairy on veins beneath, 5-nerved, 4-8 x 2-5 cm, petioles usually longer than blade, spreading, slender. Spikes 1-2.5 cm long, axillary. Male flowers: few, sessile, very minute, at top of spikes; sepals 4, ca. 1 mm long. Female flowers: many, crowded at base of spike; bracts 1-2-flowered, 1.8-2 mm long, folded, ± tubular, with many nerves ending in long subulate hispid teeth as long as limb; sepals 3, ovate, acute; ovary sparsely hispid. Schizocarp glabrous, enclosed by accrescent bracts; cocci very thin, white, twisted after dehiscence. Seeds subglobose-ovoid, smooth.

Fl. & Fr.: July. Oct.

Ecology: Not common; in open grassy places, river-banks, roadsides, etc.

Distribution: India: Western Himalaya, from Kashmir through Punjab, Uttar Pradesh, Bihar to West Bengal and Deccan Peninsula. Sri Lanka, Arabia, Tropical Africa.

Specimens examined: Ghanghree, 1002; Barkattawa, 1702.

Use: Plant is a laxative and vermifuge.

2. *Acalypha indica* L., Sp. Pl. 1003. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 416. 1887; Prain, Bengal Pl. 2: 948. 1903; Haines, For. Fl. Chota Nagpur 231. 1910 & Bot. Bihar & Orissa pt. 2: 113. 1921.

Local names: Kuppi, Khokli.

Monoecious, erect, annual herb, 30-75 cm tall; branches numerous, ascending, striate, thinly pubescent. Leaves long-petioled, ovate or rhomboid-ovate, acute at apex, rounded or shortly cuneate at base, glabrous, thin, 2.5-7 x 2-4.5 cm; petioles very variable in length, 2-10 cm long, slender, pubescent; stipules minute. Spikes 5-15 cm long, axillary, terminating in an allomorphic flower. Male flowers: minute, in clusters of

3-7 towards upper part of spikes; stamens with curved swollen hyaline filaments; anthers vermiculiform, subsessile, *ca.* 0.2 mm long. Female flowers : scattered, in lower parts of spike, 3-5 together in axial of bracts; bracts folded concave, ovate-cuneiform, truncate, crenate, 6-8 mm in diam; calyx of 3 minute hyaline scales with gland-tipped ciliae; ovary 3-lobed, 1.2-1.5 mm across, hispid; style arms with 3 slender branches. Schizocarp small, hispid, concealed by bract, 2-3 mm across. Seed ovoid, smooth, pale-brown, 1 mm long. Allomorphic flower on 2-4 mm long stalk, with 2 toothed tubular parts.

Fl. & Fr. : June. Feb.

Ecology: Common; in waste lands, along railway tracks, etc.

Distribution: Throughout the hotter parts of India. Tropical Africa, Timor, Philippines, Myanmar, Sri Lanka.

Specimens examined : Ghanghree, 1047; Markachho, 1481.

Uses : Decoction of plant is used as laxative. Leaf-juice is employed for cutaneous troubles. Juice of fresh leaves is emetic.

2. ANTIDESMA L.

The genus sometimes included under a separate family. Stilaginaceae (e.g., Airy Shaw in Kew Bull. Add. Ser. VIII : 208. 1980).

Antidesma acidum Retz., Obs. Bot. 5 : 30. 1789; Airy Shaw in Kew Bull. 26 : 352. 1972.

Stilago diandra Roxb., Pl. Corom. 2 : 35, t. 166. 1798.

Antidesma diandrum (Roxb.) Roth, Nov. Sp. 369. 1821; Hook. f. in Hook. f., Fl. Brit. India 5: 361. 1887, p.p.; Prain, Bengal Pl. 2 : 938. 1903; Haines, For. Fl. Chota Nagpur 226. 1910 & Bot. Bihar & Orissa pt. 2: 138. 1921.

Stilago lanceolaria Roxb., Fl. Ind. 3: 760. 1832.

Antidesma ghaesembilla sensu Hook. f. in Hook. f., Fl. Brit. India 5: 357. 1887, p.p. quoad syn. *A. acidum* Retz., non Gaertn.

Local name : Amti, Amari.

Large shrub to small tree; young parts pubescent. Leaves obovate-oblong, or obovate-elliptic, cuneate at base, acute or acuminate at apex, glabrous and shining above, sometimes slightly pubescent beneath, 4-10 x 2.5-5 cm; petioles 3-4 mm long, grooved above, stipules linear, 5-6 mm long. Racemes slender, glabrous or slightly pubescent, 3-8 cm long. Flowers minute, all pedicellate. Bracts ovate-oblong, ca. 1 mm long. Disk lobed, glabrous. Corolla absent. Male flowers : 0.5-0.6 mm across; pedicels 1-1.2 mm long; calyx as long as pedicel; lobes 4, short, pilose inside; stamens 2, in cavities of disk; pistillode 0. Female flowers : 0.6-0.7 mm across; pedicels stouter than in male; calyx 1.5-1.7 mm long; lobes deeper than in male; ovary glabrous; stigmas 2, short, one of them usually 2-fid. Drupe subglobose or ellipsoid, 3-4 mm in diam., red. Seed slightly compressed, rugose.

Fl. : Apr.-June. *Fr.* : Oct. Jan.

Ecology : Very common; along slopes of low hills, banks of streams, forests, etc.

Distribution : India: Sub Himalayan tract, Uttar Pradesh, Bihar, Orissa, West Bengal, Central India, Deccan Peninsula. S. China, Indochina, Myanmar, Sri Lanka, Java.

Specimens examined : Pratappur, 467; National Park, 969.

Uses: Leaves are used as vegetable and made into a preserve. Seeds yield a fatty oil which is used for making soap. Fruits are eaten by local poor people.

3. BRIDELIA Willd.

Bridelia retusa (L.) Spreng. in L., Syst. Veg. ed. 16, 3 : 48. 1826; Hook. f. in Hook. f., Fl. Brit. India 5: 268. 1887, *p.p.*; Prain, Bengal Pl. 1: 927. 1903; Haines, For. Fl. Chota Nagpur 215. 1910 & Bot. Bihar & Orissa pt. 2: 119. 1921. *Cluytia retusa* L., Sp. Pl. 1042. 1753.

C. spinosa Roxb., Pl. Corom. 2: 38, t. 172. 1802.

Bridelia spinosa Roxb., Fl. Ind. 3: 735. 1832.

Local name : Kasai.

Moderate-sized, dioecious, deciduous tree, to 15 m tall, with long conical thorns on trunk when young; bark grey. Leaves coriaceous, stiff, elliptic-oblong, obtuse, subacute, rounded or retuse at apex, truncate or rounded or sub-cordate at base, entire or slightly crenulate, bright-green and glabrous above, glaucous and finely tomentose beneath, 10-20 x 3-6 cm; secondary veins 15-25 pairs; petiole 0.7-1.2 cm long, stipules ovate-lanceolate, deciduous, usually oblique at base, 5-7 mm long. Flower-clusters dense., 5-6 mm in diam., combined in 8-15 cm long spikes. Bracts scaly. Male flowers : shortly pedicelled; calyx greenish, tinged with red, glabrous, 3.5-4 mm in diam.; lobes 5, triangular-ovate, acute, spreading; petals 5, greenish-white, obovate, pectinate, angular or coarsely toothed; stamens 5, borne on androgynophore, exserted; anthers oblong, 4-5 mm; pistillode bifurcate; disk thick and pulpy, patelliform. Female flowers : subsessile; calyx as in male; petals greenish-white, subspathulate, entire, persistent; ovary half-inferior, globose; disk truncate or 5-lobed. Drupe globose, 6-8 mm across, greenish-yellow or flesh-coloured; pyrenes 2, ridged.

Fl. : Aug.-Sept. *Fr.* : Nov.-Jan.

Ecology : Very common; in forests, roadsides, etc.

Distribution : Throughout India. Sri Lanka, Myanmar.

Specimens examined : National Park, 57, 477; Hazaribagh, 671.

Uses : Wood is used for rafters, posts, cart-shafts, wheels and agricultural implements. Bark has some antiviral, hypoglycaemic and hypotensive properties. Leaves are used as fodder. Fruits are edible.

4. CHROZOPHORA JUSS., *nom. cons.*

Chrozophora rottleri (Geiseler) A. Juss., Euphorb. Gen. 28. 1824; Prain in Kew Bull. 1918 : 95. 1918; Haines, Bot. Bihar & Orissa pt. 2: 102. 1921, *p.p.*; Balakr. in Bull. Bot. Surv. India 15 : 4. 1976. *Croton rottleri* Geiseler, Croton Monogr. 54. 1807.

Chrozophora plicata (Vahl) A. Juss. var. *rottileri* (Geiseler) Muell.-Arg. in DC., Prodr. 15(2) : 747. 1866; Hook. f. in Hook. f., Fl. Brit. India 5: 410. 1887.

C. plicata auct. non (Vahl) A. Juss. : Hook. f. in Hook. f., Fl. Brit. India 5: 409. 1887; Prain, Bengal Pl. 2: 994. 1903; Haines, For. Fl. Chota Nagpur 229. 1910.

C. tinctoria auct. non (L.) A. Juss. : Hook. f. in Hook. f., Fl. Brit. India 5: 409. 1887.

Local name : Shadevi, Subali.

Erect annual herbs, to 75 cm tall. Stems usually unbranched in lower part, branched above. Leaves thick, sub-coriaceous, variable in shape and size, broadly ovate-orbicular, sometimes obscurely 3-lobed, wrinkled, rounded at apex, subcordate or truncate at base 5-10 × 3.5-10 cm, 3-nerved from base; petioles 2.5-5 cm long, stipules deciduous, subulate. Racemes terminal or subterminal, densely stellately hairy, 2-4 cm long. Male flowers : sessile or shortly pedicellate, crowded in upper part; sepals ovate, 2.5-3 mm long; petals 5, lanceolate, yellow, 4-5 mm long; stamens 15, in two whorls. Female flowers : 5-6 mm across, pedicellate; disk-glands 5, alternipetalous; sepals lanceolate, 2-3 mm long; petals elliptic lanceolate, 2-2.5 mm long; ovary globose 4-5 mm across, 3-celled; cells 1-ovuled; styles 3, dividing into 6 stigmatose arms. Schizocarp stellate-tomentose, depressed, 7-9 mm across, red-purple when mature. Seeds globose.

Fl. & Fr. : Feb. June.

Ecology : Common; in waste places, roadsides, etc.

Distribution : Throughout India. Nepal, Myanmar, Indo-China, Sri Lanka.

Specimens examined : Telaiya Dam, 640; Chatra, 1096.

Uses : Plant is acrid and poisonous. Capsules yield a blue colour which is used in different purposes. Seeds are used as cathartic.

5. CLEISTANTHUS Hook.f. ex Planch.

Cleistanthus collinus (Roxb.) Benth. ex Hook. f. in Hook. f., Fl. Brit. India 5: 274. 1887; Prain, Bengal Pl. 2: 928. 1903; Haines, For. Fl. Chota Nagpur 217. 1910 & Bot. Bihar & Orissa pt. 2: 121 1921. *Cluytia collina* Roxb., Pl. Corom. 2: 37, t. 169. 1802.

Local name : Garati, Kirla.

Deciduous small tree, to 8 m tall; bark rough, with red blaze; twigs slender, lenticellate, Leaves coriaceous, broadly obovate-elliptic to orbicular, obtuse or rounded at base, rounded or retuse at apex, glaucous beneath, 4-10 x 3-8 cm; secondary veins 5-8 pairs, slender, spreading, petioles 4-6 mm long; stipules deciduous, shorter than petioles. Male flowers in 3-6 flowered axillary clusters, females solitary; both *ca.* 1 mm across. Bracts villous, minute. Sepals 5, lanceolate, spreading, 5-6 mm long. Petals 5, minute, narrow, ovate, fleshy, 2-2.2 mm long. Male flowers : disk pulvinate; stamens 5, exserted; filaments curved *ca.* 2.5 mm long; pistillode conical, 2-fid. Female flowers : disk conical, with thick margin; ovary ovoid, *ca.* 3 mm in diam., cells 2-ovuled. Schizocarp somewhat 3-gonous, woody, chestnut-coloured when ripe, shining, 2-2.5 cm in diam. Seeds 3.5-4 mm across.

Fl. : Apr.-June. *Fr.*: Feb. - Apr. of following year.

Ecology : Common; on hills, along streams, nalas, in forests, etc.

Distribution : India: Himachal Pradesh, Uttar Pradesh, Bihar, Orissa, Madhya Pradesh, Rajasthan, Gujarat, Deccan Peninsula. Sri Lanka.

Specimens examined : Telaiya Dam, 626; Bishnugarh, 1948.

Uses : Wood is used for house-posts. Leaves are abortifacient. Root, leaves and bark are used as fish-poison.

6. CROTON L.

Key to the Species

- 1a. Herbs. Leaves with 3 basal nerves.
Ovary stellate hairy ... 1. *C. bonplandianus*
- 1b. Large shrub to small tree. Leaves penninerved.
Ovary lepidote ... 2. *C. roxburghii*

1. **Croton bonplandianus** Baill. in *Adansonia* 4: 339. 1864; Croizat in *J. Bombay Nat. Hist. Soc.* 41 : 573. 1940 ('bonplandianum'); Radcliffe-Smith in *Kew Bull.* 30 : 678. 1975.

C. sparsiflorus Morong in Ann. N.Y. Acad. Sci. 7: 221. 1893; Prain in Rec. Bot. Surv. India 3: 276. 1905; Haines, Bot. Bihar & Orissa pt. 2 : 105. 1921.

Erect, stellate-hairy, annual herbs, 50-80 cm tall. Stems much branched, ribbed. Leaves ovate-lanceolate, acute at apex, cuneate or rounded at base, serrate, sparsely stellate hairy beneath, 3-nerved at base, 2.5-5 x 1.2-5 cm; petiole 1-1.5 cm long. Racemes 8-15 cm long. Bracts 2.5-3 mm long. Pedicel 1 mm long with glands on either side. Male flowers : 3.5-4 mm across; sepals 5, *ca.* 1mm long, ovate, acute; petals oblong, villous, 2 mm long; stamens 12-15. Female flowers : 2.5-3 mm across; sepals 5, lanceolate, acute, 1.3-1.5 mm long; petals absent; ovary tomentose, *ca.* 1.5 mm in diam. Schizocarp of 3 bivalved cocci, stellate-hairy, 5-6 x 4 mm. Seeds oblong, brown, smooth.

Fl. & Fr.: Almost throughout the year but chiefly during May-Sept.

Ecology: Very common; in waste lands, harvested paddy fields, along roadsides, railway yards, etc.

Distribution: Throughout India. Native of temperate South America.

Specimens examined: Jhumri Telaiya, 154; Ramgarh, 564.

Uses: Seeds yield a fatty oil having satisfactory drying properties. Cake is useful as a manure.

2. *Croton roxburghii* Balak. in Bull. Bot. Surv. India 3: 39. 1962. *C. oblongifolius* Roxb., Fl. Ind. 3 : 685. 1832, non Delile 1814, *nec* Siebr. ex Spreng. 1826; Hook. f. in Hook. f., Fl. Brit. India 5 : 386. 1887; Prain, Bengal Pl. 2 : 943. 1903; Haines, For. Fl. Chota Nagpur 228. 1910 & Bot. Bihar & Orissa pt. 2 : 105. 1921.

Local names: Maisonda, Chuka.

Moderate-sized tree, to 15 m tall, clothed with minute orbicular silvery scales throughout. Leaves alternate, crowded towards ends of the branchlets, coriaceous, oblong-lanceolate, acute or subacute at apex, cuneate at base, crenate-serrate, glabrous when mature, penninerved, 12-25 x 5.5-12 cm, petiole 1.5-3 cm long. Racemes erect, 8-25 cm long;

flowers solitary or fasciculate in axils or minute linear-subulate bracts. Male flowers : 2.5-3 mm across; sepals ovate or triangular, obtuse, 2.5-3 mm long; petals 2.8-3 mm long, elliptic-lanceolate, obtuse, woolly; stamens about 12, inflexed in bud; filaments *ca.* 3 mm long, hairy on lower half. Female flowers : 4-5 mm across; sepals more acute than in male, ciliate along margins; petals *ca.* 2 mm long, obovate with woolly margins; ovary lepidote; styles *ca.* 4 mm long, each again subdivided into 2 long slender curled braches. Schizocarp subglobose, 7-9 mm in diam., slightly 3-lobed, clothed with small orbicular scales, splitting into 3 bivalved cocci. Seeds ellipsoid, rounded and quite smooth on back, brown.

Fl. : Jan. Feb.; *Fr.* : Apr. - May.

Ecology : Common; in forests, roadsides, etc.

Distribution : India : Central India, West Bengal, Bihar, Orissa. Sri Lanka, Bangladesh, Myanmar.

Specimens examined : National Park, 193, 428; Koderma Forest, 1252.

Uses: Seeds yield an oil which is used as purgative. Seeds are also used for stupefying fish and for insecticidal purposes.

7. DRYPETES Vahl

Drypetes roxburghii (Wall.) Hurusawa in J. Fac. Sci. Tokyo, Sec. III. Bot. 6: 337. 1954; Airy Shaw in Kew Bull. 26 : 257. 1972 & 37 : 17. 1982 & Kew Bull. Add. Ser. IV : 107. 1975 & VIII : 77. 1980. *Putranjiva roxburghii* Wall., Tent. Fl. Nep. 61. 1826; Hook. f. in Hook. f., Fl. Brit. India 5: 336. 1887; Prain, Bengal Pl. 2: 936. 1903; Haines, For. Fl. Chota Nagpur 224. 1910 & Bot. Bihar & Orissa pt. 2: 136. 1921; Steenis in Blumea 8: 515. 1957.

Nageia putranjiva Roxb., Fl. Ind. 3 : 766. 1832.

Local name : Piten, Jia-puta.

Evergreen moderate-sized tree, to 20 m tall; branches pubescent, somewhat drooping. Leaves coriaceous, lanceolate or oblong-lanceolate, obliquely obtuse or rounded at base, acute or shortly acuminate at apex,

serrulate, dark-green, shining, 5-10 x 2-4 cm; petioles 5-8 mm long; stipules triangular, deciduous. Corolla absent. Male flowers : numerous, in dense fascicles on leafless shoots or previous year's wood; pedicels minute, 1-1.5 mm long; sepals 3-5, lanceolate or linear-oblong, ciliate, 2-2.5 mm long; stamens 1-3; filaments thick, *ca.* 1 mm long; anthers ovate, hairy. Female flowers : axillary, solitary or 2-few, green, 3.5-4mm across; pedicels 0.6-1 cm long; sepals 5-6, elliptic, ciliate, 2.2-2.5 mm long, entire or toothed upwards; ovary pubescent, 3-celled; styles recurved, dilated. Drupe ellipsoid, hoary, 1.5-2 x 1.2-1.5 cm. Seeds with hard, rugose stone.

Fl.: Mar. May *Fr.*: Jan. - May of following year.

Ecology: Common; in mixed forests; also planted in roadsides, gardens, parks, railway platforms, etc.

Distribution: Throughout the tropical parts of India. Western Himalaya, Myanmar, Indo-China, Sri Lanka, Java, Moluccas, Lesser Sunda Islands, E. New Guinea.

Specimens examined: Hazaribagh, 708; Tondwa, 1439.

Uses: Wood is used for house-building, agricultural implements and stool-handles. Decoction of leaves and fruits is given for cold, fever, rheumatism. Stones are strung into rosaries and necklaces. Seeds yield a burning oil.

Note: Airy Shaw (1975 and 1982) recognised two varieties, viz. var. *roxburghii* and var. *timorensis*. The specimen of this area is referable to var. *roxburghii*. Var. *timorensis* does not occur in India.

8. EUPHORBIA L.

Key to the Species

1a. Erect, perennial shrub or small tree, >2 m high:

2a. Armed with stipular spines:

3a. Branchlets 3-5-winged. Style-arms 2-cleft ... 1. *E. antiquorum*

3b. Branchlets not winged, but 5-angled
in cross section. Style-arms undivided ... 6. *E. ligularia*

- 2b. Unarmed:
- 4a. Stems thick and fleshy. Leaves few, small, all green ... 9. *E. tirucalli*
- 4b. Stems slender, woody. Lower leaves alternate, green, upper floral leaves opposite, scarlet-red ... 7. *E. pulcherrima*
- 1b. Annual herbs, <1 m long, with erect ascending or prostrate stems and branches:
- 5a. Leaves spirally arranged below, opposite above or all spirally arranged:
- 6a. Involucres with single well-developed obconical gland having disciform hollow top. Stipules of glands ... 4. *E. heterophylla*
- 6b. Involucres with 4-5 semilunate horned glands. Stipules absent ... 2. *E. dracunculoides*
- 5b. Leaves all opposite:
- 7a. Involucres solitary or in axillary clusters. Plants prostrate:
- 8a. Leaves entire, or sometimes serrulate at apex. Involucres glabrous ... 3. *E. heyneana*
- 8b. Leaves crenulate. Involucres ciliolate ... 8. *E. thymifolia*
- 7b. Involucres in dense globose axillary cymes. Plants erect or ascending ... 5. *E. hirta*

1. ***Euphorbia antiquorum*** L., Sp. Pl. 450. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 255. 1887; Prain, Bengal Pl. 2: 923. 1903; Haines, For. Fl. Chota Nagpur 213. 1910 & Bot. Bihar & Orissa pt. 2: 143. 1921.

Local name: Tidhara-send.

Armed, much-branched, erect shrub or small tree, to 4 m tall; branches green, jointed; branchlets 3-5-winged; wings repand-sinuate; thick, bearing sharp stipulary spines of 1-1.2 cm long. Leaves small, few, from sides of wings, sub-sessile, fleshy, obovate-oblong or spatulate, cuneate at base,

rounded at apex, glabrous, fugacious, 0.6-1.2 cm long. Cyathia 3-nate, forming short axillary pedunculate cymes. Involucres hemispherical, 1-1.2 cm broad, yellow; glands 5, large, semicircular, broader than long; appendage 0. Male flowers: in 5 groups of *ca.* 8 each, a few sterile, bracteolate; stalk 3-3.5 mm long; anthers dehiscing vertically. Female flower: erect; styles free, 2-fid, recurved. Schizocarp *ca.* 1 cm in diam.; cocci compressed, glabrous. Seeds *ca.* 2.5 mm long.

Fl. & Fr.: Nov. - Jan.

Ecology: Not common; in village hedges, shrubberies, etc.

Distribution: Throughout the hotter parts of India. Sri Lanka, Myanmar to Vietnam.

Specimen examined: Hazaribagh, 1237.

Uses: Plant is used as purgative and digestive. Decoction of plant is given in gout and also used for nervine troubles and dropsy. Latex is applied to wound of domestic animals to kill maggots; also used as fish-poison.

2. ***Euphorbia dracunculoides*** Lam., *Encycl.* 2: 428. 1786; Hook. f. in Hook. f., *Fl. Brit. India* 5: 262. 1887; Prain, *Bengal Pl.* 2: 924. 1903; Haines, *Bot. Bihar & Orissa* pt. 2: 145. 1921.

E. angustifolia Buch. -Ham. ex D. Don, *Prodr.* 62. 1825; Hook. f. in Hook. f., *Fl. Brit. India* 5: 265. 1887.

Local names: Jychi, Chagulputputi.

Glabrous, usually dichotomously much-branched annual herbs, 30-50 cm tall; stems many from root; branches divaricate. Leaves sessile, spirally arranged below, linear-lanceolate, cuneate, rounded or subcordate at base, subacute at apex, 2.5-6 x 0.3-0.4 cm; floral leaves broader at base and shorter; secondary veins inconspicuous. Involucres solitary at forks, subsessile, turbinate or campanulate, glabrous without, hairy within, 2.2-2.5 mm across; lobes short, ovate, ciliolate; glands 4-5, semilunate, horned. Male flowers: filaments pubescent; anther-cells globose. Female flowers: styles as long as ovary, shortly 2-fid at apex. Capsule 3-4 mm in diam., smooth; cocci reticulato-venose with a median dorsal vein; seeds oblong, tubercled.

Fl. & Fr.: Nov. Mar.

Ecology: Not common; in agricultural fields, forests under shades of trees, etc.

Distribution: Throughout the plains and low hills of India. Arabia, Tropical Africa.

Specimen examined: Chatra, 1091.

Use: Fruits are used to remove warts.

3. *Euphorbia heyneana* L., Spreng. in, Syst. Veg. ed. 16, 3: 791. 1826; Panigr. in Kew Bull. 29: 695. 1974.

E. microphylla Heyne ex Roth., Nov. Pl. Sec. 229. 1821, non Lam. 1788; Hook. f. in Hook. f., Fl. Brit. India 85: 252. 1887; Prain, Bengal Pl. 2: 925. 1903; Haines, Bot. Bihar & Orissa pt.2: 148. 1921.

