

**Flora of India  
Series 3**

# **FLORA OF WEST CHAMPARAN DISTRICT, BIHAR**

**P. K. BHATTACHARYYA  
&  
KRISHNENDU SARKAR**



**BOTANICAL SURVEY OF INDIA**

# FLORA OF WEST CHAMPARAN DISTRICT BIHAR

P.K. Bhattacharyya  
and  
Krishnendu Sarkar



BOTANICAL SURVEY OF INDIA  
CALCUTTA

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Cover Photo : *Exacium tetragonum* Roxb., Gobardhana, West Champaran.

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# C O N T E N T S

Foreword	...	...	i
Preface	...	...	iii
<b>INTRODUCTION</b>			
Physiography	...	...	1-3
Important places	...	...	3-4
Geology and soil	...	...	4
Climate	...	...	4-5
History	...	...	5-6
The people	...	...	7
Earlier collections and publications	...	...	9
Present collection	...	...	9
Vegetation	...	...	9-12
Helophytes and hydrophytes	...	...	13
Economic botany	...	...	13-18
Analysis of the flora	...	...	19-20
Rare, endangered and endemic plants	...	...	20-22
Plan followed in this flora	...	...	22-23
Abbreviations	...	...	23-24
References	...	...	25-26
 <b>TAXONOMIC ACCOUNT</b>			
Synoptical key to families	...	...	26-40
Enumeration	...	...	41-496
Summary	...	...	496
Appendix	...	...	497-499
Index	...	...	500-534

## FOREWORD

The Botanical Survey of India has taken up the publication of new Flora of India under four series : Series 1 on the National Floras comprising taxonomic revisions of families, tribes and genera for the whole country; Series 2 on the floristic inventories of different States/Union territories or large physiographic regions; Series 3 pertaining to the floras of important districts and Series 4 to include special publications and monographs on Indian Flora.

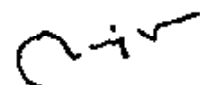
Bihar, one of the largest states in the country with its dense forests has not been fully explored for its plant wealth. The Botanical Survey of India undertook District Flora Project in 1982 at all-India level. Under this project, five districts of Bihar, namely Dumka, West Champaran, Hazaribagh, Palamau and Giridhi were allotted to different University experts. The present work is the outcome of both extensive and intensive botanical explorations in the district of West Champaran and of a critical evaluation of the flora.

In this work, the introductory chapter outlines the location, general topographical and climatic features, history of the locality and its people, the past and present botanical surveys, general vegetation types and their floristic composition, economic plants and the phytogeographical considerations of the district. The flora provides a comprehensive coverage of the floristics of the West Champaran District.

The taxonomic part deals with keys to the classes, families, genera, species and infra specific taxa. Notes on distribution, frequency, phenology and field collection numbers have been provided for each taxon. Photographs of the location, and the people and line drawings for some important species have been included.

**Flora of West Champaran District, Bihar** is an in-depth scientific study of the flowering plants of the West Champaran district of Bihar. It is to be hoped that this work will be of immense help to students and teachers of botany, foresters, environmentalists, conservationists and persons concerned with raw plant materials for industry alike and will also richly contribute for writing up of the state flora of Bihar with changing needs and new challenges.

Botanical Survey of India  
P-8, Brabourne Road  
Calcutta - 700 001.  
March, 1997.



P. K. Hajra  
Director

## PREFACE

The West Champaran District Flora Project was undertaken for several cogent reasons. Primarily this area was not well explored for its plant wealth and there was no current District Flora for the Bihar State. There are specialized sandstones flora at Ramnagar-Someswar area, seasonally inundated low land area at Bettiah and the endemic flora in the sub-Himalayan tract. To facilitate modern botanical studies, the current system of classification and the names in current use are simply indispensable.

This Project was conceived by the first author (P.K.B.) in 1986. It was performed under the grants from the Botanical Survey of India (1986-89) and the University of Burdwan (1990-91). The total cost of the project has been Rs. 1,75,000. The University of Burdwan, where the principal investigator is based was a natural choice for the research base. One of us (K.S.) while working as a Research Scholar under the supervision of the other (P.K.B.) initially prepared it as a Thesis for the award of Ph.D. degree of the Burdwan University and the Degree was awarded to him in 1992.

**Flora of West Champaran District, Bihar** is a thoroughly revised version of the original thesis, reset and edited by the first author. For the preparation of the index to the flora, grateful thanks are due to Mr. Ananda Gopal Banerji, Junior Research Fellow, Dept. of Botany, Burdwan University.

The authors are grateful to Dr. M. P. Nayar, former Director and Dr. U.C. Bhattacharyya, former Joint Director, both of the Botanical Survey of India for their encouragement and support. We also gratefully acknowledge the support and help provided by Dr. Bartel Hansen, Keeper of the Botanical Museum and Library, University of Copenhagen and also by Dr. P. Hiepko, Keeper of the Willdenow Herbarium, Botanischer Garten and Botanisches Museum, Berlin-Dahlem, when the first author visited their respective institutions in 1987. Dr. Hansen deserves special thanks for offering comments and suggestions on an earlier draft of the work.

Without the active support and patronization of Dr. P. K. Hajra, the present Director, Botanical Survey of India, this book could not have been published.

We are grateful to Shri Utpal Chatterjee, Scientist-B, In-charge, Publication Section, Shri R. G. Bhakta, Publication Officer, Shri S. K. Sur, Sr. Proof Reader and their associates, for their co-operation and help in bringing out the book.

Our final acknowledgement strikes a note of sadness, Dr. Sushil Kumar Mukerjee, Ex-Keeper, C.N.H. (CAL) who used to take much interest in this work and to whom we are indebted for so much help and sympathy, has recently passed away.

Burdwan University,  
March, 1997.

P. K. Bhattacharyya  
and  
Krishnendu Sarkar



Pl. 1. Dry-deciduous forest, Someswar Hills.



Pl. 2. Tarai grassland, Madanpur.



**Pl. 3. A ravine in the Someswar Hills.**



Pl. 4. Soil erosion, Someswar Hills



Pl. 5. Collection of forest resources by the *Tharu* tribe,  
Bhikhna Thori.



Pl. 6. Preservation of cow-dung-cake by the tribal people, Bikhna Thori.



Pl. 7. *Nelumbo nucifera* Gaertn.. Majhaolia.



Pl. 8. *Argemone mexicana* L., Bettiah.



Pl. 9. *Coccinea grandis* (L.) Voigt, Narkatiaganj.



Pl. 10. *Butea monosperma* (Lamk.) Taub., (Flame of the Forest) Bakhri Bazar.



Pl. 11. *Abrus precatorius* L., Bettiah.



Pl. 12. *Jatropha gossypifolia* L., Bettiah.



Pl. 13. *Reinwardtia indica* Dumort., Bhikhna Thori.



Pl. 14. *Trachyspermum villosum* (Haines) Bhatta. et Sarkar  
(= *Carum villosum* Haines) at Someswar Hills.



Pl. 15. *Swertia angustifolia* Ham. ex D. Don, Valmikinagar.



Pl. 16. *Exacum tetragonum* Roxb., Gobardhana, West Champaran.



Pl. 17. *Wrightia arborea* (Dennst.) Mabb., Ramnagar.



Pl. 18. *Calotropis gigantea* (L.) R.Br., Bettiah.



Pl. 19. *Merremia vitifolia* (Burm.f.) Hall.f., Bhikhna Thori.



Pl. 20. *Bacopa monnieri* (L.) Pennell., Majhaolia.



Pl. 21. *Aeginetia indica* L., Bhikhna Thori.



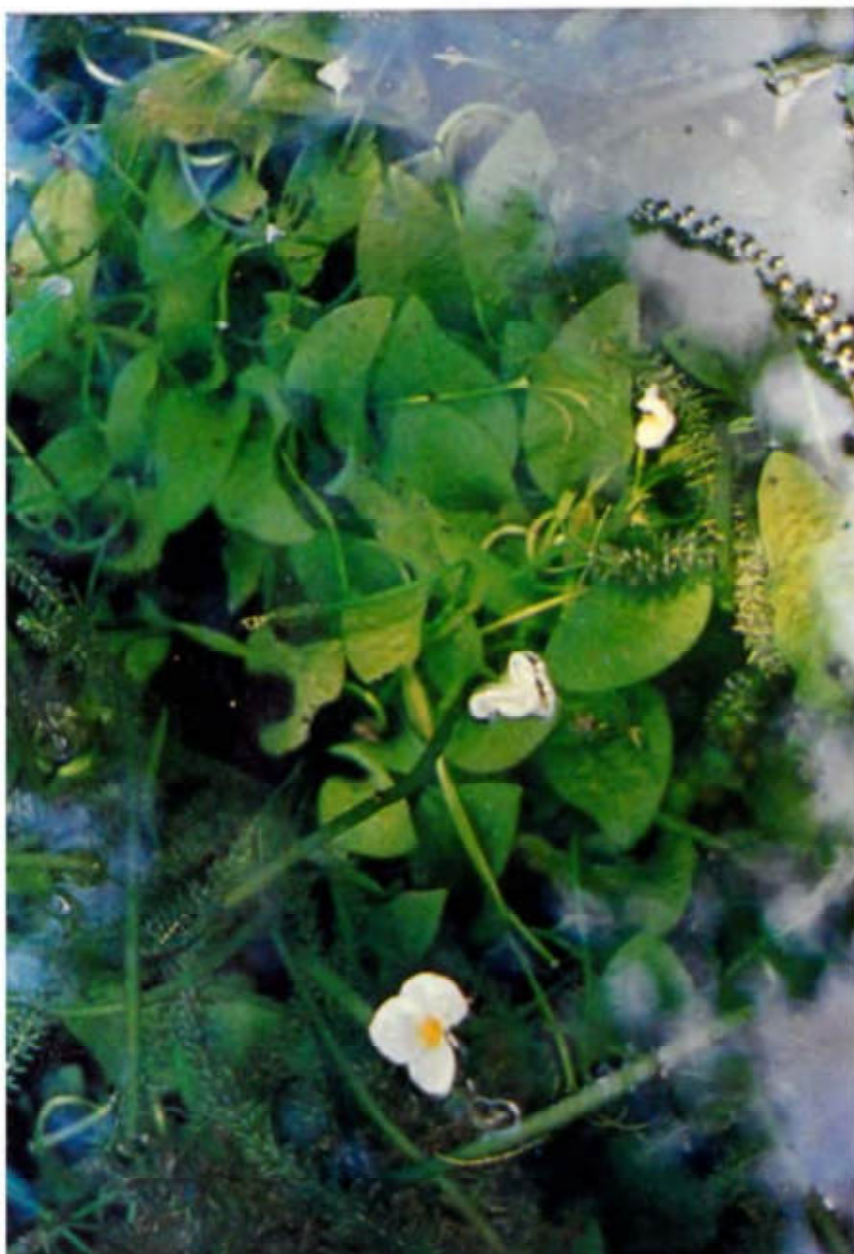
Pl. 22. *Phlogacanthus thyriformis* (Hardw.) Mabb.,  
Someswar Hills.



Pl. 23. *Jasminum multiflorum* (Burm. f.) Andrews, Kotraha.



Pl. 24. *Caesulia axillaris* Roxb., Mungraha.



Pl. 25. *Ottelia alismoides* (L.) Pers., *Hydrilla verticillata* (L.f.)  
Royle and *Vallisneria spiralis* L., Bettiah.



Pl. 26. *Aponogeton natans* (L.) Eng. & Kra.  
( = *A. monostachyon* L.f.), Madanpur, West Champaran.



Pl. 27. *Typhonium trilobatum* Schott., Bagaha.



Pl. 28. Sabai collectors, Someswar Hills.



Pl. 29. Bundles of Sabai, Someswar Hills.



Pl. 30. *Phragmites vallatoria* (L.) Veld. (= *P. karka* (Retz.)  
Trin. ex Steud.), Gobardhana.



Pl. 31. *Curcuma zedoaria* (Christm.) Rosc., Someswar Hills.



Pl. 32. *Vanda tessellata* (Roxb.) G.Don, Madanpur, West Champaran.

## INTRODUCTION

### Physiography

The district West Champaran is situated between 26°30' and 27°30' north latitude and between 83°45' and 84°40' east longitude (Map 1). It extends over an area of 5228 sq. km. Bettiah is the district headquarter. There are two subdivisions, Bagaha and Bettiah.

The name " Champaran " is a corruption of "Champa-aranya " i.e., the forest of "Champa" trees (*Michelia champaca L.*), a designation which is popularly believed to date back to the time when the district was a vast forest, uninhabited except by solitary ascetics ( O' Malley, 1907 ). Vide notification number RS. VW. -86- fUt. dated 2.11.72, West Champaran district with the jurisdiction of Bettiah Sadar subdivision has been created from Champaran district.

The district is bounded on the north and north-east by Nepal ; on the east and south-east by the district East Champaran ; on the south by Gopalganj district and on the north-west by the Gorakhpur district of Uttar Pradesh.

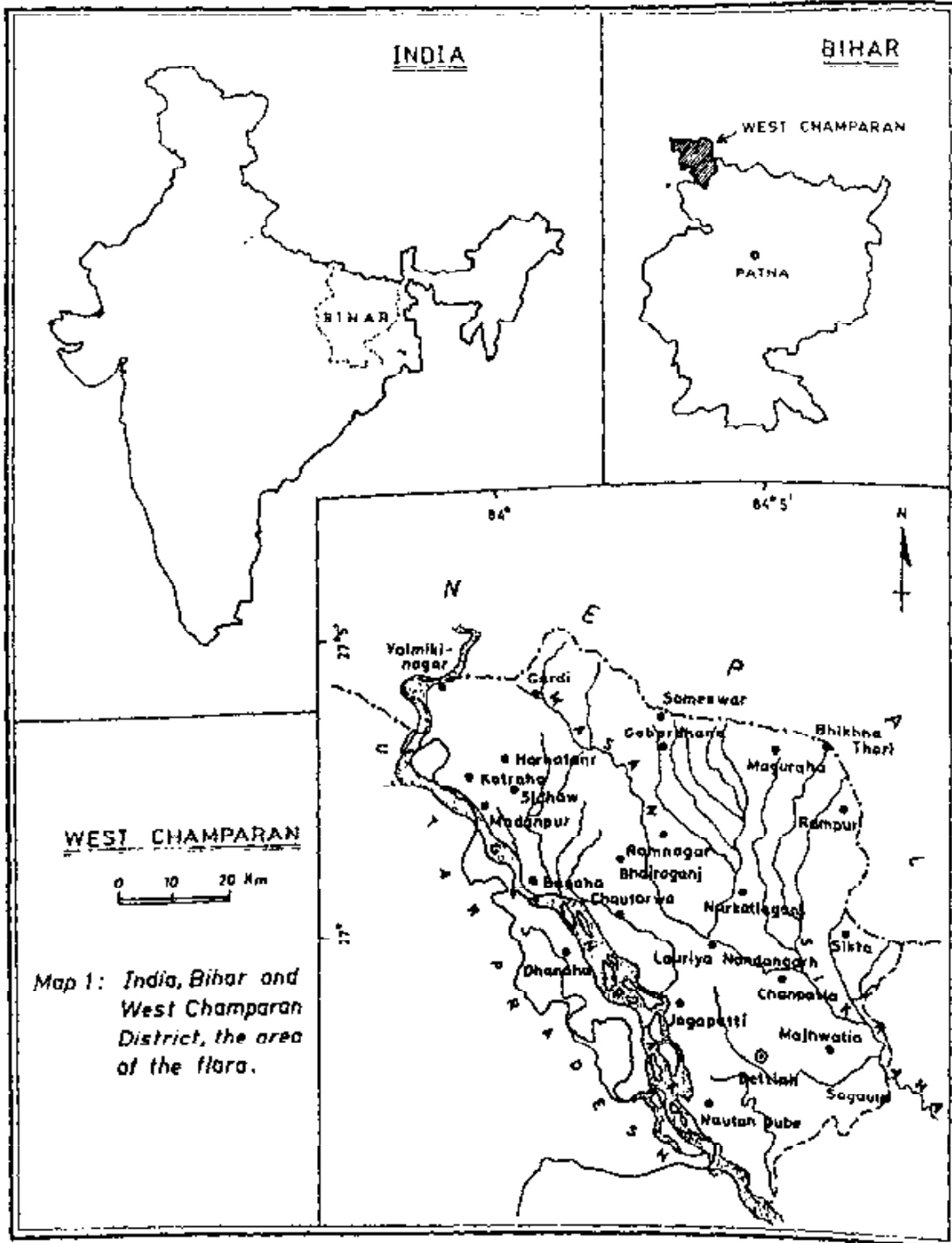
In shape, West Champaran roughly resemble a rectangle. The maximum length and width of the district are 115 and 82 km respectively.

Topographically the district can be divided into 4 distinct tracts. These are :

- a. Northern tract is the Someswar and Dun range of ill-compacted sandstones containing large stretches of dry deciduous forests.
- b. Skirting these hills is the submontane tract, the Tarai, containing grasslands, scrubs and forests.
- c. Northern side of the Little Gandak is composed of old alluvium and contains much lowland suitable for rice cultivation.
- d. The southern part of the Little Gandak is composed of recent alluvium deposited during the oscillations of the Gandak while it shifted westwards to its present channel. It is characterised by stretches of upland varied in places by large marshy depressions. Here the soil is lighter and suitable for rabi crops.

The altitude of the plain land varies from 76-300 m.

The hill system consists of Dun Hills and Someswar Hills. It is the extension of Siwalik range. Dun Hills extends for about 50 km south-eastern direction from the north-west corner of the district, with an average breadth of 10-12 km. Someswar range is situated to the north of the Dun Hills. The



average height is 457 m. The Fort Someswar is 762 m high. These hills are mainly composed of unconsolidated sandstones. In some places these hills are inaccessible to man. Steep ravines had produced by the action of rainfall. The character of the surface varies, being rocky and barren in some places, while in others it is thickly covered with deciduous trees and grasses. The great peaks of Dhaulagiri, Gosainthan, Gourishankar are closely visible from the Fort Someswar.

The Gandak or Great Gandak is the largest river of the district. The river rises in the southern boundary of central Tibet and after receiving the drainage of the Himalaya enters the plains near Valmikinagar. Little Gandak is the second largest river of the district. It rises in the western extremity of the Someswar Hills and flows through the centre of the district from north-west to south-east direction. In the northern portion of its course it is known as the Hara and in the southern portion as the Buri Gandak or Sikrana. Between Great Gandak and Sikrana, the only important rivers are the Lalbegi and Dhanauti. Dhoram, Pondai, Singhara, Harbora, Ramraika, Masan represent minor rivers.

Gold is found in the beds of hill-streams in the form of small particles or in lumps about the size of a dried pea (Hunter, 1877). "Salgramasila" are known to occur from the river-bed of Gandak. There are large stretches of marshylands near Bettiah and Bagaha (Map 2). It is also known as "chaurs"

### IMPORTANT PLACES

*Bettiah* : It is the headquarter of the district West Champaran. The name Bettiah is said to be derived from the fact that the place was once famous for its cane (bet) jungle.

*Bagaha* : It is the headquarter of the subdivision Bagaha, situated on the eastern bank of the Great Gandak, 56 km north-east of Bettiah.

*Ramnagar* : It is a small town, situated 21 km to the north-west of Bettiah. There is a large Shiva temple on the northern extremity of the town.

*Narkatiaganj* : It is a small town, situated on the north-east corner of the district.

*Lauriya Nandangarh* : A village of the Bettiah subdivision about 25 km north-west of Bettiah. It contains some of the most interesting remains of the lion pillar of Ashoka, and some ancient mounds. The pillar's shaft is formed of a single block of polished sandstone. It is 10 m high. The pillar is scribed with the edicts of Ashoka. The pillar is now over 2,000 years old.

*Valmikinagar* : It is situated on the confluence of rivers Tamsa, Gandak and Narayani on the outskirts of the mighty Himalayas. It is believed to be the place where the epic Ramayana was created by the great poet sage Valmiki. Its previous name was Bhaisaloton.

*Bhikhna Thori* : A village on the north-east extremity of the district. There is a connecting road to Nepal. Chinese pilgrims entered India probably through this Bhikhna Thori Pass.

## GEOLOGY AND SOIL

The northern part of the district is occupied by the Dun and Someswar Hills and are distinct geologically and floristically from other parts of the district. They are composed of sandstones and gravels of the Siwalik system. It occupies the outer Himalayas or the Siwalik ranges, which intervene between the lesser Himalayas and the gangetic plains.

The Someswar system occupies the geological time scale from Middle Miocene to Lower Pleistocene of Tertiary. They are known as the Siwalik system, because of their constituting the Siwalik Hills near Hardwar. The composition of the Siwalik deposits shows that they are nothing else than the alluvial detritus derived from the subaerial waste of the mountains, swept down by their numerous rivers and streams and deposited at their foot (Wadia, 1919). Siwalik system is composed of detrital rocks, such as coarsely-bedded sandstones, sand rock ; clays and conglomerates. The lithology of the Siwaliks suggests their origin ; they are chiefly water-worn debris of the granitic core of the central Himalaya, deposited in valleys of the Siwalik-river.

Soil of this district is of two types, tarai soil and alluvial soil. Tarai soil is restricted in the forest areas and the alluvial soil occupies the remaining portion of the district. The soil remains wet for over six months in a year.

## CLIMATE

The climate of the district is broadly divisible into—summer season : late March to May ; rainy season : June to October ; cold season : November to early March. The climate is pleasant during the cold season.

The mean temperature is 24° C. The highest temperature reaching in the afternoons of April and May has been recorded as 36° C and the lowest in the pre-dawn period of December has been recorded as 4° C

The mean humidity is 83 percent. The rainfall is heavier than all other districts of Bihar. The annual average rainfall is 137.16 cm. June and July experience the heaviest showers.

## HISTORY

Legendary history, local tradition, the names of places and archaeological remains, all point to a prehistoric past. Local tradition asserts that in the early ages Champaran was a dense primeval forest, in whose solitude Brahman hermits studied the "aranyakas". In the Vishnu and other Puranas mention is often made of a Champak-aranya stretching along the Salgrami or Narayani river (= The Gandak) and according to the descriptions contained in ancient writings, it was a place of retreat for Hindu ascetics. Various parts of the district are also connected by immemorial tradition with many of the great Hindu rishis—Utthanpad, Dhruba, Valmiki, Lava, Kusha and others.

Apart, however, from these traditions, it seems probable Champaran was occupied at an early period by races of Aryan descent. Videhas after their migration from Punjab settled in this part. This area was in course of time ruled over by king Janaka of Ramayana, in a place called Jankigarh. Under his rule the kingdom of Mithila was the most civilized kingdom in India. His chief priest was Yajnavalkya, who revised the Yajur Vedas. The speculations of the monarch himself, enshrined in the sacred works called the Upanishads. The kingdom of Virat mentioned in the Mahabharata was situated at or near a village called Vairati. Vrijjians replaced the rule of Videha. The Vrijjians were probably the Scythian invaders (Beal, 1884). Lauriya Nandangarh were once capital of the Vrijjian tribes (Cunningham, 1871). Great mound of earth at Lauriya Nandangarh were erected to serve as sepulchral barrows for their rulers (Cunningham, 1871). In one of them a small punch-marked silver coin has been found, which may be as old as 1000 B C ; and it seems at least certain that they were erected before the rise and spread of Buddhism. Ajatasatru, the king of Magadha extended his rule in this area at the close of the 6th century BC (Smith, 1904). A few places in Champaran may be associated with the life of Buddha. According to Buddhist tradition, Buddha stripped himself of his princely dresses and ornaments, cut his hair, and assumed the outward aspect and character of an ascetic. The place is known as Chandaka's return. Buddha passed through Champaran on his last march from Vaisali to Kusinara, the scene of his death. Lauriya Nandangarh or its neighbourhood is believed by some to be the site of the "ashes stupa" erected over the ashes or charcoal taken from his funeral pyre.

In the 4th century BC this area passed under the rule of Mauryan Emperor. The great pillar at Lauriya Nandangarh was erected by Ashoka.

Chinese pilgrims Fa Hian (400 A D), Sung-Yun (518 AD) also visited the district. They entered India probably by the Bhikhna Thori pass. Hiuen Tsiang also travelled Champaran in the first half of the seventh century. The first place which he visited in this district was the site of Chandaka's return, which he mentions as being situated in the kingdom of Rama, a kingdom which had been waste and desolate for many years, the towns beings decayed and the inhabitants few. The site of Chandaka's return was commemorated by a great stupa built by Ashoka in midst of dense forest. Leaving this place, he proceeded south-east to the stupa built over the ashes of Buddha, by which were an old Buddhist monastery and another large stupa built by Ashoka, mostly in ruins but still 100 ft high. From this place he went north-east to Kushinagara "through a great forest along a dangerous and difficult road, where wild oxen and herds of elephants, and robbers and hunters cause incessant troubles to travellers" (Smith, 1904). This account sufficiently shows that the northern part of Champaran was still almost an uninhabited waste (O' Malley, 1907).

Around 850 AD Gopala, the founder of Pala dynasty, extended his power westward over Bihar. Around 925 AD it was under Yasovarman and early in the 11th century it was under the rule of Chedi kings. Later it was a part of Sena dynasty.

In the beginning of the 13th century Muhammadan conquest swept over Bihar. In the early part of the century Champaran was under Simraon dynasty. Its founder was Nanyupa Deva. In 1323 the Emperor Tughlak Shah defeated Hara Singh Deva and took the possession over Champaran.

A Roman Catholic Mission was established at Bettiah in December 1745 by the Italian Missionary of the Capuchin order. At the fag end of the 19th century one Hieronymite Missionary first collected plants in the unworked district of Champaran.

In 1764 Champaran passed with the rest of Bengal under British rule after the decissive battle of Buxar.

In 1813 Colonel Hickey for the first time founded an indigo factory in this district. The general farmers of Champaran were in great distress and were forced to cultivate indigo by British indigo planters.

M. K. Gandhi in April 1917 defied section 144 of Criminal Procedure Code in Champaran of Bihar which was one of his first testing ground of 'Satyagraha'. There riots testified against the indignities suffered by them at the hands of British indigo planters (Phatak, 1965 ).

## THE PEOPLE

The district has a populations of 19,72,610 persons (Padmanavan, 1984). At the census of 1901 the population was 7,49,864 (Gait, 1901). Thus in a period of 80 years the population becomes more than double. The percentage of increase is 163. The principal statistics of the census of 1901 and 1981 are reproduced in the table 1. The abrupt increase of population in this area is due to the partition of Bengal and migration of Bangladeshi refugee.

**Table 1 :** The Principal Statistics of the District

CENSUS 1901 (Gait, 1901)				
Area in sq. km	No. of Villages	of Towns	Population	Population per sq. km
5,213.6	1,319	1	7,49,864	144
CENSUS 1981 (Padmanavan, 1984)				
5,228.0	1,496	4	19,72,610	377

The total area of the district is 5228 sq. km of which 5,177.5 sq.km (99.04%) is the rural area. There are total 1496 villages of which 1363 are inhabited and 133 are uninhabited. Total rural population is 18,28,062, i.e. 92.67% of which 9,54,582 persons are male and 8,73,480 are female. Rural population per sq. km is 353 persons. Number of occupied residential houses are 2,80,824 and number of households are 3,04,179.







The urban area occupies 50.5 sq. km (0.96%). Total urban population is 1,44,548 persons (7.33%) of which 77,451 persons are male and 67,097 persons are female. Population per sq. km is 2,869 persons. Bettiah, the district head quarter contains a population of 72,167 persons

Total main workers are 1,18,040 persons of which 92,559 persons are male and 25,481 persons are female. Total 11,700 persons are cultivator.

Total 3,70,579 persons (18.79%) are literate in the district of which 2,86,472 persons (77.3%) are male and 84,107 persons (22.7%) are female.

Map 2: Wild, pastoral and agricultural landscape of the district West Champaran.

REFERENCES

- Dry deciduous forest 
- Wet deciduous forest 
- Grassland 
- Marshyland 
- Irrigated cropland 
- Unirrigated cropland 



The district is dominated by Hindu population. Total 15,80,257 persons out of 19,72,610 are Hindu. Thus 80% are Hindu. Muslim population is of 3,87,243 persons (18%).

Total shedule cast population is of 2,90,812 persons (14.74%) of which 2,80,000 persons (96.28%) live in the rural areas and 10,812 persons (3.72%) live in the urban area. About 7.85% of the S.C. population are literate.

The Tharus are an aboriginal tribe who inhabit the sub-Himalayan Tarai. The origin of the Tharus has formed the subject of much controversy, but the most probable explanation seems to be that they are a Dravidian race (O' Malley, 1907) whose ancestors ruled at one time in the valley of the Ganges and were gradually driven up into sub-Himalayan forests. There they have been brought into contact with the Nepalese and other hill tribes, and their physiognomy has acquired in some instances a slightly Mongolian cast, which shows itself chiefly, but not to a striking degree, in slanting eyes, high cheek-bones, and scanty beards and moustaches. In other respects, thier physical characteristics are of the strictly Indian type.

The vernacular language in the district is a dialect of Bihari Hindi called Bhojpuri. There are 3 forms of this dialect – Madhesi, Awadhi and Tharu. Madhesi is the mixture of Bhojpuri and Maithili which is spoken over the whole west Champaran. Tharu dialect is a mixture of Bhojpuri and aboriginal words. It is the dialect of the Tharus. Muslim peoples speak in Awadhi dialect.

### EARLIER COLLECTIONS AND PUBLICATIONS

One Carmelite, White Friar (Hieronymus in Prain) Father Rev. Rastier (around 1900) collected plants from Champaran (Haines, 1925). Henry Haselfort Haines (b. 1867–d. 1945), British forester in India extensively collected plants from this district around the years 1919 and 1925. Haines "has visited, either on special duty, or on behalf of private owners, or during short periods of leave, the forests of Champaran" (Haines, 1925). Banerjee and Banerjee (1963, 1969); Thothathri (1965); Thothathri, Shetty and Hajra (1966) collected some plants from this district.

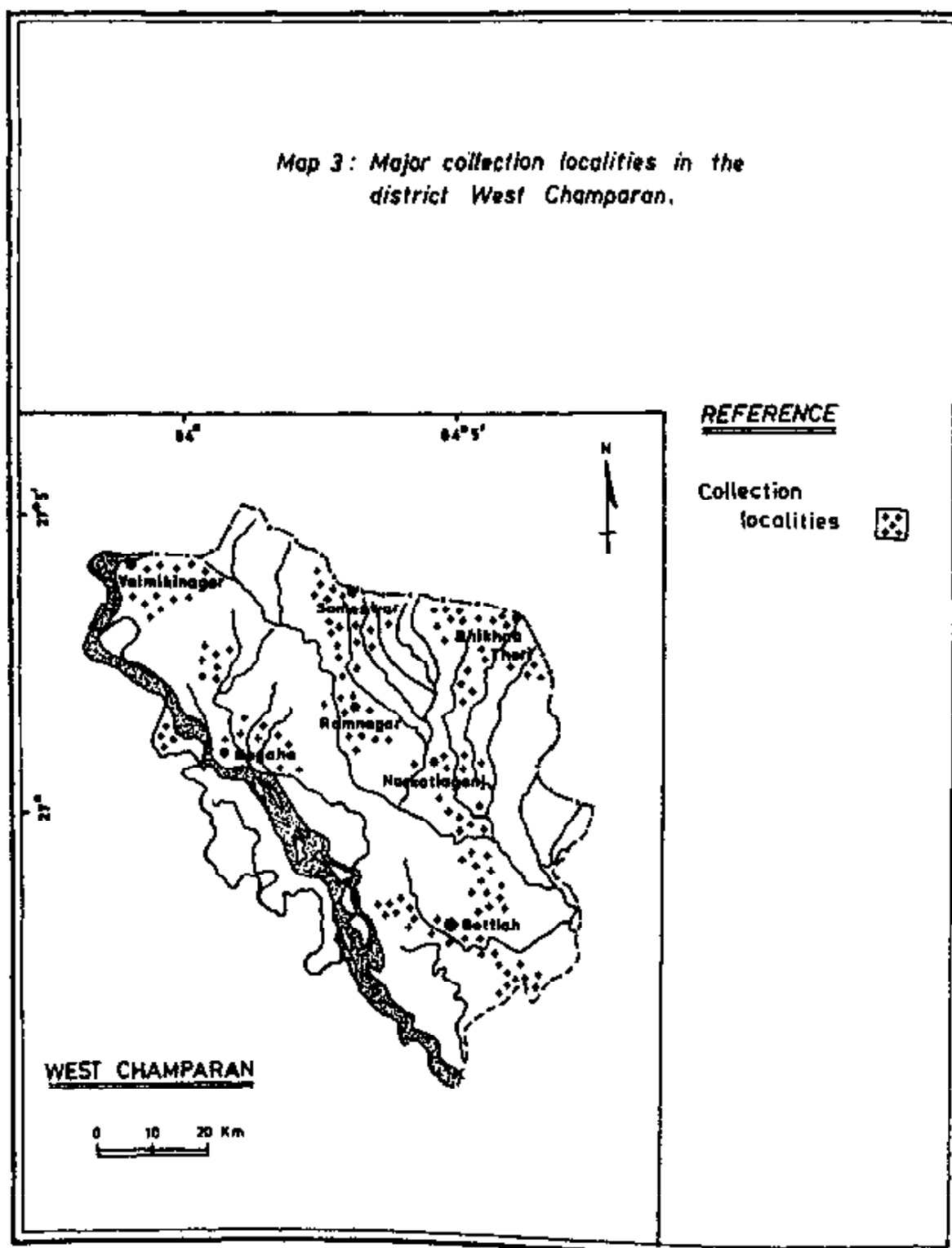
### PRESENT COLLECTION

More than 4000 plant specimens belonging to 2000 field numbers collected in different seasons in 10 collection trips involving 102 collection days between the years 1986 and 1990, form the basis of the present work. Major collection localities are shown in the Map 3.

### VEGETATION

The district West Champaran is included in the Gangetic plain. It is

Map 3: Major collection localities in the district West Champaran.



characterized by the complete absence of Cupuliferae and by few or very few Ranunculaceae, Magnoliaceae, Cruciferae, Guttiferae and the presence of *Shorea robusta*, *Terminalia* spp., *Anogeissus latifolia*, *Madhuca* spp., *Butea* spp., *Schleichera oleosa*, *Bauhinia* spp., *Zizyphus* spp., *Nyctanthes arbor-tristis*, *Dendrocalamus strictus*, *Saccharum* spp. (Haines, 1925).

Total forest area is 900 sq. km (Map 2). The percentage of forests to geographical area is below 10 for the entire Bihar state. But in case of West Champaran it is 17.1%. The status of the forest is "protected". Forest revenue (1969-70) ranges from 40 & 11-20 rupees/ hectare of forests (Dasgupta, 1976).

Towards the beginning or middle of the hot season the forest is for the most part nearly leafless. The monsoon period is further characterized by the rapid production of shoots and leaves of numerous woody and herbaceous climbers, e. g., *Dioscorea*, *Smilax*, *Ipomoea*. During this period shoots and leaves develop also in deciduous and evergreen trees, shrubs and subshrubs. Numerous annuals also emerge and cover the entire forest floor. The forest area can broadly be classified into two major groups--Tropical Dry Deciduous Forests and Tropical Moist Deciduous Forests. In both these forests sal is the predominant element. A short account of the two major forest types is given below.

I. *Tropical Dry Deciduous Forests* : It occupies the entire forest areas excepting the small forest tract near Valmikinagar. The entire northern part is occupied by the sandstone hills. The sandstone areas are characterised by the presence of *Shorea robusta*, *Dillenia aurea*, *D. pentagyna*, *Kydia calycina*, *Butea monosperma*, *Anogeissus latifolia*, *Aegle marmelos*, *Lagerstroemia parviflora*, *Bauhinia purpurea*, *Thespesia lampas*, *Dalbergia sissoo*, *Miliusa velutina*, *Bombax ceiba*, *Mangifera indica*, *Clausena kanpurensis*, *Sterculia urens*, *S. villosa*, *Terminalia belerica*, *T. alata*, *T. chebula*, *Careya arborea*, *Woodfordia fruticosa*, *Eugenia heyneana*, *Anthocephalus cadamba*, *Adina cordifolia*, *Mitragyna parviflora*, *Pavetta indica*, *Gardenia turgida*, *Coffea benghalensis*, *C. khasiana*, *Hymenodictyon orixense*, *Wendlandia tinctoria*, *Xeromphis spinosa*, *X. uliginosa*, *Spermadictyon suaveolens*, *Nyctanthes arbor-tristis*, *Ardisia solanacea*, *Holarrhena pubescens*, *Calotropis gigantea*, *C. hamiltonii*, *Ehretia laevis*, *Oroxylum indicum*, *Stereospermum chelonoides*, *S. colais*, *Phlogacanthus thyriformis*, *Eranthemum purpurascens*, *Gmelina arborea*, *Clerodendrum serratum*, *Caryopteris bicolor*, *Cassine glauca*, *Schleichera oleosa*, *Murraya paniculata*, *M. koenigii*, *Celtis tetrandra*, *Holoptelea integrifolia*, *Trema orientalis*, *T. politoria*, *Ficus semicordata*, *Streblus asper*, *Salix tetrasperma*, *Antidesma ghaesembilla*, *Bischofia javanica*, *Bridelia retusa*, *Croton roxburghii*, *Emblica officinalis*, *Kirganelia reticulata*, *Trewia nudiflora* and others.

Lianas and climbers are represented by *Bauhinia vahlii*, *Butea parviflora*, *Meliosma simplicifolia*, *Ficus heterophylla*, *Capparis sepiaria*, *Acacia sinuata*,

*Dalbergia volubilis*, *Derris cuneifolia*, *D. hainesiana*, *D. scandens*, *Milletia extensa*, *Combretum roxburghii*, *Celastrus paniculatus*, *Reissantia arborea*, *Clematis gouriana*, *Tinospora cordifolia*, *Mezoneuron cucullatum*, *Tetrastigma alaicorne*, *T. lanceolarium* and *Dioscorea* spp.

On the higher elevation of the Someswar Hills *Eriolaena wallichii*, *Rhus javanica*, *Maclura cochinchinesis*, *Uraria pulchra*, *Rubus ellipticus* and *Boehmeria macrophylla* are of common occurrence.

Ravines in the higher hills show *Cleidion javanicum*, *Drypetes assamica*, *Maytenus rufa*, *Sabia paniculata*, *Phoenix* spp., *Meliosma simplicifolia* and *Dendrocalamus hamiltonii*. Slopes and ridges of Someswar Hills show *Dillenia aurea*, *D. pentagyna*, *Clausena kanpurensis*, *Terminalia alata*, *Grewia helicterifolia*, *Thysanolaena latifolia*, *Croton roxburghii* and others.

The undergrowth in the hill slopes, exposed forest floors show large number of annual and perennial species. Few important compositions are as follows: *Polygala crotalarioides*, *Gentiana aprica*, *Begonia picta*, *Trachyspermum villosum*, *Ochna obtusata*, *Duchesnea indica*, *Potentilla supina*, *Euphorbia fusiformis*, *Salomonina ciliata*, *Swertia angustifolia*, *Poa annua*, *Capillipedium assimile*, *C. parviflorum*, *Eragrostiella bifaria*, *Hackelochloa granularis*, *Geniosporum coloratum*, *Acrocephalus hispidus*, *Aeginetia indica*, *Scutellaria repens*, *Barleria strigosa*, *Ruellia beddomei*, *Knoxia brachycarpa*, *Inula cappa*, *Epipactis veratrifolia*, *Geodorum densiflorum*, *Pectilis gigantea*, *Nervilia aragoana* and *N. plicata*.

Tarai grass lands are characterized by the following grasses : *Arundo donax*, *Phragmites vallatoria*, *Cymbopogon* spp., *Eragrostis* spp., *Saccharum arundinaceum*, *S. bengalense*, *S. procerum*, *S. spontaneum*, *Themeda arundinacea*, *T. caudata*, *T. laxa*, *Vetiveria zizanoides*, *Rottboellia exaltata* etc. Shrubs and trees are represented by *Acacia* spp. *Grewia* spp. *Calotropis* spp. etc.

II. *Tropical Moist Deciduous Forests* : It is characterized by the following trees : *Shorea robusta*, *Terminalia alata*, *T. chebula*, *T. bellerica*, *Dalbergia sissoo*, *D. latifolia*, *Adina cordifolia*, *Stereospermum chelonoides*, *Schleichera oleosa*, *Lansea coromandelica*, *Bischofia javanica*, *Bombax ceiba*, *Lagerstroemia parviflora*, *Kydia calycina*, *Mallotus philippensis*, *Gmelina arborea*, *Antidesma ghaesembilla* etc. Shrubs are represented by *Breynia retusa*, *B. vitis-idaea*, *Anisomeles indica*, *Colebrookea oppositifolia*, *Hyptis suaveolens*, *Pogostemon benghalense*, *Clerodendrum infortunatum*, *Lippia javanica*, *Barleria cristata*, *B. prionitis*, *Leea* spp., *Desmodium* spp., *Bambusa tulda*, *B. balcooa*, *B. vulgaris*, *Dendrocalamus strictus* form dense thickets. Woody and herbaceous climbers include *Mucuna* spp., *Smilax zeylanica*, *Dioscorea* spp., *Ichnocarpus frutescens*, *Paederia foetida* and others. Undergrowth in the forests show large number of herbs, shrubs and grasses.

## HELOPHYTES AND HYDROPHYTES

There are 78 species of helophytes and hydrophytes in West Champaran. They are grouped in the following categories.

I. Free- floating hydrophytes : *Eichhornia crassipes*, *Lemna aequinoctialis*, *Pistia stratiotes*, *Spirodela polyrrhiza*, *Trapa natans* var. *bispinosa*.

II. Suspended submerged hydrophytes : *Ceratophyllum demersum*, *Utricularia aurea*, *U. exoleta*.

III. Anchored submerged hydrophytes : *Aponogeton natans*, *Blyxa octandra*, *Hydrilla verticillata*, *Myriophyllum tetrandrum*, *Najas minor*, *Nechamandra alternifolia*, *Potamogeton nodosus*, *P. pectinatus*, *Vallisneria spiralis*, *Ottelia alismoides*.

IV. Anchored hydrophytes with floating shoot : *Alternanthera philoxeroides*, *Aponogeton natans*, *Hygroryza aristata*, *Ipomoea aquatica*, *Ludwigia adscendens*, *Neptunia oleracea*.

V. Anchored hydrophytes with floating leaves : *Monochoria hastata*, *M. vaginalis*, *Nelumbo nucifera*, *Nymphaea nouchali*, *N. Pubescens*, *N. rubra*, *Nymphoides cristatum*, *N. indicum*, *Ottelia alismoides*, *Sagittaria guayanensis*.

VI. Emergent amphibious plants (helophytes): *Aeschynomene indica*, *A. multiflora*, *Amaranthus sessilis*, *Bacopa monieri*, *Bergia ammonnioides*, *Bulbostylis densa*, *Commelina hasskarlii*, *C. longifolia*, *Cyperus articulatus*, *C. brevifolius*, *C. cyperoides*, *C. difformis*, *C. flavidus*, *C. haspan*, *C. iria*, *C. kyllingia*, *C. niveus*, *C. nutans*, *C. radiatus*, *C. rotundus*, *C. sanguinolentus*, *C. triceps*, *Echinochloa colonum*, *E. stagnina*, *Elytrophorus spicatus*, *Enydra fluctuans*, *Eriocaulon quinquangulare*, *Fimbristylis dichotoma*, *F. littoralis*, *Fuirena ciliaris*, *Hygrophila schulli*, *H. polysperma*, *Hymenachne acutigluma*, *Juncus prismatocarpus*, *Lasia spinosa*, *Leersia hexandra*, *Limnophila indica*, *L. sessiliflora*, *Lindernia rugosa*, *Melochia corchorifolia*, *Oryza rufipogon*, *O. sativa*, *Polygonum glabrum*, *P. hydropiper*, *P. lapathifolium*, *Ranunculus sceleratus*, *Rotala indica*, *R. rosea*, *R. rotundifolia*, *Scirpus articulatus*, *S. juncoides*, *S. supinus*, *Sesbania bispinosa*, *Typha angustata*, *T. elephantina*.

## ECONOMIC BOTANY

Most of the people of this sub-Himalayan district still depend on the wild plant resources for their various needs. During field trips some efforts were also diverted towards the collection of information on the local uses of plants. Particularly uses of plants in fishing or hunting, in thatching, in rough weaving of plates, granary vessels, shelter, utensils, non-conventional raincoat, in the preparation of food-stuff, in the washing of clothes or in bathing are very

attractive and noteworthy. In the fast flowing hilly streams fishing is troublesome due to the boulders of various sizes. Instead of using nets local people use pulp of toxic fruits. Fruits are crushed and mixed with mud. This preparation are evenly distributed in a particular area of stagnant water, where flow had been previously diverted for fishing. Collected economic plants are broadly categorized according to their uses.

## 1. Industrial Plants

### a. Fibre Plants

**I. Textile fibres :** *Abutilon hirtum*, *A. indicum*, *A. persicum*, *Agave americana*, *Bauhinia purpurea*, *B. racemosa*, *B. vahlii*, *Cannabis sativa*, *Cocos nucifera*, *Corchorus capsularis*, *C. olerius*, *Crotalaria juncea*, *C. spectabilis*, *Cyperus comosus*, *Gossypium hirsutum*, *Hibiscus cannabinus*, *H. sabdariffa*, *Imperata cylindrica*, *Linum usitatissimum*, *Saccharum spontaneum*, *Sansevieria roxburghiana*, *Triumfetta rhomboidea*, *Urena lobata*, and *U. sinuata*.

**II. Brush fibres :** *Arundinella setosa*, *Borassus flabellifer*, *Caryota urens*, *Cocos nucifera*, *Phoenix acaulis*, *P. dactylifera*, *P. humilis*, and *Thysanolaena latifolia*.

**III. Plaiting and rough weaving fibres :** *Argyreia setosa*, *Arundo donax*, *Bambusa arundinacea*, *B. bulcooa*, *B. tulda*, *Bauhinia vahlii*, *Borassus flabellifer*, *Bridelia retusa*, *B. stipularis*, *Butea monosperma*, *B. parviflora*, *Calamus tenuis*, *C. viminalis* var. *fasciculatus*, *Dendrocalamus hamiltonii*, *D. stricta*, *Desmostachya bipinnata*, *Erythrina variegata*, *Eulaliopsis binata*, *Ficus semicordata*, *F. virens*, *Hibiscus vitifolius*, *Malachra capitata*, *Marsdenia tenacissima*, *Musa sapientum*, *Naravelia zeylanica*, *Nelumbo nucifera*, *Pavonia repanda*, *Phoenix* spp., *Phragmites vallatoria*, *Porana paniculata*, *Saccharum arundinaceum*, *S. bengalense*, *S. spontaneum*, *Sida acuta*, *Streblus asper*, *Typha angustifolia*, *T. elephantina*, *Urena* spp. and *Vetiveria zizanioides*.

**IV. Filling fibres :** *Bombax ceiba*, *Calotropis acia*, *C. hamiltonii*, *C. gigantea*, *Ceiba pentandra*, *Cryptolepis buchanani*, *Gossypium hirsutum* and *Typha* spp.

**V. Paper making fibres :** *Bambusa* spp., *Dendrocalamus* spp., and *Themeda caudata*.

**VI. Miscellaneous fibres :** *Apluda mutica*, *Luffa cylindrica*, *Sida acuta*, and *Urena* spp.

**b. Wood producing plants :** *Aegle marmelos*, *Acacia catechu*, *A. nilotica*, *A. suma*, *Ailanthus excelsa*, *Albizia chinensis*, *A. lebeck*, *A. procera*, *Anogeissus*

*latifolia*, *Antidesma ghaesembilla*, *Barringtonia acutangula*, *Bischofia javanica*, *Bombax ceiba*, *Butea monosperma*, *Careya arborea*, *Cassia fistulosa*, *Cassine glauca*, *Casuarina equisetifolia*, *Ceiba pentandra*, *Celtis tetrandra*, *Dalbergia latifolia*, *D. sissoo*, *Desmodium oojeinense*, *Diospyros montana*, *Diploknema butyracea*, *Embllica officinalis*, *Limonia acidissima*, *Ficus benghalensis*, *F. racemosa*, *F. religiosa*, *F. semicordata*, *F. virens*, *Holoptelea integrifolia*, *Kydia calycina*, *Lagerstroemia parviflora*, *Leucaena leucocephala*, *Madhuca latifolia*, *Mangifera indica*, *Melia azadirach*, *Michelia champaca*, *Mimusops elengii*, *Pithecellobium dulce*, *Polyalthia longifolia*, *Pterospermum acerifolium*, *Salix tetrasperma*, *Schleichera oleosa*, *Shorea robusta*, *Soymida febrifuga*, *Sterculia foetida*, *S. urens*, *S. villosa*, *Streblus asper*, *Syzygium cumini*, *S. heyneanum*, *Swietenia macrophylla*, *S. mahagoni*, *Tamarindus indica*, *Terminalia alata*, *T. arjuna*, *Thespesia populnea*, *Toona ciliata*, *Trema orientalis*, *T. politoria*, *Trewia nudiflora* and *Xylosma longifolia*.

c. **Tannin and dye yielding plants** : *Acacia catechu*, *A. suma*, *Butea monosperma*, *Carthamus tinctorius*, *Curcuma domestica*, *Diospyros montana*, *Glochidion velutinum*, *Indigofera astragalina*, *I. tinctoria*, *Mallotus philippensis*, *Nyctanthes arbor-tristis*, *Semecarpus anacardium*, *Terminalia bellerica*, *T. chebula*, *Woodfordia fruticosa*.

d. **Gum and resin yielding plants** : *Acacia* spp. *Aegle marmelos*, *Anogeissus latifolia*, *Butea monosperma*, *B. parviflora*, *Cordia myxa*, *Lannea coromandelica*, *Limonia acidissima*, *Shorea robusta*, and *Sterculia urens*.

e. **Essential oil yielding plants** : *Acacia farnesiana*, *Chenopodium album*, *C. ambrosioides*, *Citrus grandis*, *C. medica*, *Cymbopogon jwarancusa*, *C. nardus*, *Hyptis suaveolens*, *Jasminum auriculatum*, *J. multiflorum*, *J. sambac*, *Leonotis nepetifolia*, *Leonurus japonicus*, *Leucas cephalotes*, *Litsea glutinosa*, *L. monopetala*, *Michelia champaca*, *Nepeta hindostana*, *Ocimum americanum*, *O. basilicum*, *Pandanus amaryllifolius*, *Perilla ocimoides*, *Plectranthus mollis*, *Pogostemon benghalense* and *Vetiveria zizanooides*.

f. **Oil seeds** : *Arachis hypogea*, *Azadirachta indica*, *Brassica campestris*, *B. nigra*, *Carthamus tinctorius*, *Cocos nucifera*, *Gossypium hirsutum*, *Guizotia abyssinica*, *Helianthus annuus*, *Linum usitatissimum*, *Madhuca latifolia*, *Nigella sativa*, *Pongamia pinnata*, *Schleichera oleosa*, *Sesamum indicum*, *Shorea robusta* and *Terminalia bellerica*.

g. **Hydrocarbon yielding plants** : *Argemone mexicana*, *Casearia graveolens*, *Celastrus paniculatus*, *Euphorbia* spp., *Jatropha curcas*, *J. gossypifolia*, *Moringa oleifera*, *Trewia nudiflora* and *Ricinus communis*.

h. **Soap substitutes** : *Acacia auriculiformis*, *A. concina*, and *Silene conoidea*.

i. Sugar yielding plants : *Borassus flabellifer*, *Phoenix* spp. and *Saccharum officinarum*.

## 2. Medicinal Plants

*Abutilon indicum*, *Acalypha indica*, *Achyranthes aspera*, *Adhatoda vasica*, *Aegle marmelos*, *Aerva lanata*, *A. sanguinolenta*, *Allophyllus serratus*, *Amischophacelus axillaris*, *Andrographis paniculata*, *Anisomeles indica*, *Aphanamixis polystachya*, *Argyreia involucrata*, *A. setosa*, *Aristolochia indica*, *Artabotrys hexapetalus*, *Asparagus racemosus*, *Azadirachta indica*, *Bacopa monnieri*, *Barleria cristata*, *B. prionitis*, *Barringtonia acutangula*, *Bauhinia vahlii*, *Biophytum sensitivum*, *Boerhavia diffusa*, *Butea* spp., *Caesalpinia bonduc*, *Calotropis hamiltonii*, *Capparis sepiaria*, *C. spinosa*, *C. zeylanica*, *Cardiospermum helicacabum*, *Cassia fistulosa*, *C. occidentalis*, *C. sophera*, *Catharanthus roseus*, *Clausena kanpurensis*, *Celastrus paniculatus*, *Centella asiatica*, *Chlorophytum arundinaceum*, *Cissampelos pareira*, *Clematis gouriana*, *Cleome chelidonii*, *C. viscosa*, *Coccinea grandis*, *Cocculus hirsutus*, *Colebrookookea oppositifolia*, *Combretum roxburghii*, *Commelina benghalensis*, *Costus speciosus*, *Crotalaria albida*, *C. juncea*, *C. spectabilis*, *Croton bonplandianum*, *Cucumis callosus*, *Curculigo orchioides*, *Cuscuta reflexa*, *Cynodon dactylon*, *Cyperus rotundus*, *Dalbergia volubilis*, *Datura metel*, *D. stramonium*, *Deeringia amaranthoides*, *Desmodium gangeticum*, *D. gyroides*, *D. triflorum*, *Digera muricata*, *Diplocyclos palmatus*, *Dodonaea viscosa*, *Dregea volubilis*, *Eclipta alba*, *Emblica officinalis*, *Erythrina variegata*, *Evolvulus alsinoides*, *Euphorbia fusiformis*, *E. hirta*, *Ficus* spp., *Filemingia strobilifera*, *Floscopa scandens*, *Fumaria indica*, *Glinus oppositifolius*, *Gloriosa superba*, *Gymnema sylvestre*, *Hackelochloa granularis*, *Hemidesmus indicus*, *Holarrhena pubescens*, *Hybanthus enneaspermus*, *Hyptis suaveolens*, *Indigofera astragalina*, *I. cassioides*, *I. linnaei*, *I. trifoliata*, *Ipomoea nil*, *I. pestrigridis*, *Jatropha gossypifolia*, *Leonotis nepetifolia*, *Leonurus japonicus*, *Leptadenia reticulata*, *Leucas cephalotes*, *L. plukenetii*, *Litsea glutinosa*, *L. monopetala*, *Malvastrum coromandelianum*, *Maytenus senegalensis*, *Melia azedarach*, *Melothria heterophylla*, *Merremia emarginata*, *M. vitifolia*, *Mimosa pudica*, *Mollugo pentaphylla*, *Momordica charantia* *M. cochinchinensis*, *Mucuna pruriens*, *Mukia maderaspatana*, *Murraya koenigii*, *M. paniculata*, *Nepeta hindostana*, *Nigella sativa*, *Ocimum americanum*, *O. basilicum*, *Operculina turpethum*, *Oxalis corniculata*, *Oxystelma esculenta*, *Pergularia daemia*, *Perilla frutescens*, *Peucedanum nagpurensis*, *Phobe lanceolata*, *Piper longum*, *P. peepuloides*, *Pistia stratiotes*, *Plectranthus mollis*, *Plumbago zeylanica*, *Pogostemon benghalense*, *Polyalthia suberosa*, *Polycarpea corymbosa*, *Polycarpon prostratum*, *Polygala arvensis*, *Pongamia pinnata*, *Remusatia vivipara*, *Ranunculus sceleratus*, *Rauwolfia serpentina*, *R. tetraphylla*, *Rivia humilis*, *Salvia plebeia*, *Scindapsus officinalis*, *Sida cordata*, *S. cordifolia*, *S. rhombifolia*, *Smilax lancefolia*, *S. ovalifolia*, *S. perfoliata*, *Solanum* spp., *Spergula arvensis*.

*Stephania japonica*, *Strychnos nux-vomica*, *Suregada multiflora*, *Tephrosia purpurea*, *Teramnus labialis*, *Terminalia arjuna*, *T. chebula*, *T. bellirica*, *Tiliacora acuminata*, *Tinospora cordifolia*, *Tridax procumbens*, *Trigonella corniculata*, *Tylophora rotundifolia*, *Uraria lagopodioides*, *U. picta*, *U. refescens*, *Urena lobata*, *U. sinuata*, *Vigna trilobata*, *Vitex negundo*, *Waltheria indica* and *Zornia diphylla*.

### 3. Fumitories and Masticatories

*Area catechu*, *Cannabis sativa*, *Nicotiana rustica*, *N. tabacum* and *Piper betle*.

### 4. Food Plants

a. The major cereals : *Oryza sativa*, *Triticum aestivum* and *Zea mays*.

b. The minor cereals and small grains : *Amaranthus caudatus*, *Dactyloctenium aegyptium*, *Echinochloa colona*, *E. stagnina*, *Eleusine coracana*, *Hordeum vulgare*, *Pennisetum typhoides*, *Oryza rufipogon*, *Setaria italica*, *S. paniculifera* and *Sorghum bicolor*.

c. Legumes : Large number of leguminous plants are cultivated in the district for pod and seeds, e.g. , *Arachis hypogaea*, *Cajanus cajan*, *Cicer arietinum*, *Dolichos lablab*, *Lathyrus sativus*, *Lens culinaris*, *Pisum sativum*, *Pithecellobium dulce*, *Tamarindus indica*, *Vicia faba* and *Vigna* spp.

d. Vegetables and fruits : *Abelmoschus crinitus*, *A. esculentus*, *Abutilon indicum*, *Aegle marmelos*, *Alangium salviifolium*, *Allium cepa*, *A. sativum*, *Alocasia indica*, *Alternanthera paronychioides*, *Amaranthus caudatus*, *A. spinosus*, *A. viridis*, *Amorphophallus paenoiifolius*, *Ananas comosus*, *Annona reticulata*, *A. squamosa*, *Antidesma ghaesembilla*, *Artocarpus lakoocha*, *Asparagus racemosus*, *Basella alba*, *Bauhinia malabarica*, *B. purpurea*, *Banincasa serifera*, *Beta vulgaris*, *Borassus flabellifer*, *Brassica* spp., *Buchanania lanzan*, *Capsicum* spp., *Carica papaya*, *Carissa carandus*, *Celastrus paniculatus*, *Chenopodium album*, *Citrullus vulgaris*, *Citrus* spp. , *Cleome gynandra*, *Coccinea grandis*, *Cocos nucifera*, *Colocasia esculenta*, *Commelina benghalensis*, *Corchorus capsularis*, *C. olerorius*, *Cucumis melo*, *C. sativus*, *Cucurbita maxima*, *Daucus carota*, *Dendrocalamus strictus*, *Dillenia indica*, *D. pentagyna*, *Dioscoria alata*, *D. bulbifera*, *D. glabra*, *D. pentaphylla*, *D. pubera*, *D. wallichii*, *Emblica officinalis*, *Erycibe paniculata*, *Limonia acidissima*, *Ficus hispida*, *F. racemosa*, *Flacourtia indica*, *F. ramontchi*, *Glinus lotoides*, *G. oppositifolius*, *Gmelina arborea*, *Grewia abutilifolia*, *G. sclerophylla*, *G. sapida*, *Hibiscus subdariffa*, *Ipomoea aquatica*, *I. batatus*, *Kirganelia reticulata*, *Lagenaria vulgaris*, *Litchi chinensis*, *Luffa cylindrica*, *Lycopersicon esculentum*, *Mangifera indica*,

*Manilkara hexandra*, *M. zapota*, *Melilotus alba*, *M. indica*, *Millusa velutina*, *Mimusops elengi*, *Mollugo pentaphylla*, *Momordica charantia*, *M. cochinchinesis*, *M. dioica*, *Moringa oleifera*, *Mucuna pruriens*, *Musa sapientum*, *Natsiatum herpeticum*, *Nelumbo nucifera*, *Nymphaea nouchali*, *N. pubescens*, *N. rubra*, *Passiflora foetida*, *Peperomia pellucida*, *Phoenix acaulis*, *P. humilis*, *P. sylvestris*, *Physalis minima*, *Pithecellobium dulce*, *Polygonum glabrum*, *Portulaca oleracea*, *P. pilosa*, *P. quadrifida*, *Psidium guajava*, *Punica granatum*, *Raphanus sativus*, *Rivea ornata*, *Rumex vesicarius*, *Semecarpus anacardium*, *Sesbania grandiflora*, *Smithia sensitiva*, *Solanum melongena*, *S. tuberosum*, *Spondias mangifera*, *Syzygium cumini*, *S. samarangense*, *Terminalia bellirica*, *Trapa natans* var. *bispinosa*, *Trianthema portulacastrum*, *Tribulus terrestris*, *Trichosanthes cucumerina*, *T. dioica*, *Typhonium trilobatum*, *Vigna vexillata*, *Woodfordia fruticosa*, *Xeromphis uliginosa*, *Zizyphus mauritana*, *Z. numularius* and *Z. oenoplia*.

## 5. Food Adjuncts

a. Spices and other flavouring materials : *Brassica juncea*, *B. nigra*, *Cap-sicum* spp., *Curcuma longa*, *C. zedoaria*, *Cinnamomun tamala*, *Coriandrum sativum*, *Cuminum cyminum*, *Foeniculum vulgare*, *Nigella sativa*, *Ocimum basilicum*, *Trigonella foenum-graecum* and *Zingiber officinale*.

b. Beverage yielding plants : *Borassus flabellifer*, *Cassia occidentalis*, *Cocos nucifera*, *Madhuca longifolia*, *Phoenix* spp., and *Tamarindus indica*.

## 6. Poisonous Plants

a. Toxic and skin-irritant and sensitizing plants : *Abrus precatorius*, *Agave americana*, *Ammania baccifera*, *Amorphophallus paenufolius*, *Argemone mexicana*, *Cannabis sativa*, *Casearia elliptica*, *C. graveolens*, *Chenopodium album*, *Clematis gouriana*, *Cleome* spp., *Crateva nurvala*, *Datura* spp., *Dioscoria hispida*, *Euphorbia* spp., *Gardenia turgida*, *Gymnopetalum cochinchinense*, *Madhuca longifolia*, *Mucuna nigricans*, *M. puriens*, *Parthenium hysterophorus*, *Polygonum hydropiper*, *Ricinus communis*, *Semecarpus anacardium*, *Stellaria media*, *Tragia* spp., *Trichosanthes tricuspidata*, *Vaccaria pyramidata*, *Xeromphis spinosa* and *Xylosma longifolia*.

b. Plants used for fishing : Fruits of *Barringtonia acutangula*, *Casearea elliptica*, *C. graveolens*, *Xeromphis spinosa* ; bark and leaves of *Tephrosia candida* ; roots of *Derris cuneifolia*, *D. scandens* and *Milletia extensa*.

c. Plants used for hunting : Ripe fruits of *Cordia myxa* ; seeds of *Strychnos nux-vomica* ; gums of *Ficus benghalense*.

## ANALYSIS OF THE FLORA

Of the 1040 species in 632 genera under 146 families, the class Magnoliopsida comprise 119 families, 488 genera and 804 species and the class Liliopsida comprise 27 families, 144 genera and 236 species (Table 2). Out of 146 families, the dicotyledons represent 81.51% and monocotyledons represent 18.49%. Out of 632 genera, dicotyledonous genera represent 77.22% and monocotyledonous genera represent 22.78%. Out of 1040 species, the dicotyledons represent 77.31% and monocotyledons represent 22.69%.

**Table 2 :** Statistical Synopsis of the Flora

Classes	No.of Families	No.of Genera	No.of Species
Magnoliopsida ( Dicotyledons )	119	488	804
Liliopsida ( Monocotyledons )	27	144	236
<b>Total</b>	<b>146</b>	<b>632</b>	<b>1040</b>

The ten dominant families (Table 3) comprise 486 species, i. e. 46.73% of the total species dealt with, remaining 136 families with a total of 554 species constitute 53.27%.

Families that are represented by single species are : Magnoliaceae, Aristolochiaceae, Nelumbonaceae, Ceratophyllaceae, Papaveraceae, Fumariaceae, Cannabaceae, Casuarinaceae, Phytolaccaceae, Aizoaceae, Basellaceae, Plumbaginaceae, Ochnaceae, Dipterocarpaceae, Clusiaceae, Turneraceae, Caricaceae, Begoniaceae, Moringaceae, Myrsinaceae, Haloragaceae, Trapaceae, Punicaceae, Alangiaceae, Olacaceae, Opiliaceae, Viscaceae, Hippocrateaceae, Icacinaceae, Burseraceae, Simaroubaceae, Zygophyllaceae, Balsaminaceae, Polemoniaceae, Hydrophyllaceae, Buddlejaceae, Sphenocleaceae, Alismataceae, Xyridaceae, Juncaceae, Bromeliaceae, Musaceae, Costaceae, Cannaceae, and Hypoxidaceae. Of these 45 families, 37 belong to dicotyledons and the rest to monocotyledons. Families with more than one species in the single genus are : Nymphaeaceae (3), Flacourtiaceae (2), Tamaricaceae (2), Passifloraceae (2), Onagraceae (4), Melastomataceae (2), Leeaceae (2), Cuscutaceae (3), Menyanthaceae (2), Oleaceae (6), Lentibulariaceae (2), Potamogetonaceae (2), Pandanaceae (2), Eriocaulaceae (2), Typhaceae (2), and Smilacaceae (3). Of these 16 families, 11 belong to dicotyledons and the rest to monocotyledons.

Thus total monotypic families are 61 in number, i.e. 41.09% of the total families dealt with. Some of the dominant genera with maximum number of species are : *Eragrostis* (16), *Ficus* (15), *Cyperus* (15), *Hedyotis* (11), *Crotalaria* (10), *Euphorbia* (9), *Desmodium* (9), *Ipomoea* (9) and *Blumea* (8).

**Table 3 :** Number of Genera and Species in respect to the ten dominant Families

Name of Family	Genera	Number of Species
Poaceae (Gramineae)	67	110
Leguminosae	41	107
Asteraceae (Compositae)	37	52
Euphorbiaceae	23	48
Rubiaceae	21	39
Acanthaceae	21	33
Malvaceae	13	26
Convolvulaceae	9	24
Cyperaceae	7	24
Scrophulariaceae	13	23
<b>Total</b>	<b>252</b>	<b>486</b>

An analysis of the 1040 species revealed that the flora is a curious mixture of Indo-Malayan and tropical elements. Large number of Himalayan plants also occur in the district.

Orchidaceae, the most dominant family for the Indian continent (vide J.D. Hooker, 1907) is represented in West Champaran by 11 species ; the reason for this is evident, the biotic influences over the vegetation. The table 4 provides a comparative statement of ten dominant families of West Champaran, Bihar and Orissa (Haines, 1925). Bengal (Prain, 1903), Gangetic plain and India (J.D. Hooker, 1907).

#### RARE, ENDANGERED AND ENDEMIC PLANTS

Increased human population in the last few decades demanding development in various spheres has resulted directly or indirectly in sudden and often far reaching

**Table 4 :** Dominance of Families – A Comparative Statement of First Ten Families

West Champaran	Bihar & Orissa (Haines, 1925)	Bengal (Prain, 1903)	Gangetic Plain (J.D. Hooker, 1907)	India (J.D. Hooker, 1907)
Gramineae	Leguminosae	Leguminosae	Gramineae	Orchidaceae
Leguminosae	Gramineae	Gramineae	Leguminosae	Leguminosae
Compositae	Cyperaceae	Cyperaceae	Cyperaceae	Gramineae
Euphorbiaceae	Compositae	Compositae	Compositae	Rubiaceae
Rubiaceae	Euphorbiaceae	Orchidaceae	Scrophulariaceae	Euphorbiaceae
Acanthaceae	Acanthaceae	Euphorbiaceae	Malvaceae	Acanthaceae
Malvaceae	Rubiaceae	Urticaceae	Acanthaceae	Compositae
Convolvulaceae	Labiatae	Acanthaceae	Euphorbiaceae	Cyperaceae
Cyperaceae	Scrophulariaceae	Scrophulariaceae	Convolvulaceae	Labiatae
Scrophulariaceae	Convolvulaceae	Convolvulaceae	Labiatae	Urticaceae

disturbances in natural ecosystems. Recent spread in developmental activities, urbanisation and additional land acquisitions for farming and grazing etc. are resulting in severe damage to natural habitats, thus threatening the very survival of several species. Various organisations like International Union for Conservation of Nature and Natural Resources (IUCN), National Committee on Environmental Planning and Coordination (NCEPC) and National Committee on Man and Biosphere (MAB) are interested in listing of species threatened with extinction and measures for their conservation. Data on Indian threatened plants is very poor (Jain *et al.*, 1981). However, about 15 to 20 per cent of the total Indian flora are considered as endangered (Jain *et al.*, 1982).

Some of the rare elements of the flora are : *Abrus pulchellus*, *Agrostemma sarmentosum*, *Clematis roylei*, *Coffea khasiana*, *Dendrocalamus hamiltonii*, *Lobelia nicotianaefolia*, *Naravellia zeylanica*, *Olax scandens*, *Pterospermum acerifolium*, *Saraca ashoka*, *Trevesia palmata*, *Xantolis tomentosa*, *Leucas helicterifolia*, *Trachyspermum villosum*, *Uraria pulchra*, *Tetrastigma alcicorne*, *Peucedanum nagpurensis* and *Bauhania scandens* var. *horsfieldii*.

The orchids, so widely distributed in India, are scarce in the district. From West Champaran only 11 species of orchids have been collected, of which 3 are epiphytic : *Rhynchostylis retusa*, *Vanda teres* and *V. tessellata* and 8 are terrestrial: *Epipactis veratrifolia*, *Eulophia graminea*, *Geodorum densiflorum*, *Nervilia aragoana*, *N. plicata*, *Pecteilis gigantea*, *Zeuxine gracilis* and *Z. strateumatica*.

*Leucas helicterifolia*, *Tetrastigma alcicorne*, *Trachyspermum villosum* and *Uraria pulchra* are endemic in the Someswar Hills.

#### PLAN FOLLOWED IN THIS FLORA

This account covers only the angiospermous plants of West Champaran. The families are arranged following Cronquist (1988) system of classification. Some of the monocot families which are not considered by Cronquist has been considered in this work. The authors considered a reasonable degree of distinction for their segregation. However these segregated taxa are arranged according to Cronquist. A key to the families has been provided for identification. There are also keys to genera and species as and when necessary. Genera and species under each family are arranged alphabetically. For each species correct botanical name and basionym, if any, have consistently been given. If the species has been described under some other name in major Indian floras, such names have also been given under synonymy. The families and genera have been described briefly. The species description excludes the characters noted in the description of families and genera. Species description is followed by data on habitat, distribution in the district, general

distribution, flowering and fruiting time. Local names and economic importances, whenever known are given at the end. Collection numbers are also given. Specimens are deposited in the herbarium of the University of Burdwan (BURD), Burdwan, West Bengal.

The collections of the previous collectors which are deposited in Sibpur (CAL) have been consulted.

There are 65 plates of drawing illustrating 84 species from 64 families. Total 27 species are represented by 25 colour photographs taken in the fields.

### ABBREVIATIONS

For economy of space, the following abbreviations have been used in reference citations of species, descriptions of taxa and at other places. These are explained below :

<i>auct. pl.</i>	=	<i>auctorum plurimorum</i> : Other authors
BBSI	=	Bulletin of the Botanical Survey of India, Calcutta.
Bhatta.	=	P. K. Bhattacharyya
Bor	=	The Grasses of Burma, Ceylon, India and Pakistan (excluding Bambuseae) by N.L. Bor (1960)
cm	=	Centimetre
<i>comb. nov.</i>	=	<i>Combinatio nova</i> : new combination of name and epithet.
Duthie, Fl.U.G.P	=	Flora of the Upper Gangetic Plain and the adjacent Siwalik and Sub-Himalayan Tracts by J. F. Duthie (3vols. 1903-29; repr. ed. 1960)
etc.	=	<i>et cetera</i> : and other
et	=	<i>et</i> : and
<i>et al.</i>	=	<i>et alia</i> : and others
<i>excl.</i>	=	<i>exclusus</i> : excluded
excl. typo	=	<i>excluso typo</i> : excluding type
f.	=	forma

Fl.	=	Flowering time
Fr.	=	Fruiting time
GBS.	=	The Garden's Bulletin Singapore, Singapore.
Haines, Bot. Bihar & Orissa	=	Botany of Bihar and Orissa by H. H. Haines in 3 vols. (1921-25 ; repr. 1961)
incl.	=	<i>inclusus</i> : included
JBNHS	=	Journal of Bombay Natural History Society, Bombay.
l.c.	=	<i>loco citato</i> : at the place cited
m	=	metre
nom.	=	<i>nomen</i> : name
nom. alt.	=	<i>nomen alternativum</i> : alternative name
nom. cons.	=	<i>nomen conservandum</i> : conserved name vide International Code of Botanical Nomenclature, App. III.1983 & 1994.
nom. illeg.	=	<i>nomen illegitimum</i> : illegitimate name
nom. nud.	=	<i>nomen nudum</i> : name unaccompanied by a description or reference to a published description.
Prain, Bengal Pl.	=	Bengal Plants by D. Prain (2 vols.1903; repr. ed 1963)
p.p.	=	<i>pro parte</i> : Partly
quoad descrip	=	<i>quod descriptio</i> : as far as the description is considered
sens. lat.	=	<i>sensu lato</i> : in a wide sense
sens. strict.	=	<i>sensu stricto</i> : in a narrow sense
var.	=	<i>varietas</i> : variety

## REFERENCES

- Banerjee, S. P. & R. N. Banerjee. Materials for a flora of north Bihar I : Champaran district. *Bull. Bot. Surv. India* 10 (2). 183-189. 1963.
- \_\_\_\_\_. A sketch of the vegetation of Champaran district of north Bihar. *Bull. Bot. Soc. Bengal* 23 (2). 167-170. 1969.
- Beal, S. Buddhist Records of the Western World. 1884.
- Cook, C.D.K. Aquatic and Wetland Plants of India. 1996.
- Cronquist, A. An Integrated System of Classification of Flowering Plants. 1981.
- \_\_\_\_\_. The Evolution and Classification of Flowering Plants (Ed.2) 1988.
- Cunningham, A. Ancient Geography of India. 1871.
- Dasgupta, S. P. (ed) . Forest Atlas of India. 1976.
- Duthie, J. F. Flora of Upper Gangetic Plain , and the adjacent Siwalik and Sub-Himalayan Tracts. 3 vols. 1903-1929 ; repr. ed. 1960.
- Gait, E. A. Bengal Census Report. 1901.
- Haines, H. H. Botany of Bihar and Orissa. 6 parts. 1921-1925 ; repr. 1961.
- Hooker , J. D. Botany, in the Imperial Gazettee of India ed. 3. 1: 157-212. 1907.
- Hunter, W. W. A Statistical Account of Bengal. vol. 13 : Tirhut and Champaran. 1-327, 1877.
- Jain, S. K. & R. R. Rao (ed). An Assessment of Threatened Plants of India. 19-23. 1981.
- \_\_\_\_\_. & K. L. Mehra (ed). Conservation of Tropical Plant Resources. 240-245. 1982.
- Landolt, E. The family of Lemnaceae, Veroeff. Geobot. Zuerich 71 : 1-566, 1986.
- O' Malley, L.S. S. Bengal District Gazetters : Champaran 1-191. 1907.
- Tadmanabha, P. (ed) . Census of India 1981, paper IV. 1984.
- Phatak, N. R. et al. Mahatma Gandhi Vol. 3. Part I : 1915-1922. 1965.
- Prain, D. Bengal Plants. 2 vols. 1903 ; repr. ed. 1963.
- Smith, V. A. Early History of India. 1904.

Thothathri, K. Critical study of three species of Champaran district *Indian Forester* 91 : 743-746, 1965.

\_\_\_\_\_, B. V. Shetty & P. K. Hajra. A contribution to the flora of Udaipur forests in Champaran district, North Bihar. *Bull. Bot. Surv. India* 8 (2) : 13-140, 1966.

Wadia, D. N. *Geology of India*. 1919.

## TAXONOMIC ACCOUNT

### Synoptical Key to Families

Ovules enclosed in the carpels, crowned by a style and stigma. Wood when present, consisting of true vessels ; cotyledons 1-2 (**Magnoliophyta**)

- |   |            |
|---|------------|
| 1a. Leaves mostly net-veined ; cotyledons 2 (seldom 1, 3, or 4) ;<br>intrafascicular cambium usually present, vascular bundles usually borne in<br>a ring which encloses pith ; floral parts, when of definite number, typically<br>borne in sets of 5, less often 4, seldom 3 (carpels often fewer) ; pollen<br>typically triaperturate, or of triaperturate derived type, except in a few of<br>the more primitive families; mature root system either primary or adventi-<br>tious or both ( <b>MAGNOLIOPSIDA</b> ). | ...<br>2   |
| 1b. Leaves mostly parallel-veined ; cotyledon 1 (or the embryo sometimes<br>undifferentiated) ; interfascicular cambium usually absent ; usually no<br>cambium of any sort ; vascular bundles generally scattered, or in 2 or more<br>rings, floral parts when of definite number typically borne in sets of 3,<br>seldom 4, never 5 (carpels often fewer) ; pollen of uniaperturate or<br>uniaperturate derived type, mature root system wholly adventitious --<br>( <b>LILIOPSIDA</b> ).                              | ...<br>120 |
| 2a. Corolla usually and calyx almost always present ; flowers generally<br>bisexual.  | ...<br>3   |
| 2b. Corolla almost always and calyx often absent ; flowers generally<br>unisexual.  | ...<br>103 |
| 3a. Segments of corolla almost always free, frequently some or all of<br>them absent ; stamens often indefinite.  | ...<br>4   |
| 3b. Segment of corolla almost always and of calyx very often coherent,<br>corolla rarely absent ; stamens almost always<br>definite.  | ...<br>72  |

4a. Stamens epigynous or perigynous arising from calyx or from a disc lining its tube. ...	5
4b. Stamens hypogynous arising apart from calyx, direct from the receptacle or from a disc. that crowns the pedicel ; segments of calyx usually free. ...	29
5a. Stems fleshy, flat, articulated, modified into cladodes, usually bearing large thorns and smaller spines ; leaves usually minute ; lobes of calyx, petals and stamens numerous ...	XXII. CACTACEAE
5b. Stems woody or herbaceous ; leaves distinct. ...	6
6a. Ovary apocarpous, with 1 or more than one carpel or syncarpous with several completely closed loculi. ...	7
6b. Ovary syncarpous, 1- locular. ...	26
7a. Ovules arising from the inner angles or from bases of carpels or loculi. ...	8
7b. Ovules suspended from apices of carpels or loculi	22
8a. Carpel solitary. ...	9
8b. Carpels several. ...	11
9a. Flowers regular ; petals valvate ...	LVIII. MIMOSACEAE
9b. Flowers irregular ; petals imbricate. ...	10
10a. Stamens 1-or 2- adelphous ...	LX. FABACEAE
10b. Stamens almost always free ...	LIX. CAESALPINIACEAE
11a. Flowers bisexual. ...	12
11b. Flowers unisexual. ...	21
12a. Carpels free, or if ultimately united, with styles distinct. ...	13
12b. Carpels and styles united throughout. ...	15
13a. Stamens indefinite ; leaves stipulate ...	LVII. ROSACEAE
13b. Stamens definite ; leaves estipulate. ...	14

14a. Capsule with circumscissile dehiscence	...	XXI. AIZOACEAE	
14b. Capsule with longitudinal dehiscence	...	XXVII. MOLLUGINACEAE	
15a. Calyx-lobes imbricate.	...		16
15b. Calyx-lobes valvate.	...		18
16a. Stamens definite ; petals valvate ; anthers opening usually by pores	...	LXVII. MELASTOMATACEAE	
16b. Stamens indefinite ; petals imbricate, anthers opening by slits.	...		17
17a. Leaves opposite	...	LXIV. MYRTACEAE	
17b. Leaves alternate	...	XXXIX. LECYTHIDACEAE	
18a. Stamens indefinite	...	LXV. PUNICACEAE	
18b. Stamens definite.	...		19
19a. Ovary free from calyx tube	...	LXII. LYTHRACEAE	
19b. Ovary adnate to calyx tube.	...		20
20a. Seed solitary	...	LXIII. TRAPACEAE	
20b. Seed numerous	...	LXVI. ONAGRACEAE	
21a. Stamens 5, usually synandrous	...	LXVI. CUCURBITACEAE	
21b. Stamens numerous, free, or filaments basally connate	...	XLVII. BEGONIACEAE	
22a. Ovules more than 1 in each loculus, flowers bisexual, or if ovules 1 in each loculus, flowers 1-sexual.	...		23
22b. Ovules solitary in each loculus ; flowers bisexual.	...		24
23a. Submerged aquatic herbs	...	LXI. HALORRHAGACEAE	
23b. Terrestrial	...	LXVIII. COMBRETACEAE	
24a. Herbs ; fruit dry	...	XCIII. APIACEAE	
24b. Trees or shrubs ; fruit somewhat fleshy.	...		25

25a. Flowers not in umbels	...	LXIX. ALANGIACEAE	
25b. Flowers in umbels	...	XCIV. ARALIACEAE	
26a. Flowers with a distinct corona between petals and stamens	...	XLIV. PASSIFLORACEAE	
26b. Flowers without a distinct corona.	...		27
27a. Soft stemmed shrubs or trees	...	XLV. CARICACEAE	
27b. Plants otherwise.	...		28
28a. Sepals and petals dissimilar	...	XLIII. TURNERACEAE	
28b. Sepals and petals similar or nearly so	...	SL. FLACOURTIACEAE	
29a. Sepals usually imbricate in bud, if valvate, sepals free.	...		30
29b. Sepals valvate, if imbricate or subimbricate then always with valvate petals.	...		67
30a. Sepals usually free sometimes basally connate.	...		31
30b. Sepals more or less united at the base.	...		53
31a. Stamens indenfinite.	...		32
31b. Stamens definite, 10 or fewer.	...		42
32a. Sepals 3 or fewer.	...		33
32b. Sepals 4 or more.	...		36
33a. Trees ; petals more or less resembling sepals	...	I. MAGNOLIACEAE	
33b. Herbs ; sepals and petals distinct.	...		34
34a. Ovary 1- locular with parietal placentas	...	XII. PAPAVERACEAE	
34b. Ovary 1- locular with free central placentas.	...		35
35a. Fruit capsular	...	XXV. PORTULACACEAE	
35b. Fruit indehiscent	...	XXVI. BASELLACEAE	

36a. Petals many in several whorls.	...	37
36b. Petals few, usually 4 or 5.	...	38
37a. Carpels free	... VI. NELUMBONACEAE	
37b. Carpels united	... VII. NYMPHAEACEAE	
38a. Sepals deciduous.	...	39
38b. Sepals persistent.	...	40
39a. Carpels distinct, usually free	... IX. RANUNCULACEAE	
39b. Carpels united into a 1-locular ovary, placentation parietal	... XLIX. CAPPARACEAE	
40a. Leaves opposite	... XXXIV. CLUSIACEAE	
40b. Leaves alternate, trees or shrubs.	...	41
41a. Ovules numerous per loculus	... XXXI. DILLENACEAE	
41b. Ovules solitary per loculus	... XXXII. OCHNACEAE	
42a. Flowers 3-2-merous	... X. MENISPERMACEAE	
42b. Flowers 4-5-merous.	...	43
43a. Petals 4 ; stamens 6.	...	44
43b. Petals usually 5, sometimes 4 ; perfect stamens as many or twice as many as petals and sepals.	...	45
44a. Sepals 4 ; stamens free in 2 rows	... L. BRASSICACEAE	
44b. Sepals 2 ; stamens united in 2 bundles	... XIII. FUMARIACEAE	
45a. Ovary 1-locular.	...	46
45b. Ovary 2- several - locular.	...	48
46a. Placentation parietal	... XLI. VIOLACEAE	
46b. Placentation free central.	...	47
47a. Leaves opposite, distinct	...XXVIII. CARYOPHYLLACEAE	
47b. Leaves alternate, scale like	... XLII. TAMARICACEAE	

48a. Seeds erect	... LXXXIV. SAPINDACEAE	
48b. Seeds pendulous.	...	49
49a. Flowers usually anisomerous ; filaments connate in a sheath <b>POLYGALACEAE</b>	... <b>LXXXIII.</b>	
49b. Flowers isomerous ; stamens quite free.	...	50
50a. Leaves compound, opposite	... XC. ZYGOPHYLLACEAE	
50b. Leaves simple, if compound, alternate.	...	51
51a. Stamens 5 ; leaves always simple	... LXXXI. LINACEAE	
51b. Stamens 5 or 10 ; leaves simple or compound.	...	52
52a. Flowers regular	... XCI. OXALIDACEAE	
52b. Flowers irregular	... XCII. BALSAMINACEAE	
53a. Stamens indefinite ; leaves not gland dotted	... XXXIII. DIPTEROCARPACEAE	
53b. Stamens definite, if indefinite, leaves gland dotted.	...	54
54a. Leaves gland - dotted	... LXXXIX. RUTACEAE	
54b. Leaves not gland - dotted.	...	55
55a. Leaves opposite, simple, ovary 3 - locular	...LXXXII. MALPIGHIACEAE	
55b. Leaves alternate ; if opposite ovary 1- locular.	...	56
56a. Carpels syncarpous, 1 - locular ; ovules numerous	... LI. MORINGACEAE	
56b. Carpels apocarpous or syncarpous, ovary septate, ovules few.	...	57
57a. Stamens alternate with the petals.	...	58
57b. Stamens opposite the petals ; leaves simple or compound.	...	65
58a. Ovules and seeds pendulous.	...	59
58b. Ovules and seeds erect or ascending.	...	63

59a. Leaves compound.	...	60
59b. Leaves simple.	...	61
60a. Filaments free	...LXXXVII. SIMAROUBACEAE	
60b. Filaments connate in a tube	... LXXXVIII. MELIACEAE	
61a. Flowers unisexual	... LXXVI. ICACINACEAE	
61b. Flowers bisexual.	...	62
62a. Ovary 3 – locular below	... LXX. OLACACEAE	
62b. Ovary 1 – locular throughout	... LXXI. OPILIAEAE	
63a. Ovary 1 – locular,leaves simple or compound, or 2 – 5 – locular ; leaves compound	...LXXXVI. ANACARDIACEAE	
63b. Ovary 3 – 5 – locular ; leaves simple.	...	64
64a. Seeds winged	...LXXV. HIPPOCRATEACEAE	
64b. Seeds not winged	... LXXIV. CELASTRACEAE	
65a. Petals imbricate ; leaves estipulate	... XI. SABIACEAE	
65b. Petals valvate ; leaves stipulate.	...	66
66a. Ovules solitary per locule ; filaments connate into a tube	... LXXIX. LEEACEAE	
66b. Ovules 2 per locule ; filaments free	... LXXX. VITACEAE	
67a. Sepals free ; flowers 3 – merous	... II. ANNONACEAE	
67b. Sepals united below ; flowers 5 or 4 – merous	...	68
68a. Anthers tetrasporangiate and bithecal ; epicalyx absent ; filaments distinct or connate.	...	69
68b. Anthers bisporangiate and monothechal ; flowers very often with an epicalyx ; filaments connate	...	72
69a. Stamens indefinite	... XXXV. TILIACEAE	
69b. Stamens definite.	...	70

- 70a. Filaments all generally connate into a tube  
around the ovary ...XXXVI. STERCULIACEAE
- 70b. Filaments free. ... 71
- 71a. Leaves compound ; stamens twice as  
many as petals ... LXXXV. BURSERACEAE
- 71b. Leaves simple ; stamens as many as petals ...LXXXVIII. RHAMNACEAE
- 72a. Stamens monadelphous ... XXXVIII. MALVACEAE
- 72b. Stamens polyadelphous ...XXXVII. BOMBACACEAE
- 73a. Ovary inferior ; stamens as many as  
corolla lobes or fewer. ... 74
- 73b. Ovary superior ; or if inferior then with  
stamens more than corolla lobes. ... 77
- 74a. Flowers borne in involucrate, centripetally  
flowering heads; anthers connate into a tube  
around the style, which pushes out the pollen ;  
ovary unilocular, with a solitary ovules ... CXIX. ASTERACEAE
- 74b. Flowers borne in various sorts of inflorescences,  
but if in head then the heads generally basically  
cymose in structure ; ovary with 1 – several locules  
and 1 – many ovules in each locule. ... 75
- 75a. Leaves opposite or whorled, stipules usually  
interpetiolar (sometimes intrapetiolar ) ;  
stamens attached to the corolla  
tube, usually well above the base ... CXVIII. RUBIACEAE
- 75b. Leaves usually alternate, estipulate ;  
stamens free from the corolla,  
or attached at the base of the tube. ... 76
- 76a. Style glabrous, and with a lobed stigma ; fruit a  
circumscissile capsule ...CXVI. SPHENOCLEACEAE
- 76b. Style with well developed collecting hairs just  
below the 2 – 3 (– 5) stigmas ; fruit various,  
not as above ...CXVII. CAMPANULACEAE

77a. Ovary 1-locular ; placentation free - central. ...	78
77b. Ovary usually 2 - many - locular ; placentation never free central. ...	79
78a. Corolla irregular ...	CXV. LENTIBULARIACEAE
78b. Corolla regular. ...	81
79a. Ovary 1 - ovuled ...	XXX. PLUMBAGINACEAE
79b. Ovary 2 - many - ovuled. ...	80
80a. Herbs ; fruit a capsule ...	LVI. PRIMULACEAE
80b. Shrubs or small trees ; fruit indehiscent ...	LV. MYRSINACEAE
81a. Stamens not epipetalous ...	LIII. EBENACEAE
81b. Stamens epipetalous. ...	82
82a. Ovary 2 - carpelled, or if 3-5-carpelled, stamens either equal to and alternate with, or fewer than the corolla lobes. ...	83
82b. Ovary 3- or more - carpelled. ...	102
83a. Corolla regular, rarely slightly oblique. ...	84
83b. Corolla irregular, or at least somewhat oblique ...	9
84a. Leaves usually opposite. ...	85
84b. Leaves usually alternate. ...	91
85a. Stamens 2 ...	CIX. OLEACEAE
85b. Stamens 4 or more. ...	86
86a. Carpels free, only the styles united ; stamens and corolla lobes always 5. ...	87
86b. Carpels as well as styles always united. ...	88
87a. Gynostegium present ...	XC VIII. ASCLEPIADACEAE
87b. Gynostegium absent ...	XC VII. APOCYNACEAE

88a. Leaves joined at the base by interpetiolar stipules or by a raised line ; ovary 2-3 (-5)-locular. ...	89
88b. Leaves exstipulate, ovary generally unilocular. ...	90
89a. Trees ; fruit a berry ...	XCV. LOGANIACEAE
89b. Shrubs ; fruit a septicidal capsule ...	CVIII. BUDDLEJACEAE
90a. Aquatic herbs ...	CII. MENYANTHACEAE
90b. Terrestrial herbs ...	XCVI. GENTIANACEAE
91a. Carpels 3 ; corolla lobes contorted ...	C III. POLEMONIACEAE
91b. Carpels 2, or if 3 with imbricate corolla lobes ...	92
92a. Ovules numerous per carpel. ...	93
92b. Ovules 2 per carpel, rarely 1. ...	94
93a. Corolla lobes imbricate ; style 2 - fid or 2 ...	CIV. HYDROPHYLLACEAE
93b. Corolla lobes plicate or if imbricate, style entire...	IC. SOLANACEAE
94a. Corolla lobes imbricate or contorted ...	CV. BORAGINACEAE
94b. Corolla lobes plicate or rarely imbricate. ...	95
95a. Leafy climbers ...	C. CONVULVACEAE
95b. Leafless parasites ...	CI. CUSCUTACEAE
96a. Carpels 2 - or more - ovuled. ...	97
96b. Carpels 1 - ovuled. ...	101.
97a. Ovary 1 - locular ...	CXI. OROBANCHACEAE
97b. Ovary 2 - locular. ...	98
98a. Fruit opening elastically into 2 - loculicidal valves ; seeds usually subtended by retinacula ...	CXII. ACANTHACEAE
98b. Fruit dehiscent, but not opening elastically, or rarely indehiscent. ...	99

99a. Seeds usually winged ; leaves compound ...	CXIV. BIGNONIACEAE	
99b. Seeds not winged ; leaves simple. ...		100
100a. Ovary 1 – locular ...	CXIII. PEDALIACEAE	
100b. Ovary 2 – locular ...	CX. SCROPHULARIACEAE	
101a. Fruit of 4 one-seeded nutlets ...	CVII. LAMIACEAE	
101b. Fruit not as above ...	CVI. VERBENACEAE	
102a. Ovary superior ; ovules solitary per locule ...	L II. SAPOTACEAE	
102b. Ovary inferior or half inferior ; ovules more than 1 per locule ...	L IV. SYMPLOCACEAE	
103a. Flowers bisexual, less often unisexual. ...		104
103b. Flowers unisexual, rarely bisexual. ...		112
104a. Ovary superior. ...		105
104b. Ovary inferior. ...		107
105a. Seeds without albumen ...	III. LAURACEAE	
105b. Seeds with copious albumen. ...		106
106a. Leaves stipulate ; stipule connate ...	XXIX. POLYGONACEAE	
106b. Leaves exstipulate ; or if stipules present, represented by tubercles. ...		107
107a. Perianth tubular ...	XX. NYCTAGINACEAE	
107b. Perianth lobes united only at the base. ...		108
108a. Perianth scarious and dry ...	XXIV. AMARANTHACEAE	
108b. Perianth membranous, herbaceous or coriaceous, never scarious. ...		109
109a. Flowers in racemes ...	XIX. PHYTOLACCACEAE	
109b. Inflorescence various ...	XXIII. CHENOPODIACEAE	

110a. Ovary several locular	... V. ARISTOLOCHIACEAE	
110b. Ovary 1-locular,	...	111
111a. Flowers bisexual ; ovules several	... LXXII. LORANTHACEAE	
111b. Flowers unisexual ; ovules two	... LXXIII. VISCACEAE	
112a. Leaves represented by a whorl of minute scale-leaves	... XVIII. CASUARINACEAE	
112b. Leafy trees, herb or shrubs.	...	113
113a. Submerged aquatic herbs	... VIII. CERATOPHYLLACEAE	
113b. Terrestrial plants.	...	114
114a. Ovary syncarpous, 1 - locular	... XLVIII. SALICACEAE	
114b. Ovary monocarpellary or syncarpous	...	115
115a. Ovary 2, or more -- locular, if 1 - locular then 2 - ovuled	... LXXVII. EUPHORBIACEAE	
115b. Ovary 1 - locular, 1- ovuled.	...	116
116a. Seeds with copious albumen ; embryo minute ...	IV. PIPERACEAE	
116b. Seeds with little or no albumen; embryo large...		117
117a. Ovary with a single style ; ovule basal or nearly so, erect	... VII. URTICACEAE	
117b. Ovary with 2 styles but one style often reduced ; ovule apical, pendulous, anatropous.	...	118
118a. Plants nearly always with laticifers and milky juice	... XVI. MORACEAE	
118b. Plants without laticifers, and without milky juice.	...	119
119a. Woody plants	... XIV. ULMACEAE	
119b. Herbs	... XV. CANNABACEAE	

- 120a. Free floating thallus like aquatic herbs ; flowers minute, naked, borne in pouches or cavities ... CXXVI. LEMNACEAE
- 120b. Plant not as above. ... 121
- 121a. Fruit a 3-valved capsule ... CXXX. JUNCACEAE
- 121b. Fruit indehiscent. ... 122
- 122a. Trees, shrubs or scramblers with plicate or pinnately divided leaves ; flowers in paniced spadices ... CXXIII. ARECACEAE
- 122a. Plant not as above. ... 123
- 123a. Dioecious spiny trees or shrubs, often supported by stiff roots ...CXXIV. PANDANACEAE
- 123b. Plant not as above. ... 124
- 124a. Inflorescence a spadix of inconspicuous flowers subtended by a spathe which is usually large and showy ... CXXV. ARACEAE
- 124b. Plant not as above. ... 125
- 125a. Tall, aquatic monoecious herbs ; leaves basal straited ; flowers in 2 cylindrical superposed spikes ... CXXIII. TYPHACEAE
- 125b. Plant not as above. ... 126
- 126a. Inflorescence a head subtended by an involucre of bracts ; flowers unisexual ...CXXIX. ERIOCAULACEAE
- 126b. Plant not as above. ... 127
- 127a. Flowers inconspicuous, subtended by glumaceous bracts and arranged in different sorts of spikelets ; perianth absent or represented by scales, lodicules and bristles. ... 128
- 127b. Plant not as above. ... 129
- 128a. Stems solid, triangular ; anthers basifixed ... CXXXI. CYPERACEAE
- 128b. Stems hollow at internodes, terete ; anthers dorsifixed; grasses ... CXXXII. POACEAE

129a. Ovary superior.	...	130
129b. Ovary inferior or half inferior.	...	136
130a. Carpels several, free.	...	131
130b. Carpels solitary, if many united.	...	132
131a. Inflorescence spicate : perianth segments 1-3; carpels 3 - 6	...CXXII. POTAMOGETONACEAE	
131b. Inflorescence with the pedicels or primary branches commonly in whorls of 3 ; perianth segments 3+ 3; carpels numerous	... CXX. ALISMATACEAE	
132a. Perianth biseriate, outer whorl sepaloid, inner whorl petaloid	...CXXVIII. COMMELINACEAE	
132b. Perianth uniseriate, or if biseriate inner and outer whorl, similar, usually petaloid or united into a tube below.	...	133
133a. Root stock usually a bulb	... CXL. LILIACEAE	
133b. Plants not as above.	...	134
134a. Woody vines with reticulately - veined leaves...	CXLIV. SMILACACEAE	
134b. Aquatic herbs ; leaves with parallel venation.	...	135
135a. Inflorescence terminating a 1 - leafed scape ; corolline segments large, bluish	... CXXXIX. PONTEDERIACEAE	
135b. Inflorescence in a dense capitulum, supported by rigid, dark brown, imbricating bracts, corolline segments small, yellow	... CXXVII. XYRIDACEAE	
136a. Climbers ; capsules winged	... CXLV. DIOSCOREACEAE	
136b. Plant not as above.	...	137
137a. Sepals usually spatuloid in form and texture ; leaves narrow and parallel veined.	...	138
137b. Plant not as above.	...	139
138a. Herbaceous geophytes ; leaves soft, annual...	CXLI. AMARYLLIDACEAE	
138b. Arborescent xerophytes ; leaves stiff, perennial	... CXLIII. AGAVACEAE	

139a. Aquatic submerged herbs	... CXXI. HYDROCHARITACEAE	
139b. Terrestrial or epiphytic herbs.	...	140
140a. Flowers actinomorphic.	...	141
140b. Flowers zygomorphic.	...	142
141a. Leaves spinescent at the margins and apex	... CXXXIV. BROMELIACEAE	
141b. Leaves not spinescent	... CXLII. HYPOXIDACEAE	
142a. Stamens united with the stigma-bearing column; seeds many, small, often very minute, without albumen	... CXLVI. ORCHIDACEAE	
142b. Stamens distinct ; seeds conspicuous, with copious albumen.	...	143
143a. Functional stamens 5, raphide sacs present	... CXXXV. MUSACEAE	
143b. Functional stamen 1; with 1 or 2 pollen sacs ; raphide sacs absent.	...	144
144a. Stamen with a single pollen- sac ; flowers asymmetrical	... CXXXVIII. CANNACEAE	
144b. Stamen with 2 pollen sacs ; flowers bilaterally symmetrical.	...	145
145a. Leaves distichous ; plants aromatic	... CXXXVI. ZINGIBERACEAE	
145b. Leaves spirally arranged ; plants not aromatic	... CXXXVII. COSTACEAE	

ENUMERATION

I. MAGNOLIACEAE

MICHELIA L.

*Michelia champaca* L., Sp. Pl. 536.1753; Haines, Bot. Bihar & Orissa. 1 : 8-9, 1921 (1961).

Leaves ovate-lanceolate, 14-19 × 6-10 cm, acute or acuminate, entire. Flowers to 7 cm long ; tepals cream-white or yellow. Cultivated for its showy, fragrant flowers. Fl. April-September. Fr. June-November, CHAMPA. Sarkar and Bhatta., 800.

Notes : "The name 'Champaran' is a corruption of Champa - aranya, i.e., the forest of Champa trees, a designation which is popularly believed to date back to the time when district was a fast forest". (O' Malley, 1907).

II. ANNONACEAE

- |  |     |               |
|--|-----|---------------|
| 1a. Stamens crowded with broad overlapping connectives, concealing anther cells. | ... | 2             |
| 1b. Stamens loosely imbricate, connective narrow, not concealing anther cells    | ... | 3. MILIUSA    |
| 2a. Petals bend in over stamens, then spreading ; climbers or samll trees.       | ... | 3             |
| 2b. Petals spreading from base ; trees   | ... | 4. POLYALTHIA |
| 3a. Petals with concave bases.   | ... | 4             |
| 3b. Petals without concave bases   | ... | 5. UVARIA     |
| 4a. Fruitlets distinct ; hook - climbers   | ... | 2. ARTABOTRYS |
| 4b. Fruitlets united medium trees  | ... | 1. ANNONA     |

1. ANNONA L.

- |   |     |                         |
|---|-----|-------------------------|
| 1a. Areoles of fruit raised, ripe fruit whitish-green | ... | 2. <i>A. squamosa</i>   |
| 1b. Areoles of fruit flat, ripe fruit redish- yellow  | ... | 1. <i>A. reticulata</i> |

1. *Annona reticulata* L., Sp. Pl. 537.1753; Hook. f. & Thom. in Hook. f., Fl. Brit. India, 1 : 78.1872 ; Haines, Bot. Bihar & Orissa 1 : 10.1921 (1961).

Small trees. Leaves oblong-lanceolate, 12-20 cm long. Flowers fascicled. Perianth in 2 whorls. Fruits sub-globose or heart-shaped, areoles not prominently raised.

Planted for its edible fruits, escape, April - June. RAMPHAL, ATA. Sarkar & Bhatta., 339.

2. *Annona squamosa* L., Sp. Pl. 537.1753; Hook. f. & Thom. in Hook. f., Fl. Brit. India. 1 : 78.1872; Haines, Bot. Bihar & Orissa 1 : 10, 1921.

Small trees or shrubs. Leaves oblong - lanceolate or elliptic, 5 - 10 cm long, coriaceous, glabrous above and pubescent beneath, obtuse or subacute. Sepals minute. Fruit globose; pulp white. Seeds black, shining. Planted for its edible fruits, escape, April-September. SITAPHAL, SARIFA. Sarkar & Bhatta., 663

## 2. ARTABOTRYS R. Br.

*Artabotrys hexapetalus* (L.f.) Bhandari in Baileya 12 (4) : 149. 1964. *Annona hexapetala* L.f., Suppl. 270. 1781. *A. odoratissimus* R. Br., Bot. Reg. t. 423. 1820; Hook. f. & Thom. in Hook. f., Fl. Brit. India 1 : 54.1872; Haines, Bot. Bihar & Orissa 1 : 10. 1921 (1961).

Large climbing shrubs. Leaves oblong-lanceolate, acuminate. Flowers solitary or in fascicles of 2, yellowish-green. Ripe carpels yellow.

Planted for its fragrant flowers. April-September. KANTHALICHAMPA. Sarkar & Bhatta., 659.

Leaves contain an antifertility principle.

## 3. MILIUSA Leschen. ex DC.

*Milusa velutina* (Dun.) Hook. f. & Thoms., Fl. Indica. 151.1855; Hook. f. & Thom. in Hook. f., Fl. Brit. India. 1 : 87. 1872 ; Haines, Bot. Bihar & Orissa 1 : 14. 1921 *Uvaria velutina* Dun., Monogr. Annonac. 91.1817.

Trees. Leaves elliptic or ovate and tomentose below. Inflorescence pedunculate, 2-3-flowered. Sepals lanceolate, petals orbicular-ovate. Fruitlets purple when ripe.

Haines (l.c.) reported the plant from Champaran. June – July. KARI, KARIOTA. Haines 34 (CAL!).

Fruits edible. Bark purgative.

#### 4. POLYALTHIA Bl.

- 1a. Petals linear ; leaves linear – lanceolate ... 1. *P. longifolia*  
 1b. Petals ovate ; leaves oblong – lanceolate ... 2. *P. suberosa*

1. *Polyalthia longifolia* Benth. & Hook. f. in Hook. f. Fl. Brit. India. 1 : 62. 1872 ; Haines, Bot. Bihar & Orissa 1 : 12. 1921 (1961).

Tall trees. Leaves linear–lanceolate, margin undulate, acuminate. Fruits globose, olive green, pulp orange coloured.

Planted as avenue tree and often run wild, South India and Sri Lanka. March –April. DEBDARU. Sarkar & Bhatta., 436, 1704.

2. *Polyalthia suberosa* (Roxb.) Benth. & Hook. f. in Thw. Enum. 394. 1864 ; Hook. f. & Thom. in Hook. f., Fl. Brit. India 1 : 65. 1872 ; Haines, Bot. Bihar & Orissa 1 : 13. 1921. *Uvaria suberosa* Roxb. Pl. Cor. t. 34. 1795.

Trees. Leaves oblong–lanceolate, acuminate, oblique at base. Flowers solitary, extra–axillary. Sepals ovate, petals reddish brown. Fruitlets 0.7 cm across.

Madanpur and surrounding areas, not very common. May–November. Sarkar & Bhatta., 1527.

Decoction of fresh roots used as an abortifacient. Fruits edible.

#### 5. UVARIA L.

*Uvaria hamiltonii* Hook. f. & Thoms. in Hook. f., Fl. Brit. India. 1:48. 1872.; Haines, Bot. Bihar & Orissa 1 : 10. 1921 (1961).

Young branches circinate. Leaves elliptic or oblong–obovate, stellate – tomentose below. Fruitlets tomentose, many – seeded.

In ravines of the northern part. May– September. Sarkar & Bhatta., 471.

## III. LAURACEAE

1a. Twining, climbing stem parasites	...	1. CASSYTHA
1b. Medium, evergreen trees.	...	2
2a. Flowers in umbels	...	2. LITSEA
2b. Flowers not in umbels	...	3. PHOEBE

## 1. CASSYTHA L.

**Cassytha filiformis** L., Sp. Pl. 35, 1753; Hook. f., Fl. Brit. India 5 : 188. 1886 ; Haines, Bot. Bihar & Orissa 3 : 838. 1924 (1961).

Stems to 0.1cm across. Perianth white. Drupe globose. On *Shorea robusta*. Tropics. Throughout the year. Sarkar & Bhatta., 1734.

2. LITSEA Lamk., *nom. cons.*

1a. Perianth 6 or 5 – partite. Stamens 9 –13.	...	2
1b. Perianth lobed, not partite ; Stamens, 9 –20	...	1. <i>L. glutinosa</i>
2a. Leaves persistent	...	2. <i>L. monopetala</i>
2b. Leaves deciduous	...	3. <i>L. sericea</i>

1. **Litsea glutinosa** (Lour.) C. B. Robins. in Philip. J. Sci. Bot. 6 : 321. 1911; Allen in Ann. Missouri Bot. Gard. 25 : 384. 1938. *Sebifera glutinosa* Lour., Fl. Cochinch. 638. 1790. *Litsea sebifera* Pers., Syn. Pl. 2 : 4. 1807; Hook. f. in Fl. Brit. India 5 : 157. 1886; Haines, Bot. Bihar & Orissa 3 : 832. *L. chinensis* Lamk. Encycl. 3 : 574. 1792, Karthi. & Kumar, Fl. Yavatmal Dist. 214. 1993.

Evergreen trees. Leaves elliptic–oblong, ovate–lanceolate, 9.6 – 18.2 × 5.1–7.4 cm, obtuse, acute or short acuminate. Umbels 3 –6 – flowered. Fruits globose, 0.8 –1 cm long.

Common in the forests. Fl. : June – July; Fr. : September – November. MEDH. Sarkar & Bhatta., 918.

Mucilaginous bark medicinal. Seeds yield a fat, used for candles and soap making

2. **Litsea monopetala** (Roxb.) Pers., Syn. Pl. 2 : 4. 1807; Allen, l.c. *Tetranthera monopetala* Roxb., Pl. Cor. 2 : 26. t. 148. 1800. *Litsea polyantha* Juss.

in Ann.Mus. Hist. Nat. Paris 6 : 211. 1805 ; Hook . f. , Fl. Brit. India 5 : 162. 1886 ; Haines Bot. Bihar & Orissa 3 : 833. 1924 (1961).

Evergreen trees. Leaves acute or obtuse and often apiculate at apex, 11.1 – 14.2 × 4.7– 7.0 cm. Umbels 5– 8– flowered. Fruit ovoid, to 0.9 cm long.

Common near Madanpur. March– September. Sarkar & Bhatta., 181.

Uses as the previous.

3. *Litsea sericea* Hook .f., Fl. Brit. India 5 : 156. 1886. *Tetranthera sericea* Wall. cat. 2545. *nom. nud.* 1828.

Deciduous trees. Terminal buds perulate. Leaves 15. 8–22.5 × 7.9– 10 cm, obtuse to acute. Umbels 8–20– flowered Anthers 12. Fruit subglobose.

Someswar, sand stone hills. Nepal, Bhutan, extending to Manipur. Fl. March. Sarkar & Bhata. 387.

### 3. PHOEBE Nees

*Phoebe lanceolata* (Nees) Nees, Syst. Laur. 109.1836 ; Hook. f. Fl. Brit. India 5 : 141.1886 ; Haines, Bot. Bihar & Orissa 3 : 835. 1924, *Ocotea lanceolata* Nees in Wall. Pl. Asiat. Rar. 2 : 71.1831. *Phoebe angustifolia* Meissn. in DC., Prodr. 15 (1) : 34.1864; Hook, f., Fl. Brit. India 5 : 141.1886.

Medium trees. Leaves elliptic–lanceolate, 13–23 × 2–4.2 cm, acuminate.

Along the ravines. Someswar hills. Subtropical Himalaya to tropical Himalay. April–June. Sarkar & Bhatta., 973.

Ash of the berries applied to sores.

## IV. PIPERACEAE

1a. Root climbers ; flowers unisexual ... 2. PIPER

1b. Herbs ; flowers bisexual ... 1. PEPEROMIA

### 1. PEPEROMIA Ruiz & Pav.

*Peperomia pellucida* (L.) Humb., Bonpl. & Kunth, Nov. Gen. Pl. 1 : 64.1816; Haines, Bot. Bihar & Orissa 3 : 829 . 1924. *Piper pellucidum* L., Sp. Pl. 30.1753.

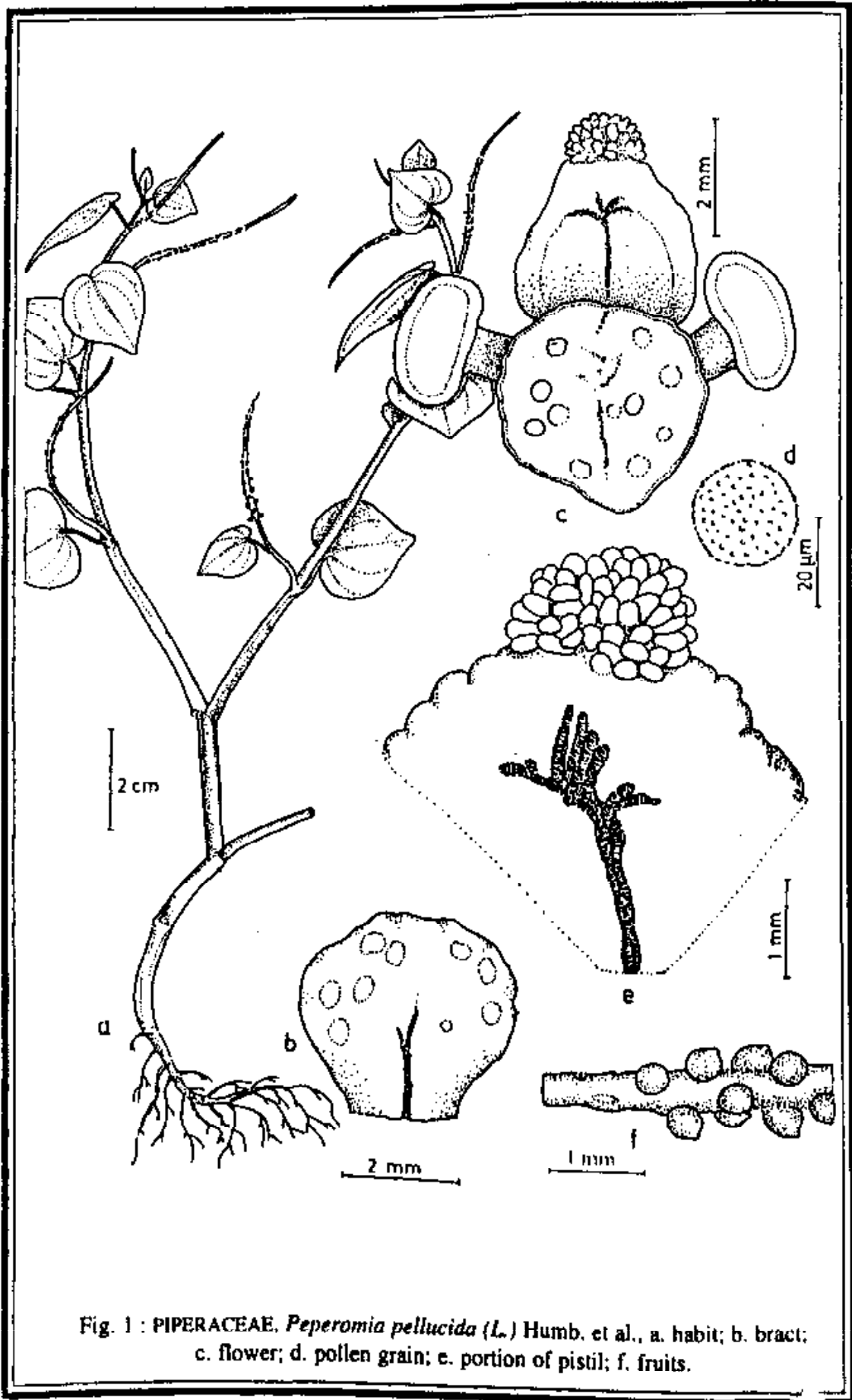


Fig. 1 : PIPERACEAE. *Peperomia pellucida* (L.) Humb. et al., a. habit; b. bract; c. flower; d. pollen grain; e. portion of pistil; f. fruits.

Branches to 30 cm long. Leaves ovate deltoid, 2-3 × 1.5-2.8 cm, 5-6 nerved, acute, entire. Spikes 5-6 cm long. Bracts with pearl-cells. Fruit 0.1 cm across.

Common in wet places. June-September. LUCHIPATA. Sarkar & Bhatta., 1407.

Used as a pot-herb.

## 2. PIPER L.

- |   |     |                          |
|---|-----|--------------------------|
| 1a. Stems slender, creeping ; stamens 2-4       | ... | 2. <i>P. longum</i>      |
| 1b. Stems stout, climbing by adventitious roots | ... | 2                        |
| 2a. Leaves ovate-lanceolate ; stamens 2-4       | ... | 3. <i>P. peepuloides</i> |
| 2b. Leaves cordate-ovate ; stamens 2            | ... | 1. <i>P. betle</i>       |

1. *Piper betle* L., Sp. Pl. 28. 1753; Haines, Bot. Bihar & Orissa 3: 827. 1924.

Leaves cordate-ovate to elliptic-oblong. Spikes pendulous. Berries 0.3-0.5 cm across.

Cultivated for its leaves. Doubtfully native of Java. PAN.

2. *Piper longum* L., Sp. Pl. 20. 1753; Hook. f., Fl. Brit. India 5: 83. 1869; Haines, Bot. Bihar & Orissa 3: 826. 1924 (1961).

Creeping or rambling, dioecious herbs. Leaves alternate, ovate or orbicular, cordate, stalked; leaves of upper nodes oblong, sessile or amplexicaule. Male spikes 5-10 cm long. Female spikes 2-3 cm long. Ovary sunken in thick rachis; stigmas 3-4. Berries 0.2-0.3 cm across.

Common in the northern part of the district. Tropics. July-January. Sarkar & Bhatta., 1437. 1468.

Roots and fruits used for diseases of respiratory tract.

3. *Piper peepuloides* Roxb., Fl. Indica. 1: 156. 1820; Hook. f., Fl. Brit. India 5: 83. 1869; Haines, Bot. Bihar & Orissa 3: 826. 1924 (1961).

Climbing shrubs; adhering to the trunks of trees by adventitious roots. Leaves alternate, ovate-lanceolate or oblong lanceolate, 10-14 cm × 6-7 cm, acuminate, oblique and rounded at base. Inflorescence leaf-opposed. Male spikes 2-5 cm long. Female spikes short, 0.5-2 cm long. Berry 0.2 cm across.

Occasional in the northern part. Tropics. October- March. PIPAL Sarkar & Bhatta., 1825.

Stems and roots used against leprosy.

## V. ARISTOLOCHIACEAE

### ARISTOLOCHIA L.

*Aristolochia indica* L. Sp. Pl. 960.1753 ; Hook . f., Fl. Brit. India 5: 75.1886 ; Haines, Bot. Bihar & Orissa 824.1924 (1961).

Twining herbs. Leaves oblong to subelliptic 5-12 × 2-5 cm. Flowers bracteate. Perianth greenish purple, 1.5-2 cm long. Capsules broadly oblong-subglobose, 3-4 cm long.

Common in wastelands. August-January. ANANTAMOOL. Sarkar & Bhatta., 960.

Aristolochic acid, a nitrophenanthrene compound obtained from roots and rhizomes, has tumour inhibiting properties.

## VI. NELUMBONACEAE

### NELUMBO Adans.

*Nelumbo nucifera* Gaertn., Fruct. 1 : 73. 1788. *Nymphaea nelumbo* L., Sp. Pl. 511.1753. *Nelumbium speciosum* Willd., Sp. Pl. 2 : 1258.1799 ; Haines, Bot. Bihar & Orissa 1 : 23. 1921. *Nelumbium nelumbo* (L.) Druce, Bot. Excl. Cl. Soc. Brit. Isles 3 : 421. 1914.

Leaf blade upto 55 cm across, petiole upto 2 m long depending on the depth of water. Pedicel to 2 m long and 1 cm across. Flowers to 25 cm across ; outer tepals calycine, inner tepals rosy-white. Receptacle 4-8 cm across.

Majhaolia and surrounding areas in shallow tanks. May-November. PADMA. Sarkar & Bhatta., 1456

Seeds, rhizomes eaten raw or cooked ; leaves used as plates. Flowers, carpels, rhizomes medicinal. Petioles, pedicels and embryos contain an alkaloid, nelumbine, which acts as a cardiac poison.

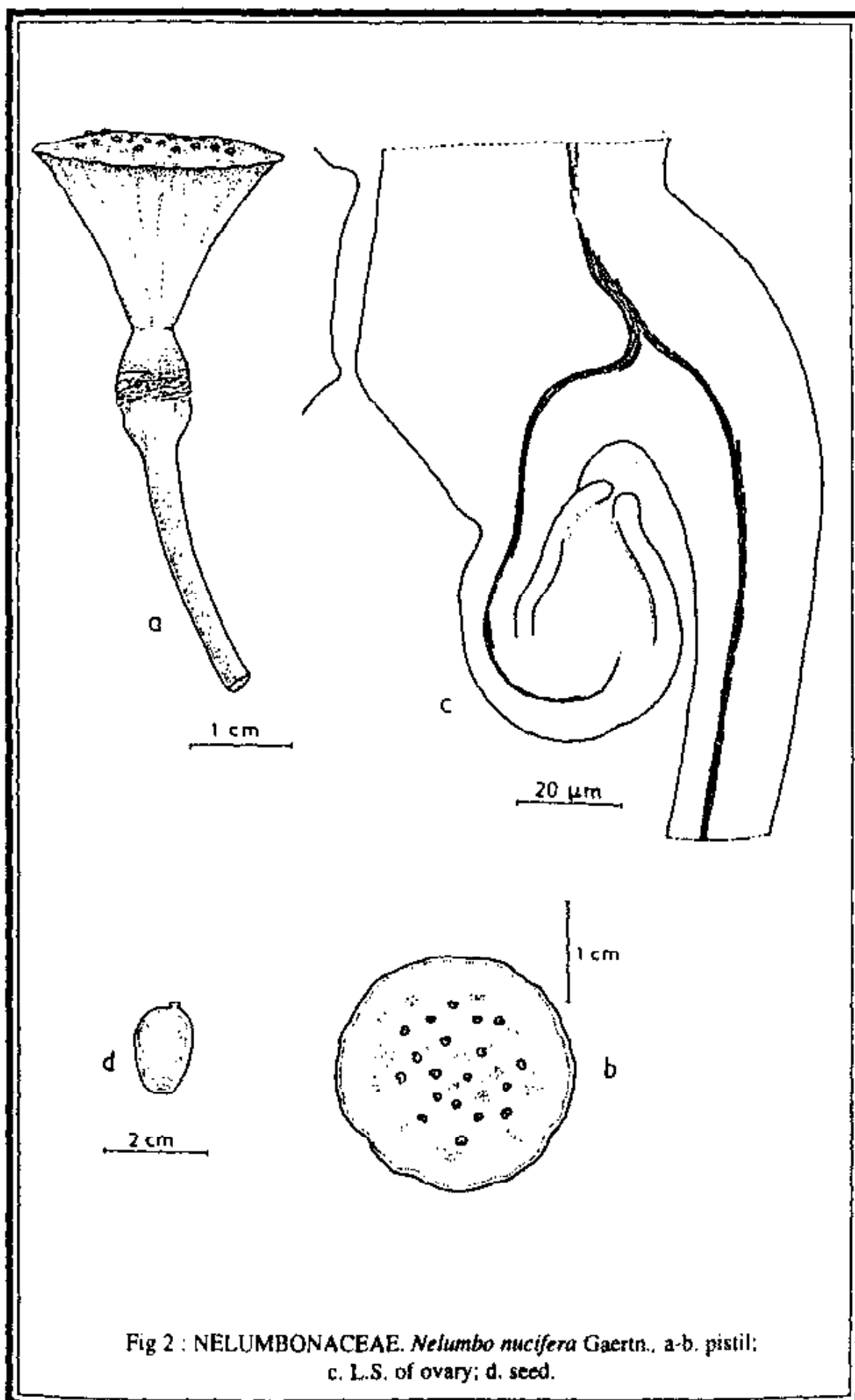


Fig 2 : NELUMBONACEAE. *Nelumbo nucifera* Gaertn., a-b. pistil;  
c. L.S. of ovary; d. seed.

## VII. NYMPHAEACEAE

NYMPHAEA L., *nom. cons.*

- 1a. Leaves glabrous beneath ; stamens appendaged ... 1. *N. nouchali*  
 1b. Leaves pubescent or villous beneath ; stamens not appendaged. 2  
 2a. Flowers white or outer few petals purple tinged at the tips;  
     stamens yellow ... 2. *N. pubescens*  
 2b. Flowers carmine red ; stamens purple ... 3. *N. rubra*

1. ***Nymphaea nouchali*** Burm. f., Fl. Ind. 120. 1768 ; Subramanyam, Aq. Ang. 6.1962 p.p. *N. stellata* Willd., Sp. Pl. ed. 4, 2 : 1154. 1799 ; Hook. f. & Th. in Hook. f., Fl. Brit. India 1 : 114. 1872 ; Haines, Bot. Bihar & Orissa 1 : 22. 1921.

Leaves rotundate, to 30 cm across, entire or sinuate, purplish beneath. Flowers to 12 cm across, bluish. Stamens appendaged, to 4 cm, long. Berry to 7 cm across.

In shallow water bodies. July–November, Sarkar & Bhatta., 820.

Fried seeds eaten. Petioles and pedicels used as a vegetable.

2. ***Nymphaea pubescens*** Willd., Sp. Pl. ed 4, 2 : 1154. 1799 ; van Royen in Nova Guinea 8 : 110. 1962. *N. nouchali* auct. non Burm. f. ; 1768. *N. lotus* var. *pubescens* (Willd.) Hook. f. & Th. Fl. India 241.1855 & Fl. Brit. India 1 : 114.1872 ; *N. lotus* L., Sp. Pl. 511.1753. p.p. excl. the type ,Haines, Bot. Bihar & Orissa 1 : 21. 1921.

Leaves oblong or rotundate, hastate, entire or sinuate–margined, villous beneath, 30 cm across. Flowers to 8 cm across, white. Stamens and stigmas yellow

In ponds. July–October. Sarkar & Bhatta., 909.

Uses as the previous.

3. ***Nymphaea rubra*** Roxb, ex Andr., Bot. Rep. 8 (104) : t. 503. 1808 ; Mitra and Subramanyam in BBSI 24 : 83. 1983 ; Prain, Bengal Pl. 1 : 140. *N. lotus* auct. non L., Hook. f. & Th. in Hook. f. , Fl. Brit. India 1 : 114. 1872 p. p.

Leaves rotundate, to 40 cm across, denticulate, purplish and hairy beneath ; petiole purplish. Flowers to 15 cm across, carmine red. Stamens dark purple.

In deep water bodies. July– October. Sarkar & Bhatta., 838.

Uses as the previous

VIII. CERATOPHYLIACEAE

CERATOPHYLLUM L.

**Ceratophyllum demersum** L., Sp. Pl. 992. 1753 ; Hook. f., Fl. Brit. India 5 : 639. 1888 ; Haines, Bot, Bihar & Orissa 3:883. 1924 (1961).

Profusely branched herbs. Leaves usually 4–9 at the nodes, dichotomously forked, 2–4.5 cm long Perianth segments greenish–white Fruits ellipsoid or ovoid, compressed, to 4 cm long, with 2 decurved spines at base.

Common in water bodies. Cosmopolitan, Fl. & Fr. all seasons. Sarkar & Bhatta., 497.

IX. RANUNCULACEAE

- 1a. Climbing shrubs ; leaves opposite ; sepals petaloid. ... 2
- 1b. Annual herbs ; leaves radical or alternate. ... 3
- 2a. Petiole tendriler ; petals 0 ... 1. CLEMATIS
- 2b. Terminal leaflet tendriler ; petals 6–12, liner ... 2. NARAVELIA
- 3a. Petals absent ; carpels more or less connate ... 3. NIGELLA
- 3b. Petals 5 ; carpels distnict ... 4. RANUNCULUS

1. CLEMATIS L.

- 1a. Flowers to 2.5 cm across ; sepals spreading from the base ; filaments glabrous ... 1. *C. gouriana*
- 1b. Flowers to 5 cm across : sepals erect with recurved tips ; filaments hairy ... 2. *C. roylei*

1. **Clematis gouriana** Roxb. (Hort. Beng. 43.1814) ex DC. Syst. 1: 138. 1817 ; Hook. f. & Thoms. in Hook. f. Fl. Brit, India 1 : 4.1872; Haines, Bot . Bihar & Orissa 1 : 4. 1921 (1961).

Branches grooved, ribs 6–12, hairy. Leaflets ovate–lanceolate, 3–6 × 1–2.5 cm, acuminate, entire or toothed ; petiole twining. Flowers cream–white, scented. Sepals ciliate. Achenes with long feathery styles.

Common on shrubs in the forests. October–January. Sarkar & Bhatta. 248. Leaves vesicant.

2. *Clematis roylei* Rehder in Journ. Arn. Arbor. 2 : 575.1941. *C. nutans* Royle, Il.30t. Himal. 51.1839, non Crantz 1763 ; Hook f. & Thoms. in Hook. f., Fl. Brit. India. 1 : 5.1872 ; Haines, Bot. Bihar & Orissa 1:3.1921 (1961).

Slender, woody climbers, branches silky–pubescent. Leaves 1–2– pinnate ; leaflets ovate–oblong, toothed or lobed. Flowers on long peduncles. Achenes ovate, silky.

Haines reported the plant from Someswar Hills. November–January. Haines 420. (CAL!).

## 2. NARAVELIA Adans., *nom. cons.*

*Naravelia zeylanica* (L.). DC., Syst.Nat. 1: 167. 1817 ; Hook . f. & Thoms. in Hook. f. , Fl. Brit. India 1 : 7. 1872 ; Haines, Bot. Bihar & Orissa 1 : 4. 1921. *Atragene zeylanica* L. Sp. Pl. 542. 1753.

Pubescent herbs ; roots tuberous. Leaflets ovate–orbicular, 9–15 × 5–7 cm acute ; tendril to 10 cm long. Flowers yellowish–white, to 2.5 cm across. Achenes with long, twisted, feathery styles, to 3 cm long

Rare in the hilly areas. September–February. Haines 194 (CAL!). Stems can be used as rough ropes.

## 3. NIGELLA L.

*Nigella sativa* L., Sp. Pl. 1753 ; Haines, Bot. Bihar & Orissa 1 : 5.1921.

Annual herbs, to 50 cm long. Leaf segments linear–lanceolate. Flowers blue, 1.5 – 2cm across. Petals 8. Capsule 1 cm long.

Cultivated for its seeds, also escape. February–April. KALAJIRA. Sarkar & Bhatta., 781.

## 4. RANUNCULUS L.

1a. Glabrous aquatic herbs ; petiole short ; achenes turgid ... 2. *R. sceleratus*

1b. Hairy annual herbs ; petiole long ; achenes flattened ... 1. *R. pensylvanicus*

1. **Ranunculus pensylvanicus** L. f., Suppl. Pl.272 : 1781. ssp. **nepalensis** (DC) Riedl. in Kew Bull. 34 : 364.1979. *R. nepalensis* DC., Prodr. 1 : 39.1824. *R. fibrosus* Wall. ex Hook. f. & Thoms., Fl. Indica 1 : 37.1855. *R. diffusus* auct. non. DC. ; Hook. f. & Thoms. in Hook. f. , Fl Brit. India 1 : 19.1872 p.p.

Stems 35 cm long. Leaves 3-partite. Lower leaves long petioled, to 14 cm long ; upper leaves sub-sessile. Flowers to 1.5 cm across. Achenes many, flattened.

Swampy areas near Madanpur. December. Sarkar & Bhatta. 225.

Note. : Under Rec. 60D, Ex. 1 the epithet *pensylvanicus* is derived from a geographical name Pennsylvania.—Bhatt.

2. **Ranunculus sceleratus** L, Sp. Pl. 531. 1753 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 16.1872 ; Haines, Bot. Bihar & Orissa 1 : 6. 1921.

Erect aquatic herbs, to 75 cm long. Leaves 3-lobed or partite ; upper leaves with linear segments, 5-12 × 4-9 cm. Flowers to 1 cm across. Carpels densely arranged on an elongated axis. Achenes minute.

Common in the marshy places. November-March. Sarkar & Bhatta., 224.

Acrid. Plant stimulant and diuretic. Proto-anemonin present.

#### X. MENISPERMACEAE

1a. Bark corky ; anthers with vertical dehiscence.	...	2
1b. Bark not corky : anthers with transverse dehiscence.	...	3
2a. Style scar in fruit terminal	...	5. TINOSPORA
2b. Style scar in fruit sub-basal	...	4. TILIACORA
3a. Stamens all free	...	2. COCCULUS
3b. Stamens all connate or only inner row connate.	...	4
4a. Inflorescence umbellate	...	3. STEPHANIA
4b. Inflorescence a paniculate cyme	...	1. CISSAMPELOS

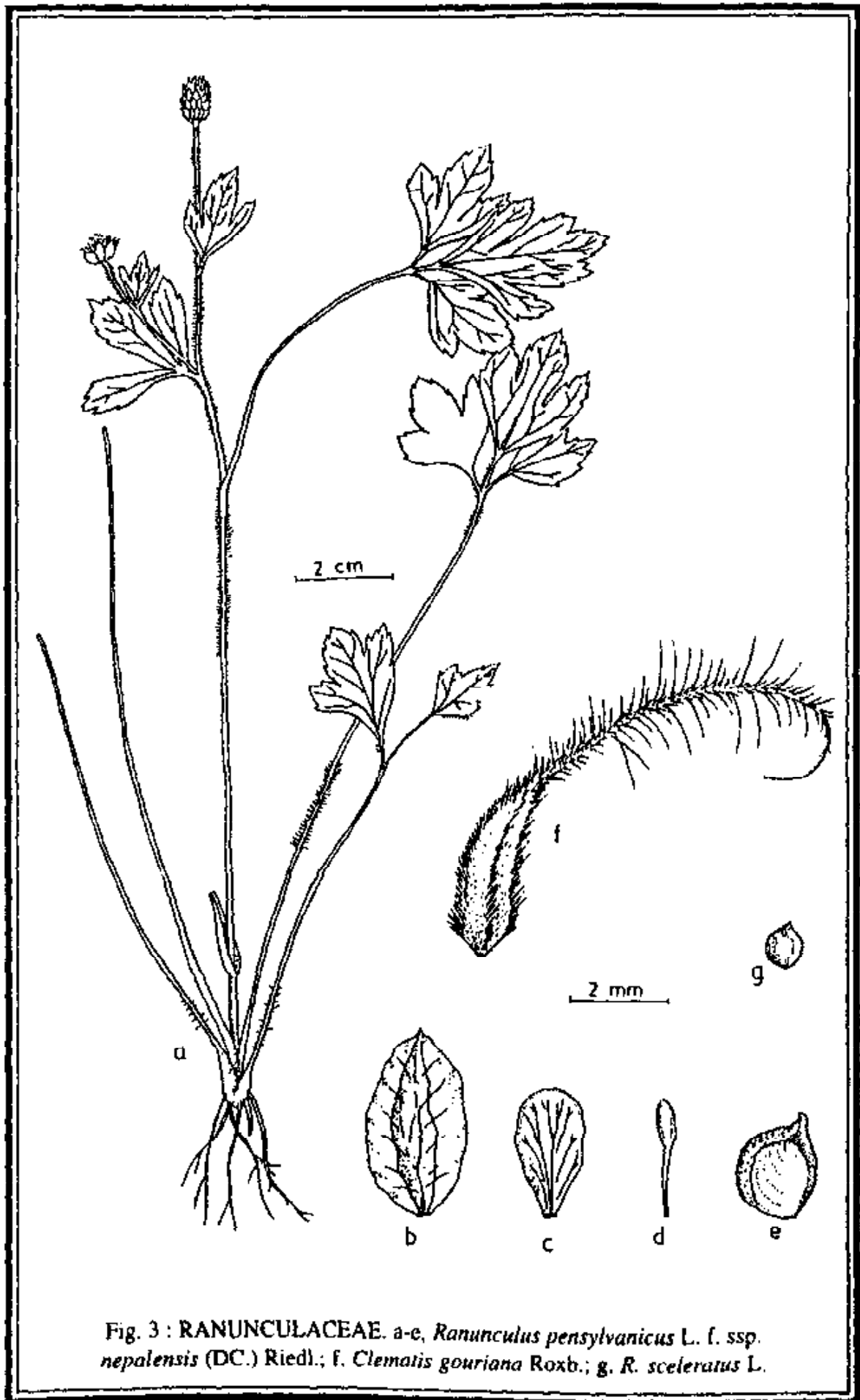


Fig. 3 : RANUNCULACEAE. a-e, *Ranunculus pensylvanicus* L. f. ssp. *nepalensis* (DC.) Riedl.; f, *Clematis gouriana* Roxb.; g, *R. sceleratus* L.

## 1. CISSAMPELOS L.

*Cissampelos pareira* L. var. *hirsuta* (Buch. – Ham. ex DC.) Forman in Kew Bull. 22 : 356. 1968. *C. hirsuta* Buch. – Ham. ex DC., Syst. 1 : 535. 1817. *C. pareira* L., Sp. Pl. 1031. 1753. p.p ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 103. 1872 ; Haines, Bot. Bihar & Orissa 1 : 17. 1921.

Twining shrubs, pubescent. Leaves orbicular or suborbicular, mucronate, cordate or truncate. Flowers greenish yellow. Drupe red or yellowish red.

Common in forest areas. Tropics. June–January. AKANADI. Sarkar & Bhatta., 493.

Root contains an alkaloid, pelosine which is used as diuretic, antiperiodic and purgative. Yields a strong fibre.

2. COCCULUS DC., *nom. cons.*

*Cocculus hirsutus* (L.) Diels in Engl., Pflanzenr. 46 : 236. 1910 ; Haines, Bot. Bihar & Orissa 1 : 20. *Menispermum hirsutum* L., Sp. Pl. 341. 1753. *C. oculus villosus* DC., Syst. Nat. 1 : 525, 1817 ; Hook. f. & Thoms. in Hook. f., Fl. Brit India 1 : 101. 1872.

Young parts villous. Leaves 3.5–6 × 1–4 cm, obtuse or mucronate at apex, rounded or truncate at base. Fruits globose, 0.3 cm across, deep purple.

Common throughout the district. May–January. Sarkar & Bhatta., 432.

Roots laxative and demulscient. Mucilaginous juice of leaves applied to eczema, prurigo etc.

## 3. STEPHANIA LOUR.

*Stephania japonica* (Thunb.) Miers in Ann. Mag. Nat. Hist. Ser. 3, 18 : 14. 1866 ; Forman in Kew Bull. 1956. 49. 1956. *Menispermum japonicum* Thunb., Fl. Jap. 193. 1784. *Stephania hernandifolia* (Willd.) Walp., Rep. 1 : 9. 1842 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 103. 1872 ; Haines, Bot. Bihar & Orissa 1 : 17. 1921.

Climbing herbs. Leaves ovate deltoid, 6–11 × 5–9 cm, acute or subobtusely. Umbels shorter than perianths. Flowers yellowish. Drupe red ; endocarp transversely ridged.

Frequent in forest undergrowth. AKANADI. Sarkar & Bhatta., 1234.

Roots used against fevers, diarrhoea, dyspepsia and urinary disorders.

4. *TILIACORA* Colebr., *nom. cons.*

*Tiliacora acuminata* (Lamk.) Hook. f. & Thoms., Fl. India. 1 : 187.1855; Forman in Kew Bull. 30 : 92.1975. *Menispermum acuminatum* Lamk., Ency. 4.101.1797. *Tiliacora racemosa* Coleber. in Trans. Linn. Soc. 13: 67, t. 6. 1822; Hook. f. & Thoms. in Hook. f. , Fl. Brit. India 1 : 99.1872 ; Haines Bot. Bihar & Orissa 1 : 19. 1921.

Leaves ovate to ovate-cordate, 8–10cm long, acuminate, entire, or undulate. Flowers yellow, showy, to 0.5 cm across. Druplets 1–10, to 0.6 cm across, orange-red.

Common in the forest areas. April–December. *TILIACORA*. Sarkar & Bhatta., 921,1365.

Used as a cure for snake-bite, and few other alkalosis.

5. *TINOSPORA* Miers, *nom. cons.*

*Tinospora cordifolia* Miers in Ann. Mag. Nat. Hist. Ser. 2, 7 : 38.1851 ; Hook. f. & Thoms. Fl. Indica 1 : 184. 1855 ; Haines, Bot. Bihar & Orissa 1 : 18. 1921.