E. orbiculata Miq., Fl. Ind. Bot. 1(2): 421. 1859, non H.B.K. 1817; Rajagopal & Panigr. in Taxon 17: 547. 1968.

E. serpens Kunth var. *indica* Engelm. ex Boiss. in DC., Prodr. 15(2): 30. 1862.

E. bombaiensis Santap. in Bull. Bot. Soc. Bengal 17: 8. 1955, *p.p.* excl. syn. *E. thymifolia* L. var. *microphylla* (Lam.) Thell.

Prostrate, annual herb. Stems numerous, much-branched, spreading from root, glabrous, slender, 10-25 cm long. Leaves opposite, rounded-oblong or subquadrate, subtruncate or retuse at apex, obliquely rounded or truncate at base, sub-sessile, entire or serrulate at apex, usually with pink margins, 4-5 x 3-3.5 mm. Stipules subulate, 2-partite or laciniately toothed. Cyathia axillary. Involucres axillary, solitary, cup-like, glabrous, 1 mm long. Peduncle 0.5-1 mm long; glands 4; appendages inconspicuous. Male florets: 1-4, ebracteolate; stalk *ca.* 0.5 mm long, anthers dehisce transversely. Female flowers: laterally pendulous; ovary 0.5 mm across; styles 3-fid from above middle, *ca.* 0.3 mm long, stigmas erect, acute. Capsule glabrous, oblong-trigonous, keeled, 1.1-1.6 mm in diam. Seeds 4-angled, 0.8-1 mm long, faintly furrowed, yellowish-brown.

Fl. & Fr.: Sept. - Mar.

Ecology: Very common; in way-sides, waste lands, gardens, etc., mostly in open places.

Distribution: India : Himachal Pradesh, Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Western India and Deccan Peninsula. Pakistan, Bangladesh, Myanmar and Java.

Specimens examined : Jhumri Telaiya, 151; Chatra, 559.

Use : Plant is used as galactagogue.

Note : Panigarhi (*l.c.*) recognised 3 subspecies viz., *ssp. heyneana*, *ssp. gallioides* and *ssp. nilagirica*. The specimens of this area is referable to typical subspecies i.e. *ssp. heyneana*.

4. ***Euphorbia heterophylla*** L., Sp. Pl. 453. 1753; Prain, Bengal Pl. 2: 924. 1903; Haines, Bot. Bihar & Orissa pt. 2: 144. 1921.

E. geniculata Ort., Nov. Pl. Descr. Dec. 18. 1797; Hook. f. in Hook. f., Fl. Brit. India 5: 239. 1887; Prain, Bengal Pl. 2: 924. 1903; Haines, Bot. Bihar & Orissa pt. 2: 144. 1921.

E. prunifolia Jacq., Hort. Schoenbr. 3: 15, t. 277. 1798; Hook. f. in Hook., Fl. Brit. India 5: 266. 1887.

Erect annual herbs, 50-80 cm tall. Stems fistular, ribbed, branched in upper part. Leaves spirally arranged below, opposite above, with stipular glands, oblong-obovate or oblanceolate-pandurate, cuneate-rounded at base, acute at apex, subentire-dentate to serrate, glabrous or hairy, 4-10 × 1-3 cm; petioles 1-3 cm long. Cyathia in terminal dense corymbose cymes of 2-2.5 cm in diam.; subtending leaves entirely green, or green with red-blotched or whitish base. Involucres 2-2.5 mm long, campanulate; lobes 5, ovate-oblong, lacerate, with gland-tipped fimbriae; gland 1, obconical, long-stalked, with expanded disciform hollow top, 1-1.2 mm across. Male flowers : many; pedicel 1.2-1.5 mm long; anthers broadly oblong, with longitudinal dehiscence. Female flowers : laterally pendulous; ovary glabrous, to 2.5 mm across; styles shortly connate, 2-fid. Schizocarp 5-6 mm across. Seeds grey, tuberculate, *ca.* 2 mm long.

Fl. & Fr.: Aug. Oct.

Ecology: Common; in open grassy places, waste lands, roadsides, agricultural fields; also cultivated in gardens.

Distribution: Almost throughout India. Native or Tropical America, now Pantropical.

Specimens examined: Ghanghree, 1013; Ramgarh Cant., 1238.

Note: Babu (Herb. Fl. Dehra Dun 458-459. 1977) maintained *E. heterophylla* and *E. geniculata* as two distinct species.

5. *Euphorbia hirta* L., Sp. Pl. 454. 1753; Haines, Bot. Bihar & Orissa pt. 2: 147. 1921.

E. pilulifera L., Sp. Pl. 454. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 250. 1887; Prain, Bengal Pl. 2 : 925. 1903.

Local name: Dudhi.

Erect or ascending, often branched from base, hispid, annual herb, 15-40 cm long, with a woody base. Leaves opposite, decussately arranged, broadly oblong or elliptic-lanceolate, obliquely rounded or cuneate at base, obtuse or subacute at apex, serrulate, sparsely hairy above, long-hairy beneath, 1.5 x 0.5-1.5 cm, petiole 1.5-3 mm long, stipules subulate, caducous. Cyathia 15-20, aggregated in single or paired subsessile, axillary cymes. Involucres subsessile, appressed-hairy outside, campanulate, 0.7-1 x 0.5-0.6 cm; lobes subulate, ciliolate; glands 4, minute, shortly stipitate, red-tipped, with a obsolete limb. Male flowers : 4-6, ebracteolate; anthers dehiscing longitudinally. Female flowers : laterally pendulous; ovary ca. 0.8 mm across, styles bifid from base, erect. Schizocarp depressed-globose, appressedly hairy, 1-2 mm across. Seeds ovoid, reddish-brown, transversely rugulose, angled, 0.7-0.8 mm long.

Fl. & Fr. : Throughout the year, chiefly during July - Nov.

Ecology: Very common; in grassy localities, roadsides, waste places, gardens, agricultural fields and field borders, etc.

Distribution : Throughout the hotter parts of India. Pantropical.

Specimens examined : Jhumri Telaiya, 161; Ramgarh, 546.

Uses : Plant is used as an ingredient of medicine for cough and asthma. It is also used in dysentery and diseases of urinogential tract. Latex is applied to warts.

Note : Some authros (e.g., Babu, Herb. Fl. Dehra Dun 458. 1977; Rani in Matthew, Fl. TN. Carnatic pt. 2 : 1434. 1983; etc.) consider *E. hirta* and *E. pilulifera* as two distinct species.

6. ***Euphorbia ligularia*** Roxb., Fl. Ind. 2 : 465. 1832; Duthie, Fl. Upp. Gang. Pl. 3 : 77. 1915; A.R. Smith in Kew Bull. 26 : 265. 1972 & 36 : 296. 1981.

E. nerifolia auct. non L.: Hook. f. in Hook. f., Fl. Brit. India 5: 255. 1887, *p.p.*; Prain, Bengal Pl. 2 : 923. 1903, *p.p.*; Haines, For. Fl. Chota Nagpur 213. 1910 & Bot. Bihar & Orissa pt. 2: 142. 1921, *p.p.*

Local names : Sehund, Pattonkisend.

Erect, glabrous, branched shrub to small tree, to 6 m tall. Branches ascending, younger ones 5-sided and angled in cross-section, with short sharp black persistent stipular spines arising from thick tubercles being arranged in 5 rows. Leaves alternate, from near ends of branches, obovate-oblong or subspathulate, narrowed at base into a short petiole, acute at apex, undulate, fleshy, deciduous, 12-20 x 6-10 cm. Involucres hemispheric, yellow, arranged in small, stout, dichotomous shortly peduncled 3-15-flowered cymes, later ones of cymes with short thick pedicels, central one sessile and usually male; lobes of involucres erect, orbicular, fimbriate, with transversely oblong glands. Bracteoles many, fimbriate. Anthers sagittate, apiculate. Style-arms connate above middle, not further divided; stigmas capitate. Capsules deeply 3-lobd, ± 1.2 cm broad; cocci glabrous, compressed.

Fl. & Fr.: Feb. - May.

Ecology : Common; planted in houses; also in village hedges, fences, waste lands near villages, etc.

Distribution : India: Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Western India, Deccan Peninsula and elsewhere in native villages. Sri Lanka, Beluchistan, Malay Islands and elsewhere.

Specimens examined : Pratappur, 939; Hazaribagh, 1217.

Uses : Milky juice is used medicinally as purgative and expectorant, also to remove warts and cutaneous eruptions. Root mixed with pepper is regarded as an antidote to snake bites.

7. ***Euphorbia pulcherrima*** Willd. ex Klotz. in Otto & Dietr., Allg. Deutsche Gartn. Zeitung 2 : 27. 1834; Prain, Bengal Pl. 2 : 924. 1903; Haines, For. Fl. Chota Nagpur 212. 1910 & Bot. Bihar & Orissa pt. 2 : 144. 1921.

Poinsettia pulcherrima Grah. in Edinburgh New Phil. J. 20 : 412. 1836; Hook. f. in Hook. f., Fl. Brit. India 5 : 239. 1886.

Unarmed shrubs, 1.5-3 m tall. Stems slender, woody. Leaves alternate, ovate-elliptic to lanceolate, narrowed at base, acute to short-acuminate at apex, entire or sinuate-toothed or lobed, pubescent beneath, 7-15 x 5-10 cm, upper narrower, opposite, mostly entire and bright scarlet-red. Cyathia borne in cymes; involucre greenish, 6 mm across, with a large yellow gland on one side.

Fl. & Fr. : Oct. - Jan.

Ecology : Very common; planted in gardens; also escapes from cultivation.

Distribution : Throughout the hotter parts of India. Native of Central America, now distributed throughout the Tropics.

Specimens examined : Hazaribagh, 675; Ramgarh, 1906.

Use : Planted as an ornamental for its coloured bracts.

8. ***Euphorbia thymifolia*** L., Sp. Pl. 454. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 252. 1887; Prain, Bengal Pl. 2: 925. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 147. 1921.

Chamaesyce thymifolia (L.) Millsp. in Publ. Field Mus. Nat. Hist. Bot. Ser. 2 : 412. 1916.

Local name : Choti-dudhi.

Prostrate, much-branched, hispidly pubescent, annual herbs. Stems usually pink, many from root; branches horizontally spreading. Leaves opposite, distichously spreading, shortly petiolate, obliquely oblong, cordate at base, rounded or obtuse at apex, crenulate, glabrous, or pubescent beneath, 1-nerved, 5-8 × 3-5 mm; stipules subulate, hairy. Involucres solitary or few together in clusters, axillary, turbinate, 0.7-1 cm across; lobes short, ciliate; glands very minute, stipitate, with or without a petaloid limb. Male flowers : 1-4, ebracteolate; anthers dehiscing vertically. Female flowers : laterally pendulous; ovary pubescent; styles forked from base. Schizocarp erect, shortly stipitate, obtusely keeled, pubescent, *ca.* 1 mm in diam. Seeds 5-6 with shallow transverse furrows.

Fl. & Fr. : July - Nov.

Ecology : Very common; in waste places, fallow fields, roadsides, etc.

Distribution : Throughout India. Tropical Asia.

Specimens examined : Ghanghree, 1064; National Park, 1187.

Uses : Leaves and seeds are used as stimulant, astringent, anthelmintic and laxative, particularly for bowel complaints of children. Plant-extract is also used as a cure for ring-worm.

9. *Euphorbia tirucalli* L., Sp. Pl. 452. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 254. 1887; Prain, Bengal Pl. 2 : 294. 1903; Haines, For. Fl. Chota Nagpur 214. 1910 & Bot. Bihar & Orissa pt. 2 : 144. 1921.

Local name : Konpal schund.

Shrubs or small trees, to 3 m tall. Branchlets terete, thick, fleshy, articulate, spreading, glabrous. Leaves spirally arranged, linear or linear-oblong, obtuse or subacute at apex, cuneate at base, entire, to 10 × 14 mm. Cyathia few, sessile, terminal. Involucres broadly cupular,

coriaceous, to 4 x 7 mm; lobes 0; glands 5, circular to \pm angular, to 3 x 4 mm thick. Ovary pubescent, to 2 x 1.5 mm; styles 3, spreading, ca. 3 mm, forked from middle; arms curved. Capsule globose, 6-8 mm in diam, minutely puberulous. Seeds globose, smooth, glabrous, dark brown, carunculate, 3-4 mm across.

Fl. & Fr. : July - Oct.

Ecology : Common; cultivated as a hedge plant in gardens; sometimes grows spontaneously.

Distribution : India : West Bengal, Bihar, Orissa, Deccan Peninsula. Native of Africa, now planted in most of Tropical Countries.

Specimen examined : Hazaribagh, 715.

Uses : Latex is vesicant and rubefacient, used externally to remove warts; it is also applied in tooth-ache. Plant-extract is toxic to fish and rats.

9. HOMONOIA LOUR.

Homonoia riparia Lour., Fl. Cochinch. 637. 1790; Hook. f. in Hook. f., Fl. Brit. India 5 : 455. 1887; Prain, Bengal Pl. 2 : 951. 1903; Haines, For. Fl. Chota Nagpur 234. 1910 & Bot. Bihar & Orissa pt. 2 : 110. 1921.

Adelia nerifolia Roth., Nov. Pl. Sp. 375. 1821.

Rigid shrub, to 2.5 m tall. Stems numerous, erect, marked with prominent leaf-scars, tomentose above. Leaves linear-oblong or linear-lanceolate, erect, cuneate or rounded at base, acute and apiculate at apex, subentire-repand, or sometimes serrulate towards tip, glabrous above, reddish-brown, and pubescent on nerves beneath; secondary veins 10-30 pairs; petioles 3-4 mm long; stipules linear-lanceolate, 3.5-4 mm long. Spikes 5-12 cm long; rachis pubescent; bracts ovate, acuminate, 1.8-2 mm long; bracteoles lanceolate, ca. 1 mm long. Male flowers : 3.5-4 mm across; sepals oblong, concave, glabrous, 2.8-3 mm long; anthers red. Female flowers : 3-3.5 mm across; sepals 5-6, ovate-lanceolate, pubescent, 2-2.5 mm long; ovary tomentose. Schizocarp globose, tomentose, 5-7 mm in diam. Seeds bright crimson, rounded on back, angular on inner face, 1.5-2 mm long.

Fl. : Mar.-Apr. *Fr.* : June-Sept.

Ecology : Rare; on rocky river-banks.

Distribution : India : Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Orissa, Western, Central and Southern India. S.E. Asia, S. China, Formosa, Malesia to Moluccas.

Specimen examined : Ramgarh Cant., 1227.

Uses : Root is laxative and diuretic and also used in piles, stone in bladder and urinary disorders. Tender leaf-tips are used as vegetable.

10. JATROPHA L.

Key to the Species

- 1a. Petals yellowish-green, united at base only; corolla-tubes of male villous within, stipules entire ... 1. *J. curcas*
- 1b. Petals purple or red, united to middle, glabrous. Stipules multifid. ... 2. *J. gossypifolia*

1. ***Jatropha curcas* L.**, Sp. Pl. 1006. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 383. 1887; Prain, Bengal Pl. 2 : 941. 1903; Haines, For. Fl. Chota Nagpur 230. 1910 & Bot. Bihar & Orissa pt. 2 : 101. 1921.

Local name : Bagbherenda.

Perennial shrub or small tree, 2-3 m tall; branches thick, with large leaf-scars; bark peeling off in thin white flakes. Leaves broadly ovate-suborbicular, cordate at base, acute at apex, entire, or shallowly 3-7-angled or lobed, 8-16 × 6-13 cm, petioles 6-15 cm long, stipules early caducous. Cymes 8-12 cm long, terminal, branched. Bracts lanceolate, acute, 1.2-1.5 cm long. Male flowers: 6-8 mm across, on short articulate pedicels; calyx green. Corolla yellowish-green; tube villous within; stamens 10, biseriate (5+5), outer ones slightly shorter than inner connate ones. Female flowers : 7-8 mm across, usually in forks of cymes, pedicelled. Calyx same as in male; lobes unequal; corolla same as in male, ovary 2 × 1.5 mm, style 4 - 5 mm long; stigmas bifid. Schizocarp oblong, indehiscent, yellow at first, turning black and rugose when dry, 2.5-3.5 × 2-2.5 cm.

Fl.: May - Aug. *Fr.*: July - Nov.

Ecology : Common; grows as a hedge plant in villages, along banks of rivers, etc.

Distribution : Almost throughout India. Native of tropical America, introduced and naturalised in other tropical Countries.

Specimens examined : Ghanghree, 1016; Hunterganj, 2150.

Uses : Seeds yield an oil which is used as a powerful purgative; also used for manufacturing candles, soaps and varnishes. Oil is also used in sciatica, dropsy and paralysis and externally for skin troubles and rheumatism. Bark yields a dye which is used for dyeing cloths and fishing nets. Juice of plant is used in scabies, eczema and ringworm.

2. *Jatropha gossypifolia* L., Sp. Pl. 1006. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 383. 1887; Prain, Bengal Pl. 2 : 941. 1903; Haines, For. Fl. Chota Nagpur 229. 1910 & Bot. Bihar & Orissa pt. 2: 101. 1921.

Local name : Bherenda.

Erect, perennial shrub, 0.6-1.5 m tall; branches tinged with dark purple. Leaves deeply 3-5-lobed, in close spirals, red to deep-pink, cordate at base with stipitate viscid glands along margins, 7-13 x 6-15 cm; lobes obovate, acute, petioles 6-10 cm long, glandular on abaxial sides; stipules dissolved into stalked seriate glands, 4-5 mm long. Cymes 4-6 cm long. Bracts lanceolate, 0.8-1 cm long, glandular on margins. Male flowers : 6-8 mm across; pedicels 3-5 mm long; sepals ovate, acute, glandular-ciliate 2-2.5 mm long; petals purple or red, obovate, 4-5 mm x 3-4 mm. Stamens 8, (sub) biseriate (5+3), inner 3 longer; filaments connate at base. Female flowers : 4-6 mm across; pedicels 1.5-2 mm long, stouter than in male; sepals ovate, acuminate, glandular on margins, 4-6 mm long; petals 0; ovary ca. 2 x 1.5 mm. Schizocarp obovoid-oblong, 3-lobed, 1.2-1.8 x 1-1.5 cm. Seed oblong-subtrigonous, 8-10 x 4-5 mm.

Fl. & Fr.: May - Oct.

Ecology : Very common; in roadsides, waste open places, river-banks, etc.

Distribution : India : West Bengal, Bihar, Orissa, Central and Western India and Deccan Peninsula. Native of Tropical America, introduced and naturalised in other Tropical Countries.

Specimens examined : Hazaribagh, 255; Ramgarh, 536.

Uses : Roots are employed against leprosy. Decotion of leaves is used as purgative and stomachic. Latex is given for ulcers. Leaf-extract is applied to intermittent fever. Seeds yield an oil which is used as purgative and emetic.

11. MALLOTUS Lour.

Mallotus philippensis (Lam.) Muell.-Arg. in *Linnaea* 34 : 196. 1865; Hook. f. in Hook. f., *Fl. Brit. India* 5 : 442. 1887; Prain, *Bengal Pl.* 2: 950. 1903; Haines, *For. Fl. Chota Nagpur* 232. 1910 & *Bot. Bihar & Orissa* pt. 2 : 106. 1921 ('Philippines').

Croton philippense Lam., *Encycl.* 2 : 206. 1786.

Local name : Kamala.

Dioecious, much-branched, small tree, to 10 m tall; branchlets, young leaves and inflorescences rusty-pubescent; bark nearly smooth, grey. Leaves spirally arranged, ovate-lanceolate, acuminate at apex, rounded at base, entire or sinuately toothed, glabrous above, pubescent and with numerous red glands beneath, 8-18 x 3-10 cm, 3-nerved at base and with 4-7 pairs of secondary veins above; petioles 2.5-5 cm long, fulvous-pubescent, thickened at both ends, often red-glandular. Male flowers : 4-4.5 mm across, sessile or shortly pedicellate, clustered in erect, terminal racemes of 15-25 cm long; bracts broadly ovate, acute, 1.2-1.5 mm long; tepals 4, free, obovate, acute, recurved, 3.5-4 mm long; stamens 20-30; anther-cells unequal, usually with few red glands. Female flowers: 3.5-4 mm across, ± sessile, solitary in a short racemes of 5-7.5 cm long; tepals 3, lanceolate, bifid, thicker than male; ovary tomentose and red-glandular. Schizocarp 3-lobed or globose, pubescent, red-glandular, 0.8-1 cm across, 3-valved. Seeds sub-globose, smooth, black, 3.5-4 mm in diam., covered with red powder.

Fl. : Oct. - Nov. *Fr.* : Feb. - Mar.

Ecology : Very common; in forests, specially in moist regions.

Distribution : Tropical parts of India, W. Himalaya to Formosa. Sri Lanka, Malesia to Australia and Melanesia.

Specimens examined : National Park, 436, 1193; Pratappur, 930.

Uses : The red powder which covers the seeds furnishes a valuable dye which is employed in dyeing silk a bright flame colour. The powder is also used in medicine and considered to be efficacious in expulsion of *Taenia* or Tape-worm. Wood is used as fuel; also for match-boxes, tool-handles and small turnery articles.

Note : Some authors have adopted the spelling 'philippinensis' referring to the Philippine Islands. Lamarck (*l.c.*), however, used the epithet 'philippense' while calling the plant '*Crotondes philippines*'

12. PEDILANTHUS Neck. ex Poit., *nom. cons.*

Pedilanthus tithymaloides (L.) Poit. in Ann. Mus. Hist. Nat. Paris 19: 390, t. 19. 1812; Hook. f. in Hook. f., Fl. Brit. India 5 : 239. 1887; Prain, Bengal Pl. 2: 925. 1903; Haines, Bot. Bihar & Orissa pt 2 : 149. 1921. *Euphorbia tithymaloides* L., Sp. Pl. 453. 1753.

Local names : Bilati-sij, Nagdaman.

Erect, fleshy subshrub, to 1 m tall; branchlets zigzag. Leaves elliptic-ovate, sessile, cuneate at base, acute at apex, brittle, variegated, 5-7 x 3-5 cm; mid-vein prominent, secondary veins obscure. Cyathia stalked, in terminal dichotomous cymes. Bracts scarlet-red, lanceolate, unequal, caducous. Involucre red or orange, slipper-shaped, 1.2-1.5 cm long; glands 4, unequal, enclosed by bracts. Male flowers : to 25; pedicels 0.8-1 cm long; filaments jointed 1.5-2.5 mm long; anthers reniform. Female flowers : erect, raised above by a 0.7-1 cm long pedicel; ovary *ca.* 1.5 mm across. Schizocarp 5-6 mm in diam. Seeds ovoid-subglobose, grey to deep brown, with acute apex and truncate base.

Fl. : Mar.-May. *Fr.* : July.-Sept.

Ecology : Common; used as a hedge plant; also naturalised in shrubberies and village-groves.

Distribution : Throughout the warmer parts of India. Native of tropical America; introduced and naturalised in elsewhere.

Specimen examined : Jaynagar, 215.

Uses : Root-powder is emetic. Latex is used in venereal diseases; also applied to warts and leucoderma patches.

13. PHYLLANTHUS L. emend. Gaertn.

Key to the Species

- 1a. Shrubs or small trees :
- 2a. Small trees. Ovary 3-celled. Fruit a drupe.
Stamens 3 or 4; filaments either all free or
all connate into a column:
- 3a. Tepals 4. Stamens 4; filaments all free ... 1. *P. acidus*
- 3b. Tepals 6. Stamens 3; filaments all connate
into a column ... 3. *P. emblica*
- 2b. Shrubs. Ovary 5-12-celled. Fruit a Berry.
Stamens 5, in 2 series; filaments of inner 3
connate into a column, of outer 2 free ... 5. *P. reticulatus*
- 1b. Herbs :
- 4a. Capsule verrucose ... 6. *P. urinaria*
- 4b. Capsule smooth :
- 5a. Stipules peltate ... 7. *P. virgatus*
- 5b. Stipules not peltate :
- 6a. Female flowers 0.15-0.17 cm across.
Disk-glands of male flowers very minute.
Seeds with regular, parallel ribs ... 4. *P. fraternus*
- 6b. Female flowers 0.25-0.3 cm across.
Disk-glands distinct, stellately
arranged. Seeds with irregular ribs ... 2. *P. debilis*

1. *Phyllanthus acidus* (L.) Skeels in U.S.D.A. Bur. Pl. Industr. Bull. 148: 17. 1909; Webster in J. Arnold Arb. 38 : 66. 1957; Airy Shaw in

Kew Bull. Add. Ser. IV : 182. 1975 & Kew Bull. 37 : 31. 1982. *Averrhoa acida* L., Sp. Pl. 428. 1753.

Cicca disticha L., Mant. Pl. 124. 1767; Haines, Bot. Bihar & Orissa pt. 2 : 129. 1921.

Phyllanthus distichus (L.) Muell.-Arg. in DC., Prodr. 15(2): 413. 1866; Hook. f. in Hook. f., Fl. Brit. India 5 : 304. 1887; Prain, Bengal Pl. 2 : 936. 1903.

Cicca acida (L.) Merr., Interpr. Herb. Amboin. 314. 1917.

Local names : Nuree, Nurphal.

Monoecious small deciduous tree, to 6 m tall. Branches thick, closely marked with scars of deciduous branchlets. Leaves (the apparent leaflets) 5-8 x 2-4 cm, obliquely elliptic, or ovate-elliptic, acute or sub-acuminate at apex, cuneate at base, somewhat pale-glaucous beneath; stipules minute, subulate, toothed. Flowers densely clustered in slender racemes from leafless branchlets. Male flowers : numerous, 3.5-4 mm across, red; tepals 4, 2+2, unequal, ovate, 1.8-2 mm long; stamens 4, exserted; filaments recurved, free; anthers oblong, dehisced vertically; disk-glands 4. Female flowers : few, greenish, solitary or subsolitary; tepals 4, two larger than the others; ovary shortly stipitate, globose, 3-celled and 3-lobed; styles 3-4, reflexed, 2-fid. Drupes depressed-globose, 6-8-grooved, juicy, 1.2-1.6 cm across; endocarp hard.

Fl. : May-June. *Fr.* : June-July.

Ecology : Common; planted in gardens.

Distribution : Throughout India. Native of coastal regions of N.E. Brazil, now cultivated in Sri Lanka, Malay Islands, China, Pacific Islands.

Specimens examined : Hazaribagh, 744.

Uses : Green leaves are edible. Fruits are eaten as such or cooked, and also made into jam and jelly. Roots and seeds are cathartic.

2. **Phyllanthus debilis** Klein ex Willd., Sp. Pl. 4 : 582. 1805; Hook. f. in Hook. f., Fl. Brit. India 5 : 299. 1887; Prain, Bengal Pl. 2 : 936. 1903; Haines, For. Fl. Chota Nagpur 222. 1910 & Bot. Bihar & Orissa pt. 2 : 127. 1921.

Monoecious, erect, slender, annual herb, 30-90 cm tall. Stem straight, with many spreading or erecto-patent branches, 2-4-edged. Leaves distichous, elliptic or elliptic-obovate, obtuse or rounded at apex, cuneate or rounded at base, glaucous beneath, 1-2 x 0.8-1.2 cm; petiole 0.15-0.2 cm long; stipules lanceolate-subulate, scarious, with setaceous tip, 1-2 mm long. Flowers short-pedicelled, in small bracteate axillary clusters; bracts lanceolate, 0.8-1 mm long. Male flowers : 3-4 mm in diam., few, in lower leaf-axils; tepals 6, obovate, 2-seriate, scarious except midrib, subacute at both ends, 1-1.2 mm long; stamens 3, exserted; filaments erect, combined into a distinct column; anthers broadly oblong, dehisced transversely; disk-glands 6, stellately arranged, yellowish. Female flowers : numerous in upper leaf-axils, 2.5-3 mm across; pedicels 1-2 mm long; tepals spreading, green with white margins, obovate-oblong or oblong-spathulate, 2-2.2 mm long; ovary 6-lobed, ca. 1 mm across; styles bifid; stigmas obtuse; disk annular, crenulate. Capsule depressed-globose, smooth, 3-valved, 3.5-4 mm across. Seeds 3-gonous, rounded and irregularly ribbed on back, 1-1.5 mm long.

Fl. & Fr. : June Dec.

Ecology : Common; on rocky soils of low hills in shady places, fallow-fields, forests, etc.

Distribution : India : North-western India, Uttar Pradesh, Bihar, Orissa, West Bengal, Sikkim Himalaya, Assam, Khasia Mountains and Deccan Peninsula. Bangladesh, New Guinea and Tropical Africa.

Specimens examined : National Park, 198; Jaynagar, 1498.

3. **Phyllanthus emblica** L., Sp. Pl. 982. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 289. 1887; Prain, Bengal Pl. 2 : 935. 1903; Haines, For. Fl. Chota Nagpur 221. 1910.

Emblica officinalis Gaertn., Fruct. Sem. Pl. 2 : 122, t. 108. f. 2. 1790; Haines, Bot. Bihar & Orissa pt. 2 : 128. 1921.

Local names : Amla, Amlika.

Monoecious, small, deciduous tree, to 8 m tall; bark greenish-grey, peeling off in scales; branches much-spreading; branchlets glabrous or finely pubescent. Leaves distichous, linear-oblong, obtuse and apiculate at apex, truncate at base, closely set along branchlets, glabrous, 1-1.5 x 0.2-0.4 cm; stipules minute, linear, fimbriate or with a hair tip. Flowers in axillary dense fascicles; both male and female flowers mixed. Male flowers : 2.5-3 mm across, usually present in upper position on slender pedicels; tepals 6, oblanceolate, obtuse, 1.2-1.5 mm long; stamens 3; filaments connate; anthers dehiscent vertically; connectives apiculate; disk-glands 6. Female flowers: 4-5 mm across, sessile, few, usually present in lower position; tepals 6, oblanceolate, obtuse, 2.2-2.5 mm long; ovary 3-celled; styles fimbriate, recurved, stigmatiferous. Drupes indehiscent, depressed-globose, succulent, fleshy, yellow when ripe, 2-3 cm across, obscurely 6-lobed, with 6-grooved endocarp. Seeds 3-gonous, irregularly ribbed; testa crustaceous.

Fl.: Feb. - May. *Fr.* : Oct. - Apr.

Ecology : Very common; in dry deciduous forest; also planted in gardens.

Distribution : Throughout India, Himalaya, Myanmar, S. China, Indo-China and Malesia.

Specimens examined : National Park, 68; Raja Rappa, 417.

Uses : Fruits are astringent, cooling, diuretic, and laxative; eaten raw or cooked and also pickled. Juice of fruits is largely used by local poor people as a cure for cough and inflammation of eyes. Dried fruits are detergent and used for shampooing hair. Wood is used for agricultural implements, poles and furniture.

4. *Phyllanthus fraternus* Webster in Contr. Grey Herb. 176 : 53. 1955 & in J. Arnold Arb. 38. : 308. 1957.

P. niruri auct. non L. : Hook. f. in Hook. f., Fl. Brit. India 5: 298. 1887; Prain, Bengal Pl. 2 : 936. 1903; Haines, For. Fl. Chota Nagpur 221. 1910 & Bot. Bihar & Orissa pt. 2: 126. 1921.

Local names : Jar-amla, Jangli amla.

Erect, monoecious, annual herb, 10-50 cm tall. Stem much branched, angular, glabrous. Branchlets slender, spreading. Leaves distichous, numerous, elliptic-oblong, obtuse at apex, rounded at base, glaucous beneath, 6-12 x 3-6 mm; petioles 1.2-1.5 mm long; stipules lanceolate, scarious, *ca.* 1 mm long. Flowers numerous, axillary, green or whitish. Male flowers : *ca.* 0.1 cm across, 1-3 together; tepals 5, ovate, obtuse, 0.7-0.8 mm long; stamens 3, exserted; filaments connate into a short column; anther-cells 3, dehisced transversely; disk-glands 6, very minute. Female flowers : numerous, solitary, 1.5-1.7 mm across; tepals 5, oblong, obtuse, 0.7-0.8 mm long; ovary globose, 0.5-0.6 mm across; styles recurved, free, 2-lobed; disk ovate, patelliform-lobed. Capsule depressed-globose, smooth, scarcely lobed, 1.8-2 mm across. Seeds brown, vertically muriculate, regularly, 3-gonous, 1.2-1.5 mm long.

Fl. & Fr. : July - Oct.

Ecology : Very common; in waste places, roadsides, gardens, open grassy lands, agricultural fields and field borders.

Distribution : Throughout India. Native of America, now Pantropical.

Specimens examined : Koderma, 155; Hazaribagh, 755.

Use : Leaves are used for treatment of jaundice by tribals.

Note : Webster (*l.c.*) considered *P. fraternus* Webster and *P. amarus* Schum. & Thonn. (a species indigenous to America, also distributed in India) as two distinct species. However, Airy Shaw (in Kew Bull. Add. Ser. IV: 182. 1975 & Kew Bull. 37 : 31. 1982) considered the two as conspecific and adopted *P. amarus* as the correct name.

5. **Phyllanthus reticulatus** Poir. in Lam., Encycl. 5: 298. 1804; Hook. f. in Hook. f., Fl. Brit. India 5: 288. 1887; Prain, Bengal Pl. 2: 935. 1903.

Kirganelia reticulata (Poir.) Baillon, Etude Euphorb. 613. 1874; Haines, For. Fl. Chota Nagpur 220. 1910 & Bot. Bihar & Orissa. pt. 2: 129. 1921.

Local name : Panjuli, Makhi.

Monoecious, sarmentose shrub, to 6 m tall; stems and branches smooth or lenticellate, slender, glabrous or pubescent. Leaves oblong or elliptic, often almost rotundate, obtuse or subacute at apex, cuneate or rounded at base, glabrous, pale beneath, 1.5-3 × 1-2 cm; petioles 0.15-0.3 cm long, slender; stipules ovate-lanceolate, often bristle-pointed, 0.13-0.15 cm long. Both male and female flowers mixed in axillary clusters or sometimes paired; clusters sometimes appearing racemose due to reduction of leaves. Male flowers: 2-7 in each cluster, 2.5-3 mm across; tepals 5, green or purple, imbricate, unequal, obovate-oblong, 2-3 mm long; inner 3 usually larger and subpetaloid; stamens 5; inner 3 connate into a column, longer; outer 2 free, shorter; anthers oblong, dehiscent vertically; disk of 5 fleshy glands. Female flowers : 1.5-2 mm across, solitary in clusters of lower axils; tepals as in male; ovary subglobose, 5-12-celled; ovules 2 per cell, superposed; disk as in male. Berries globose, 4-6 mm across, smooth, shining black, 8-10-seeded. Seeds irregularly 3-gonous, finely granulate; testa crustaceous.

Fl. & Fr.: Most of the year, but chiefly during Feb. - June.

Ecology : Very common; in shrubberies, hedges, waste-lands, river-banks, nalas, etc.

Distribution : Tropical parts of India, Himalaya. Sri Lanka, S.E. Asia, S. China, Malesia and tropical Africa.

Specimens examined : Ramgarh, 547; Barkaganwa, 1280.

Uses : Leaves are diuretic. Leaf-juice with camphor and cubebs is used for bleeding gums and for diarrhoea in infants. Bark is astringent and diuretic.

6. *Phyllanthus urinaria* L., Sp. Pl. 982. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 293. 1887; Prain, Bengal Pl. 2 : 935. 1903; Haines, For. Fl. Chota Nagpur 221. 1910 & Bot. Bihar & Orissa pt. 2 : 125. 1921.

Local name : Lal-bhuin anvalah, Hazar mani.

Monoecious, annual herb, 30-60 cm tall. Stems erect, often reddish, flattened or slightly winged, with numerous spreading leafy branchlets.

Leaves small, distichous, closely set, oblong, rounded and apiculate at apex, obliquely rounded at base, minutely ciliate along margins, glabrous, 5-20 x 2-5 mm; stipules ovate, setaceously acuminate, 3-4 mm long. Flowers minute, reddish, axillary, but secund and appearing to be borne on undersurface of branchlets; flower-clusters functionally 1-sexual, male flowers first developing and deciduous, later female, so that lower ones, appear all female. Male flowers : 1.2-1.5 mm across; tepals 6, oblong-suborbicular, white, 0.5-0.6 mm long; stamens 3, filaments very short, connate; anthers connivent, sub-globose, dehisced vertically; disk glands 6, peltate, minute. Female flowers : 1.8-2 mm across; tepals 6, linear-oblong, spreading, 0.6-0.7 mm long; styles horizontally spreading, connate at base, with 2 minute spreading lobes; disk annular. Capsules globose, densely verrucose, 2.5-3 mm across. Seeds triquetrous with transverse furrows on back and faces.

Fl. & Fr.: July - Dec.

Ecology : Very common; in waste lands, harvested paddy fields, garden lands, roadsides, open wet grassy places, etc.

Distribution : Throughout India. Pantropical.

Specimens examined : Hazaribagh, 108; Ghanghree, 1075.

Uses : Plant is astringent, diuretic, stomachic, and febrifuge; also used in diarrhoea, dysentery, dyspepsia, colic, dropsy and urino-genital diseases. Young roots are given in jaundice. Latex is applied to sores. Juice of leaves with coconut milk is used as an appetizer to children. Plant is used as fish-poison.

7. *Phyllanthus virgatus* Forst. f. Fl. Ins. Austr. Prodr. 65. 1786; Airy Shaw in Kew Bull. 26(2) : 325. 1972 & Kew Bull. Add. Ser. IV : 186. 1975 & VIII : 194. 1980 & Kew Bull. 37: 34. 1982.

Phyllanthus simplex Retz., Obs. Bot. 5 : 29. 1789; Hook. f. in Hook. f., Fl. Brit. India 5 : 295. 1887; Prain, Bengal Pl. 2 : 936. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 125. 1921.

Local name : Bhuin aonra.

Monoecious, glabrous, perennial herb, with a long tap-root; branches numerous, slender, flat, narrowly margined, 30-60 cm long. Leaves distichous, numerous, closely placed and overlapping, sub-sessile, linear-oblong, obtuse to acute and apiculate at apex, rounded at base, glabrous, 12-20 x 3-6 mm; stipules 1-1.2 mm long, peltate, triangular, often with an auricled base on one side, brown. Flowers axillary, usually 3-nate, 2 males and 1 female or sometimes females solitary in upper axils. Male flowers : smaller than female, 0.7-0.8 mm across; pedicels 1.5-2 mm long; tepals 6, oblong, obtuse, long; stamens 3; included; filaments free; anthers dehisced transversely; disk glands 6. Female flowers : 1.5-2 mm across; pedicels 4-6 mm long; tepals oblong, mucronate, ca. 1 mm long; ovary ca. 1 mm across; styles horizontally spreading, recurved; disk annular, crenulate. Capsules depressed-globose, slightly 3-lobed, 2.5-3 mm across, smooth and glabrous. Seeds triquetrous, minutely tubercled, ca. 1 mm long.

Fl. & Fr. : Aug. Dec.

Ecology : Common; in waste lands, grassy localities, arable and fallow fields, etc.

Distribution : Throughout India, Himalaya. Indo-China, S. China, Malesia and Polynesia.

Specimens examined : Koderma, 164; Hazaribagh, 717.

Uses : Plant is antiseptic. Leaves are useful in eye troubles, itch and gonorrhoea. Root extract is applied to mammary abscesses.

14. RICINUS L.

Ricinus communis L., Sp. Pl. 1007. 1753; Hook. f. in Hook. f., Fl. Brit. India 5: 457. 1887; Prain, Bengal Pl. 2 : 952. 1903; Haines, For. Fl. Chota Nagpur 234. 1910 & Bot. Bihar & Orissa pt. 2 : 112. 1921; Airy Shaw in Kew Bull. Add. Ser. IV : 191. 1975 & Kew Bull. 37 : 34. 1982.

Local name : Erandhi.

Evergreen, perennial shrub, to 5 m tall. Leaves 6-10-fid, 7-15 x 7-15 cm; lobes lanceolate, acuminate, thinly pubescent below; petioles to 20 cm long. Panicle terminal, 10-15 cm long. Male flowers : 1.2-1.5 mm

across; calyx cupular, 3-partite; lobes lanceolate, 3.5-4 mm long, acuminate, with inrolled margins; stamens many, in branched fascicles; anther-cells divergent, 3.5-4 mm long; connective mucronate; rudiment of pistil absent. Female flowers : 5-6 mm across; calyx spathaceous, caducous, 5-partite; segments sub-equal, lanceolate, acute, 4-5 mm long; staminodes 0; ovary globose, echinate, 3-celled, 2.5-3 mm in diam., ovule 1 per cell; styles 2-branched; branches covered on inside with stigmatic papillae. Schizocarp 3-lobed, 2-3 cm across. Seeds oblong, shining mottled, smooth, 1-1.2 cm long.

Fl. & Fr.: Almost throughout the year.

Ecology : Cultivated as a source of oil; also found as an escape in waste open places, along irrigation canals, etc.

Distribution : Throughout India. Probably native of N.E. Tropical Africa; now widely cultivated throughout the Tropics.

Specimens examined : Hazaribagh, 105, 729; Jaynagar, 1810.

Uses : Seeds yield Castor oil which is used as cathartic and also for lubrication and illumination. Oil in crude stage is used for dyeing cotton, for making soaps, typewriter ink, imitation leathers and synthetic nylon. Castor cake is used as manure. Poultice of leaves is applied to boils and sores.

15. SEBASTIANIA Spreng.

Sebastiania chamaelea (L.) Muell.-Arg. in DC., Prodr. 15(2) : 1175. 1866; Hook. f. in Hook. f., Fl. Brit. India 5 : 475. 1888; Prain, Bengal Pl. 1 : 955. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 118. 1921.

Tragia chamaelea L., Sp. Pl. 981. 1753.

Erect or ascending, annual, herbs, 30-60 cm tall, woody at base. Stems slender, ribbed or terete, glabrous, numerous from a long thin tap root; branchlets puberulous. Leaves linear-lanceolate or narrowly oblong, acute or obtuse and apiculate at apex, cuneate at base, glabrous, finely serrulate. 5-10 × 0.3-0.5 cm, with a strong midvein prominent beneath; petioles 2.5-3 mm long; stipules ovate, minute, fimbriate. Spikes 2-3 cm long. Bracts

very small, lanceolate, acute, with a small stipitate gland on each side. Male flowers : minute, 1.2-1.5 mm across, in clusters of 3; tepals 3, ovate, ciliate, acuminate 2-2.5 mm long; stamens 3, free, alternating with tepals, exserted; anthers globose. Female flowers : ca. 1 mm across; tepals 3, larger than male, obovate, acute, ciliate, 2-glandular; styles small, undivided. Schizocarp subglobose-oblong, 6-8 mm long; each cocci with 2 vertical rows of warts on back. Seeds oblong, rounded at both ends, yellow, 4-5 mm long.

Fl. & Fr. : Oct. Dec.

Ecology : Very common; in agricultural fields, open grassy places, on thin layer of soil of exposed rocks, forest glades, etc.

Distribution : India : Deccan Peninsula, Orissa, Bihar, Uttar Pradesh. Sri Lanka to Australia and the Pacific.

Specimens examined : Raja Rappa, 373; Pokharia (National Park), 479.

Use : Decoction of plant with ghee is used as tonic; also applied externally to head in vertigo. Leaf-juice is used in diarrhoea.

16. TRAGIA L.

Tragia involucrata L., Sp. Pl. 98. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 465. 1887, p.p.; Prain, Bengal Pl. 2 : 952. 1903; Haines, For. Fl. Chota Nagpur 235. 1910 & Bot. Bihar & Orissa pt. 2 : 115. 1921.

Local name : Barhanta.

Evergreen perennial, covered with spreading stinging hairs. Leaves oblong, ovate-oblong, or elliptic, acuminate at apex, rounded or sub-cordate at base, sharply serrate, almost tomentose beneath when young, hairy and setose when mature, 3-10 x 2-5 cm; petioles 1.2-2 cm long, stipules ovate, acute, auricled at base, 5-6 mm long. Racemes axillary, leaf-opposed or terminal, 2.5-5 cm long. Male flowers : 1.4-1.6 mm across; sepals 3, broadly elliptic or orbicular, concave, glabrous, 1.2-1.5 mm long; petals 0; stamens 3; anther cells contiguous, parallel; pistillode small, 3-fid. Female flowers : 2.5-3 mm across, few; sepals 6, ovate, 1.5-1.8 mm long, sericeous without;

ovary 3-lobed hispid; styles circinate-revolute. Schizocarp 3-lobed, white, hispid or strigosely tomentose, 7-8 mm in diam. Seeds globose, smooth, purple or black, covered with white scales.

Fl. & Fr. : Dec. Apr.

Ecology : Very common; in waste places, roadsides, hedges, among rocks, etc.

Distribution : Throughout India. Himalaya. Myanmar, China, Sri Lanka.

Specimens examined : Hazaribagh, 722; Ramgarh, 540.

Uses : Paste prepared from root is applied for extraction of worms. Plant-extract, mixed with *Ocimum sanctum* (Tulsi) juice is applied to itchy eruptions on skin. Fruit is used for enlarged spleen.

17. TREWIA L.

Trewia nudiflora L., Sp. Pl. 1193. 1753; Hook. f. in Hook. f., Fl. Brit. India 5 : 423. 1887; Prain, Bengal Pl. 2 : 948. 1903; Haines, For. Fl. Chota Nagpur 230. 1910 & Bot. Bihar & Orissa pt. 2 : 105. 1921.

Local name : Gambhar.

Large deciduous tree, to 15 m tall; bark smooth, grey; younger and tender parts covered with cottony wool; older parts glabrous. Leaves opposite, broadly ovate, shortly acuminate at apex, sub-cordate or truncate at base, entire, glabrous, bright-green above, 7-17 x 5-14 cm; petiole 2.5-7 cm long, stipules minute, acute, caducous. Male flowers : 4.5-5 mm across, usually in threes together on slender, bracteolate, articulate pedicels in drooping racemes of 10-20 cm long; sepals 5, ovate, puberulous 2-2.5 mm long, reflexed; stamens many, free; outer anthers introrse, inner anthers extrorse. Female flowers : 2.2-2.5 mm across, usually solitary or 2-3 together on 7-10 cm long peduncles; sepals 3-5, broad, urceolate, caducous; ovary globose, woolly, 2-celled, ca. 2 mm across; styles 2, yellow. Fruit globose, almost woody, tomentose when young, 2.5-4 cm in diam. Seeds rounded on back, smooth, polished, dark-brown.

Fl. : Jan.-Mar. *Fr.* : Oct.-Dec.

Ecology : Not common; along road-sides, river-banks, village surroundings, etc.

Distribution : Hotter parts of India, Himalaya. Myanmar, Indo-China, S. China, Sri Lanka, W. Malesia.

Specimen examined : Ramgarh, 530.

Uses : Wood is used for packing-cases, matches, agricultural implements, yokes, slates and picture frames and toys. Poultice of root is applied to gout and rheumatism.

76. RHAMNACEAE

Key to the Genera

- 1a. Fruiting-calyx hypogynous or perigynous.
Tendrils absent:
- 2a. Fruit samaroid. Climbing or scrambling,
unarmed shrubs ... 2. VENTILAGO
- 2b. Fruit a drupe with a 1-4-celled stone. Trees,
erect or straggling shrubs or lianas, armed
with stipular prickles ... 3. ZIZIPHUS
- 1b. Fruiting-calyx epigynous. Climbing shrubs with
tendrils ... 1. HELINUS

1. HELINUS E. Meyer ex Endl., *nom. cons.*

Helinus lanceolatus Wall. ex Brandis, For. Fl. 574. 1874; Lawson in Hook. f., Fl. Brit. India 1 : 644. 1875; Prain, Bengal Pl. 1 : 335. 1903; Haines, For. Fl. Chota Nagpur 274. 1910 & Bot. Bihar & Orissa pt. 2 : 199. 1921.

Unarmed climbing shrub; branches ridged, puberulous; branchlets ending in a tendril. Leaves lanceolate or ovate-lanceolate, rounded or subcordate at base, acute at apex, glaucous beneath, 3-veined, 4-10 × 1.5-4 cm; petioles 0.5-1.5 cm long; stipules 1-1.2 mm long, ovate-rounded. Inflorescence a peduncled cymose umbel. Peduncle 1-3 cm long. Flowers

4-5 mm in diam.; pedicels 0.4-1.5 cm long. Calyx 3.5-4 mm long; lobes 5, ovate-triangular, acute. Petals 5, pale yellow or greenish-yellow, oblong, folded round the stamens, 1-2 mm long. Stamens 5, equalling the petals. Disk filling the calyx tube, epigynous. Ovary inferior, 3-celled; style 3-cleft; stigmas recurved. Fruit globose, 0.7-1 cm across.

Fl. : Feb. - Apr. *Fr.* : Apr. - June.

Ecology : Not common; in slopes of forests, sides of rocky ravines, etc.

Distribution : India: North-Western Himalaya, from Kashmir to Kumaon, Punjab, Uttar Pradesh, Bihar, Orissa. Nepal.

Specimens examined : National Park, 1161, 2036.

2. VENTILAGO Gaertn.

Ventilago denticulata Willd., Ges. Natur. f. Fr. Neue. Schr. 3 : 417. 1801; DC., Prodr. 2 : 38. 1825; Banerjee & Mukherjee in Ind. For. 96 : 209. 1970.

V. calyculata Tul. in Ann. Sci. Nat., ser., 4, 8 : 124. 1857; Lawson in Hook. f., Fl. Brit. India 2 : 631. 1875; Prain, Bengal Pl. 1 : 334. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 193. 1921.

V. maderaspatana Gaertn. var. *calyculata* King in J. Asiat. Soc. Bengal 65 : 378. 1896; Haines, For. Fl. Chota Nagpur 273. 1910.