Stems with corky periderm ; moisture absorbing green aerial roots on nodes. Leaves ovate, to 7 × 9 cm. Flowers yellow 0.4 cm across. Druplets scarlet.

Common. August–January. *CURACH*. Sarkar & Bhatta. 987.

Stems, leaves and roots medicinal. Aqueous or alcoholic extract of stem increases endogenous insulin secretion. Leaves rich in protein, Calcium and Phosphorus. Root a powerful emetic.

XI. *SABIACEAE*

- |                                 |     |                    |
|---------------------------------|-----|--------------------|
| 1a. Woody vines ; stamens equal | ... | 2. <i>SABIA</i>    |
| 1b. Trees ; stamens unequal     | ... | 1. <i>MELIOSMA</i> |

1. *MELIOSMA* B1.

*Mellosma simplicifolia* (Roxb.) Walp., Rep. 1 : 423. 1842 ; Hook. f., Fl. Brit. India 2:5.1876 ; Haines, Bot. Bihar & Orissa 1 : 226. 1921.

Leaves ovate or oblanceolate. Cymes lax. Drupe globose.

Haines (*l.c.*) reported the plant from the ravines in the Someswar hills. Haines 631 (CAL!).

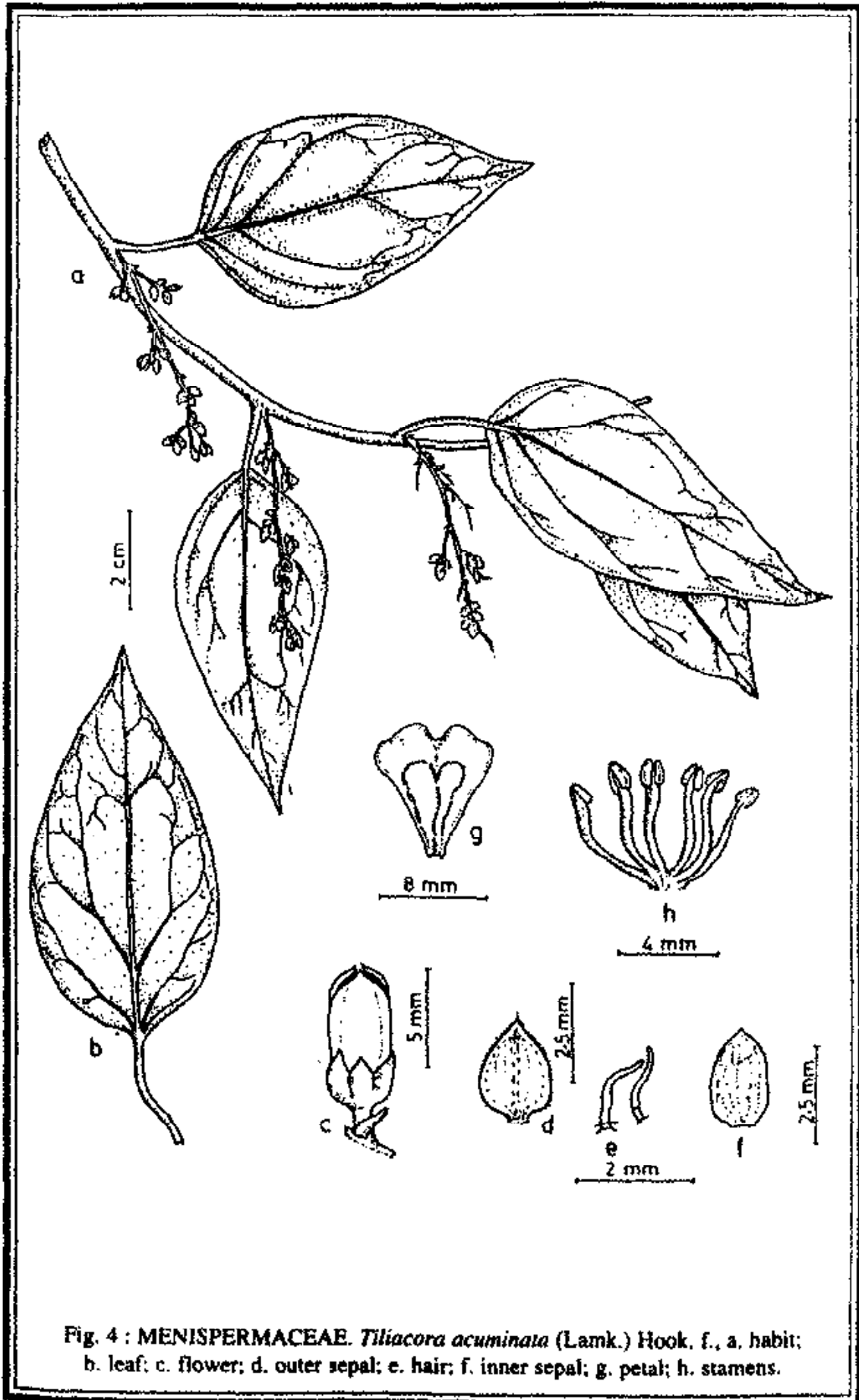


Fig. 4 : MENISPERMACEAE. *Tiliacora acuminata* (Lamk.) Hook. f., a. habit; b. leaf; c. flower; d. outer sepal; e. hair; f. inner sepal; g. petal; h. stamens.

## 2. SABIA Colebr.

*Sabia paniculata* Edgew. ex Hook. f. & Th. in Fl. Indica. 1 : 221. 1855 ; Hook. f. , Fl. Brit. India 2 : 3. 1876 ; Haines, Bot. Bihar & Orissa 1 : 226. 1921.

Leaves elliptic or oblong-lanceolate, coriaceous. Flowers yellow. Drupe orbicular.

Haines (*l.c*) reported it from Bettiah and Someswar hills. Haines 502 (CAL!).

## XII. PAPAVERACEAE

## ARGEMONE L.

*Argemone mexicana* L. Sp. Pl. 508. 1753 ; Haines, Bot. Bihar & Orissa 1 : 24. 1921 (1961).

Prickly herbs, 30-70 cm high. Leaves sinuate-pinnatifid, 5-12 × 2-6 cm. Seeds many, globose, ornamented, black.

Common in open wastelands. Native of central America now a pantropical weed. January-April. Sarkar & Bhatta., 658.

Oil extracted from seeds are used as adulterant of mustard oil. Poisonous.

## XIII. FUMARIACEAE

## FUMARIA Tourm. ex L.

*Fumaria indica* Pugsley in J. Linn. Soc. Bot. 44 : 313.1919 ; Whitmore, in Hara et al. Enum. Fl. Pl. Nepal 2 : 36.1979. *F. parviflora* auct. non Lamk. ; Wt. & Arn., Prodr. 18.1834.

Diffuse herbs ; branches to 40 cm long. Flowers pink, to 0.5 cm long. Fruit globose.

A common weed of winter crops. December-March. PITPAPRA. Sarkar & Bhatta., 1731

Used as a cooling agent in fevers.

Notes : *F. parviflora* Lamk. occurs in North Africa, Europe and Central Asia.

XIV. ULMACEAE

- |  |     |               |
|--|-----|---------------|
| 1a. Leaves pinnately-veined ; fruit a samara                 | ... | 2. HOLOPTELEA |
| 1b. Leaves multicostate from base of lamina ; fruit a drupe. |     | 2             |
| 2a. Polygamo-monoecious ; leaves canescent beneath...        |     | 3. TREMA      |
| 2b. Dioecious ; leaves glabrous or pubescent                 | ... | 1. CELTIS     |

1. CELTIS L.

*Celtis tetrandra* Roxb., Fl. Indica. 2 : 63. 1832. ; Hook. f., Fl. Brit. India 5 : 482. 1888, incl. var. *hamiltonii* Hook. f. et var. *mollis* (Planch.) Hook. f. ; Haines, Bot. Bihar & Orissa 3 : 848. 1924.

Semi-deciduous trees ; young branches grey-pubescent. Leaves ovate-elliptic, 5-20 × 2-8 cm, acuminate, serrate, oblique. Drupe globose, 1 cm across.

Occasional, Madanpur and surrounding areas. January-February. Sarkar & Bhatta., 210.

Wood used for match-boxes.

2. HOLOPTELEA Planch.

*Holoptelea integrifolia* (Roxb.) Planch., Ann. Sc. Nat. Bot. Ser. 3,10 : 269. 1848 ; Hook. f. Fl. Brit. India 5 : 481.1888 ; Haines, Bot. Bihar & Orissa 3 : 847. 1924 *Ulmus integrifolius* Roxb. Pl. Cor. t. 78.1798.

Branchlets lenticellate. Leaves elliptic-ovate, 9-12 × 5-6 cm, lateral nerves 5-7 pairs ; stipules lanceolate. Flowers greenish-brown, pubescent. Samaras elliptic or sub-orbicular, 2-2.5 cm across.

Occasional in dry deciduous forest. February-April. Sarkar 453.

Wood used for indoor building purpose, furniture, cabinet work etc. Suitable for plywood, match-boxes etc. seeds contain a fatty oil.

3. TREMA Lour.

- |   |     |                         |
|---|-----|-------------------------|
| 1a. Leaves distinctly unequal at base, mostly<br>3 - nerved | ... | 1. <i>T. orientalis</i> |
| 1b. Leaves almost equal at base, 5-nerved                   | ... | 2. <i>T. politoria</i>  |

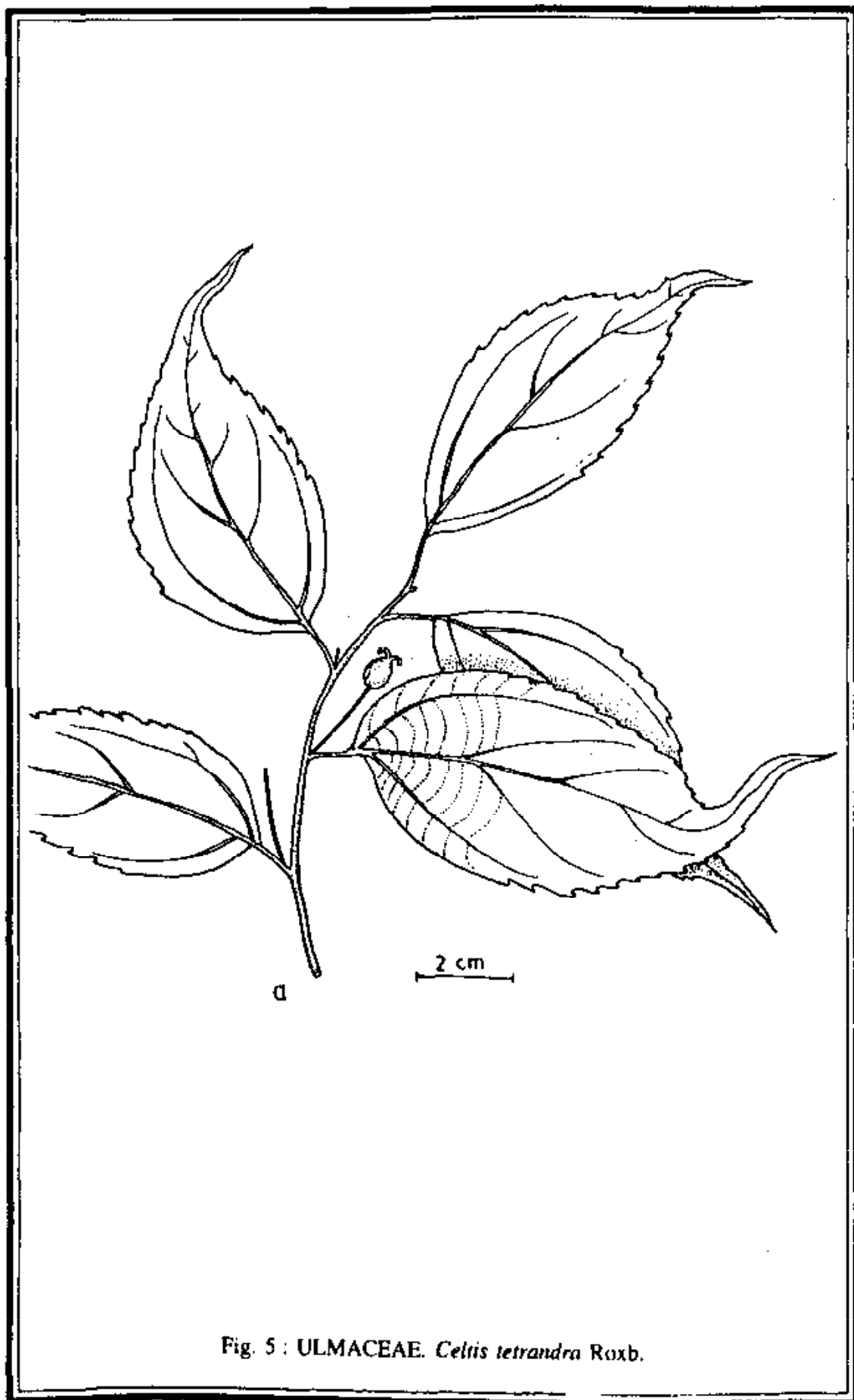


Fig. 5 : ULMACEAE. *Celtis tetrandra* Roxb.

1. **Trema orientalis** (L.) Bl. ; Mus. Bot. 2 : 61. 1856 ; Hook. f., Fl. Brit. India. 5 : 484. 1888 ; Haines, Bot. Bihar & Orissa 3 : 848. 1924. *Celtis orientalis* L., Sp. Pl. 1044.1753.

Small trees or shrubs. Leaves ovate-lanceolate or elliptic, 5-15 × 2-6 cm. acuminate, serrate, obliquely subcordate, tomentose beneath. Flowers unisexual. Drupes black, 0.5 cm long.

Common in the moist deciduous forest. All seasons. Sarkar & Bhatta., 502, 1450.

Wood used for match-boxes. Bark yields fibre, used for ropes, twine, and coarse cloth.

2. **Trema politoria** Planch., in Ann. Sc. Nat. Ser. 3.10 : 326.1848 ; Hook.f., Fl. Brit. India 5 : 484. 1888 ; Haines, Bot. Bihar & Orissa 3 : 849. 1924.

Small trees. Leaves oblong or ovate-lanceolate, acuminate, serrulate. Flowers in compact cymes. Drupe globose.

Haines (*loc. cit.*) reported the plant from hills of Champaran. Haines 493. (CAL)

Uses as the previous ones.

## XV. CANNABACEAE

### CANNABIS TOURN. ex L.

**Cannabis sativa** L., Sp. Pl. 1027.1753 ; Hook. f., Fl. Brit. India 5 : 487.1888 ; Haines, Bot. Bihar & Orissa 3 : 850. 1924.

Herbs to 1.5 m high. Leaves petiolate, to 15 cm long.

Common along the sides of the railway track. Central Asia. October-March. **BHANG, GANJA, SIDDHI, CHARAS.** Sarkar & Bhatta. 896.

## XVI. MORACEAE

- |   |   |
|---|---|
| 1a. Flowers in dense heads or on or inside of fleshy receptacle | 2 |
| 1b. Flowers not as above.                                       | 4 |

2a. Armed, scandent shrubs ; flowers in globose heads	...	3. MACLURA
2b. Unarmed trees or scandent shrubs.	...	3
3a. Flowers hidden in a hollow receptacle	...	2. FICUS
3b. Flowers exposed on a spongy receptacle	...	1. ARTOCARPUS
4a. Male flowers in cylindrical or somewhat ovoid spikes	...	4. MORUS
4b. Male flowers subcapitate	...	5. STREBLUS

1. ARTOCARPUS J. R. & G. Forst. *nom. cons.*

**Artocarpus lacucha** Buch.- Ham. in Mem. Wern. Soc. 5:333.1826  
*A. lakoocha* Roxb., Fl. Indica. 3 : 524.1832 ; King in Hook. f., Fl. Brit. India 5 : 543. 1888 ; Haines, Bot. Bihar & Orissa 3 : 865.1924.

Branches spreading. Leaves elliptic-ovate, 15-26 × 8-15 cm, shortly acuminate, entire, pubescent beneath. Male receptacle orange-yellow, to 2 cm across. Female receptacle greenish-yellow when ripe, to 7.5 cm across.

Common in swampy grounds near Madanpur and Gobardhana. Fl. : December ; Fr. : June-July. DENYO. Sarkar & Bhatta., 500, 1292.

Young male receptacle and fruits eaten.

2. FICUS L.

1a. Staminate, pistillate and gall flowers in the same receptacle : stamen 1	...	2
1b. Staminate and gall flowers in separate receptacle to the pistillate : stamens 1 - 3	...	9
2a. Leaves tomentose or pubescent beneath	...	2. <i>F. benghalensis</i>
2b. Leaves glabrous	...	3
3a. Lateral nerves close, parallel : receptacles always paired	...	4
3b. Lateral nerves not close and parallel, receptacles not always paired	...	6

4a. Leaves oblong	...	12. <i>F. rigida</i>
4b. Leaves orbicular or broadly elliptic	...	5
5a. Ripe receptacles yellow	...	3. <i>F. benjamina</i>
5b. Ripe receptacles purple or white	...	7. <i>F. microcarpa</i>
6a. Leaves caudate	...	7
6b. Leaves not caudate	...	8
7a. Leaf base truncate or slightly attenuate : cusps 6 cm long	...	11. <i>F. religiosa</i>
7b. Leaf base cordate : cusps 3 cm. long	...	1. <i>F. arnottiana</i>
8a. Receptacle sessile	...	15. <i>F. virens</i>
8b. Receptacle with 0.5 cm pedicel	...	13. <i>F. rumphii</i>
9a. Stamen 1	...	10
9b. Stamens 2-3	...	13
10a. Leaves opposite	...	6. <i>F. hispida</i>
10b. Leaves alternate	...	11
11a. Small trees	...	14. <i>F. semicordate</i>
11b. Scandent shrubs	...	12
12a. Leaves heteromorphous	...	5. <i>F. heterophylla</i>
12b. Leaves not as above	...	4. <i>F. fruticosa</i>
13a. Scandent shrubs	...	14
13b. Trees	...	15
14a. Receptacles to 5 cm across	...	9. <i>F. pumila</i>
14b. Receptacles to 1.3 cm across	...	4. <i>F. fruticosa</i>
15a. Receptacles 1.2 - 2.5 cm across	...	8. <i>F. palmata</i>
15b. Receptacles to 5 cm across	...	10. <i>F. racemosa</i>

1. **Ficus arnottiana** (Miq.) Miq., Ann. Bot. Lugd. - Bat. 3 : 287.1867 ; King in Hook. f., Fl. Brit. India 5 : 513. 1888 ; Haines, Bot. Bihar & Orissa 3 : 874. 1924 *Urostigma arnottiana* Miq., London J. Bot. 6 : 564.1847.

Small trees. Leaves broadly ovate, 13 × 9 cm, caudate, cordate at base, glabrous ; cusp to 1.2 cm long. Figs clustered in the axils of fallen leaves, subsessile, glabrous, globose, to 0.8 cm across, purple, to black.

Occasional in the sandstone hills. Fruits ripen March-June. Sarker & Bhatta., 1426.

2. **Ficus benghalensis** L., Sp. Pl. 1057.1753 ; King in Hook. f., Fl. Brit. India 5 : 499.1888 ; Hines, Bot. Bihar & Orissa 3 : 874. 1924.

Large trees ; aerial roots numerous. Leaves coriaceous, ovate or orbicular-ovate or elliptic, 10-20 × 5-12 cm, obtuse. Figs sessile, in pairs, globose, to 2 cm across, red when ripe.

Common, sometimes planted. Fl. & Fr. : Throughout the year. BARH, BOT. Sarker & Bhatta., 913.

3. **Ficus benamina** L., Mant, 129.1771 ; King in Hook. f., Fl. Brit. India 5 : 508.1888 ; *F. comosa* Roxb. Fl. Indica. 3 : 552.1832 ; Haines, Bot. Bihar & Orissa 3 : 868. 1924.

Large trees ; branches drooping ; aerial roots present. Leaves broadly-elliptic or ovate, 5-7 × 2.5-4 cm, shortly acuminate, glabrous. Figs axillary, globose to 2.3 cm across, yellow when ripe.

Planted. India. Burma. Fruit ripens March-May. Sarker & Bhatta., 312.

4. **Ficus fruticosa** Roxb., Fl. Indica. 3 : 533.1832 ; Merrill in Brittonia 4 : 44.1941. *F. scandens* Roxb., Fl. Indica. 3 : 65.1832 ; King in Hook. f., Fl. Brit. Indica 5 : 526.1888

Scandent shrubs. Leaves elliptic-ovate, 7 × 3.5 cm, sub-acute, entire. Figs axillary, on long peduncle, globose, to 1 cm across. Tepals 4.

Collected near Bhikhna Thori. Fruit ripens April-May. Sarker & Bhatta., 966, 1270.

5. **Ficus heterophylla** L. f., Suppl. 442.1781 ; King in Hook. f., Fl. Brit. India 5 : 518. 188 ; Haines, Bot. Bihar & Orissa 3 : 876. 1924.

Scandent shrubs ; stems to 0.5 cm across. Leaves membranous, ovate or

lanceolate, sub-entire or denticulate, scabrid on both the surfaces ; juvenile 3-many-lobed. Figs solitary, ellipsoid, 1.2–2.2 × 0.8–1.7 cm, orange–red when ripe.

Common along hedges. Fruit ripens May–June. Sarkar & Bhatta. 52,900.

6. *Ficus hispida* L. f., Suppl. 442.1781 ; King in Hook. f., Fl. Brit. India 5 : 522.1888 ; Haines, Bot. Bihar & Orissa 3 : 878.1924.

Small trees, or shrubs, all parts more or less hispid pubescent. Leaves mostly opposite, ovate, oblong or subovate, 15–25 × 7–14.5 cm, abruptly acuminate, truncate–cordate at base, scabrid above. Figs clustered on leafless branches, globose, stalked, yellow when ripe, up to 5 cm across.

Common. Fruit ripens January–February. DUMUR. Sarkar & Bhatta. 147, 777.

7. *Ficus microcarpa* L. f., Suppl. 442.1781 ; Corner in GBS 17 : 397. 1959. *F. retusa* sensu Hook. f., non L. ; King in Hook, f., Fl. Brit India 5 : 511.1888 ; Haines, Bot. Bihar & Orissa 3 : 869.1924.

Large tree ; aerial roots numerous. Leaves obovate, 7 × 5 cm, obtuse at apex, glabrous. Figs axillary, paired, globose, sessile, 0.5–0.9 × 0.7–1.1 cm purplish or black when ripe.

Occasional near villages. January–October. Sarkar & Bhatta. 1335.

8. *Ficus palmata* Forssk., Fl. Aegypt. – Arab., 179.1775 ; King in Hook. f., Fl. Brit. India 5 : 530.1888 ; Haines, Bot. Bihar & Orissa 3 : 879.1924.

Small trees, tomentose. Leaves orbicular–ovate, 4–13 cm long, acute or apiculate, denticulate, sometimes more or less lobed. Figs axillary, solitary subglobose or pyriform, to 2 cm across, yellow when ripe.

Planted. Fruit ripens September. Sarkar & Bhatta. 799.

9. *Ficus pumila* L., Sp. Pl. 1753.

Creeping by nodal roots. Leaves polymorphous, sessile or stalked, cordate–ovate or elliptic to oblong–elliptic, 2.5–10 cm long. Figs axillary, solitary peduncled, pyriform or obovoid, to 7 cm, purplish–yellow when ripe.

Bettiah, on *Bombax ceiba* L.; an escape. Japan, China, Australia. Fruit ripens December–January. Sarkar & Bhatta., 1299.

10. *Ficus racemosa* L., Sp. Pl. 922.1753 ; Nair, Fl. Punjab Plains 243.1978. *F. glomerata* Roxb., Pl. Corom. 2 : 13.f. 123.1798 ; King in Hook. f., Fl. Brit. India 5 : 535.1888 ; Haines, Bot. Bihar & Orissa 3 : 880.1924.

Large trees ; stems and young twigs greyish brown. Leaves ovate-oblong or elliptic-lanceolate, 5-15 × 3-7 cm, subacute. Figs on the main branches or on short leafless branches, pyriform or subglobose, 2-3 cm across, yellow when ripe.

Common. Throughout the year. GULAR. Sarkar & Bhatta., 403.

11. *Ficus religiosa* L., Sp. Pl. 1059.1753 ; King in Hook. f., Fl. Brit. India 5 : 513.1888 ; Haines, Bot. Bihar & Orissa 3 : 874.1924.

Large trees. Leaves ovate, 5-15 cm broad, caudate-acuminate with 2-9 cm long acumen, coriaceous, drooping ; petiole to 7 cm long. Figs axillary, paired, depressed-globose, to 1 cm across, dark-purple when ripe.

Widely cultivated along roadsides and near temples. May-September. PIPAL. Sarkar & Bhatta. 1494, 1880.

Leaves a good fodder. Wood used as minor-timber.

12. *Ficus rigida* Jack., Mal. Misc. 2(7) : 72.1822 ; King in Hook. f., 5 : 505.1888. *F. glaberrima* Bl. Bijdr. 457.1825 ; King in Hook. f., Fl. Brit. India 5 : 505.1888 ; Haines, Bot. Bihar & Orissa 3 : 870. 1924.

Medium trees. Leaves elliptic oblong or ovate-lanceolate, to 13 cm long, subacuminate, glabrous. Figs axillary, paired, globose, to 1.2 cm across, orange-yellow when ripe.

Sandstone hills. Fruit ripens February-March. Sarkar & Bhatta., 1412.

13. *Ficus rumphii* Bl., Bijdr. 437.1825 ; King in Hook. f., Fl. Brit. India 5 : 512.1888 ; Haines, Bot. Bihar & Orissa 3 : 873.1924.

Medium trees. Leaves broadly ovate, to 15 cm long, acuminate, glabrous. Figs axillary, paired, depressed-globose, sessile, black when ripe.

Madanpur forests. Fruit ripens May-June. Sarkar & Bhatta., 605.

14. *Ficus semicordata* Buch. - Ham. ex J.E Smith in Rees, Cyclop. 14.n. 71.1810 ; Corner in GBS 17 : 449.1959. *F. cunia* Buch.—Ham. ex Roxb. Fl. Indica 3 : 561.1832 ; King in Hook. f., Fl. Brit. India 5 : 523.1888, excl. syn.

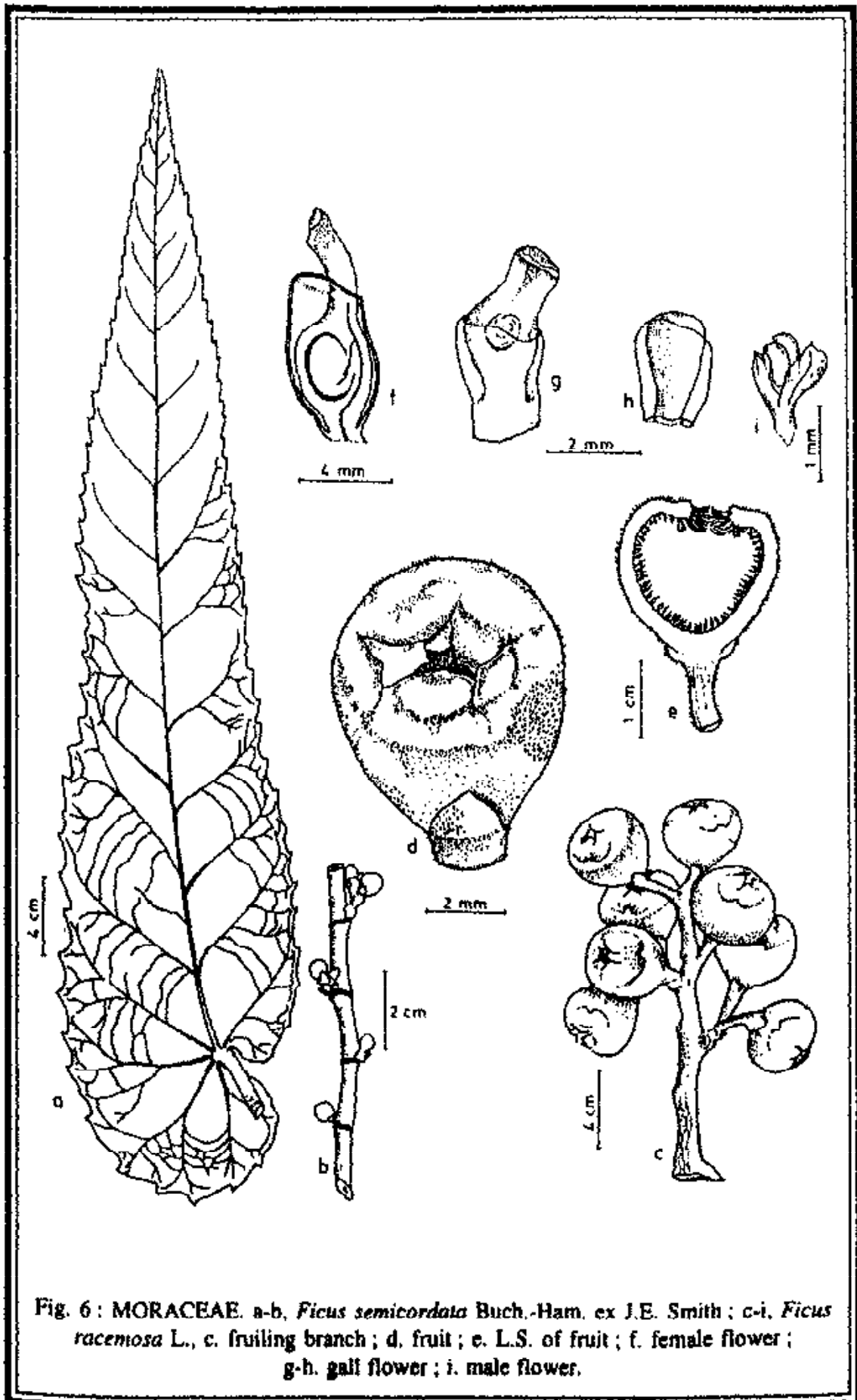


Fig. 6 : MORACEAE. a-b, *Ficus semicordata* Buch.-Ham. ex J.E. Smith ; c-i, *Ficus racemosa* L., c. fruiting branch ; d. fruit ; e. L.S. of fruit ; f. female flower ; g-h. gall flower ; i. male flower.

*F. conglomerata* Roxb l.c. 559 ; Haines, Bot. Bihar & Orissa 3 : 877. 1924.

Small trees. Leaves elliptic to oblong-lanceolate, 20-35 × 5-11 cm, acuminate, serrate, base semisagittate, lobes unequal. Figs on upto 4 cm long, branched, drooping, leafless branches, globose or pyriform, to 1.5 cm across, reddish-brown when ripe.

Standstone hills and adjacent areas. Fruit ripens. August-September. Sarkar & Bhatta., 418, 1432, 1495.

Bark yields a strong fibre.

15. *Ficus virens* Ait., Hot. Kew 3 : 451.1789 ; Corner in GBS 17 : 376.1959. *F. infectoria* sensu Roxb., Fl. Indica 3 : 551.1832, non Willd., King in Hook. f., Fl. Brit. India 5 : 515.1888 ; Haines, Bot. Bihar and Orissa 3 : 871.1924.

Large trees. Leaves ovate or ovate-oblong to 18 cm long, acuminate, entire, more or less undulate. Figs axillary, paired, globose, 0.8 cm across, stalked, whitish-red when ripe.

Planted near Bettiah Bus stand. Indomalesia. December-June. Sarker & Bhatta., 767.

Bark yields a good fibre.

### 3. *MACLURA* Nutt., *nom. cons.*

*Maclura cochinchinensis* (Lour.) Corner in GBS 19 : 239.1962. *Vanieria cochinchinensis* Lour., Fl. Cochinch. 564.1790. *Cudrania javanensis* Trec., Ann. Sci. Nat. Ser. 3, 8 : 123.1847 ; Hook. f., Fl. Brit. India 5 : 538.1888 p.p. ; Haines, Bot. Bihar & Orissa 3 : 864.1924.

Spines axillary, more or less straight, to 2.2 cm long. Leaves elliptic ovate, to 7 cm long.

Sandstone hills. April-May. Sarkar & Bhatta., 1822.

Note : Corner ( l.c. ) treated *Cudrania* Trec. ( 1847 ) as congeneric with *Maclura* Nutt. ( 1818 ).

### 4. *MORUS* L.

*Morus indica* L., Sp. Pl. 986.1753 ; Hook. f., Fl. Brit. India 5 : 492.1888 ; Haines, Bot. Bihar & Orissa 3 : 861.1924.

Trees to 5 m high ; branches spreading. Leaves ovate, to 10 cm long, serrate. Female spikes more or less ovoid.

Planted near villages or self-sown. Fl. : October–February ; Fr. : March–May. TUNT. Sarkar & Bhatta., 437.

Fruits edible.

5. STREBLUS Lour.

*Streblus asper* Lour., Fl. Cochinch. 2 : 615.1790 ; Hook. f., Brit. India 5 : 489.1888 ; Haines, Bot. Bihar & Orissa 3 : 860.1924.

Profusely branched, very leafy, deciduous trees. Leaves elliptic or rhomboid, or obovoid, 5–8 × 2.5–4 cm, irregularly toothed. Flowers greenish white. Fruit yellow, to 0.6 cm across, edible.

Common in the villages. March–July. SHEORA. Sarkar & Bhatta., 1290,1826.

Bark yields a fibre.

XVII. URTICACEAE

- |   |     |               |
|---|-----|---------------|
| 1a. Stinging hairs present  | ... | 3. FLEURYA    |
| 1b. Stinging hairs absent   | ... | 2             |
| 2a. Pistillate flowers with 3–5-partite perianth, or perianth obsolete. |     | 3             |
| 2b. Pistillate flowers with tubular perianth.                           | ... | 4             |
| 3a. Leaves alternate ; flowers on a fleshy receptacle.                  | ... | 2. ELATOSTEMA |
| 3b. Leave opposite ; flowers not on a fleshy receptacle                 | ... | 4. PILEA      |
| 4a. Herbs ; leaves upto 5 cm long                                       | ... | 5. POUZOLZIA  |
| 4b. Sub-shrubs ; leaves larger  | ... | 1. BOEHMERIA  |

1. BOEHMERIA Jacq.

- |  |     |  |
|--|-----|--|
| 1a. Leaves alternate, lanceolate                   | ... | 2. <i>B. penduliflora</i>                        |
| 1b. Leaves opposite, orbicular–elliptic or obovate |     | 1. <i>B. macrophylla</i> . var. <i>scabrella</i> |

1. **Boehmeria macrophylla** Hornem., Hort. Reg. Bot. Hafn. 2 : 890.1815. non D. Don, var. *scabrella* (Roxb.) Long in Notes Royal Bot. Gard. Edin. 40 : 129.1982. *Urtica scabrella* Roxb., Fl. Indica. 3 : 581.1832. *Boehmeria platyphylla* var. *scabrella* (Roxb.) Wedd., Monogr. 365.1856 ; Hook. f., Fl. Brit. India 5 : 578.1888 ; Haines, Bot. Bihar & Orissa 3 : 856.1924. *B. scabrella* Gaud., Bot. Freyc. Voy. 500.1830.

Sub-shrubs to 1 m high. Leaves 5–8.1 × 1.8 – 3.6 cm, rounded at base, dentate serrate. Inflorescence axis to 15 cm long.

Along ravines, Bhikhna Thori. Fr. : December. Sarkar & Bhatta., 195, 1268, 1984.

2. **Boehmeria penduliflora** Long in Notes Royal Bot. Gard. Edin. 40 : 130. 1982. *B. macrophylla* D. Don, Prodr. 60.1825 ; Hook. f., Fl. Brit. India 5 : 577. 1888 ; Duthie, Fl. U.G.P. 2 : 224. 1915 ; Haines, Bot. Bihar & Orissa 3 : 855.1924.

Sub-shrubs, to 1.5 m high. Leaves 14.5–3.5 × 2.2–3.4 cm, acuminate, serrate. Inflorescence axis to 50 cm.

Way to Someswar, in sandstone hills. Subtropical Himalaya. Fr. : October. Sarkar & Bhatta., 1653,1692,1818.

## 2. ELATOSTEMA J.R. & G. Forst., *nom. cons.*

**Elatostema rupestre** Wedd., Monogr. 304.1856 ; Hook. f., Fl. Brit. India 5 : 564.1888.

Herbs to 10 cm high, sometimes to 20 cm high. Leaves obliquely, or narrowly elliptic-lanceolate, 1.3–3.5 × 0.7–2.7 cm acute, upper-half serrate.

Along ravines in the sandstone hills. August–October. Sarkar & Bhatta., 1480, 1683.

## 3. FLEURYA Gaud.

**Fleurya interrupta** Gaud., in Freyc. Voy. Bot. 497. t. 83.1830 ; Hook. f., Fl. Brit. India 5 : 548.1888 ; Haines, Bot. Bihar & Orissa 3 : 852.1924. *Laportea interrupta* Chew, Gard. Bull. Straits. 21:200.1965.

Herbs, to 65 cm high, sparsely hairy ; stem reddish. Leaves ovate ; blade 8–12 × 5–7.5 cm, acuminate, dentate-serrate ; petiole 5–8.5 cm long, ventrally channelled. Inflorescence axis to 28 cm long.

Along waste lands. July–October. LAL – BICHUA. Sarkar & Bhatta., 1519.

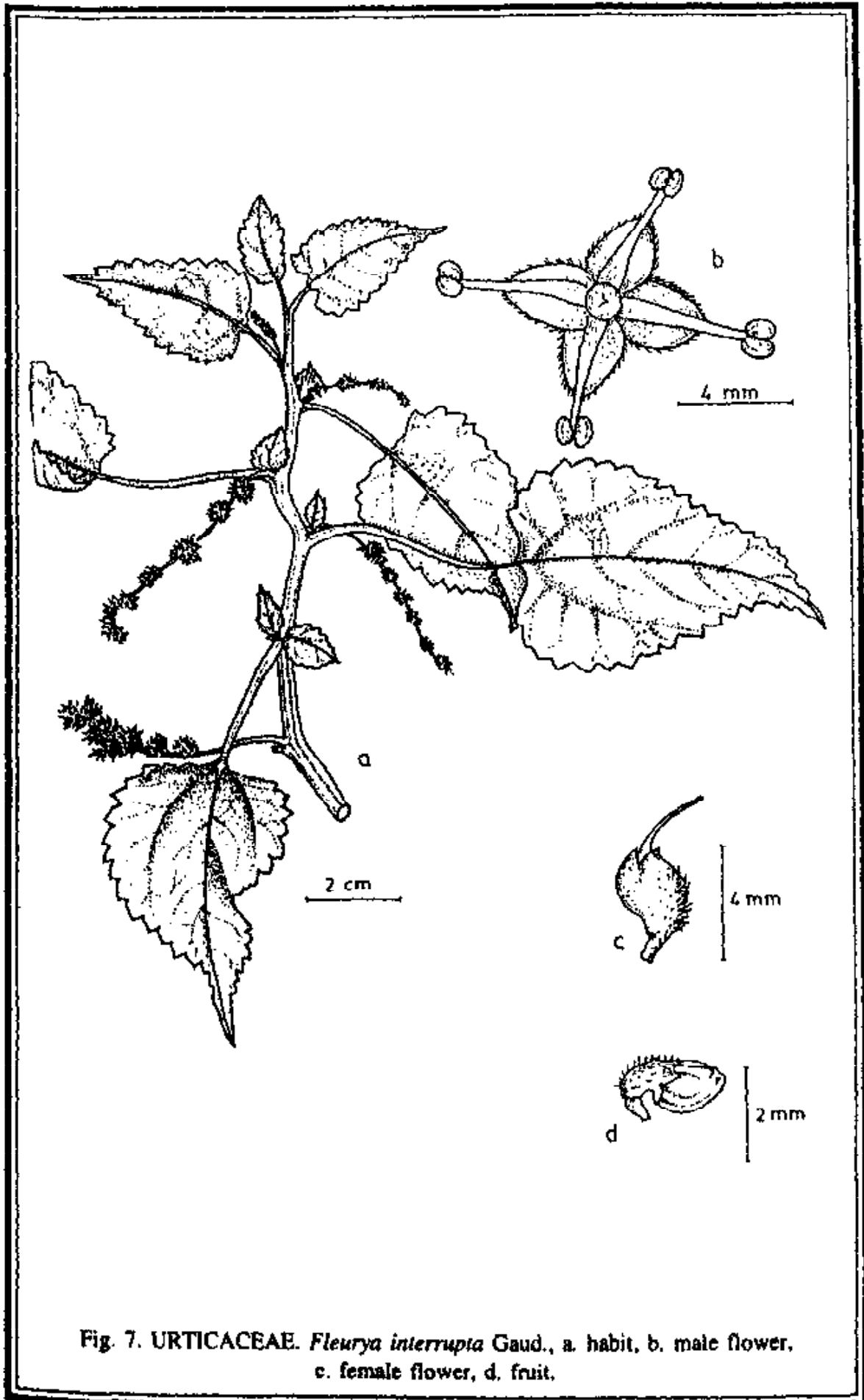


Fig. 7. URTICACEAE. *Fleurya interrupta* Gaud., a. habit, b. male flower, c. female flower, d. fruit.

4. *PILEA* Lindl., *nom. cons.*

***Pilea microphylla* (L.) Liebm.** in Vidensk. Selsk. Skr. 5(2) : 296.1851. Haines, Bot. Bihar & Orissa 3 : 854. *Urtica microphylla* L. Sp. PL. 1753. *Pilea muscosa* Lindl. Coll. Bot.t.4.1821. Hook. f., Fl. Brit. India 5 : 551.1888.

Minute herbs, to 9 cm high. Leaves 0.2–0.3 cm long.

On damp brick walls. Native of S. America. July–October. Sarkar & Bhatta., 890.

5. *POUZOLZIA* Gaud.

1a. Leaves ovate ... 2. *P. zeylanica*

1b. Leaves linear–lanceolate ... 1. *P. pentandra*

1. ***Pouzolzia pentandra*** Benn.& Brown, Pl. Jav. Rar. 64, t. 14.1838 ; Hook. f., Fl. Brit. India 5 : 583.1888. Haines, Bot. Bihar & Orissa 3 : 857.1924.

Herbs with slender branches, to 50 cm high. Leaves 0.7 – 1.5 cm long. Staminate flowers 5–merous. Achenes conical, black, shining.

Wet places, near nalas. August–December. Sarkar & Bhatta. 198 ; Banerjee 377. (CAL!).

2. ***Pouzolzia zeylanica* (L.) Benn. & Brown**, Pl. Jav. Rar. 67.1838 ; Tuyama in Fl. East. Him. 62.1966. *Parietaria zeylanica* L., Sp. Pl. 1 : 1052.1753. *P. indica* L., Mant, 1 : 128.1767. *Pouzolzia indica* (L.) Gaud., Freyc. Voy. Bot. 503.1830 ; Hook. f., Fl. Brit. India 5 : 581.1888. Haines, Bot. Bihar & Orissa 3 : 856.1924.

Herbs, 20 to 50 cm high ; Stems reddish. Leaves 1–2 cm long. Staminate flowers : sepals 4 ; stamens 4.

Common along wet places. India, China, Indonesia. October–January. Sarkar & Bhatta., 885.

## XVIII. CASUARINACEAE

## CASUARINA Adans.

***Casuarina equisetifolia*** J. R. & G. Forst., Char. Gen. 104. t. 52. 1776 ; Bailey, Man. Cult. Pl. 316.1949.

Tall trees ; branchlets cylindrical, grooved, jointed ; Bark rough, brownish. Leaves in whorls of 6–8, scaly, basally connate at each node. Male flowers in

terminal spikes ; perianth segments 1-2 ; stamen 1; pollen grains binucleate, (2-)3(-5)-porate. Female flowers in bracteate heads ; tepals 0 ; carpel 1 ; ovules 2.

Planted in gardens and along roadsides. Indigenous on the sandy sea coasts of Chittagong, Burma and N. Australia. JHAU. Sarkar & Bhatta., 1512.

### XIX. PHYTOLACCACEAE

#### RIVINA L.

*Rivina humilis* L. Sp. Pl. 121.1753 ; *R. laevis* L., Sp. Pl. 121.1753 ; Hook. f., Fl. Brit. India 5 : 21.1886 ; Haines, Bot. Bihar & Orissa 2 : 811.1924.

Herbs to 1 m tall. Leaves 6-12 × 2-4 cm, ovate lanceolate, acuminate. Flowers white ; bracteoles minute. Berry 0.4-0.5 cm across, bright red or deep orange. Seeds lenticular, arillus minute.

Bettiah and surrounding areas in waste places. Neotropical or pantropical weed. July-November. Sarkar & Bhatta., 63.

Febrifuge. Berries yield a red dye.

### XX. NYCTAGINACEAE

- |  |                      |
|--|----------------------|
| 1a. Annual or perennial herbs ; leaves opposite ; stigma capitate.   | 2                    |
| 1b. Subscandent shrubs ; leaves alternate ;<br>corolloid involucre subtending a small<br>cluster of flowers ; stigma lateral | ... 2. BOUGAINVILLEA |
| 2a. Diffuse herbs ; flowers paniculate or umbellate ;<br>anthocarp sticky  | ... 1. BOERHAVIA     |
| 2b. Erect herbs ; roots tuberous ; calyx-like<br>involucre subtending a single flower ;<br>anthocarp coriaceous              | ... 3. MIRABILIS     |

#### 1. BOERHAVIA L.

*Boerhavia diffusa* L., Sp. Pl. 3.1753 ; Stemmerik in van Steenis Fl. Males. Ser. 1, 6 (3) : 454.1964 ; Haines, Bot. Bihar & Orissa 2 : 795.1924. B.

*repens* L., Sp. Pl. 3.1753 ; Hook. f., Fl. Brit. India. 4 : 709. 1885. *B. repens* var. *diffusa* ( L. ) Hook. f., Fl. Brit. India. 4 : 709.1885 ; *B. repens* var. *procumbens* ( Roxb. ) Hook. f., Fl. Brit. India. 4 : 709.1885.

Branches to 1 m long. Leaves ovate-rounded or lanceolate, 2-6 × 1-3 cm, acute or obtuse, entire. Coralloid calyx bright purple, to 0.3 cm across.

Common in waste places and open dry lands. Fl. & Fr. throughout the year. Sarkar & Bhatta., 850.

Root expectorant, diuretic and laxative. Active constituent alkaloid punamavine.

### 2. BOUGAINVILLEA Comm. ex Juss., *nom cons.*

**Bougainvillea spectabilis** Willd., Sp. Pl. 2 : 348.1799 ; Bailey, Man. Cult. Pl. 358.1949.

Climbing shrubs, armed with straight or recurved spines. Leaves ovate, acuminate, entire. Corolloid involucre of various colours. Calyx 5-6-lobed. Stamens 7-8, included.

Grown in gardens for beautiful coloured bracts. Native of Brazil. Sarkar & Bhatta., 1000.

### 3. MIRABILIS L.

**Mirabilis jalapa** L., Sp. Pl. 177.1753 ; Bailey, Man. Cult. pl. 358. 1949.

Perennial herbs. Leaves ovate-lanceolate, acute or acuminate, entire. Calyx 5-lobed. Stamens 5-6, exserted. Anthocarp obovoid, ribbed, black, to 0.5 cm across.

Planted in gardens for its showy flowers, often found wild.

A native of Mexico. Fl. & Fr. all along the year. Sarkar & Bhatta., 806.

## XXI. AIZOACEAE

### TRIANTHEMA L.

**Trianthema portulacastrum** L., Sp. Pl. 223.1753 ; Baker in Fl. Mal. 4 (3) : 274.1951. *T. monogyna* L., Mant. 69.1767, *nom, illeg.* ; Cl. in Hook. f., Fl. Brit. India 2 : 660.1879 ; Haines, Bot. Bihar & Orissa 1 : 51.1921.

Branches to 25 cm long. Leaves obovate, lamina 2-4 × 1-2.5 cm ; petiole to 2.5 cm long. Flowers to 0.25 cm across. Fruit obscurely 2-lobed. Seeds black, ornamented.

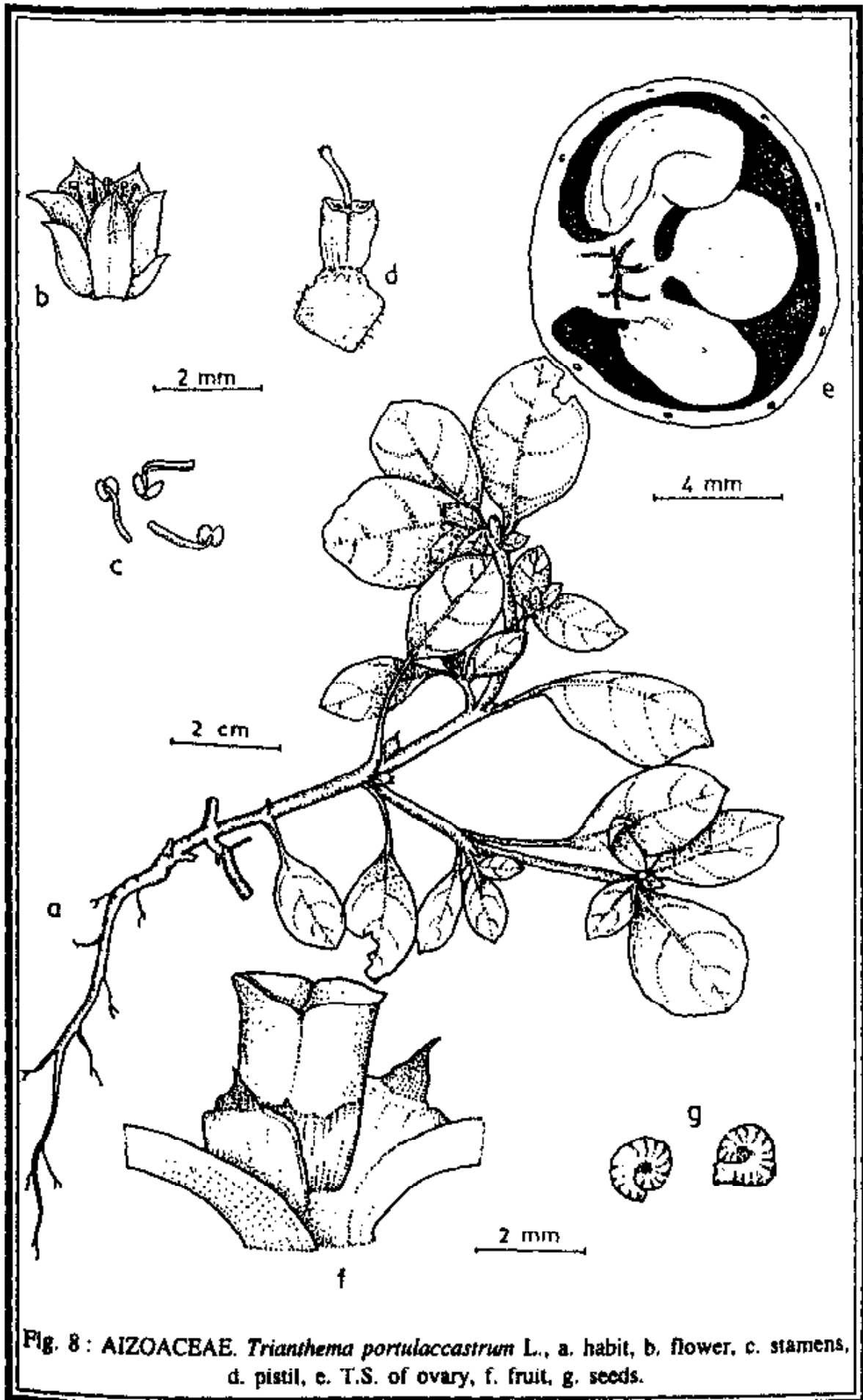


Fig. 8 : AIZOACEAE. *Trianthema portulacastrum* L., a. habit, b. flower, c. stamens, d. pistil, e. T.S. of ovary, f. fruit, g. seeds.

A common weed on exposed, waste places. June–September. SABUNI. Sarkar & Bhatta., 720.

Used as a pot herb. Medicinal.

## XXII. CACTACEAE

- |                                      |     |            |
|--------------------------------------|-----|------------|
| 1a. Stems flattened ; flowers yellow | ... | 2. OPUNTIA |
| 1b. Stems angular ; flowers white    | ... | 1. CEREUS  |

### 1. CEREUS Mill.

*Cereus peruvianus* ( L. ) Mill., Gard. Dict. ed. 8, 4.1768. *Cactus peruvianus* L., Sp. Pl. 467.1753.

Shrubs, upto 4 m high, strongly 6 – angled. Flowers white, 20 × 8 cm.

Planted near villages for fencing. Native of America. Fl. May–June. Sarkar & Bhatta., 841.

### 2. OPUNTIA L.

*Opuntia stricta* ( Haw. ) Haw. var. *dillenii* ( Ker-Gawl. ) Benson, Cact. & Succ. J. Amer. 41 : 126.1969. *Cactus dillenii* Ker-Gawl. in Edw., Bot. Reg. 3. t. 255. 1818. *Opuntia dillenii* Haw., Suppl. Pl. Succ. 79.1819 ; Hook. f., Fl. Brit. India 2 : 657.1879 ; Haines, Bot. Bihar & Orissa 2 : 421.1922.

Shrubs to 2 m high. Areoles with 2–7 spines. Flowers yellow, to 6 cm across. Berries globose, fleshy, glochidiate.

In waste places near villages. Fl. : March. PHANIMANSA. Sarkar & Bhatta., 772.

## XXIII. CHENOPODIACEAE

- |  |     |                |
|--|-----|----------------|
| 1a. Flowers bracteate, bracteoles 2      | ... | 2. BETA        |
| 1b. Flowers without bracts or bracteoles | ... | 3. CHENOPODIUM |

### 1. BETA L.

*Beta vulgaris* var. *orientalis* (Roth) Moq., in DC., Prodr. 13 (2) : 56. 1849; Ulbrich in Engler & Prantl, Die Natur Pflanzenfam. 16C : 460. 1934; Nayar & Ramamurthy, Econ. Bot. 31 : 372-373. 1977. *B. orientalis* Roth, Nov.

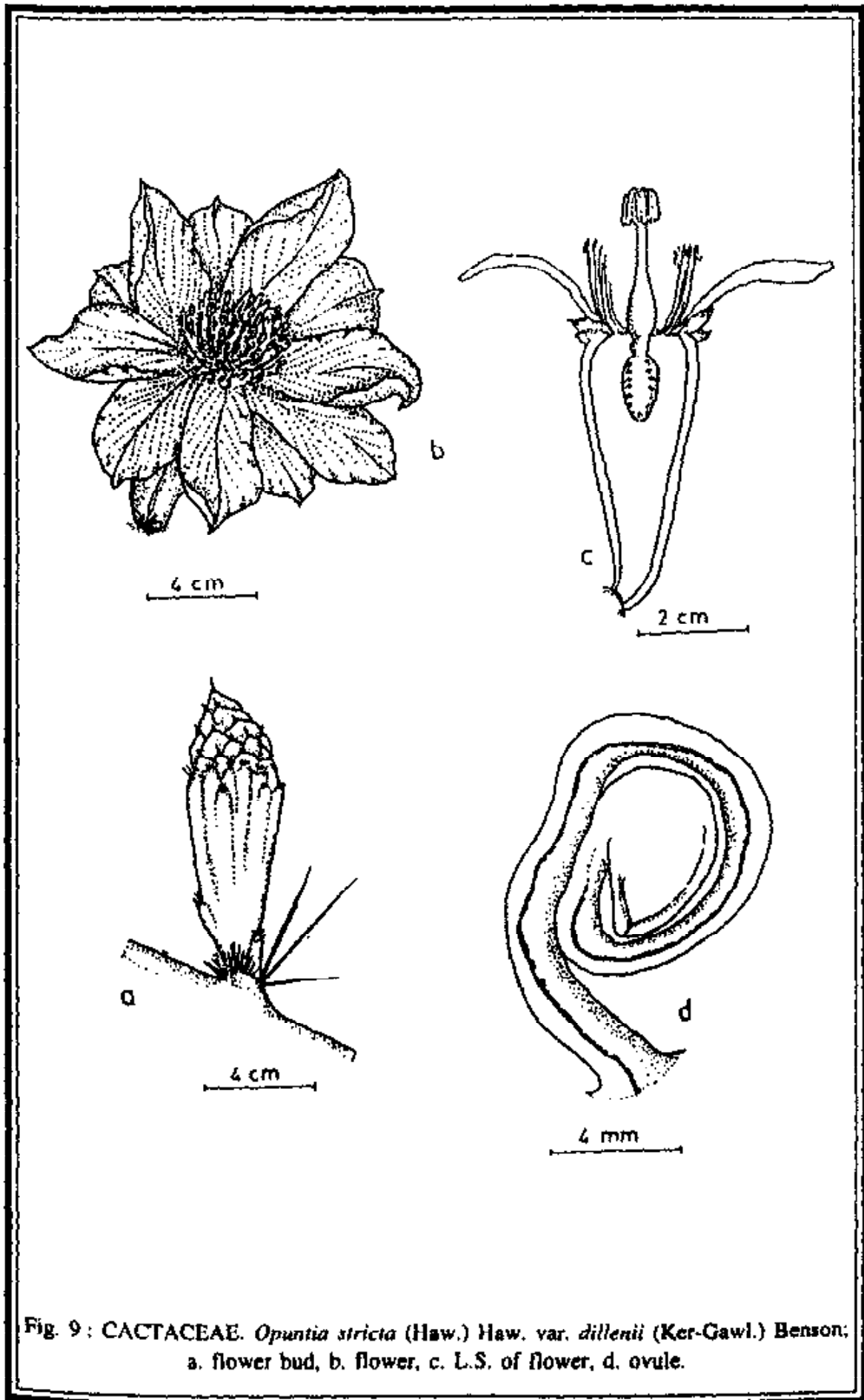


Fig. 9 : CACTACEAE. *Opuntia stricta* (Haw.) Haw. var. *dillenii* (Ker-Gawl.) Benson;  
 a. flower bud, b. flower, c. L.S. of flower, d. ovule.

Pl. Sp. 181, 1821; *B. benghalensis* Roxb. Fl. Indica 2 : 59, 1832; *Beta palonga* Basu & Mukh., K. K., Canadian J. Bot. 53 (12) : 1166-1175, 1975.

A succulent, glabrous herb with large tap root. Leaves radical and alternate subentire. Flowers small hermaphrodite, clustered, in terminal spikes or panicles; bracts distinct, bracteoles 2. Perianth 5 lobed, the base thickened and indurated in fruit.

Winter season crop. Fleshy roots and leaves are edible PALANG. Sarkar & Bhatta., 370.

## 2. CHENOPODIUM L

- |  |     |                           |
|--|-----|---------------------------|
| 1a. Aromatic glandular herbs ; stigmas 5 | ... | 2. <i>C. ambrosioides</i> |
| 1b. Non-aromatic herbs ; stigmas 2       | ... | 1. <i>C. album</i>        |

1. *Chenopodium album* L., Sp. Pl. 219.1753 ; Hook f., Fl. Brit. India 5 : 3.1886 ; Haines Bot. Bihar & Orissa 2 : 808.1924.

Erect herbs branches to 30 cm high. Leaves ovate-rhomboid to oblong lanceolate, lobed Flowers in axillary and terminal leafy panicles. Perianth green. Seeds orbicular, compressed, shining.

Common winter season weed of cultivated fields. Native of Europe. November-January. Sarkar & Bhatta., 1341.

Used as a pot herb

2. *Chenopodium ambrosioides* L., Sp. Pl. 219.1753; Hook f., Fl. Brit. India. 5 : 4.1886 ; Haines , Bot. Bihar & Orissa 2 : 808.1924.

Leaves linear-lanceolate, 5.5-7.5 × 1-1.7 cm , serrate. Flowers in axillary and terminal leafy spikes Perianths green. Seeds compressed, globose.

Roadside weed . Native of N. America. September-March. Sarkar & Bhatta., 390, 1342.

Yields an essential oil.

## XXIV. AMARANTHACEAE

- |                                    |     |            |
|------------------------------------|-----|------------|
| 1a. Leaves opposite.               | ... | 2          |
| 1b. Leaves alternate.              | ... | 7          |
| 2a. Flowers mixed with hooked awns | ... | 9. PUPALIA |
| 2b. Flowers not with above awns.   | ... | 3          |

3a. Flowers in elongated spikes	...	1. ACHYRANTHES
3b. Flowers in globose-cylindric heads.	...	4
4a. Leaves filiform	...	10. TRICHURUS
4b. Leaves otherwise	...	5
5a. Anthers 2-locular	...	2. AERVA
5b. Anthers 1-locular	...	6
6a. Stigma 1, style reduced	...	3. ALTERNANTHERA
6b. Stigmas 2, style long	...	8. GOMPHRENA
7a. Climbing shrubs ; fruit a berry	...	6. DEERINGIA
7b. Annual herbs ; fruits otherwise.	...	8
8a. Ovary 2-many-ovuled	...	5. CELOSIA
8b. Ovary 1-ovuled.	...	9
9a. Flowers bisexual	...	7. DIGERA
9b. Flowers unisexual, polygamous	...	4. AMARANTHUS

1. ACHYRANTHES L.

**Achyranthes aspera** L Sp. Pl. 204. 1753 ; Hook f., Fl. Brit. India. 4 : 730.1885 ; Haines, Bot. Bihar & Orissa 2 : 805.1924.

Leaves ovate elliptic-lanceolate or orbicular-ovate, glabrous, acute-acuminate, cuneate. Spike to 50 cm long with deflexed, greenish or greenish-violet flowers, to 0.3 cm long. Perianth persistent.

Common in waste places. October -January Sarkar & Bhatta., 1116.

Decoction of herb diuretic used in renal dropsies.

2. AERVA Forssk., *nom. cons.*

1a. Stigmas 2 ; spikes all axillary	...	1. <i>A. lanata</i>
1b. Stigma 1 or obscurely 2-lobed ; spikes axillary and flowers also in leafless elongated racemes	...	2. <i>A. sanguinolenta</i>

1. *Aerva lanata* (L.) Juss. in Ann. Mus. Nat. Hist. Paris 11: 131.1808. Hook. f., Fl. Brit. India 4: 728.1885; Haines, Bot. Bihar & Orissa 2: 804.1924. *Achyranthes lanata* L. Sp. Pl. 205.1753.

Perennial herbs, to 60 cm high. Leaves ovate-elliptic or obovate, 0.5-5.0 × 0.2-3.0 cm. Spike cylindric. Flowers, bracts and bracteoles wooly.

Common in wastelands September-April, Sarkar & Bhatta., 914.

Used in cough, sore throat, diabetes and lithiasis.

2. *Aerva sanguinolenta* (L.) Bl., Bijdr. 547.1826; Backer in Fl. Mal. 4: 85.1949. *Achyranthes sanguinolenta* L., Sp. Pl. 2. 294.1762. *Aerva scandens* Wall ex Moq. in DC. Prodr. 13: 302.1849; Hook. f., Fl. Brit. India. 4: 724. 1885; Haines, Bot. Bihar & Orissa 2: 804. 1924.

Herbs sometimes scandent. Leaves elliptic-ovate to elliptic-lanceolate, 7-9 × 3-4 cm appressed hairy, green or purple. Perianth to 0.2 cm long with excurrent mucro. Staminodes usually reduced to teeth. Seeds reniform, deep brown-black.

Occasional in waste places. October-May. Sarkar & Bhatta., 1029.

Roots used in dysentery

### 3. ALTERNANTHERA Forssk.

- |   |     |                             |
|---|-----|-----------------------------|
| 1a. Procumbent herbs; flowering axis elongated. | ... | 2                           |
| 1b. Prostrate herbs; flowering axis shortened   | ... | 1. <i>A. paronychioides</i> |
| 2a. Peduncle to 2 cm long                       | ... | 2. <i>A. philoxeroides</i>  |
| 2b. Peduncle under 1 cm long                    | ... | 3 <i>A. sessilis</i>        |

1. *Alternanthera paronychioides* A. St.-Hil., Bres. 2: 439.1833; Miers & Gillis in J. Arn. Arb. 58: 62.1977.

Branches rooting at nodes, forming mats. Leaves oblanceolate elliptic, 1-1.5 × 0.5 cm, hairy. Flower heads 0.7 cm across. Perianth segments 3-nerved. Stamens 3-5, alternating with sublacerate pseudo-staminodes.

Common in wet places, banks of ponds. October-March. Sarkar & Bhatta., 1818.

2. *Alternanthera philoxeroides* (Mart.) Grisebach, Abh. Konigl. Ges. Wiss. Goettingen 24 : 36.1879 ; Verma & Hanri in Fl. Raipur 314.1984. *Bucholzia philoxeroides* Mart., Nova Acta Acad. Gæs. Leop.-Carol. German. Nat. Cur. 13(1) : 315.1826.

Aquatic herbs. Leaves lanceolate, obovate, acute or rounded, cuneate at base, 4-11×0.7-2 cm. Inflorescence usually solitary, axillary and terminal. Perianth segments white, to 0.4 cm long

In water bodies September-March. Sarkar & Bhatta., 835,910.

3. *Alternanthera sessilis* (L.) R. Br. ex DC., Cat. Hort. Monspel. 4 : 77.1813. Hook. f., Fl. Brit. India 4 : 771.1885 ; Haines, Bot. Bihar & Orissa 2 : 806.1924. *Gomphrena sessilis* L. Sp. Pl. 225. 1753.

Leaves linear-elliptic, oblong, ovate, rounded, cuneate at base, 3-4×0.5-1 cm. Flowers-head globose, later cylindric. Perianth segments equal or nearly so. Stamens 3-5, alternating with filamentous pseudostaminodes.

Common in waste places and edges of water bodies, cultivated fields. July-February. Sarkar & Bhatta., 834.

A good fodder, increases the flow of milk in cattle.

#### 4. AMARANTHUS L.

1a. Annual armed herbs	...	4. <i>A. spinosus</i>
1b. Herbs not armed	...	2
2a. Perianth segments 5	...	1. <i>A. caudatus</i>
2b. Perianth segments 3 or 2.	...	3
3a. Perianth segments 3.	...	4
3b. Perianth segments 2	...	2. <i>A. tenuifolius</i>
4a. Utricle indehiscent or dehiscent irregularly	...	5. <i>A. viridis</i>
4b. Utricle circumscissile	...	3. <i>A. tricolor</i>

1. *Amaranthus caudatus* L., Sp. Pl. 990.1753 ; Haines, Bot. Bihar & Orissa 2: 800. 1924.

Annual branched herbs, to 1m tall; branches grooved. Leaves elliptic, obtuse. Flowers in drooping terminal spikes.

Cultivated for its grain A winter season crop. RAMDANA Sarkar & Bhatta., 1705.

2. *Amaranthus tenuifolius* Willd., Sp. Pl. 4 : 381.1805; Hook. f., Fl. Brit. India 4 : 722. 1885 ; Haines, Bot. Bihar & Orissa 2 : 802. 1924.

Annual prostrate or ascending herbs, to 20 cm long. Leaves linear or oblanceolate-oblong, 2.5 × 0.8 cm., retuse at apex. Flowers in axillary clusters. Perianth segment 2. Stamens 2. Utricle indehiscent.

Weed of cultivated fields. Tropics. August–February. Sarkar & Bhatta., 1319.

3. *Amaranthus tricolor* L., Sp. Pl. 989,1753 ; Bailey, Man Cult. Pl. 355. 1949.

Annual or perennial herbs. Leaves ovate-rhomboid or elliptic. Flowers in dense axillary clusters or in terminal spike. Perianth awned.

Planted for its variegated leaves. November–May. Sarkar & Bhatta., 1105.

4. *Amaranthus spinosus* L., Sp. Pl. 991.1753 ; Hook. f. Fl. Brit. India 4 : 718.1885 ; Haines, Bot. Bihar & Orissa 799.1924.

Erect, armed herbs; spines axillary, long, sharply pointed, dull green. Leaves lanceolate or ovate-elliptic, 1.5– 6 × 0.6–2.5 cm, acute to acuminate. Perianth segments 5. Stamens 2–3 Seeds compressed, shining black.

Common. Tropics. Fl. & Fr. usually throughout the year. Sarkar & Bhatta., 826.

Used as pot herb. Also medicinal.

5. *Amaranthus viridis* L., Sp. Pl. ed. 2. 1405. 1763 ; Hook. f., Fl. Brit. India 4 : 720.1885 ; Prain, Bengal Pl. 2 : 651 ; Duthie, Fl. U.G.P. 2 : 136. Haines, Bot. Bihar & Orissa 2 : 801. *A. gracilis* Desf., Tabl. Encycl. 43.1804.

Annual, erect herbs. Leaves ovate-rhomboid or oblong, glabrous or sparingly hairy, 2.5–8 × 0.9–3.5cm, Flowers in axillary clusters or in terminal interrupted spikes. Perianth segments 3, Stamens 3. Seeds shining black

Common in waste places, also cultivated Tropics, March–May. Sarkar & Bhatta., 821.

Used as a pot herb.