V. maderaspatana auct. non Gaertn. : Roxb., Fl. Ind. 2 : 413. 1824.

Local name : Pitti.

Large scandent, unarmed, climbing shrub; branches pubescent. Leaves ovate-oblong to elliptic-oblong, obliquely rounded at base, sub-acute at apex, irregularly crenate-serrate, pubescent, 5-15 x 2.5-7 cm; lateral veins 4-8 pairs, alternate, ascending and converging; petioles to 8 mm long, channelled. Flower-clusters ca. 3 mm in diam., pedicellate, pubescent. Sepals 5, puberulous outside, keeled within, with an incurved pointed apex, ca. 2 mm long. Petals spatulate, obcordate at apex, enclosing the stamens

in bud, *ca.* 1.5 mm long. Stamens as long as petals; connective prolonged. Disk villous. Ovary hairy; styles diverging. Fruit samaroid; divided into a lower globose seed-chamber and upper flat wing; wing oblong, brown or golden, grey-pubescent, terminated by remains of stigma, reticulate, 3-6 cm long and 0.8-1.2 cm broad; seed-chamber 5-6 mm in diam. Seed 1, subglobose, 2.5-3 mm.

Fl. : Sept.-Jan. *Fr.* : Feb.-May.

Ecology : Very common; in forests, sides of rocky ravines, etc.

Distribution : Throughout India. Nepal, Bhutan, Indo-China, West China, Myanmar, Malesia.

Specimens examined : Simaria, 798; Katkamosandi, 1406; Ramgarh, 1921.

Uses : Bark yields a cordage fibre. Sap of bark is used as a cure for deafness. Seeds yield a fatty oil which is used for cooking.

3. ZIZIPHUS Mill.

Key to the Species

- 1a. Straggling shrubs. Fruit 0.4-0.6 cm in diam., turning black when ripe ... 3. *Z. oenoplia*
- 1b. Erect trees or shrubs :
- 2a. Fruit 1.2-2 cm in diam., turning yellow or orange when ripe ... 1. *Z. mauritiana*
- 2b. Fruit 0.7-0.8 cm in diam., turning red when ripe ... 2. *Z. nummularia*

1. *Zizyphus mauritiana* Lam., *Encycl.* 3 : 319. 1789; Santap. in *J. Bombay Nat. Hist. Soc.* 51 : 802. 1953.

Rhamnus jujuba L., *Sp. Pl.* 194. 1753.

Zizyphus jujuba (L.) Gaertn., *Fruct. Sem. Pl.* 1 : 203. 1788, non Mill. 1768; Lawson in *Hook. f., Fl. Brit. India* 1 : 632. 1875; Prain, *Bengal*

Pl. 1 : 333. 1903; Burkill in Rec. Bot. Surv. India 4 : 103. 1910; Haines, For. Fl. Chota Nagpur 269. 1910 & Bot. Bihar & Orissa pt. 2 : 194. 1921.

Local name : Baer.

Large shrub or small tree, to 10 m tall, spiny or sometimes unarmed, with many drooping branches; young branches softly pubescent. Leaves ovate-elliptic, ovate or suborbicular, obliquely rounded or subcordate at base, rounded at apex, irregularly denticulate, glabrous and shining above, rusty-tomentose beneath, basally 5-nerved, convergent, 2.5-6 x 2-4 cm; petioles 6-8 mm long; stipular thorns solitary or in pairs, erect or recurved, to 6 mm long. Flowers 5-6 mm across, borne in 15-20 flowered dense fascicles. Peduncle to 4 mm long. Pedicel shorter than peduncle, hairy. Calyx glabrous within, pubescent outside, divided about halfway down; lobes 5, ovate, 1.2-1.5 mm long. Petals 5, spathulate, white, concave, 1.2-1.5 mm long. Stamens 5, 0.8-1 mm long. Ovary embedded in 10-lobed disk, 2-celled; style 2, united to middle; stigmas bifid. Drupe globose, fleshy, smooth, turning yellow or orange when ripe, 1.2-2 cm in diam.

Fl. : Mar.-Oct. *Fr.* : Jan.-Mar.

Ecology : Very common; in waste places, vacant plots, forests, roadsides, etc.; also planted in gardens.

Distribution : Throughout India. Sri Lanka, Malacca, Afghanistan, Tropical Africa, Malay Archipelago, China, Australia.

Specimens examined : National Park, 73; Chowparan, 1363; Hunterganj, 2124.

Uses : Fruits are eaten fresh, dried, candied or stewed. Kernels are used in nausea, vomiting and for abdominal pain in pregnancy. Seeds are given in diarrhoea. Wood is used for wells, axe- and hoe-handles, yokes, toys, etc.

2. *Ziziphus nummularia* (Burm. f.) Wight & Arn., Prodr. Fl. Ind. Orient. 162. 1834; Lawson in Hook. f., Fl. Brit. India 1 : 632. 1875; Burkill in Rec. Bot. Surv. India 4 : 103. 1910; Haines, Bot. Bihar & Orissa pt. 2 : 195. 1921. *Rhamnus nummularia* Burm. f., Fl. Ind. 67. 1768.

Local name : Jhahrberi.

Small profusely armed shrub, to 4 m tall. Stems divaricately branched, slender, often zigzag. Leaves elliptic to orbicular, rounded at both ends, spinous-serrulate, dark-green and velvety above, grey-tomentose beneath, basally 3-nerved, convergent, 1.2-2 cm across; petiole 1.5-2 mm long; stipular thorns in pairs, one slender, straight and sharp, to 1.2 cm long, other short, recurved, to 4 mm long. Flowers 1.5 mm across, borne in axillary cymes, to 1 cm long. Calyx pubescent without, divided more than half-way down; lobes 5, ovate. Petals 5, spatulate, with convolute margins, longer than stamens. Stamens 5. Ovary 2-celled, embedded in 10-lobed disk with a pit opposite to each lobe; style 2, united to middle. Drupe globose, glabrous, 7-8 mm across, turning red when ripe.

Fl. : Oct.-Dec. *Fr.* : Nov.-Feb.

Ecology : Not common; in forests, near railway-tracks, roadsides, etc.

Distribution : India: Punjab, Gujarat, Western Peninsula, Bihar, Himalaya. Nepal, C. Asia, Sri Lanka, Malasia.

Specimens examined : Jhumri Telaiya, 317.

Uses : Tender parts are grazed by animals. Fruits are edible. Leaves are used in scabies and other cutaneous diseases. Fruits are used in bilious affections.

3. *Ziziphus oenoplia* (L.) Mill., Gard. Dict. ed. 8, 3. 1768; Lawson in Hook. f., Fl. Brit. India 1 : 634. 1875; Prain, Bengal Pl. 1 : 334. 1903; Burkill in Rec. Bot. Surv. India 4 : 103. 1910; Haines, For. Fl. Chota Nagpur 270. 1910 & Bot. Bihar & Orissa pt. 2 : 196. 1921. *Rhamnus oenoplia* L., Sp. Pl. 194. 1753.

Ziziphus albens Roxb., Fl. Ind. 1 : 607. 1820.

Local name : Makai.

Straggling thorny shrub, to 6 m tall. Young branches rusty tomentose. Leaves ovate-lanceolate, asymmetric, obliquely cuneate at base, acute or

subacuminate at apex, denticulate, glabrescent above, appressed fulvous-pubescent beneath, basally 3-nerved, convergent, 2.5-6.5 x 1.5-2.5 cm; petiole to 5 mm long; stipular thorns solitary, recurved, 4-6 mm long. Cymes to 1.2 cm long, 5-8-flowered. Flowers 3-3.5 mm across. Calyxlobes 5, ovate, connate at base, 1.2-1.5 mm long, hairy without. Petals 5, greenish, obovate, 1-1.2 mm long. Stamens 5, 1-1.2 mm long. Ovary embedded in 10-lobed disk, 2-celled; style 2, connate to above middle; stigmas 2-fid. Drupe globose, 4-6 mm across, turning black when ripe.

Fl. : June-Sept. *Fr.* : Nov.-Jan.

Ecology : Very common; in scrub jungles, along roadsides, railway tracts, etc.

Distribution : Throughout the hotter parts of India. Sri Lanka, Malacca, Tropical Asia and Australia.

Specimens examined : National Park, 75; Ramgarh, 530; Chatra 1668.

Uses : Fruits are edible. Roots are given in hyperacidity. Fruits are used for stomach-ache.

77. LEEACEAE

LEEAE van Royen ex L., *nom. cons.*

Leea asiatica (L.) Ridsdale in Manilal, Bot. Hist. Hort. Malab. 189. 1990. *Phytolacca asiatica* L., Sp. Pl. 474. 1753.

L. crispa van Royen ex L., Syst. Nat. ed. 12, 2 : 627. 1767; Lawson in Hook. f., Fl. Brit. India 1 : 655. 1875; Prain, Bengal Pl. 1 : 340. 1903; Haines, For. Fl. Chota Nagpur 279. 1910 & Bot. Bihar & Orissa pt. 2 : 208. 1921.

L. herbacea Buch. - Ham. in Trans. Linn. Soc. 14 : 228. 1823; Prain, Bengal Pl. 1 : 340. 1903; Haines, For. Fl. Chota Nagpur 280. 1910.

L. aspera Edgew. in Trans. Linn. Soc. 20 : 36. 1846, *nom. illegit.*, non. Wall. ex G. Don 1831; Lawson in Hook. f., Fl. Brit. India 1 : 665. 1875; Prain, Bengal Pl. 1 : 340. 1903; Haines, For. Fl. Chota Nagpur 280.

1910 & Bot. Bihar & Orissa pt. 2: 208. 1921; Panigr. in Phytomorphology 28 : 250. 1978.

L. edgeworthii Santap. in Rec. Bot. Surv. India 16 : 54. 1953, *nom. illegit. Superfl.*

L. pumila Kurz in J. Asiat. Soc. Bengal 41 : 302. 1872; Lawson in Hook. f., Fl. Brit. India 1 : 606. 1875.

Semi-herbaceous shrub, to 7 m tall; stems usually fluted and crispately winged. Leaves 1- or 3-foliolate or 1-2-pinnate; petiole 1-4 cm long; petiolar stipule a narrow wing, 1.5-4 x 0.4-0.5 cm long, with narrow scar; rachis 4-12 cm long; usually crispately winged; leaflets broadly ovate-oblong, chartaceous, glabrous or sparsely hairy above, nearly glabrous to densely hairy beneath, rounded to cordate at base, acuminate at apex, deeply crenate to serrate, 5-7-nerved, 10-18 x 5-12 cm; pearl gland globular, sparse; petiolule 0.5-1.5 cm long, winged. Cymes 4-10 cm long. Bracts ovate or lanceolate, 4-6 mm long. Flowers 5-merous. Calyx *ca.* 2 x 3 mm; lobes *ca.* 0.5 x 1.2 mm. Corolla-tube 3-4 mm long including staminodal lobes; corolla-lobes 2.5-3 mm long. Staminodial tube 2-2.5 mm long; upper free part 1.5-2 mm long; lower free part 0.4-0.5 mm long. Stamens free; anthers attached to filaments by a conspicuous boss. Ovary 4-8-celled. Fruits purple-black, 1-1.2 cm in diam. Seeds usually 6, *ca.* 5 x 3 mm.

Fl.: July-Sept. *Fr.*: Nov.-Dec.

Ecology : Common; in forests, valleys and slopes of hills, ravines, etc,

Distribution : India: Western Himalaya, Punjab, Uttar Pradesh, Bihar, West Bengal, Sikkim, Assam, Manipur, Meghalaya, Tripura, Orissa, Central India, Tamilnadu, Karnataka. Bhutan, Nepal, Bangladesh, Myammar, Thailand, Cambodia, Laos, N. and S. Vietnam, China.

Specimens examined : Pratappur, 602; National Park, 2022.

Uses: Fruits are eaten. Root-tubers are used against worms.

78. VITACEAE

Key to the Genera

- 1a. Inflorescence cirriferous. Leaves usually simple.
Berry 2-3-seeded ... 1. AMPELOCISSUS
- 1b. inflorescence not cirriferous :
- 2a. Leaves simple. Berry usually 1-seeded.
Albumen of seed divided into 3 parallel parts ... 3. CISSUS
- 2b. Leaves digitately or pedately 3-12-foliolate.
Berry 1-4-seeded. Albumen of seed not divided
into parallel parts ... 2. CAYRATIA

1. AMPELOCISSUS Planch., *nom. cons.*

- 1a. Disk not furrowed. Leaves 3-5-lobed. Petals red ... 3. *A. tomentosa*
- 1b. Disk 5-furrowed :
- 2a. Leaves 3-7-angled or lobed. Petals deep
reddish-brown. ... 2. *A. latifolia*
- 2b. Leaves neither angled nor lobed, with
coarsely glandular-dentate margins. Petals
greenish-purple ... 1. *A. arnottiana*

*1. ***Ampelocissus arnottiana*** Planch. in DC., Monog. Phan. 5 : 379. 1887; Gamble, Fl. Madras 1 : 230 (165). 1918; Manilal & Sivarajan, Fl. Calicut 68. 1982.

Vitis indica auct. non L. : Lawson in Hook. f., Fl. Brit. India 1 : 653. 1875; Cook, Fl. Bombay 1 : 253. 1902; Duthie, Fl. Upp. Gang. Pl. 1 : 172. 1903.

Local name : Jangli-angur.

Slender climbing shrubs. Stems slender, cylindric, striate, hollow, floccose-woolly; tendrils simple, to 15 cm long, woolly. Leaves broadly ovate, deeply cordate at base with a narrow sinus and rounded lobes, acute to subacuminate at apex, coarsely glandular-dentate, glabrous and shining above, tomentose on veins beneath, 10-22 × 8-20 cm; secondary veins 6-

8 pairs, prominent beneath; petiole 5-8 cm long, densely woolly. Flowers 5-merous, subsessile, hidden in a reddish woolly tomentum, in dense clusters on thick branches of a racemose or paniculate cyme of 5-8 cm long; peduncle usually with a simple tendril at base of cyme. Calyx small, truncate. Petals oblong, greenish-purple, 2-2.5 mm long. Disk 5-furrowed. Berry ovoid-oblong, globose, smooth, purple, 1.5-2 cm in diam.

Fl. & Fr.: Oct. Jan.

Ecology : Not common; in forests, hedges and thickets.

Distribution : India : Uttar Pradesh, Central and Southern India. Sri Lanka.

Specimens examined : Churchu, 689; National Park, 1198.

Uses : Juice of root is used as diuretic and aperient; also used in eye troubles and for ulcers.

2. *Ampelocissus latifolia* (Roxb.) Planch. in J. Vigne Am. 1884: 374. 1884; Gamble, Fl. Madras 1 : 230 (165). 1918; Momiyama in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 93. 1979. *Vitis latifolia* Roxb., Fl. Ind. 1 : 661. 1832; Lawson in Hook. f., Fl. Brit. India 1: 652. 1875; Prain, Bengal Pl. 1: 337. 1903; Haines, For. Fl. Chota Nagpur 276. 1910 & Bot. Bihar & Orissa pt. 2 : 203. 1921.

Vitis montana Lawson in Hook. f., Fl. Brit. India 1 : 652. 1875.

Local name : Panibel.

Large climbing herb; stems finely striate, ± glabrous. Leaves 10-20 cm long and broad, ± orbicular, palmately 3-7-angled or lobed, cordate at base, crenate-serrate or dentate, tomentose beneath when young; main veins 5-7 pairs; petioles 6-10 cm long. Thyrses compact, pyramidal. Peduncles very stout; tendrils slender, forked. Flowers mostly 5-merous. Calyx small. Petals oblong, deep reddish-brown, 1.8-2 mm long, saccate at apex. Disk 5-furrowed. Berry globose, glabrous, black, 0.6-1 cm across. Seeds ellipsoid, 4-7 mm long, rugose.

Fl. & Fr.: June - Oct.

Ecology : Common; in hedges, shrubberies, low scrub jungles, forests, etc.

Distribution : India : West and North-West India, Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Deccan Peninsula. Nepal.

Specimens examined : National Park, 993; Jaynagar, 1520; Ghanghree, 2155.

Uses : Fruits are edible. Juice of tender leaves is used in dental troubles and as detergent for indolent ulcers. Decoction of leaves is used in dysentery.

3. *Ampelocissus tomentosa* (Roth) Planch. in J. Vigne Am. 1884: 374. 1884; Gamble, Fl. Madras 1 : 230 (165). 1918; Ramamoor. in Saldan. & Nicols., Fl. Hassan Dist. 358. 1976. *Vitis tomentosa* Heyne ex Roth, Nov. Pl. Sp. 157. 1821; Lawson in Hook. f., Fl. Brit. India 1 : 650. 1875; Prain, Bengal Pl. 1 : 338. 1903; Haines, For. Fl. Chota Nagpur 276. 1910 & Bot. Bihar & Orissa pt. 2 : 203. 1921.

Local name : Ghora-lidi.

Large climbing herbs; stems densely cinnamomeous woolly. Leaves 8-20 cm long and broad, orbicular, palmately 3-5-lobed, deeply cordate at base, closely serrate, densely brown-tomentose beneath; basal lobes usually rounded; petioles 4-8 cm long. Cymes densely woolly, 5-10 cm long, compact, shortly peduncled; peduncle 2-2.5 cm long; tendril 1-3-forked. Flowers sessile, 5-merous. Calyx woolly outside; teeth triangular. Petals ovate-oblong, red, spreading, glabrous. Disk not furrowed. Berry subglobose, 6-8 mm in diam., black. Seeds obcordate, pitted.

Fr. & Fr. : Aug. - Dec.

Ecology : Very common; in forests, low scrub jungles, along banks of rivers and streams, etc.

Distribution : India : Western Peninsula, Tamilnadu, Orissa, West Bengal, Bihar. Nepal, Sri Lanka.

Specimens examined : Jaynagar, 1500; Tondwa, 1881; Hazaribagh, 2276.

Uses : Roots and bark are used for haemorrhoids. Root-extract is applied in swellings.

2. CAYRATIA JUSS., *nom. cons.*

Key to the Species

- 1a. Leaves usually digitately or sometimes pedately 3-5-foliolate :
- 2a. Leaflets 3, pubescent on both surfaces.
Berry 2-4-seeded, black when ripe ... 3. *C. trifolia* var. *cinerea*
- 2b. Leaflets mostly 5, sometimes 3, glabrous and shining above, pubescent beneath. Berry 1-seeded, red or pink when ripe ... 1. *C. auriculata*
- 1b. Leaves pedately 7-11-foliolate. Berry 2-4-seeded, cream-coloured when ripe ... 2. *C. pedata*

1. *Cayratia auriculata* (Roxb.) Gamble, Fl. Madras 1 : 237 (170). 1918; Matthew & Britto in Matthew, Fl. Tamilnadu Carnatic pt. 1 : 278. 1983. *Cissus auriculata* Roxb., Fl. Ind. 1 : 130. 1820.

Vitis auriculata (Roxb.) Wall. ex Wight, Icon. t. 145. 1839; Lawson in Hook. f., Fl. Brit. India 1 : 658. 1875; Prain, Bengal Pl. 1 : 338. 1903; Haines, For. Fl. Chota Nagpur 277. 1910 & Bot. Bihar & Orissa pt. 2 : 206. 1921.

Large, subsucculent climber; branchlets densely white-pubescent. Tendrils 2-3-fid. Leaves digitately or sometimes pedately 3-5-foliolate; petiole 7-15 cm long; stipules scimitar-shaped or half-orbicular, 2-3.5 cm long; leaflets broadly elliptic or obovate, acute or shortly acuminate at apex, crenate-serrate, shining and glabrous above, pubescent beneath, 6-15 x 3-10 cm; petiolules 1.2-4 cm long. Cymes divaricately branched, longer than petioles; peduncles striate, pubescent; pedicels very short. Calyx pubescent out-side. Petals oblong, hooded at apex, pubescent outside. Berry globose, cherry-like, 1.8-2.2 cm in diam., red or pink when ripe. Seed 1, ellipsoid-subglobose, 1.2-1.5 cm in diam.

Fl. & Fr.: Aug. Dec.

Ecology : Common; in low scrub jungles, near banks of rivers, streams or other water courses.

Distribution : Throughout India. China, Myanmar, Malesia.

Specimens examined : Hazaribagh, 990; Morkachho, 1489; Etkhori, 1868.

2. *Cayratia pedata* (Lam.) Juss. ex Gagnep. in Not. Syst. Paris 1: 346. 1910; Gamble, Fl. Madras 1 : 236 (169). 1918; Rickett & Stafleu in Taxon 8 : 309. 1959. *Cissus pedata* Lam., Encycl. 1 : 31. 1783.

Collumella pedata Lour., Fl. Cochinch. 1 : 85. 1790.

Vitis pedata Vahl ex Wight & Arn., Prodr. Fl. Ind. Orient. 128. 1834; Lawson in Hook. f., Fl. Brit. India 1 : 661. 1875; Prain, Bengal Pl. 1 : 339. 1903; Haines, For. Fl. Chota Nagpur 278. 1910 & Bot. Bihar & Orissa pt. 2 : 206. 1921.

Large climbing herbs or shrubs; branches softly pubescent. Tendrils long, slender, forked at ends. Leaves pedately 7-11-foliolate; petioles 5-10 cm long, hairy or glabrate; leaflets oblong-lanceolate, cordate at base, acute or acuminate at apex, crenate-serrate, softly hairy, 5-20 x 2.5-8 cm; lateral ones unequal-sided, elliptic and sharply acuminate; petiolules variable in length, of terminal leaflets much longer. Cymes divaricate, short-peduncled, nearly as long as petiole. Petals white, ovate. Berry subglobose, 5-6 mm in diam., glabrous, 2-4-seeded, green, turning cream-coloured when ripe. Seeds hemispheric, smooth, with one cavity closed by a membrane on ventral face.

Fl. & Fr. : Aug. Dec.

Ecology : Very common; in waste places, low scrub jungles, hedges and shrubberies, etc.

Distribution : Major parts of India. Bangladesh, Myanmar, Sri Lanka and Malesia.

Specimens examined : Patratu, 1340; Bishnugarh, 1938.

Uses : Leaves are used as astringent and refrigerant. Decoction leaves is used to check uterine reflexes.

3. **Cayratia trifolia** (L.) Domin var. **cinerea** (Lam.) Babu, Herb. Fl. Dehra Dun 108. 1977. *Cissus cinerea* Lam., III. 1 : 332. 1797.

*C. carnos*a (Lam.) Gagnep. var. *cinerea* (Lam.) Gagnep., Not. Syst. 1 : 348. 1911.

Vitis trifolia auct. non L. : Haines, For. Fl. Chota Nagpur 277. 1910 & Bot. Bihar & Orissa pt. 2 : 205. 1921. *p.p.*

*V. carnos*a sensu Wight & Arn. Prodr. Fl. Penin. Ind. Orient. 127. 1834, *p.p.*, non *Cissus carnosus* Roxb.; Lawson in Hook. f., Fl. Brit. India 1 : 127. 1875, *p.p.*

Local name : Amar-lati.

Slender climbing herbs; stems succulent, compressed; branches brittle, striate, pubescent when young. Tendrils short, slender, 2-3 times forked, usually ending in adhesive disks. Leaves digitately 3-foliolate; petioles 2-4 cm long; leaflets thick, elliptic, tately 3-foliolate; petioles 2-4 cm long; leaflets thick, elliptic, obovate or broadly ovate, cuneate or subcordate at base, acute or subacuminate at apex, crenate-dentate, pubescent on both surfaces, 4-7 × 2-3.5 cm; petiolules 0.4-1 cm long, of terminal leaflet longer; stipules ovate, acute, small. Cymes lax, divaricate, pubescent, long-peduncled, 5-9 cm in diam.; peduncles 8-12 cm long; pedicels 2.5-3 mm long. Calyx 0.5-0.7 mm long, pubescent outside. Petals ovate-oblong, greenish-white, 2.5-3 mm long, saccate at tip, pubescent outside. Style 1-1.2 mm long, usually pink. Berry depressed-globose, 1-1.5 cm in diam., glabrous, black when ripe, 2-4-seeded. Seeds triangular, 4-5 mm long.

Fr. & Fr. : May - Nov.

Ecology : Common; in roadsides, waste places, hedges, on rocks, old walls, etc.

Distribution : Throughout India. Bangladesh, Sri Lanka, Java.

Specimens examined : Tandwa, 1436; Simaria, 1629.

Uses : Roots are used as astringent; ground roots with pepper are applied to boils. Poultice of leaves is applied to yoke-sore of bullocks.

Note : According to Babu (*l.c.*), the type variety differs from the var. *cinerea* by glabrous leaves and comparatively shorter petals and fruits.

3. *Cissus* L.

Cissus repanda Vahl, *Symb.* 3 : 18. 1794; Gamble, *Fl. Madras* 1 : 234 (167). 1918; Deb, *Fl. Tripura* 1 : 413. 1981.