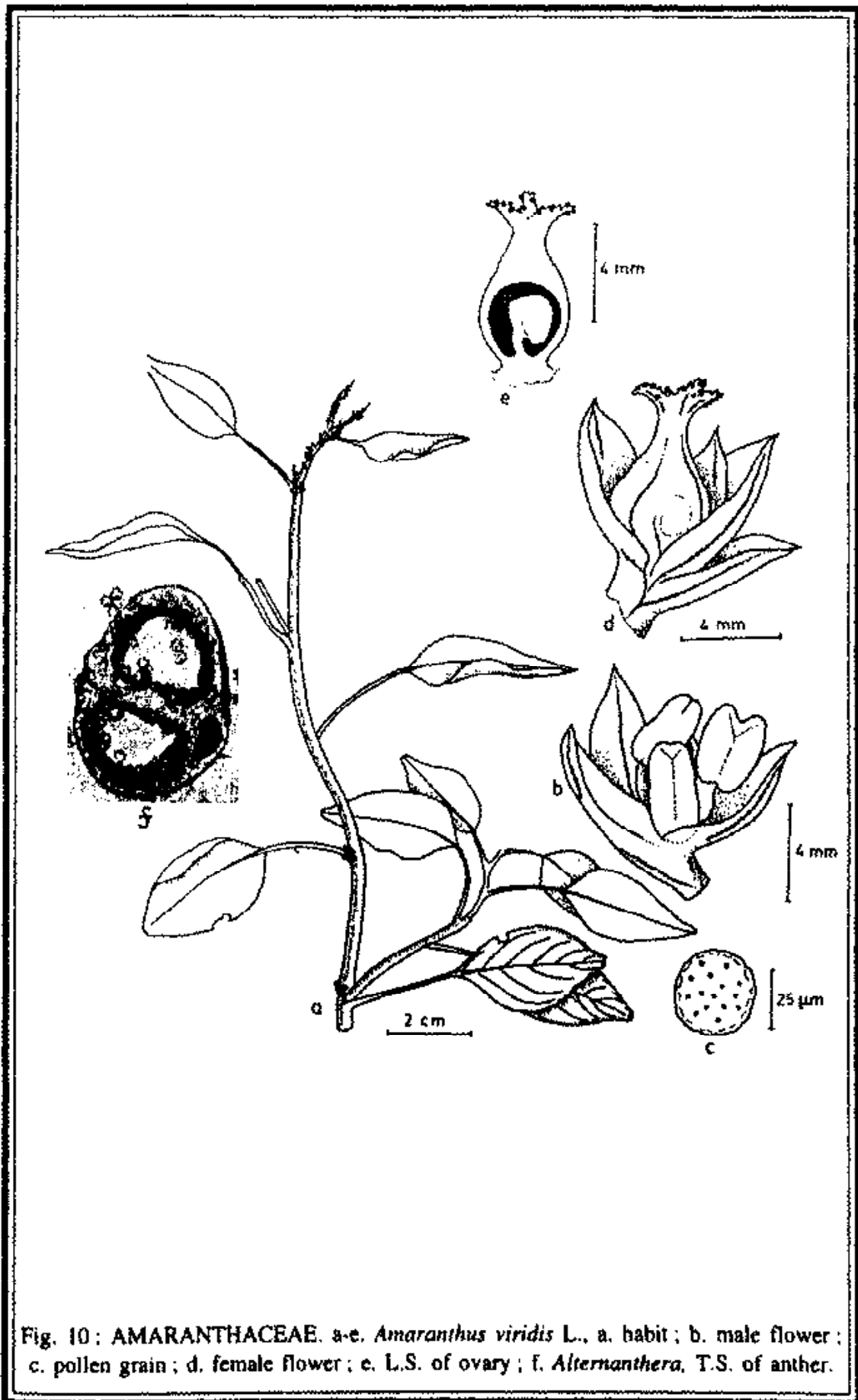


Fig. 10 : AMARANTHACEAE. a-e. *Amaranthus viridis* L., a. habit ; b. male flower ; c. pollen grain ; d. female flower ; e. L.S. of ovary ; f. *Alternanthera*, T.S. of anther.

## 5. CELOSIA L.

*Celosia argentea* L., Sp. Pl. 205.1753 ; Hook. f., Fl. Brit. India 4 : 741. 1885 ; Haines Bot Bihar. Orissa. 2 : 792. 1924.

Annual herbs. Leaves linear-lanceolate or lanceolate, 7-15×1.5-2.5 cm. Spikes terminal cylindrical, 1 cm across Flowers pinkish or white.

Common in cultivated fields . Tropics. August-December . Sarkar & Bhatta., 1462, 1715.

Seeds used in diarrhoea, eye troubles and sore mouth.

*Celosia argentea* f. *cristata* (L.) Schinz in Pflanzenfam ed 2, 16C : 29. 1934, *C. cristata* L. Sp. Pl. 205. 1753.

Leaves broad. Racemes condensed Flowers crimson or yellow.

Common garden ornamental, also escape October-February. Sarkar & Bhatta., 1612.

## 6. DEERINGIA R. Br.

*Deeringia amaranthoides* (Lamk.) Merr. Interpr. Rump. Herb. Amb. 211.1917 ; Backer in Fl. Mal 4 : 71. 1949. *Achyranthes amaranthoides* Lamk. Ency. 1 : 548. 1785. *Deeringia baccata* Moq. in DC. Prodr. 13.236.1849 ; Haines , Bot . Bihar & Orissa. 2 : 796 . *D. celosoides* R. Br., Prodr. 413. 1810. Hook. f. , Fl. Brit. India 4 : 714. 1885.

Leaves ovate-lanceolate. 5-10×2-3.5 cm, acuminate, entire. Flowers to 0.2 cm across, yellowish-green. Berry bright scarlet.

Occasional in village hedges. August-December. Sarkar & Bhatta., 641.

Roots used as a sternutatory ; leaves applied to sores. Young leafy shoots eaten.

## 7. DIGERA Forssk.

*Digera muricata* (L.) Mart. in Beitr. Amar. 77.n. 2.1825 ; Backer in Fl. Mal. 4 : 80.1949. *Achyranthes muricata* L., Sp. Pl. ed. 2. 295.1762. *D. arvensis* Forssk., Fl. Aegypt. Arab. 65. 1775 ; Hook f. , Fl. Brit. India. 4 : 717. 1885.

Diffuse herbs, 20-60 cm high. Leaves ovate-oblong, 2-6×1-4 cm. Racemes axillary., to 10 cm long. Flowers 0.3-0.5 cm long, pink or white, mostly accompanied by a pair of sterile lateral flowers.

Occasional as weed in cultivated fields Sarkar & Bhatta., 797.

Tender shoot eaten as pot herb Flowers and seeds prescribed for urinary discharges.

### 8. GOMPHRENA L.

- 1a. Erect herbs ; flowers purple ... 1 *G. globosa*  
 1b. Prostrate or procumbent herbs ; flowers white ... 2. *G. serrata*

#### 1. *Gompherena globosa* L., Sp. Pl. 224. 1753.

Annual erect herbs . Leaves to 10 cm long. Flowers usually bright purple in dense terminal heads.

A garden ornamental. August –December. GULBAHAR. Sarkar & Bhatta., 832.

#### 2. *Gomphrena serrata* L., Sp. Pl. 224. 1753 ; Miers in Taxon 29 : 86.1980.

Herbs, white hairy. Leaves oval–oblong, 3–7×1–2 cm. Flowers in dense, globose or cylindrical, terminal or axillary clusters, to 1 cm across. Perianth hairy on back. Fruit an achene.

Common in waste places. Fl. & Fr. throughout the year. Sarkar & Bhatta., 1106.

Note : The specimen is often misidentified as *G. celosioides* Mart., which is restricted to S. America

### 9. PUPALIA Juss., *nom. cons.*

*Pupalla lappacea* (L.) Juss in Ann Hist Nat. Paris 2 : 132. 1803 ; Hook. f., Fl. Brit India . 4 : 724. 1885 ; Haines, Bot. Bihar & Orissa 2 : 803.1924. *Achyranthes lappacea* L., Sp. Pl. 204.1753. *Pupalia atropurpurea* (Lamk.) Moq. in DC., Prodr. 13(2) : 331. 1849 ; Hook. f., Fl. Brit . India 4 : 723. 1885 ; Haines, Bot. Bihar. Orissa 2 : 803 .1924.

Leaves ovate or elliptic, 9.2–4.5 cm acute. Flowers purplish. Hooked awns help in seed dispersal.

Common in open scrub. September –Janury. Sarkar & Bhatta., 805.

## 10 TRICHURUS Townsend

**Trichurus monsoniae** (L.f.) Townsend Kew Bull. 29 : 466.1974.  
*Illecebrum monsoniae* L. f. , Suppl. 161, 1781. *Aerva monsoniae* (Retz. ) Mart.,  
 Nova . Acta. Akad. Caes. Leop. , Carol. German . Nat. Cur. 13 : 291 1826 . Hook.  
 f., Fl. Brit. india 4 : 728. 1885. Haines, Bot. Bihar & Orissa 2 : 804.1924.

Annual herbs to 25 cm high . Leaves , opposite or fascicled , to 3 cm . long.  
 Spikes to 1.2 cm long white or purplish white. Seeds ovoid with an  
 areole -like depression.

Occasional in sandy river beds October- May. Sarkar & Bhatta., 1156.

## XXV. PORTULACACEAE

## PORTULACA L

1a. Nodes without appendages, plant glabrous ...	1. <i>P. oleracea</i>
1b. Nodes with a ring of hairs ...	2
2a. Leaves opposite ...	4. <i>P. quadrifida</i>
2b. Leaves alternate ...	3
3a. Petals upto 12 mm ...	2. <i>P. pilosa</i>
3b. Petals upto 25 mm ...	3. <i>P. pilosa ssp. grandiflora</i>

1. *Portulaca oleracea* L., Sp. Pl. 445. 1753 ; Hook f., Fl. Brit. India  
 1 : 246.1874 ; Haines , Bot . Bihar & Orissa 1 : 48.1921.

Prostrate or ascending, sub -succulent herbs; branches up to 25 cm tall.  
 Leaves sub-opposite or whorled, obovate, sub-sessile, 1.5×2cm. Flowers clus-  
 tered . Petals 5-6, yellow , fugacious. Stamens 8-12. Capsules globose 0.4×0.25  
 cm.

Common weed of open waste lands July-January. NUNYA. Sarkar &  
 Bhatta., 441.

Eaten as pot herbs . In homoeopathy the herb is employed to stimulate gastric  
 secretion. Diuretic due to the presence of high percentage of potassium salts.

2. *Portulaca pilosa* L. , Sp. Pl. 445.1753 ; Geesink in Blumea 17 : 295.1969.

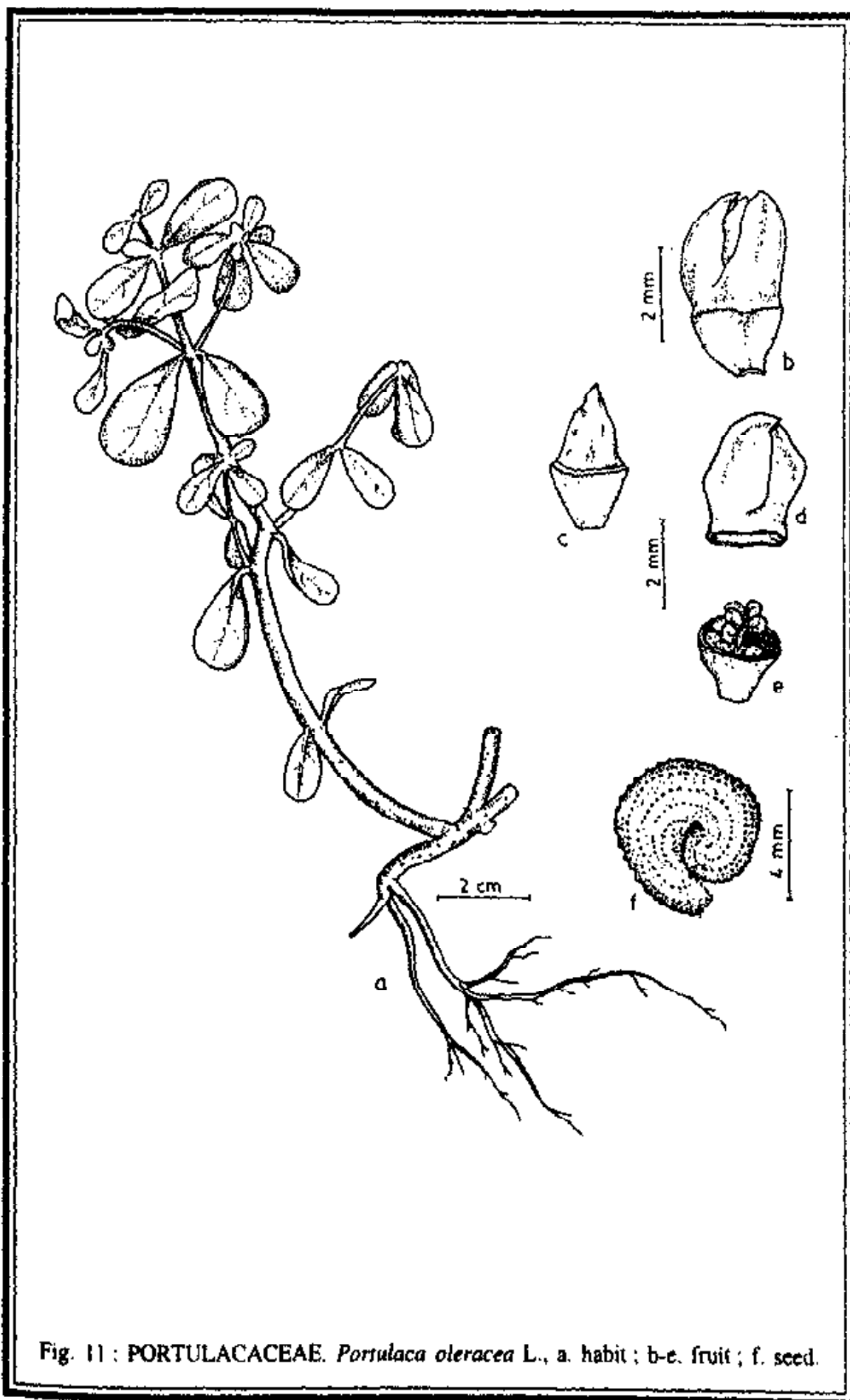


Fig. 11 : PORTULACACEAE. *Portulaca oleracea* L., a. habit ; b-e. fruit ; f. seed.

*P. tuberosa* Roxb. (Hort. Beng. 91.1814 ; *nom.*) Fl. Indica 2 : 464. 1832 ; Hook f. , Fl Brit. India 1 : 247.1874 ; Haines , Bot. Bihar Orissa 1 : 48. 1921.

Branches to 20 cm long ; root stock branched, tuberous. Leaves subterete, 1–1.4 cm × 0.1–0.2 cm. Flowers solitary or clustered. Petals 4–6, up to 12 mm pink. Stamens 9–14. Seeds black, with prominent raised tubercles.

Common in dry sandy soil near Bhikhna Thori. July–November. Sarkar & Bhatta., 977.

Eaten as pot herbs.

3. *Portulaca pilosa* subsp. *grandiflora* (Hook.) Geesink, Blumea 17: 297.1969. *P. grandiflora* Hook., Bot. Mag. m.s. Bot. 1885. 1829.

Diffuse herbs. Leaves fleshy 1.5– 2 cm × 0.2–0.3 cm. Flowers terminal, solitary or clustered. Petals coloured 25 mm. Seeds many, black

Common garden ornamentals. A native of South America. June –December. Sarkar & Bhatta., 791.

4. *Portulaca quadrifida* L., Mant. 1 : 73. 1771 ; Hook . f., Fl. Brit. India 1 : 247.1874 ; Haines, Bot. Bihar & Orissa 1 : 48.1921.

Prostrate herbs. Leaves opposite, fleshy, 0.4 – 0.5 cm long, stipular appendages hairy, white. Flowers solitary, terminal. Petals 4, yellow. Stamens 8–12. Style 3–4-cleft.

Common in wet places forming mats. July-December. Sarkar & Bhatta., 1525.

Uses as pot herbs but excessive use may cause stupefaction.

## XXVI. BASELLACEAE

### BASELLA L.

*Basella alba* L., Sp. Pl. 272 .1753 ; Backer in Fl. Mal. 1, 5 : 301, t. 1.1958, *B. rubra* L., 1. c. ; Hook. f., Fl. Brit. India 5 : 20.1886 ; Haines, Bot. Bihar & Orissa 2 : 810.1924.

Leaves ovate, to 8 × 5 cm, acute, entire, cordate, shining. Spikes axillary, peduncled, lax. Flowers pinkish. Perianth fleshy. Fruit globose, to 0.5 cm across, purplish or blackish violet.

On roadside hedges. December–March. PUIN. Sarkar & Bhatta., 331.

Used as pot herb.

## XXVII. MOLLUGINACEAE

- 1a. Diffuse, prostrate herbs ; flowers in axillary fascicles ... 1. GLINUS  
 1b. Erect herbs ; flowers in axillary or terminal dichasial cymes ... 2. MOLLUGO

## 1. GLINUS L.

- 1a. Stellate-pubescent herbs ; leaves obovate ... 1. *G. lotoides*  
 1b. Glabrous herbs ; leaves  
 oblong-spathulate or oblanceolate ... 2. *G. oppositifolius*

1. *Glinus lotoides* L., Sp. Pl. 463.1753. *Mollugo hirta* Thunb., Prodr. Fl. Cap. 1 : 24.1794 ; Cl. in Hook. f., Fl. Brit. India 2 : 662.1879 ; *M. lotoides* (L.) O. Kuntze, Rev. Gen. Pl. 214.1891 ; Haines, Bot. Bihar & Orissa 1 : 50.1921.

Prostrate or ascending, diffuse herbs, to 50 cm long. Leaves in 2-3-nate clusters. 1-3 × 0.5-1.5 cm, apiculate. Tepals densely stellate-pubescent. 0.5-1 cm long. Stamens 10. Styles 5. Capsule 5-valved.

Common in sandy river beds, also a weed in cultivation. May-April. Sarkar & Bhatta., 431.

Tender shoots eaten as a pot herb.

2. *Glinus oppositifolius* (L.) A. DC., Bull. Herb. Boiss. 2, 1 : 552.1901 ; Backer in Fl. Mal. 4,3:270.1951. *Mollugo oppositifolia* L. Sp. Pl. 89.1753 ; Duthie, Fl. U.G.P. 1:355. *M. spergula* L., Syst. ed. 10 : 881. 1759 ; Haines, Bot. Bihar & Orissa 1 : 50.1921.

Prostrate, diffuse herbs ; branches to 40 cm long. Leaves 3-5-nate. Flowers to 1 cm long. Tepals 0.3-0.5 cm long, greenish white. Stamens 5. Styles 3. Capsule 3-valved.

A frequent weed throughout the district. August - April. GHIMA. Sarkar & Bhatta., 506.

Eaten as a pot herb. Medicinal : Juice applied to itch and other skin troubles.

## 2. MOLLUGO L.

*Mollugo pentaphylla* L., Sp. Pl. 89.1753 ; Duthie, Fl. U.G.P. 1 : 355. *M. stricta* L. Sp. Pl. ed. 2 : 131.1762 ; Cl. in Hook. f., Fl. Brit. India 2 : 663.1879. Haines, Bot. Bihar & Orissa 1 : 49.1921.

Leaves spathulate or linear-lanceolate, 2-3.5 × 1-1.7 cm. Flowers 0.1-0.2 cm long, pedicellate ; pedicel to 0.6 cm long. Capsule ellipsoid, to 0.2 cm long.

Common in wet places along grasses. August–November. Sarkar & Bhatta., 836.

Eaten as a pot herb. Stomachic, aperient, antiseptic and emmenagogue.

### XXVIII. CARYOPHYLLACEAE

1a. Sepals connate, 5-toothed ; petals clawed.	...	2
1b. Sepals free ; petals not clawed.	...	4
2a. Styles 2	...	3
2b. Styles 3	...	4. <i>SILENE</i>
3a. Sepals keeled	...	7. <i>VACCARIA</i>
3b. Sepals not keeled	...	1. <i>DIANTHUS</i>
4a. Sepals green, with scarious margins ; Petals bifid	...	5. <i>SPERGULA</i>
4b. Sepals scarious, petals entire.	...	5
5a. Stipules scarious.	...	6
5b. Stipules 0	...	6. <i>STELLARIA</i>
6a. Prostrate herbs ; leaves spatulate ; sepals keeled	...	3. <i>POLYCARPON</i>
6b. Erect herbs ; leaves subulate ; sepals not keeled	...	2. <i>POLYCARPAEA</i>

#### 1. *DIANTHUS* L.

*Dianthus caryophyllus* L., Sp. Pl. 205.1753 ; Bailey, Man.Cut. Pl. 375. 1949.

Glabrous tufted herbs. Flowers to 4 cm across, variously coloured. Seeds discoid, to 0.3 cm across.

A garden ornamental. **CARNATION**, Sarkar & Bhatta., 610.

#### 2. *POLYCARPAEA* Lamk., *nom. cons.*

*Polycarphaea corymbosa* ( L. ) Lamk., Encycl. 2 : 129.1797 ; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 245.1874 ; Haines, Bot. Bihar & Orissa 1 : 47.1921. *Achyranthes corymbosa* L., Sp. Pl. 205.1753.

Profusely branched herbs ; branches to 30 cm long ; taproot longer than the branches. Leaves linear lanceolate 0.5–1 × 0.1 cm ; stipules to 0.5 cm long. Seeds brownish.

Common in open places. September–December. Sarkar & Bhatta., 109.

Leaves used in jaundice.

### 3. POLYCARPON L.

**Polycarpon prostratum** (Forssk.) Aschers. & Schweinf. in Osterr. Bot. Zeitschr. 39.128.1889; Milne Redhead in Kew Bull. 1948:451.1948. *Alsine prostrata* Forssk., Fl. Aegypt. – Arab. 207.1775. *Pharnaceum depressum* L., Mant. 562.1771. *Polycarpon loeflingiae* Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 245.1874 ; Haines, Bot. Bihar & Orissa 1 : 47.1921.

Profusely branched herbs ; branches to 25 cm long. Leaves sessile, 0.3–1.5 × 0.1–0.6 cm. Flowers to 0.25 cm long, greenish–white. Capsule many-seeded.

Common in wet places. August–April. Sarkar & Bhatta., 1346.

### 4. SILENE L., *nom. cons.*

**Silene conoidea** L., Sp. Pl. 418.1753 ; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 218.1874.

Leaves spathulate, oblong or lanceolate, 6–11 × 0.5–1 cm. Flowers pink, claw auricled. Calyx inflated in fruit. Capsule sessile, ovoid.

A weed in wheat fields. January–March. Sarkar & Bhatta., 1662.

Herb contains saponin.

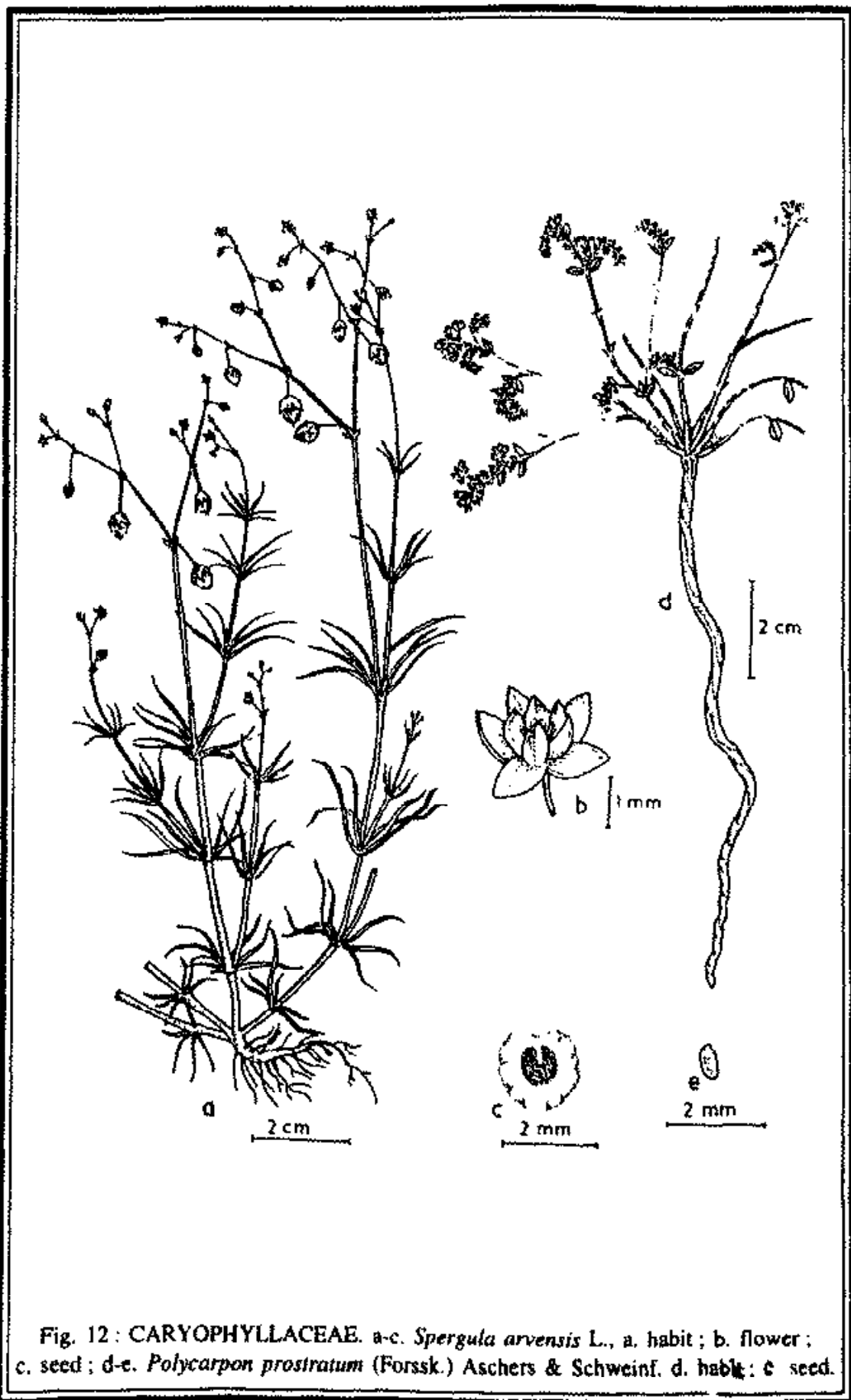
### 5. SPERGULA L.

**Spergula arvensis** L., Sp. Pl. 440.1753 ; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 243.1874 ; Haines, Bot. Bihar & Orissa 1 : 46.1921.

Pubescent, diffuse herbs. Leaves linear to 2.5 cm long. Flowers to 0.3 cm across. Petals obtuse, white. Capsule to 0.6 × 0.5 cm. Seeds flat, to 0.1 cm across.

A weed in cultivation. December–February. Sarkar & Bhatta., 664.

Seeds yield a fatty oil. Used in pulmonary tuberculosis.



## 6. STELLARIA L.

**Stellaria media** (L.) Villars, Hist. Pl. Dauph. 3 : 615.1789 ; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 230.1874 ; Haines, Bot. Bihar & Orissa 1 : 45.1921. *Alsine media* L., Sp. Pl. 272.1753.

Erect herbs. Leaves sessile or stalked, ovate or elliptic-ovate, 3 × 1.5 cm acute or acuminate. Flowers to 0.7 cm across. Petals 2-fid, white. Capsule 6-valved, larger than the calyx. Seeds orbicular, tubercled, deep brown.

An occasional weed. Tropics and subtropics. January–March. Sarkar & Bhatta., 1538.

Leaves contain toxic nitrate concentrates.

## 7. VACCARIA Medik.

**Vaccaria pyramidata** Medik., Phil. Bot. 1 : 96.1789 ; Nair, Fl. Punjab Plain 25.1978. *Saponaria vaccaria* L., Sp. Pl. 409.1753 ; Edgew. & Hook. f. in Hook. f., Fl. Brit. India 1 : 217.1874 ; Haines, Bot. Bihar & Orissa 1 : 45.1921.

Herbs, to 35 cm high. Radical leaves oblong ; cauline leaves linear-lanceolate, amplexicauled. Calyx tubular. Petals ovate, pink. Capsule oblong-ovoid. Seeds subglobose, tubercled.

A weed in cultivation. January–March. Sarkar & Bhatta., 683.

Saponin of seeds show hemolytic activity.

## XXIX. POLYGONACEAE

1a. Herbs or subshrubs.	...	2
1b. Climbers	...	1. ANTIGONON
2a. Perianth lobes 3–5 ; stigma capitate	...	2. POLYGONUM
2b. Perianth lobes 6 ; stigma fimbriate	...	3. RUMEX

## 1. ANTIGONON Endl.

**Antigonon leptopus** Hook. & Arn., Bot. Beech. Voy 308. t. 69.1841 ; Haines, Bot. Bihar & Orissa 2 : 821.1924.

Leaves ovate-triangular, 5-10 × 3-6 cm, pubescent on the nerves beneath. Flowers pink-red, 0.7-1 cm across. Fruit ovoid-conical, 0.6 cm across.

On bushes and hedges near Bettiah. August-December. Sarkar & Bhatta., 790.

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

1a. Inflorescence axillary; clustered ; diffuse herbs	...	5. <i>P. plebejum</i>
1b. Inflorescence terminal, racemose ; erect herbs.	...	2
2a. Nut biconvex.	...	3
2b. Nut trigonous.	...	4
3a. Stipules ciliate	...	4. <i>P. lapathifolium</i>
3b. Stipules eciliate	...	3. <i>P. glabrum</i>
4a. Racemes dense ; bracts glabrous.	...	5
4b. Racemes slender ; bracts glandular or not	...	2. <i>P. hydropiper</i>
5a. Leaves acute at base, marginal cilia of ocreae longer than the tube	...	1. <i>P. barbatum</i>
5b. Leaves subcordate at base, marginal cilia or ocreae shorter than the tube	...	6. <i>P. salicifolium</i>

1. *Polygonum barbatum* L., Sp. Pl. 362.1753 ; Hook. f., Fl. Brit. India 5 : 37.1886. Haines, Bot. Bihar & Orissa 2 : 816.1924. *P. stagninum* Meisn. in Wall., Pl. As. Rar. 3 : 36.1832 ; Hook. f. *l.c.* 5 : 37.1886.

Perennial aquatic herbs. 15-30 cm high. Leaves linear lanceolate, 5-20 cm long. Racemes terminal, paniced. Perianth lobes 5, white or pinkish. Stamens 6. Styles 3. Nut to 0.2 cm long.

Common in marshy places. Fl. & Fr. September-April, sometimes throughout the year. Sarkar & Bhatta., 205.

2. *Polygonum hydropiper* L., Sp. Pl. 361.1753 ; Hook. f., Fl. Brit India 5 : 39.1886 ; Haines, Bot. Bihar & Orissa 2 : 817.1924.

Glabrous herbs. Leaves lanceolate, 12 × 2.6 cm acuminate, entire. Racemes terminal, paniculate or not ; bracts with ciliate margin. Perianth glandular. Stemens 8.

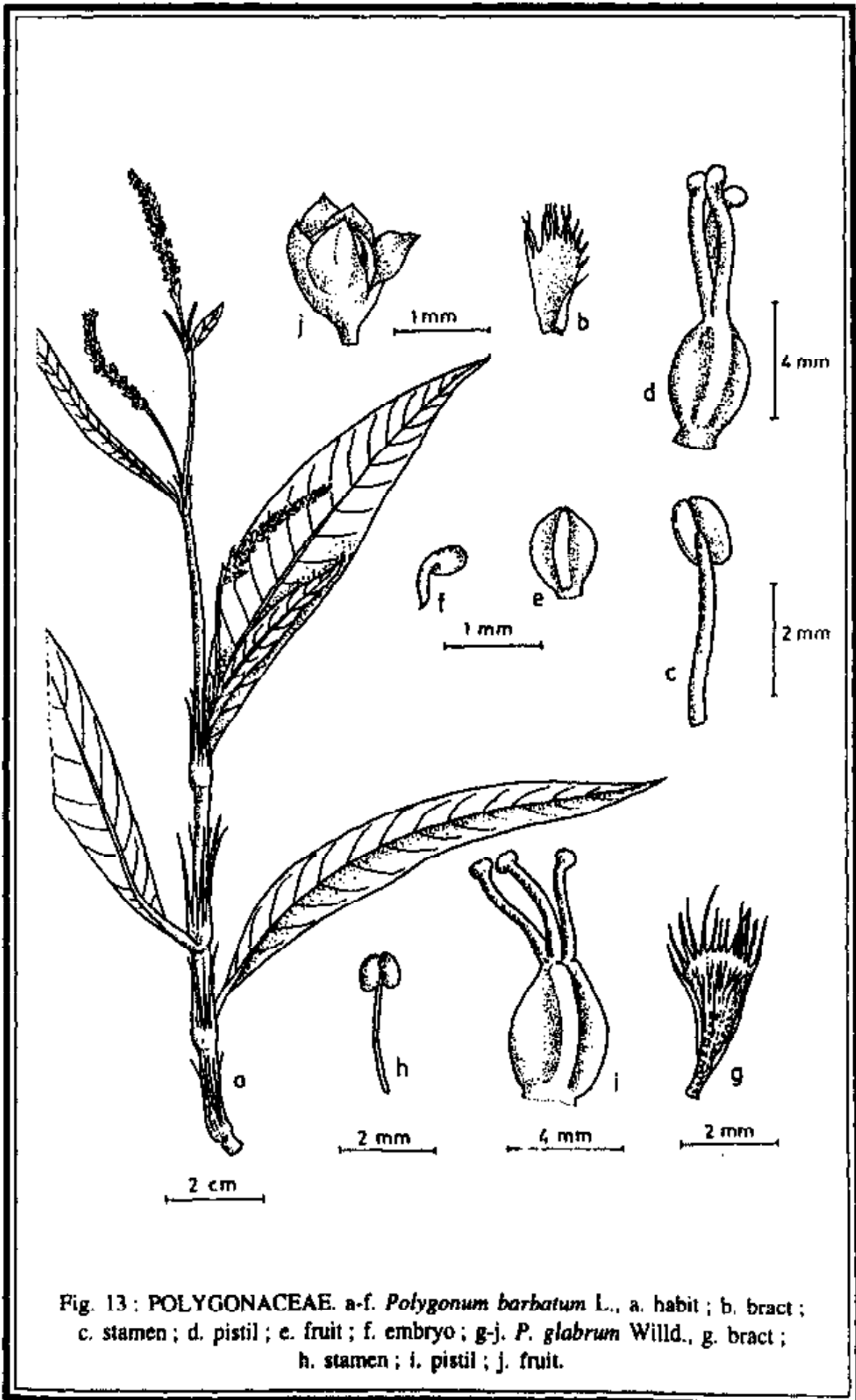


Fig. 13 : POLYGONACEAE. a-f. *Polygonum barbatum* L., a. habit ; b. bract ; c. stamen ; d. pistil ; e. fruit ; f. embryo ; g-j. *P. glabrum* Willd., g. bract ; h. stamen ; i. pistil ; j. fruit.

Common in marshy lands. August–February. Sarkar & Bhatta., 1129.

3. *Polygonum glabrum* Willd., Sp. Pl. 2 : 447.1799 ; Hook. f., Fl. Brit. India 5 : 34.1886 ; Haines, Bot. Bihar & Orissa 2 : 814.1924.

Perennial herbs, creeping at base, 1.0–2.5 m high. Leaves lanceolate or elliptic–ovate, 15–20 × 2–2.7 cm, acuminate. Racemes terminal, paniced ; bracts glabrous. Perianth lobes 5, pinkish red or white. Stamens 8. styles 2. Nut dark brown.

Occasionally in marshy lands. October–March. Sarkar & Bhatta., 145.

4. *Polygonum lapathifolium* L. var. *lanatum* ( Roxb. ) Steward in Contrib. Gray Herb. 5(88) : 46.1930. *P. lanatum* Roxb., Fl. Indica. 2 : 285.1824. *P. lanigerum* R. Br., Prodr. 419.1810 ; Hook. f., Fl. Brit. India 5 : 35.1886. Haines, Bot. Bihar & Orissa 2 : 815.1924.

Subshrubs to 1.25 m high, clothed with white woolly hairs. Leaves narrow-lanceolate, to 20 cm long, acuminate. Subsessile. Flowers in paniced racemes, perianths red ; bracts tomentose. Nut orbicular, black, to 0.2 cm long.

Common in marshy places. September–November. Sarkar & Bhatta., 1610.

5. *Polygonum plebejum* R. Br., Prodr. 420.1810 ; Hook. f., Fl. Brit. India 5 : 27.1886. Haines, Bot. Bihar & Orissa 2 : 813.1924.

Small, tufted herbs, hairy. Leaves linear oblong, 1–3 × 0.1 cm, obtuse or rounded. Perianth white or pink. Nut to 0.1 cm long.

Common in cultivated fields and moist areas. January–April. Sarkar & Bhatta. 29, 1677.

6. *Polygonum salicifolium* Willd., Enum. Hort. Berol. 428.1809. *P. serrulatum* Lag., Gen. & Sp. Pl. Na. 14.1816 ; Hook. f., Fl. Brit. India 5 : 38.1886 ; Haines, Bot. Bihar & Orissa 2 : 816.1924.

Slender herbs. Leaves elliptic or lanceolate, 12 × 1.5 cm, acute, entire, narrowed or rounded at base. Racemes terminal ; bracts with ciliate margins. Perianth lobes 5, white. Stamens 5–8. Styles 3, connate below. Nut trigonous.

Occasional in moist places, March–May. Sarkar & Bhatta. 787 ; Banerjee 359 (CAL!).

Note : Haines stated that *P. orientale* L. probably occur in N. Champaran.

## 3. RUMEX L.

- 1a. Flowers bisexual ... 1. *R. dentatus*  
 1b. Flowers polygamous ... 2. *R. vesicarius*

1. **Rumex dentatus** L., Mant. Pl. 2 : 226.1771 ; Hook. f., Fl. Brit. India. 5 : 59.1886 ; Haines, Bot. Bihar & Orissa 2 : 820.1924. *R. klotzschianus* Meissn. in DC., Prod. 14.157.1856.

Annual herbs, glabrous ; stem tinged with red, grooved. Leaves variable, radical leaves larger than cauline leaves, oblong, 7-10 × 3.2 cm, obtuse, base rounded or cordate. Flowers in leafy or leafless whorls. Perianth 6-lobed, lobes 0.5 cm long. Nut trigonous, brown.

Occasional. October-February. Sarkar & Bhatta., 240.

2. **Rumex vesicarius** L., Sp. pl. 336.1753 ; Hook. f., Fl. Brit. India 5 : 61.1886 ; Haines, Bot. Bihar & Orissa 2 : 821.1924.

Annual herbs. Leaves elliptic-ovate, cordate or hastate at base. Fruiting calyx, orbicular, pinkish.

Probably ( Haines, *l.c.* ) in cultivation in Bettiah. A native of Punjab hills. PALAK. Sarkar & Bhatta., 583.

## XXX. PLUMBAGINACEAE

## PLUMBAGO L.

**Plumbago zeylanica** L., Sp. Pl. 151.1753 ; Hook. f., Fl. Brit. India 3 : 480.1882 ; Haines, Bot. Bihar & Orissa 2 : 529.1922.

Erect or subscandent undershrubs. Leaves ovate, acute. Calyx segments covered with sticky, gland-tipped hairs. Corolla white.

Moist, shady places near Madanpur. All seasons. CHETA, CHITRAK. Sarkar & Bhatta., 411, 1824.

Root-bark contains plumbagin, an alkaloid. Root extracts are used against rheumatic joints, leprosy, paralytic limbs, piles, diarrhoea and skin diseases.

## XXXI. DILLENACEAE

## DILLENIA L.

- |   |     |                        |
|---|-----|------------------------|
| 1a. Flowers white, to 11 cm across ; fruits<br>8-10 cm across | ... | 2. <i>D. indica</i>    |
| 1b. Flowers yellow, flowers and fruits smaller.               | ... | 2                      |
| 2a. Flowers to 9 cm across ; fruits 2-3.5 cm across           | ... | 1. <i>D. aurea</i>     |
| 2b. Flowers 2.5-4 cm across ; fruits to 2 cm across           | ... | 3. <i>D. pentagyna</i> |

1. *Dillenia aurea* Sm. in Exot. Bot. 2 : 65. t. 92 - 93.1805 ; Hook. f., & Thoms. in Hook. f., Fl. Brit. India 1 : 37.1872 ; Haines, Bot. Bihar & Orissa 1 : 7.1921.

Deciduous small trees. Leaves oblong-ovate, 15-30 × 9-20 cm, entire or denticulate. Flowers solitary in short leafless branches. Carpels 10-12. Fruit orange yellow.

Haines (*l.c*) reported the plant from Bettiah. April-June. AGHAI. Haines 21 (CAL!).

2. *Dillenia indica* L., Sp. Pl. 535.1753 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 37.1872 ; Haines, Bot Bihar & Orissa 1 : 7.1921.

Evergreen trees. Leaves oblong-lanceolate 15-30 × 5-12 cm, dentate-serrate. Flowers solitary. Carpels 14-20. Fruit yellowish-green. Seeds many, hairy.

Planted for its fruits. May-January. CHALDA. Sarkar & Bhatta., 1699.

3. *Dillenia pentagyna* Roxb., Pl. Corom. 21, t. 20.1795 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 38.1872.

Deciduous trees. Leaves obovate, 20-50 × 7-20 cm, acute, entire or denticulate. Flowers on short leafless branches. Sepals ovate, acute. Petals obovate. Carpels 5 : ovules many. Fruit orange-red.

Occasional in the northern hilly areas. March-May. AGHAI. Sarkar & Bhatta., 182.

## XXXII. OCHNACEAE

## OCHNA L.

**Ochna obtusata** DC., Ann. Mus. Paris 17 : 441. Pl. 2.1811 var. **pumila** (Buch. –Ham. ex DC.) Kanis in Blumea 16 : 34.1968. *O. pumila* Buch. –Ham. ex DC., Prodr. 1 : 736.1824 ; Bennet in Hook. f., Fl. Brit. India 1 : 528.1879 ; Haines, Bot. Bihar & Orissa 1 : 175.1921.

Undershrubs ; branches to 30 cm long, developing annually from a perennial root–stock. Leaves oblanceolate, 10–15 × 3–6 cm. Flowers to 3.5 cm across, yellow.

Common in the sandstone area. February–July. Sarkar & Bhatta., 1236.

## XXXIII. DIPTEROCARPACEAE

## SHOREA Roxb. ex C.F. Gaertn.

**Shorea robusta** C.F. Gaertn., Suppl. Carp. 1 : 28. t. 186. 1805 ; Hook. f., Fl. Brit. India 1 : 306.1874 ; Haines, Bot. Bihar & Orissa 1 : 58.1921.

Trees, 10–30 m high. Leaves ovate–oblong, 9–17 × 5–7 cm, cuspidate. Flowers in axillary or terminal panicles. Sepals persistent and enlarging in fruits, to 3–6 cm long, liner–lanceolate wings, cream coloured. Fruit ovoid, about 1 cm long, beaked.

Major constituent of the dry deciduous forests. Fl. : February–April ; Fr. May–June. SAL. Sarkar & Bhatta., 968.

A valuable timber.

XXXIV. CLUSIACEAE (GUTTIFERAE *nom. alt.*)

## HYPERICUM L.

**Hypericum japonicum** Thunb. ex Murr., Syst. Veg. ed. 14 : 702.1784 ; Dyer in Hook. f. Fl. Brit. India 1 : 256.1874 ; Haines, Bot. Bihar & Orissa 1 : 53.1921. Robson in Blumea 20 : 267.1972.

Minute herbs, to 8 cm long. Leaves elliptic or oblong, to 0.5 cm long. Flowers yellow, to 0.5 cm across. Capsule included within accrescent calyx, 3–valved.

Weed of damp places. April–June. Sarkar & Bhatta., 870.

Note : In most of our floras *Hypericum* is placed in Hypericaceae Juss.

## XXXV. TILIACEAE

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Fruits covered with hooked spines                                    | ... | 3. TRIUMFETTA           |
| 1b. Fruits not covered with hooked spines.                               | ... | 2                       |
| 2a. Trees or shrubs ; fruit a drupe                                      | ... | 2. GREWIA               |
| 2b. Herbs or undershrubs ; fruit a subglobose<br>or subcylindric capsule | ... | 1. CORCHORUS            |
| 1. CORCHORUS L.  |     |                         |
| 1a. Capsule subglobose   | ... | 2. <i>C. capsularis</i> |
| 1b. Capsule subcylindric.  | ... | 2                       |
| 2a. Erect herbs ; Capsular beak solitary                                 | ... | 3. <i>C. olitorius</i>  |
| 2b. Herbs or undershrubs ; capsular beak bifid                           | ... | 1. <i>C. aestuans</i>   |

1. *Corchorus aestuans* L., Syst. Nat. ed. 10, 1 : 1079. 1757. *C. acutangulus* auct. non. Forssk. ; Lam., Encyl. 2 : 104.1786 ; Mast. in Hook. f., Fl. Brit. India 1 : 398.1874 ; Haines, Bot. Bihar & Orissa 1 : 90.1921.

Annual herbs. Leaves elliptic ovate, 3-5 × 1.7-3 cm, acute ; stipules lanceolate, acicular. Flowers in leaf-opposed cymes. Capsule 6-angled, 1-3 × 0.25-0.3 cm. Seeds brown.

Common. August-October. Sarkar & Bhatta., 990.

2. *Corchorus capsularis* L., Sp. Pl. 529. 1753 ; Prain, Bengal Pl. 1 : 196.1903.

Erect annual herbs, glabrous. Leaves ovate-lanceolate, 7-10 × 1-3 cm, acute-acuminate. Capsule depressed, to 1 cm across, ridged and muricated. Seeds wedge-shaped, smooth, brown.

Cultivated for its fibre. August-October. PAT. Sarkar & Bhatta., 831.

3. *Corchorus olitorius* L., Sp. Pl. 529.1753 ; Prain, Bengal Pl. 1 : 196.1903.

Leaves elliptic-lanceolate, 6.5-8 × 2-4 cm, acute-acuminate, rounded. Capsule 5-valved, 4-5 cm long, glabrous. Seeds 3-angled, blackish.

Cultivated for its fibre. August-October. PAT. Sarkar & Bhatta., 956.

## 2. GREWIA L.

1a. Medium trees.	...	2
1b. Shrubs.	...	3
2a. Fruits 4-lobed	...	2. <i>G. disperma</i>
2b. Fruits not prominently 4-lobed	...	5. <i>G. polygama</i>
3a. Leaves broadly ovate or orbicular.	...	4
3b. Leaves linear, lanceolate or oblong lanceolate.	...	6
4a. Leaves stellate hairy on both the surfaces.	...	5
4b. Leaves stellate hairy beneath	...	7. <i>G. sclerophylla</i>
5a. Droupes not lobed	...	1. <i>G. abutilifolia</i>
5b. Droupes somewhat lobed	...	6. <i>G. sapida</i>
6a. Fruits 2-4-lobed	...	3. <i>G. helicterifolia</i>
6b. Fruits not lobed	...	4. <i>G. hirsuta</i>

1. *Grewia abutilifolia* Vent. ex Juss. in Ann. Mus. Nat. Hist. Paris 4 : 92.1789. *G. aspera* Roxb. ex Roth Nov. Pl. Sp. 245.1821 ; Mast in Hook. f., Fl. Brit. India 1 : 390.1874 ; Haines, Bot. Bihar & Orissa 1 : 92.1921.

Shrubs, branches densely stellate-hairy. Leaves elliptic to orbicular-ovate, usually lobed, acute-acuminate, serrate dentate. Flowers axillary in sessile umbel. Petals white, 0.3-0.4 cm long. Drupes globose, fleshy, rugose, 2-2.5 cm across.

Occasional in forest areas. Fl. April-August, Fr. September-February. Sarkar & Bhatta., 508.

2. *Grewia disperma* Rottbl. in Spreng., Syst. Veg. 2 : 579.1825 ; Haines, Bot. Bihar & Orissa 1 : 95.1921. *G. multiflora* auct. non Juss. : Mast. in Hook. f., Fl. Brit. India 1 : 388.1874. *G. glabra* Bl., Bijdr. 115. 1825 June-Dec. *G. laevigata* auct. non Vahl; Mast. in Hook. f., Fl. Brit. India 1 : 389.1874.

Medium trees. Leaves narrow-elliptic or oblong-lanceolate, 14 x 4 cm, acuminate, serrate. Flowers axillary, usually umbellate. Petals white. Fruits usually 4-lobed, 2-5-seeded, indehiscent.

Occasional in forest areas. July–February. Sarkar & Bhatta., 1484.

3. *Grewia helicterifolia* Wall. ex G. Don, Gen. Syst. 1 : 548.1831 ; Ghafoor, Fl. West Pakistan 75 : 10.1974. *G. polygama* auct. non Roxb. : Mast in Hook. f., Fl. Brit. India 1 : 391.1874. p.p *G. hirsuta* var. *helicterifolia* ( Wall. ex G. Don ) Haines, For. Fl. Chota Nagpur 196.1910 ; Haines, Bot. Bihar & Orissa 1 : 94.1921.

Shrubs. Leaves linear–lanceolate, 5–15 × 1.5–2 cm, abaxial surface with adpressed white hairs. Flowers white. Fruite 2–4–lobed, to 0.7 cm across.

Occasional in sandstone areas. August–November. Sarkar & Bhatta., 926.

4. *Grewia hirsuta* Vahl, Symb. 1 : 34.1790, Mast. in Hook. f., Fl. Brit. India 1 : 391.1874 ; Haines, Bot. Bihar & Orissa 1 : 93.1921.

Shrubs. Leaves elliptic–ovate, 6–7 × 3.3–5 cm, acuminate, serrulate, unequal. Flowers axillary, cymose, polygamous. Petals yellow, oblong. Stamens many. Stigma fimbriate. Drupe globose, fleshy, 1 cm in diameter.

Common near Someswara hills. July–January. Sarkar & Bhatta., 1107.

5. *Grewia polygama* Roxb., Fl. Indica 2:588.1832. Mast. in Hook. f., Fl. Brit. India 1 : 391.1874.

Small trees. Leaves oblong–lanceolate, 5–11 × 1.8–3 cm, palmately 3–nerved, velvety–tomentose beneath, acute, serrate, rounded. Flowers axillary, cymose, polygamous. Sepals 0.5–0.6 cm long. Petals white, oblong. Torus 0.1 cm long. Stamens 16–20. Stigma laciniate. Drupes glabrous, 1–2 cm across.

In mixed forest. N. Indica, Sri Lanka, Australia. Sarkar & Bhatta., 1711.

6. *Grewia sapida* Roxb., Fl. Indica 2 : 584.1832 ; Mast. in Hook. f., Fl. Brit. India 1 : 387. 1874 ; Haines, Bot. Bihar & Orissa 1 : 98.1921.

Shurbs or undershrubs, branches develop annually from a perennial root stock. Leaves suborbicular, obovate, obtuse, serrate, cuneate, basally 5 nerved. Flowers axillary. Drupe globose, lobed, 0.6 cm across.

In mixed forest. April–June. PHALSA. Sarkar & Bhatta., 906.

Fruits edible.

7. *Grewia sclerophylla* Roxb. ex G. Don, Gen. Syst. 1 : 550.1831 ; Haines, Bot. Bihar & Orissa 1 : 93.1921. *G. scabrophylla* Roxb. Fl. Indica 2 : 584.1832 ; Mast. in Hook. f., Fl. Brit. India 1 : 387.1874.

Shrubs, branches tomentose, developing from a woody stock. Leaves elliptic-ovate, 8-17 × 5-9 cm, petiole thick, to 1.3 cm long. Flowers in axillary 2-3-umbelled on short peduncles. Fruits globose, fleshy, purplish, 1.7-2 cm across.

Common in sand stones and river beds near Bhikhna Thori. May-November. DAPHAR. Sarkar & Bhatta., 1484.

Fruits edible. Roots used for cough and irritable condition of the intestines and bladders.

3. TRIUMFETTA L.

*Triumfetta rhomboidea* Jacq., Enum, Syst. Pl. 22.1760 ; Mast in Hook. f., Fl. Brit. India 1 : 395.1874 ; Haines, Bot. Bihar & Orissa 89.1921 *T. bartramia* L., Syst. Nat. ed 10,2 : 1044 1759 ; *nom. ambig. & nom. superfl.*

Herbs or undershrubs, to 1 m high. Leaves rhomboid, usually 3-lobed, 5-7 nerved. acute-acuminate, serrate. Petals yellow. Fruits 0.4-0.5 cm across.

Common in the forest margins and waste places. October-January. Sarkar & Bhatta., 880.

Yields fibre. Leaves and flowers used against leprosy. Seeds yield a fatty oil.

XXXVI. SETERCULIACEAE

- |   |     |               |
|---|-----|---------------|
| 1a. Herbs shrubs or trees ; leaves not palmately lobed ;<br>flowers bisexual ; petals present . | ... | 2             |
| 1b. Trees ; leaves palmately lobed ; flowers unisexual ; petals absent.                         |     | 7             |
| 2a. Annual herbs or undershrubs ; ovary 1-5-locular ;<br>capsule loculicidal.                   | ... | 3             |
| 2b. Shrubs or trees ; ovary 5-10-locular ;<br>fruit a capsule or of twisted follicles.          | ... | 5             |
| 3a. Capsule 2-valved , seeds solitary   | ... | 9. WALTHERIA  |
| 3b. Capsule 5-valved ; seeds many   | ... | 4             |
| 4a. Stamens 20 ; flowers to 3 cm across   | ... | 5. PENTAPETES |
| 4b. Stamens 5 ; flowers to 0.5 cm across  | ... | 4. MELOCHIA   |

- 5a. Calyx tubular; follicles twisted ; seeds tubercled ... 3. HELICTERES
- 5b. Calyx 5-partite or sepals only connate  
at base ; capsule woody ; seeds winged. ... 6
- 6a. Staminodes absent ; capsule upto 10-valved ;  
valves villous on axial angles ; ... 1. ERIOLAENA
- 6b. Staminodes present ; capsule 5-valved ;  
valves glabrous on inner angles ... 6. PTEROSPERMUM
- 7a. Calyx elongated , tubular ; follicles membranous ... 2. FIRMIANA
- 7b. Calyx short , tubular or deeply lobed ; follicles woody. ... 8
- 8a. Leaves glabrous ; pistils sessile ; seeds winged ... 7. PTERYGOTA
- 8b. Leaves tomentose ; gynophore elongated ;  
seeds not winged ... 8. STERCVLIA

#### 1. ERIOLAENA DC.

*Eriolaena wallichii* DC., Mem. Mus. Hist. Nat. Paris . 10, 102. 1823 ; Mast  
in Hook . f., Fl. Brit. India. 1:370.1874; Haines, Bot.Bihar. Orissa 1 : 83.1921.

Large shrubs. Leaves to 17 cm across. Peduncle to 3 cm long,  
1-flowered. Flowers yellow. Capsule to 5x2.5 cm. Seeds to 1cm long.

Occasional in the sandstone hills, Bhikhna Thori, Fl. : July-Sept. ; Fr. :  
November -December Sarkar & Bhatta., 975, 1440.

#### 2. FIRMIANA Marsili

- 1a. Leaves glabrous or sparsely stellate beneath;  
flowers orange scarlet ... 1. *F. colorata*
- 1b. Leaves tomentose beneath ; flowers yellow ... 2. *F. fulgens*

1. *Firmiana colorata* (Roxb.) R Br. in Bennet & Brown Pl. Jav. Rar.  
235.1844 ; Kost in Reinwardtia 5 : 386. 1960. *Sterculia colorata* Roxb ., Pl.  
Cor. 1 : 26.1795 ; Mast. in Hook. f., Fl. Brit India 1 : 359.1874 ; Haines , Bot. Bihar  
& Orissa 1 : 80.1921.

Leaves 5(-3) -lobed , 15-30 cm long, sparsely stellate hairy beneath;  
lobes caudate. Flowers paniced. Follicles to 10x4cm ovate -oblong

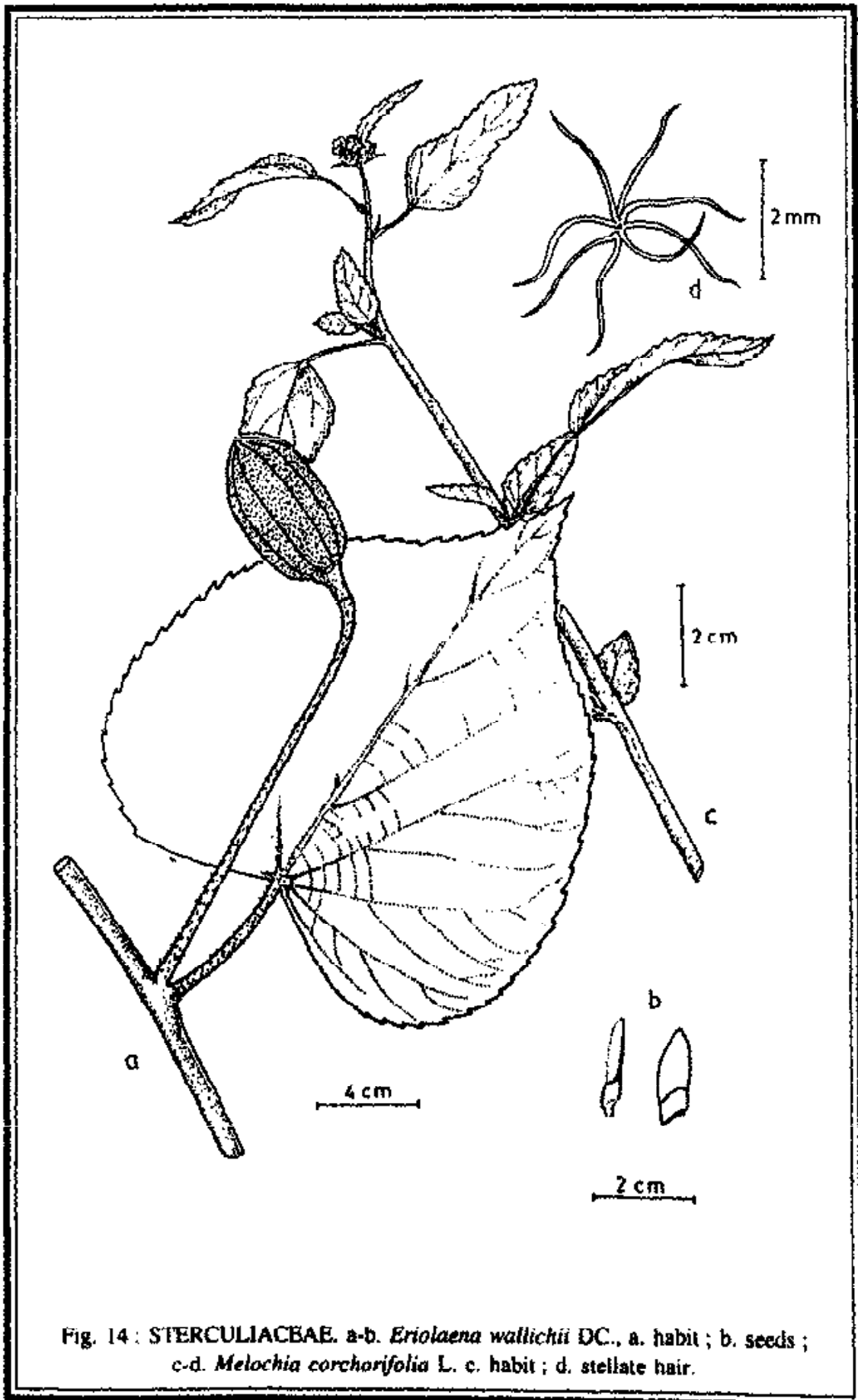


Fig. 14 : STERCULIACEAE. a-b. *Eriolaena wallichii* DC., a. habit ; b. seeds ;  
 c-d. *Melochia corchorifolia* L. c. habit ; d. stellate hair.

Ramnagar forests ( Haines *l.c.* ) Fl. : March –April ; Fr. : April–May; leafless : January–May.

2. **Firmiana fulgens** ( Wall. ex Mast ) Corner Ways Trees Mal 1 : 610.1940; Kost Reinwardtia 4:293.1960. *Sterculia fulgens* Wall ex Mast. in Hook . f. ,Fl. Brit. India 1 : 360.1874. *S. pallens* Wall . ex King in Jour. As. Soc. Beng 60(2) : 73. 1891 ; Haines, Bot. Bihar & Orissa 1 : 80.1921.

Large trees ; bark more or less smooth Leaves sub –orbicular, 14–20 cm across, cordate at base , terminally 3–lobed Panicles erect. Follicles 7–10 cm long, 2–seeded.

Bikhna Thori, India , Himalayan region. Sarkar & Bhatta., 762.

### 3. HELICTERES L.

**Helicteres isora** L. Sp. Pl. 963.1753; Mast . in Hook f., Fl Brit India 1 : 365.1874 ; Haines , Bot. Bihar & Orissa 1 : 82.1921.

Large shrubs to 2.5 m high . Leaves broadly oblong or rotundate , to 15 cm long, crenate–serrate, acute. Flowers to 3.5 cm long , pink –red. Follicles spirally twisted 5–7 cm long.

Northern area. Sarkar & Bhatta., 1309.

Bark yields fibre . Leaves , roots and fruits medicinal.

### 4. MELOCHIA L.

**Melochia corchorifolia** L Sp Pl 675.1753 ; Mast in Hook f. Fl Brit. India 1: 374.1874 ; Haines , Bot. Bihar & Orissa 1: 85.1921.

Herbs to 50 cm high Leaves ovate –oblong , 2–6 cm long , acute , serrate. Flowers pink, subtended by 4–5 bracteoles. Capsule globose, hirsute, reddish brown

Common in waste lands. May–Sept. Sarkar & Bhatta., 1054, 1093.

Bark yields silvery–white, durable fibres.

### 5. PENTAPETES L.

**Pentapetes phoenicea** L. Sp. Pl. 698.1753 ; Mast. in Hook f. Fl Brit India 1: 371.1874 ; Haines , Bot. Bihar & Orissa 1: 85.1921.

Herbs to 1.25 m high . Leaves crenate-serrate, 8-13 × 1.5-2 cm. Flowers red. Capsule subglobose to 1.1 cm across. Seeds blackish obscurely 3-angled, 0.15-0.2 cm across.

Occasional in damp places near Bettiah also planted in gardens July-November Sarkar & Bhatta., 860.

Roots antibilious, used for flatulence.

6. *PTEROSPERMUM* Schreber, *nom cons.*

*Pterospermum acerifolium* Willd., Sp. Pl. 3: 729.1800; Mast in Hook f Fl Brit . India 1 : 368.1874 ; Haines Bot Bihar & Orissa 1 : 82.1921.

Large trees. Leaves elliptic-oblong, 16 × 12 cm Peduncle 1-3-flowered. Flowers to 12 cm long, white fragrant. Capsule woody 11× 6 cm

Planted near Ramnagar Shiva temple . Fls. March-July. MUCHAKUNDA. Haines 244 (CAL!).

Note : Haines (*l.c*) stated that the plant is indigenous in the Ramnagar hills (N . Champaran ) but the species has become occational due to over exploitation.

7. *PTERYGOTA* Schott & Endl.

*Pterygota alata* (Roxb .) R . Br. in Benn & Brown Pl. Jav Rar. 234. 1844 ; Abedin & Ghaffoor, Fl. West Pakistan 99 : 23. 1976. *Sterculia alata* Roxb., Pl. Cor. 3 : 48 . t . 287. 1820 ; Mast in Hook . f . , Fl. Brit . India 1 : 360.1874 ; Haines, Bot . Bihar & Orissa 1 : 80.1921.

Tall trees Leaves ovate-oblong, 20-30 × 11-18 cm, 7-fribbed, acute, cordate at base. Panicles rusty-tomentose Follicles globose, to 10 cm across. Seeds many with corky wings to 8 cm long.

Planted as avenue tree , Bettiah. April-December. Sarkar & Bhatta., 920.

8. *STERCULIA* L.

- |  |                      |
|--|----------------------|
| 1a . Leaves compound , digitate ; calyx deeply divided ...           | 1. <i>S. foetida</i> |
| 1b. Leaves palmately lobed ; calyx campanulate. ...                  | 2                    |
| 2a. leaves 5-lobed, lobes entire ; flowers yellow ...                | 2. <i>S. urens</i>   |
| 2b. Leaves 5-7-lobed, lobes usually 3-lobed ;<br>flowers pinkish ... | 3. <i>S. villosa</i> |

1. *Sterculia foetida* L. Sp. Pl 1008. 1753 ; Mast in Hook f. Fl. Brit India 1 : 355 .1874 ; Haines , Bot. Bihar & Orissa 1 : 78. 1921.

Large trees . Leaflets 5-9, oblong-lanceolate, acuminate. Flowers in upright panicle of racemes, purplish with a bad smell . Follicles boat-shaped, scarlet red.

Planted as avenue tree. March-June Sarkar & Bhatta., 386.

2. *Sterculia urens* Roxb. Pl Cor. 1 : 25.t. 24.1795 ; Mast. in Hook f. Fl. Brit. India 1 : 355. 1874 ; Haines , Bot. Bihar & Orissa 1 : 97.1921.

Large deciduous trees; bark papery. Leaves long-petioled, 20-30 cm broad, cordate . Panicles 10-20 cm long. Flowers about 5 cm across. Stamens 15. Carples 5. Follicles hairy.

Northern area . Fl. : Jan-Feb . ; Fr. : April ; leafless : Dec- May. Sarkar & Bhatta. 1093.

3. *Sterculia villosa* Roxb. ex DC., Prodr. 1 : 483.1824 ; Mast . in Hook. f ; Fl. Brit. India 1 :355.1874; Hains Bot . Bihar & Orissa 1 : 97.1921.

Trees bark greyish-brown leaf scars prominent. Leaves 5-7-lobed to 30 cm broad, cordate. Flowers in rusty-pubescent panicles, about 1 cm across. Follicles tomentose , scarlet inside.

Bhikhna Thori Fl : Jan.-March. Fr. May-June. Leafless : Dec. -May Sarkar & Bhatta., 1627.

#### 9. WALTHERIA L.

*Waltheria indica* L. Sp. Pl. 673.1753 ; Mast . in Hook f., Fl Brit . India 1 : 374 . 1874 ; Haines, Bot. Bihar & Orissa 1 : 85.1921 *W. americana* L., Sp. Pl. 673. 1753.

Tomentose undershrubs to 80 cm high Leaves oblong-lanceolate, sub-elliptic, 3-6 × 1.5-3.5 cm, crenate-serrate. Flowers 6 cm across, yellow. Capsule ovoid, villous. Seeds smooth.

Common in waste lands. June-October. Sarkar & Bhatta., 448.

Febrifuge, purgative and emollient. Roots chewed to control internal haemorrhages

#### XXXVII. BOMBACACEAE

- |  |     |           |
|--|-----|-----------|
| 1a. Flowers crimson, to 13 cm across     | ... | 1. BOMBAX |
| 1b. Flowers white, less than 5 cm across | ... | 2. CEIBA  |

1. **BOMBAX L., *nom. cons.***

**Bombax ceiba** L., Sp. Pl. 511. 1753 ; Robyns in Bull. Jard. Bot. Brux. 33 : 88.1963. *B. malabaricum* DC. Prodr. 1 : 479. 1824 ; Mast. in Hook. f., Fl. Brit. India 1 : 349.1874 ; Haines, Bot. Bihar & Orissa 1 : 77.1921.

Stem buttressed. Leaflets 5-7, lanceolate, acuminate. Flowers clustered on the tip of defoliated branches. Calyx woolly within. Petals crimson, fleshy. Capsule oblong-elliptic 10-13 × 4.5-6 cm. Seeds round, 0.3 cm across.

Common February-April SIMAL. Sarkar & Bhatta., 416.

Silky hairs surrounding the seeds are mainly used for stuffing pillows. Wood is used in match stick industry.

2. **CEIBA Mill.**

**Ceiba pentandra** (L.) Gaertn., Fruct. 2 : 244 . t. 133. 1791 ; Chandrabose, Fl. Tamilnadu 1 : 38. 1983. *Bombax pentandra* L., Sp. Pl. 511.1753.

Planted as road side tree. Rapid growing.

Source of 'Kapok' fibre. The fibre is resistant, buoyant, water resisting, and highly moisture proof. Sarkar & Bhatta., 451.

**XXXVIII. MALVACEAE**

- |  |     |                |
|--|-----|----------------|
| 1a. Inflorescence a panicle ; flowers polygamous ;<br>fruits winged          | ... | 6. KYDIA /     |
| 1b. Inflorescence of various kinds ; flowers bisexual ;<br>fruits not winged | ... | 2              |
| 2a. Epicalyx lobes broadly ovate ; seeds<br>enveloped in a floss             | ... | 4. GOSSYPIMUM, |
| 2b. Epicalyx lobes linear, or absent ; seeds without floss.                  |     | 3              |
| 3a. Fruits covered with hooked bristles                                      | ... | 13. URENA /    |
| 3b. Fruits smooth or muricate  | ... | 4              |
| 4a. Flowers in contracted head   | ... | 7. MALACHARA   |
| 4b. Flowers solitary or in open inflorescence                                | ... | 5              |

5a. Filaments all along the staminal column. Epicalyx present ;	...	6
5b. Filaments only at the top of the staminal column. Epicalyx absent (except <i>Alcea</i> )	...	10
6a. Flowers less than 3 cm long ; fruit a schizocarp	...	10. PAVONIA
6b. Flowers more than 5 cm long ; fruit a capsule	...	7
7a. Calyx toothed , persistent ; style unbranched	...	12. THESPESIA
7b. Calyx deeply lobed, or if toothed then caducous ; style branched.	...	8
8a. Calyx toothed, splitting on one side, adnate to and falling off with the corolla	...	1. ABELMOSCHUS
8b. Calyx deeply lobed, not splitting, free from corolla and persistent.	...	9
9a. Petals spreading	...	5. HIBISCUS
9b. Petals not spreading	...	9. MALVAVISCUS
10a. Epicalyx present	...	3. ALCEA
10b. Epicalyx absent	...	11
11a. Flowers 2.5 -3 cm across ; carpels 15-22 ; mericarps 2-seeded	...	2. ABUTILON ,
11b. Flowers 0.5-1.5 cm across ; carpels 5-10; mericarps 1-seeded	...	12
12a. Bracteoles present	...	8. MALVASTRUM
12b. Bracteoles absent	...	11. SIDA †
1. ABELMOSCHUS Medic.		
1a. Flowers white to pink	...	1. <i>A. angulosus</i>
1b. Flowers yellow with purple centre.	...	2
2a. Leaves palmately 5-7 lobed	...	3. <i>A. esculentus</i>
2b. Leaves suborbicular-ovate or hastate and crenate dentate	...	2. <i>A. crinitus</i>

1. *Abelmoschus angulosus* Wall ex Wt. & Arn. Prodr. 53.1834 ; Borssum in *Blumea* 14 : 104.1966. *Hibiscus angulosus* (Wt. & Arn.) Steud., Nomencl. ed, 2, 1 : 758.1840 ; Mast. in Hook. f., Fl. Brit. India 1 : 341. 1874.

Undershrubs pubescent. Leaves more or less orbicular 12 × 15 cm, cordate, acuminate, dentate. Flowers axillary, solitary in terminal lobes, racemes. Petals white to pink . Capsule ovoid, beaked , bristly, included in epicalyx.

Occasional. September – December. Sarkar & Bhatta., 678.

2. *Abelmoschus crinitus* Wall., Pl. Asiat. Rar. 1 : 39. t. 44.1830 ; Borssum in *Blumea* 14 : 103 .1966. *Hibiscus cancellatus* Roxb., Fl Indica 3 : 201.1832 ; non L. f., 1781 ; Mast . in Hook . f., Fl. Brit . India 1 : 342 1874 ; Haines , Bot. Bihar & Orissa 1 : 67.1921.

Herbs with bristly-hairy stems and leaves. Lower leaves sub-orbicular ovate, upper leaves hastate, crenate-dentate. Flowers in terminal racemes. Corolla yellow with purplish centre, 5–7 cm long . Capsule oblong -ovoid , 3–4 cm long , covered with yellowish stiff hairs.

Occasional in moist deciduous forests. August–December. Sarkar & Bhatta., 1235.

Roots edible. Herb used for dysentery, also yields a fibre.

3. *Abelmoschus esculentus* (L.) Moench, Meth. Pl. 617. 1794 ; Borssum in *Blumea* 14: 100. 1966. *Hibiscus esculentus* L. Sp. Pl. 696 1753.

Annual hirsute herbs. Leaves 5–7 lobed. Flowers 4–7 cm across, yellow with purple centre. Stigmas purple.

Commonly cultivated. Green fruits used as a vegetable. Sarkar & Bhatta., 593.

## 2. ABUTILON Mill.

- |   |     |                       |
|---|-----|-----------------------|
| 1a. Mericarps 5                                 | ... | 3. <i>A. persicum</i> |
| 1b. Mericarps 15 or more.                       | ... | 2                     |
| 2a. Glandular-pubescent herbs ; mericarps 20–25 | ... | 1 <i>A. hirtum</i>    |
| 2b. Pubescent undershrubs ; mericarps to 18     | ... | 2. <i>A. indicum</i>  |

1. *Abutilon indicum* (L.) Sweet, Hort. Brit ed. 1,54. 1826 ; Mast in Hook. f., Fl. Brit . India 1 : 326.1874 Haines , Bot . Bihar & Orissa 1 : 64.1921. *Sida indica* L. Cent Pl 2. : 26 1756.

Undershrubs, hairy velvety – tomentose. Leaves orbicular-ovate , more or less lobed, 4–7 cm across, acuminate, crenate-dentate Flowers axillary with long peduncle. Calyx small, basally connate. Petals yellowish orange, adnate to

staminal tube. Carpels 18, truncate at tip, stellate hairy. Mericarps attached to the axis only at the base. Dehiscence valvular. Seeds few per mericarp, compressed, ornamented.

Common. Throughout the year. Sarkar & Bhatta., 463.

Roots, leaves and seeds medicinal, also yields a fibre.

2. *Abutilon hirtum* (Lamk.) Sweet, Hort. Brit. ed. 1. 43. 1826; Borssum in *Blumea* 14 : 168. 1966. *Sida hirta* Lamk., *Encycl.* 1 : 7. 1783; *Abutilon graveolens* (Roxb. ex Hornem.) Wt. & Arn. ex Wall. Cat. 13. 1833; Mast. in Hook. f., *Fl. Brit. India* 1 : 327. 1874.

Annual viscid herbs, 1–2 cm high. Leaves suborbicular, cordate, 2–9 × 1–8 cm, more or less dentate or 3-lobed. Flowers orange yellow with a purple blotch, 2.5–3.5 cm across. Mericarps stellate tomentose.

Occasional near Bettiah. August–January. Sarkar & Bhatta., 647.

3. *Abutilon persicum* (Burm f.) Merr. *Philip J. Sci* 19 : 364. 1921; Borssum in *Blumea* 14 : 163. 1966. *Sida persica* Burm f. *Fl. India* 148 t. 47, 1 1768. *S. polyandra* Roxb. *Fl. Indica* 3 : 173. 1832. *Abutilon polyandrum* (Roxb.) Wt. & Arn., *Prodr.* 55. 1834; Mast in Hook. f., *Fl. Brit. India* 1 : 325. 1874; Haines, *Bot. Bihar & Orissa* 1 : 63. 1921.

Suffruticose herbs, to 3 m, glandular, pubescent. leaves ovate–orbicular, cordate, acuminate. Flowers solitary axillary, paniced. Petals yellow. Staminal column short with a ring of hairs at apex. Mericarps awned.

Ramnagar, occasional. May–November. Sarkar & Bhatta., 618.

### 3. ALCEA L

*Alcea rosea* L., *Sp. Pl.* 687. 1753; Whitmore in *Enum. Fl. Pl. Nepal* 2 : 67. 1979. *Althea rosea* (L.) Cav., *Diss.* 2 : 91, t. 28. f. 1. 1786.

Herbs, to 1.5 m high. Leaves cordate–ovate. Flowers in axillary, or terminal racemes; to 6 cm across. Petals coloured. Seeds reniform, ornamented.

Winter season garden ornamental. A native of Greece. Sarkar & Bhatta., 515.

### 4. GOSSYPIMUM L

*Gossypium hirsutum* L., *Sp. Pl.* ed. 2, 2 : 975. 1762. var. *hirsutum* Borssum in *Blumea* 14 : 124. 1966. *G. herbaceum* L., *Sp. Pl.* 693. 1753. var. *hirsutum* (L.) Mast. in Hook. f., *Fl. Brit. India* 1 : 347. 1874.

Shrubs, 1–2.5 m high. Leaves broadly ovate–cordate, 3-lobed. 5–15 cm long. Flowers pale yellow, 4–5 cm across. Capsules ovoid, beaked, 3–4 cm long, 1.5–2 cm across. Seeds with white floss.

Occasionally planted (never in large scale) for its cotton in the villages. Sarkar & Bhatta., 775.

### 5. *HIBISCUS* L., *nom cons*

1a. Leaves deeply lobed ; lobes oblong lanceolate. ...	2
1b. Leaves not, or shallowly lobed. ...	3
2a. Calyx with white arachnoid tomentum ...	1 <i>H. cannabinus</i>
2b. Calyx without the above tomentum ...	4. <i>H. sabdariffa</i>
3a. Leaves shallowly lobed. ...	4
3b. Leaves not lobed, serrate ...	3. <i>H. rosa-sinensis</i>
4a. Herbs or undershrubs ; flowers yellow ...	5. <i>H. vitifolius</i>
4b. Large shrubs, flowers pink-white ...	2. <i>H. multabilis</i>

1. *Hibiscus cannabinus* L., Syst. Nat. ed. 10, 2 : 1149. 1759 ; Mast. in Hook. f. Fl. Brit. India 1 : 339. 1874 ; Haines, Bot. Bihar & Orissa 1 : 70. 1921.

Annual herbs. 0.5–1.5 m high. Lower leaves usually unlobed, upper palmately divided. Flowers axillary, 5–7 cm across, white or yellow with a purple eye. Calyx lobes with a large sessile gland. Capsule ovoid, covered with bristles.

Cultivated for its fibres, also escape. August–November. Sarkar & Bhatta., 648.

2. *Hibiscus mutabilis* L., Sp. Pl. 694. 1753 ; Mast. in Hooker. f., Fl. Brit. India 1 : 344, 1874 ; Haines, Bot. Bihar & Orissa 1 : 70. 1921.

Large shrubs or small trees. Leaves cordate to suborbicular, 5–7-lobed. Flowers large, coloured. Epicalyx lobes 7–10, linear lanceolate. Staminal column shorter than petals.

Common garden ornamental. A native of China. September–November. Sarkar & Bhatta., 461.

3. *Hibiscus rosa-sinensis* L., Sp. Pl. 694. 1753.

Arborescent shrubs. Leaves ovate or ovate-lanceolate, acute or acuminate, serrate. Flowers axillary solitary, showy, coloured. Epicalyx segments 5–7. Staminal column usually exerted far beyond the petals.

Common garden ornamental. Flowers throughout the year. JABA. Sarkar & Bhatta., 750.

4. *Hibiscus sabdariffa* L., Sp. Pl. 695. 1753 ; Mast. in Hook. f., Fl. Brit. India 1 : 340. 1874 ; Haines, Bot. Bihar & Orissa 1 : 70. 1921.

Erect herbs, reddish green, 0.5 – 1.5 m high. Leaves mostly suborbicular, palmately 3–5-lobed. Serrate–dentate. Flowers yellow, to 4 cm across. Calyx fleshy, lobes with a sessile subapical gland. Capsule ovoid, beaked ; seeds with minute stellate hairs.

Cultivated for its fleshy calyx, also escape. September–November. PATWA. Sarkar & Bhatta., 1313.

Fleshy calyx used for jellies and sauces. Leaves, seeds and ripe calyx diuretic, antiscorbutic.

5. *Hibiscus vitifolius* L., Sp. Pl. 696. 1753 ; Mast in Hook. f., Fl. Brit. India 1 : 338. 1874 ; Haines, Bot. Bihar & Orissa 1 : 70. 1921. *Fioria vitifolia* Mattei, Bol. R. Orto. Bot. Paleimo 2:71.1916.

Annual undershrubs, slightly viscid. Upper leaves 3–5 lobed, orbicularovate, 3–5 cm across. Flowers axillary, drooping. Epicalyx segments 6–12, linear. Petals yellow with purple eye. Capsule globose, 1.5 cm across, beaked, winged. Seeds tuberculate.

Common in waste places. September–February. Sarkar & Bhatta., 682.

Yields a fibre used for cordage, twines, ropes etc.

#### 6. KYDIA Roxb.

*Kydia calycina* Roxb., Pl. Cor. t. 215.1811 ; Mast in Hook. f., Fl. Brit. India. 1 : 348.1874 . Haines, Bot. Bihar & Orissa 1 : 76.1921.

Deciduous trees. Leaves suborbicular, sinuately 3-lobed, 5–15 cm across. Flowers white. 1.5–2 cm across. Capsule subtended by a whorl of unequal, spatulate, 10–15 cm long epicalyx lobes.

Common in moist deciduous forests. September–January. Sarkar & Bhatta., 1500.

Wood used for planks, agricultural implements, match–boxes and also yields pulp used for newsprint. Bark yields fibre.

#### 7. MALACHRA L.

*Malachra capitata* L., Syst. Nat. ed 10, 2 : 458.1759 ; Mast. in Hook. f., Fl. Brit. India 1 : 329.1874 . Haines, Bot. Bihar & Orissa 1 : 64.1921.

Leaves 10–15 cm across, toothed ; petioles to 13 cm long. Epicalyx reniform. Flowers yellow. Fruits subglobose, compressed.

Common in waste lands and cultivated fields as weed. Native of S. America. October–March. Sarkar & Bhatta., 1306.

Yields a fibre. Roots and leaves medicinal.

8. MALVASTRUM A. Gray, *nom. cons.*

**Malvastrum coromandelianum** (L.) Gracke in Bonplandia 5 : 295. 1857; Haines, Bot. Bihar & Orissa 1 : 60 1921. *Malva coromandeliana* L. Sp. Pl. 687. 1753. *Malvastrum tricuspdatum* (R. Br.) A. Gray, Pl. Wright. 1 : 16.1852 ; Mast. in Hook. f., Fl. Brit. India 1 : 321.1875.

Woody herbs. Leaves ovate to ovate-lanceolate, 5 – nerved 5 × 3 cm, dentate, truncate. Flowers axillary, solitary, yellow, 1.2 – 1.4 cm in diam.; pedicels 0.5–1.3 cm. Epicalyx lobes linear-lanceolate. Calyx 0.7-1 cm long, lobes triangular, acute, persistent. Corolla rotate. Staminal column shorter than corolla. Mericarps awned.

Common in waste places. July— November. Sarkar & Bhatta., 371.

Decoction given in dysentery. Stems yield a fibre, also used for making brooms.

## 9. MALVAVISCUS Cav.

**Malvaviscus arboreus** Cav., Diss. 3 : t. 48. f. 1 : 1787; Bailey, Manu. Cult. Pl. 661.1949.

Tall shrubs. Leaves 3-lobed, acuminate, cordate at base. Flowers solitary, never fully expanding. Petals scarlet, convolute.

Garden ornamental. Native of South America. Throughout the year. Sarkar & Bhatta., 1697.

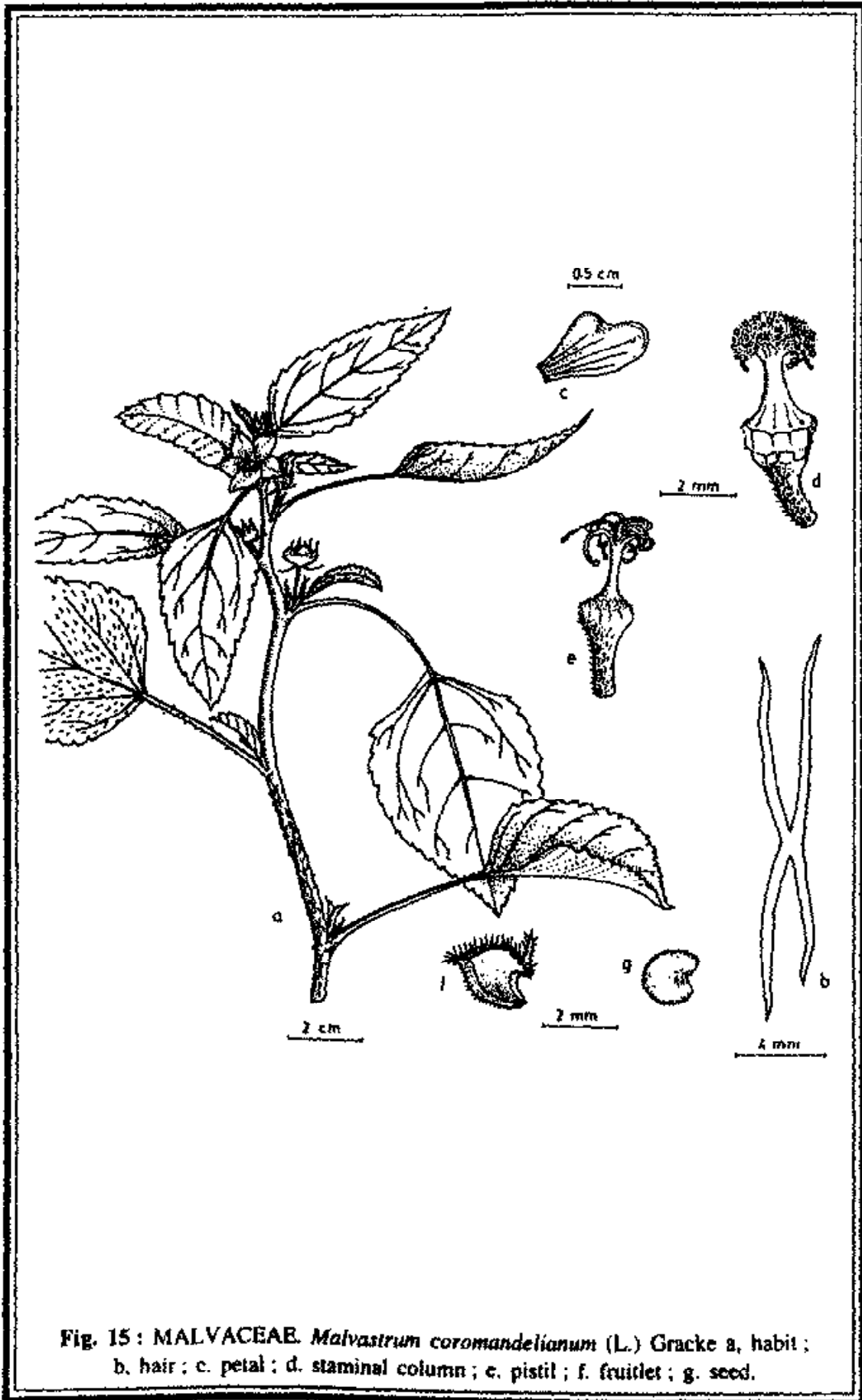
10. PAVONIA Cav., *nom. cons.*

**Pavonia repanda** (Roxb. ex J.E.Sm.) Spreng., Syst. 3 : 98. 1826 ; Borssum in Blumea 14 : 135,137.1966. *Urena repanda* Roxb. ex J. E. Sm. in Rees. Cyclop. 37. n. 6.1819 ; Mast, in Hook. f., Fl. Brit. India 1 : 330. 1874; Haines, Bot. Bihar & Orissa 1 : 65.1921.

Undershrubs, upto 1.25 m tall, stellate hairy. Leaves lobed, palminerved, cordate-dentate. Flowers in axillary racemes. Bracteoles linear. Calyx linear-oblong. Carpels smooth. Seeds smooth, brown.

Occasional as weed in sugarcane fields. September–December. Sarkar & Bhatta., 1583.

Yields fibre. Roots, and barks used in hydrophobia.



11. SIDA L.

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Leaves cordate at base.  | ... | 2                        |
| 1b. Leaves cuneate to truncate at base.                              | ... | 3                        |
| 2a. Flowers white or creamy ; mericarps 8-10-<br>awned ; cocci 10    | ... | 3. <i>S. cordifolia</i>  |
| 2b. Flowers yellow ; mericarps with very short<br>awn, cocci 5       | ... | 2. <i>S. cordata</i>     |
| 3a. Leaves hoary or stellate beneath,<br>usually rhomboid or obovate | ... | 4. <i>S. rhombifolia</i> |
| 3b. Leaves glabrous beneath, linear-lanceolate<br>or oblong          | ... | 1. <i>S. acuta</i>       |

1. *Sida acuta* Burm. f., Fl. Indica 147.1768 ; Haines, Bot. Bihar & Orissa 1 : 63.1921. *S. carpinifolia* Mast. in Hook. f., Fl. Brit. India 1 : 323.1874 ; non Linn. f., 1781.

Weak undershrubs ; stems woody, to 75 cm long. Leaves lanceolate or ovate-lanceolate, 3-5 × 0.5-1.3 cm, acute to acuminate, serrate. Peduncle short. Flowers yellow. Calyx lobes triangular, acute. Mericarps 5-6, to 0.25 cm long, awned.

Common in waste lands, and of cultivated fields. Pantropical. August-December. Sarkar & Bhatta., 459, 1043.

Barks used as minor fibre and the plant as broom. Leaves and roots medicinal.

2. *Sida cordata* (Burm. f.) Borssum in Blumea 14 : 182.1966 ; Bennet, Fl. Howrah 236.1979. *Melochia cordata* Burm. f., Fl Indica 143.1768. *Sida humilis* Cav., Diss. 5. t. 134. f. 2. 1788 ; Mast. in Hook. f., Fl. Brit India 1 : 322.1874. var. *veronicifolia* Mast. l.c. *S. veronicifolia* Lam., Encycl. 1 : 5.1783.

Small spreading herbs, hairy and sometimes viscid. Leaves suborbicular to ovate, 1 - 2.5 cm long, acute-acuminate, dentate, cordate. Flowers axillary, usually solitary ; peduncle upto 5 cm long. Cocci 2-toothed, hairy.

Common. Pantropical. July - December, sometimes throughout the year. Sarkar & Bhatta., 598.

Tonic and astringent, used in fevers and urinary complaints. Root-bark used in leucorrhoea, micturition and gonorrhoea.

3. *Sida cordifolia* L., Sp. Pl. 684. 1753 ; Mast. in Hook. f., Fl. Brit. India 1 : 324.1874 ; Haines, Bot. Bihar & Orissa 1 : 61.1921.

Undershrubs, tomentose. Leaves ovate-orbicular, 5.5 × 3.5 cm, acute or rounded crenate-dentate, cordate, stipules setaceous. Flowers axillary, solitary or in few-flowered raceme; peduncle 2.5 cm long. Calyx segments acute. Carpels hairy, reticulate, 2-awned, awns with retrorse hairs.

Common. August-December. KUNGYI. Sarkar & Bhatta., 510.

Yields fibre as substitute for jute. Leaves demulcent and febrifuge, also used in dysentery. Roots astringent, diuretic and tonic.

4. *Sida rhombifolia* L., Sp. Pl. 684.1753 ; Mast. in Hook. f., Fl. Brit. India 1 : 323.1874. p.p. ; Haines, Bot. Bihar & Orissa 1 : 61.1921.

Herbs or undershrubs, pubescent. Leaves rhomboid or obovate, 1-5 × 0.5-4 cm, white pubescent, beneath, acute, crenate, cuneate, basally 3-nerved. Flowers axillary ; pedicel slender. Calyx lobes triangular, acute, hairy. Carpels 5-9, awned.

Common. August-December. LAL BERELA. Sarkar & Bhatta., 1044, 1832.

Used in rheumatism and tuberculosis. Leaves as well as roots contain ephedrine.

## 12. *THESPESIA* Soland. ex Corrêa, *nom. cons.*

- |   |     |                       |
|---|-----|-----------------------|
| 1a. Shrubs ; leaves usually palmately lobed | ... | 1. <i>T. lampas</i>   |
| 1b. Trees ; leaves entire                   | ... | 2. <i>T. populnea</i> |

1. *Thespesia lampas* (Cav.) Dalz. ex Dalz. & Gibs. ; Bombay Fl. 19.1861; Mast. in Hook. f. Fl. Brit. India 1 : 345.1874 ; Haines, Bot. Bihar & Orissa 1 : 73.1921. *Hibiscus lampas* Cav., Diss. 3 : 154, t. 56. f. 2.1787.

Shrubs to 2 m high. Leaves orbicular to triangular, 3-lobed, 12-15 × 7-10 cm, acute-acuminate, cordate or truncate. Flowers terminal in a few flowered raceme. Epicalyx 6-lobed. Calyx persistent. Corolla yellow with blackish-purple centre. Capsule 3-5-valved, woody, loculicidal. Seeds triangular to reniform, smooth, deep-brown.

Bhikhna Thori, Madanpur, July – December, Sarkar & Bhatta. 215.

2. **Thespesia populnea** (L.) Soland. ex Correa, Ann. Mus. Natl. Hist. Nat. 9 : 290, t. 8, f. 1. 1807 ; Mast. in Hook. f., Fl. Brit. India 1 : 345.1874; Haines, Bot. Bihar & Orissa 1 : 73.1921. *Hibiscus populneus* L., Sp. Pl. 794, 1753.

Leaves ovate, 8–11 × 5–6 cm, acuminate, entire, cordate at base. Flowers axillary, solitary, showy. Capsule globose, to 2.2 cm across, covered with scales.

Avenue tree, often cultivated. October. Sarkar & Bhatta., 460.

Wood used for agricultural implements. Bark, leaves, flowers and fruits used in cutaneous affections. Seeds purgative, also yield a fatty oil.

### 13. URENA L.

1a. Leaves not divided below the middle ... 1. *U. lobata*

1b. Leaves divided below the middle ... 2. *U. sinuata*

1. **Urena lobata** L., Sp. Pl. 692.1753 ; Mast. in Hook. f., Fl. Brit. India 1 : 329, 1874 ; Haines, Bot. Bihar & Orissa 1 : 65. 1921.

Undershrubs. Leaves sub-orbicular or shallowly lobed, 5–10 cm across. Flowers axillary solitary, to 1.5 cm across.

Common along roadsides. August–December. Sarkar & Bhatta., 1060.

Yields a fibre known as Aramina fibre or Congo jute, used as jute. Roots diuretic. Decoctions of stems and roots used for flatulent colic.

2. **Urena sinuata** L., Sp. Pl. 692.1753 ; Mast. in Hook. f., Fl. Brit. India 1 : 329.1874 ; Haines, Bot. Bihar & Orissa 1 : 65.1921.

Undershrubs. Leaves orbicular-ovate, palmately lobed, lobes 5, serrate. Flowers to 2 cm across, pink. Carpels glochidiate.

In waste places and wet deciduous forests. August–November. Sarkar & Bhatta., 774.

Yields fibre. The fibre is resistant to damage by termites and water. Leaves used in inflammation of intestine and bladder.

## XXXIX . LECYTHIDACEAE

- 1a. Flowers in pendulous racemes ; fruit 1-seeded ... 1. BARRINGTONIA  
 1b. Flowers in short spikes ; fruit many-seeded ... 2. CAREYA

1. BARRINGTONIA J. R. & G. Forst., *nom. cons.*

**Barringtonia acutangula** Gaertn., Fruct. 2 : 97.1791; Cl. in Hook. f., Fl. Brit. India 2 : 508.1879 ; Haines, Bot. Bihar & Orissa 2 : 384.1922.

Leaves ovate-oblong, 8-14 × 3-6 cm, subacute or rounded. Racemes slender, 10-30 cm long. Flowers fragrant, yellowish-scarlet. Calyx persistent. Fruit to 2 cm long.

Bettiah. September-November. HIZAL. Sarkar & Bhatta., 428.

Bark, root and seeds employed as fish-poison. Powdered seed used as an emetic and expectorant.

2. CAREYA Roxb., *nom. cons.*

- 1a. Trees ; flowers sessile ... 1. *C. arborea*  
 1b. Undershrubs ; flowers stalked ... 2. *C. herbacea*

1. **Careya arborea** Roxb., Pl. Cor. t. 218.1811 ; Cl. in Hook. f., Fl. Brit. India 2 : 510.1879 ; Pl. 1: 357 ; Haines, Bot. Bihar & Orissa 2 : 383.1922.

Deciduous trees ; bark dark brown. Leaves obovate, 10-30 × 5-15 cm, crenate denticulate, obtuse or shortly acuminate. Flowers yellowish-white. Fruits 4-8 cm across, many-seeded.

Occasional in the forest area. April - June. KUMBI. Sarkar & Bhatta., 421.

Timber used for agricultural implement.

2. **Careya herbacea** Roxb. Pl. Cor. 3 : 13.1811 ; Cl. in Hook. f. Fl. Brit. India 2 : 511.1879 ; Haines, Bot. Bihar & Orissa 2 : 383.1922.

Undershrubs, root-stock woody. Leaves obovate or oblanceolate, serrulate. Flowers terminal, greenish purple.

Haines (*l.c.*) reported the plant from open grass lands of Champaran. March-April. Haines 772 (CAL!).

**XL. FLACOURTIACEAE**

- |   |     |               |
|---|-----|---------------|
| 1a. Fruit a berry ; flowers unisexual.                  | ... | 2             |
| 1b. Fruit a loculicidal capsule ; flowers bisexual      | ... | 1. CASEARIA   |
| 2a. Ovary incompletely 2-8-locular;<br>styles 2 or more | ... | 2. FLACOURTIA |
| 2b. Ovary 1-locular ; style 1                           | ... | 3. XYLOSMA    |

**1. CASEARIA Jacq.**

- |                      |     |                         |
|----------------------|-----|-------------------------|
| 1a. Leaves tomentose | ... | 1. <i>C. elliptica</i>  |
| 1b. Leaves glabrous  | ... | 2. <i>C. graveolens</i> |

1. **Casearia elliptica** Willd., Sp. Pl. 2 : 628.1799 ; Whitmore in Enum. Flow. Pl. of Nepal 2 : 48.1979. *C. tomentosa* Roxb., Fl. Indica. 2 : 421.1832 ; Cl. in Hook. f., Fl. Brit. India 2 : 592.1879 ; Haines, Bot. Bihar & Orissa 1 : 40.1921.

Medium trees. Leaves distichous, elliptic-oblong, 7.5-19.5 × 2.5 - 6.5 cm, subentire, tomentose. Capsule ellipsoid, 2.4 × 1.5 cm, yellowish-green when ripe. Seeds globose, to 0.3 cm across ; aril scarlet.

Common along the sal forests. March-June. Sarkar & Bhatta., 503, 1157, 1492.

Fruits used for poisoning fish.

2. **Casearia graveolens** Dalz. in Hook., J. Bot, 4 : 197.1852 ; Cl. in Hook. f., Fl. Brit. India 2 : 592.1879 ; Haines, Bot. Bihar & Orissa 1 : 40.1921.

Shrubs or small trees. Leaves elliptic-oblong or ovate, 13-14.5 × 4.5-5.2 cm, crenulate. Flowers to 0.5 cm across. Capsule to 1.7 cm long, yellow when ripe.

Common as the previous. May-June. CHILLA. Sarkar & Bhatta., 236.

Uses as the previous.

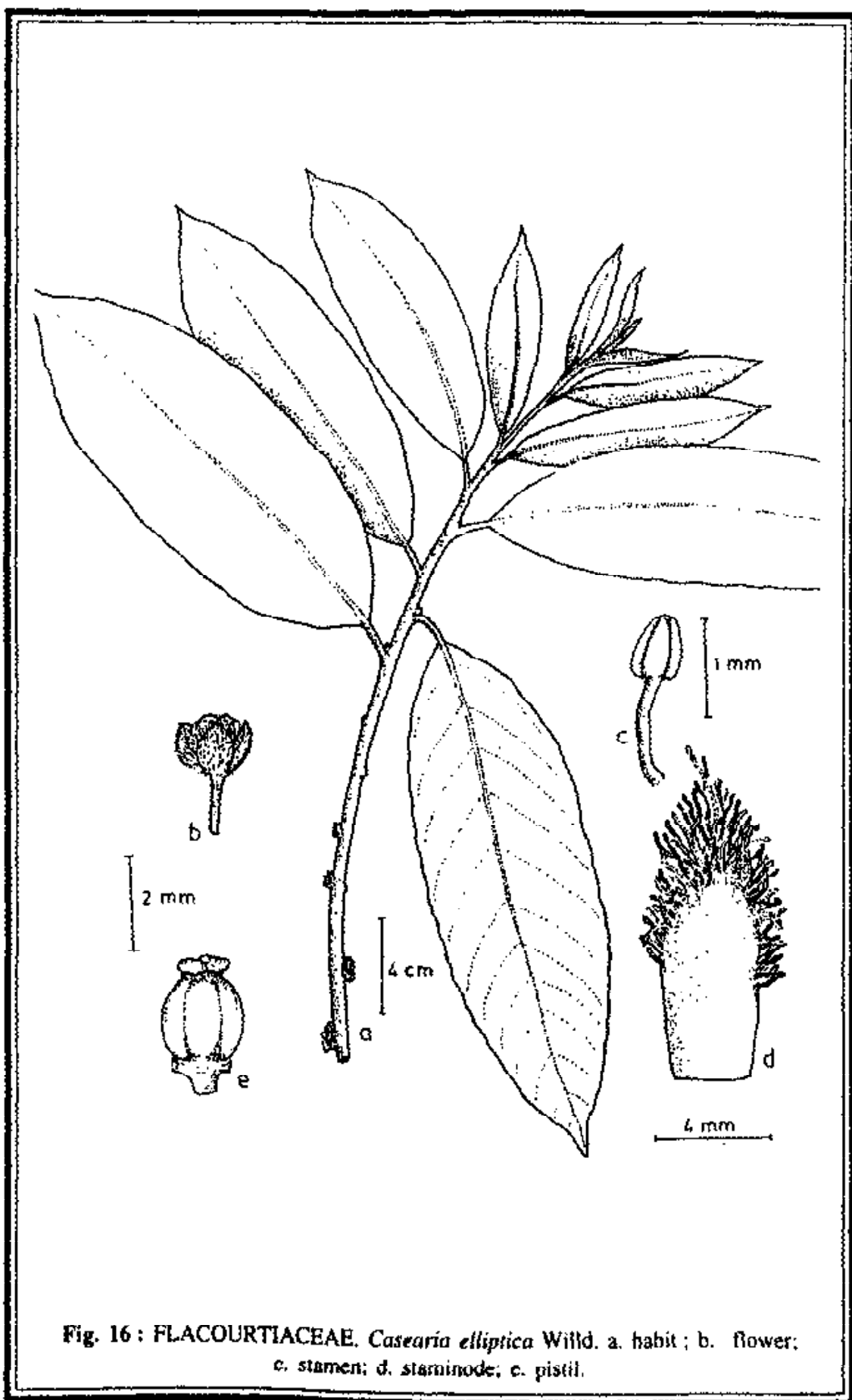


Fig. 16 : FLACOURTIACEAE. *Casearia elliptica* Willd. a. habit ; b. flower ;  
c. stamen ; d. staminode ; e. pistil.

2. *FLACOURTIA* L' Hér.

- 1a. Shrubs or small trees ; spines leafy ;  
leaves up to 2 cm long ... 1. *F. indica*
- 1b. Small trees ; spines not leafy ; leaves larger ... 2. *F. ramontchi*

1. *Flacourtia indica* (Burm. f.) Merr., Interp. Rumph. Herb. Amb. 377.1917 ; Fosberg in Kew Bull. 29 : 254. 1974. *Gmelina indica* Burma. f., Fl. Indica. 132. t. 39. f. 5.1768. *Flacourtia sepiaria* Roxb., Pl. Cor. 1 : 48. t. 68.1796 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 194.1872 ; Haines, Bot. Bihar & Orissa 1 : 37.1921.

Leaves obovate,  $1.8 \times 1.3$  cm ; leaves on spines smaller. Berry to 0.6 cm across, purplish green ; stalk to 0.6 cm long.

Along the dry deciduous forests. February–May. KANJU, BAINCHI. Sarkar & Bhatta., 640.

Fruits eaten.

2. *Flacourtia ramontchi* L'Hér. Stirp. Nov. 3 : 59.1785 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 193.1872 ; Haines, Bot. Bihar & Orissa 1 : 38.1921 ; Fosberg in Kew Bull. 29 : 254.1974.

Leaves ovate or ovate-orbicular,  $5.7 - 6.7 \times 3.8 - 4.9$  cm. Berry to 0.5 cm across.

In the dry deciduous forestes. February – May. BÉNGHI. Sarkar 414.

Fruits eaten. Wood used for agricultural implements.

Note : Sleumer in Fl. Males. (1954) treated *F. indica* (Burm. f.) Merr. & *F. ramontchi* L'Hér. as conspecific.

3. *XYLOSMA* G. Forst., *nom. cons.*

*Xylosma longifolia* Clos, in Ann. Sc. Nat. Ser. 4, 8 : 230.1857 ; Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1:194. 187.1872 ; Haines, Bot. Bihar & Orissa 1 : 39.1921.

Trees to 3 m high. Spines on the basal portion of the trunk to 8 cm long, branched and sharply pointed. Leaves lanceolate,  $13-16.5 \times 4-4.7$  cm, obtusely serrate. Fruits 0.4–0.5 cm across, scarlet.

Sandstone hills, not very common. November – April. Sarkar & Bhatta., 1681.

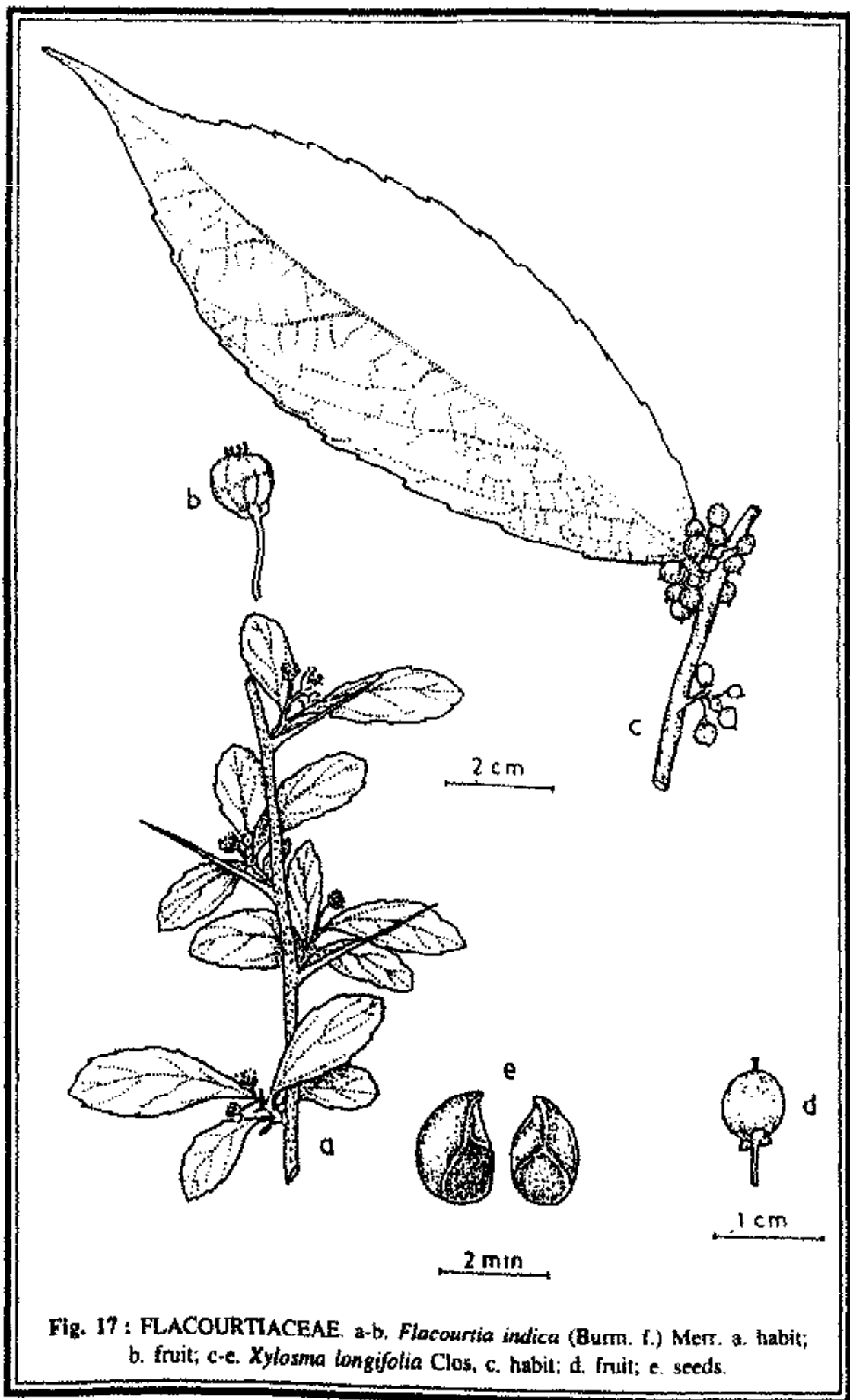


Fig. 17 : FLACOURTIACEAE. a-b. *Flacourtia indica* (Burm. f.) Merr. a. habit; b. fruit; c-e. *Xylosma longifolia* Clos, c. habit; d. fruit; e. seeds.

Wood used for house-posts and fences. Extract of tender leaves produces opium-like effect.

### XLI. VIOLACEAE

- 1a. Lower petal nearly rounded at apex ; seeds striate ... 1. *HYBANTHUS*  
 1b. Lower petal deeply emarginate at apex ; ... 2. *VIOLA*  
 seeds smooth

#### 1. *HYBANTHUS* Jacq., *nom. cons.*

*Hybanthus enneaspermus* (L.) F. Muell. Fragm. Phyt. Austr. 10 : 81.1876 ; Tennant in Kew Bull. 16 : 431.1963. *Viola enneasperma* L., Sp. Pl. 937.1753 ; *Ionidium heterophyllum* Vent., Jardin Malm. t. 27.1803 ; Hook. f., Fl. Brit. India 1 : 185.1872 ; *Hybanthus suffruticosus* (L.) Bajll., Bot. Med. 2 : 841.1884 ; Haines, Bot. Bihar & Orissa. 1 : 34.1921.

Perennial, fruticose, diffuse herbs ; branches ascending, 5–20 cm long. Leaves linear-lanceolate, serrate, 7–35 × 2–6 cm. Corolla pink, lowest petal largest with claw and ovate, broad limb. Capsule globose, 0.5–0.6 cm across, 9–12-seeded.

Common in waste lands and forest floors. August–February. Sarkar & Bhatta., 1141.

Leaves and roots medicinal.

#### 2. *VIOLA* L.

*Viola tricolor* L., Sp. Pl. 937.1753 ; Bailey, Manu. Cult. Pl. 638.1949.

Leaves radical, sagittate or hastate, crenulate. Flowers variously coloured. Garden pansy.

December—March. Sarkar & Bhatta., 766.

### XLII. TAMARICACEAE

#### TAMARIX L.

- 1a. Shrubs ; leaves sheathing, amplexicaul ;  
 stamens 10 ... 1. *T. ericoides*  
 1b. Small trees ; leaves not sheathing and  
 amplexicaul ; stamens 5 ... 2. *T. indica*

1. *Tamarix ericoides* Rottl. in Ges. Naturf. Fr. Berl. Neue Schr. 4 : 214.1803 ; Dyer in Hook. f., Fl. Brit. India 1 : 1874 ; Haines, Bot. Bihar & Orissa 1 : 52.1921.

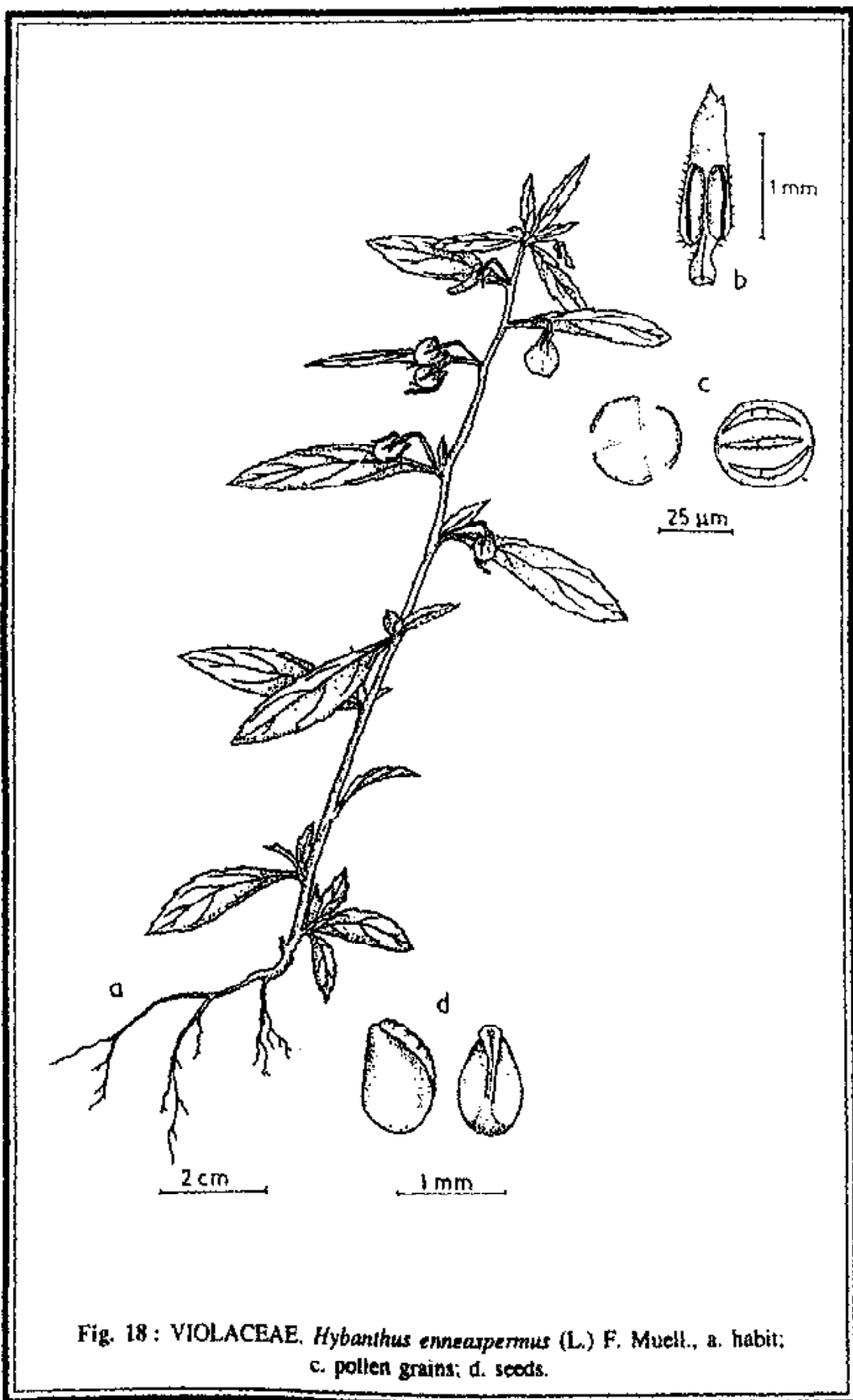


Fig. 18 : VIOLACEAE. *Hybanthus enneaspermus* (L.) F. Muell., a. habit; c. pollen grains; d. seeds.

Branches crowded. Leaves glaucous. Racemes dense-flowered. Flowers to 0.6 cm long. Capsule to 0.9 cm long.

Probably occurring in the northern area. India. October. JHAU. Shetty 304. (CAL!).

2. **Tamarix indica** Koen. ex Willd. in Ges. Naturf. Fr. Berl. Neue Schr., 4:214.1803. Haines, Bot. Bihar & Orissa 1:53.1921; *T. gallica* auct. pl. non L. 1753; Dyer in Hook. f., Fl. Brit. India 1:248.1878.

Branches slender, drooping. Leaves imbricate on growing twigs. Racemes terminal, paniced. Flowers to 0.1 cm across. Petals longer than sepals. Ovary trigonous; styles 3. Capsule to 0.3 cm across.

Common in the sandy river beds. August–September. JHAU. Sarkar & Bhatta., 287.

### XLIII. TURNERACEAE

#### TURNERA L.

**Turnera ulmifolia** L., Sp. Pl. 271.1753; Haines, Bot. Bihar & Orissa 2 : 401.1922.

Shrubs. Leaves elliptic–lanceolate, serrate, with 2 glands on petiole. Capsule subglobose. Seeds brownish.

An escape of cultivation. Native of America. March–June. Sarkar & Bhatta. 1903.

### XLIV. PASSIFLORACEAE

#### PASSIFLORA L.

1a. All leaves palmately 3 – lobed ; flowers to 3 cm across ... 1. *P. foetida*

1b. All leaves not palmately lobed ; flowers to 1 cm across ... 2. *P. suberosa*

1. **Passiflora foetida** L., Sp. Pl. 959.1753; Hook. f., Fl. Brit. India 2 : 599.1879; Haines, Bot. Bihar & Orissa 2 : 402.1922.

Foetid herbs. Leaves 3–lobed, petioles and leaf margins with glandular hairs; stipules laciniate. Flowers solitary. Involucral bracts filiform–pectinate, glandular. Berry globose, within involucral bracts, 1.5 cm across.

Occasionally in waste lands. Tropical America. August–December. Sarkar & Bhatta., 339 ; Sarkar 961.

Ripe fruits edible.

2. *Passiflora suberosa* L., Sp. Pl. 969.1753 ; Hook. f., Fl. Brit. India 2 : 599.1879.

Leaves palmately lobed or ovate–elliptic. Inflorescence cymose. Petals absent. Bracts not forming involucre. Berries 0.7–1 cm across. Ripe fruits blackish–violet.

Common in waste places. September–March. Sarkar & Bhatta., 877.

## XLV. CARICACEA

### CARICA L.

*Carica papaya* L., Sp. Pl. 1036. 1753 ; Hook. f., Fl. Brit. India 2 : 599.1879.

Cultivated for its fruits. Native of S. America. Fl. & Fr. : all round the year. PAPIYA. Sarkar & Bhatta., 1733.

## XLVI. CUCURBITACEAE

1a. Ovules horizontal ; stamens 3.	...	2
1b. Ovules pendulous ; stamens 5.	...	1. ACTINOSTEMMA
2a. Anther-cells flexuous or conduplicate.	...	3
2b. Anther-cells straight or curved, not conduplicate.	8	
3a. Corolla rotate.	...	4
3b. Corolla campanulate divided	...	2. COCCINEA
4a. Corolla lobes fimbriate along their margins	...	9. TRICHOSANTHES
4b. Corolla lobes with entire margins	...	5
5a. Calyx tube of male flower elongated	...	4. GYMNOPETALUM
5b. Calyx tube of male flower short.	...	6

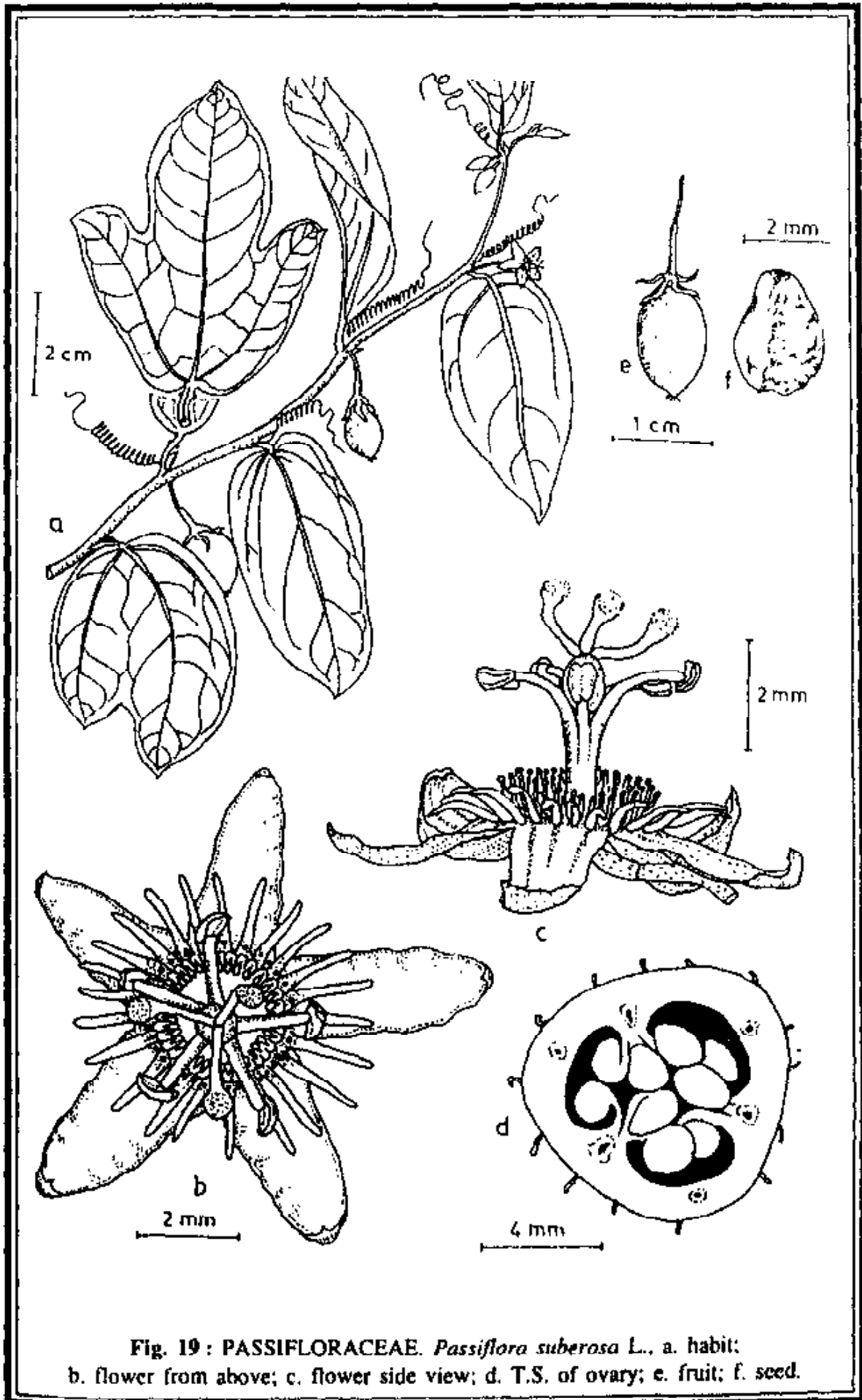


Fig. 19 : PASSIFLORACEAE. *Passiflora suberosa* L., a. habit; b. flower from above; c. flower side view; d. T.S. of ovary; e. fruit; f. seed.

- |   |     |              |
|---|-----|--------------|
| 6a. Stamens inserted at the mouth of the calyx tube ;<br>anthers free                     | ... | 5. LUFFA     |
| 6b. Stamens inserted below the mouth of the calyx<br>tube ; anthers more or less coherent | ... | 7            |
| 7a. Calyx with 2-3 scales at its base ; male<br>flowers with large enveloping bracts      | ... | 7. MOMORDICA |
| 7b. Calyx without basal scales ; bracts absent  | ... | 3. CUCUMIS   |
| 8a. Plants monoecious   | ... | 8. MUKIA     |
| 8b. Plants dioecious  | ... | 6. MELOTHRIA |

### 1. ACTINOSTEMMA Griff.

**Actinostemma tenerum** Griff., Pl. Cantor. 24. t. 3.1837 ; Cl. in Hook. f., Fl. Brit. India 2 : 633.1879 (excl. syn).

Tendrils bifid. Leaves narrowly ovate, 4-8 × 2-4 cm, sagittately 3-lobed, denticulate. Fruit ovoid, 2-1.2 cm. Seeds broadly ovate.

Along grasslands on medium shrubs. December. Sarkar & Bhatta., 229. 230.

### 2. COCCINEA Wt. & Arn.

**Coccinea grandis** (L.) Voigt, Hort. Suburb. Calc. 59,1845 ; Bhandari, Fl. India. Des. 163. 1978. *Bryonia grandis* L., Mant. 1 : 126.1767. *Coccinea indica* Wt. & Arn., Prodr. 1 : 347.1834 ; *Cephalandra indica* Naud., Ann. Sc. Nat. Ser. 5.5 : 16.1859; Cl. in Hook. f., Fl. Brit.India 2 : 621.1879 (Excl. syn.) ; Haines, Bot. Bihar & Orissa 2 : 417.1922.

Leaves entire or palmately lobed, to 8 cm long. Male flowers to 3 cm across. Corolla white. Fruits oblong, rounded at both ends, 5 × 2.5 cm, red when ripe.

Common. Fl. & Fr. throughout the year. KUNDRI, TELAKUCH. Sarkar & Bhatta., 778.

Roots, stems and leaves are used in indigenous medicine.

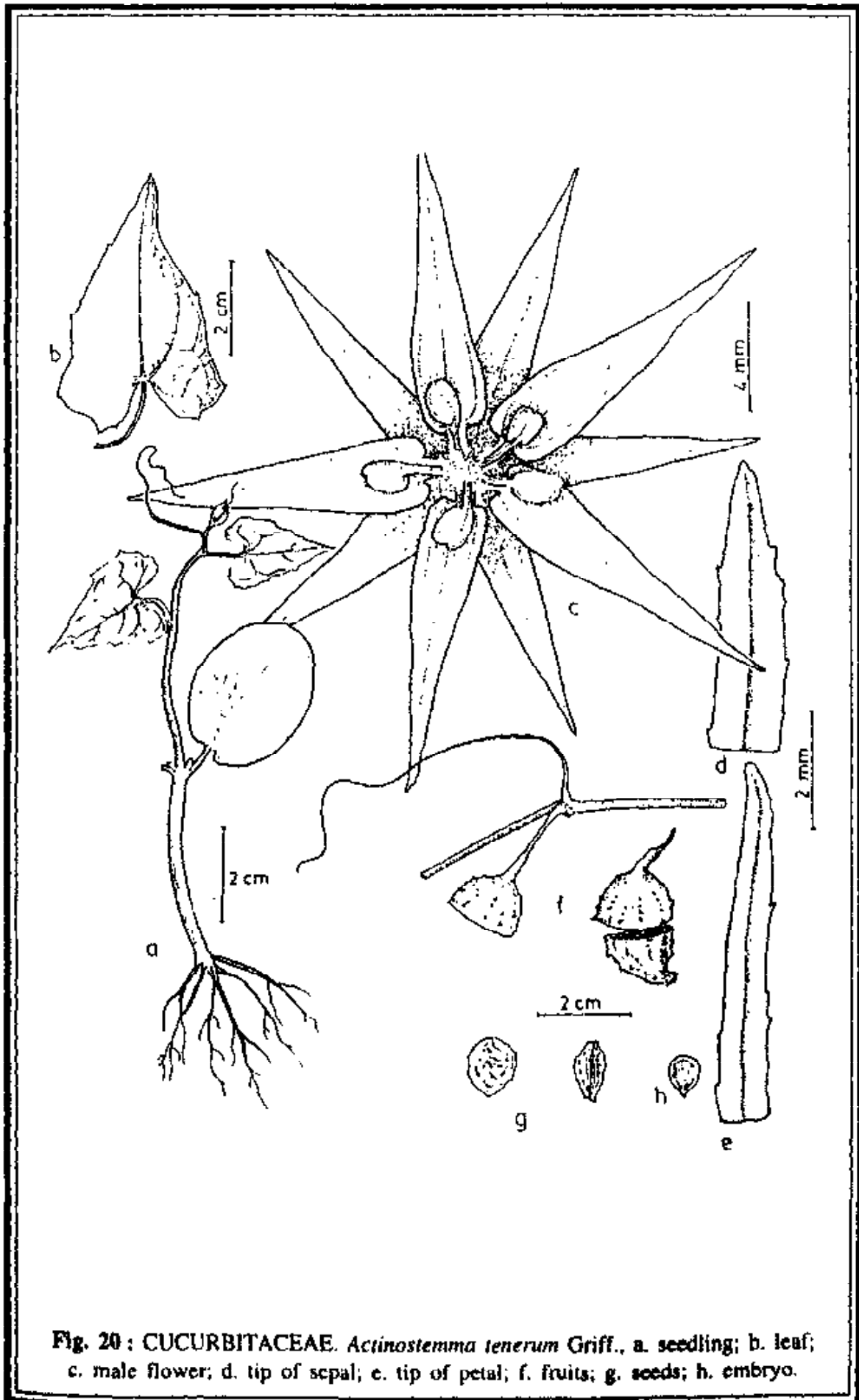


Fig. 20 : CUCURBITACEAE. *Actinostemma tenerum* Griff., a. seedling; b. leaf; c. male flower; d. tip of sepal; e. tip of petal; f. fruits; g. seeds; h. embryo.

## 3. CUCUMIS L.

**Cucumis callosus** (Rottl.) Cogn. in Engl., Das Pflanzenr. 4. 275. 2 : 129. 1924. Chakravarty, Fasc. Fl. India II : 31.1982. *Bryonia callosa* Rottl., Neue Schrift. Ges. Nat. Freunde. Zur. Berlin 4 : 210.1803 *Cucumis trigonus*. Roxb., Fl. Indica 2 : 722. 1824 ; Cl. in Hook. f., Fl. Brit. India 2 : 619. 1879 ; Haines, Bot. Bihar & Orissa 2 : 409.1922.

Leaves suborbicular, lobed, to 5 cm broad. Flowers to 0.6 cm long. Fruits ellipsoid-globose, 3-4 cm long, pungent, greenish yellow with greyish stripes.

In waste lands. July - January. Sarkar & Bhatta., 1187.

Pulp of fruits and decoction of roots used as a purgative.

## 4. GYMNOPTALUM Arn.

**Gymnopetalum cochinchinense** (Lour.) Kurz in J. As Soc. Beng. 40 : 57.1871; Cl. in Hook. f., Fl. Brit. India 2 : 611.1879 ; Haines, Bot. Bihar & Orissa 2 : 406.1922. *Bryonia cochinchinensis* Lour., Fl. Cochinch. 595.1790.

Leaves suborbicular, 5-angular or deeply 5-lobed, to 6 cm long, minutely denticulate. Flowers white. Fruit 5 × 2-3 cm, red when ripe.

On roadside hedges. September-October. Sarkar & Bhatta., 1464.

The fruit is said to be poisonous. Roots and leaves medicinal.

## 5. LUFFA Mill.

**Luffa cylindrica** (L.) Roem., Fam. 2 : 63.1846 ; Chakravarty, Fasc. Fl. India II : 70.1982. *Momordica cylindrica* L., Sp. Pl. 1009.1753. *Luffa aegyptiaca* Mill., Dict. ed. 4 : 500.1785 ; Cl. in Hook. f., Fl. Brit., India 2 : 614.1879 ; Haines, Bot. Bihar & Orissa 2 : 414.1922.

Leaves suborbicular, to 20 cm across, palmately 5-lobed. Flowers yellow. Pollen grains 3-colporate, suborbicular. Fruit subcylindric, not angular, 15-40 × 6-8 cm. Seeds ovate, to 1 cm long.

Cultivated and self-sown. July - December. GHEONRA, DHUNDUL. Sarkar & Bhatta., 374.

Tender fruits are used as vegetable. Fibrovascular bundles of ripe fruits produce bath-sponge.

6. *Melothria* L.

***Melothria heterophylla*** (Lour.) Cogn. in DC., Monog. Phan. 3 : 618.1881; Haines, Bot. Bihar & Orissa 2 : 407.1922. *Solena heterophylla* Lour., Fl. Cochinch. 1 : 514.1790. *Zehneria umbellata* Thw., Enum. Pl. Zeyl. 125.1853; Cl. in Hook. f., Fl. Brit. India 2 : 625.1879, *p.p.*

Leaves coriaceous, extremely polymorphic, lanceolate, ovate, oblong or sub-orbicular, undivided or variously lobed, 5 – 20 cm long. Flowers yellow, small. Fruits 4–5 × 2 cm.

On hedges near villages. September–November. Sarkar & Bhatta. 1021. Roots medicinal.

7. *Momordica* L.

1a. Plants monoecious ; fruit muricate ... 1. *M. charantia*

1b. Plants dioecious ; fruit echinate ... 2. *M. dioica*

1. ***Momordica charantia*** L., Sp. Pl. 1009.1753 ; Cl. in Hook. f. Fl. Brit. India 2 : 618.1879 ; Haines, Bot. Bihar & Orissa 2 : 412. 1922.

Leaves reniform or suborbicular, to 10 cm broad, deeply 5–7-lobed; lobes dentate or lobulate. Flowers yellow. Fruits 4–6 cm long (in the wild form), bitter.

Cultivated and wild near villages. May – October. UCHCHHE. Sarkar & Bhatta., 980, 1220.

Fruits eaten as a vegetable, considered medicinal.

2. ***Momordica dioica*** Roxb. ex Willd., Sp. Pl. 4 : 605.1805 ; Cl. in Hook. f., Fl. Brit. India 2 : 617.1879 (excl. syn.) ; Haines, Bot. Bihar & Orissa 2 : 412.1922.

Leaves ovate, 4–10 × 3–8 cm, entire or lobed. Flowers yellow. Fruits ovoid, to 5 cm long, pointed at both ends.

In waste lands. June–October. KAKSA, KAKROL. Sarkar & Bhatta., 933.

Fruits eaten as a vegetable. Mucilaginous tuber is used medicinally against bleeding of piles.

8. *Mukia* Arn.

*Mukia maderaspatana* (L.) Roem., Fam. 47.1846 ; Haines, Bot. Bihar & Orissa 2 : 408.1922. Jeffrey in Kew Bull. 34 : 794.1980. *Cucumis maderaspatanus* L., Sp. Pl. 1012.1753. *Mukia scabrella* (L.f.) Arn. in Hook. J. Bot. 3 : 276.1841; Cl. in Hook. f., Fl. Brit. India 2 : 623.1879 (excl. syn.) ; *Melothria maderaspatana* (L.) Cogn. in DC., Monogr. 3 : 623.1881; Chakravarty, Fasc. Fl. India II : 83.1982.

Leaves ovate-deltoid, angular or lobed, 4-15 × 3-13 cm, denticulate. Flowers yellow. Fruits globose, to 1 cm across, scarlet when ripe.

In waste places. June - December. Sarkar & Bhatta., 1467.

Roots and tender shoots medicinal.

Note : Chakravarty (l.c.) treated *Mukia* Arn. (1840) as congeneric with *Melothria* L. (1753)

9. *Trichosanthes* L.

1a. Fruits elliptic - oblong ... 1. *T. cucumerina*

1b. Fruits ovoid ... 2. *T. tricuspidata*

1. *Trichosanthes cucumerina* L., Sp. Pl. 1008.1753 ; Cl. in Hook. f., Fl. Brit. India 2 : 609.1879 ; Haines, Bot. Bihar & Orissa 2 : 405.1922.

Leaves broadly ovate or reniform, to 10 cm long, 5-7-lobed, denticulate. Fruits to 6 cm long. scarlet when ripe, 8-10-seeded.

In waste places. June-October. BAN CHICHINGA. Sarkar & Bhatta., 1022.

Fruits bitter, not suitable as a vegetable.

2. *Trichosanthes tricuspidata* Lour., Fl. Cochinch. 569.1790.; Hara & Sutton, Enum. Fl. Pl. Nepal 2 : 180.1979. *T. palmata* Roxb., Fl. Indica 3 : 704.1832; Cl. in Hook. f., Fl. Brit. India 1 : 606.1879 ; Haines, Bot. Bihar & Orissa 2 : 405.1922. *T. bracteata* (Lamk.) Voigt, Hort. Sub. Calc. 58.1845.

Leaves broadly ovate, sub-entire or palmately 3-5-lobed, denticulate. Male flowers in 5-10-flowered clusters. Female flowers solitary. Fruit to 5 cm across, scarlet when ripe.

Common. July-December. MAKAL. Sarkar & Bhatta., 373,934, 1979.

Fruits poisonous and haemagglutinating.

**XLVII. BEGONIACEAE**

**BEGONIA L.**

**Begonia picta** Sm., Exot. Bot. 2 : 81.5.101.1804; Hook. f., Fl. Brit. India 2 : 638.1879 ; Haines, Bot. Bihar & Orissa 2 : 418.1922.

Herbs to 28 cm high. Lower leaves large, to 20 × 13 cm, hairy. Staminate and pistillate flowers in separate branches, pink.

Shady, moist areas of the sandstone hills. August–November. Sarkar & Bhatta., 1475, 1510.

**XLVIII. SALICACEAE**

**SALIX L.**

**Salix tetrasperma** Roxb., Pl. Cor. 1 : 66. t. 97.1795 ; Hook. f. Fl. Brit. India 5 : 626.1888 ; Haines, Bot. Bihar & Orissa 3 : 881.1924.

A small tree ; young branches pinkish in colour ; older branches whitish. Leaves lanceolate–falcate, 7–15 × 1.5–2.2 cm, acuminate, sub–entire to serrulate, ventrally shining white. Male catkins 2–10 cm long. Female catkins to 12 cm long.

Common in sandy river beds of the northern tract. Fr. : December. Sarkar & Bhatta., 289.