Vitis repanda (Vahl) Wight & Arn., *Prodr. Fl. Ind. Orient.* 125. 1834; Lawson in Hook. f., *Fl. Brit. India* 1 : 648. 1875; Prain, *Bengal Pl.* 1 : 338. 1903; Haines, *For. Fl. Chota Nagpur* 275. 1910 & *Bot. Bihar & Orissa* pt. 2 : 201. 1921.

Local name : Pani-bel.

Large climbing herbs; branches ferruginous-tomentose when young, becoming glabrescent with maturity. Tendrils bifid. Leaves broadly ovate to suborbicular, deeply cordate at base, acuminate at apex, usually repandly crenate-dentate or inciso-serrate, when young densely tomentose beneath and less so above, when mature becoming glabrous on both sides, 10-20 x 7-16 cm; petioles 10-20 cm long; stipules oblong, rounded at apex, 5-7 mm long. Thyrses long-peduncled, tomentose, bearing 3-5 compound umbellately branched cymes; peduncles 4-10 cm long. Calyx 1.5-2 mm across, hairy outside. Petals pink, ovate-oblong, expanding widely and reflexed, boat-shaped at apex, 2-2.2 mm long. Berry pyriform, mucronate, 0.8-1 cm long. Seed obovoid, smooth 6-7 mm long.

Fl. & Fr. : Apr. - July.

Ecology : Not common; in valleys and damp jungles.

Distribution : Throughout India. Bangladesh, Sri Lanka.

Specimens examined : Satganwa, 591; Barkattwa, 1703.

79. LINACEAE

LINUM L.

Linum usitatissimum L., Sp. Pl. 277. 1753; Prain, Bengal Pl. 1 : 289. 1903; Haines, For. Fl. Chota Nagpur 236. 1910 & Bot. Bihar & Orissa pt. 2 : 150. 1921; Hazra in Thothathri, Fasc. Fl. India 13 : 12. 1983.

Local names : Alsi, Tisi.

Erect, annual herbs, 60-120 cm tall. Stems terete, simple below, corymbosely branched above. Leaves subsessile, linear-lanceolate, acute, glabrous, 1.5-3.5 x 0.2-0.7 cm; stipules absent. Flowers 5-merous, terminal and leaf-opposed, collected into leafy corymb; pedicels 1-4 cm long. Sepals elliptic, acute, 0.6-0.9 cm long. Petals broadly obovate or rounded, blue-purple or white, dentate-crenate, 0.8-1.5 cm long. Fertile stamens 5, alternipetalous; staminodes 5, minute, opposite to petals. Stigmas clavate, usually cohering. Fruit globose, septicidal. Seeds compressed, shining brown; testa swelling and slimy when moistened.

Fl. & Fr. : Jan. Apr.

Ecology : Common; cultivated in agricultural fields; also found as an escape in waste places, river-beds, road-sides, cultivated fields, etc.

Distribution : Cultivated throughout India particularly in Rajasthan, Uttar Pradesh, Bihar, West Bengal, Orissa, Madhya Pradesh, Maharashtra, etc. Indigenous in localities situated between the Persian Gulf, the Caspian and Black Seas, cultivated and/or escapes in almost all parts of the World.

Specimens examined : Hazaribagh, 111 ; Chowparan, 1359.

Uses : Seeds yield an oil which is used in paint and varnish industry; oil-cake is used as a protein supplement for live-stock.

80. MALPIGHIACEAE

HIPTAGE Gaertn.

Hiptage benghalensis (L.) Kurz in J. Asiat. Soc. Bengal 43(2) : 136. 1874; Jacobs in Steenis, Fl. Males. Ser. 1, 5 : 132. 1955. *Banisteria benghalensis* L., Sp. Pl. 427. 1753.

Hiptage madablota Gaertn., Fruct. Sem. Pl. 2 : 169, t. 116. f. 4. 1790; Hook. f. in Hook. f., Fl. Brit. India 1: 418. 1874; Prain, Bengal Pl. 1 : 290. 1903; Haines, For. Fl. Chota Nagpur 264. 1910 & Bot. Bihar & Orissa pt. 2 : 152. 1921.

Molina racemosa Lam. ex Cav., Diss. 9 : 435, t. 362. 1790.

Gaertnera racemosa (Cav.) Roxb., Pl. Corom. 1 : 19, t. 18. 1795.

Local name : Madhivilata, Madhmalti.

Climber, to 30 m. Young branches and inflorescence hoary or appressed-pubescent. Leaves oblong or ovate-lanceolate, acuminate or rarely acute at apex, rounded at base, entire, pink or reddish and with short-hairs when young, getting green and subcoriaceous when older, 10-15 x 4-6cm, glabrous and shining above, minutely appressed pubescent beneath ; petioles 0.7-1 cm long. Racemes 10-20 cm long. Bracts lanceolate, 2-5 mm long. Pedicels thickened towards the flower, articulated about middle, 1-1.8 cm long, to 3 cm long in fruit, 2-bracteolate. Calycine gland convex, elliptic to lanceolate, half on the calyx, half decurrent on the pedicel. Sepals ovate to elliptic, persistent, 2-5 mm long. Petals white, yellow at base, orbicular to elliptic, clawed, hairy outside, with fimbriate margins, inner one with 2 outgrowths at base. Stamens 10; staminal filaments connate at base, shorter filaments 3-5 mm long, larger one 0.8-1.2 cm long. Ovary 3-celled. Samaras variable in size and shape, dark reddish when fresh, shiny brown when dry; middle wing elliptic or obovate, sometimes divided into 2 lobes, 5-6 x 0.8-1.2 cm, lateral ones linear-oblong 2-2.5 x 0.5-1 cm. Seed solitary, subglobose, to 1 cm across.

Fl. : Feb. - Mar. *Fr.* : Apr. - May.

Ecology : Common; generally cultivated in gardens, near houses, etc.; also abundant by stream banks, along nalas and ravines, etc.

Distribution : Throughout India. Sri Lanka, South China, Formosa, Malesia and other tropical countries.

Specimens examined : Hazaribagh, 1572; Ghanghree, 2151.

Uses : Leaf-extract is used in cutaneous diseases, also used as insecticidal and for scabies. Plant is used in chronic rheumatism and asthma. Leaves are used as fodder.

81. POLYGALACEAE

Key to the Genera

- 1a. Inflorescence a raceme. Sepals unequal ; inner 2 larger and usually petaloid. Keel petal bearded. Stamens 8. Seeds arillate or carunculate ... 1. POLYGALA
- 1b. Inflorescence a spike. Sepals nearly equal, all petaloid. Keel petal not bearded. Stamens 4 or 5. Seeds without aril or caruncle ... 2. SALOMONIA

1. POLYGALA L.

Polygala arvensis Willd., Sp. Pl. 3 : 876. 1802; Burt in Notes Roy. Bot. Gard. Edinburgh 32 : 404. 1973.

P. chinensis auct. non L.: Benn. in Hook. f., Fl. Brit. India 1 : 204. 1872, *p.p.*; Prain, Bengal Pl. 1 : 235. 1903, *p.p.*; Haines, For. Fl. Chota Nagpur. 264. 1910 & Bot. Bihar & Orissa pt. 2 : 41. 1921, *p.p.*; Mukerjee in Bull. Bot. Soc. Bengal 12 : 38. 1958; Adema in Blumea 14: 269. 1966.

Local names : Meradu, Miragu.

Erect or ascending or semiprostrate, branched, annual herbs, 5-25 cm tall. Stems terete, puberulous. Leaves shortly petioled, obovate, elliptic or lanceolate, attenuate at base, acute and apiculate at apex, 1-nerved, 2-20 x 1-7 mm. Racemes extra-axillary, several on stem or twig, shorter than leaves, few flowered, 2-10 mm. Bracts caducous. Bracteoles ovate, persistent. Pedicel 1-1.5 mm long. Outer 3 sepals ovate, with ciliate margins, sometimes purple-tinged; inner two wing-like, with ciliate or smooth margins, 5-nerved. Petals 3, blue to violet; lateral ones asymmetric, obtriangular, shallow-emarginate, shorter than keel petal; keel petal with straight, finger-like appendages, to 2.5 mm long. Stamens 8; staminal sheath to 1.5 mm long, with 2 single filaments and 2 bundles of 3 connate filaments. Ovary compressed, obcordate, with ciliate margin; style emerging from cleft of ovary. Capsule *ca.* 3 x 3 mm. Seeds obovate-oblong, black, hairy, to 2.5 mm long.

Fl. & Fr. : July - Nov.

Ecology : Very common; in grasslands, waste places, roadsides, forests, etc.

Distribution : Throughout India. Tropical Asia, Australia.

Specimens examined : Hazaribagh, 281; Telaiya Dám, 629; Tandwa, 1427.

Uses: Tender leaves are eaten by poor people. Infusion of leaves is given in asthma, bronchitis and catarrhal affections. Roots are used for fever.

Note : Burt (l.c.) pointed out that *P. arvensis* Willd. was misidentified as *P. chinensis* L. which was once known under the name *P. glomerata* Lour. Although *P. chinensis* is the older name for *P. glomerata*, the adoption of that name will certainly create confusion. Therefore, he rejected that name under Art. 69 of ICBN and adopted *P. glomerata* Lour. as correct name. Sumithraarachchi (in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 314. 1987), however, considered *P. arvensis* Willd. and *P. chinensis* L. as conspecific and adopted the latter as correct name. *P. glomerata* Lour. is treated by him as another distinct taxon.

2. SALOMONIA LOUR.

Salomonias ciliata (L.) DC., Prodr. 1: 334. 1824; Benn. in Hook. f., Fl. Brit. India 1 : 206. 1872; Merr. in Philipp. J. Sci. 7 : 237. 1912; Lauen. in Notes Roy. Bot. Gard. Edinburgh 26: 344. 1964; Sumithraarachchi in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6 : 316. 1987. *Polygala ciliata* L., Sp. Pl. 705. 1753.

Salomonias oblongifolia DC., Prodr. 1 : 334. 1824; Benn. in Hook. f., Fl. Brit. India 1 : 207. 1872; Prain, Bengal Pl. 1 : 233. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 43. 1921.

Erect, simple or branched annual, to 15 cm tall. Stems fluted, usually glabrous. Leaves elliptic, sometimes cordate, truncate or cordate at base, acute at apex, ciliate or not, 0.3-1 x 0.2-0.5 cm. Spikes to 8 cm long, ascending. Flowers crowded, pink; bracteole linear-lanceolate, ca. 0.15

cm long. Sepals 5, to 0.15 cm long. Lateral petals 2, lanceolate, to 0.18 cm long, adnate to boat-shaped keel petal, usually rolled; keel petal to 0.3 cm long. Staminal sheath to 0.2 cm long; anther-lobes dehiscence by apical slits. Ovary emerginate at apex, with ciliate margin; style curved; stigma emerging well above level of anthers. Style to 0.18 cm long. Capsule broadly obcordate, *ca.* 0.1 x 0.2 cm; seeds round, black, 0.05 cm in diam.

Fl. & Fr. : July - Oct.

Ecology : Not common ; in swampy areas, grassy localities of forests, etc.

Distribution : India : Subtropical Himalaya, Uttar Pradesh, Bihar, West Bengal, Sikkim, Orissa, Eastern and Western Penninsulas. Nepal, Bangladesh, Sri Lanka, Indo-Malaysia to Torpical Australia.

Specimens examined : Pratappur, 916 ; Ghanghree, 2166.

82. SAPINDACEAE

Key to the Genera

- 1a. Climbing herbs with tendrils. Leaves biternate.
Capsule membranous, inflated ... 1. CARDIOSPERMUM
- 1b. Trees or erect shrubs. Leaves not biternate:
 - 2a. Ovules two in each cell of ovary. Leaves simple. Capsule much compressed, winged ... 3. DODONAEA
 - 2b. Ovules solitary in each cell of ovary :
 - 3a. Seeds arillate :
 - 4a. Ovary entire. Petals absent ... 6. SCHLEICHERA
 - 4b. Ovary 2-3-lobed :
 - 5a. Petals present ... 2. DIMOCARPUS
 - 5b. Petals absent ... 4. LITCHI
 - 3b. Seeds without aril ... 5. SAPINDUS

1. *CARDIOSPERMUM* L.

***Cardiospermum halicacabum* L.**, Sp. Pl. 366. 1753; Hiern. in Hook. f., Fl. Brit. India 1 : 670. 1875; Prain, Bengal Pl. 1 : 342. 1903; Haines, For. Fl. Chota Nagpur 262. 1910 & Bot. Bihar & Orissa pt. 2 : 221. 1921; Mukerjee in J. Econ. Tax. Bot. 1 : 80. 1980.

Local name : Kanphuti.

Annual-perennial, wiry, sarmentose or climbing, nearly glabrous or thinly pubescent herbs. Branches slender, striate. Leaves deltoid, 2-ternate; uppermost ones usually 3-foliolate; petioles 1-5 cm long; leaflets lanceolate-oblong to ovate, decurrent on petiole, acute or obtuse and mucronate at apex, pinnati-lobed to incisoserrate, glabrous except hairy nerves beneath, 1-6 x 0.5-3 cm. Inflorescences axillary, 2-tendriferous at base, with 3 racemiform branches. Flowers 3-4 mm across; peduncles slender, stiff, 3-10 cm long. Pedicels very slender, 0.4-1 cm long. Outer 2 sepals flat, rounded, minutely hairy on back, *ca.* 1.5 x 1.2 mm ; inner 2 larger than outer, 2-grooved, membranous, *ca.* 3 x 2 mm. Petals 4, pairwise approximate, white, obovate-spathulate, retuse, with scales on inner sides of their bases, *ca.* 3 mm long. Stamens 8, unilateral; staminal filaments 1.5-2 mm long. Pistillode in male minute. Ovary hairy on angles; cells 3, 1-ovuled; style very short, with 3 linear branches. Capsules shortly stalked, subglobose or depressed pyriform, short-hairy, winged at angles, loculicidally 3-valved, 1.5-2 x 2-2.6 cm. Seeds globose, smooth, glabrous, black, 4-6 mm in diam.

Fl. & Fr. : May - Nov.

Ecology : Common; in scrub jungles, hedges, thickets, forest edges, etc.

Distribution : Throughout India. Tropical and Subtropical Africa, America, Malacca, Sri Lanka and Pakistan.

Specimens examined : Ramgarh, 552 ; Chatra, 832.

Uses: Roots are diuretic, diaphoretic, emetic and laxative. Plant is used for rheumatism,, lumbago and nervous diseases.

Note : Adelbert (in *Blumea* 6 : 322. 1948) recognised a variety viz. var. *luridum* (Bl.) Adelb. on the basis of size of fruit. The typical variety has fruits of 1.5-2 x 2-2.7 cm, while the var. *luridum* bears fruits of ca. 3 x 3.5 cm size. The specimen of this area is referable to typical variety.

2. DIMOCARPUS Lour.

Dimocarpus longan Lour., Fl. Cochinch. 233. 1790; Leenh. in *Blumea* 19 : 122. 1971.

Euphoria longana Lam., Encycl. 3 : 574. 1792.

Nephelium longana (Lam.) Camb., Mem. Mus. Hist. Nat. Paris 18: 30. 1829; Hiern in Hook. f., Fl. Brit. India 1 : 688. 1875; Prain, Bengal Pl. 1 : 346. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 214. 1921.

Euphoria longan (Lour.) Steud., Nomencl. Bot. 1 : 328. 1921; Mukerjee in J. Econ. Tax. Bot. 1 : 80. 1980.

Local name : Anshphal.

Trees, to 20 m tall. Branches dark-brown, warty-lenticellate. Leaves 4-5-jugate; rachis 10-35 cm long; petiole terete, 3-10 cm long; petiolule 2-10 mm long; leaflets subopposite, ovate-lanceolate, obliquely cuneate at base, obtuse to shortly acuminate at apex, repand, glabrous, shining, 8-25 x 1.5-6.5 cm. Inflorescences terminal and axillary, puberulent; cymules 1-3-flowered. Flowers 4-6 mm across. Calyx tomentose on both surfaces, deeply 5 lobed. Petals 5, spatulate, yellowish-white, about equalling calyx. Disk tomentose. Stamens included in female flowers, shortly exerted in male. Ovary 2-3-lobed and locular; ovule 1 per locule; stigma-lobes spreading. Fruit globose, reddish or purple, tubercled, 1.2-2 cm in diam. Seeds globose, enclosed by pulpy aril.

Fl. : Mar.-Apr. *Fr.* : Oct.-Dec.

Ecology : Not common; planted in garden, also found in forests, along roadsides, etc.

Distribution : India : Native of S.W. India, also occurs wildy in forests of Western Ghats, Assam and Meghalaya, cultivated as an

ornamental or shade tree in almost all parts of the country. Sri Lanka, Myanmar, Thailand, Cambodia, N. Vietnam, China, Taiwan, Hainan, Malesia, Java, Borneo.

Specimens examined : Chatra, 835; Hazaribagh, 1715.

Uses : Fruits are eaten fresh, dried or canned. Wood is used for furniture and agricultural implements. Arit is useful for tonic and refrigerant.

3. DODONAEA Mill.

Dodonaea angustifolia L. f., Suppl. Pl. 218. 1782; Leenh. in Blumea 28 : 280. 1983.

D. burmanniana DC., Prodr. 1: 616. 1824; Wight & Arn., Prodr. Fl. Ind. Orient. 114. 1834.

Dodonaea viscosa auct. non (L.) Jacq.: Hiern in Hook. f., Fl. Brit. India 1 : 697. 1875, *p.p.*; Prain, Bengal Pl. 1 : 347. 1903, *p.p.*; Haines, Bot. Bihar & Orissa pt. 2 : 217. 1921; Mukerjee in J. Econ. Tax. Bot. 1: 80. 1980.

Local names: Sinatha, Aliar.

Evergreen shrub, to 5 m tall branchlets glabrous or short-hairy. Leaves oblong-lanceolate or obovate-oblong, with tapering, shortly decurrent base, acute or obtuse at apex, with recurved margins, glabrous, or short-hairy on midrib beneath, 2.5-12 x 0.5-3 cm. Inflorescences 2-6 cm long. Pedicels 0.2-1 cm long. Calyx-segments oval or ovate-oblong, obtuse, short-hairy at top, on back and along margins, 0.2-0.3 cm long. Corolla absent. Anthers quadrangular, 0.15-0.2 cm long. Disk in bisexual and female accrescent. Ovary glabrous or pubescent. Capsule compressed and orbicular or sharply trigonous, emerginate at top and base, with 2-3-membranous veined wings, septifragally 2-3-valved. 1.5-2.5 cm in diam. Seeds globose, black, 0.35-0.4 cm in diam.

Fl. : Nov. - Jan. *Fr.* : Sept. - Nov.

Ecology : Common; grown in garden as a hedge plant and ornamental, also self-grown along river-banks.

Distribution : Throughout India, Pakistan, Australia, Java, S. Africa, N. America, China and Sri Lanka.

Specimens examined : Koderma, 880; National Park, 1172; Hunterganj, 1664.

Uses: Wood is used for making tool-handles and walking sticks. Leaves are used as febrifuge and also on burns, swellings and wounds.

4. LITCHI Sonn.

Litchi chinensis Sonn., Voy. Ind. 2 : 230. pl. 129. 1782; Radlkofer in Pfl-reich. 98 : 917. 1932; Leenh. in Blumea 24 : 398. 1978.

Nephelium litchi Camb. in Mem. Mus. Hist. Nat. Paris 18 : 30. 1829; Hiern in Hook. f., Fl. Brit. India 1 : 687. 1875; Prain, Bengal Pl. 1: 346. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 214. 1921.

Local name : Lichi.

Small tree, 7-15 m tall. Leaflets 2-6 pairs, opposite or alternate, oblong-lanceolate or ovate, cuneate at base, acuminate at apex, glabrous, 5-15 cm long. Flowers minute, numerous, in terminal pyramidal panicles. Calyx shallowly lobed. Corolla absent. Disk annular. Stamens straight, far exerted, incurved in bud. Ovary 2-celled, compressed-silky, one lobe usually developing in fruit; style with 2 recurved lobes in fertile flowers but undivided in male flowers. Schizocarps red or pink when ripe, globose, covered with angular-contiguous, mucronate tubercles, 2.5-3.5 cm in diam. Seed 1, 1.5-2 cm long, oblong-elliptic, brownish. Aril fleshy, white, adnate at base to seed.

Fl. Feb. Mar. *Fr.*: May - June.

Ecology : Common; cultivated in gardens; also found in villages, roadsides, etc.

Distribution: Throughout India, Sri Lanka, South China.

Specimens examined : Ichak, 319; Hazaribagh, 1482.

Uses: Delicious fleshy and sweet arils of ripe fruits are eaten as such or canned. Seeds are used as anodyne in neuralgic disorders and orchitis.

5. SAPINDUS L.

Key to the Species

- 1a. Leaflets oblong or obovate-oblong, rounded or emarginate at apex ... 1. *S. emarginatus*
- 1b. Leaflets obliquely lanceolate or elliptic-lanceolate, acuminate at apex ... 2. *S. laurifolia*

Note : Hiern (*l.c.*) followed by Prain (*l.c.*) treated *S. emarginata* and *S. laurifolia* as conspecific under the name *S. trifoliata* L. However, Gamble (*l.c.*), Haines (*l.c.*), Santapau (Fl. Khandala ed. 3, 49. 1967), Gandhi (*l.c.*), Mukherjee (*l.c.*) and others kept them as distinct. Gandhi (*l.c.*) has also viewed to avoid the earliest name *S. trifoliata* from being used as correct name for *S. emarginata* as the name *S. trifoliata* is a *nomen ambiguum*.

1. ***Sapindus emarginatus*** Vahl, Symb. Bot. 3 : 54. 1794; Gamble, Fl. Madras 1 : 250 (178). 1918; Haines, Bot. Bihar & Orissa pt. 2 : 215. 1921; Mukerjee in J. Econ. Tax. Bot. 1 : 81. 1980.

S. trifoliata L., Sp. Pl. 367. 1753, *nom. ambig.*; Hiern. in Hook. f., Fl. Brit. India 1 : 682. 1875, *p.p.*; Prain, Bengal Pl. 1 : 344. 1903.

S. laurifolius Vahl var. *emarginatus* (Vahl) Cooke, Fl. Bombay Pr. 1 : 194. 1903.

Local name : Ritha.

Tree, to 15 m tall; young parts tomentose. Leaf-rachis 5-12 cm long; leaflets 2-3 pairs, oblong or obovate-oblong, rounded at base, rounded or emarginate at apex, not shining, glabrous above, pubescent beneath, 6-15 × 2.5-8 cm; secondary veins 7-10 pairs, running close to margin, raised on both sides; petiolules 3-6 mm long. Panicles dense, terminal, shorter than leaves. Sepals 5, oblong or ovate, tomentose. Petals 5, lanceolate, long-clawed, densely yellow-hairy outside, fringed, 3-4 mm long, with 2

inflected woolly tufts on margin representing the scale. Fruit 2-3-lobed, tomentose when young, yellow-brown, glabrescent and wrinkled when ripe, 1.5-2 cm in diam; cocci globose, 1-seeded. Seed round, blackish, smooth, 7-10 mm in diam.

Fl.: Nov.-Jan. *Fr.*: Mar.-June.

Ecology : Common; in roadsides, villages near habitational sides, forests, etc.

Distribution : India : West Bengal, Bihar, Orissa, Uttar Pradesh, Deccan Peninsula. Myanmar, Sri Lanka.

Specimen examined : Hazaribagh, 1204.

Uses : Fruits and root-bark is saponaceous and used as detergent; also used as fish-poison. Fruits are emetic, tonic, astringent and anthelmintic, used in asthma, colic due to indigestion, diarrhoea, cholera, tuberculosis, paralysis of limbs, and lumbago.

2. *Sapindus laurifolia* Vahl, *Symb.* 3 : 54. 1794; Gamble, *Fl. Madras* 1 : 250(178). 1918 ('laurifolius'); Gandhi in Saldan. & Nicols., *Fl. Hassan Dist.* 368. 1976; Mukerjee in *J. Econ. Tax. Bot.* 1 : 81. 1980.

S. trifoliata auct. non Linn. : Hiern. in Hook. f., *Fl. Brit. India* 1 : 682. 1875. *p.p.*; Prain, *Bengal Pl.* 1 : 344. 1903; Haines, *Bot. Bihar & Orissa* pt. 2 : 215. 1921.

Local name : Ritha.

Tree, to 12 m tall. Leaflets 2-3 pairs, subopposite, obliquely lanceolate or elliptic-lanceolate, cuneate or subattenuate at base, acuminate at apex, glabrous and shining above, nearly glabrous or minutely pubescent beneath, 7-17 x 2.5-8 cm; secondary veins 8-10 pairs; petiolules 3-4 mm long. Panicles terminal, rusty pubescent, dense, shorter than leaves; male flowers many, bisexual ones few. Sepals 5, ovate-roundish, fulvous-pubescent outside 3.5-4 mm in diam. Petals lanceolate, white-villous on both sides, short-clawed, narrower than sepals; scales usually 2, minuate, attached at each side of petal, sometimes 0. Disk with a fleshy hirsute margin. Anthers apiculate. Fruit 2-3-lobed, velvety-ferruginous when young,

glabrescent and wrinkled when ripe; cocci globose, 1-seeded. Seed blackish, smooth, 7-10 mm in diam.