**XLIX. CAPPARACEAE**

- |  |     |             |
|--|-----|-------------|
| 1a. Trees; leaves 3–foliolate  | ... | 3. CRATEVA  |
| 1b. Herbs or shrubs (sometimes scandent) ;<br>leaves simple or palmately compound. | ... | 2           |
| 2a. Herbs; leaves palmately–compound   | ... | 2. CLEOME   |
| 2b. Shrubs, armed with stipular spines ; leaves simple                             | ... | 1. CAPPARIS |

**1. Capparis L.**

- |  |     |                        |
|--|-----|------------------------|
| 1a. Prostrate shrubs ; flowers axillary, solitary                    | ... | 2. <i>C. spinosa</i>   |
| 1b. Erect or scandent shrubs ; flowers umbellate<br>or in fascicles. | ... | 2                      |
| 2a. Flowers in supra–axillary fascicles or solitary                  | ... | 3. <i>C. zeylanica</i> |
| 2b. Flowers in terminal umbells                                      | ... | 1. <i>C. sepiaria</i>  |

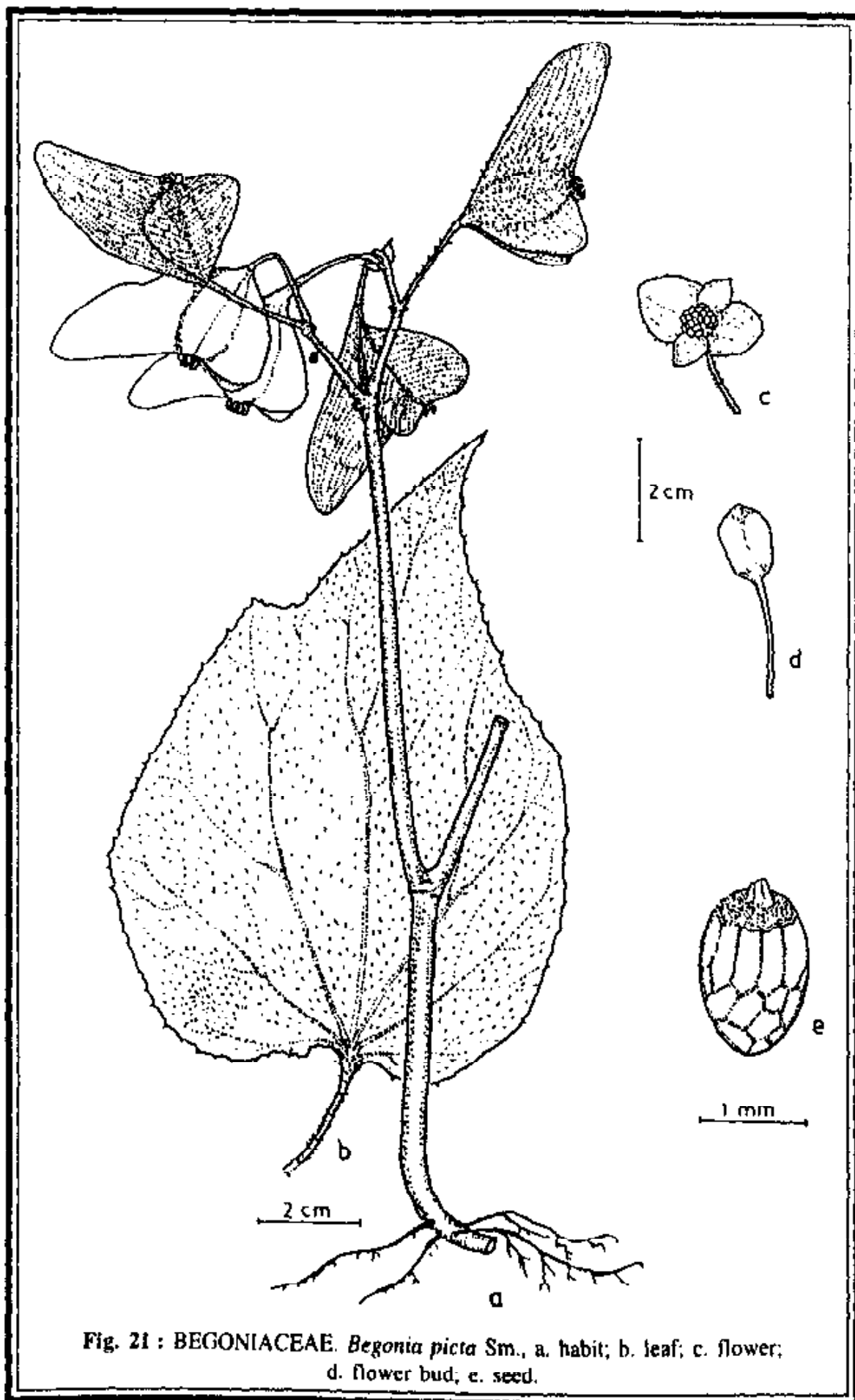


Fig. 21 : BEGONIACEAE. *Begonia picta* Sm., a. habit; b. leaf; c. flower; d. flower bud; e. seed.

1. *Capparis sepiaria* L., Syst. Nat. ed. 10, 2 : 1071.1759 ; Hook. f., Fl. Brit. India 1 : 177.1872 ; Haines, Bot. Bihar & Orissa 1 : 33.1921.

Branches grey-pubescent. Leaves elliptic to suborbicular, 3-6 × 2-4 cm, acute, entire, cuneate or rounded at base. Umbells many-flowered. Gynophore to 0.8 cm long. Fruit globose, smooth, to 0.9 cm across.

Dry forest areas. April-December. Sarkar & Bhatta., 1828.

Febrifuge and useful for skin troubles.

2. *Capparis spinosa* L., Sp. Pl. 503.1753 ; Hook. f., Fl. Brit. India 1 : 173.1872 ; Prain, Bengal. Pl. 1 : 150 ; Haines, Bot. Bihar & Orissa 1 : 32.1921.

Leaves orbicular, stipular spines hooked or straight. Flowers white. Fruits ovoid or oblong, ribbed.

Haines (*l.c.*) reported the plant as very rare from rocky valleys in Bettiah. Haines 4070. (CAL!).

Pickled flower buds produce caper sauce.

3. *Capparis zeylanica* L., Sp. Pl. ed. 2, 720.1762 ; Jacobs in Blumea 12: 505.1965. *C. horrida* L. f., Suppl. Pl. 264.1781 ; Hook. f., Fl. Brit. India 1 : 178.1872 ; Haines, Bot. Bihar & Orissa 1 : 32.1921.

Scandent shrubs, young parts fuscous-tomentose. Leaves ovate-oblong, 3-6 × 2-4 cm. Flowers 4-5.5 cm across, pinkish-white. Fruits long-stalked, scarlet red, 3-4 cm across.

Common on hedges. Sarkar & Bhatta., 399.

Fruits pickled. Root-bark sedative and stomachic, used in cholera.

## 2. Cleome L.

- |  |                         |
|--|-------------------------|
| 1a. Gynandrophore elongated ; flowers whitish pink ... | 2. <i>C. gynandra</i>   |
| 1b. Gynandrophore absent ; flowers yellow or pink. ... | 2                       |
| 2a. Capsules glandular-pubescent ...                   | 3. <i>C. viscosa</i>    |
| 2b. Capsule glabrous ...                               | 1. <i>C. chelidonii</i> |

1. *Cleome chelidonii* L. f., Suppl. Pl. 300.1781 ; Hook. f., Fl. Brit. India 1 : 170.1872 ; Haines, Bot. Bihar & Orissa 1 : 31.1921.

Annual herbs to 80 cm long. Leaves 3–7-foliolate ; leaflets 1–3 × 0.2–0.8 cm. Flowers in an elongated raceme. Sepals 0.3 cm long. Stamens many. Capsules beaked, 7–9 cm long.

Occasional near Bettiah. July–September. Sarkar & Bhatta., 1134.

Used as a vermifuge.

2. *Cleome gynandra* L., Sp. Pl. 671.1753 ; Jacobs in Fl. Mal. 6 : 101.1960. *C. pentaphylla* L. Sp. Pl. ed. 2.983.1762. *Gynandropsis pentaphylla* (L.) DC., Prodr. 1 : 238.1824 ; Hook. f., Fl. Brit. India 1 : 171.1872 ; Haines, Bot. Bihar & Orissa 1 : 31.1921.

Erect, glandular – pubescent herbs, to 1 m tall. Leaves 3–5-foliolate; leaflets unequal, obovate, larger ones 2 – 3 × 1 – 2 cm. Flowers in elongated racemes, bracts trifoliolate. Sepals 0.2–0.3 cm. long. Petals clawed. Gynandrophore 1–2 cm long. Capsules 4–7 cm long.

Growing gregariously in waste places. August – February. HURHURIA. Sarkar & Bhatta., 1460, 1882.

Used as a pot herb. Seeds rubefacient and anthelmintic. Also used as a fish-poison.

3. *Cleome viscosa* L., Sp. Pl. 672.1753 ; Hook. f., Fl. Brit. India 1 : 170.1872 ; Haines, Bot. Bihar & Orissa 1 : 30.1921.

Annual, glandular–pubescent herbs, to 1 m tall. Leaves usually 3 (–5)-foliolate; leaflets obovate or oblanceolate, 1.5–3.5 × 0.8–1.7 cm. Flowers in elongated corymbiform raceme. Sepals 5.5–8 cm long. Petals clawed. Siliqua cylindric, beaked, 5–7 cm × 0.2–0.3 cm. Seeds dark brown.

Frequent in the district. May – January. HURHURIA. Sarkar & Bhatta., 810.

Medicinal. Seeds used as condiment, carminative and anthelmintic.

### 3. *Crateva* L.

*Crateva nurvala* Buch.-Ham., Trans. Linn. Soc. London 15 : 121.1827 ; Jacobs., Blumea 12 : 194.1964. *C. religiosa* auct. non Forst.; var. *nurvala*

Hook. f. & Thoms. in Hook. f., Fl. Brit. India 1 : 172.1872 ; Haines, Bot. Bihar & Orissa 1 : 31.1921.

Leaflets lanceolate, to 15 cm long. Petals yellowish to bluish. Stamens bluish. Berry to 0.4 cm across, scarlet red when ripe.

Common. Fl. : December–January ; Fr. : May–June. BARUN. Sarkar & Bhatta., 336, 1881.

### L. BRASSICACEAE (CRUCIFERAE *nom. alt.*)

- |  |            |
|--|------------|
| 1a. Leaves pinnatifid to almost entire ; siliquae linear ... | 1. RORIPPA |
| 1b. Leaves not pinnatifid ; siliculae sub-orbicular ...      | 2. THLASPI |

#### 1. RORIPPA Scop.

**Rorippa indica** (L.) Hiern, Cat. Afr. Pl. Welw. 1 : 26, add. & Corr. 1896 ; Raizada in Ind. Forest. 92 : 322.1966. *Sysymbrium indicum* L., Mant. 1 : 93.1771. *Nasturtium indicum* DC., Syst. 2 : 199.1818 ; Hook. f. & Anders. in Hook. f., Fl. Brit. India 1 : 134.1872 *p.p.* ; Haines, Bot. Bihar & Orissa 1 : 27.1921.

Herbs, to 50 cm high. Leaves lyrate-pinnatifid to almost entire, serrate. Flowers to 0.2 cm across. Siliquae 1–1.4 cm long. Seeds rugose, brownish.

Common in wet places. July–December. Sarkar & Bhatta., 1184.

#### 2. THLASPI L.

**Thlaspi arvense** L., Sp. Pl. 641.1753 ; Hook. f. & Anders in Hook. f., Fl. Brit. India 1 : 162.1872 ; Haines, Bot. Bihar & Orissa 1 : 29.1921.

Herbs, to 40 cm high. Leaves to 4 cm long. Flowers minute. Siliculae 0.3–0.4 cm long.

Weed of Rabi crops. January – March. Sarkar & Bhatta., 1332.

Note : *Raphanus sativus* L. and the different species and varieties of *Brassica* L. are cultivated as winter season crop for oil seeds or vegetables.

## L I. MORINGACEAE

### MORINGA L.

*Moringa oleifera* Lamk. Encycl. 1 : 398.1785 ; Steenis in Fl. Mal. 5 : 554.1953 ; Haines, Bot. Bihar & Orissa. 2 : 235.1922. *M. pterygosperma* Gaertn., Fruct. 2 : 314.1791 ; Hook. f., Fl. Brit. India 2 : 45.1876.

Deciduous trees. Leaflets elliptic-ovate, 1.5-2 × 0.5-1.5 cm. Flowers white. Capsule 3-valved, to 5.0 cm long.

Planted throughout the district for its fruits. January-April. SEHJAN, Sarkar & Bhatta., 408.

Notes : Haines (l.c.) stated that the plant is wild in the valleys of the Ramnagar Hills along river bed.

## L II. SAPOTACEAE

1a. Evergreen trees ; flowers along with leaves.	...	2
1b. Deciduous trees ; flowers when plant leafless	...	2. MADHUCA
2a. Sepals 5, uniseriate.	...	3
2b. Sepals 6-8 in 2 series.	...	4
3a. Staminodes present ; fertile stamens 5 ; ovary 5-locular	...	5. XANTOLIS
3b. Staminodes absent ; stamens 30-40 ; ovary 7-9-locular	...	1. DIPLOKNEMA
4a. Fertile stamens 8 ; staminodes 8	...	4. MIMUSOPS
4b. Fertile stamens 6 ; staminodes 6	...	3. MANILKARA

### 1. Diploknema Pierre

*Diploknema butyracea* (Roxb.) Lam in Jard. Bot. Buitzg. Ser. 3.7.187.1925 & 8.465.1927 var. *butyracea* ; P. Royen in Blumea 9 : 82.1958. *Bassia butyracea* Roxb. Asiat. Res. 8 : 499.1809 ; Cl. in Hook. f., Fl. Brit. India. 3 : 546.1882 ; Haines, Bot. Bihar & Orissa 2 : 537.1922.

Leaves obovate-oblong, sub-obtuse, tomentose. Calyx lobes 5, uniseriate, imbricate. Corolla 8-10-lobed, lobes spreading. Stamens 30-40 ; anthers exserted. Ovary 7-9-celled. Berry ovoid, 1-3-seeded.

A rare tree in the Someswar Hills. PHULWA. Sarkar & Bhatta., 923.

Seeds yield a fat, used as a cooking medium. Wood durable.

## 2. Madhuca J. F. Gmel.

**Madhuca longifolia** (Koen.) Mac Bride, var. **latifolia** (Roxb.) Chevalier, Rev. Bot. Appl. 23 : 149.1943. *Bassia latifolia* Roxb., Pl. Cor. 1 : 20, t. 19.1795 ; Cl. in Hook. f., Fl. Brit. India 3 : 544. 1882 ; Haines, Bot. Bihar & Orissa 2 : 536.1922.

Medium trees, with spreading branches. Leaves oblong-elliptic. Corolla lobes ovate, fleshy, white. Berry ovoid, brown-tomentose. Seeds ellipsoid, shining brown.

Occasional in the forest margins. February - June. MAHUA. Sarkar & Bhatta., 522.

Seeds are source of an edible oil. Mahua cake used as manure, it possesses insecticidal and pesticidal properties. Mahua flowers are rich in sugars, used in the preparation of distilled liqueurs and vinegar.

## 3. MANILKARA Adans., *nom. cons.*

- 1a. Leaves elliptic-ovate or oblong ;  
berry oblong-elliptic ... 2. *M. hexandra*
- 1b. Leaves oblong-lanceolate ; berry globose ... 1. *M. zapota*

1. **Manilkara Zapota** (L.) P. Royen, Blumea 7:410. 1953. *Manilkara achras* (Mill.) Fosberg in Taxon, 13 : 255.1964. *Achras zapota* L., Sp. Pl. ed. 2.469.1762.

Evergreen trees. Leaves oblong-lanceolate, obtuse. Flowers solitary, axillary. Berry globose, brown, to 4 cm across.

Planted for its edible fruits.

A native of S. America. Fl. & Fr. throughout the year. SABEDA. Sarkar & Bhatta., 865.

2. *Manilkara hexandra* (Roxb) Dub. in Ann. Mus. Col. Mars. (ser.3) 3 : 9.1915. *Mimusops hexandra* Roxb., Pl. Cor. 1:16, t. 15.1795.

Large trees. Leaves in terminal clusters, oblong, elliptic or elliptic-ovate. Flowers in axillary fascicles, white. Berry oblong-ellipsoid, 3 × 1 cm, greenish-yellow. Fruits edible.

Planted in gardens. KHIRKUL. Sarkar & Bhatta., 876.

#### 4. MIMUSOPS L.

*Mimusops elengi* L., Sp. Pl. 349.1753 ; Haines, Bot. Bihar & Orissa 2 : 538. 1922.

Leaves acute, margins wavy. Flowers white, fragrant, to 1.5 cm across. Fruit elliptic, 2.5 – 1.4 cm, orange red, edible.

Planted as a roadside plant and also in gardens. Sarkar & Bhatta., 442.

#### 5. XANTOLIS Raf.

*Xantolis tomentosa* (Roxb.) Raf., Sylv. Tell. 36.1838; P. Royen in Blumea 8 : 226.1957. *Sideroxylon tomentosum* Roxb., Pl. Cor. 1 : 28. t. 28.1795 ; Cl. in Hook. f., Fl. Brit. Ind. 3 : 538.1882 ; Haines, Bot. Bihar & Orissa 2 : 536.1922.

Leaves elliptic-ovate. Flowers white. Berry rounded, yellowish green.

Haines (*l.c.*) reported the plant from Bettiah forest. But at present there is no trace of such forest. Haines 691 (CAL!).

### LIII. EBENACEAE

#### DIOSPYROS L.

- |                                  |     |                         |
|----------------------------------|-----|-------------------------|
| 1a. Unarmed trees ; stamens many | ... | 1. <i>D. malabarica</i> |
| 1b. Armed trees, stamens 16      | ... | 2. <i>D. montana</i>    |

1. *Diospyros malabarica* (Desr.) Kostel, All. Med. Pharma. Fl. 3 : 1099.1834 ; Brink in Bull. Jard. Bot. Butzg. " ser. 3 ", 15 : 325.1938. *Garcinia malabarica* Desr. in Lamk., Encycl. 3 : 701.1792. *Diospyros embryopteris* Pers., Syn. 2 : 624.1807 ; Cl. in Hook. f., Fl. Brit. India 3 : 556.1882 ; Prain, Bengal Pl. 1 : 481 ; Haines, Bot. Bihar & Orissa 2 : 543.1922.

Trees, about 4 m high ; bark black, smooth. Leaves coriaceous, 12.5 – 22.5 cm long. Flowers white, fragrant ; staminate in umbellate cymes ; pistillate solitary. Fruit globose, yellow when ripe, to 4 cm across.

Occasional. Fl. : March – May ; Fr. : October – November. GAB. Sarkar & Bhatta., 1295.

Ripe fruits edible. Raw fruits contain tannin.

2. *Diospyros montana* Roxb., Pl. Cor. 1. 37. t. 48.1795 ; Cl. in Hook. f., Fl. Brit. India 3 : 555.1882 ; Haines, Bot. Bihar & Orissa 2 : 542.1922.

Small trees, to 3 m high. Leaves ovate, softly pubescent when young, mature leaves glabrous. Staminate flowers green in 3–7 or more-flowered cymes ; buds conical. Female flowers green or yellow, on very short peduncles. Fruits globose, to 1.5–2 cm across, greenish yellow.

In sal forests. June–September. BISGAB. Sarkar & Bhatta., 905.

Wood used for carts, agricultural implements etc. Crushed leaves and fruits used for stupefying fish.

#### LIV. SYMPLOCACEAE

##### SYMPLOCOS L.

*Symplocos racemosa* Roxb., Fl. Indica. 2 : 539.1832 ; Cl. in Hook. f., Fl. Brit. India 3 : 576.1882 ; Haines, Bot. Bihar & Orissa 2 : 547.1922.

Small trees Leaves elliptic-oblong or oblong-lanceolate, to 12 cm long, entire, subcoriaceous. Flowers yellow, fragrant, to 1.2 cm across. Drupe subglobose, purplish, to 0.5 cm across.

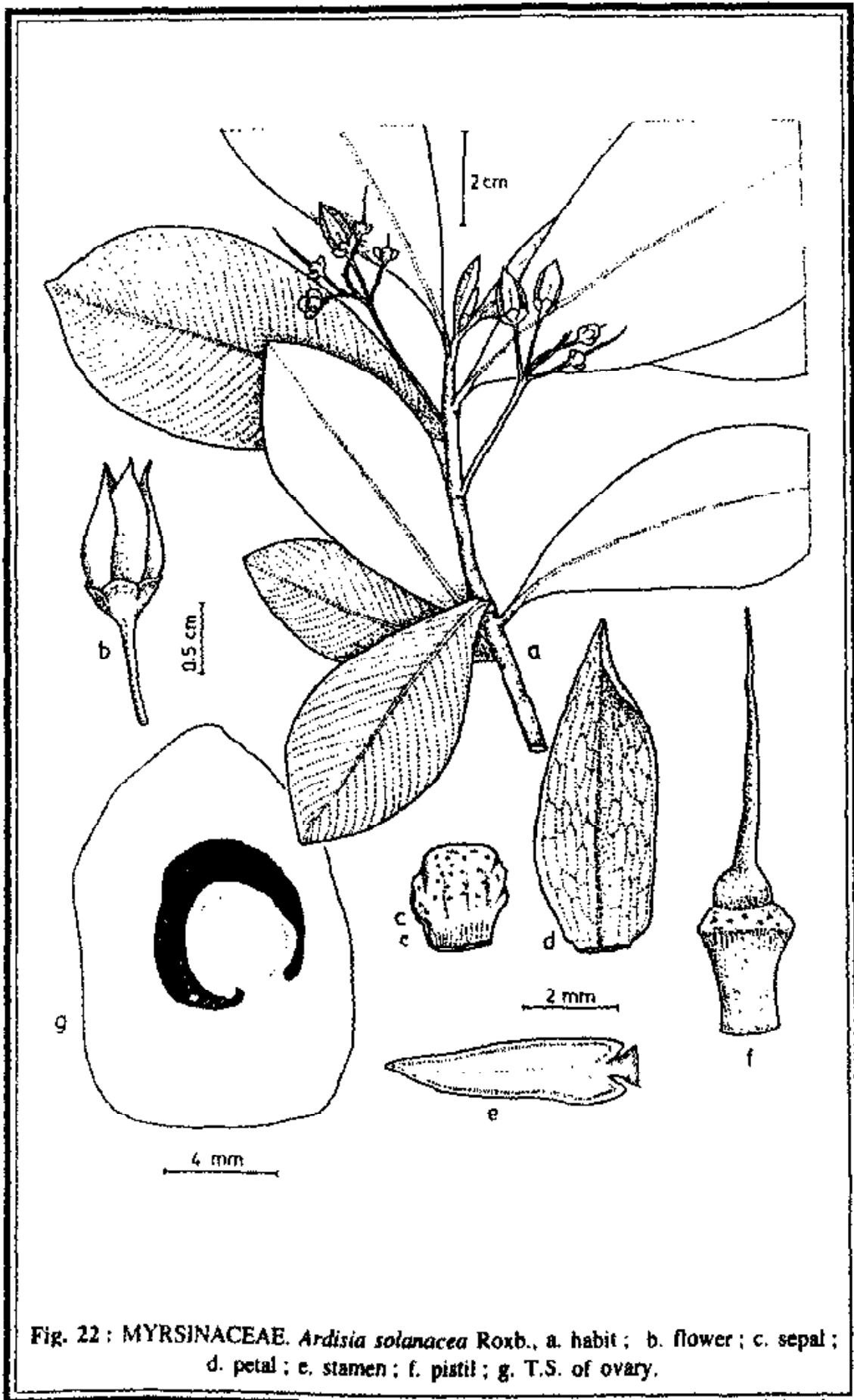
Very common along the forest areas. Fr. : December. LODHRA. Sarkar & Bhatta., 1568.

Bark medicinal.

#### LV. MYRSINACEAE

##### ARDISIA Swartz, *nom. cons.*

*Ardisia solanacea* Roxb., Pl. Cor. t. 27.1785; Duthie, Fl. U.G.P. 1 : 464; Haines, Bot. Bihar & Orissa 2 : 534.1922. *A. humilis* auct. non Vahl ; Cl. in Hook. f., Fl. Brit. India 3 : 529.1882, *p.p.*



Shrubs to 3.5 m high. Leaves ovate-oblongate or ovate-oblong, to 18 cm long, subcoriaceous. Corolla rose-coloured. Drupe globose, to 0.7 cm across, olive green or black.

Common in the moist forests. Fl. March–April ; fruits ripen during November–December. Sarkar & Bhatta., 160.

## LVI. PRIMULACEAE

- |  |     |              |
|--|-----|--------------|
| 1a. Leaves in basal rosette ; petals white ;<br>capsule 5-valved | ... | 2. PRIMULA   |
| 1b. Leaves opposite ; petals blue ;<br>capsule circumscissile    | ... | 1. ANAGALLIS |

### 1. ANAGALLIS L.

*Anagallis arvensis* L., Sp. Pl. 148.1753 ; var. *caerulea* (L.) Gouan, Fl. Monspel. 30.1765 ; Kollmann & Feinburn in Notes, Royal Bot. Garden, Edin. 28 : 176.1968. *A. caerulea* L., Amoen. Acad. 4 : 479.1759. *A. arvensis* sensu Hook. f., Fl. Brit. India 3 : 506.1882. *p.p* ; Haines, Bot. Bihar & Orissa 2 : 531.1922. Tokyo code 67.1994.

Herbs to 25 cm long. Leaves ovate 1–1.5 × 0.4–0.8 cm, amplexicaul at the base. Pedicel slender. Flowers to 0.6 cm across. Capsule to 0.5 cm across.

A common weed of Rabi crops. Temperate and tropical regions. January–March. Sarkar & Bhatta., 1713, 1728.

### 2. PRIMULA L.

*Primula umbellata* (Lour.) Bentvelzen in Fl. Mal. 6 (2) : 191. 1962. *Drosera umbellata* Lour., Fl. Cochinch. 186.1790. *Androsace saxifragifolia* Bunge, Mem. Ac. Fmp. Sci. St. Petersb. Ser. b, Sci. Nat. 2 : 127.1835; Hook. f., Fl. Brit. India 3 : 496.1882 ; Haines, Bot. Bihar & Orissa 2 : 530.1922.

Annual herbs. Leaves suborbicular to 2 cm across, cordate, crenate. Scape few-flowered. Seeds minute, angular.

Weed of wet places. January – March. Sarkar & Bhatta., 1172, 1302.

## LVII. ROSACEAE

- |                                       |     |               |
|---------------------------------------|-----|---------------|
| 1a. Shrubs, with subscaudent branches | ... | 3. RUBUS      |
| 1b. Annual or perennial herbs.        | ... | 2             |
| 2a. Ripe receptacle fleshy            | ... | 1. DUCHESNEA  |
| 2b. Ripe receptacle dry               | ... | 2. POTENTILLA |

## 1. DUCHESNEA Sm.

**Duchesnea indica** (Andr.) Focke in Pfamilien III. 3 : 33.1888 ; Hara in Ohashi Fl. East. Himalaya 120.1966. *Fragaria indica* Andr., Bot. Repos. 7 : t. 479.1807 ; Hook. f., Fl. Brit. India 2 : 343.1878 ; Haines, Bot. Bihar & Orissa 2 : 353.1922.

Branches to 20 cm long. Leaflets obovate, crenate-serrate. Flowers to 1.4 cm across.

Wet forest floors. November-January. Sarkar & Bhatta., 382.

Considered useful as a low ground cover.

## 2. POTENTILLA L.

**Potentilla supina** L., Sp. Pl. 497.1753 ; Hook. f., Fl. Brit. India 2 : 359.1878 ; Haines, Bot. Bihar & Orissa 2 : 354.1922.

Branches to 30 cm long ; leaves distant. Leaflets obovate, to 1.3 cm long, serrate. Flowers to 0.7 cm across.

Wet forest floors. Sarkar & Bhatta., 42 ; 1671.

## 3. RUBUS L.

**Rubus ellipticus** Sm. in Rees, Cyclop. 30 : n. 16.1815 ; Hook. f., Fl. Brit. India 2 : 336.1878 ; Haines, Bot. Bihar & Orissa 2 : 353.1922.

Evergreen shrubs. Leaflets obovate, serrate. Flowers to 1 cm across, white. Drupelets orange in colour, edible.

Someswar hills. Sarkar & Bhatta., 627.

**LVIII. MIMOSACEAE**

1a. Petioles modified into phyllodes	...	1. ACACIA
1b. Petioles not as above.	...	2
2a. Pinnae of leaves 2 or 4, digitately arranged	...	6. PITHECELLOBIUM
2b. Pinnae of leaves several, pinnately arranged.	...	3
3a. Aquatic herbs ; internodes with spongy floats	...	5. NEPTUNIA
3b. Plants not as above.	...	4
4a. Flowers in elongated spikes	...	1. ACACIA
4b. Flowers in globose heads.	...	5
5a. Spiny or prickly trees, shrubs or scramblers.	...	6
5b. Unarmed trees or shrubs.	...	7
6a. Stamens 4 or 8 ; pods breaking up into 1-seeded joints	...	4. MIMOSA
6b. Stamens many ; pods not as above	...	1. ACACIA
7a. Shrubs or small trees ; stamens 10	...	3. LEUCAENA
7b. Trees ; stamens numerous	...	2. ALBIZIA

**1. ACACIA Mill.**

1a. Flowers in elongated spikes.	...	2
1b. Flowers in globose heads.	...	5
2a. Petioles modified into phyllodes	...	1. <i>A. auriculiformis</i>
2b. Petioles not modified into phyllodes.	...	3
3a. Leaf-rhachis pubescent.	...	4
3b. Leaf-rhachis glabrous	...	3. <i>A. chundra</i>

- 4a. Bark black in colour ... 2. *A. catechu*
- 4b. Bark white in colour ... 6. *A. polyacantha*
- 5a. Small trees ; branches and petioles not prickly ; stipular spines present or absent. ... 6
- 5b. Scandent shrubs ; branches and petioles prickly ; stipular spines absent ... 7. *A. sinuata*
- 6a. Pods cylindrical ... 4. *A. farnesiana*
- 6b. Pods moniliform ... 5. *A. nilotica*

1. **Acacia auriculiformis** A. Cunn. ex Benth. in Hook., London J. Bot. 1: 377.1842; Verma et al., Fl. Raipur, Durg & Rajnandgaon 133.1985. *Racosperma auriculiforme* (A. cunn. ex Benth.) Pedley, Bot. J. Linn, Soc 92 (3) : 247.1986.

Medium trees. Phyllodes laterally compressed. Flowers yellow on elongated heads. Pod twisted. Seeds with yellow aril.

Common in plantation. Fl. : August – September ; Fr. : January – May. Sarkar & Bhatta., 596.

2. **Acacia catechu** (L. f.) Willd., Sp. Pl. 4 : 1079.1806 ; Baker in Hook. f., Fl. Brit. India 2 : 295.1878 ; Haines, Bot. Bihar & Orissa 2 : 344 ; *Mimosa catechu* L. f., Suppl. 439.1781.

Medium trees. Pinnae 7–24 pairs, 4 cm long ; leaflets 12–20 pairs, linear, 0.5 × 0.05 cm, subacute, ciliate. Spikes axillary, white or yellowish. Pod flat, smooth, constricted, usually 4–7-seeded.

Predominant along the Tarai forests. July–December. KHAIR. Sarkar & Bhatta., 231.

Heart wood used as the source of 'Khair'.

3. **Acacia chundra** (Roxb.) Willd., Sp. Pl. 4 : 1078.1806 ; Saldanha, Fl. Karnataka 1 : 395.1984. *Mimosa chundra* Roxb. ex Rottbl., Ges. Naturf. Freunde Berlin Neue Schriften 4 : 207.1803. *Acacia catechu* (Roxb.) Willd. var. *sundra* Prain, J. Asiat. Soc. Beng. Pl. 2, Nat. Hist. 66 : 508–510.1898 ; *A. sundra* DC., Prodr. 2 : 458.1825 ; Baker in Hook. f., Fl. Brit. India 2 : 295.1878.

Small trees. Pinnae 10–20 pairs ; leaflets 30–40 pairs, oblong, 0.4 × 0.1 cm. Spikes 5–8 cm long, white. Pod to 6 cm long, 3–4-seeded.

Common. April – December. Sarkar & Bhatta., 1255.

Used as *A. catechu* (Roxb.) Willd.

4. *Acacia farnesiana* (L.) Willd., Sp. Pl. 4 : 1083.1806 ; Baker in Hook. f., Fl. Brit. India 2 : 292.1878 ; Haines, Bot. Bihar & Orissa 2 : 338.1922. *Mimosa farnesiana* L., Sp. Pl. 521.1753.

Shrubs or small trees. Pinnae 5–7 pairs, to 2 cm long ; leaflets 10–20 pairs. Heads to 1.3 cm across. Pod subcylindric, curved, to 5.6 cm long, 4–6-seeded.

Along dry forests. September–July. GANDHA BABUL. Sarkar & Bhatta., 47.

5. *Acacia nilotica* (L.) Willd. ex Delile, Fl. Aegypt. III. 79.1813, subsp. *indica* (Benth.) Brenan in Kew Bull. 12 : 84.1957. *Mimosa nilotica* L., Sp. Pl. 521.1753. *p.p.* *Acacia arabica* auct. non (Lamk.) Willd., 1808 ; Baker in Hook. f., Fl. Brit. India 2 : 293.1878 ; Prain, Bengal Pl. 1 : 330 ; Haines, Bot. Bihar & Orissa 2 : 338.1922.

Medium trees ; bark deeply cracked; stipular spines to 8 cm long. Pinnae 3–6-Pairs ; leaflets 10–20 pairs, 0.5 × 0.1 cm. Heads to 1 cm across, yellow. Pod constricted in between seeds, to 20 cm long, whitish-green.

Common. August–April. BABUL. Sarkar & Bhatta., 1621.

Wood durable. Gum is of economic importance.

6. *Acacia polyacantha* Willd., Sp. Pl. 4 : 1079, 1806 ; Brenan, Kew Bull. 1956 : 195.1956. *Mimosa suma* Roxb., Fl. Ind. 2 : 563.1832. *Acacia suma* (Roxb.) Buch.–Ham. ex Voigt, Hort. Sub. Calc. 260.1845 ; Baker in Hook. f., Fl. Brit. India 2 : 294.1878 ; Haines, Bot. Bihar & Orissa 2 : 344.1922.

Trees. Leaves with a large gland on the base of the petiole ; pinnae 10 – 20 pairs, to 5 cm long ; leaflets 20–50 pairs, ciliate. Spikes to 12 cm long, white. Pod to 15 cm long, indehiscent, many – seeded.

In the deciduous forests. Fl. : March – June. Fr. : August – February. Sarkar & Bhatta., 631.

Heart wood used as *A. catechu* (Roxb.) Willd.

7. *Acacia sinuata* (Lour.) Merr., Trans. Amer. Philos. Soc. 24 (2) : 186.1935; Saldanha, Fl. Karnataka 1 : 396.1984. *Mimosa sinuata* Lour., Fl.

Cochinch. 653.1790. *M. concinna* Willd., Sp. Pl. 4 : 1039.1806. *Acacia concinna* (Willd.) DC., Prodr. 2 : 464.1825 ; Baker in Hook. f., Fl. Brit. India 2 : 296.1878 ; Haines, Bot. Bihar & Orissa 2 : 343.1922.

Prickly scandent shrubs. Pinnae 3–8 pairs, 4 cm long; leaflets 20–25 pairs, 0.8 × 0.17 cm. Heads to 1.2 cm across, pinkish or reddish. Pod thick, fleshy, 12–17 × 2–3 cm, brownish or black.

Common along dry-deciduous forests. Fl. January–April; Fr.: September–March. SIKAKAI. Sarkar & Bhatta., 1584.

Pods used as detergent.

## 2. ALBIZIA Durazz.

- |   |     |                           |
|---|-----|---------------------------|
| 1a. Leaflets 20–65 pairs ; stipules large   | ... | 1. <i>A. chinensis</i>    |
| 1b. Leaflets 6–20 pairs ; stipules small.   | ... | 2                         |
| 2a. Flowers on 0.3–0.5 cm long pedicels ;<br>pods stramineous when dry                    | ... | 2. <i>A. lebbeck</i>      |
| 2b. Flowers sessile or subsessile ; pods dark<br>reddishbrown or blackish–brown when dry. | ... | 3                         |
| 3a. Midrib of the leaflets closer to its<br>upper margin                                  | ... | 3. <i>A. odoratissima</i> |
| 3b. Midrib of the leaflets closer to its<br>lower margin                                  | ... | 4. <i>A. procera</i>      |

1. *Albizia chinensis* (Osb.) Merr., Amer. J. Bot. 3 : 573.1916 ; Ali, Fl. W. Pak. 36 : 21.1973. *Mimosa chinensis* Osb., Dag. Ostind. Resa 233.1757. *Albizia stipulata*, (DC.) Boivin, Encycl. 19. Siecle 2 : 33.1838. Baker in Hook. f., Fl. Brit. India 2 : 300.1878, *p.p.* ; Haines, Bot. Bihar & Orissa 2 : 349.1922.

Large trees. pinnae 10–20 pairs, 9 cm long ; leaflets sublanceolate, to 0.8 cm long. Heads to 2.5 cm across. Flowers pale–white. Pods 15–20 cm long, 8–10–seeded.

Common. Fl. : May–June ; Fr. : October–April. Sarkar & Bhatta., 1394.

Wood used for packing cases.

2. *Albizia lebbeck* (L.) Benth., London J. Bot. 3 : 87.1844 ; Baker in Hook. f., Fl. Brit. India 2 : 298.1878 ; Haines, Bot. Bihar & Orissa 2 : 346.1922.

*Mimosa lebbeck* L., Sp. Pl. 516.1753.

Large trees, pinnae 3–5 pairs ; leaflets 6–8 pairs, obliquely oblong to 4 cm long, retuse or obtuse. Heads axillary, fascicled, to 4 cm across, greenish–yellow, fragrant. Pods 20–30 cm long, brownish–white.

Common, also planted. Fl. : April – June; Fr. : January – March. SIRIS. Sarkar & Bhatta., 516.

Timber durable.

3. *Albizia odoratissima* (L. f.) Benth., London J. Bot. 3 : 88.1844 ; Baker in Hook. f., Fl. Brit. India 2 : 299.1878 ; Haines, Bot. Bihar & Orissa 2 : 347.1922. *Mimosa odoratissima* L. f., Suppl. Pl. 437.1781.

Trees. Pinnae 2–5 pairs ; leaflets 6–24 pairs, obliquely oblong, 2.5 × 0.8 cm, obtuse. Heads terminal or axillary, 2–2.5 cm across. Pod thin, to 15 cm long, brown.

Northern part. Indomalesia. Fl. : May – June ; Fr. : November – February. SIRIS. Sarkar & Bhatta., 630.

Wood used for constructional purposes.

4. *Albizia procera* (Roxb.) Benth., London J. Bot. 3 : 89.1844 ; Baker in Hook., f., Brit. India 2 : 299.1878 ; Haines, Bot. Bihar & Orissa 2 : 346.1922; *Mimosa procera* Roxb., Pl. Cor. t. 121.1799.

Trees. Pinnae 3–6 pairs ; leaflets 5–11 pairs, broadly oblong, 2.5–5 cm long. Heads to 1.5 cm across, greenish–white. Pod to 20 cm long, reddish–brown.

Northern part. Fl. : August – September; Fr. : December – May. Sarkar & Bhatta., 693.

Uses as the previous.

### 3. LEUCAENA Benth.

*Leucaena leucocephala* (Lamk.) de Wit in Taxon 10 : 53.1961. *Mimosa leucocephala* Lamk., Encycl. 1 : 12.1783. *Leucaena glauca* Benth. in Hook. London J. Bot. 4 : 416.1842 ; Baker in Hook. f., Fl. Brit. India 2 : 290.1878.

Pinnae 4–8 pairs ; leaflets 10–15 pairs, linear, 0.7–1.2 cm long. Heads to 2.5 cm across, pale white. Pod to 15 cm long and 2 cm broad, brown.

Planted and self sown. August–September. KUBABUL. Sarkar & Bhatta. 594.

Source of fuel wood.

## 4. MIMOSA L.

- 1a. Spreading herbs or subshrubs ;  
 pods 1.5 – 2.5 cm long ... 2. *M. pudica*
- 1b. Shrubs ; pods 5 – 9 cm long ... 1. *M. himalayana*

1. *Mimosa himalayana* Gamble in Kew Bull. 1920 : 4.1920. Verma et al. in Fl. Raipur, Durg & Rajn. 138.1985. *M. rubicaulis* Barker in Hook. f., Fl. Brit. India 2 : 291.1878 ; Haines, Bot. Bihar & Orissa 2 : 336, 1922. non Lamk. 1783.

Branches angular, prickly. Pinnae 6–10 pairs ; leaflets 7–10 pairs. linear, to 1 cm long. Heads to 1.2 cm across, pinkish. Pod linear-oblong, 6–8 cm long.

Dry forest areas. August–April. Sarkar & Bhatta., 1064.

Note : Ohashi in Hara et al. Enum 2 : 126.1979, reduced it into a subsp. of *M. rubicaulis* Lamk.

2. *Mimosa pudica* L., Sp. Pl. 518.1753; Baker in Hook. f., Fl. Brit. India 2 : 291.1878 ; Haines, Bot. Bihar & Orissa 2 : 336.1922.

Leaves sensitive ; pinnae 1 – 2 pairs, digitate ; leaflets 12–30 pairs, linear-oblong, to 0.7 cm long. Heads to 1.2 cm across. Pods 3–4 cm long, 3–5-seeded.

Along moist places. July–December. LAJJABATI. Sarkar & Bhatta., 533.

## 5. NEPTUNIA Lour.

*Neptunia oleracea* Lour., Fl. Cochinch. 654.1790 ; Baker in Hook. f., Fl. Brit. India 2 : 285.1878.

Leaves sensitive. Leaflets 8 –15 pairs, linear, to 1 cm long. Heads to 1.2 cm long, yellow. Pod to 4 cm long, dark brown.

Along water bodies. July – December. Sarkar & Bhatta., 368.

6. PITHECELLOBIUM Mart., *nom. cons.*

*Pithecellobium dulce* (Roxb.) Benth. in Hook f., London J. Bot. 3 : 194.1844 ; Baker in Hook. f., Fl. Brit. India 2 : 302.1878 ; Haines, Bot. Bihar & Orissa 2 : 349.1922. *Mimosa dulcis* Roxb., Pl. Corom. 1 : 67. t. 99.1798.

Pinnae 2 ; leaflets 2 in each pinnae, obliquely elliptic, 2-4 × 1-2 cm. Heads to 1 cm across, greenish-white. Seeds with fleshy edible aril.

Planted along roadsides, also self sown. Introduced from tropical America. January-May. Sarkar & Bhatta., 597.

**LIX. CAESALPINIACEAE**

1a. Leaves simple	...	1. BAUHINIA
1b. Leaves pinnately compound.	...	2
2a. Leaves 1 - pinnate.	...	3
2b. Leaves 2 - pinnate.	...	5
3a. Petals 0	...	5. SARACA
3b. Petals present.	...	4
4a. petals 3	...	6. TAMARINDUS
4b. Petals 5	...	3. CASSIA
5a. Pods not winged	...	2. CAESALPINIA
5b. Pods winged	...	4. MEZONEURON

**1. BAUHINIA L.**

1a. Fertile stamens 10.	...	2
1b. Fertile stamens 3 or 4.	...	3
2a. Calyx distinctly 5-cleft	...	3. <i>B. racemosa</i>
2b. Calyx spathaceous	...	1. <i>B. malabarica</i>
3a. Trees	...	2. <i>B. purpurea</i>
3b. Tendrilled climbers	...	4. <i>B. vahlii</i>

1. *Bauhinia malabarica* Roxb., Fl. Indica. 2 : 321.1832 ; Baker in Hook. f., Fl. Brit. India 2 : 277.1878 ; Haines, Bot. Bihar & Orissa 2 : 322.1922.

Small trees. Leaves to 15 cm across, lobed. Flowers in subcorymbose racemes. Calyx 5-lobed. Petals 5, white. Pod straight, flattened, to 22 cm long.

Along dry deciduous forests. Fl. : Sept. – Nov.; Fr. : Jan. – March. Sarkar & Bhatta., 1616.

Wood used as fuel.

2. **Bauhinia purpurea** L., Sp. Pl. 375.1753 ; Bakar in Hook. f., Fl. Brit. India 2 : 284. 1878 ; Haines, Bot. Bihar & Orissa 2 : 323.1922.

Medium trees. Leaves to 15 cm long, deeply lobed. Flowers in terminal paniculate racemes. Petals purple. Pod flat, linear, to 28 cm long.

Along the dry deciduous forests. Fl. : Sept.–Nov.; Fr. : Jan.–March. KOILARA. Sarkar & Bhatta., 753.

Bark yields a fibre.

3. **Bauhinia racemosa** Lamk., Encycl. 1 : 390.1785 ; Baker in Hook. f., Fl. Brit. India 2 : 276. 1878 ; Haines, Bot. Bihar & Orissa 2 : 322.1922.

Small trees. Leaves deeply cleft, to 5 cm across. Flowers in lax racemes. Petals white. Pod falcate, to 30 cm long.

In the dry deciduous forests. Fl. : March – June ; Fr. : Nov. – Feb. KATMOULI. Sarkar & Bhatta., 1497.

Bark yields a fibre.

4. **Bauhinia vahlii** Wt. & Arn., Prodr. 297.1834 ; Baker in Hook. f., Fl. Brit. India 2 : 279.1878 ; Haines, Bot. Bihar & Orissa 2 : 324.1922.

Huge climbers ; stems to 40 cm across. Young leaves and branches rusty tomentose. Leaves to 35 cm across, deeply 2-lobed. Flowers in terminal racemes. Petals white. Pod woody, 15–33 × 7–10 cm. covered with dense tomentum. Seeds flat, to 2.5 cm across.

Common in the hilly areas. Fl. : Feb. – June ; Fr. : Dec. – March. MOULAN. Sarkar & Bhatta., 222.

Leaves used as plates. Bark yields a fibre.

Note : Haines (*Op. cit.* 325) reported **Bauhania scandens** L. var. **horsfieldii** (Miq.) Ohashi (*Bauhania anguina* Roxb.) from Ramnagore Hills.

## 2. CAESALPINIA L.

- |                               |     |                          |
|-------------------------------|-----|--------------------------|
| 1a. Scandent shrubs.          | ... | 2                        |
| 1b. Small trees               | ... | 3. <i>C. pulcherrima</i> |
| 2a. Pods with straight spines | ... | 1. <i>C. bonduc</i>      |
| 2b. Pods unarmed              | ... | 2. <i>C. digyna</i>      |

1. **Caesalpinia bonduc** (L.) Roxb., Fl. Indica 2 : 362.1832 emend. Dandy & Exell. J. Bot. 76 : 175.1938. *Guilandina bonduc* L., Sp. Pl. 381.1753, non 1762. *Caesalpinia bonducella* (L.) Flem., Asiat. Res. 11 : 159. 1810 ; Baker in Hook. f., Fl. Brit. India 2 : 254. 1878 ; *C. crista* auct. ; Haines, Bot. Bihar & Orissa 2 : 331. 1922 ; non L. 1753.

Scandent shrubs. Pinnae 6–8 pairs. Leaflets 8 pairs, oblong or ovate – oblong, 3 × 1.8 cm. Flowers in elongated racemes. Pod ovoid, sub-compressed, to 8 cm across, 1–2-seeded.

Common along hedges. Pantropics. August–April. KATKARANJ. Sarkar & Bhatta., 473.

Seeds and bark medicinal.

2. **Caesalpinia digyna** Rottl. in Ges. Naturf. Freunde Berl. Neue Schr. 4 : 200.1803 ; Baker in Hook. f., Fl. Brit. India 2 : 256.1878 ; Haines, Bot. Bihar & Orissa 2 : 330.1922.

Scandent shrubs, armed with curved prickles. Pinnae 8–10 pairs. Leaflets 7–12 pairs, oblong. Flowers on elongated racemes. Pod thick, fleshy, 1 – 4 – seeded.

In the dry deciduous forests. Fl. : July – Oct.; Fr. : Feb. – April. Sarkar & Bhatta., 660.

Pods contain tannin.

3. **Caesalpinia pulcherrima** (L.) Swartz, Obs. 166.1791 ; Baker in Hook. f., Fl. Brit. India 2 : 255. 1878.

Cultivated trees with spreading branches. Flowers red. Pod flat.

Planted for its showy flowers. Sarkar & Bhatta., 496.

3. CASSIA L., *nom. cons.*

- 1a. Small trees ; Flowers in pendulous racemes ... 1. *C. fistula*
- 1b. Herbs or subshrubs ; flowers in upright racemes. ... 2
- 2a. Sepals linear or lanceolate, acute ... 2. *C. mimosoides*
- 2b. Sepals broadly ovate or obovate, obtuse. ... 3
- 3a. Leaflets more than 8 pairs, oblong-lanceolate ... 4. *C. sophera*
- 3b. Leaflets less than 6 pairs, elliptic-ovate ... 3. *C. occidentalis*

1. **Cassia fistula** L. Sp. Pl. 377. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 261. 1878 ; Haines, Bot. Bihar & Orissa 2 : 315. 1922.

Small trees. Leaves to 45 cm long ; leaflets 4-8 pairs, ovate to ovate-lanceolate, 10-15 x 4-7 cm. Pendulous racemes to 30 cm long. Flowers yellow, to 4 cm across. Fruit indehiscent, cylindrical, to 70 cm long.

Common. Fl.: April-August. Fr. : Nov-Dec. AMALTAS. Sarkar & Bhatta., 629.

2. **Cassia mimosoides** L. Sp. Pl. 379. 1753; Baker in Hook. f., Fl. Brit. India 2 : 266. 1878 ; Haines, Bot. Bihar & Orissa 2 : 319. 1922.

Diffuse herbs. Leaves to 10 cm long ; leaflets to 0.5 cm long. Flowers solitary, small. Pod flat, to 5 cm long, many-seeded.

Exposed moist places. June-August. Sarkar & Bhatta., 1078.

3. **Cassia occidentalis** L. Sp. Pl. 377. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 262. 1878 ; Haines, Bot. Bihar & Orissa 2 : 318. 1922.

Subshrubs, to 2m high. Leaves to 20 cm long ; leaflets 4-6 pairs. Flowers to 2 cm across. Petals yellow. Stamens 6-7. Pod linear, turgid, to 10 cm long.

Weed of waste places. June-September. KASONDI. Sarkar & Bhatta., 1589.

Leaves, roots and seeds purgative.

4. **Cassia sophera** L. Sp. Pl. 379. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 262. 1878 ; Haines, Bot. Bihar & Orissa 2 : 318. 1922.

Subshrubs, to 1.2 m high. Leaves to 13 cm long ; leaflets 5–10 pairs. Flowers to 2.1 cm across, yellow. Stamens 6–7. Pod subcylindric.

Weed of moist places. August–March. Sarkar & Bhatta., 860.

#### 4. MEZONEURON Deaf.

*Mezoneuron cucullatum* (Roxb.) Wt.&Arn., Prodr. 283. 1834 : Baker in Hook. f., Fl. Brit. India 2 : 258, 1878 ; Haines, Bot. Bihar & Orissa 2 : 329. *Caesalpinia cucullata* Roxb., Fl. Indica 2 : 358.1832.

Leaf rachis to 35 cm long ; pinnae 3–5 pairs, to 10 cm long ; leaflets 4 pairs. elliptic–ovate, acuminate, to 8 cm long. Flowers in drooping inflorescences. Petals yellow. Pod to 10 cm long, tinged with red.

Along the forests November–March. Sarkar & Bhatta., 1140, 1271.

#### 5. SARACA L.

*Saraca asoca* (Roxb.) de Wilde, Blumea 15 : 393. 1968 ; Zuijderhoudt in Blumea 15 : 422. 1968. *Jonesia asoca* Roxb., Asiat. Res. 4 : 365. 1795. *Saraca indica* auct. non L. : Baker in Hook f., Fl. Brit. India 2 : 271.1878 ; Haines, Bot. Bihar & Orissa 2 : 326. 1922.

Medium tree with spreading branches. Leaflets 4–6 pairs, oblong, to 22 cm long. Flowers red or orange–red. Pod to 14 cm long.

Someswar Hills, rare. March–June. Sarkar & Bhatta., 1490.

#### 6. TAMARINDUS L.

*Tamarindus indica* L., Sp. Pl. 34. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 273. 1878 ; Haines, Bot. Bihar & Orissa 2 : 325. 1922.

Leaves 4–15 cm long ; leaflets 10–20 pairs, oblong, 1.2–1.8 × 0.4–0.5 cm, obtuse. Flowers 1.2–1.5 cm long. Petals yellow with red veins. Pod subcylindric, to 15 cm long.

Common near villages. Sarkar & Bhatta., 220. 754.

Fruit–juice obtained after soaking ripe fruits in water is used in various dishes ; also medicinal.

LX. FABACEAE (PAPILIONACEAE *nom. alt.*)

1a. Plants with hairs fixed by their centres; anthers gland-tipped or mucronate	...	14. INDIGOFERA
1b. Plants with basifixed hairs or glabrous; anthers not mucronate or glandtipped	...	2
2a. Pod dehiscent by both sutures	...	3
2b. Pod indehiscent or rarely (some <i>Desmodia</i> ) opening along the ventral suture	...	17
3a. Leaf-rachis ending in a bristle or tendril ; Leaflets even-pinnate; pod compressed	...	4
3b. Leaf-rachis not ending in a tendril; leaves odd-pinnate or simple or digitately 3-more foliolate	...	6
4a. Stems herbaceous; flowers axillary solitary, or racemed; stipules large; stamens 10, 2-adelphous the vexillary stamen free, or 1-adelphous the vexillary stamen joined to sheath; style bearded	...	5
4b. Stems woody (climber); flowers in terminal racemes; stipules narrow, equal at base; stamens 9, 1-adelphous in a sheath, slit above, vexillary 0; style not bearded	...	1. ABRUS
5a. Staminal tube oblique at the mouth; style with dorsal tuft of hairs or bearded round tip	...	27. VICIA
5b. Staminal tube truncate at mouth; style bearded along the inner face, flat, dilated at tip	...	15. LATHYRUS
6a. Leaves simple or digitately compound, pod turgid	...	7
6b. Leaves pinnately compound, pod various	...	8
7a. Stamen 1-adelphous, 10, sheath split along back, anthers 5 long and 5 on alternating short free filaments; leaves simple sessile, or digitately 3-7 foliolate, not glandular beneath; seeds many	...	8. CROTALARIA

- |   |     |               |
|---|-----|---------------|
| 7b. Stamens 2-adelphous, 9+1; leaves digitately 3-foliolate with small bracts or petioled 1-foliolate with large bracts, glandular beneath; seeds 1-2   | ... | 13. FLEMINGIA |
| 8a. Leaves pinnately 3-foliolate  | ... | 9             |
| 8b. Leaves pinnately 5-many foliolate   | ... | 15            |
| 9a. Pod dehiscing from apex to base   | ... | 10            |
| 9b. Pod dehiscing at seed-bearing apex only elsewhere seedless and indehiscent; petals unequal; flowers large   | ... | 5. BUTEA      |
| 10a. Leaves glandular beneath; stamens 9+1; the two upper calyx-lobes much connate; pod compressed deeply transversely lineate between the seeds; seeds 4 or more; funicle centric; stipels often wanting | ... | 11            |
| 10b. Leaves not glandular beneath; leaflets stipellate  | ... | 12            |
| 11a. Climbers; stigma small terminal; pod oblong-obtuse   | ... | 4. ATYLOSIA   |
| 11b. Woody undershrubs; stigma dilated, oblique; pod acute  | ... | 6. CAJANUS    |
| 12a. Style bearded below the stigma; stamens 9+1, stigma oblique; pod coriaceous, not septate between the smooth seeds  | ... | 28. VIGNA     |
| 12b. Style not bearded below the stigma   | ... | 13            |
| 13a. Nodes of racemes not swollen; stamens 1-adelphous, five alternate anthers sterile; petals of equal length  | ... | 24. TERAMNUS  |
| 13b. Nodes of racemes swollen; stamens 2-adelphous (9+1); petals very unequal   | ... | 14            |
| 14a. Armed trees; anthers uniform; keel and wings both shorter than standard; stamens submonadelphous.  |     | 12. ERYTHRINA |

14b. Climbers; anthers dimorphous; standard shorter than keel and wings	...	19 MUCUNA
15a. Pods transversely septate between the seeds; stamens 2-adelphous (9+1)	...	21. SESBANIA
15b. Pods not septate; stamens submonadelphous, the vexillary stamen usually united in the middle to the edges of the sheath	...	16
16a. Leaflets closely parallel-veined; pod thin, early dehiscent	...	23. TEPHROSIA
16b. Leaflets reticulately veined; pod thick, tardily dehiscent	...	18. MILLETTIA
17a. Pod not segmented, always indehiscent	...	18
17b. Pod of 1 or several indehiscent 1-seeded segments; in some <i>Desmodia</i> dehiscing along the ventral suture	...	23
18a. Trees or strong woody climbers; leaflets entire	...	19
18b. Herbs; leaflets with the veins produced as marginal teeth; leaves always 3-foliolate	...	21
19a. Leaflets opposite, stamens usually submonadelphous, the vexillary stamen united in the middle to the sheath, sometimes 2-adelphous (9+1)	...	20
19b. Leaflets distinctly alternate; flowers small; pods narrow	...	9. DALBERGIA,
20a. Pod wingless	...	20. PONGAMIA,
20b. Pod winged	...	10. DERRIS
21a. Pod subglobose, hardly longer than calyx	...	17. MELILOTUS
21b. Pod flattened, much longer than calyx	...	22
22a. Pod straight or curved, not spiral	...	25. TRIGONELLA
22b. Pod spirally twisted	...	16. MEDICAGO

- 23a. Leaflets exstipellate ... 24
- 23b. Leaflets stipellate ... 27
- 24a. Stamens 1-adelphous, anthers dimorphous; leaves digitately 2-4-foliolate; joints of pod muricated ... 29. ZORNIA.
- 24b. Stamens 2-adelphous, anther uniform ... 25
- 25a. Stamens 9 in a sheath slit above with a free vexillary stamen; leaves 3-foliolate; pod a solitary 1-seeded flattened segment ... 7. CAMPYLOTROPIS
- 25b. Stamens in 2 lateral bundles of 5 each; leaves pinnate; joints of pod papillose ... 26
- 26a. Leaves even-pinnate, end-leaflet replaced by a bristle; pod folded within the calyx ... 22. SMITHIA
- 26b. Leaves odd-pinnate; pod straight exerted; marsh plant ... 2. AESCHYNOMENE.
- 27a. Pod folded within the calyx, calyx-teeth setaceous ... 26. URARIA
- 27b. Pod straight exerted ... 28
- 28a. Pod flattened; joints thin or, if coriaceous, broader than thick; if as thick as broad much longer than broad; sometimes opening along lower suture ... 11. DESMODIUM.
- 28b. Pod often terete; joints coriaceous, about as thick as they are broad and long ... 3. ALYSICARPUS

I. ABRUS Adans.

- 1a. Pods oblong, 3-5-seeded ... 1. *A. precatorius*
- 1b. Pods linear, 8-12-seeded ... 2. *A. pulchellus*

1. *Abrus precatorius* L., Syst. Nat. ed 12. 472. 1767. Baker in Hook. f., Fl. Brit. India 2 : 175. 1876 ; Haines, Bot. Bihar & Orissa 2 : 259. 1922.

Leaflets 10-20 pairs. 1.2-2.5 × 0.4-0.7 cm. Flowers in dense racemes.

Corolla pinkish white. Pod to 5 cm long. Seeds subglobose, shining, scarlet red with black eye.

Common. Fl. : August-September ; Fr.: September-June. KUCH. Sarkar & Bhatta., 1700.

Seeds used as beads.

2. *Abrus pulchellus* Wall. ex Thw. Enum. 91. 1859 ; Baker in Hook. f., Fl. Brit. India 2 : 175. 1876 ; Haines, Bot. Bihar & Orissa 2 : 258. 1922.

Racemes lax. Pod turgid.

Rare. Haines 84. (CAL!).

## 2. AESCHYNOMENE L.

1a. Stems spongy, swollen ... 1. *A. aspera*

1b. Stems not spongy, slender ... 2. *A. indica*

1. *Aeschynomene aspera* L., Sp. Pl. 713. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 152. 1876 ; Haines, Bot. Bihar & Orissa 2 : 266. 1922.

Stout herbs, to 3 m high, somewhat floating. Leaves to 13 cm long ; leaflets numerous, linear to 1 cm long. Flowers to 2 cm long, yellow. Pods 4.5-8 cm long.

Marshy places. Fl. July-August. SOLA. Sarkar & Bhatta., 928.

Spongy stem is the 'Sola' of commerce.

2. *Aeschynomene indica* L., Sp. Pl. 713. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 151 ; Haines, Bot. Bihar & Orissa 2 : 265. 1922.

Slender herbs, to 1.2 m high. Leaves to 8 cm long ; leaflets linear, to 0.6 cm long. Flowers to 1 cm long. Pods 3-6 cm long.

Moist places. August-December. Sarkar & Bhatta., 1799.

## 3. ALYSICARPUS Desv., *nom. cons.*

1a. Pod moniliform ... 2. *A. monilifer*

1b. Pod not moniliform. ... 2

- 2a. Calyx as long as first joint of pod ... 3. *A. vaginalis*  
 2b. Calyx much longer than first joint of pod ... 1. *A. bupleurifolius*

1. ***Alysicarpus bupleurifolius*** (L.) DC. ,Prodr. 2 : 352. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 158. 1876 ; Haines, Bot. Bihar & Orissa 2 : 269. 1922. *Hedysarum bupleurifolium* L., Sp.Pl. 745.1753.

Annual herbs. Leaves to 3 cm long. Racemes with distant pairs of purplish-red flowers. Calyx-lobes ciliate. Pod rugose, glabrous.

Along moist grass lands. September-October. Sarkar & Bhatta., 1476.

2. ***Alysicarpus monilifer*** (L.) DC. ,Prodr. 2 : 353. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 157. 1876 ; Haines, Bot. Bihar & Orissa 2 : 270. 1922 *Hedysarum moniliferum* L., Mant. Pl. 1 : 102. 1767.

Prostrate herbs with spreading hairs. Leaves 1-foliolate, elliptic oblong, to 1.5 cm long. Racemes dense. Corolla pink. Pod to 1.6 cm long, joints 4-7.

Common. Tropics. July-December. Sarkar & Bhatta., 789.

3. ***Alysicarpus vaginalis*** (L.) DC., Prodr. 2 : 353. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 158. 1876; Haines, Bot. Bihar & Orissa 2 : 271. *Hedysarum vaginalis* L., Sp. Pl. 746. 1753.

Prostrate or ascending, diffuse herbs. Leaves 1-foliolate, elliptic to lanceolate. Racemes to 5 cm long. Corolla purplish. Pod to 2.5 cm long ; joints 6-8.

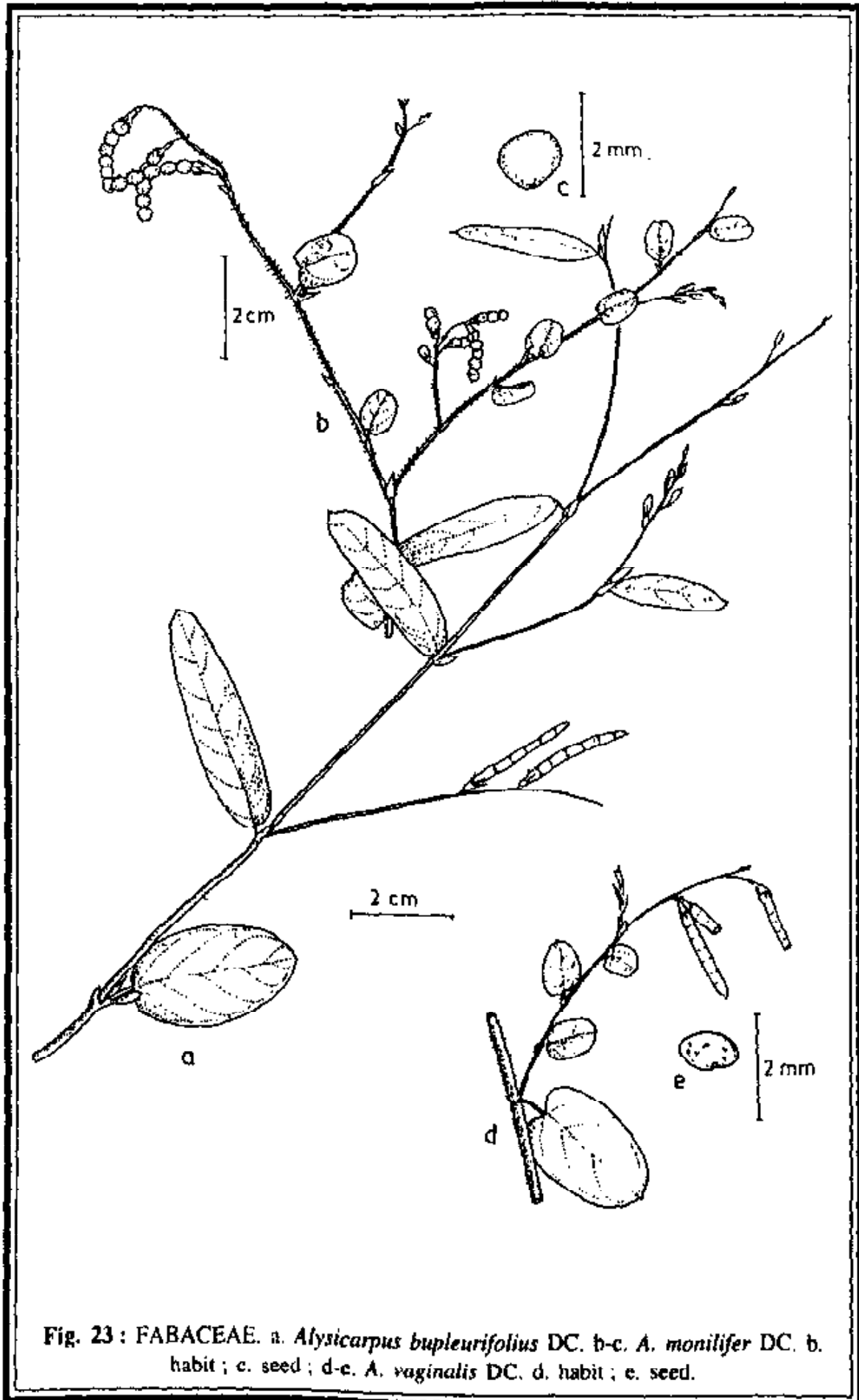
Common. September-April. Sarkar & Bhatta., 1014.

#### 4. **ATYLOSIA** Wt. & Arn.

- 1a. Suffruticose twiner ... 10. *A. volubilis*  
 1b. Herbaceous twiner ... 2. *A. scarabaeoides*

1. ***Atylosia volubilis*** (Blanco) Gamble, Fl. Madras 1 : 369.1918 ; *Atylosia crassa* Prain, J. Asiatic Soc. Beng. 45. 342. 1898. Haines, Bot. Bihar & Orissa 2 : 286.1922. *Cytisus volubilis* Blanco. Fl. Filip., 599.1837.

Branches and undersurface of leaves rusty tomentose. Leaflets to 8 cm long. Racemes lax. Corolla yellow. Pod to 4 cm long.



Forest areas. January-March. Sarkar & Bhatta., 1367, 1638.

2. *Atylosia scarabaeoides* (L.) Benth. in Miq., Pl. Jungh. 242.1852 ; Baker in Hook. f., Fl. Brit. India 2 : 215. 1876 ; Haines, Bot. Bihar & Orissa 2 : 287. 1922. *Dolichos scarabaeoides* L., Sp. Pl. 726. 1753.

Greenish-pubescent herb. Leaflets ovate-oblong, to 4.5 cm long. Racemes to 2 cm long. Corolla yellow. Pod to 2.5 cm long, linear-oblong.

Common along hedges. October-February. Sarkar & Bhatta., 599.

5. *BUTEA* Roxb. ex Willd., *nom. cons.*

- |                                      |     |                          |
|--------------------------------------|-----|--------------------------|
| 1a. Scandent shrubs                  | ... | 3. <i>B. parviflora</i>  |
| 1b. Plants otherwise.                | ... | 2                        |
| 2a. Shrubs with sub-sarmentose stems | ... | 1. <i>B. buteiformis</i> |
| 2b. Trees                            | ... | 2. <i>B. monosperma</i>  |

1. *Butea buteiformis* (Voigt) Grierson & Long in Notes Royal Bot. Gard. Edin. 37 : 346. 1976. *Mezotropis buteiformis* Voigt, Hort. Suburb. Calc. 239. 1845. *B. minor* Ham. ex Baker in Hook. f., Fl. Brit. India 2 : 195. 1876 ; Haines, Bot. Bihar & Orissa 2 : 293.1922.

Yellowish tomentose throughout. Leaflets broadly elliptic, to 45 cm long. Flowers in dense, paniced racemes. Petals red. Pod sub-sessile, oblong.

Someswar Hills. September-January. Sarkar & Bhatta., 1536.

2. *Butea monosperma* (Lamk.) Taub. in Pflanzenfam. 3(3) : 366. 1894 ; Santapau in Bull. Bot. Surv. Ind. 3 : 12.1962. *Erythrina monosperma* Lamk., Encyl. 1 : 391. 1783 ; *Butea frondosa* Koen. ex Roxb. in Asiat. Res. 3 : 469. 1792 ; Baker in Hook. f., Fl. Brit. India 2 : 194 ; Haines, Bot. Bihar & Orissa 2 : 292.1922.

Medium trees. Leaflets rhomboid or broadly ovate, to 18.5 cm long. Flowers in dense racemes, red, showy. Calyx dark brown-tomentose. Pod to 15 cm long.

Northern boundary of the district. January-June. PALASH. Sarkar & Bhatta., 688, 1703.

Gum medicinal. Petals yield a dye.

3. *Butea parviflora* Roxb. Fl. Indica 3 : 248. 1832 ; Haines, Bot. Bihar & Orissa 2 : 293. *Spatholobus roxburghii* Benth. in Miq., Pl. Jungh. 238. 1891; Baker in Hook. f., Fl. Brit. India 2 : 193. 1876.

Woody climber. Leaflets obovate-rhomboid, to 30 cm long. Flowers in paniced racemes, lax. Pods 7-9 cm long.

Common along forests. October–March. MAULA. Sarkar & Bhatta., 267, 1381.

Leaves used as plates. Bark medicinal.

#### 6. CAJANUS DC., *nom. cons.*

*Cajanus cajan* (L.) Millsp. in Paubl., Field Mus. Nat. Hist. Bot. Ser. 2:53.1900. *Cytisus cajan* L., Sp. Pl. 2 : 739. 1753.

Cultivated perennials. Leaflets to 10 cm long. Pod linear-oblong, to 10 cm long. Seeds globose.

Throughout the district. ARHAR. Sarkar & Bhatta., 793.

Seeds used as pulse.

#### 7. CAMPYLOTROPIS Bunge

*Campylotropis stenocarpa* (Klotz.) Schindler in Fedde, Reprt. Sp. Nov. 11 : 345. 1912 ; Ali in Biologia 12(2) : 44. 1966. *Oxyramphis stenocarpa* Klotz. in Klotz. & Garcke, Bot. Ergebn. Reise Waldemar 158. t. 1.1862. *Lespedeza macrostyla* Baker in Hook. f., Fl. Brit. India 1 : 60. 1872 ; Haines, Bot. Bihar & Orissa 2 : 262. 1922.

Shrubs, to 1 m high. Leaflets obvate, to 2 cm long. Flowers pink, to 1 cm long. Pod small.

Rare. Northern India. November–December. Shetty 358 (CAL!).

#### 8. CROTALARIA L.

1a. Leaves simple.	...	2
1b. Leaves 3-foliolate.	...	9
2a. Stems winged	...	2. <i>C. bialata</i>
2b. Stems not winged.	...	3

3a. Diffuse herbs.	...	4
3b. Erect herbs or sub-shrubs.	...	5
4a. Bracts subulate, minute	...	8. <i>C. prostrata</i>
4b. Bracts leafy	...	4. <i>C. hirta</i>
5a. Pods not longer than calyx	...	3. <i>C. calycina</i>
5b. Pods exserted.	...	6
6a. Stipules 0	...	1. <i>C. albida</i>
6b. Stipules present.	...	7
7a. Herbaceous, pod glabrous	...	9. <i>C. spectabilis</i>
7b. Woody, pod velvety.	...	8
8a. Branches angular	...	10. <i>C. tetragona</i>
8b. Branches cylindrical	...	5. <i>C. juncea</i>
9a. Pod cylindrical, 30-40 seeded	...	7. <i>C. pallida</i>
9b. Pod sub-globose, 2-seeded	...	6. <i>C. medicaginea</i>

1. *Crotalaria albida* Heyne ex Roth, Nov. Sp. Pl. 333.1821 ; Baker in Hook. f., Fl. Brit. India 2 : 71. 1876 ; Haines, Bot. Bihar & Orissa 2 : 242.1922.

Branches to 60 cm long. Leaves linear oblong, 2-7 × 0.5-1 cm. Racemes terminal, few flowered. Corolla yellow, glabrous. Pod oblong, to 1 cm long, glabrous, 2-5-seeded.

Common in forest-floors. August-April. Sarkar & Bhatta., 144.

Roots purgative.

2. *Crotalaria bialata* Schrank, Pl. Rar. Hort. Monac. t. 13. 1817 ; Roxb., Fl. Indica. 3 : 274. 1832. *C. alata* Buch. - Ham. & Roxb. ex D. Don, Prodr. 241. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 69. 1876 ; Haines, Bot. Bihar & Orissa 2 : 241.1922.

Sub-erect herbs, or sub-shrubs. Leaves linear-lanceolate, 4 × 0.5-0.7 cm,

silky beneath, Racemes terminal, several flowered. Calyx to 1 cm long. Corolla not exerted. Pod oblong to 3 cm long.

Collected near Valmikinagar, rare. October-December. Sarkar & Bhatta., 240 ; Sarkar 1391.

Yields green manure.

3. **Crotalaria calycina** Schrank, Pl. Rar. Hort. Monac. t. 12.1817 ; Baker in Hook. f., Fl. Brit. India 2 : 72. 1876 ; Haines, Bot. Bihar & Orissa 2 : 242.1922.

Erect herbs, hairy. Leaves linear lanceolate, silky beneath, to 8 cm long. Flowers in terminal lax racemes. Calyx reddish-brown, to 1.5 cm long. Pod subcylindric, 2-2.5 × 0.8 cm, included, glabrous.

Common along the exposed forest grounds. October-January. Sarkar & Bhatta., 49.

4. **Crotalaria hirta** Willd., Ges. Naturf. Fr. Neue. Schr. 4 : 217. 1803; Baker in Hook. f., Fl. Brit. India 2 : 67. 1876 ; Haines, Bot. Bihar & Orissa 2 : 241. 1922.

Suberect, villous sub-shrubs. Leaves linear-oblong-lanceolate, 1.5-4.0 × 0.3-1.0 cm, obtuse. Flowers in subcapitate, 1-6-flowered racemes. Calyx to 0.4 cm long. Corolla equalling calyx. Pod oblong, to 1 cm long. glabrous, 15-20-seeded.

Common. November-December. Sarkar & Bhatta., 1015.

5. **Crotalaria juncea** L., Sp. Pl. 214. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 79. 1876 ; Haines, Bot. Bihar & Orissa 2 : 243. 1922.

Erect sub-shrubs ; branches furrowed. Leaves oblong-lanceolate, obtuse, to 9 cm long. Racemes terminal, many-flowered. Corolla exerted. Pod turgid, velvety, to 2.6 cm long, 10-15-seeded.

Cultivated and escape. October-May. SAN. Sarkar & Bhatta., 83.

Cultivated for its fibres. Stems used as paper pulp.

6. **Crotalaria medicaginea** Lamk., Encycl. 2 : 201. 1790 ; Baker in Hook. f., Fl. Brit. India 2 : 81. 1876 ; Haines, Bot. Bihar & Orissa 2 : 244. 1922.

Slender herbs. Leaflets oblanceolate, subtruncate 0.7-1 × 0.2-0.5 cm;

stipules often filiform. Racemes terminal and leaf-opposed. Flowers to 0.5 cm long. Pod subglobose, apiculate, to 0.3 cm across, 2-seeded.

Common in waste lands. September–November. Sarkar & Bhatta., 924.

7. *Crotalaria pallida* Ait., Hort. Kew. 32 : 20. 1789; Polhill in Kew Bull. 22 : 262. 1968. *C. striata* DC., Prodr. 2 : 131. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 84. 1876 ; Haines, Bot. Bihar & Orissa 2 : 244. 1922.

Sub-shrubs, somewhat glabrous. Stipules 0. Leaflets elliptic, to 10 cm long. Flowers in terminal, many-flowered racemes. Corolla exserted, glabrous. Pod exserted, glabrescent, 20–30-seeded.

Common. October–April. Sarkar & Bhatta., 986.

8. *Crotalaria prostrata* Rottl. ex Willd., Enum. Hort. Berol. 747. 1809; Baker in Hook. f., Fl. Brit. India 2 : 67. 1876 ; Haines, Bot. Bihar & Orissa 2 : 240. 1922.

Diffuse herbs ; branches sometimes suberect. Leaves obovate-oblong, 2–4 × 1–2 cm. Flowers in long-peduncled racemes. Pod linear-oblong, to 1.5 cm long, several-seeded.

Common in waste lands. September–June. Sarkar & Bhatta. 563.

9. *Crotalaria spectabilis* Roth, Nov. Pl. Sp. 341. 1821; Ali in Biol. 12(2): 26. 1966. *C. sericea* Retz., Obs. 5 : 26. 1789 ; non Burm. f. ; Baker in Hook. f., Fl. Brit. India 2 : 75. 1876 ; Haines, Bot. Bihar & Orissa 2 : 243. 1922.

Sub-shrubs, to 1.25 m high. Leaves obovate or oblanceolate, 5–15 cm long, pubescent beneath. Racemes terminal, many-flowered ; bracts foliaceous, to 1.8 cm long. Pod linear-oblong, inflated, glabrous, many-seeded.

Along waste lands. November–June. ATASI. Sarkar & Bhatta., 1139.

Fibre strong. Medicinal.

10. *Crotalaria tetragona* Roxb., Fl. Indica 3 : 263. 1832 ; Baker in Hook. f., Fl. Brit. India 2 : 78. 1876 ; Haines, Bot. Bihar & Orissa 2 : 244. 1922.

Erect shrubs, to 2 m high. Leaves linear or lanceolate, to 20 cm long, glabrescent or silky-hairy. Flowers in lateral and terminal racemes. Calyx densely brown-velvety. Corolla bright yellow. Pod exserted, hairy, to 6 cm long, 12–20-seeded.

Sandstone areas. July–Jan. Sarkar & Bhatta. 1720.

9. DALBERGIA L. f., *nom. cons.*

- |   |     |                        |
|---|-----|------------------------|
| 1a. Scandent shrubs ; climbing by hooks     | ... | 3. <i>D. volubilis</i> |
| 1b. Large trees.                            | ... | 2                      |
| 2a. Leaflets acuminate ; flowers subsessile | ... | 2. <i>D. sissoo</i>    |
| 2b. Leaflets obtuse ; flowers stalked       | ... | 1. <i>D. latifolia</i> |

1. **Dalbergia latifolia** Roxb., Pl. Cor. t. 113. 179. 1799 ; Baker in Hook. f., Fl. Brit. India 2 : 231. 1876 ; Haines, Bot. Bihar & Orissa 2 : 307. 1922.

Leaflets 3-7, orbicular or elliptic obovate, 4-6 cm long. Panicles lax, 5-10 cm long. Flowers white. Pod oblong-lanceolate, 3.5-8.5 × 2.0 cm.

Forest areas. September-January. SITSAL. Sarkar & Bhatta., 1283.

Wood useful.

2. **Dalbergia sissoo** Roxb., Fl. Indica 3 : 223. 1832 ; Baker in Hook. f., Fl. Brit. India 2 : 231 ; Haines, Bot. Bihar & Orissa 2 : 307. 1922.

Trees ; stems with furrowed bark. Leaves 3-5-foliolate ; leaflets ovate or suborbicular, 3-6 cm long, sparsely hairy above. Panicles axillary, dense. Flowers to 0.7 cm long, pinkish or bluish. Pods 5-9 cm long, 1-4-seeded.

Wild in the moist forest areas and planted for its valuable wood. April-June. SISU. Sarkar & Bhatta., 445.

Wood excellent for furniture.

3. **Dalbergia volubilis** Roxb., Pl. Cor. t. 191. 1805 ; Baker in Hook. f., Fl. Brit. India 2 : 235 ; Haines, Bot. Bihar & Orissa 2 : 309. 1922.

Branches to 6 m long. Leaflets 11-13, obovate or ovate-oblong, to 3.5 cm long, obtuse or emarginate. Panicles large. Flowers to 0.7 cm long, bluish-white. Pod oblong, 5-7 cm long, 1-2-seeded.

In sal forests. December-February. Sarkar & Bhatta., 1369, 1622.

Leaf-juice medicinal.

10. **DERRIS** LOUR., *nom. cons.*

- |                                      |     |                         |
|--------------------------------------|-----|-------------------------|
| 1a. Flowers in clusters.             | ... | 2                       |
| 1b. Flowers not in clusters          | ... | 2. <i>D. hainesiana</i> |
| 2a. Leaflets 4–5 pairs, oblanceolate | ... | 1. <i>D. cuneifolia</i> |
| 2b. Leaflets 3–6 pairs, lanceolate   | ... | 3. <i>D. scandens</i>   |

1. ***Derris cuneifolia*** Benth. in Miq., Pl. Jungh. 1 : 258. 1852 ; Baker in Hook. f., Fl. Brit. India 2 : 243. 1878 ; Haines, Bot. Bihar & Orissa 2 : 312. 1922.

Leaflets oblanceolate or oblong-obovate, to 13 cm long, glabrous. Racemes short, lateral. Pod thin, flat, narrowly winged, to 7 cm long, 1–3-seeded.

Large climbers along the sandstone hills. April–January. Sarkar & Bhatta., 761.

Roots contain cuneifolin, feebly toxic to fish.

2. ***Derris hainesiana*** Thoth. in Bull. Bot. Surv. India 3 : 198. 1962. *D. laxiflora* Haines. in Bot. Bihar & Orissa 3 : 312. 1922, non Benth. 1860.

Leaflets ovate-oblong, sometimes obovate, to 6 cm long. Flowers in rusty tomentose panicles. Pod oblong, flat, to 5 cm long, 1-seeded.

Someswar Hills, not very common. Endemic. August–December. Sarkar & Bhatta., 1483.

3. ***Derris scandens*** (Roxb.) Benth. in J.-Linn. Soc. 4 (Suppl.) : 103. 1860, non (Aube.) Pittier 1917 ; Baker in Hook. f., Fl. Brit. India 2 : 240. 1876 ; Haines, Bot. Bihar & Orissa 2 : 312. 1922 ; Thoth. & Nair in Taxon 30 : 44. 1981. *Dalbergia scandens* Roxb., Pl. Cor. t. 192. 1805.

Woody climbers. Leaflets oblong to obovate-oblong, obtuse, to 6 × 2.2 cm. Racemes to 30 cm long ; rachis and pedicels appressed hairy. Corolla white. Stamens monadelphous. Pod linear-lanceolate, to 9 cm long, 1–4-seeded.

Common in the forest areas. May–December. Sarkar & Bhatta., 1206. 1608.

Used as fish-poison.

11. *DESMODIUM* Desv., *nom. cons.*

1a. Herbs, sub-shrubs or shrubs.	...	2
1b. Medium trees	...	6. <i>D. oojeinense</i>
2a. Leaves 3-foliolate.	...	3
2b. Leaves 1-foliolate, when 3-foliolate pods indistinctly jointed, dehiscing in a continuous line along the ventral suture	...	7
3a. Erect herbs or shrubs.	...	4
3b. Trailing herbs	...	9. <i>D. triflorum</i>
4a. Flowers in dense axillary umbellate heads	...	8. <i>D. triangulare</i>
4b. Flowers in elongated racemes.	...	5
5a. Clusters of flowers concealed by two large foliaceous bracts	...	7. <i>D. pulchellum</i>
5b. Flowers not as above.	...	6
6a. Joints 3-4 times longer than broad	...	4. <i>D. laxiflorum</i>
6b. Joints twice longer than broad	...	1. <i>D. confertum</i>
7a. Leaves 1-foliolate ; joints about as broad as long	...	2. <i>D. gangeticum</i>
7b. Leaves 3-foliolate or two lateral leaflets minute or 0 ; joints indistinct.	...	8
8a. Sub-shrubs ; lateral leaflets minute	...	5. <i>D. motorium</i>
8b. Shrubs ; lateral leaflets well developed	...	3. <i>D. gyroides</i>

1. *Desmodium confertum* DC. in Ann. Sc. Nat. Ser. 1, 5 : 100. 1825; Baker in Hook. f., Fl. Brit. India 2 : 1876 ; Haines, Bot. Bihar & Orissa 2 : 275. 1922.

Shrubs ; branches drooping, appressed hairy. Leaflets 3 ; terminal obovate, laterals elliptic-oblong, silky beneath. Racemes to 10 cm long, paniced. Pod densely plumose, to 6 cm long, compressed.

Sandstone hills, occasional. November-February. Sarkar & Bhatta., 1416.

2. *Desmodium gangeticum* (L.) DC., Prodr. 2 : 327. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 168. 1876, incl. var. *maculatum* (L.) Baker, l.c.; Haines, Bot. Bihar & Orissa 2 : 276. *Hedysarum gangeticum* L., Sp. Pl. 746. 1753.

Herbs or subshrubs, to 80 cm high. Leaflets 3–15 cm long, scabrid above and grey-silky beneath. Racemes paniced, to 25 cm long. Flowers to 0.9 cm long, white. Pod curved, to 2 cm long, deeply indented on the lower suture.

Common. May-January. SALPANI. Sarkar & Bhatta., 1066, 1392.

Roots medicinal.

3. *Desmodium gyroides* DC., Mem. Leg. 322. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 175. 1876 ; Haines, Bot. Bihar & Orissa 2 : 279. 1922.

Subshrubs or shrubs. Terminal leaflet obovate, to 8 cm long, laterals smaller. Racemes terminal and axillary. Flowers purple, to 1.3 cm long. Pod to 5 cm long, hairy, 6–10-seeded.

Very rare in the sandstone areas. August-January. Sarkar & Bhatta., 1556.

Leaves medicinal.

4. *Desmodium laxiflorum*. DC., in Ann. Sc. Nat. Paris 4 : 100. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 164. 1876 ; Haines, Bot. Bihar & Orissa 2 : 275. 1922.

Subshrubs, to 1 m high. Leaflets ovate-lanceolate or rhomboid, hairy beneath, terminal 8–15 × 4–8 cm. Flowers in lax racemes, to 1 cm long. Corolla bluish-white. Pods 3–4 cm long, hairy, 6–8-jointed.

Common on forest floors. August-January. Sarkar & Bhatta., 1605.

5. *Desmodium motorium* (Houtt.) Merr. in J. Arn. Arb. 19 : 345. 1938; Backer & Bakh. f., Fl. Java 1 : 605. 1963. *Hedysarum motorium* Houtt. in Nat. Hist. 2.10 : 246. 1779. *Desmodium gyrans* DC., Prodr. 2 : 326. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 174. 1876 ; Haines, Bot. Bihar & Orissa 2 : 278. 1922.

Slender herbs, or subshrubs. Terminal leaflet elliptic-oblong, rounded at both ends, usually glaucous beneath. Racemes terminal to 13 cm long ; bracts large, foliaceous. Pod to 3.5 cm long, oblong, pubescent.

Along forest margins and exposed grounds. August–December. BANCHANRAL. Sarkar & Bhatta., 1371.

Leaves a good fodder.

6. *Desmodium oojeinense* (Roxb.) Ohashi in Ginkgoana 1 : 117. 1973 & Enum. Fl. Pl. Nepal 2 : 118. 1979. *Dalbergia oojeinesis* Roxb., Fl. Indica 3 : 200. 1832. *Ougeinia dalbergioides* Benth. in Miq., Pl. Jungh. 216. 1852 in adnota ; Baker in Hook. f., Fl. Brit. India 2 : 261. 1876.; Haines, Bot. Bihar & Orissa 2 : 271. 1922.

Medium trees, deciduous, blaze streaked with red. Leaflets elliptic–obovate, 7–15 × 4–9 cm. Racemes axillary, fascicled. Flowers to 1 cm long, pink. Pod linear-oblong, 5–10 cm long, jointed ; seeds reniform.

Along the sandstone areas. Fl. : February–April. PANAN. Sarkar & Bhatta., 1238, 1668.

Wood valued for building and agricultural implements.

7. *Desmodium pulchellum* (L.) Benth., Fl. Hongk. 83.1861 ; Baker in Hook. f., Fl. Brit. India 2 : 162. 1876 ; Duthie, Fl. U. G. P. 1 : 260 ; Haines, Bot. Bihar & Orissa 2 : 273. *Hedysarum pulchellum* L., Sp. Pl. 747.1753.

Subshrubs or shrubs, to 1.5 cm high ; branches grey hairy. Leaflets elliptic or ovate oblong, terminal, 6–12 cm long ; laterals about half as long grey hairy beneath. Flowers umbelled, to 0.6 cm long, yellowish-white. Pod to 1.5 cm long, 2–3–jointed.

Common in the sal forests. China. September–February. Sarkar & Bhatta., 1737.

Leaves used as fodder.

8. *Desmodium triangulare* (Retz.) Merr., J. Arn. Arbor. 23 : 170. 1942; Saldanha, Fl. Karnataka 454.1984. *Hedysarum triangulare* Retz., Obs. Bot. 3 : 40. 1783. *Desmodium cephalotes* Wt. & Arn., Prodr. 224. 1834 ; Baker, in Hook. f. Fl. Brit. India 2 : 161. 1876 ; Haines, Bot. Bihar & Orissa 2 : 273.1922.

Subshrubs or shrubs ; branches triangular and hairy. Leaflets elliptic or obovate, to 15 cm long, silky beneath. Flowers in short–peduncled, several-flowered umbels. Pod to 2.2 cm long, 4–6–jointed, white silky.

In the forest areas. August–January. Sarkar & Bhatta., 1240.

9. *Desmodium triflorum* (L.) DC., Prodr. 2 : 334. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 173. 1876 ; Haines, Bot. Bihar & Orissa 2 : 278. *Hedysarum triflorum* L., Sp. Pl. 749. 1753.

Slender herbs, annual. Leaflets obovate, truncate or emarginate, to 1.2 cm long. Flowers 1-4 together, axillary, bluish-white. Pods on filiform pedicels, curved, 3-5-jointed, glabrous or hairy, to 1.3 cm long.

Along waste places. August-January. Sarkar & Bhatta., 1011.

Leaves medicinal.

## 12. ERYTHRINA L.

*Erythrina variegata* L., Herb. Amb. 10. 1754. var. *orientalis* (L.) Merr., Interpret. Herb. Amb. 276. 1917 ; Maheswari, Bull. Bot. Surv. India 3 : 46. 1961. *E. indica* Lamk., Encyl. 2 : 391. 1786 ; Baker in Hook. f., Fl. Brit. India 2 : 188. 1876 ; Haines, Bot. Bihar & Orissa 2 : 297. 1922.

Prickly trees. Leaflets broadly deltoid or subrhomboid, to 15 cm long. Flowers red, showy, to 6 cm long. Pod to 25 cm long.

Common. Tropics. March-July. PALIT MANDAR. Sarkar & Bhatta., 1739.

Leaves medicinal. Bark yields a fibre. Raw seeds poisonous.

Note : Haines stated that "*Erythrina resupinata* very likely occur in Champaran," but not found.

## 13. FLEMINGIA Roxb. ex W.T. Ait., *nom. cons.*

Note : *Maughania* J. St.-Hil. (1813) is reunited with *Flemingia* W.T.Ait. (1812).—Bhatta.

- |  |     |                             |
|--|-----|-----------------------------|
| 1a. Leaves 1-foliolate   | ... | 5. <i>F. strobilifera</i>   |
| 1b. Leaves 3- foliolate.   | ... | 2                           |
| 2a. Inflorescence racemose.  | ... | 3                           |
| 2b. Inflorescence capitate   | ... | 3. <i>F. strobilifera</i> . |
| 3a. Erect or prostrate shrubs ; leaflets with 6-10 secondary nerves. |     | 4                           |
| 3b. Erect shrubs, secondary nerves less than 6 in number             | ... | 3. <i>F. macrophylla</i>    |
| 4a. Erect shrubs   | ... | 1. <i>F. angustifolia</i>   |
| 4b. Prostrate shrubs   | ... | 4. <i>F. prostrata</i>      |

1. *Flemingia angustifolia* Roxb., Fl. Indica 3 : 341. 1832 ; Haines, Bot. Bihar & Orissa 2 : 281. 1922.

Erect undershrubs ; branches tomentose, leaflets lanceolate. Racemes dense, axillary and terminal.

Ramnagar forests. October–December. Sarkar & Bhatta., 506.

2. *Flemingia involucrata* Benth. in Miq., Fl. Jungh. 246. 1852 ; Baker in Hook. f., Fl. Brit. India 2 : 229. 1876 ; Haines, Bot. Bihar & Orissa 2 : 283. 1922.

Erect shrubs, pubescent. Leaf rachis 1.3 cm long. Leaflets elliptic-lanceolate, to 9 cm long. Flowers in terminal or axillary, dense hairy heads. Pod 1-seeded.

Open forest floors. Haines 357 (CAL!).

3. *Flemingia macrophylla* (Willd.) O. Ktze ex Merr. in Philip. J. Sci. Bot. 5 : 130. 1910 ; Gandhi in Saldaha & Nicolson, Fl. Hassan Dist. 254. 1976. *Crotalaria macrophylla* Willd., Sp. Pl. 3 : 982. 1802. *Flemingia congesta* Ait., Hort. Kew. ed. 2, 4 : 349. 1812 ; Roxb., Fl. Ind. 3 : 340. 1832 ; Baker in Hook. f., Fl. Brit. India 2 : 228. 1876 ; *F. c.* var. *semialata* (Roxb.) Baker. l.c. 2 : 229. 1876. *F. c.* var. *latifolia* (Roxb.) Baker l.c. *F. c.* var. *wightiana* (W. & A.) Baker l.c. *F. stricta* Roxb., Cor. Pl. 3 : t. 248. 1815 ; Baker l.c. 2 : 228. 1876 ; Prain, l.c. ; Duthie, l.c. 1 : 200 ; Haines, l.c. 2 : 281. *F. wallichii* W. & A., Prodr. 242. 1834 ; Baker, l.c.

Subshrubs, to 1.5 m high. Leaflets ovate-oblong., 10–15 × 4–5 cm, sparsely beneath. Racemes axillary, solitary or fascicled. Corolla purplish white, to 1.2 cm long. Pod to 0.7 cm long, pubescent, 2-seeded.

In sal forests. Shetty 227 (CAL!).

4. *Flemingia prostrata* Roxb., Fl. Indica 3 : 338. 1832 ; Haines, Bot. Bihar & Orissa 2 : 281. 1922.

Subshrubs ; branches diffuse, tomentose. Leaflets lanceolate or linear-lanceolate. Flowers in dense axillary racemes.

Forest areas. Bannerjee 452 (CAL!).

5. *Flemingia strobilifera* (L.) W.T. Ait., Hort. Kew. ed. 2, 4 : 350. 1812. Baker in Hook. f., Fl. Brit. India 2 : 227. 1876 ; Haines, Bot. Bihar & Orissa

2 : 280.1922. *Hedysarum strobiliferum*. L., Sp. Pl. 764. 1753. *F. strobilifera* var. *bracteata* (Roxb.) Baker *I.c. Flemingia bracteata*. Wt. *I.c.*, t. 268. 1840 : Haines. *I.c.*

Shrubs or undershrubs; branches pubescent. Leaflets oblong-lanceolate, to 10 cm long, pubescent beneath. Racemes to 10 cm long. Flowers included within folded bracts. Pod oblong, apiculate, to 7 cm long.

Exposed forest floors, common. November-February. Sarkar & Bhatta., 1376, 1669.

Medicinal

#### 14. INDIGOFERA L.

1a. Leaves simple	...	3. <i>I. linifolia</i>
1b. Leaves imparipinnate.	...	2
2a. Flowers in axillary short peduncled heads	...	4. <i>I. linnaei</i>
2b. Flowers in axillary racemes.	...	3
3a. Leaves 3-foliolate	...	6. <i>I. trifoliata</i>
3b. Leaves more than 3-foliolate.	...	4
4a. Bracts minute.	...	5
4b. Bracts exceeding the buds	...	2. <i>I. cassioides</i>
5a. Pod tetragonous	...	1. <i>I. astragalina</i>
5b. Pod linear	...	5. <i>I. tinctoria</i>

1. *Indigofera astragalina* DC., Prodr. 2 : 228. 1825 ; Gillett in Kew Bull. 24 : 500-501. 1970. *I. hirsuta* Baker in Hook. f., Fl. Brit. India 2 : 98.1876. p.p. ; Haines, Bot. Bihar & Orissa 2 : 250.1922. non L.

Annual herbs, to 70 cm high. Leaflets 5-11, oblong, 1-4 × 0.7-2.2 cm, pilose on both sides. Flowers to 0.5 cm long, orange red. Pods tetragonal, to 2 cm long, 4-6-seeded.

Waste places. September-December. Sarkar & Bhatta., 1009.

Medicinal. Source of indigo.

2. *Indigofera cassioides* Rottl. ex DC., Prodr. 2 : 225. 1825 ; Ali, Bot. Notiser 111 : 569. 1958. *I. pulchella* auct. non Roxb., 1832 ; Baker in Hook. f., Fl. Brit. India 2 : 101. 1876 ; Haines, Bot. Bihar & Orissa 2 : 251.1922.

Deciduous shrubs to 2.5 cm high. Leaflets elliptic-oblong, to 2.5 cm long, glaucous beneath. Racemes 10–20 cm long, 15–20-flowered. Flowers to 1.5 cm long, mauve-pink. Pod turgid, reflexed, to 5 cm long, 10–12-seeded.

Sandstone areas. India. November–April. Sarkar & Bhatta., 1676.

Medicinal.

3. *Indigofera linifolia* (L.f.) Retz., Obs. 4 : 29.1786 ; Baker in Hook. f., Fl. Brit. India 2 : 92, 1876 ; Haines, Bot. Bihar & Orissa 2 : 248.1922. *Hedysarum linifolium* L. f., Suppl. 331. 1781.

Prostrate herbs ; branches slender; to 50 cm long, whitish pubescent. Leaves simple, linear-oblong, to 0.8 cm long. Flowers in lax racemes, red. Pod globose, to 0.15 cm across, silvery silky.

Common along grasslands. August–January. Sarkar & Bhatta., 1036.

A vermifuge.

4. *Indigofera linnaei* Ali in Bot. Notiser 3 : 549. 1958 ; Backer & Bakh. f., Fl. Java 1 : 591. 1963. *I. enneaphylla* L., Mant. Pl. Alt. 272, 1771, *nom illeg.* Baker in Hook. f., Fl. Brit. India 2 : 94. 1876 ; Haines, Bot. Bihar & Orissa 2 : 249.1922.

Diffuse, spreading herbs. Leaflets 5–11, linear-oblong, 0.6–1 × 0.2–0.5 cm, pubescent to 0.4 cm long, red. Pod oblong, thinly hairy, to 0.4 cm long, 2-seeded.

Open grounds, river beds West Africa. July – November. Thothathri 9924. (CAL!).

Medicinal.

5. *Indigofera tinctoria* L., Sp. Pl. 751. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 99. 1876 ; Haines, Bot. Bihar & Orissa 2 : 250.1922.

Subshrubs to 70 m high, appressed-pubescent Leaflets 7–11, opposite, linear-oblong, apiculate, 1–2.5 cm long. Racemes slender, axillary, to 4 cm long. Flowers pink. Pod linear, to 4 cm long, slightly curved.

In waste places. September–December. NIL. Sarkar & Bhatta., 1251.

Source of indigo.

6. **Indigofera trifoliata** L., Cent. Pl. 2 : 29. 1756 ; Baker in Hook. f., Fl. Brit. India 2 : 96. 1876 ; Haines, Bot. Bihar & Orissa 2 : 248. 1922.

Diffuse herbs ; branches deciduously hairy. Leaflets 3, oblong, obtuse, to 1.5 cm long. Racemes sessile, to 1 cm long. Flowers to 0.5 cm long, pink. Pod straight, slightly 4-winged. to 2 cm long.

In waste places. July–October. Sarkar & Bhatta., 792.

Seeds medicinal.

#### 15. LATHYRUS L

**Lathyrus aphaca** L., Sp. Pl 729. 1753 ; Baker in Hook f., Fl. Brit. India 2 : 179. 1876 ; Haines, Bot. Bihar & Orissa 2 : 261.1922.

Slender herbs. Stipule large, ovate, hastate, foliaceous. Flowers yellow. Pod sub-falcate, to 2.5 cm long ; seeds compressed, beaked.

Weed of cultivated fields. December–March. Sarkar & Bhatta., 1444,1695,1724.

#### 16. MEDICAGO L., *nom. cons.*

**Medicago lupulina** L., Sp. Pl. 779. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 90. 1876 ; Haines, Bot. Bihar & Orissa 2 : 246. 1922.

Procumbent, pubescent herbs. Leaflets obovate, to 0.6 cm long. Flowers minute, pale yellow. Pod sub-globse to reniform, black when ripe.

Common weed. January–March. Sarkar & Bhatta., 384.

#### 17. MELILOTUS Juss.

1a. Corolla white ; pod 2-seeded ... 1. *M. alba*

1b. Corolla yellow ; pod 1-seeded ... 2. *M. indica*

1. **Melilotus alba** Desr. in Lamk., Encyl. 4 : 63. 1789 ; Baker in Hook. f., Fl. Brit. India 2 : 89. 1876 ; Haines, Bot. Bihar & Orissa 2 : 246.1922.

Biennial herbs. Leaflets obovate-oblong, to 2.1 cm long. Racemes to 6 cm long. Corolla to 0.4, cm long. Pod 0.4 cm across.

Weed of cultivated fields. S. E. Asia. January – April. Sarkar & Bhatta., 1737.

Used as a pot herb.

2. *Melilotus indica* All., Fl. Pedem. 1 : 308. 1765 ; Haines, Bot. Bihar & Orissa 2 : 245. 1922. *M. parviflora* Desf., Fl. Atlant. 2 : 192. 1800 ; Baker in Hook. f., Fl. Brit. India 2 : 89. 1876.

Annual herbs. Leaflets obovate or oblanceolate, to 2.5 cm long. Racemes to 6 cm long, dense. Pod 0.2 cm across, 1-seeded.

Weed. January–March. Sarkar & Bhatta., 1736.

Used as a pot herb.

#### 18. *MILLETTIA* Wt. & Arn., *nom. cons.*

*Millettia extensa* (Benth.) Baker in Hook f., Fl. Brit. India 2 : 109. 1876 ; Ohashi in Enum. Fl. Pl. Nepal 2 : 125. 1979. *Otosema extensa* Benth. in Miq., Pl. Jungh. 249. 1852. *M auriculata* Baker ex Brandis, For. Fl. India 138. 1874 ; Baker l.c. 2 : 108. 1876 ; Haines, Bot. Bihar & Orissa 2 : 257. 1922.

Leaves to 50 cm long ; leaflets 7–9 obovate, membranous or subcoriaceous, 7.5–20.5 cm long. Calyx densely silky pubescent. Corolla white. Pod 10–15 cm long, densely rusty-tomentose.

Sandstone areas. October–December. Sarkar & Bhatta., 187.

Leaves a good fodder. Roots used as fish-positon.

#### 19. *MUCUNA* Adans., *nom. cons.*

- |                         |     |                        |
|-------------------------|-----|------------------------|
| 1a. Pod winged, plaited | ... | 1. <i>M. nigricans</i> |
| 1b. Pod not as above    | ... | 2. <i>M. pruriens</i>  |

1. *Mucuna nigricans* (Lour.) Steudel. Nom. Bot. ed. 2, 2 : 163. 1841; Tateishi & Ohashi in Bot. Mag. Tokyo 94 : 100. 1981. *Citta nigricans* Lour, Fl. Cochinch. 456. 1790. *Mucuna imbricata* DC. Prodr. 2 : 406. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 187. 1876 ; Haines, Bot. Bihar & Orissa 2 : 296. 1922.

Woody climbers. Leaflets ovate-oblong, 10–20 cm long, sparsely hairy beneath. Racemes 8–10 flowered. Corolla dull purple. Pod oblong, wings well developed ; plaits oblique, 11–15 × 5–6 cm, with stiff, deciduous stinging hairs. Seeds globose, brownish, to 1.5 cm across.

Occasional in the forests. August–February. KAWACH. Sarkar & Bhatta., 1607. Stem medicinal.

2. *Mucuna pruriens* (L.) DC. Prodr. 2 : 405. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 187. 1876 ; *Dolichos pruriens* L. in Stickman, Diss. Herb. Amb. 23. 1754. *Mucuna prurita* Hook., Bot. Misc. 2 : 348. 1830, *nom. superfl.* ; Haines, Bot. Bihar & Orissa 2 : 296. 1922.

Leaflets obovate, rhomboid or ovate, 5–15 × 3–12 cm pubescent on both surfaces. Racemes to 25 cm long, drooping. Flowers to 4 cm long, deep purple. Pods 5–6 cm long, clothed with stinging hairs.

Common near villages and in forests. October–May. KAWACH. Sarkar & Bhatta., 1624, 1701.

Pod eaten. Root and seeds medicinal.

#### 20. PONGAMIA Adans., *nom. cons.*

*Pongamia pinnata* (L.) Pierre, Fl. For. Cochinch. t. 385. 1899 ; Thoth., Bull. Bot. Surv. India 3 : 418. 1962. *Cytisus pinnatus* L., Sp. Pl. 741. 1753. *Pongamia glabra* Vent., Jard. Malm. t. 28. 1803 ; Baker in Hook. f., Fl. Brit. India. 2 : 240. 1876 ; Haines, Bot. Bihar & Orissa 2 : 331. 1922.

Medium trees with spreading branches. Leaves 7–15 cm long ; leaflets 5–7 ovate-oblong, shining above. Racemes upto 10 cm long. Flowers upto 1.2 cm long. Corolla pinkish. Pod obliquely oblong, shortly cuspidate, 4–5 cm long.

Common near villages. May–January. KARANJ. Sarkar & Bhatta., 786.

Seeds is the source of "Pongam oil".

#### 21. SESBANIA Scop., *nom. cons.*

- |   |     |                          |
|---|-----|--------------------------|
| 1a. Trees ; flowers 6 –10 cm long                 | ... | 2. <i>S. grandiflora</i> |
| 1b. Herbs or shrubs ; flowers within 2.5 cm long. | ... | 2                        |
| 2a. Annual herbs or subshrubs of marshy places    | ... | 3. <i>S. sesban</i>      |
| 2b. Large shrubs                                  | ... | 1. <i>S. bispinosa</i>   |

1. *Sesbania bispinosa* (Jacq.) W.F. Wight in U. S. Dept. Agr. Bur. Pl. Ind. Bull. 137 : 15. 1909 ; Gillett in Kew Bull. 17 : 129. 1963. *Aeschynomene bispinosa* Jacq., Ic.Pl. Rar. 3 : 13, t. 564. 1793. *Sesbania acauleata* (Willd.) Pers., Syn. 2 : 316. 1807 *nom. illeg.* ; Baker in Hook. f., Fl. Brit. India 2 : 115. 1876 ; *S. paludosa* Prain, Bengal Pl. 1 : 288 ; Haines, Bot. Bihar & Orissa 2 : 257. 1922.

Annual or biennial herbs. Leaves 15–30 cm long ; leaflets linear. Racemes 8–13 cm long, 3–12-flowered. Pod slender, curved or twisted, 15–25 cm long, many seeded.

In marshy places. July–December. Sarkar & Bhatta., 1310.

2. **Sesbania grandiflora** (L.) Poir. in Lamk., Encyl. 7 : 127. 1806.  
*Robinia grandiflora* L., Sp. Pl 722, 1753.

Small trees. Leaves 15–30 cm long ; leaflets 10–20 pairs, linear–oblong. Flowers white, showy, to 10 cm long. Pod linear, 30–45 cm long.

Cultivated. Tropics. June–December. BAKPHUL. Sarkar & Bhatta., 547.

Flowers eaten.

3. **Sesbania sesban** (L.) Merr. in Philip. J. Sci. Bot 7 : 235. 1912 ; Gillett in Kew Bull. 17 : 112. 1963. *Aeschynomene sesban* L., Sp. Pl. 714. 1753. *Sesbania aegyptiaca* (Poir.) Pers., Syn. 2 : 316. 1807 ; Baker in Hook f., Fl. Brit. India 2 : 114. 1876 ; Haines, Bot. Bihar & Orissa 2 : 256. 1922.

Large shrubs. Leaves 10–20 cm long ; leaflets 12–20 pairs, linear–oblong. Corolla to 1.5 cm long, yellow. Pod linear, twisted, to 20 cm long, many-seeded.

Occasionally planted and self-sown. August–December. DHANCHA. Sarkar & Bhatta., 974.

Used as a fuel wood.

## 22. SMITHIA Ait., *nom. cons.*

**Smithia sensitiva** Ait. Hort. Kew. 3 : 496. 1789 ; Baker in Hook f., Fl. Brit. India 2 : 148. 1876 ; Haines, Bot. Bihar & Orissa 2 : 265. 1922.

Profusely branched herbs. Leaves to 2.5 cm long ; leaflets linear, sensitive, 0.5–0.6 × 0.25 cm. Flowers yellow. Pod with 4–6 joints, papillose.

Common along grasslands. September – November. Sarkar & Bhatta., 1463.

Leaves used as a pot herb.

## 23. TEPHROSIA Pers., *nom. cons.*

1a. Shrubs ; leaflets over 2.3 cm long ... 1. *T. candida*

1b. Subshrubs ; leaflets less than 2.3 cm long ... 2. *T. purpurea*

**1. Tephrosia candida** DC., Prodr. 2 : 240. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 111. 1876 ; Haines, Bot. Bihar & Orissa 2 : 253. 1922.

Shrubs. Leaflets 19–25 Racemes to 20 cm long. Corolla red or white. Pod tomentose, to 10 cm long, 10–15 seeded.

Rare, Someswar Hills. Haines 229 (CAL!).

Bark and leaves used as fish poison.

2. **Tephrosia purpurea** (L.) Pers. Syn. 2 : 329. 1807 ; Baker in Hook. f., Fl. Brit. India 2 : 211. 1876 ; Haines, Bot. Bihar & Orissa 2 : 255. 1922. *Cracca purpurea* L., Sp. Pl. 752. 1753.

Subshrubs, to 40 cm high. Leaves 6–10 cm long; leaflets 7–17, oblanceolate, 2.2 × 1 cm, glabrous or hairy. Racemes many-flowered, leaf-opposed. Calyx 0.5 cm long. Corolla pink, to 1 cm long. Pod curved, 4 × 0.4 cm, 6–10-seeded.

Common. July–March. Sarkar & Bhatta., 984.

Medicinal.

#### 24. TERAMNUS R. Br.

**Teramnus labialis** (L.f.) Spreng., Syst. Veg. 3 : 235. 1826 ; Baker in Hook. f., Fl. Brit. India 2 : 184. 1876 ; Haines, Bot. Bihar & Orissa 2 : 289. 1922. *Glycine labialis* L. f., Suppl. Pl. 325. 1781.

Branches pubescent. Leaf rachis to 7 cm long ; leaflets ovate–elliptic, 2.0–6.0 × 1.5–3.5 cm. Racemes 1 – 5 cm long. Flowers to 0.5 cm long white. Pod to 5 cm long, appressed hairy.

Common along roadside hedges. July–December. Sarkar & Bhatta., 1800.

Used in rheumatism, teberculosis etc.

#### 25. TRIGONELLA L.

**Trigonella corniculata** L., Syst. ed. 10. 1180. 1759 ; Baker in Hook f., Fl. Brit. India 2 : 88. 1876 ; Haines, Bot. Bihar & Orissa 2 : 245. 1922.

Herbs to 30 cm high. Leaflets obovate to 2 cm long. Flowers yellow. Pod curved, flat, to 2 cm long, 4–8-seeded.

Weed of cultivated fields. December–March. PIRING. Sarkar & Bhatta., 1723.

The plant contains diosgenin.

#### 26. URARIA Desv.

- |                             |     |   |
|-----------------------------|-----|---|
| 1a. Racemes dense, plumose. | ... | 2 |
| 1b. Racemes lax, elongated. | ... | 3 |

- |  |     |                            |
|--|-----|----------------------------|
| 2a. Leaves 1-3-foliolate ; joints of pod 2   | ... | 1. <i>U. lagopodioides</i> |
| 2b. Leaves 5-9-foliolate : joints of pod 3-6 | ... | 2. <i>U. picta</i>         |
| 3a. Flowers to 0.5 cm ; pod puberulous       | ... | 4. <i>U. rufescens</i>     |
| 3b. Flowers to 1 cm ; pod hairy              | ... | 3. <i>U. pulchra</i>       |

1. *Uraria lagopodioides* Desv., J. Bot 1 : 22. 1813 ; Haines, Bot. Bihar & Orissa 2 : 267.1922. *U. repanda* Wall. ex Benth., in Miq. Pl. Jungh. 213. 1852; Baker in Hook. f., Fl. Brit. India 2 : 156. 1876.

Herbs. Leaves 3 - foliolate ; Leaflets ovate to elliptic, 8 × 4.5 cm, finely pubescent beneath. Racemes to 8 cm long. Corolla bluish, to 0.9 cm long. Pod oblong, jointed, 8 cm long.

Common in the forest floors. August - October. Sarkar & Bhatta., 379.

Decoction of leaves used in diarrhoea.

2. *Uraria picta* (Jacq.) Desv. ex DC., Prodr. 2 : 324. 1825 ; Baker in Hook. f., Fl. Brit. India 2 : 155. 1876; Haines, Bot. Bihar & Orissa 2 : 267.1922. *Hedysarum picta* Jacq., Collectanea 2 : 262. 1789.

Subshrubs, perennial, pubescent. Leaflets linear-oblong, 10-20 cm long, usually with yellowish or purplish green bands along the nerves. Racemes to 14 cm long, cylindrical. Corolla to 0.6 cm long, purple. Pod with 3-6 joints, greyish.

In the sal forests. August-October. Sarkar & Bhatta., 1241.

Medicinal.

3. *Uraria pulchra* Haines, Kew Bull. 8. 1921 ; Haines, Bot. Bihar & Orissa 2 : 268. 1922.

Shrubs. Leaves 3-foliolate; leaflets elliptic oblong or obovate. Flowers on slender, paniced, lax racemes. Pod glandular-hairy, joints 5-7.

Someswar Hills. Endemic. Haines 506. (CAL!).

4. *Uraria rufescens* (DC.) Schindl. in Fedde, Rep. 21 : 14. 1925 ; van Meeuwen in Reinwardtia 5 : 453. 1961. *Hedysarum rufescens* DC. in Ann. Sc. Nat. 4 : 101. 1825. *Uraria hamosa* Wall. ex W. & A., Prodr. 222. 1834 ; Baker in Hook. f., Fl. Brit. India 2 : 156. 1876 ; Haines, Bot. Bihar & Orissa 2 : 268.1922.

Herbs. Leaves 1-3-foliolate; leaflets obovate or broadly elliptic, to 6.5 cm

long. Racemes elongated. to 30 cm long. Corolla purple. Pods with 4-6 joints, pubescent.

Common. August-January. Sarkar & Bhatta., 1265, 1451, 1625.

Decoction of leaves antipyretic.

### 27. VICIA L.

1a. Climbing or diffuse herbs.	...	2
1b. Stout, erect herbs.	...	1. <i>V. faba</i>
2a. Racemes 1-2-flowered	...	3. <i>V. sativa</i>
2b. Racemes few-flowered	...	2. <i>V. hirsuta</i>

1. *Vicia faba* L., Sp. Pl. 736. 1753 ; Haines, Bot. Bihar & Orissa 2 : 260. 1922; Kumar & Subra., Chromo. Atlas Flow. Pl. Indian Subc. I : 212.1986.

Cultivated annual plants, to 70 cm high. Leaflets 2-3 pairs, elliptic-lanceolate. Flowers white. Pod turgid, to 5 cm long ; seeds round, to 0.6 cm across.

Commonly cultivated. November-March. BAKLA. Sarkar & Bhatta., 242.

Beans and seeds edible.

2. *Vicia hirsuta* S. F. Gray, Nat. Arr. Brit. Pl. 2 : 614.1821. Bakar in Hook. f., Fl. Brit. India 2 : 177. 1876 ; Haines, Bot. Bihar & Orissa 2 : 260. 1922.

Week annual herbs. Leaves slender ; leaflets 9-11, linear, to 1.2 cm long. Flowers purplish. Pod oblong, 2-seeded.

Along grasslands. December-April. Sarkar & Bhatta., 206.

3. *Vicia sativa* L., Sp. Pl. 736. 1753 ; Baker in Hook. f., Fl. Brit. India 2 : 178. 1876 ; Haines, Bot. Bihar & Orissa 2 : 260.1922.

Slender herbs. Leaflets 8-12, linear-lanceolate, 1.0-2.5 cm long. Flowers 1-3, axillary, mauve. Pod linear, pubescent, 6-10 seeded.

Common. November-March. Sarkar & Bhatta., 380.

28. *VIGNA* Savi, *nom. cons.*

- 1a. Leaflets deeply 3-lobed. ... 1. *V. trilobata*  
 1b. Leaflets not as above ... 2. *V. vexillata*

1. *Vigna trilobata* (L.) Verdc. in *Taxon* 17 : 172. 1968 & *Kew Bull.* 24 : 560. 1970. *Dolichos trilobatus* L., *Mant. Pl.* 101. 1767. *Phaseolus trilobus* Baker in *Hook. f., Fl. Brit. India* 2 : 201. 1876 ; Haines, *Bot. Bihar & Orissa* 2 : 301. 1922. non (L.) W. Ait. 1789.

Prostrate or ascending herbs. Leaves long-petioled. Leaflets 3-lobed, middle-lobe larger than others. Racemes with 20 cm long peduncle. Flowers to 0.6 cm long, yellow. Pods 3-5 cm long, 6-12-seeded.

In waste places. Palaeotropics. August-December. Sarkar & Bhatta., 788.

Medicinal, also used as a pulse.

2. *Vigna vexillata* (L.) A. Rich., *Hist., Fis. Polit. Nat.* 1. Cuba (Spanish ed.) 11 : 191. 1845 ; Baker in *Hook. f., Fl. Brit. India* 2 : 206. 1876; Haines, *Bot. Bihar & Orissa* 2 : 303. 1922. *Phaseolus vexillatus* L., *Sp. Pl.* 724. 1753.

Prostrate or subscandent herbs; branches slender. Leaflets ovate-lanceolate, acute or acuminate, 7.5 × 9.5 × 1-5 cm. Spikes 3-6 cm long. Flowers yellow. Pod to 9 cm long, many-seeded.

Common. July-October. Sarkar & Bhatta., 1679.

Rootstock eaten.

29. *ZORNIA* Gmel.

*Zornia gibbosa* Span. in *Linnaea* 15 : 192. 1841 ; Mohlenbrock, *Webbia* 16 : 112. 1961. *Z. diphylla* auct. ; Baker in *Hook. f., Fl. Brit. India* 2 : 147. 1876 ; Haines, *Bot. Bihar & Orissa* 2 : 263. 1922. non (L.) Pers.

Prostrate herbs. Leaflets linear-lanceolate, to 2.5 cm long. Spikes 3-6 cm long. Flowers yellow. Pod to 1 cm long, echinate.

Common in grasslands. July-December. Sarkar & Bhatta., 613.

Medicinal.

## LXI. HALORAGACEAE

## MYRIOPHYLLUM L.

*Myriophyllum tetrandrum* Roxb., Fl. Indica 1 : 470. 1820 ; Meijden in Blumea 17 : 308. 1969. *M. indicum* sensu Cl. in Hook. f., Fl. Brit. India 2 : 433. 1878 ; Haines, Bot. Bihar & Orissa 1 : 360. 1922.

Aquatic herbs. Submerged leaves filiform, 0.7–2.5 cm long. Male flowers on the upper node and female flowers on the lower nodes. Flowers to 0.1 cm long. Petals white. Stamens 4. Stigmas green, fimbriate. Fruits 4–10-lobed, with rounded dorsal ridges, 0.1 cm across.

Ramnagar, road-side ditches and ponds. July–October. Sarkar & Bhatta., 1617.

Note : *Myriophyllum indicum* Willd. occurs in Ceylon and Coromandel.

## LXII. LYTHRACEAE

- |   |                  |
|---|------------------|
| 1a. Herbs ; flowers and fruits 1.0–2.5 mm long. ...   | 2                |
| 1b. Trees or shrubs ; flowers and fruits more than 5 mm long. ...   | 3                |
| 2a. Flowers in dichasial cymes ; fruits circumscissile or bursting irregularly. ...                                     | 1. AMMANNIA      |
| 2b. Flowers solitary, spicate or racemose ; fruits septicial ...  | 4. ROTALA        |
| 3a. Hypanthium tubular, more or less oblique at the mouth ; petals subulate ; fruits included within the hypanthium ... | 5. WOODFORDIA    |
| 3b. Hypanthium cupular, straight at the mouth ; petals obovate or spatulate ; fruits exerted from the hypanthium. ...   | 4                |
| 4a. Sepals and petals 4 each, stamens 8 ; fruits bursting irregularly ...   | 3. LAWSONIA      |
| 4b. Sepals and petals 3 or 6 – 9 each ; stamens numerous ; fruits dehiscing by valves ...                               | 2. LAGERSTROEMIA |

1. *Ammannia* L.

- 1a. Cymes sub-sessile ... 1. *A. baccifera*  
 1b. Cymes distinctly peduncled ... 2. *A. multiflora*

1. *Ammannia baccifera* L., Sp. Pl. ed. 2, 175. 1762 ; Cl. in Hook. f., Fl. Brit. India 2 : 569. 1879 ; Haines, Bot. Bihar & Orissa 2 : 396. 1922.

Leaves elliptic-lanceolate, 3.5 × 1.4 cm. Flowers dark red. Calyx tube widely campanulate Petals 0. Stamens 4. Capsule sub-globose. Seeds minute.

Very comon in Wet places. Palaeotropics. July-December. Sarkar & Bhatta., 817.

Acrid leaves are used in skin affections.

2. *Ammannia multiflora* Roxb., Fl. Indica 1 : 426. 1820 ; Cl. in Hook. f., Fl. Brit. India 1 : 426. 1879 ; Haines, Bot. Bihar & Orissa 2 : 396 1922.

Erect herbs. Leaves linear-oblong, to 3.5 cm long. Calyx lobes 4, triangular Petals 0. Stamens 4-8. Capsule globose.

Common weed in marshes. July-January. Sarkar & Bhatta., 1469.

2. *LAGERSTROEMIA* L.

- 1a. Hypanthium prominently ribbed ;  
 flowers 5-7 cm across ... 3. *L. speciosa*  
 1b. Hypanthium not ribbed ;  
 flowers 1.0-3.5 cm across ... 2  
 2a. Leaves green beneath ; capsule  
 about 1.0 × 0.8 cm ... 1. *L. indica*  
 2b. Leaves glaucous beneath ;  
 capsule 1.5-2.5 × 1.0-1.5 cm ... 2. *L. parviflora*

1. *Lagerstroemia indica* L., Syst. ed. 10. 1076. 1759 ; Cl. in Hook. f., Fl. Brit. India 2 : 575. 1879 ; Haines, Bot. Bihar & Orissa 2 : 391 .1922.

Deciduous shrubs. Leaves subsessile, elliptic-oblong, 3-10 × 2-4 cm. Panicles 5-20 cm long. Petals suborbicular with crisped margins, white, lilac or rose-coloured

Planted for its showy flowers. Native of China. May-August. FARUS. Sarkar & Bhatta., 1468.

2. *Lagerstroemia parviflora* Roxb., Pl. Cor. 1: 47.1.66.1795 ; Cl. in Hook. f., Fl. Brit. India 2 : 575.1879 ; Haines, Bot. Bihar & Orissa 2 : 392.1922.

Medium or tall trees. Leaves elliptic-oblong or ovate-lanceolate, 4-9 × 2-4 cm, usually pubescent beneath. Panicles 5-20 cm long. Petals to 0.3 cm long, crisped. Capsule ellipsoid, 1.5-4.0 cm long, smooth.

Very common tree in the sub-Himalayan forests. Fl. : April-May ASIDH. Sarkar & Bhatta., 170.

A valuable timber.

3. *Lagerstroemia speciosa* (L.) Pers., Synops 2 : 72. 1807 ; Furtado & Montien in GBS 24 : 264.1969. *Munchausia speciosa* L. in Munch., Der. Haus. 5(1) ; 357. t. 2. 1770. *Lagerstroemia flos-reginae* Retz., Obs. Bot. 5 : 25. 1789; Cl. in Hook. f., Fl. Brit. India 2 : 577. 1879 p.p. ; Haines, Bot. Bihar & Orissa 2 : 391. 1922.

Evergreen trees. Leaves elliptic-lanceolate, to 20 cm long. Flowers showy, purple. Capsule subglobose, to 2.5 cm across.

Planted for its showy flowers. JARUL. Sarkar & Bhatta., 902.

### 3. LAWSONIA L.

*Lawsonia inermis* L., Sp. Pl. 349.1753 ; Koehne in Pflanzenr 17 : 270. 1903 ; Haines, Bot. Bihar & Orissa 2 : 390. *L. alba* Lamk., Encyl. 3 : 106.1789; Cl. in Hook. f., Fl. Brit. India 2 : 573. 1879.

Shrubs to 1-3 m high. Leaves lanceolate or oblanceolate, 2-3 cm long. Flowers to 0.5 cm across, greenish-creamy, fragrant. Fruit globose, to 0.6 cm across.

Planted for its dye yielding leaves. MEHNDI. Sarkar & Bhatta., 930.

### 4. ROTALA L.

- |   |     |                           |
|---|-----|---------------------------|
| 1a. Inflorescence terminal, leaves suborbicular | ... | 3. <i>R. rotundifolia</i> |
| 1b. Inflorescence axillary, leaves lanceolate.  | ... | 2                         |
| 2a. Hypanthium tubular ; sepals 4.              | ... | 4. <i>R. indica</i>       |
| 2b. Hypanthium campanulate ; sepals 5.          | ... | 2. <i>R. rosea</i>        |

1. *Rotala indica* (Willd.) Koehne in Bot. Jahrb. 1 : 172. 1881 ; Blatter & Hallb. in JBNHS 26 : 711.1918. *Peplis indica* Willd., Sp Pl. 2 : 244.1779. *Ammannia peploides* Spreng., Syst. 1 : 444.1853 ; Cl. in Hook. f., Fl. Brit. India 2 : 566. 1879 ; Haines, Bot. Bihar & Orissa 2 : 394. 1922.

Leaves elliptic-lanceolate, to 1.7 cm long. Flowers axillary ; bracteoles linear. Calyx campanulate, lobes lanceolate, acuminate capsule 2-valved.

Occasional in wet places. October-December. Sarkar & Bhatta., 1470.

2. *Rotala rosea* (Poir.) C. Cook, Boissiera 29:86. 1979; *Rotala pentandra* (Roxb.) Blatt. & Hallb. in JBNHS 25 : 707.1918; Leeuwen in Blumea 19 : 95. 1971. *Ammannia pentandra* Roxb., Fl. Indica. 1: 448.1820; Cl. in Hook f., Fl. Brit. India 2 : 568. 1879 ; Haines, Bot. Bihar & Orissa 2 : 395. 1922.

Branched herbs, to 30 cm high. Leaves oblong-lanceolate, sessile. Flowers axillary-bracteoles subulate. Capsule globose 3-valved.

Common in wet places. Sarkar & Bhatta., 1294.

3. *Rotala rotundifolia* (Roxb.) Koehne in Bot. Jahrb. 1 : 175.1880 ; Cooke, Boissiera 29 : 49.1979. *Ammannia rotundifolia* Buch.-Ham.ex Roxb., Fl. Indica 1 : 446.1820 ; Cl. in Hook. f., Fl. Brit. India 2 : 566. 1879 ; Haines, Bot. Bihar & Orissa 2 : 394.1922.

Branches to 20 cm long, somewhat creeping. Leaves suborbicular, to 1.3 cm across. Flowers in terminal spikes ; bracteoles foliaceous. Calyx lobes 4, triangular. Petals 4, purple. Stamens 4. Capsule 4-valved.

Common along the margin of marshes. December-April. Bhikhna Thori. Sarkar & Bhatta., 196.

#### 5. WOODFORDIA Salisb.

*Woodfordia fruticosa* (L.) Kurz in J. Asiat. Soc. Beng. 40 : 56.1871 ; Haines, Bot. Bihar & Orissa 2 : 390. 1922. *Lythrum fruticosum* L., Syst. ed. 10.1045. 1759. *Woodfordia floribunda* Salisb., Parad. London t. 42. 1806 ; Cl. in Hook. f., Fl. Brit. India 2 : 572. 1879.

Shrubs, to 1-2 m high. Leaves linear-lanceolate, subsessile, 3-10 cm long. Calyx tube to 1 cm long, scarlet; lobes 0.3 cm long; accessory lobes to 0.1 cm long. Petals small. Fruit to 1 cm long.

Common in the sal forests. January - May. Sarkar & Bhatta., 1809.

Flowers yield a red dye. Dried fruits, leaves and flowers are medicinal.

## LXIII. TRAPACEAE

## TRAPA L.

**Trapa natans** L., Sp. Pl. 120. 1753. var. **bispinosa** (Roxb.) Makino in Inuma, Somoku – Dzusetu ed. 3, 1 : 137., 1907 ; Brenan, Fl. Trop. East Afr. 3, 1953. *T. bispinosa* Roxb., Pl. Cor. 3: t. 234. 1815 ; Hook f., Fl. Brit. India 2 : 590. 1879 ; Haines, Bot. Bihar & Orissa 2 : 400. 1922.

Leaf blade 3–5 cm broad, crenulate, red and villous beneath; petioles inflated. Flowers to 2 cm long, white with a yellow blotch in the mouth. Fruits urn-shaped, 2–3 cm across, with 2 horns.

Common in water bodies. India, Sri Lanka. June–October. PANIPHAL. Sarkar & Bhatta., 1513.

Fruits edible.

## LXIV. MYRTACEAE

- |                              |     |                |
|------------------------------|-----|----------------|
| 1a. Fruit fleshy.            | ... | 2              |
| 1b. Fruit dry                | ... | 1. CALLISTEMON |
| 2a. Calyx limb closed in bud | ... | 2. PSIDIUM     |
| 2b. Calyx lobes open in bud  | ... | 3. SYZYGIUM    |

## 1. CALLISTEMON R. Br.

**Callistemon linearis** DC., Prodr. 3 : 223. 1828 ; Haines, Bot. Bihar & Orissa 2 : 382. 1922.

Bottle-brush Trees. Leaves linear-lanceolate. Flowers deep purple.

Planted in gardens. Native of Australia. Flowers throughout the year. Sarkar & Bhatta., 809.

## 2. PSIDIUM L.

**Psidium guajava** L., Sp. Pl. 470. 1753 ; Duthie in Hook. f., Fl. Brit. India 2 : 1878.

Small trees. Leaves elliptic-ovate, acute rounded at base, shortly petiolate. Flowers white. Ovary inferior.

Cultivated for its edible fruits. Introduced from S. America. Flowers throughout the year., AMRUT, RUNI., Sarkar & Bhatta., 45.

3. *SYZYGIUM* Gaertn., *nom. cons.*

- 1a. Ripe fruits deep purple, 1-seeded. ... 2  
 1b. Ripe fruits cream-white, few-seeded ... 3. *S. samarangense*  
 2a. Large trees : leaves over 10 cm long ... 1. *S. cumini*  
 2b. Shrubs or small trees ; leaves under 10 cm long ... 2. *S. heyneanum*

1. *Syzygium cumini* (L.) Skeels in U.S. Dept. Agr. Bur. Pl. Industr. Bull. 248. 25. 1912 ; Hara, Enum. Fl. Pl. Nepal 2 : 169. 1979. *Myrtus cumini* L., Sp. Pl. 471. 1753. *Eugenia jambolana* Lamk., Encyl. 3 : 198. 1789 ; Duthie, in Hook. f., Fl. Brit. India 2 : 499. 1879 ; Haines, Bot. Bihar & Orissa 2 : 376. 1922.

Large trees. Leaves elliptic-oblong to obovate, 7-15 × 3-8 cm, abruptly acuminate, cuneate or rounded at base. Flowers 0.6 - 0.7 cm across. Berries oblong-ellipsoid, to 2 cm long.

Forest areas and also cultivated. April - July. JAM. Sarkar & Bhatta., 602.

Ripe fruits edible. Wood durable.

2. *Syzygium heyneanum* (Duthie) Wall. ex Gamble, Fl. Madras 482. 1919; Gandhi in Fl. Hassan Dist. 281. 1976. *Eugenia heyneana* Duthie in Hook. f., Fl. Brit. India 2 : 500. 1879 ; Haines, Bot. Bihar & Orissa 2 : 377. 1922.

Shrubs. Leaves oblong-lanceolate, 7-12 cm long. Flowers in short paniced cymes, white. Berries oblong, to 1 cm long.

Along streams. India. May-August. Sarkar & Bhatta., 175, 1118.

Fruits sometimes eaten.

3. *Syzygium samarangense* (Bl.) Merr. & Perry in J. Arn. Arb. 19 : 115. 1938. *Myrtus samarangensis* Bl., Bijdr. 1084. 1826. *Eugenia javanica* Lamk., Encyl. 3 : 200. 1789.

Small trees. Leaves oblong, to 20 cm long, cordate or subcordate at base. Flowers white. Fruit turbinate, to 2 cm across.

Cultivated. Native of Malacca. April - June. JAMRUL. Sarkar & Bhatta., 443.

Fruits edible.

## LXV. PUNICACEAE

## PUNICA L.

*Punica granatum* L., Sp. Pl. 472. 1753 ; Bailey, Man. Cult. Pl. 721.1949.

Shrubs. Planted for its edible fruits. Wild within the Balkan region to northern India

Fl. & Fr. all along the year. DARIM. Sarkar & Bhatta., 881.

## LXVI. ONAGRACEAE

## LUDWIGIA L.

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Prostrate herbs ; floating branches with clusters of white spongy spindle-shaped aerophores at the nodes; petals white | ... | 1. <i>L. adscendens</i> |
| 1b. Usually erect herbs ; aerophores absent ; petals yellow.   | ... | 2                       |
| 2a. Usually villous-pubescent herbs, sometimes sub-glabrous ; sepals and petals more than 0.5 cm long ; stamens 8          | ... | 2. <i>L. octovalvis</i> |
| 2b. Glabrous or puberulous herbs ; sepals and petals less than 0.5 cm long ; stamens usually 4-5.                          | ... | 3                       |
| 3a. Capsule terete ; seeds pluriseriate in each locule.  | ... | 3. <i>L. perennis</i>   |
| 3b. Capsule slightly 4-angled ; seeds uniseriate in each locule  | ... | 4. <i>L. prostrata</i>  |

1. *Ludwigia adscendens* (L.) Hara in J. Jap. Bot. 28 : 290.1953 ; Raven in Reinwardtia 6 : 387.1963. *Jussiaea adscendens* L., Mant. Pl. 1 : 69. 1771. *J. repens* L., Sp. Pl. 388.1753 ; Cl. in Hook. f., Fl. Brit. India 2 : 587.1879 ; Haines Bot. Bihar & Orissa 2 : 398.1922.

Aquatic creeping herbs. Leaves elliptic-oblong, 1-7 cm long. Flowers solitary, axillary, pentamerous. Capsule terete, 10-ribbed, to 2.5 cm long.

Common in the shallow water bodies. January-August. KANJELATA, KESARA DAM. Sarkar & Bhatta., 958.

Forms a constituent of poultices; used for ulcers and skin complaints.

2. *Ludwigia octovalvis* (Jacq.) Raven in Kew Bull. 15 : 476. 1962 [including ssp. *breviseipala* (Brenan) Raven & ssp. *sessiliflora* (Mich.) Raven, Raven in Steenis, Fl. Males. I. 8 : 101. 1977] ; Raven in Reinwardtia 6 : 356. 1963. *Oenothera octovalvis* Jacq., En. Syst. Pl. 19. 1760. *Jussiaea suffruticosa* L., Sp. Pl. 388. 1753 ; Cl. in Hook. f., Fl. Brit. India 2 : 587. 1879 ; Haines, Bot. Bihar & Orissa 2 : 398. 1922.

Profusely branched herbs, to 2 m high. Leaves elliptic-lanceolate, 2.0–8.0 × 0.5–2.5 cm. Flowers solitary, 4–merous. Capsules terete, 8–ribbed, to 3 cm long. Seeds globose.

Common along sandy river beds and margin of road–side ditches. August–January. Sarkar & Bhatta., 927.

Considered astringent, anthelmintic, carminative and diuretic.

3. *Ludwigia perennis* L., Sp. Pl. 119. 1753. Raven *l.c.*; *L. parviflora* Roxb., Fl. Indica 440. 1820 ; Cl. in Hook. f., Fl. Brit. India 2 : 588. 1879. Haines, Bot. Bihar & Orissa 2 : 399. 1922.

Herbs, to 0.5 m high. Leaves elliptic–lanceolate, 2.5–8.0 × 0.4–2.5 cm. Flowers solitary, 4 – merous. Sepals 4, rarely 5, to 0.3 cm long. Petals 0.2– 0.25 cm long. Stamens 4 or 5, rarely more. Capsule to 1 cm long. Seeds minute.

Common in the margins of road–side ditches. August–February. Sarkar & Bhatta., 81.

4. *Ludwigia prostrata* Roxb., Fl. Indica 1 : 441. 1820 ; Cl. in Hook. f., Fl. Brit. India 2 : 588. 1879 ; Haines, Bot. Bihar & Orissa 2 : 399. 1922.

Annual herbs, to 60 cm high. Leaves ovate–lanceolate, 1.0–10 × 0.3–1.8 cm. Flowers solitary 4–5–merous. Sepals deltoid, to 2 cm long. Petals spatulate. Stamens 4–8. Capsules 1.2–2.2 cm long. Seeds triangular.

Along road–side ditches. November–April. Banerjee 398. (CAL!)

## LXVII. MELASTOMATACEAE

### OSBECKIA L.

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Flowers 5–merous, to 3–5 cm across,<br>mauve–purple or white | ... | 1. <i>O. nepalensis</i> |
| 1b. Flowers 4–merous, to 2.5 cm across,<br>rose–coloured         | ... | 2. <i>O. nutans</i>     |

1. *Osbeckia nepalensis* Hook., Exot. Fl. t. 31. 1822 ; Cl. in Hook. f., Fl. Brit. India 2 : 521. 1879 ; Haines, Bot. Bihar & Orissa 2 : 387. 1922.

Shrubs, to 1 m or more long ; stems 4-angled. Leaves lanceolate. Flowers in dense branched clusters.

Haines (*l.c.*) reported this plant from Bettiah and Ramnagar, but it is rare. July–November. Haines 309 (CAL!).

2. *Osbeckia nutans* Wall. ex Triana in Trans. Linn. Soc. 28 : 54. 1871 ; Cl. in Hook. f., Fl. Brit. India 2 : 521. 1879 ; Haines, Bot. Bihar & Orissa 2 : 387. 1922.

Straggling shrubs. Leaves lanceolate. Flowers axillary or in few-flowered terminal clusters.

Haines (*l.c.*) reported this plant from Champaran. Now the Plant is rare in this area. Haines 250 (CAL!).

### LXVIII. COMBRETACEAE

1a. Climbing shrubs ; petals present.	...	2
1b. Trees ; petals absent.	...	3
2a. Hypanthium elongated into a long tube	...	3. QUISQUALIS
2b. Hypanthium constricted above ovary	...	2. COMBRETUM
3a. Flowers in globose heads	...	1. ANOGEISSUS
3b. Flowers in spikes	...	4. TERMINALIA

#### 1. ANOGEISSUS (DC.) Wall. ex Guill.

*Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. Perr. & A. Rich., Fl. Seneg. Tent. 1 : 280. 1832 ; Cl. in Hook. f., Fl. Brit. India 2 : 450. 1878 ; Haines, Bot. Bihar & Orissa 1 : 370 .1922. *Conocarpus latifolia* Roxb. ex DC., Prodr. 3 : 17. 1828.