Fl.: Dec. Feb. *Fr.*: Mar. - May.

Ecology : Common; in roadsides, villages near habitational sides, etc.

Distribution : India : West Bengal, Bihar, Orissa, Uttar Pradesh, Deccan Peninsula and elsewhere in the country. Sri Lanka, Bangladesh.

Specimen examined : Hazaribagh, 1211.

Uses : Same as those of *S. emarginata*.

6. SCHLEICHERA Willd., *nom. cons.*

Schleichera oleosa (Lour.) Oken, Allg. Naturgesch. 3(2) : 1341. 1841; Merr. in J. Arnold Arb. 31 : 284. 1950; Benth., Tr. Calcutta 121. 1961; Sutton in Hara & Williams, Enum. Fl. Pl. Nepal 2 : 97. 1979; Mukerjee in J. Econ. Tax. Bot. 1 : 81. 1980.

S. trijuga Willd., Sp. Pl. 4 : 1096. 1806; Hiern in Hook. f., Fl. Brit. India 1 : 681. 1875; Prain, Bengal Pl. 1 : 345. 1903; Haines, For. Fl. Chota Nagpur 261. 1910 & Bot. Bihar and Orissa pt. 2 : 213. 1921.

Local name : Kusum.

Large, deciduous tree, to 20 m tall; bark thin, smooth, grey. Leaves 20-40 cm long; leaflets ± opposite, sessile, coriaceous, elliptic or oblong, cuneate-subcordate as base, obtuse-rounded at apex, entire, of lowest pair 5-8 × 2.5-6 cm of terminal pair 10-22 × 4-10 cm. Racemes 5-10 cm long, interrupted, usually branched, axillary or below leaves. Calyx-lobes 5, cream-yellowish, triangular, ovate, 0.8-1 mm long. Petals absent. Disk flat, with wavy margins. Stamens 6-8, inserted within disk; filaments 1.2-1.5 mm long, equal, free, pilose; anthers oblong. Ovary narrowed to a rigid style; stigma lobed. Pistillode small. Fruit 2.5-3 cm long, with a sharp point, slightly muricate. Seeds 1 or 2, ovoid, compressed, brown, 1.2-1.5 cm long.

Fl. : Feb.-Mar. *Fr.*: July-Aug.

Ecology : Common; in forests, roadsides, etc.

Distribution : Throughout India. Sri Lanka, Java, Timor.

Specimens examined : Patratu, 573; Raja Rappa, 858.

Uses : The tree is an important host for lac. Wood is used for oil and sugar mills, rice pounders, pestles, axles, shafts, mortars, agricultural implements and tool-handles. Timber is suitable for construction and cabinet-work. It is a good fuel and makes excellent charcoal. Seeds yield an oil which is used for massage in rheumatism. Bark is used in applications for pain in back, inflammations and ulcers.

83. BURSERACEAE

Key to the Genera

- 1a. Drupe trigonous, valvately dehiscent; pyrenes separating. Calyx 5-toothed. Disk fleshy, annular. Flowers appearing when the tree in leafless condition ... 1. **BOSWELLIA**
- 1b. Drupe globose or ovoid, indehiscent; pyrenes not separating :
- 2a. Calyx urceolate, 5-fid. Disk thin, lining the calyx-tube. Flowers appearing when the tree in leafless condition ... 3. **GARUGA**
- 2b. Calyx not urceolate, 4-6-toothed. Disk small, annular. Flowers appearing on new leafy shoots ... 2. **BURSERIA**

1. **BOSWELLIA** Roxb.

Boswellia serrata Roxb. ex Colebr. in *Asiat. Res.* 9 : 379, t. 5. 1807; Benn. in *Hook. f., Fl. Brit. India* 1 : 528 1961; Prain, *Bengal Pl.* 1: 310. 1903; Haines, *For. Fl. Chota Nagpur* 241. 1910 & *Bot. Bihar & Orissa* pt. 2 : 172. 1921.

B. glabra Roxb., *Pl. Corom.* 3: 4, t. 207. 1811; Gamble, *Fl. Madras* 1 : 168 (120). 1915.

B. serrata Roxb. ex Colebr. var. *glabra* (Roxb.) Benn. in *Hook.f., Fl. Brit. India* 1 : 528. 1875.

Local name : Salai, Sali, Salga.

Moderate-sized tree, to 10 m tall with grey bark peeling off in thin flakes and pubescent branchlets, Leaves terminally clustered, to 45 cm long with densely tomentose rachis; leaflets 9-16 pairs, inequilateral, lanceolate or ovate-lanceolate, thin coriaceous, sub-acute or obtuse at apex, obliquely cuneate at base, coarsely crenate-serrate, glaucous beneath, pubescent on nerves above, 2.5-7.5 x 1.2-3 cm. Racemes 10-20 cm long, pubescent. Flowers 7-8 mm across; bracts subulate pedicels 6-8 mm long. Calyx-lobes 5, ovate-triangular, pubescent outside, to 1.2 mm long. Petals 5, white ovate-oblong, with thickened base, pubescent outside, to 6.5 mm long. Stamens 10, 5 longer and 5 shorter, inserted at base of disk. Anthers introrse, sagittate. Ovary ovoid, 3-celled, across; ovules 2 in each cell, pendulous; style grooved. Drupe to 1.2 x 0.8 cm, splitting into 3 valves and with 3-winged hard pyrenes.

Fl. : Jan. Mar. *Fr.* : May - June.

Ecology : Very common; on slopes of dry hills.

Distribution: India : Western Himalaya, Central India, Bihar, West Bengal, Deccan Peninsula.

Specimens examined : National Park, 432; Ghanghree, 1302; Morkachho, 1958.

Uses : Plant exudes a golden yellow gum-resin. An antiseptic lotion is prepared from its bark which is applied externally on wounds. Decoction of bark-chips is given in stomachic pain. Wood is used for plywood, hard boards, packing cases, toys, etc. Bark is used by local people in diarrhoea and skin troubles.

2. BURSERA Jacq. ex L., *nom. cons*

Bursera serrata Wall. ex Colebr. in Trans. Linn. Soc. 15 : 316, t. 4. 1827; Benn. in Hook. f., Fl. Brit. India 1: 530. 1875; Prain, Bengal Pl. 1 : 311. 1903; Haines, For. Fl. Chota Nagpur 240. 1910 & Bot. Bihar & Orissa pt. 2 : 171. 1921.

Protium serratum (Wall. ex Colebr.) Engl. in DC., Monogr. Phan. 4: 88. 1883.

Medium-sized tree, to 12 m tall; branchlets pubescent. Leaves imparipinnate, 15-30 cm long; petiolules 0.6-1.2 cm long; leaflets 3-4 pairs, opposite, ovate-oblong, narrowed at base, acuminate-caudate at apex, entire or \pm serrulate, pubescent beneath specially on nerves, 7-1.4 x 3-6 cm. Panicles lax, much-branched, shorter than leaves. Flowers hermaphrodite, 2.5-3 mm in diam., green. Calyx-tube small; teeth 5, minute, obtuse. Petals 5, spreading above. Stamens 10, shorter than petals. Drupe globose, red when ripe, 1.2-2 cm in diam., with 1-3 pyrenes; fruiting pedicel greatly thickened and elongated.

Fl.: Mar.-Apr. *Fr.*: Apr.-May.

Ecology : Very common, in hilly forests, specially at cooler regions, along banks of streams, etc.

Distribution : India : West Bengal, Bihar, Orissa, Central India, Assam. Bangladesh, Pakistan.

Specimens examined : Pratappur, 600; Koderma Forest, 1773.

Uses : Fruits are edible. Wood is much used in making furniture.

3. GARUGA Roxb.

Garuga pinnata Roxb., Pl. Corom. 3 : 5, t. 208. 1811; Benn. in Hook. f., Fl. Brit. India 1 : 528. 1875; Prain, Bengal Pl. 1 : 311. 1903; Haines, For. Fl. Chota Nagpur 240. 1910 & Bot. Bihar & Orissa pt. 2: 170. 1921.

Local name : Jiga, Kikar.

Trees 5-10 m high. Branchlets pubescent in younger parts. Leaves 15-45 cm long, pubescent when young; stipules spatulate to linear, deciduous, 0.5-1 cm long; stipellae wanting; leaflets 9-23, elliptic or oblong to lanceolate, obliquely rounded or cuneate at base, acuminate at apex, 5-14 x 2-5.5 cm. Inflorescences lateral, paniculate, 7-20 cm long; peduncle 2-6 cm long. Flowers 5-merous, 6-8mm long when open; pedicels 1-3 mm long. Receptacle cylindrical, 3-4.5 mm long and in diam., pubescent. Calyx 5-fid, urceolate. Petals 5, oblong 0.5-0.6 cm long, tomentose on both sides. Stamens 10, free; filaments 2.5-3 mm long, hairy at base. Disk-lobes trapeziform to deltoid. Ovary globular, pilose, shortly stalked, 5-celled;

1. ANACARDIUM L.

Anacardium occidentale L., Sp. Pl. 383. 1753; Hook. f. in Hook. f., Fl. Brit. India 2 : 20. 1876; Prain, Bengal Pl. 1 : 354. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 220. 1921.

Local name : Kaju.

Spreading evergreen tree, to 12 m tall, with milky juice. Leaves thick coriaceous, obovate or obovate-oblong, rounded or cuneate at base, obtuse, rounded or slightly emarginate at apex, entire, glabrous, 8-20 x 5-13 cm, with 8-14 pairs of nearly horizontal secondary nerves; petiole 0.6-1.5 cm long. Flowers (male) *ca.* 8 mm across, borne in paniculate or sometimes corymbose inflorescences, terminal and also in upper leaf-axils, 15-25 cm long. Peduncle to 10 cm long. Floral bracts ovate-oblong, 5-10 mm long. Pedicels 2-5 mm long. Calyx-lobes 5, unequal, ovate-lanceolate, 0.3-0.5 cm long, caducous. Petals 5, greenish-cream with red stripes, linear-lanceolate, reflexed during anthesis, 0.7-1.2 cm long. Stamens 0.25-1 cm long. Pistillode in male rudimentary, 0.2-0.3 cm long. Ovary 1-celled, 1-ovuled, *ca.* 0.1 mm across; style 4-10 mm long. Drupe reniform 2.5-3.5 x 1.5-2 cm, greyish brown when fresh; hypocarp 2-3 x 1-2 cm, bright yellow or red, shiny, 10-20 x 4-8 cm in fresh state.

Fl. : Mar.-Apr. *Fr.* : Apr.-May.

Ecology : Not common; planted in village surroundings, gardens, etc.

Distribution : India : Naturalised in hotter parts of India particularly in Maharashtra, Karnataka, Goa, Kerala, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, Bihar, etc. Native of Tropical America, widely cultivated in the Tropics.

Specimens examined : Pratappur, 914; Hazaribagh, 1249.

Uses : Kernels are eaten raw and fried; also employed in sweetmeats and confectionery. Thickened peduncles are used for jams and for preparation of wines and beverages. Cashew shells yeild an oil which is used as preservative in printing of fishing-nets. Plant exudes a gum which is used as protection for books and wood work against insects.

2. BUCHANANIA Spreng.

Buchanania lanzan Spreng. in J. Bot. (Schrader) 2 : 234. 1801; Gamble, Fl. Madras 1 : 258. 1918; Panigr. and Murti, Fl. Bilaspur, 1 : 172. 1989.

B. latifolia Roxb., Fl. Ind. 2 : 385. 1832; Hook. f. in Hook. f., Fl. Brit. India 2 : 23. 1876; Prain, Bengal Pl. 1 : 351. 1903; Haines, For. Fl. Chota Nagpur 258. 1910 & Bot. Bihar & Orissa pt. 2 : 221. 1921.

Local names : Piyar, Charoli.

Small to moderate-sized tree, to 10 m tall. Bark dark-grey to black. Branchlets with prominent leaf scars, pubescent or sericeous. Leaves broadly oblong or elliptic, rounded-retuse at apex, sub-cuneate to rounded at base, entire, pubescent beneath, 15-25 x 5-10 cm, with 14-20 pairs of nearly straight and stout secondary nerves; petiole stout, pubescent, 0.8-1.5 cm long. Panicles dense, pyramidal, shorter than leaves, to 16 cm long. Flowers *ca.* 6 mm across, sessile. Branch-axes woolly or velvety, divaricate. Bracts small, caducous. Calyx-lobes 5, persistent, *ca.* 1.5 mm long. Petals 5, creamish-white, oblong, 2-2.5 mm long. Stamens 10, spreading, as long as petals. Disk fleshy, 5-lobed. Carpels 5, hairy, seated in cavity of the disk, one perfect, others 4 reduced to thread-like processes. Drupe sub-globose, black, slightly compressed, *ca.* 1.2 cm in diam. with 2-valved bony stone. Seeds gibbous, acute at one end, with thick cotyledons.

Fl. : Jan.-Apr. *Fr.* : Apr.-June.

Ecology : Very common; in forests.

Distribution : Throughout India in dry deciduous forests. Nepal, Myanmar, Thailand.

Specimens examined : Pokharia (National Park), 71; Pratappur, 610; Koderma Forest, 1761.

Uses : Seeds are eaten. They yield an oil which is used in confectionery and indigenous medicine; also used for glandular swellings of neck. Wood is used for beams, furniture, window frames, boxes, match-

splints, etc. Plant exudes a gum which is used for tanning and in diarrhoea and intercostal pain. Leaves are lopped for fodder.

3. LANNEA A. Richard, *nom. cons.*

Lannea coromandelica (Houtt.) Merr. in J. Arnold Arb. 19 : 353. 1938; Ding Hou in Steenis Fl. Males. ser. 1, 8 : 479. 1978; *Dialium coromandelicum* Houtt., Nat. Hist. II. 2 : 39, t. 5.f.2. 1774.

Odina wodier Roxb., Fl. Ind. 2 : 293. 1832; Hook. f. in Hook. f., Fl. Brit. India 2 : 29. 1876; Prain, Beng. Pl. 1 : 354. 1903; Haines, For. Fl. Chota Nagpur 256. 1910 & Bot. Bihar & Orissa pt. 2 : 223. 1921.

Local name : Jhingan, Doka.

Deciduous, small tree, to 10 m tall. Branchlets rusty stellate-tomentose. Leaves alternate, 10-25 cm long. Leaflets 7-13, opposite, elliptic-oblong, ovate or ovate-oblong, obliquely rounded at base, caudate-acuminate at apex, entire, puberulous beneath especially on midrib and nerves, 4-10 x 2.5-4.5 cm, with 8-11 pairs of secondary nerves; petiolules very short, to 5 mm long, those of terminal leaflets much longer, to 3 cm long. Flowers subsessile, borne in simple or compound racemes in axils of leaf-scars; female racemes simple, to 15 cm long; male one compound, 10-25 cm long; pedicels very short, pubescent; floral bracts triangular, ciliate, *ca.* 1 mm long. Calyx-lobes 4, ovate-triangular, ciliate, *ca.* 1 mm long. Petals 4, elliptic or oblong, yellowish-green, tinged with red, 2-2.5 mm long, spreading, reflexed in female flowers. Stamens 8, 2-2.5 mm long. Staminodes in female 0.8-1.2 mm long. Disk annular, *ca.* 1 mm across. Ovary ovoid-oblong, 4-celled, usually 1 fertile, *ca.* 0.8 mm across. Abortive pistil in male 0.5-1 mm long. Drupe broadly ellipsoid, sometimes slightly subreniform, trapezoid or rounded-rectangular, to 10 x 5 mm, red when ripe, with a hard stone. Seed reniform, to 8 x 4 mm.

Fl. : Mar.-Apr. *Fr.* : Apr.-June.

Ecology : Common; in forests, along roadsides, village surroundings, etc.

Distribution : Throughout India. Indo-China, China, Sri Lanka, Myanmar, Thailand, Malesia.

Specimens examined : National Park, 431; Pratappur, 611; Koderma Forest, 2042.

Uses : Plant exudes a gum in considerable quantity which is used for cotton printing by weavers and in medicine. Bark is used as astringent; also useful for tanning fishing nets. Young leaves and twigs are edible for cattle and man. Wood is used for house building, furniture, oil presses, rice pounders, brushbacks, slate frames, etc.

4. MANGIFERA L.

Mangifera indica L., Sp. Pl. 200. 1753; Hook.f. in Hook. f., Fl. Brit. India 2 : 13. 1876; Prain, Bengal Pl. 1 : 352. 1903; Haines, For. Fl. Chota Nagpur 258. 1910 & Bot. Bihar & Orissa pt. 2 : 220. 1921.

Local names : Aam, Amb.

Tree, 10-30 m tall, with widely spreading branches. Bark grey, longitudinally fissured. Leaves subcoriaceous, crowded at end of branches, oblong, linear-oblong to oblong-lanceolate, cuneate at base, acute to acuminate at apex, entire, or sometimes undulate, glabrous 10-30 x 2-10 cm, with 10-30 pairs of secondary nerves elevated on both surfaces; petiole 1.5-8 cm long, convex beneath, grooved or flat above. Panicles terminal, also in the uppermost leaf axil, pyramidal, 10-40 cm long. Flowers very small, subsessile; floral bracts ovate-oblong, 3.5-4 mm long. Calyx-segments 5, ovate-oblong, or elliptic, puberulous, 2-2.5 mm long. Petals 5, elliptic-oblong or ovate-oblong, 3.5-4.5 mm long, pale cream. Disk shortly cupular, 5-lobed or notched, papillate. Stamens 5, 1 (rarely 2) fertile, 2-3 mm long, others staminoidal, 1 mm long. Ovary ovoid, oblique, 1.2-1.5 mm across; style excentric 1.5-2 mm long; stigma simple. Sterile pistil in male flowers obscure or absent. Drupe ovoid-oblong unequal-sided, smooth, yellow to yellowish-green when ripe, 4-15 x 2-8 cm, with orange juicy flesh and thick hard stone having fibrous coat.

Fl. : Jan.-Mar. *Fr.* : May-June.

Ecology : Very common; in roadsides, villages, forests, etc.

Distribution : India: major parts of India particularly in Punjab, Uttar Pradesh, Bihar, West Bengal, Orissa, Andhra Pradesh, Tamilnadu.

Maharashtra, etc. Probably native of Indo-Mayanmar regions, widely cultivated throughout the Tropics of both hemispheres.

Specimens examined : Hazaribagh, 58; Barhi, 1386; Chatra, 1669.

Uses : Unripe green fruits are pickled, used for chutney and culinary preparations. Ripe fruits are deliciously eaten or preserved by canning, or used for juice and squash, jams and jellies, preserves, mango-lether, etc. Wood is used for furniture, floor and ceiling boards, window frames, agricultural implements, etc. Bark is used for uterine haemorrhage. Leaves are lopped for fodder.

5. SEMECARPUS L.f.

Semecarpus anacardium L. f., Suppl. Pl. 182. 1781; Hook. f. in Hook. f, Fl. Brit. India 2: 30. 1876; Prain, Bengal Pl. 1: 353. 1903; Haines, For. Fl. Chota Nagpur 257. 1910 & Bot. Bihar & Orissa pt. 2: 222. 1921.

Local names : Bhelwa, Bhilawa, Kharw.

Moderate-sized, polygamo-dioecious tree, to 10 m tall, exuding a dark acrid juice. Young parts finely pale-pubescent. Leaves thick- coriaceous, oblong or obovate-oblong, rounded or slightly retuse-emarginate or often subacute at apex, rounded, subcordate or subcuneate at base, entire, opaque above, minutely brown pubescent beneath, 20-60 × 10-20 cm with 16-25 pairs of stout, slightly arched secondary nerves, petioles 2.5-5 cm long, finely pubescent. Flowers 0.6-0.8 cm across, subsessile, unisexual, or sometimes bisexual, borne in fascicles on large terminal panicles equalling or shorter than leaves, foliar bracts lanceolate, 3-4 mm long. Calyx-segments 5, deltoid, ca. 1 mm long, caducous. Petals 5, greenish-white, oblong, 2-2.5 mm long. Disk annular, broad, ca. 2 mm villous. Stamens 5, inserted at base of the disk, all fertile, smaller and imperfect in female; filaments subulate, free, ca. 1 mm long. Ovary tomentose. Pistillode absent in male. Drupe obliquely ovoid or oblong, smooth, shining, black when ripe, 2-2.5 cm long; hypocarp orange-coloured, equal to drupe.

Fl. : June-Aug. *Fr.* : Oct.-Dec.

Ecology : Very common; in forests, slopes of low hills, etc.

Distribution : Throughout the hotter parts of India including tropical outer Himalaya. Sri Lanka, Eastern Archipelago and North Australia.

Specimens examined : Pokharia (National Park), 70, 2011; Koderma forest, 1264; Pratappur, 1542.

Uses : Fleshy hypocarp of fruit is eaten when ripe. Fruits are used for ascites, rheumatism, asthma, neuralgia, epilepsy and psoriasis. Bruised fruit is applied to uteri to procure abortion. Oil extracted from fruit is used externally in rheumatism and leprous nodules. Gum exuded from bark is used in scrophulous, venereal and leprous affections and nervous debility. Ashes of plant in combination with other drugs are used by tribals in snake bite and scorpion sting.

6. SPONDIAS L.

Spondias pinnata (L. f.) Kurz in Prelim. Rep. For. & Veg. Pegu. 1875, App. A. XLIV & B. 42; Airy Shaw & Forman in Kew Bull. 21 : 8, f. 2, 1 & 2. 1967; *Mangifera pinnata* L. f., Suppl. 156. 1781.

S. mangifera Willd., Sp. Pl. 2 : 751. 1799; Hook. f. in Hook. f., Fl. Brit. India 2 : 42, 1876. Prain, Bengal Pl. 1 : 356. 1903; Haines., For. Fl. Chota Nagpur 259. 1910 & Bot. Bihar & Orisa pt. 2 : 224. 1921.

Local names : Amara, Jangli aam.

Tree, 20-25 m tall. Bark grey, smooth. Leaves alternate, glabrous, imparipinnate; rachis 6-20 cm long, petiole 4-5.5 cm long; leaflets chartaceous to coriaceous, opposite, elliptic-oblong, abruptly acuminate at apex, obliquely rounded-obtuse to abruptly cuneate-sub-attenuate at base, crenate or serrate, or entire, 6-20 x 3-8 cm, with 12-25 pairs of horizontal secondary veins joining with an intra marginal vein; petiolules to 1 cm long, those of terminal one to 2.5 cm long. Panicles terminal, rarely also axillary, glabrous, to 40 cm long. Flowers ca. 6 mm across, sessile or subsessile, 5-merous; floral bracts ovate to linear, 1-3 mm long. Calyx-lobes triangular, caducous, ca. 0.5 mm long. Petals greenish-white, ovate-oblong, 2.5-3 mm long. Stamens 10, inserted below the disk, 1.2-1.6 mm long; filaments free, subulate; anthers broadly ovoid. Disk cupular, 10-toothed. Ovary subglobose, ca. 0.8 mm across, 5-(or 4-) celled; styles 5 (or 4), free, ca. 0.5 mm long. Pistillode in male with five styles. Drupe ellipsoid or ellipsoid-oblong, smooth, 3-5 x 2.5-3.5 cm, yellow-orange when ripe.

Fl. : Feb.-Mar. *Fr.* : June.

Ecology : Common; in forests of dry regions, village surroundings, etc.

Distribution : Throughout India. Widely distributed in Indo-Malesia, especially in Java and Philippines.

Specimens examined : Pratappur, 608; National Park, 2030.

Uses : Fruits are eaten raw or cooked; also used for jams and jellies. Juice is employed as diuretic and febrifuge. Infusion of leaves and roots is used against cough. Decoction of leaves is given as a lotion for eye troubles. Bark is used as astringent and purgative and in dysentery. Wood is used for house posts, match-splints, furniture, etc.

85. SIMAROUBACEAE

Ailanthus Desf., *nom. cons.*

Ailanthus excelsa Roxb. Pl. Corom. 1 : 24, t. 23. 1795; Benn. in Hook. f., Fl. Brit. India 1 : 518. 1875; Prain, Bengal Pl. 1 : 308. 1903; Haines, For. Fl. Chota Nagpur 238. 1910 & Bot. Bihar & Orissa pt. 2: 169. 1921.

Local names : Pir nim, Ghora nim, Maharukh.

Large, semideciduous, polygamous tree, to 20 m tall, with light-coloured bark and stout densely tomentose branchlets covered by persistent leaf-scars. Leaves alternate, unequally pinnate, to 30 cm long, with hoary tomentose rachis; leaflets 8-14 pairs, alternate below, subopposite above, inequilateral, oblong-lanceolate, acuminate at apex, very unequal at base, very coarsely toothed, densely pubescent beneath, pubescent above when young, 8-15 x 5-7.5 cm; petiole 3-6 cm long with 2 hairy glands near base. Panicles lax, much branched. Flowers 7-8 mm across; bracts lanceolate, to 2 mm long; pedicel slender, ca. 5 mm long. Calyx-lobes 5, ovate. Petals 5, ovate-lanceolate, reflexed, to 4 mm long. Male flower : stamens inserted at base of 10-lobed disk, filaments short, half as long as the anthers. Female flowers : carpels 5, ca. 4 mm long; styles connate at base. Samaras oblong, copper-red, prominently veined, 4-6 x 0.8-1.2 cm, twisted near base. Seeds solitary.

1. AZADIRACHTA A. Juss.

Azadirachta indica A. Juss. in Mem. Mus. Par. 19 : 221, t. 2. f. 5. 1830; Haines, For. Fl. Chota Nagpur 251. 1910 & Bot. Bihar & Orissa pt. 2 : 176. 1921.

Melia azadirachta L., Sp. Pl. 358. 1753; Hiern in Hook. f. Fl. Brit. India 1 : 544. 1875; Prain, Bengal Pl. 1 : 314. 1903.

Local name : Nim.

Large or medium-sized tree, 12-18 m tall, with a straight trunk. Branchlets glaucous. Leaves 20-35 cm long, crowded near ends of branches; leaflets 9-12, subopposite, oblong-lanceolate, falcate, inequilateral, subcoriaceous, obliquely acute at base, acuminate at apex, glabrous on both surfaces, petiole to 5 cm long; petiolule very short, *ca.* 2 mm long. Panicles shorter than leaves, to 15 cm long. Flowers 5-merous, *ca.* 8 mm across, bracts minute, lanceolate, caducous; pedicels *ca.* 5 mm long. Calyxlobes ovate, minutely ciliolate, *ca.* 0.1 cm long. Petals white, oblong-obovate faintly puberulous outside, 5-6 mm long. Disk 0. Stamens 10, monadelphous; staminal tube glabrous, obconic, toothed at apex, *ca.* 4 mm long; anthers slightly exserted, apiculate. Ovary 3-locular; ovules 2 and collateral in each cell. Drupe ellipsoid, glabrous, yellow when ripe, 1.2-1.5 x 0.4-0.6 cm, 1-seeded. Seed ellipsoid, 7-8 mm long.

Fl. : Mar.-May. *Fr.* : June-July.

Ecology : Common; cultivated; but also found wildly near gardens, villages, roadsides, etc.

Distribution : Throughout India. Native of India and China, naturalised in Pakistan, Malesia, Nepal.

Specimens examined : National Park, 416; Hazaribagh, 1594; Hunterganj, 2136.

Uses : Bark is used in skin troubles. Leaves in form of poultice is applied to boils, decoction is given for ulcers and eczema. Fruits are used as purgative and emollient. Seeds yield an oil which is used for skin-affections. Wood is used for house-building, boards, panels, toys and

ploughs. Fresh tender twigs are used to clean teeth, particularly for pyrrhoea.

2. MELIA L.

Melia azedarach L., Sp. Pl. 384. 1753; Hiern in Hook. f., Fl. Brit. India 1 : 544. 1875; Prain, Bengal Pl. 1 : 314. 1903; Haines, For. Fl. Chota Nagpur 252. 1910 & Bot. Bihar & Orissa pt. 2 : 177. 1921.

Local names : Bakain, Drek.

A medium-sized tree, to 13 m high. Leaves bi- or tri-pinnate, 20-40 cm high. Pinnae opposite or alternate; leaflets 4-11, opposite or nearly so, ovate or lanceolate, thin coriaceous, obliquely rounded at base, acuminate at apex, obtusely serrate, often lobed, glabrous on both surfaces, slightly inequilateral, 1.2-5 x 0.6-2.5 cm; petiole 15 cm long, petiolule 1 cm long. Flowers fragrant, 1 cm across, in long-peduncled axillary panicle, shorter than leaves; pedicels slender, to 2 mm long. Peduncle 6-8 cm long. Calyx pubescent outside, divided nearly to base; lobes 5, ovate-oblong, pubescent without, 1.5 mm long. Petals 5, lilac, lanceolate-ovate, glabrescent, 1.5 cm long. Staminal tube dark purple, puberulous, 7 mm long, 10-toothed; anthers 10, sessile, glabrous, apiculate. Ovary ovoid, 1 mm across, 5-celled; ovules 2 per cell; style 3 mm long, attenuate. Drupe ellipsoid-globose, 1-seeded, yellowish, 1.2-1.8 x 0.8-1 cm.

Fl.: May-June. *Fr.*: Nov.-Dec.

Ecology : Planted in roadsides; also self-sown.

Distribution : Throughout India, Pakistan, China, Iran, Turkey, Myanmar, Nepal.

Specimens examined : Telaiya Dam, 630; Ramgarh Cant, 1908.

Uses : Leaves, bark and fruits are used as insect-repellent. Leaf-juice is used as anthelmintic, and diuretic. A gum collected from tree is used in spleen enlargement. Wood is used for toys, packing cases, agricultural implements, musical instruments, etc. Seeds yield an oil which is useful for soap-making and hair oils.

3. SOYMIDA A. JUSS.

Soymida febrifuga (Roxb.) A Juss. in Mem. Mus. Hist. Nat. 19. 251, t. 11. f. 26. 1830; Hiern in Hook. f., Fl. Brit. India 1 : 567. 1875; Prain, Bengal Pl. 1 : 319. 1903; Haines, For. Fl. Chota Nagpur 250. 1910 & Bot. Bihar & Orissa pt. 2 : 175. 1921. *Swietenia febrifuga* Roxb., Bot. Descr. Swietenia 1. 1793.

Swietenia soymida A. Duncan, Tent. Inaug. Swietenia 16. 1794 & in Med. Comm. II, 9 : 405. 1795, *nom. superfl.*

Local name : Rohun.

Medium-sized to large tree, to 20 m tall. Leaves 20-45 cm long, crowded towards end of branches; leaflets 3-6 pairs, elliptic or oblong, obliquely rounded at base, obtuse at apex, entire, glabrous, thick-coriaceous, 4-12 x 1.8-7 cm; petiolules very short, 3-4 mm long. Panicles almost equalling the leaves, with alternate, divaricate branches. Flowers 5-merous, ca. 1 cm across; bracts ovate-deltoid, minute. Calyx-lobes ovate, pubescent, 1.8-2 mm long. Petals greenish-white, obovate, notched at apex, 5-6 mm long. Staminal tube about half as long as petals, 10-cleft; lobes bi-dentate; anthers 10, sessile, between lobes. Ovary 5-celled, each cell with 12 biseriate pendulous ovules; style short; half as long as petals, stigma discoid, 5-angled. Capsule obovoid, 3-6 cm long, black when ripe. Seeds oblong, 3.5-4 mm long.

Fl. : Feb.-Apr. *Fr.* : May-July.

Ecology : Common; in dry forests, roadsides, on stony hill-slopes, etc.

Distribution : North-Western and Central India, Bihar, Orissa, Deccan Peninsula. Sri Lanka.

Specimens examined : Hazaribagh, 1208; Patratu, 2187.

Uses : Bark is used in treatment of diarrhoea and dysentery. Decoction of leaves is used for gargles and rheumatic swellings. Wood is used for posts, beams, plough-shares, pestles and pounders, and furniture. Gum exuded from bark is a good adhesive mucilage.

4. SWIETENIA Jacq.

Key to the Species

- 1a. Leaflets 3-6 cm long. Capsule 6-10 cm long ... 1. *S. mahagoni*
 1b. Leaflets 8-12 cm long. Capsule 14-18 cm long ... 2. *S. macrophylla*

1. **Swietenia mahagoni** (L.) Jacq., Enum. Pl. Carib. 20. 1760; Hiern in Hook. f., Fl. Brit. India 1 : 540. 1875; Prain, Bengal pl. 1 : 319. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 175. 1921. *Cedrus mahagoni* L., Syst. Nat. ed. 10, 2 : 940. 1759.

Local name : Mahagni.

A tall tree, to 24 m tall. Bark rugose, grey-black. Leaves to 14 cm long. Leaflets 4-5 pairs, oblong-lanceolate, falcate, glabrous above, puberulous below, very obliquely cuncate at base, acuminate at apex, entire, 3-6 x 1-2 cm; petiole 2.5-3 cm long; petiolule 5 mm long. Flowers *ca.* 7.5 mm across, in axillary panicles, 6-8 cm long. Peduncle 3-3.5 cm long. Pedicel 1.5-2 mm long. Calyx-lobes 5, obovate-oblong, pubescent, c. 2 mm long. Petals 5, cream, spreading pubescent without. *ca.* 5 x 2 mm. stamens 10; staminal tube 2.5-3.5 mm teeth sharp; anthers included, alternating with teeth. Ovary 5-locular; ovuler many in each locule; style attenuate, *ca.* 2 mm long. Capsule oblong, 6-10 cm x 4-5.5 cm. Seeds many, to 5 x 1.5 cm.

Fl.: Apr.-May. *Fr.*: July -Oct.

Ecology : Common; planted along roadsides, on railway stations, in forests, etc.; also self-grown.

Distribution : Throughout India. Native of Tropical America and West Indies, introduced and widely cultivated throughout the Tropics.

Specimens examined :Telaiya Dam, 635; Hazaribagh, 2269.

Uses : Wood is used for decorative furniture, cabinet-work, etc. Bark is used as antipyretic, tonic and astringent.

2. **Swietenia macrophylla** King in Hook., Icon. Pl. 16, t. 1550. 1886; Prain, Bengal Pl. 1 : 319. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 175. 1921.

Local name : Bora mahagni.

Tall tree, to 24 m tall. Bark grey-brown, rough, flaking off in small pieces. Leaves to 20 cm long; leaflet 3 or 4 pairs, subopposite, ovate-lanceolate, coriaceous, inequilateral, glabrous, glossy above, dull below, obliquely cuneate at base, acuminate at apex, entire, 8-12 × 3-4.5 cm, petiole 5-8 cm long; petiolule 0.5-1 cm long. Panicles axillary, 7-10 cm long. Flowers sweet-smelling, greenish, 7-8 mm across. Calyx-lobes suborbicular, 0.5-0.6 mm long. Petals 5, greenish-white, oblong, 3.5-4 mm long. Stamens 10; staminal tube whitish, 3.5-4 mm long; anthers included, inserted below sinus. Disk bright red. Ovary 5-locular; ovules many in each locule; stigma slightly lobed. Capsule globose, 14-18 × 6-7.5 cm, very woody. Seeds 5-6.5 cm long.

Fl. : Apr.-May *Fr.* : July-Oct.

Ecology : Very common; planted along roadsides, railway platforms, gardens, etc.; also self-grown.

Distribution : Throughout India. Now widely cultivated in Tropics.

Specimens examined : Koderma, 1999; Hazaribagh, 2267.

Uses : Wood is used for furniture and plywood. Seeds yield an oil which is useful as moderate drying oil and for soap-making.

5. **TOONA** (Endlicher) Roem.

Toona ciliata Roem., Syn. Hesper. 139. 1846; Santap. in Bull. Bot. Surv. India 3 : 13. 1962.

Cedrela toona Roxb. ex. Rottl. & Willd. in Ges. Naturaf. Fr. Neue. Schr. 4 : 198. 1803; Hiern in Hook. f., Fl. Brit. India 1 : 568. 1875; Prain, Bengal Pl. 1 : 320. 1903; Haines, For. Fl. Chota Nagpur 249. 1910 & Bot. Bihar & Orissa pt. 2 : 174. 1921.

Local name: Toon.

Medium-sized or large tree, to 18 m tall. Branches numerous, tomentose, forming a shady head. Leaves 30-45 cm long; leaflets 5-12 pairs, opposite or alternate, oblong-lanceolate, thin-coriaceous, inequilateral, obliquely cuneate at base, acuminate at apex, entire-subundulate, glabrous, 7-10 x 2-3 cm. Petiole to 6 cm long; petiolule 6-7 mm long. Flowers 5-merous, ca. 7.5 mm across. Panicles nearly as long as leaves, drooping or suberect from new shoots. Calyx divided nearly to base; lobes orbicular-ovate, ciliate, ca. 1 mm long. Petals white, broadly oblong-elliptic, ciliate, imbricate, ca. 5 mm long. Disk thick, 5-lobed. Stamens 5, each inserted on one of lobes of disk; anthers oblong, versatile. Staminodes 0. Ovary ovoid, 5-locular, ca. 2 mm, pubescent; ovules 2-seriate. Capsule 1.5-2.5 cm long, oblong septifragal. Seeds 25-30, oblong, thin, winged at both ends, 1.5-2 cm long.

Fl. : Mar.-Apr. *Fr.* : June-July.

Ecology : Common; planted along roadsides; also self-grown near villages.

Distribution : India : Tropical Himalaya, throughout hilly regions of Central, Eastern and Southern India. Pakistan, Myanmar, Malesia, Australia, Java, Nepal.

Specimens examined : Hazaribagh, 1568, Hunterganj, 2148.

Uses : Wood is used for furniture, floors, doors, windows, plywood manufacture, etc. Bark is used for chronic dysentery of infants.

87. RUTACEAE

Key to the Genera

- 1a. Innovations and inflorescences puberulent with rusty-red hairs. Style persistent. Ovules 1-2 in each cell of ovary ... 4. GLYCOSMIS
- 1b. Innovations glabrous, or if puberulent the hairs varies but never rusty-red. Style articulate at top of ovary, deciduous :

- 2a. Leaves simple or unifoliolate :
- 3a. Stamens 8-10. Ovules 1 or 2 in each cell of ovary ... 2. ATALANTIA
- 3b. Stamens 4 times or more as many as petals, usually at least 20. Ovules 4-5 in each cell of ovary ... 3. CITRUS
- 2b. Leaves either pinnate or trifoliolate :
- 4a. Petiole winged. Branches armed. Stamens 8 or 10. Ovules many in each cell of ovary ... 5. LIMONIA
- 4b. Petiole not winged :
- 5a. Branches unarmed. Stamens 10. Ovules 1 or 2 in each cell of ovary ... 6. MURRAYA
- 5b. Branches armed. Stamens 30-50. Ovules many in each cell of ovary ... 1. AEGLE

1. AEGLE Correa, *nom. cons.*

Aegle marmelos (L.) Correa in Trans. Linn. Soc. 5 : 223. 1800; Hook. f. in Hook. f., Fl. Brit. India 1 : 516. 1875; Prain, Bengal Pl. 1: 305. 1903; Haines, For. Fl. Chota Nagpur 247. 1910 & Bot. Bihar & Orissa pt. 2 : 167. 1921.

Local name : Bel.

Small to moderate-sized tree, to 10 m tall. Spines strong, straight, 1-2.5 cm long. New branchlets green, zig-zag, compressed. Leaves alternate, trifoliolate; petiole 2-5 cm long, slightly swollen at base; leaflets lanceolate or ovate-lanceolate, rounded at base, acute or subacuminate at apex, glabrous or grey-pubescent, 4-7 x 2-4 cm, the terminal one larger, long-petioled; the lateral ones sessile, usually with oblique base. Panicles short, 4-5 cm long, peduncle and pedicels minutely pubescent, pedicels 2-5 mm long. Sepals broadly deltoid, puberulent, 1.2-1.5 mm long. Petals oblong-obovate, greenish white, glandular, 1-1.4 cm long. Stamens 30-50, in double or triple series, unequal, dull white; filaments glandular, 4-7 mm long. Ovary light green, 8-20-celled, each with many ovules in 2 series; style short, stout; stigma longitudinally furrowed. Fruit of 8-12 segments, within a subglobose, grey, yellowish brown or greenish woody pericarp

cell, 7-20 cm in diam.; pulp orange or yellowish. Seeds in a clear mucilaginous pulp, oval, woolly, pubescent, 8-10 mm long.

Fl.: Apr.-May. *Fr.*: June-Aug.

Ecology : Very common; in forests of both low hills and plains; also planted in villages near temples.

Distribution : Throughout India. Sri Lanka, Myanmar, Indo-China; distributed through cultivation in S.E. Asia, Malesia and few other tropical countries.

Specimens examined : Hazaribagh, 271; National Park, 1174; Koderma Forest, 1763.

Uses : Fruits are edible. Dried unripe fruits are used as a remedy for diarrhoea and dysentery. The leaves are considered as very sacred. Gummy substance around seeds serves as an adhesive.

2. ATALANTIA Correa, *nom. cons.*

Atalantia monophylla DC., Prodr. 1 : 535. 1824; Hook. f. in Hook. f., Fl. Brit. India 1 : 511. 1875, *p.p.*; Prain, Bengal pl. 1 : 304. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 161. 1921.

Small, glabrous tree, armed; spines straight, to 2 cm long. Leaves ovate or elliptic, broadly cuneate at base, obtuse and clearly notched at apex, entire to obscurely undulate, 3-15 x 2-5 cm, petiole 0.6-1 cm long. Inflorescences racemose, fascicled, axillary. Pedicels 0.6-1.5 cm long. Calyx irregularly lobed or spathiform, usually deeply 2-cleft. Petals 4 or 5, 0.8-1 cm long. Stamens 8 or 10, unequal, connate at base to form a tube. Ovary 6-7 mm long; stigma sessile, irregularly 3 to 4-lobed. Hesperidium globose, to 2 cm in diam., yellowish-green; pulp-vesicles distally tapered, sessile. Seeds few or sometimes solitary.

Fl. : Oct.-Dec. *Fr.*: Apr.-May.

Ecology : Common; planted in gardens, also found to grow in scrub jungles of low hills.

Distribution : India : Deccan Peninsula, Bihar, Orissa, Central India, Assam, Meghalaya. Sri Lanka, Indo-China, Malesia, North Vietnam.

Specimens examined : Hazaribagh, 1201; Chowparan, 1690.

Uses : Wood is used for cabinet work and furniture. Fruits yield an oil used externally in rheumatism.

3. CITRUS L.

Key to the Species

- 1a. Petioles wingless, not or very indistinctly articulated with the leaf-blade ... 4. *C. medica*
- 1b. Petioles winged, distinctly articulated with the leaf-blade :
 - 2a. Leaves 15-25 x 8-15 cm size. Petiole-wing 4-8 cm broad, obcordate. Fruit large, 10-15 cm or more in diam ... 3. *C. grandis*
 - 2b. Leaves 5-12 x 2.5-5 cm size. Petiole-wing 0.4-1.5 cm broad, not obcordate. Fruit 3-7 cm in diam :
 - 3a. Pulp-vesicles pale green. Seeds not angular, smooth ... 1. *C. aurantifolia*
 - 3b. Pulp-vesicles orange. Seeds angular, with rough margins ... 2. *C. aurantium*

Citrus aurantifolia (Christm. & Panz.) Swingle in J. Wash. Acad. Sci. 3 : 465. 1913; Stone in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 424. 1985. *Limonia aurantifolia* Christm. & Panz., Pflanzenr. Syst. 1 : 618.1777.

Citrus acida Roxb., Fl. Ind. 3 : Ind. 3 : 390. 1832.

C. medica L. var. *acida* (Roxb.) Brandis, For. Fl. 52. 1874; Hook, f. in Hook. f., Fl. Brit. India 1 : 515. 1875; Prain, Bengal Pl. 1:307. 1903.

Local names : Pati nimbu, Kagchi nimbu.

Small tree, to 7 m tall. Branchlets with short, stiff, sharp spines. Blades elliptic to oblong-ovate, rounded at base, subacute to obtuse at apex, with crenulate margins, 5-8 x 3-5 cm; petioles narrowly winged; wing 4-10 mm broad, spathulate. Inflorescence short, usually 2-7-flowered, rarely 1-flowered. Flowers small; buds white. Sepals 4-5. Petals usually 4, sometimes 5, 0.8-1.2 cm long. Stamens 20-25. Ovary depressed-globose, 9-12-celled; style caducous. Fruit small, subglobose to ovoid, sometimes with apical papilla, green to greenish-yellow, 3-6 cm in diam.; pericarp thin, densely glandular; pulp-vesicles small, pale green; juice very sour. Seeds obovoid, smooth, 5-8 mm long.

Fl. : Feb. Apr. *Fr.*: July - Oct.

Ecology : Common; cultivated in gardens; also self-grown near houses, village surroundings, waste places, etc.

Distribution : India : Wild in the warm valleys of the outer Himalaya from Garwal of Uttar Pradesh through Sikkim and Assam to Khasi and Garo Hills, Madhya Pradesh, Western Peninsula; also cultivated and/or self-grown in other warmer parts and elsewhere in the country. Bangladesh, Sri Lanka, Malesia, Pakistan.

Specimens examined : Hazaribagh, 1378; Ichak, 1832.

Uses : Fruits are used in the preparation of confections, marmelades, liquors, and other drinks. Flowers, leaves and fruits yield a volatile oil used in perfumery.

2. *Citrus aurantium* L., Sp. Pl. 782. 1753; Hook. f. in Hook. f., Fl. Brit. India 1 : 515. 1875; Prain, Bengal Pl. 1 : 307. 1903; Haines, For. Fl. Chota Nagpur 246. 1910 & Bot. Bihar & Orissa pt. 2 : 166. 1921.

C. aurantium L. var. *bigardia* Hook. f. in Hook. f., Fl. Brit. India 1 : 515. 1875.

Local name : Khatta nimbu.

Small tree, to 8 m tall. Younger branches angular. Spines 4-8 cm long on rapidly growing younger shoots. Blade ovate, cuneate to rounded at base, subacute to obtuse at apex, with slightly undulate to subcrenate

margins, 6-12 x 2.5-5 cm; petiole 2-3 cm long; wing spatulate, 0.5-1.5 cm broad. Inflorescence few-flowered, axillary. Flowers large, fragrant, mostly bisexual (a few staminate ones sometimes intermixed). Petals white. Fruits subglobose, slightly oblate, 5-7 cm in diam., greenish-yellow to brilliant vermilion or scarlet-red; pericarp closely adherent, moderately thick; segments 10-12; pulp-vesicles orange; juice sour. Seeds numerous, angular-ovoid, with usually rough margins. Fruit-centre usually becoming hollow.

Fl.: Jan.-Mar. *Fr.*: Apr.-June.

Ecology : Not common; in valleys and slopes of hills; also planted in gardens.

Distribution : Throughout India. Probably native of S. China and Indo-China, also introduced in Sri Lanka.

Specimens examined : National Park, 1224; Gola, 1538.

Uses : Fruits are used in the preparation of confections, marmalades, liquors, and other drinks. Flowers, leaves and fruits yield a volatile oil used in perfumery.

3. *Citrus grandis* (L.) Osbeck, *Dagb. Ostind. Resa* 98. 1757; Stone in *Dassan. & Fosb., Rev. Handb. Fl. Ceylon* 5 : 426. 1985. *C. aurantium* L. var. *grandis* L., *Sp. Pl.* 783. 1753.

C. decumana L., *Syst. ed.* 12, 508. 1767; Hook. f. in *Hook. f., Fl. Brit. India* 1 : 516. 1875; Prain, *Bengal Pl.* 1 : 307. 1903; Haines, *For. Fl. Chota Nagpur* 247. 1910 & *Bot. Bihar & Orissa* pt. 2 : 167. 1921.

Local names : Maha nimbu, Chakotra.

Small or medium-sized tree, to 15 m tall. Young branchlets angular, slightly pubescent. Blades large, ovate to elliptic, rounded or subcordate at base, subacute or obtuse at apex, with subentire to shallowly crenulate, 15-25 x 8-15 cm, petiole broad, obcordately winged; wing about one-fourth to one-third as long as blade; mid-vein and main lateral veins usually persistently pubescent. Inflorescence a single flower or a cluster of few flowers, axillary. Flowers large, 5-merous, puberulous. Petals white.

Stamens 20-25, with large linear anthers. Ovary large, globose; cells more than 10; style cylindrical, caducous. Fruit large to very large, 10-15 cm or more in diam., sub-globose to pyriform; pericarp pale green to pale yellowish, smooth to rather gland-pitted; segments large, firm, pale green to pinkish; pulp-vesicles firm, rather dry; juice scanty, mildly acid to mildly sweet or insipid. Seeds large, plump, wrinkled.

Fl.: Feb.-Apr. *Fr.*: June-Oct.

Ecology : Common; usually cultivated in gardens, village-roadsides, etc.; also self-grown in village surroundings.

Distribution : Almost throughout India, particularly in Tamilnadu, Karnataka, Maharashtra, Punjab, Uttar Pradesh, Bihar, West Bengal, etc. Native of Malesia, now widely cultivated in various tropical and warm-temperate countries.

Specimens examined : Barkagaon, 1276; Gola, 1540.

Uses : Leaves are used in epilepsy, chorea and convulsive coughs. Fruits are edible, made into jams and marmalades; also considered nutritive and refrigerant.

4. *Citrus medica* L., Sp. Pl. 782. 1753; Hook. f. in Hook. f., Fl. Brit. India 1 : 514. 1875; Prain, Bengal Pl. 1 : 306. 1903; Haines, For. Fl. Chota Nagpur 246. 1910 & Bot. Bihar & Orissa pt. 2 : 167. 1921.

Local name : Bijaura.

Shrub or small tree. Branchlets angular, often purplish when young, later subterete and glabrous. Blades elliptic-ovate to ovate-lanceolate, obtuse to rounded at apex, rounded or subcuneate at base, with serrate or crenate margins, 7-15 x 4-10 cm; petioles short, ± wingless, without or with indistinct articulation at apex. Inflorescence short, racemose, axillary, few-flowered. Flower buds large, purplish. Flowers bisexual or staminate. Petals 5, pinkish or purplish outside. Stamens usually 30-40, sometimes more. Ovary large, cylindrical, 10-13-celled. Fruit ovoid to oblong, usually mammillate at apex, yellow, rough-tuberculate, 6-10 in diam.; pericarp thick; segments rather small; pulp-vesicles greenish to pale; juice acid. Seeds many, angular, obovoid, plump, acute.

Fl.: Feb.-Apr. *Fr.*: July-Nov.

Ecology : Common: in valleys and slopes of hills, near ravines, streams, etc.; also planted in gardens, wasate places of village-surroundings, etc.

Distribution : India : Wild in the valleys along foot of Himalaya from Garwal to Sikkim, Khasia and Garrow Mountains, Central India and Western Peninsula, also distributed in other warmer parts and elsewhere in the country. Bangladesh, Sri Lanka, Pakistan.

Specimens examined : Churchu, 1281; Ichak, 1853; Pratappur, 2109.

Uses : Fruits are used mainly for pickling, also candied. Root is used in constipation, vomiting, urinary disorders, etc. Wood is used for agricultural implements. Preserved rind is used in dysentery.

4. GLYCOSMIS Correa

Glycosmis pentaphylla (Retz.) A. DC., Prodr. 1 : 538. 1824, *quoad comb. nom.*; Mitra & Subram. in J. Arnold Arbor. 50 : 155. 1969; Stone in Dassan. & Fosb., Vev. Handb. Fl. Ceylon 5 : 449. 1985. *Limonia pentaphylla* Retz., Obs. Bot. 5 : 24. 1788.

Limonia arborea Roxb., Pl. Corom. 1 : 60, t. 85. 1798.

Glycosmis arborea (Roxb.) DC., Prodr. 1 : 538. 1824; Narayanas. in Rec. Bot. Surv. India 14 : 20, f. 6. 1941.

G. pentaphylla (Retz.) Correa : sensu Hook. f. in Hook f., Fl. Brit. India 1 : 499. 1875, *p.p.*, non *Limonia pentaphylla* sensu Roxb. 1798 which is *G. mauritiana* (Lam.) Tanaka; Prain, Bengal Pl. 1 : 300. 1903, *p.p.*, Haines, For. Fl. Chota Nagpur 243. 1910 & Bot. Bihar & Orissa pt. 2 : 164. 1921. *p.p.*

Local name : Ban-nimu.

Shrub, to 3 m tall; branchlets glabrous. Petiole 2.5-5 cm long; petiolule slightly enlarged, curved; leaflets usually 5 or 3, rarely 7 or 2 or 1, elliptic or oblong-elliptic, attenuate at base, acuminate at apex, entire to minutely

or distinctly crenulate-serrate, usually paler or whitish beneath, 6-24 x 2-8 cm. Inflorescence axillary, paniculate, to 8 cm long. Bracteoles rusty-puberulent. Pedicels 0.8 mm long. Sepals broadly ovate-rotund, scarious and ciliolate at margins, puberulent, 1.2-1.5 mm across. Petals ovovate-elliptic, glabrous, entire, with thinner margins, to 5 x 2.5 mm. Stamens glabrous, to 3.5 mm long; anthers ovate-elliptic, cordate. Disk pale, obscurely lobulate. Ovary ovoid-cylindric, 2-2.5 mm long; stigma minutely papillose; ovary-cells 5. Fruit subglobose, white to pink, 1-1.3-cm across. Seed(s) mostly 1, sometimes 2 or 3, round to plano-convex, oblong.

Fl.: Sept.-Dec. *Fr.*: Nov. - Feb.

Ecology : Common; in village shrubberies, roadsides, scrub jungles, etc.

Distribution : Throughout India. Sri Lanka, Southeast Asia and Malesia.

Specimens examined : Tandwa, 1425; Markachho, 1968.

Uses : Juice of leaves is used locally in fever and liver complaints. Leaves are made into a paste and used in eczema and other skin diseases.

5. LIMONIA L.

Limonia acidissima L., Sp. Pl. ed. 2, 554. 1762; Airy Shaw in Kew Bull. 1939 : 293. 1939; Haines, For. Fl. Chota Nagpur 245. 1910 & Bot. Bihar & Orissa pt. 2 : 163. 1921.

Schinus limonia L., Sp. Pl. 389. 1753.

Feronia limonia (L.) Swingle in J. Washington Acad. Sci. 4 : 328. 1914; Tanaka in J. Ind. Bot. Soc. 16 : 232. 1937.

Feronia elephantum Corr. in Trans. Linn. Soc. London 5 : 225. 1800; Hook. f. in Hook. f., Fl. Brit. India 1 : 516. 1875; Prain, Bengal Pl. 1 : 305. 1903.

Local names : Bilin, Kait.

Deciduous, glabrous tree, to 8 m tall. Bark pale grey, shallowly furrowed. Spines 1-3 cm long. Leaves 3-10 cm long; leaflets 5-7, subsessile, obovate or trapezoid-ovate, cuneate at base, obtuse, acute or notched at tip, crenulate, 2.5-5 × 1.2-2.5 cm. Inflorescences cymose-paniculate, spreading, usually from leafless nodes; flowers small, numerous, staminate and perfect ones usually together in same inflorescence. Calyx small, glandular; lobes 5, broadly ovate, acute, ca. 0.5 mm long. Petals 5, 5-6 mm long, elliptic-oblong, acute. Stamens 7-12; filaments 2.5-3 mm long; anthers with one small apical gland. Ovary round, incompletely 4-6 celled; stigma 5-angulate-lobulate. Fruit globose, grey, rough, 5-7.5 cm in diam.; rind woody; pulp acidic, whitish. Seeds oblong, embedded in pulp.

Fl.: May-June. *Fr.*: Nov.-Dec.

Ecology : Common; mostly cultivated; sometimes found wildly in hilly jungles.

Distribution : Throughout India, mostly in drier regions. Sri Lanka, Myanmar, Indo-China; also cultivated in various countries.

Specimens examined : Hazaribagh, 489; Markachho, 1462.

Uses : Fruits are eaten; also used for making sherbet. Branches are lopped for fodder. Leaves are used as aromatic, carminative and astringent. Wood is used for house building, naves of wheels and oil crushers, pen holders and agricultural implements.

6. *MURRAYA* Koen. ex L., *nom. cons.*

Key to the Species

- 1a. Leaflets 3-7, rarely 1. Petals 1.2-2 cm long. Berry red or orange-yellow when ripe ... 2. *M. paniculata*
- 1b. Leaflets 11-25. Petals 0.6-0.8 cm long. Berry purplish-black when ripe ... 1. *M. koenigii*

1. *Murraya koenigii* (L.) Spreng., Syst. Veg. 2 : 315. 1825; Hook. f. in Hook. f., Fl. Brit. India 1 : 503. 1875; Prain, Bengal Pl. 1 : 302. 1903; Haines, For. Fl. Chota Nagpur 244. 1910 & Bot. Bihar & Orissa pt. 2 : 165. 1921. *Bergera koenigii* L., Mant. 1 : 565. 1767.

Chalcas koenigii (L.) Kurz in J. Asiat. Soc. Bengal 44 : 132. 1875.

Local names : Barsanga, Kurry patta.

Shrubs to small trees, to 6 m tall. Bark dark grey. Twigs slender, pubescent. Leaves crowded at twig-ends, 15-30 cm long; petioles 1.2-1.5 cm long, swollen at base, puberulent; leaflets 11 to 25, ovate-lanceolate, obliquely cuneate at base, acuminate with a notched tip, entire in lower half then minutely glandular-crenulate, dark green above, paler beneath, pellucid-gland dotted, 3-5 × 1.5-2.5 cm; petiole 2-3 mm long. Inflorescence terminal, dense, corymbose, paniculate, to 6 cm long and 8 cm wide. Flowers numerous, cymosely arranged. Pedicels 1.8-4 cm long. Sepals triangular, subacute, pubescent, *ca.* 1.5 mm long. Petals linear-oblong, rounded, white, gland-dotted, 6-8 mm long. Stamens alternately longer and shorter; filaments dilated below; ovary 2-celled; ovules usually solitary in each cell. Fruit ovoid or subglobose, apiculate, rugose, purplish-black when ripe, 6-8 mm in diam., 1- or 2-seeded. Seeds globular-ovoid, with translucent testa.

Fl. & Fr. : Feb. Sept.

Ecology : Common; cultivated in gardens, sometimes met with as an escape in roadsides, waste places, etc.

Distribution : Almost throughout India. Sri Lanka, Myanmar, Indo-China, Hainan and Southern China; also cultivated in various tropical countries.

Specimens examined : Hazaribagh, 229; Ramgarh, 1132.

Uses : Leaves are used as a flavouring and in chutneys, also yield an essential oil which is used as a fixative for soap perfume. Fruits are edible. Leaves are used for diarrhoea and dysentery and for checking vomiting. Root-extract is given for relief from renal pain. Wood is used for agricultural implements.

2. *Murraya paniculata* (L.) Jack, Mal. Misc. 1 (no. 5) : 31. 1820; Santap., Fl. Khandala ed. 3, 33. 1967; Stone in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 5 : 459. 1985. *Chalcas paniculata* L., Mant. 1 : 68. 1767.

M. exotica auct. non. L. : Roxb., Fl. Ind. 2 : 374. 1832; Hook. f. in Hook. f., Fl. Brit. India 1 : 502. 1875; *p.p.*; Prain, Bengal Pl. 1 : 302. 1903; Haines, For. Fl. Chota Nagpur 244. 1910 & Bot. Bihar & Orissa pt. 2 : 164. 1921.

Local names : Kamini, Marchula.

Shrubs to small trees, 3-5 m tall. Bark smooth, yellowish-white. Branches slender, glabrous. Leaves 10-15 cm long; leaflets 3-7, rarely 1, ovate or ovate-elliptic, obliquely cuneate at base, acuminate with a notched tip, entire or obscurely crenate, densely glandular, glossy and darker above, 3-7 x 2.5-3.5 cm; petiolule 3-5 mm long. Panicle axillary, few-flowered, to 4 cm long. Pedicel 0.5-1 cm long. Sepals glandular, oblong. Petals white, oblong-lanceolate, subobtusate, 1.2-2 cm long. Filaments linear, flat, tapering beneath the anther. Ovary hirsute, 2-celled. Berry red or orange-yellow when ripe, ovoid-acuminoid, apiculate, 1.2-1.5 cm long, smooth, 1-2 seeded, seated on the persistent calyx. Seeds woolly, flat.

Fl. : Apr.-July. *Fr.* : Dec.-Feb.

Ecology : Very common; in rural surroundings, forests, hills, etc; also cultivated in gardens.

Distribution : Throughout hotter parts of India. Malesia, China, Australia, Pacific Islands, Sri Lanka, etc.

Specimens examined : Hazaribagh, 492; Koderma, 1258.

Uses : Leaves are used in diarrhoea and dysentery. Leaves and root-bark are used in cough, rheumatism and hysteria. Leaf-decoction is given in dropsy. Wood is used for stool-handles, walking sticks, cabineworks and mathematical instruments.

Note : Stone (*l.c.*) restricted *M. paniculata* (L.) Jack to the wild forms with ovate or ovate-elliptic, acuminate, comparatively larger leaflets (3-7 cm long), ovoid-acuminoid fruits and larger flowers, as distinct from *M. exotica* L. which is usually placed in synonymy with this species. *M. exotica* being characterised by obovate to subelliptic leaflets (1-3.5 cm long) with obtuse or bluntly acuminate apex, ellipsoid-subglobose fruits and smaller flowers appears in cultivation in Sri Lanka only.

88. ZYGOPHYLLACEAE

TRIBULUS L.

Tribulus terrestris L., Sp. Pl. 387. 1753; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 423. 1872; Prain, Bengal Pl. 1 : 292. 1903; Haines, Bot. Bihar & Orissa pt. 2: 153. 1922. Gandhi in Saldan. & Nicols., Fl. Hassan Dist. 397. 1976; Dassan. in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 6:422. 1987.

T. lanuginosus L., Sp. Pl. 387. 1753.

Local names : Gokharu, Hathichighar.

Annual. Branches to 150 cm long, radiating from stem. Larger leaves to 5.5 cm long, with 4-8 pairs of pinnae; smaller to 3.5 cm long, with 2-4 pairs of pinnae; rachis ending in a *ca.* 1 mm long mucro; pinnae sessile, oblong, oblique at base, apiculate, with silky hairs on both surfaces, 3-15 x 1-5 mm. Flowers 0.7-2 cm across, pedicels 0.7-1.5 cm long. Sepals 5, lanceolate, yellowish-green, villous outside, 4-8 mm long. Petals 5, bright yellow, obovate, broadly rounded, 0.5-1 cm long. Stamens 5+5, outer whorl opposite the petal and slightly longer; filaments of shorter stamens to 0.25 cm long, of longer to 3.5 mm; intrastaminal scales 3-lobed, free, 0.4-0.6 mm long. Ovary tuberculate, stiff-hairy, 5-lobed and 5-loculed; ovules 3-5 in each loculus; style with 5 longitudinal grooves and 1.5-2 mm long or inconspicuous or minute; stigmatic lobes greenish-yellow, papillose, 0.6-0.8 mm long. Fruit 6-8 mm; mericarps tuberculate, woody, white-hairy, each with 2 large divaricate spines and 2 short spines.

Fl. & Fr. : June - Nov.

Ecology : Very common; in waste sandy grounds, cultivated fields, along railway tracks, roadsides, etc.

Distribution : Throughout India, particularly in dry warmer regions. Native to Mediterranean regions, distributed throughout the warmer countries of the world.

Specimens examined : Ghanghree, 1009; Jhumri Telaiya, 1752.

Uses : The dried fruits are used in local medicine particularly in diseases of genito-urinary system.

Note : Here, the treatments of Edgeworth and Hooker. f. (*l.c.*), Gandhi (*l.c.*), Dassanayake (*l.c.*), etc. are followed in keeping *T. lanuginosus* L. as synonym under *T. terrestris* L. However, Nayar & Giri (in Bull. Bot. Surv. India 24 : 161, 1983) considered them as two distinct species. The main distinguishing features lie in the style and leaflet characters. In former, the style being 0.15-0.25 cm long and leaflets ovate-oblong or ovate-orbicular, whereas in latter, the style inconspicuous or hardly 0.05 cm long and leaflets oblong. According to them, both the species are distributed together particularly in dry warmer regions of the world. Shukla (in Ind. For. 97 : 226-228, 1971) recorded his field observation of separate seed-sowing of the two species for 3 generations and concluded that as the variations are genetically controlled, *T. lanuginosus* L. may be a cytological variant of *T. terrestris* L. Following this statement of Shukla (*l.c.*) and their own study of a number of Indian specimens and careful field observation, Nayar and Giri (*l.c.*) have come to the decision to keep *T. lanuginosus* L. as distinct from *T. terrestris* L. However, more detailed study from different branches is required.

89. OXALIDACEAE

Key to the Genera

- 1a. Herbs. Fruit a capsule :
- 2a. Leaves never crowded at end of stem or branches, usually digitately 3-foliolate. Capsule with valves remaining attached to central axis ... 3. OXALIS
- 2b. Leaves crowded at end of stem or branches, paripinnate with more than 3 pairs of leaflets. Capsule with valves usually separating from axis to the base into a 5-rayed star, without leaving a collumella ... 2. BIOPHYTUM
- 1b. Large shrubs to trees. Fruit a berry ... 1. AVERRHOA

1. AVERRHOA L.

Averrhoa carambola L., Sp. Pl. 428. 1753; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1: 439. 1874; Prain, Bengal Pl. 1 : 296. 1903; Haines, For. Fl. Chota Nagpur 236. 1910 & Bot. Bihar & Orissa pt. 2 : 157. 1921.

Local names : Kamrakh, Karmal.

Small tree, densely branched, to 14 m tall. Branches often drooping with yellowish to reddish-pubescent innovations. Leaves 3-6-jugate, not clustered terminally; rachis to 20 cm long; leaflets ovate or ovate-oblong to elliptic, acute to acuminate, entire, glaucous beneath, to 7.5 x 3.5 cm. Flowers heterodistylous, melliferous; pedicels 4-7 mm long, articulated 1-2 mm below flower. Sepals triangular to obovate-oblong, yellowish brown to red, glabrous, to 4 mm long. Petals coherent above claw, obovate, purple with white markings, glabrous without, minutely glandular-pubescent inside, to 7 mm long. Stamens 10, 5 shorter stamens without anthers; shorter filaments to 1.5 mm long; longer ones to 3 mm long. Ovary elliptic, appressed-pubescent on ribs, to 2.5 mm long; styles 5, distinct; longer ones to 2 mm long, shorter ones 0.6 mm long. Fruit ellipsoid with (3-) 5 deep longitudinal angular ribs, yellow at maturity, to 8 x 4 cm with minute rimae on ribs. Seeds to 10, 8-12 x 4-5 mm; aril fleshy, bilabiate, enclosing seed.

Fl. : June Sept. *Fr.* : Sept. - Nov.

Ecology: Common; mostly cultivated, also found in village surroundings, roadsides, river banks and also in forests.

Distribution: Throughout India. Native country unknown, possibly Central and East Java, but escaping freely, often a relict of former cultivation.

Specimens examined : Koderma, 178; Hazaribagh, 1709; Koderma, 1990.

Uses : Fruits are eaten as such or after cooking; also used for making jellies, jams and pickles. Wood is used for building purposes and for furniture.

2. BIOPHYTUM DC.

Biophytum sensitivum (L.) DC., Prodr. 1 : 690. 1824; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 436. 1874, *p.p.*; Prain, Bengal Pl. 1: 295. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 156. 1921.

Oxalis sensitiva L., Sp. Pl. 434. 1753.

Local name : Lakchana.

Erect, pretty little annual herb, to 25 cm. Stem simple, hispidly pubescent. Leaves 7-12-jugate; rachis 5-10 cm long, sparsely strigose; leaflets 6-15 pairs, subsessile, truncate at base, rounded and apiculate at apex; terminal pair largest, falcate-obovate, 0.8-1.5 x 3-8 mm, asymmetric; upper ones oblong, 5-10 x 3-6 mm; basal ones ovate, 3-7 x 2-4 mm. Peduncles 7 to 10-flowered, 3-7 cm long, appressed-strigose and glandular-hairy. Pedicels 0.5-2 mm long. Bracts ovate-attenuate, 1.5-3 mm long. Sepals ovate-lanceolate, strigose and glandular-pubescent, 4-7 mm long, 5-9-nerved and longer than pedicels in fruit. Petals lanceolate, yellow with purplish lines in limb, 5-7 mm long. Stamens 10; shorter filaments 1-1.5 mm long; longer ones 2-2.5 mm long, ciliate. Ovary to 1.5 cm, terminally ciliate; style to 1 mm long; stigmas flattened, 2-fid. Capsule ellipsoid, puberulous at apex, minutely glandular hairy along ribs, 3-4 mm long. Seeds 0-3 per cell, tubercled and ridged transversely, 0.8-1 mm long.

Fl. & Fr.: July - Sept.

Ecology : Common; in shaded localities, waste lands, river banks, under damp thickets, etc.

Distribution : Throughout the hotter parts of India. Widespread in Indo-Malesian Tropics.

Specimens examined : Ghanghree, 1035; National Park, 1571.

Uses : Tribals apply the extract of plant to their children to induce sleep. Plant is also used in chest complaints, convulsions and inflammatory tumours. Plant-ash is mixed with lime-juice and given for stomachache. Decoction of leaves is given in diabetes and asthma.

3. OXALIS L.

Key to the Species

- 1a. Diffuse herb with creeping stem. Bulb absent. Petals yellow.
Leaves cauline; leaflets obovate with rounded lobes ... 1. *O. corniculata*
- 1b. Stemless erect herb. Bulb present. Petals red-purple with greenish base. Leaves basal. Leaflets obovate, fish-tail-like, with acute lobes ... 2. *O. latifolia*

1. *Oxalis corniculata* L., Sp. Pl. 435. 1753; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1: 436. 1874; Prain, Bengal Pl. 1 : 294. 1903; Haines, Bot. Bihar & Orissa pt. 2 : 157. 1921.

Local names : Amboti, Chalmori, Amrul sak.

Diffuse, creeping, perennial herbs, rooting at nodes. Stems several from main root, with ascending to suberect branches above ground, appressed-pubescent. Leaves cauline, digitately 3-foliolate; leaflets obcordate with rounded lobes, cuneate at base, glabrous to sericeous above, paler, often glaucous beneath, 0.4-2 x 0.5-1.8 cm. Stipules indistinct to small, rectangular, to 2.5 mm long. Flowers 6-8 mm across, in cymose to pseudo-umbellate inflorescence; bracts 2-several, subopposite to whorled, ovate-lanceolate, puberulous, 3-4 mm long. Peduncles 3-10 cm long, sparsely puberulous. Pedicels 0.8-2 cm long, articulated beneath calyx. Sepals lanceolate, obtuse, sparsely puberulous, 2-5 mm long. Petals yellow, spatulate-oblong to oblanceolate, rounded to emarginate at apex, 0.5-1 cm long. Outer stamens shorter than inner; longer filaments to 3.5 mm and shorter to 2.5 mm long. Ovary ellipsoid, puberulous, to 1.5 mm long; style minutely ciliate. Capsule linear-cylindric, pentagonal, acuminate at apex, minutely puberulous, 1-2 cm long. Seeds 5-10 per fruit, ovoid, flattened, transversely ridged, to 1 x 0.7 mm.

Fl. & Fr. : Almost throughout the year, but chiefly during Aug-Dec.

Ecology : Common; in waste lands, moist grass-fields, gardens, river banks, on walls, along roads, forest-edges, etc.

Distribution : Throughout India. Cosmopolitan, origin unknown.

Specimens examined : Hazaribagh, 250; Jhumri Telaiya, 683; Ghanghree, 1305.

Uses : Leaves are eaten as salad or cooked as vegetable; also used for sandwiches, pickles and chutneys. Fresh juice of plant given in dyspepsia, piles and anaemia. Infusion of leaves is used to cure opacity of cornea.

Note : Most complex and variable weed in habit, size and shape of leaflets, length of peduncles, degree of hairiness and length of capsules.

Several intraspecific varieties are found in nature, but all appear to be linked by intermediate forms.

*2. *Oxalis latifolia* Kunth in H.B.K., Nov. Gen. Sp. 5: 237, t. 467. 1821; Calder in Rec. Bot. Surv. India 6 : 335. 1912.

Stemless herb from bulbous base having no rootstock. Bulb ovoid, with numerous basal stolons, with few scales and ending in ovoid bulbils. Leaves basal, digitately 3-foliolate; leaflets broadly obdeltoid, fishtail-shaped with 2 acute lobes, often with 2 minute calli at notch, glabrous above, subglaucous beneath, 1.2-7.5 cm x 2.5-8.5 cm; petiole to 20 cm long, glabrous. Flowers in 5-13-flowered umbellate inflorescence. Peduncles slightly hairy, to 25 cm long. Bracts 2, ovate, with glabrous or strigose margins, ca. 0.6 mm. Pedicels filiform, glabrous, to 2 cm long. Sepals oblong 4-5 mm long; apical calli 2, minutely hastate, orange, to 1 mm long. Petals red-purplish with greenish base, 1-2 cm long. Longer filaments 4-5 mm long, with a minute tooth; shorter ones 2.5-3 cm long; staminal tube stipitate. Ovary stipitate, sparsely ciliate at apex on ribs; style sparsely ciliate; stigma peltate; ovules 3-6 per cells in rows. Fruits not seen.

Fl.: Dec.-Mar. *Fr.*: Feb.-May.

Ecology : Common; generally cultivated in gardens, also found as an escape in waste places, in cultivation, etc.

Distribution : India : North-western Himalayas, Chota Nagpur, Assam, Peninsular India, Palni Hills and Khandala. Native of Central and Tropical South America, cultivated and escaping in many countries of the world.

Specimens examined : Hazaribagh, 510; Markachho, 1480.

Uses : Plant is used as soporific. Leaves and bulbs are used as green manure.

Note : According to Babu (Herb. Fl. Dehra Dun 104. 1977), this species has been misidentified as *O. latifolia* Kunth by Calder (*l.c.*) and others, and for this he has used a new name as *O. richardiana* Babu. He added that *O. latifolia* is a tropical American species and is easily

recognisable by appendiculate longer filaments and glabrous shorter filaments. *O. richardiana* is native to Mexico and West Indies and naturalised in India and other countries.