Leaves broadly elliptic, 5–7 × 3–5 cm, obtuse at both ends. Heads axillary, solitary or 2–3 together, peduncled, to 1 cm across. Fruits 0.3–0.5 × 0.3 cm, brown.

Common in the mixed forest. Fl. : May–September ; Fr. September–January. Sarkar & Bhatta., 192.

Wood a valuable timber.

2. **COMBRETUM** Loebl., *nom. cons.*

**Combretum roxburghii** Spreng., Syst. 2: 331.1825; Exell in Fl. Mal. 4(5). 544. 1954. *C. decandrum* Roxb., Pl. Cor. 1 : 49, t, 59. 1796. non Jacq. 1760 ; Cl. in Hook. f., Fl. Brit. India 2 : 452. 1878 ; Haines, Bot. Bihar & Orissa 1 : 373. 1922.

Young parts silky-pubescent. Leaves elliptic-oblong. 7-12 × 3-5 cm, acuminate. Spikes 15-30 cm long, in axillary and terminal panicles. Flowers white. Fruits oblong-elliptic, 20-30 cm long with 5 membranous wings.

Common in mixed forest. October - March. Sarkar & Bhatta., 378.

Leaves febrifuge.

3. **QUISQUALIS** L.

**Quisqualis indica** L., Sp.Pl. ed. 2. 556.1759 ; Haines, Bot. Bihar & Orissa 2 : 372.1922.

Leaves elliptic-oblong, persistent, petiole transformed into spine. Flowers in terminal racemes, white-red, fragrant.

Commonly grown as garden ornamental. Native of Malayan Peninsula, Philippine and western tropical Africa. Fl.: throughout the year. Sarkar & Bhatta., 608.

4. **TERMINALIA** L., *nom. cons.*

1a. Fruits not winged.	...	2
1b. Fruits winged.	...	3
2a. Leaves clustered at ends of branches	...	3. <i>T. bellirica</i>
2b. Leaves not clustered	...	4. <i>T. chebula</i>
3a. Leaves glabrous	...	2. <i>T. arjuna</i>
3b. Leaves tomentose	...	1. <i>T. alata</i>

1. **Terminalia alata** Heyne ex Roth, Nov. Pl. Sp. 379. 1821 ; Kanai in Fl. East. Him. 220.1966. *T. tomentosa* (Roxb.). Wt. & Arn., Prodr.

1 : 314.1834 ; Cl. in Hook. f., Fl. Brit. India 2 : 447. 1878 ; Haines, Bot. Bihar & Orissa 1 : 369 .1922.

Large trees. Leaves elliptic – lanceolate, 12–20 × 6–9 cm ; glands at leaf base. Spikes paniculate. Flowers to 0.5 cm across, white. Fruits to 4 cm long ; wings to 2.5 cm broad.

Common in the mixed forest. Fl. : May – June. Fr. : January – March. ASAN. Sarkar & Bhatta., 209.

Wood used in furniture manufacture. Bark medicinal. Leaves feed to tasar silk-worms.

2. *Terminalia arjuna* (Roxb. ex DC.) Wt. & Arn. Prodr. 312. 1834 ; Cl. in Hook. f., Fl. Brit. India 2:447. 1878 ; Haines Bot. Bihar & Orissa 1 : 368. 1922. *Pentaptera arjuna* Roxb. ex DC. , Prodr. 3: 14.1828.

Evergreen trees. Leaves oblong or oblong-lanceolate, 7–15 × 4–7 cm, with glands at the leaf base. Spikes paniced, Flowers to 0.5 cm across, white. Fruits indehiscent, to 3.5 cm long , wings to 1 cm broad, brown.

Not common May – April. ARJUN. Sarkar & Bhatta., 422.

Wood suitable for plywood manufacture. Other uses same as the previous.

3. *Terminalia bellirica* (Gaertn.) Roxb., Pl. Corom. 2 : 54. t. 198. 1805 ; Cl. in Hook. f., Fl. Brit. India 2 : 445. 1878 ; Haines, Bot. Bihar & Orissa 1 : 367. 1922. *Myrobalanus bellirica* Gaertn., Fruct. 2 : 90. 1791.

Leaves clustered at the tips of branchlets, elliptic-obvoate, 7–25 cm long, obtuse or cuspidate. Spikes solitary, axillary or extra-axillary, interrupted, 7-15 cm long. Flowers to 0.5 cm across, creamy white. Fruits globose or ovoid, to 3 cm long, grey-tomentose.

Common in deciduous forest. Fl. : April ; Fr. : October – June. BAHERA. Sarkar & Bhatta., 44.

Wood useful. Kernels yield an inedible oil, used for soap manufacture. Ripe fruits used as astringent and purgative.

4. *Terminalia chebula* Retz., Obs. Bot. 5 : 31. 1788., Cl. in Hook. f., Fl. Brit. India 2 : 445. 1878 ; Haines, Bot. Bihar & Orissa 1 : 368. 1922.

Young parts rusty-tomentose. Leaves elliptic-ovate, 7–15 × 5–10 cm;

glands at apex of petiole. Spikes terminal. Flowers to 0.5 cm across. Drupes ovoid ellipsoid, 2-3.5 × 1.2-2 cm, glabrous, 5-angled.

Common in the forest areas, Fl. : April - May ; Fr. : October - February. HARA, Sarkar & Bhatta., 48.

Tannin content of fruits 30-32%. Fruits laxative, stomachic, tonic and used in Ayurvedic medicine.

## LXIX. ALANGIACEAE

*ALANGIUM* Lamk., *nom. cons.*

*Alangium salvifolium* (L.f.) Wang. in Engl. Pflanzenr. 4 (220b) : 9. 1910 ; Verma et al. in Fl. Raipur, Durg & Rajnandgaon 168. 1985. *Grewia salvifolia* L.f., Suppl. 409. 1781. *Alangium lamarkii* Thw. Enum. 133. 1859; Hook. f., Fl. Brit. India 2 : 741. 1879 ; Haines, Bot. Bihar & Orissa 2 : 437. 1922.

Deliquescent trees. Leaves oblong or elliptic-lanceolate, acute or acuminate, 7-15 cm long, pubescent beneath. Flowers to 2.5 cm long, fragrant. Berry globose to 1.5 cm across, pinkish or violet ; pulp white.

Near villages and miscellaneous forests. April - July. Sarkar & Bhatta., 452, 1603.

Root-bark medicinal.

Note : To form a compound word or epithet under Art. 60.8 & Rec. 60G, the final vowel in Latin is reduced to i (*Salvia-folius* will be *salviifolius*;—W.T. Stearn 1978, Botanical Latin, pp. 266-268. U.K.).—Bhatta.

## LXX. OLACACEAE

*OLAX* L.

*Olax scandens* Roxb., Pl. Cor. 2 : 2, t. 102. 1799 ; Mast. in Hook. f., Fl. Brit. India 1 : 575. 1875 ; Haines, Bot. Bihar & Orissa 1 : 189. 1921.

Scandent shrubs. Leaves oblong. Flowers white. Calyx persistent. Drupe oblong-globose. Rare. Haines 1051 (CAL).

## LXXI. OPILIACEAE

*CANSJERA* Juss., *nom. cons.*

*Cansjera rheedei* J. F. Gmel., Syst. Nat. 2 : 4,20.1791; 1 : 280. 1791 ;

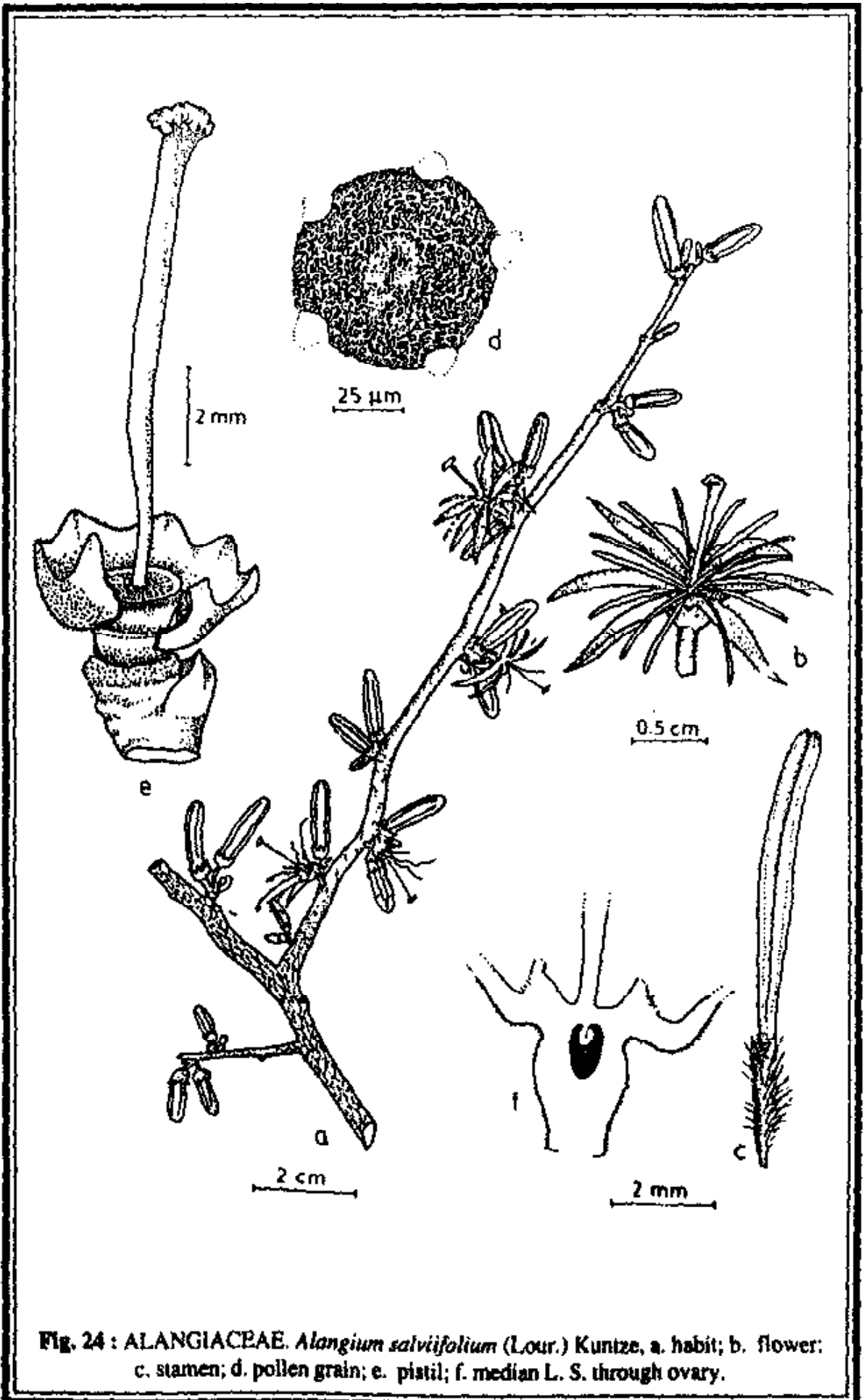


Fig. 24 : ALANGIACEAE. *Alangium salvifolium* (Lour.) Kuntze, a. habit; b. flower; c. stamen; d. pollen grain; e. pistil; f. median L. S. through ovary.

Mast. in Hook. f., Fl. Brit. India, 1 : 582. 1875. Haines, Bot. Bihar & Orissa 1 : 191. 1921.(1961).

Scandent shrubs. Leaves ovate-lanceolate, acuminate. Flowers greenish white.

Drupe ovoid, orange-red when ripe.

Someswar hills (Haines, *l.c.*), rare. Haines 663 (CAL).

## LXXII. LORANTHACEAE

- |  |     |              |
|--|-----|--------------|
| 1a. Flowers 5-merous, regular ; corolla tube not split on one side ; bracts cupular ; berries ovoid-oblong, glabrous       | ... | DENDROPHTHOE |
| 1b. Flowers 4 (-5)-merous, irregular, corolla tube split half-way on one side ; bracts ovate ; berries pyriform, tomentose | ... | LORANTHUS    |

### 1. DENDROPHTHOE Mart.

**Dendrophthoe falcata.** (L.f.) Etting, in Denkschr. Akad. Wissench. Math. Nat. 32 : 52. 1872 ; Verma & Chandra in Fl. Raipur, Durg & Rajnandgaon 326. 1985. *Loranthus falcatus* L.f., Suppl. 211. 1781. *L. longiflorus* Desr. in Lamk., Encycl. 3 : 598. 1789 ; Hook. f., Fl. Brit. India 5 : 214. 1886 ; Haines, Bot. Bihar & Orissa 3 : 840. 1924.

Leaves elliptic-oblong, obovate or ovate-lanceolate, to 12 cm long, obtuse or rounded. Corolla tube to 5 cm long. Fruit bright red, to 3.5 cm across.

Epiphytic, parasitic shrubs on *Terminalia* and *Acacia*. All seasons. BANDA.Sarkar & Bhatta., 391, 1397.

Bark medicinal.

### 2. LORANTHUS Jacq., *nom. cons.*

**Loranthus parasiticus** (L.) Merrill, Philip. J. Sci. 15(3) 232-233.1919. *Scurrula parasitica* L. Sp. Pl. 110. 1753 ; Danser in Bull. Jard.Bot. Buit. Ser. III. 16 : 34. 1938. *Loranthus scurrula* L., Sp. Pl. ed. 2. 472.1762; Roxb. Pl. Cor. 2 : 19. t. 140.1798 ; Hook. f., Fl. Brit. India 5 : 208. 1886 ; Haines, Bot. Bihar & Orissa 3 : 841. 1924.

Leaves ovate-oblong or elliptic 5-10 × 3 -5.5 cm cuneate at base, young

leaves rusty-tomentose. Corolla tube to 3.6 cm long, corolla lobes reflexed.

Occasional in the northern area on *Acacia catechu*. Fl. : October. Sarkar & Bhatta., 995.

### LXXIII. VISCACEAE

#### VISCUM L.

*Viscum nepalense* Spreng., Syst. Cur. Post. 47. 1827; Ramamoorthy in Fl. Hassan Dist. 311. 1976. *V. articulatum* auct. Hook. f., Fl. Brit. India 5: 226. 1886 ; Haines, Bot. Bihar & Orissa 3 : 843. 1924 ; non Burm. f., 1768.

Shrublets, to 75 cm long ; branches pendent ; internodes to 5 cm long. flattened, dark-green with more or less distinct longitudinal furrows. Fruit globose, smooth, yellowish-green.

Common parasites on the branches of *Acacia* spp. April – June. BANDA. Sarkar & Bhatta., 971.

Note : The Viscaceae have traditionally been included in the Loranthaceae often as a separate subfamily. Embryological features support the view that the Loranthaceae and Viscaceae are two distinct families. Rao (J. Indian Bot. Soc. 36 : 113-168. 1957) and Wiens (Abeywick's Fl. Ceylon 1 : 68, 1973) considered the Burman's species to be conspecific with Sprengel's.

### LXXIV. CELASTRACEAE

1a. Large shrubs or trees.	...	2
1b. Scandent shrubs	...	2. CELASTRUS
2a. Armed with sharp axillary thorns	...	3. MAYTENUS
2b. Unarmed trees	...	1. CASSINE

#### CASSINE L

Note : *Cassine* L., (1754) and *Elaeodendron* Jacq., (1787) are congeneric.

*Cassine glauca* (Rottbl.) O. Kuntze, Rev. Gen. Pl. 1 : 114. 1891 ; Ding Hou in Fl. Mal. 6 (2) : 286. 1962. *Mangifera glauca* Rottbl., Nye Saml. Vid. Selsk. Skrift. 2 : 534. 1783. *Elaeodendron glaucum* (Rottbl.) Pers., Syn. Pl. 1 : 241. 1805 ; Law. in Hook. f., Fl. Brit. India 1 : 623. 1875 Haines, Bot. Bihar & Orissa 1 : 196. 1921.

Large trees. Leaves orbicular-elliptic, 8-10 × 4-5 cm, crenate, serrate, acuminate. Flowers greenish-white. Stamens shorter than petals. Seeds not arillate.

Occasional in Bhikhna Thori. September-February. GETI, MUTOWAR Sarkar & Bhatta., 1427.

Wood useful for cabinet-works. Bark and leaves contain about 15% tannins.

## 2. CELASTRUS L.

**Celastrus paniculatus** Willd., Sp. Pl. 1 : 1125. 1797 ; Law. in Hook. f., Fl. Brit. India 1 : 616. 1875 ; Haines, Bot. Bihar & Orissa 1 : 195. 1921.

Branches lenticellate. Leaves obovate-oblong, 4-10 × 3-7 cm, crenate-serrate, shortly acuminate. Flowers to 0.5 cm across. Capsule 3-lobed, to 0.8 cm across. Aril fleshy, bright red.

Common in the forest areas, April-June ; October-January. MALKANGNI. Sarkar & Bhatta., 1230.

Celastrine, an alkaloid, obtained from seeds is a nerve stimulant and brain tonic. Seeds, fruit coats and arils yield fatty oils.

## 3. MAYTENUS Molina *emend.* Bosc

Note : *Maytenus* Molina (1782) and *Gymnosporia* Hook. f. (1862) are congeneric.

- |  |     |                           |
|--|-----|---------------------------|
| 1a. Leaves obovate ; flowers in axillary or extra-axillary, paniced cyme | ... | 2. <i>M. senegalensis</i> |
| 1b. Leaves elliptic ovate ; flowers in axillary sessile, or paniced cyme | ... | 1. <i>M. rufa</i>         |

1. **Maytenus rufa** (Wall.) Hara in Japanese J. Bot. 40 : 327. 1962 & Fl. East. Him. 190. 1966. *Celastrus rufa* Wall. in Roxb., Fl. Indica 2 : 397. 1824. *Gymnosporia rufa* (Wall.) Law. in Hook. f., Fl. Brit. Indian 1 : 620. 1875 ; Haines, Bot. Bihar & Orissa 1 : 194. 1921.

Large shrubs or small trees. Leaves 8-11 cm long. Capsule 3-gonous, 0.6 cm across.

Rare, Someswar Hills. Sarkar & Bhatta., 1403.

2. **Maytenus senegalensis** (Lamk.) Exell in Bot Soc. Brot. Ser. 2,

26: 223. 1952 ; Robson, Fl. Zamb. 2(2) : 367. 1966. *Celastrus senegalensis* Lamk., Encycl. 1 : 661. 1785. *Gymnosporia montana* (Roth.) Benth., Fl. Austral. 1 : 400. 1863 ; Law, in Hook. f., Fl. Brit. India. 1 : 621. 1875 ; Haines, Bot. Bihar & Orissa 1 : 194. 1921.

Small trees ; young branches and peiole pinkish ; axillary spines straight. Leaves 4-7 × 2.5-4.5 cm, serrate. Flowers white. Sepals 5. Petals 5. Capsule 2-3-seeded, scarlet.

Occasional in Bhikhna Thori and Someswar Hills. Indomalesia, S. Asia, Africa and Australia. August-Februasry. Sarkar & Bhatta., 1264. 1482.

Bark and young shoots medicinal.

Note : Ding Hou (*l.c.* 1962) considered *Maytenus emarginata* (*G. montana*) is distinct from the African *M. senegalensis*.

## LXXV. HIPPOCRATEACEAE

### REISSANTIA *Halle*

*Reissantia arborea* (Roxb) Hara in Jour. Jap. Bot. 40 : 327. 1965 & Fl. East Him. 191. 1966. *Hippocratea arborea* Roxb., Fl. Indica 1 : 167. 1820 ; Law, in Hook. f., Fl. Brit. India 1 : 625. 1875 ; Haines, Bot. Bihar & Orissa 1 : 199. 1921.

Scandent shrubs. Leaves ovate or ovate-lanceolate, 10-18 × 5-7.5 cm, acuminate. Flowers yellowish. Capsule flat, 5-7 × 2-2.5 cm. Seeds to 5 cm long.

Common throughout the forest areas. Indomalesia. Fl. : June-September; fruits mature in December. MAANAHAR. Sarkar & Bhatta., 1202, 1245, 1508.

## LXXVI. ICACINACEAE

### NATSIATUM Buch.-Ham. ex Arn.

*Natsiatum herpeticum* Buch.-Ham. ex Arn., Edin. New Phil. J. 16 : 314. 1835 ; Law, in Hook. F., Fl. Brit. India 1 : 595. 1875 ; Haines, Bot. Bihar & Orissa 1 : 188. 1921.

Strong climbers. Leaves cordate-ovate, to 18 cm long, palmi-nerved. Pendulous racemes to 10 cm long, axillary or supra-axillary.

Occasional in the forest areas. January-April. Sarkar & Bhatta., 141; 1656.

Leaves and tender shoots consumed as a pot herb, especially with fish.

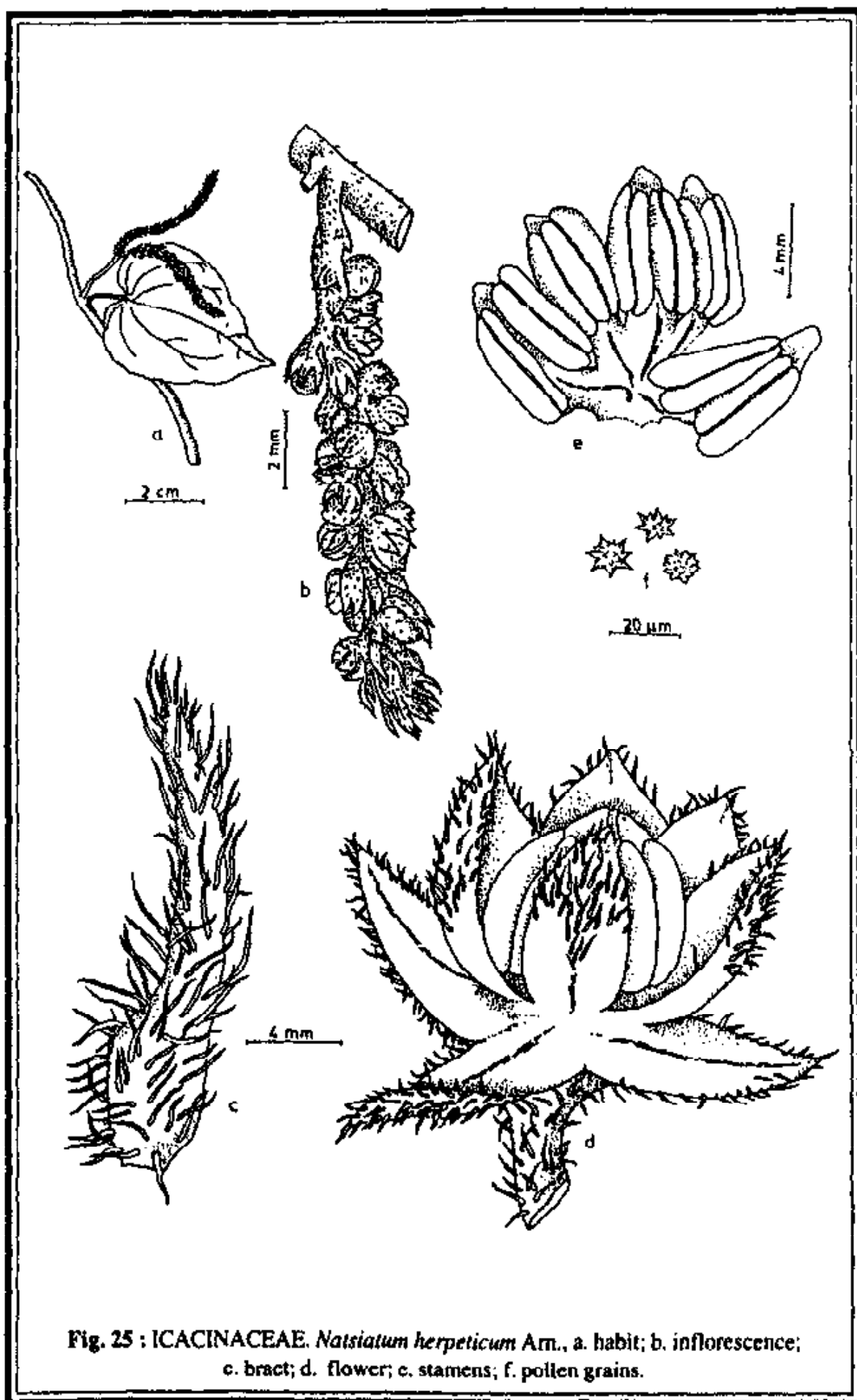


Fig. 25 : ICACINACEAE. *Natsiatum herpeticum* Arn., a. habit; b. inflorescence; c. bract; d. flower; e. stamens; f. pollen grains.

**LXXVII. EUPHORBIACEAE**

1a. Plants with milky latex ; flowers arranged in cyathea	...	11. EUPHORBIA
1b. Plants without milky latex ; Flowers not arranged in cyathea.	...	2
2a. Perianth differentiated into distinct calyx and corolla.	...	3
2b. Perianth monochlamydeous, either calycine or corolline.	...	6
3a. Stamens 5, on a gynandrophore ; ovary locules 2- ovuled	...	5. BRIDELIA
3b. Stamens more, not on a gynandrophore, ovary locules 1- ovuled.	...	4
4a. Flowers in corymbs ; main branches terminated by pistillate flowers, others staminate	...	13. JATROPHA
4b. Flowers in racemes ; pistillate flowers at base and staminate flowers above.	...	5
5a. Inflorescence terminal ; stamens incurved in bud	...	8. CORTON
5b. Inflorescence axillary ; stamens erect in bud	...	7. CHROZOPHORA
6a. Plants twining, with stinging hairs.	...	22. TRAGIA
6b. Plants erect, without stinging hairs.	...	7
7a. Leaves 3-foliolate	...	3. BISCHOFIA
7b. Leaves simple	...	8
8a. Leaves peltate, palminerved ; stamens numerous in branched fascicles	...	18. RICINUS
8b. Plants not as above.	...	9
9a. Flowers in elongated, simple or branched spikes or racemes.	...	10

9b. Flowers, at least the male, solitary, or in fascicles, clusters or very short cymes.	...	15
10a. Monoecious herbs.	...	11
10b. Monoecious or dioecious trees or scandent shrubs.	...	12
11a. Pistillate flowers with large, suborbicular bracts ; styles laciniate	...	1. ACALYPHA
11b. Pistillate flowers without large bracts ; styles linear, simple	...	16. MICROCOCCA
12a. Disk present ; ovary 1-locular	...	2. ANTIDESMA
12b. Disk absent ; ovary 2-4-locular.	...	13
13a. Fruit drupaceous.	...	23. TREWIA
13b. Fruit schizocarpic.	...	14
14a. Anther cells oblong	...	15. MALLOTUS
14b. Anther cells subglobose	...	6. CLEIDION
15a. Trees ; fruits up to 3 cm across.	...	16
15b. Shrubs or herbs ; fruits smaller.	...	18
16a. Leaves up to 1 cm long.	...	10. EMBLICA
16b. Leaves larger.	...	17
17a. Monoecious or dioecious trees : stamens 2-10; ovules 2 per locule	...	9. DRYPETES
17b. Monoecious trees ; stamens 10- many ; ovules 1 per locule	...	21. SUREGADA
18a. Flowers with distinct disk or disk-glands.	...	19
18b. Flowers without disk.	...	21

19a. Herbs ; stamens 3	...	17. PHYLLANTHUS
19b. Plant not as above.	...	20
20a. Monoecious ; stamens 3 united, 2 free ; pistillode absent	...	13. KIRGANELLIA
20b. Dioecious; stamens all free ; pistillode present	...	20. SECURINEGA
21a. Ovary 3-15 locular; stamens 3-12	...	12. GLOCHIDION
21b. Ovary 3 - locular ; stamens 3.	...	22
22a. Staminal column 3-gonous	...	19. SAUROPUS
22b. Staminal column terete	...	4. BREYNIA

### 1. ACALYPHA L.

**Acalypha indica** L., Sp. Pl. 1003. 1753 ; Hook. f., Fl. Brit. India 5 : 416. 1887 ; Haines, Bot. Bihar & Orissa 1 : 117. 1921.

Erect herbs to 50 cm high. Leaves ovate or rhomboid-ovate, 2.5-7.5 × 2-5 cm, acute or subobtuse, crenate-serrate. Racemes to 8 cm long, terminated by a sterile appendage. Seeds ovoid, smooth.

In waste lands. June-October. Sarkar & Bhatta., 1180.

Decoction used as a laxative.

### 2. ANTIDESMA L.

**Antidesma ghaesembilla** Gaertn., Fruct. 1 : 189. t. 39. 1788 ; Hook. f., Fl. Brit. India 5 : 357. 1887 ; Haines, Bot. Bihar & Orissa 1 : 144. 1921.

Leaves broadly elliptic or orbicular-oblong, 5-10 × 2-5 cm, obtuse, tomentose beneath. Disk annular. Drupe to 0.6 cm across, blackish or reddish-purple.

In sal forests. Fr. : November-December. Sarkar & Bhatta., 193.

Acid fruits edible. Wood used in house construction.

### 3. BISCHOFIA Bl.

**Bischofia javanica** Bl., Bijdr. 1168. 1827 ; Hook. f., Fl. Brit. India 5 : 345. 1887 ; Haines, Bot. Bihar & Orissa 1 : 145. 1921.

Tall trees with spreading branches. Leaflets ovate-elliptic, 7.5–20 × 4–9 cm, crenate-dentate. Berry to 1 cm across, smooth, greenish.

Common near Verihari, along streams. Fl. February–March. KAIN. Sarkar & Bhatta., 407.

Wood durable.

#### 4. BREYNIA J. R. & G. Forst., *nom. cons.*

- 1a. Young stems 4-angled ; calyx in fruit large ... 1. *B. retusa*  
 1b. Young stems not 4-angled ;  
 calyx in fruit smaller ... 2. *B. vitis-idaea*

1. **Breynia retusa** (Dennst.) Alston in Ann. Roy. Bot. Gard. Peradeniya 11 : 204. 1929 ; Airy Shaw in Kew Bull. 26 : 227. 1972. *Phyllanthus retusus* Dennst., Schliissel Hort. Malab. 31. 1818. *Breynia patens* (Roxb.) Benth. in Benth. & Hook. f., Gen. Pl. 3 : 277. 1883 ; Hook. f., Fl. Brit. India. 5 : 329. 1887 ; Haines, Bot. Bihar & Orissa 1 : 138. 1921.

Shrubs, to 1.25 m high. Leaves orbicular, to 1.5 cm long. Flowers pendulous. Fruiting calyx crimson. Schizocarp blackish.

Rare. April–July. Sarkar & Bhatta., 1530.

2. **Breynia vitis-idaea** (Burm. f.) Fischer in Bull. Misc. Inf. Kew 1932 : 65. 1932 ; Airy Shaw in Kew Bull. 26 : 277. 1972. *Rhamnus vitis-idaea* Burm. f., Fl. Indica 61. 1768. *Breynia rhamnoides* (Willd.) Muell.-Arg. in DC., Prodr. 15(2) : 440. 1866 ; Hook. f., Fl. Brit. India 5 : 330. 1887 ; Haines, Bot. Bihar & Orissa 1 : 138. 1921.

Shrubs to 2 m high. Leaves sub-orbicular, 0.7–1 cm long. Fruit globose, to 0.5 cm across, red when ripe.

Along forest margins and roadside hedges. June–October. Sarkar & Bhatta., 420.

Medicinal.

#### 5. BRIDELIA Willd.

- 1a. Scandent shrubs ... 2. *B. stipularis*  
 1b. Small trees. ... 2

- 2a. Armed with thick, conical thorns on trunk ;  
 drupe globose ... 1. *B. retusa*
- 2b. Not armed : drupe oblong ... 3. *B. verrucosa*

1. ***Bridelia retusa*** (L.) Spreng., Syst. Veg. 3 : 48. 1826 ; Hook. f., Fl. Brit. India 5 : 268.1887 ; Haines, Bot. Bihar & Orissa 1 : 123. 1921 ; *Clusia retusa* L., Sp. Pl.1042. 1753.

Leaves elliptic-oblong, 10-25 cm long, finely tomentose beneath. Flowers greenish yellow. Drupe to 0.8 cm across, greenish yellow.

Common in the sal forests. Fruit ripens in December. KAKA. Sarkar & Bhatta., 108.1151.

Leaves used as a substitute for salpati. Drupes eaten.

2. ***Bridelia stipularis*** Bl., Bijdr. 597.1827 ; Hook. f., Fl. Brit. India 5 : 270. 1887 ; Haines, Bot. Bihar & Orissa 1 : 125. 1921.

Branches drooping. Leaves broadly elliptic-oblong, to 13 cm long, sub-acute, tomentose beneath. Drupe to 1.2 cm long, greenish-yellow with deep-purple marks.

Common along the forests. Fruit ripens in December. Sarkar & Bhatta., 143.

Uses as the previous.

Note : Many authors treated it under *B. scandens* (Roxb.) Willd. (1805).

3. ***Bridelia verrucosa*** Haines, Bot. Bihar & Orissa Pt. 2, 120.1921 ; repr. 1 : 123. *B. montana* sensu Hook. f., Fl. Brit. India 5 : 269.1887 ; non Willd.

Leaves broadly elliptic or obovate, to 12.5 cm long, rounded at both ends. Drupe oblong - ellipsoid, blackish purple, to 0.6 cm across.

Occasional near sandstone hills. Fruit ripens in December. Sarkar & Bhatta., 1349.

## 6. **CLEIDION** Bl.

***Cleidion javanicum*** Bl., Bijdr. 613.1827 ; Hook. f., Fl. Brit. India 5 : 444.1887 ; Haines, Bot. Bihar & Orissa 1 : 113. 1921.

Evergreen trees. Leaves elliptic-lanceolate acuminate, serrate. Staminate flowers in slender spikes or racemes. Pistillate flowers solitary.

Haines (*l.c.*) stated the plant as rare near streams (Gobardhana). Haines 560 (CAL!).

### 7. *CHROZOPHORA* Neck.ex Juss., *nom. cons.*

***Chrozophora rottleri*** (Geis.) Juss. ex Spreng., Syst. Veg. 3 : 850. 1826 ; Haines, Bot. Bihar & Orissa 1 : 107. 1921. *Croton rottleri* Geis. Crodt. Monogr. 54. 1807. *Chrozophora plicata* forma 1. Hook. f., Fl. Brit. India 5 : 409-410. 1887.

Annuals or perennials, to 90 cm high. Leaves orbicular with 3 rounded lobes. 3-8 cm broad, undulate-crenate. Flowers greenish yellow. Fruit to 0.6 cm across.

A gregarious plant of waste places. Throughout the year. Sarkar & Bhatta., 413, 936.

### 8. *CROTON* L.

1a. Suffruticose herbs ; leaves upto 5 cm long ... 1. *C. bonplandianum*

1b. Small trees ; leaves upto 30 cm long ... 2. *C. roxburghii*

1. ***Croton bonplandianum*** Baill. in Adans. 4 : 339. 1864 ; Verma et al. in Fl. of Raipur, Durg & Rajnandgaon 337. 1985. *C. sparsiflorum* Morong. in Ann. N. Y. Acad. Sc. 7 : 221-1893 ; Haines, Bot. Bihar & Orissa 1 : 109. 1921.

Leaves ovate lanceolate, serrate. Spikes to 15 cm long. Stamens 15-16. Fruit to 0.4 cm across. Seeds with caruncle.

Weed of waste places and cultivated fields. Native of South America. Throughout the year. Sarkar & Bhatta., 116.

Watery latex is used on wounds.

2. ***Croton roxburghii*** Balak. in Bull. Bot. Surv. India 3 : 39. 1962. *C. oblongifolius* Roxb., Fl. Indica 3 : 685. 1832 ; Hook. f., Fl. Brit. India 5 : 387. 1887 ; Haines, Bot. Bihar & Orissa 1 : 108. 1921. non Delile 1814 nec. Siebr. ex Spr. 1826.

Deciduous trees. Leaves oblong-lanceolate, serrate, coriaceous. Racemes pendulous, to 20 cm long. Capsule subglobose, 0.8 cm across.

In moist forest areas. December–April. Sarkar & Bhatta 183, 1117.

### 9. DRYPETES Vahl

- 1a. Ovary 2-locular ; drupe 2-seeded ... 1. *D. assamica*  
 1b. Ovary 3-locular ; drupe 1-seeded ... 2. *D. roxburghii*

1. *Drypetes assamica* (Hook.f.) Pax. & Hoffm. in Pflanzenr. IV. 147 (15) : 241.1922 ; Airy Shaw in Kew Bull. 26 : 253. 1972. *Cyclostemon assamicus* Hook. f., Fl. Brit. India 5 : 342.1887 ; Haines, Bot. Bihar & Orissa 1 : 141. 1921.

Small trees. Leaves elliptic-oblong or ovate-oblong. Flowers globose green. Staminate flowers in clusters. Pistillate flowers axillary. Drupe ovoid – oblong.

Haines (*l.c.*) reported the plant from Someswar hills, along nalas and ravines. Sub—Himalayan region.

2. *Drypetes roxburghii* (Wall.) Hurusawa in J. Fac. Sci. Univ. Tokyo Sect. 3, Bot. 6 : 337.1954 *Putranjiva roxburghii* Wall., Tent. Fl. Nep. 61. 1826 ; Hook. f., Fl. Brit. India 5 : 336.1887 ; Haines, Bot. Bihar & Orissa 1 : '40. 1921.

Handsome trees, with drooping branches. Leaves elliptic-oblong, or oblong lanceolate, to 7 cm long. Flowers dioecious. Drupe ovoid. With an apiculation, to 1.3 cm across.

In mixed forests. India, Sri Lanka, Burma. Fl. : April – May ; fruit ripens in the winter season. Sarkar & Bhatta., 638.

### 10. EMBLICA Gaertn.

*Emblica officinalis* Gaertn., Fruct. 2 : 122. t. 108.1790 ; Haines. Bot. Bihar & Orissa 1 : 132. 1921. *Phyllanthus emblica* L., Sp. Pl. 982. 1753 ; Hook. f., Fl. Brit. India 5 : 289.1887.

Trees with spreading branches. Leaves distichously arranged. Oblong-elliptic to linear, 0.6 – 1.5 × 0.2 cm. Berry to 3 cm across, sap green when ripe.

Common in mixed forests. Fl. : February–May. Fr : October–April. AMLA. Sarkar & Bhatta., 427, 1115.

Fruit medicinal.

## 11. EUPHORBIA L.

- |  |     |                             |
|--|-----|-----------------------------|
| 1a. Stems underground ; leaves all radical, succulent  | ... | 2. <i>E. fusiformis</i>     |
| 1b. Stems not as above ; leaves not all radical,<br>not succulent.   | ... | 2                           |
| 2a. Lower leaves alternate, upper opposite or whorled.   |     | 3                           |
| 2b. Leaves all opposite.   | ... | 4                           |
| 3a. Floral leaves scarlet  | ... | 8. <i>E. pulcherrima</i>    |
| 3b. Floral leaves green  | ... | 1. <i>E. dracunculoides</i> |
| 4a. Leaves all or at least the larger ones 1-5 cm long ;<br>gland appendages petaloid or obsolete.                       | ... | 5                           |
| 4b. Leaves all 0.2-0.7 cm long ;<br>gland appendages obsolete.   | ... | 6                           |
| 5a. Stem-apices bearing long patent hairs in<br>addition to short appressed hairs ;<br>gland appendages obsolete         | ... | 4. <i>E. hirta</i>          |
| 5b. Stem-apices glabrous or pubescent with short<br>appressed or slightly spreading hairs ;<br>gland appendages petaloid | ... | 5. <i>E. parviflora</i>     |
| 6a. Stems more or less hispidly hairy ;<br>fruit pubescent or hirsute.   | ... | 7                           |
| 6b. Stems and fruits glabrous  | ... | 6. <i>E. orbiculata</i>     |
| 7a. Leaves crenulate   | ... | 9. <i>E. thymifolia</i>     |
| 7b. Leaves entire.   | ... | 8                           |
| 8a. Capsule hirsute  | ... | 3. <i>E. granulata</i>      |
| 8b. Hairs only on the ribs of the lobes of fruits  | ... | 7. <i>E. prostrata</i>      |

1. *Euphorbia dracunculoides* Lamk., Encyl. 2 : 428. 1786 ; Hook. f., Fl. Brit. India 5 : 262. 1887 ; Haines, Bot. Bihar & Orissa 1 : 150. 1921. *E. angustifolia* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal, 62. 1825 ; Hook. f., Fl. Brit. India 5 : 265. 1887.

Erect, glabrous, annual herbs, to 20 cm high. Leaves linear-lanceolate, sessile. Cyathea axillary, solitary.

A common weed of winter crops. India, extending to tropical Africa. Fl.: March – June. Sarkar & Bhatta., 901.

Seeds contain a drying oil.

2. **Euphorbia fusiformis** Buch.-Ham. ex D. Don, Prodr. Fl. Nepal 62.1825 ; Hook. f., Fl. Brit. India 5 : 257. 1887 ; Haines, Bot. Bihar & Orissa 1 : 148.1921. *E. acaulis* Roxb. [Hort. Beng. 36.1814 *nom. nud.* &] Fl. Indica 2 : 272.1832.

Glabrous, succulent, perennial herbs. Stems underground, fusiform, to 12.5 cm across, fleshy. Leaves obovate-oblong, to 25 cm long.

Along the sandstone hills. Fl., : March – April, Sarkar & Bhatta., 1080, 1448.

Juice acrid and iridescent.

3. **Euphorbia granulata** Forssk ., Fl. Aegypt.-Arab. 94.1775 ; Hook. f., Fl. Brit. India 5 : 252.1887 ; Haines, Bot. Bihar & Orissa 1 : 153. 1921.

Annual, prostrate herbs upto 12 cm long. Leaves ovate-oblong, to 0.4 cm long ; stipules minute. Cyathea subsessile. Fruit hairy.

In waste places. Fl. : October. Sarkar & Bhatta., 680.

4. **Euphorbia hirta** L. Sp. Pl. 454.1753 ; Haines, Bot. Bihar & Orissa 1 : 152. 1921. A.R. Smith in Kew Bull. 26 : 264. 1972. *E. pilulifera* auct. Hook. f., Fl. Brit. India 5 : 250. 1887 ; non L. 1753.

Annual or perennial, to erect or prostrate hairy herbs. Leaves obovate elliptic, 1.5–3 × 0.7–1.4 cm, serrulate, oblique at base. Cyathea axillary in capitate, peduncled cymes. Fruit depressed globose.

Common throughout the district. Throughout the year. Sarkar & Bhatta., 415, 840, 1108.

Used for cough and asthma.

5. **Euphorbia orbiculata** H.B.&K., Nov. Gen. et Sp. 2 : 52. 1817; Raj. & Panig. in Taxon 17 : 547.1986. *p.p.* ; *E. microphylla* Heyne ex Roth, Nov. Pl. Sp. 227.1821, non Lamk. 1786 ; Hook. f., Fl. Brit. India 5 : 252.1887; Haines, Bot. Bihar & Orissa 1 : 153. 1921.

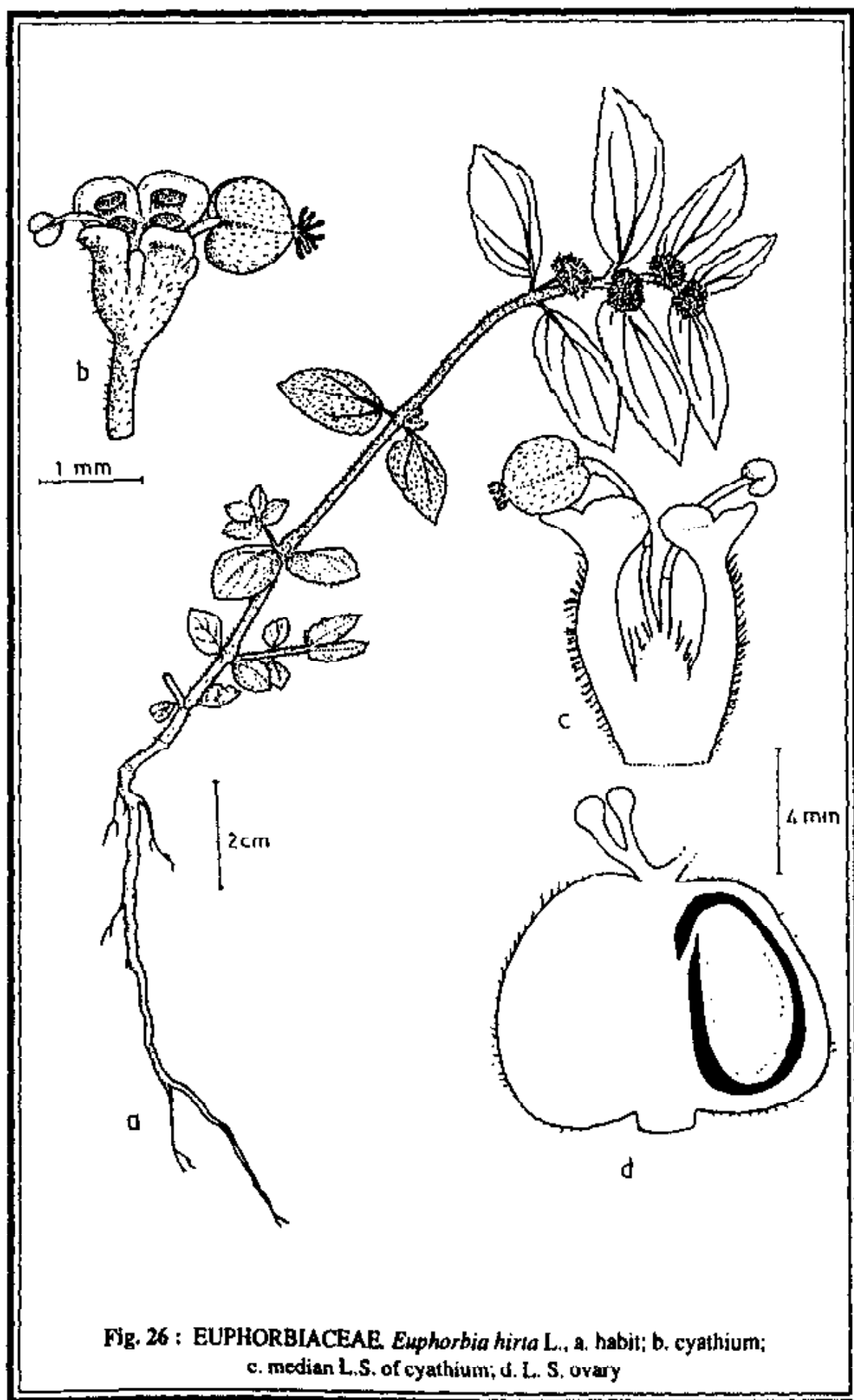


Fig. 26 : EUPHORBIACEAE. *Euphorbia hirta* L., a. habit; b. cyathium; c. median L.S. of cyathium; d. L. S. ovary

Annual, procumbent herbs, hairy. Leaves oblong–rounded, to 0.6 cm long, toothed ; stipules subulate. Glands stalked. Fruit glabrous.

In waste places. December – March. Sarkar & Bhatta., 606.

6. *Euphorbia parviflora* L., Syst. Nat. ed 10. 2 : 1047.1759 ; *Euphorbia hypericifolia* sensu Hook. f., Fl. Brit. India 5 : 249.1887 ; Prain, Bengal Pl. 2 : 692. Haines, Bot. Bihar & Orissa 1 : 151.1921. non L. 1753 ; *E. indica* Lamk ., Encycl. 2 : 423. 1786.

Erect herbs. Leaves oblong or ovate – lanceolate, to 1.5 cm long, serrate, oblique. Cyathea axillary, clustered. Seeds smooth.

In waste grounds. December. Sarkar & Bhatta., 152.

7. *Euphorbia prostrata* Ait., Hort. Kew ed. 1. 2 : 139. 1789 ; Hook. f., Fl. Brit. India. 5 : 266. 1887 ; Burch in Rhodora 68 : 1966.

Annual, diffuse herbs, pinkish green to green. Leaves oblong–elliptic, to 0.5 cm long, somewhat crenulate. Ribs of the schizocarp with spreading hairs. Seeds brownish.

In exposed grounds. Throughout the year. Banerjee 996 (CAL!).

8. *Euphorbia pulcherrima* Willd. ex Klotzsch, in Otto & Dietr. Allg.Gartenz 2 : 27. 1834 ; Hook. f., Fl. Brit. India 5 : 239.1887.

Shrubs with spreading branches. Bracts showy, scarlet. Involucres with a large yellow nectary gland.

Planted as a garden ornamental. Fl. : December–January. Sarkar & Bhatta., 1631.

9. *Euphorbia thymifolia* L., Sp. Pl. 454.1753 ; Hook. f., Fl. Brit. India 5 : 252. 1887 ; Haines, Bot. Bihar & Orissa 1 : 152.1921.

Annual prostrate herbs, purplish green. Leaves oblong–ovate, 0.4 – 0.7 cm long, serrate. Cyathea axillary, usually solitary.

In exposed grounds. Throughout the year. Sarkar & Bhatta, 815.

## 12. GLOCHIDION J.R. & G. Forst., *nom. cons.*

- |                                     |     |                        |
|-------------------------------------|-----|------------------------|
| 1a. Glabrous shrubs or small trees. | ... | 2                      |
| 1b. Pubescent trees                 | ... | 4. <i>G. velutinum</i> |

- 2a. Fruit much depressed and deeply lobed ... 3. *G. multiloculare*  
 2b. Fruit not much depressed and lobed. ... 3  
 3a. Stamens 3 ... 1. *G. assamicum*  
 3b. Stamens 4-6 ... 2. *G. lanceolarium*

1. ***Glochidion assamicum*** (Muell. Arg.) Hook. f., Fl. Brit. India 5 : 319. 1887; Haines, Bot. Bihar & Orissa 1 : 136. 1921 *Phyllanthus assamicus* Muell.-Arg. in Flora 378. 1865.

Small trees. Leaves elliptic-oblong. Anthers 3. Ovary 4-5-lobed.

Ramnagar. Sarkar & Bhatta., 1245.

2. ***Glochidion lanceolarium*** Dalz., Bombay Fl. 235. 1861; Hook. f., Fl. Brit. India 5 : 308. 1887; Haines, Bot. Bihar & Orissa 1 : 136. 1921.

Medium trees. Leaves elliptic or elliptic-acuminate. Male flowers numerous, clustered, yellowish-green; stamens 4-6. Female flowers usually 1-3, campanulate. Fruit orbicular.

Haines (*l.c.*) stated the plant as "not very common in Champaran". Thothathri 8011 (CAL!).

3. ***Glochidion multiloculare*** Muell.-Arg. in Linnaea 32 : 59. 1863; Hook. f., Fl. Brit. India 5 : 307. 1887; Haines, Bot. Bihar & Orissa 1 : 135. 1921.

Branches drooping. Leaves oblong-obovate, to 12 cm long, obtuse, subcoriaceous, sometimes purplish beneath. Fruits 2-2.5 cm broad. Seeds reddish.

In mixed forests. April-October. Sarkar & Bhatta., 624.

4. ***Glochidion velutinum*** Wt., Ic. 5 : 29. t. 1907. 1852; Hook. f., Fl. Brit. India 5 : 322. 1887; Haines, Bot. Bihar & Orissa 1 : 135. 1921.

Small trees, pubescent or tomentose all along. Leaves elliptic-oblong or lanceolate, 5-10 x 3-6 cm, acute or acuminate. Male flowers to 0.4 cm across, yellowish. Anthers 3. Female flowers green; ovary 4-7-locular. Fruit orbicular-depressed.

Rare in the district. April-August. Thothathri 1899.

Bark used for tanning.

13. *JATROPHA* L.

- 1a. Glandular, pubescent subshrubs ;  
 Leaves deeply palmately lobed ... 2. *J. gossypifolia*
- 1b. Eglandular or glandular shrubs ; leaves not as above. 2
- 2a. Flowers greenish—yellow ... 1. *J. curcas*
- 2b. Flowers scarlet ... 3. *J. integerrima*

1. *Jatropha curcas* L., Sp. Pl. 1006. 1753 ; Hook. f., Fl. Brit. India 5 : 338. 1887 ; Haines, Bot. Bihar & Orissa 1 : 105.1921.

Shrubs, to 4 m high, bark peeling off in whitish, papery flakes. Leaves broadly ovate-cordate, 10–15 cm across. Corolla 5–10-lobed, to 0.7 cm across. Fruit subglobose or oblong, to 2–5 cm long.

Planted for fencing in villages and self-sown. Native of America. July–January. Sarkar & Bhatta., 829.

2. *Jatropha gossypifolia* L., Sp. Pl. 1006. 1753 ; Hook. f., Fl. Brit. India 5 : 383. 1887 ; Haines, Bot. Bihar & Orissa 1 : 105.1921.

Subshrubs or small shrubs, to 1.5 m high ; young branches & leaves reddish. Leaves palmately 3–5-lobed, suborbicular, to 12.5 cm across, margins glandular hairy. Corolla red. Stamens 10–12. Fruit oblong, to 2 cm long.

In waste lands. A native of Brazil. April–September. Sarkar & Bhatta., 798.

Seeds yield 'Curcas oil', a powerful purgative.

3. *Jatropha integerrima* Jacq., Stirp. Sel. Amer. 256.1763 ; Airy-Shaw in Kew Bull. 26 : 284.1972. *J. pandurifolia* Andr., Bot. Repos. 4 : t. 267.1799.

Leaves panduriform, not glandular margined. Flowers to 2 cm across, showy.

Planted in gardens. Native of Cuba. Throughout the year. Sarkar & Bhatta., 908.

14. *KIRGANELIA* Juss.

*Kirganelia reticulata* (Poir.) Baill., Etudes Gen. Euph. 614. 1858 ; Haines, Bot. Bihar & Orissa I : 134.1921. *Phyllanthus reticulatus* Poir. in Lamk.,

Encycl. 5 : 298. 1804. Hook. f., Fl. Brit. India 5 : 288. 1887.

Shrubs, to 2 cm high. Leaves elliptic-orbicular, 0.5–2.5 × 0.3–0.3 cm ; petiole reddish, to 0.1 cm long. Fruit globose, 0.5 cm across, drooping, purplish when ripe.

Common along roadside hedges, or in waste lands. Throughout the year. Sarkar & Bhatta., 1530.

Fruits eaten.

#### 15. MALLOTUS Lour.

- |   |                           |
|---|---------------------------|
| 1a. Medium or small trees ; fruit scarlet-tomentose ... | 1. <i>M. philippensis</i> |
| 1b. Scandent shrubs ; fruit rusty-tomentose ...         | 2. <i>M. repandus</i>     |

1. **Mallotus philippensis** (Lamk.) Muell.-Arg. in Linnaea 34 : 196. 1865 ; Hook. f., Fl. Brit. India 5 : 442. 1887 ; Haines, Bot. Bihar & Orissa 1 : 110 (*philippinensis*) 1921. *Croton philippensis* Lamk., Encycl. 2 : 206. 1786.

Leaves ovate or ovate-elliptic 8–15 × 3–8 cm, acute-acuminate, toothed, scarlet-pubescent beneath. Flowers in axillary racemes. Capsule sub-globose, lobed, to 1 cm across.

Common along the margins of sal forests. October–March. Sarkar & Bhatta., 46, 1499. 1522.

Glandular hairs from fruits yield a dye, giving a rich golden red colour on silk.

2. **Mallotus repandus** Muell. -Arg. in Linnaea 34 : 197. 1865 ; Hook. f., Fl. Brit. India 5 : 442. 1887 ; Haines, Bot. Bihar & Orissa 1 : 111. 1921.

Leaves ovate, 5–10 × 4–8 cm, sinuate toothed or entire, softly stellate pubescent beneath. Flowers in terminal racemes. Capsule globose, to 0.5 cm across.

Scandent on trees near Bettiah, common. January–April. Sarkar & Bhatta. 412. 1150.

#### 16. MICROCOCCA Benth.

**Micrococca mercurialis** (L.) Benth. in Hook., Niger. Fl. 503. 1849 ; Pax & Hoffmann in Pflanzenr. 63 : 133. 1914. *Tragia mercurialis* L., Sp. Pl. 980. 1753. *Claoxylon mercurialis* (L.) Thw., Enum. 142. 1859 ; Hook. f., Fl. Brit. India 5 : 412. 1887 ; Haines, Bot. Bihar & Orissa 1 : 116. 1921

Herbs, to 30 cm high. Leaves ovate-lanceolate, 2.5–3.5 × 1.2–2.5 cm, serrate. Fruit to 0.25 cm across. green.

Gregarious along moist places. June–October. Sarkar & Bhatta., 818.

17. *PHYLLANTHUS* L. *emend.* Gaert.

- |   |                          |
|---|--------------------------|
| 1a. Anthers subglobose or reniform, horizontally dehiscent.   | 2                        |
| 1b. Anthers oblong, vertically dehiscent. ...   | 5                        |
| 2a. Filaments more or less free to the base ...   | 6. <i>P. virgatus</i>    |
| 2b. Filaments connate into a column. ...  | 3                        |
| 3a. Almost all cymules unisexual ; cymules of proximal 2–5 nodes with 2–4 male flowers ; all succeeding nodes with solitary female flowers. ...   | 4                        |
| 3b. Most cymules bisexual ; cymules of proximal 2–3 nodes with 1–3 male flowers ; all succeeding nodes with bisexual cymules of 1 male and 1 female or 2 males and 1 female flowers or other combinations ... | 2. <i>P. amarus</i>      |
| 4a. Main stem, when very young, with conspicuous normal leaves in about ten lower nodes ; branchlets smooth ; female disk saucer-shaped. ...  | 1. <i>P. airy-shawii</i> |
| 4b. Main stem, even when young usually naked, rarely with leaves in lower 2–3 nodes ; branchlets usually scabridulous, female disk of 6–9 lacerate and toothed segments. ...                                  | 3. <i>P. fraternus</i>   |
| 5a. Shrubs ...  | 4. <i>P. lawii</i>       |
| 5b. Herbs ...   | 5. <i>P. urinaria</i>    |

1. *Phyllanthus airy-shawii* Brunel & Roux, Nord. J. Bot. 4 : 470.1984 ; Mitra & Nayar in Taxon 33(2) : 470.1988. *P. debilis* Buch-Ham. ex Hook. f., Fl. Brit. India 5 : 299. 1887, *p.p.* ; non Klein ex Willd. 1805 ; Haines, Bot. Bihar & Orissa 1 : 131. 1921.

Annual herbs. Leaves linear-elliptic-lanceolate or oblanceolate, 0.4–2 × 0.15–0.6 cm, narrowed to a point at apex. Disk obtusely and shallowly 6-lobed along margin. Styles appressed and spreading.

On wet grounds. May–October. Sarkar & Bhatta., 1446.

2. **Phyllanthus amarus** Schum. & Th., Kongl. Danske Vidensk. Selsk. Skr. 4 : 195.6.1829 ; Webster in J. Arn. Arb. 37 : 13.1956 & 38 : 313.1957 ; Mitra and Jain : Bull. Bot. Surv. India 27 : 164.1985. *P. nanus* Hook. f., Fl. Brit. India 5 : 298.1887 ; Haines, Bot. Bihar & Orissa 1 : 131.1921.

Annual herbs. Leaves elliptic-oblong or obovate-oblong, 0.3–1.1 × 0.15–0.6 cm. Capsule to 0.18 cm across.

On moist grounds. Probably native to America, now a pantropical weed. May–October. Sarkar & Bhatta., 996.

Note : *P. niruri* in Hook. f., Fl. Brit. India is a mixture of 3 distinct species, viz., *P. amarus* Schum. & Th., *P. fraternus* Webster & *P. debilis* Klein ex Willd., the true *P. niruri* L., being endemic to West Indies.

3. **Phyllanthus fraternus** Webster, Contr. Gray Herbs 176 : 53. 1955 ; Mitra and Jain in Bull. Bot. Surv. India 27 : 172.1985. *P. niruri* sensu Hook.f., Fl. Brit. India 5 : 298. 1887 p.p. ; Haines, Bot. Bihar & Orissa 1 : 130.1921.

Annual herbs. Leaves oblong or elliptic-oblong, 0.3–1.6 × 0.2–0.8 cm stipules lanceolate. Styles erect and spreading.

In waste lands. May–July. Sarkar 1531 ; Banerjee 157, 357,688. (CAL!).

4. **Phyllanthus lawli** Grah., Cat. Pl. Bombay 181.1839 ; Hook.f., Fl. Brit. India 5 : 290. 1887 ; Haines, Bot. Bihar & Orissa 1 : 128.1921.

Shrubs with numerous rigid stems, to 1.5m high ; branchlets spreading. Leaves ovate-oblong, 0.3–0.8 cm long. Fruit globose, 0.3–0.4 cm across, smooth.

Along riverbeds and the sandstone areas. January–March. Sarkar & Bhatta., 1758.

5. **Phyllanthus urinaria** L., Sp. Pl. 982.1753 ; Hook. f., Fl. Brit. India 5 : 293.1887 ; Haines, Bot. Bihar & Orissa 1 : 129. 1921.

Pinkish green annual herbs. Leaves oblong-lanceolate, mucronate at apex. Disk-lobes glandular.

In waste places. July–January. Sarkar & Bhatta., 819.

6. *Phyllanthus virgatus* Forst. f., Fl. Ins. Austr. Prodr. 65. 1786 ; Airy Shaw in Kew Bull. 26 : 325.1972. *P. simplex* Retz., Obs. Bot. 5 : 29.1789 ; Hook. f., Fl. Brit. India 5 : 295.1887 ; Haines, Bot. Bihar & Orissa 1 : 130.1921.

Annual slender herbs ; sometimes perennial and suffruticose at base producing several slender branches. Leaves elliptic lanceolate or oblong 1–3 × 0.3–0.6 cm ; stipules peltate. Fruit long pedicelled.

Common in waste lands. June–January. Sarkar & Bhatta., 682, 839, 1927.

#### 18. RICINUS L.

*Ricinus communis* L., Sp. Pl. 1007. 1753 ; Hook. f., Fl. Brit. India 5 : 457. 1887 ; Haines, Bot. Bihar & Orissa 1 : 116. 1921.

Stout shrubs. Leaves peltate, orbicular, to 15 cm across, glaucous. Flowers yellow. Fruit subglobose, echinate, 1.5–2.5 cm long. Seeds carunculate.

An escape in waste places near villages. Introduced from Africa. January–June. Sarkar & Bhatta., 967.

Seeds yield 'Castor oil'.

#### 19. SAUROPLUS BL.

*Sauropus quadrangularis* (Willd.) Muell.–Arg. var. *pubescens* Kurz, For. Fl. Burma 2 : 350. 1877 ; Airy Shaw in Kew Bull. 26 : 337.1972. *S. pubescens* Hook. f., Fl. Brit. India 5 : 335. 1887 ; Haines, Bot. Bihar & Orissa 1 : 139. 1921.

Erect undershrubs, tomentose when young. Leaves broadly ovate or elliptic, pubescent beneath.

Haines (*l.c.*) reported this plant from Ramnagar. Haines 809 (CAL!).

#### 20. SECURINEGA Commerson ex Juss., *nom. cons.*

*Securinega virosa* (Roxb. ex Willd.) Baill. in Adansonia 6 : 334.1866 ; Airy Shaw in Kew Bull. 35 : 688.1980. *Phyllanthus virosus* Roxb. ex Willd., Sp. Pl. 4 : 578.1805. *Fluggea microcarpa* Bl., Bijdr. 580. 1825 ; Hook. f., Fl. Brit. India 5 : 328. 1887 ; Haines, Bot. Bihar & Orissa 1 : 127. 1921.

Straggling shrubs. Leaves elliptic obovate or orbicular. Fruit depressed white.

Rare. Banerjee 966 (CAL!).

## 21. SUREGADA Roxb. ex Rottl.

**Suregada multiflora** (Juss.) Baill., Et. Gen Euphorb. 396.1858 ; Airy Shaw in Kew Bull. 36 : 349.1981. *Gelonium multiflorum* Juss., Euph. Gen. Tent. Ill, t. 10. f. 31A. 1824 ; Hook. f., Fl. Brit. India 5 : 459. 1887 ; Haines, Bot. Bihar & Orissa 1 : 118. 1921.

Leaves elliptic-oblong, to 13 cm long, entire, shining above. Male flowers yellow, to 0.4–0.5 cm across ; stamens numerous from an annular receptacle. Ripe fruit to 1.5 cm across, orange-yellow.

Along roadsides and forest margins. March–June. Sarkar & Bhatta., 1542.

Wood has waxy odour. Bark used as a purgative.

Note : *Suregada* Roxb.ex Rottl. (1803) and *Gelonium* Roxb.ex Willd. (1805) are congeneric.

## 22. TRAGIA L.

1a. Leaves ovate or lanceolate, acute at base ... 2. *T. involucrata*

1b. Leaves linear or oblong-lanceolate, cordate at base. ... 1. *T. hispida*

1. **Tragia hispida** Willd., Sp. Pl. 4 : 323.1805 ; Pax & Hoffmann in Pflanzenr. 68. 79. 1919. *T. involucrata* var. *angustifolia* Hook. f., Fl. Brit. India 5 : 465.1888.

Twining herbs. Leaves 3.5–11 × 0.4–1.6 cm, acuminate, entire ; stipules to 0.3 cm long. Male flowering axis to 4.5 cm-long. Capsule to 0.6 cm across.

Along forest margins, on hedges. All seasons. Sarkar & Bhatta., 907.

2. **Tragia involucrata** L., Sp Pl. 980. 1753 ; Hook. f., Fl. Brit. India 5 : 465.1888 ; Haines, Bot. Bihar & Orissa 1 : 119. 1921. Rama. & V. J. Nair, Fl. Cannanore 427.1988.

Straggling herbs. Leaves 4–8 × 2.1–4 cm, acuminate, serrate. Fruits to 0.6 cm across. Fruiting calyx to 0.6 cm long.

In waste places, on hedges. All seasons. Sarkar & Bhatta., 1307.

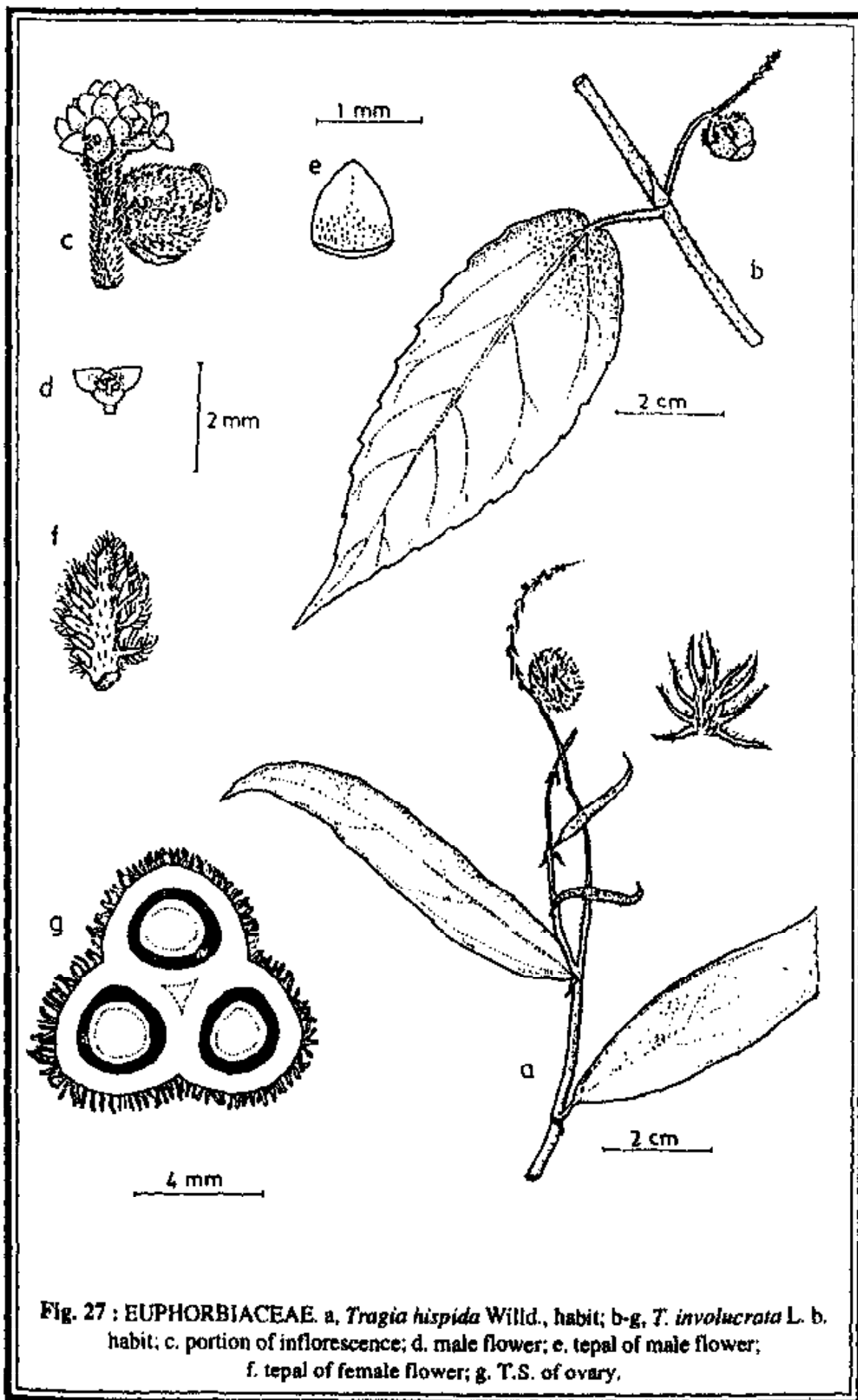


Fig. 27 : EUPHORBIACEAE. a, *Tragia hispida* Willd., habit; b-g, *T. involucrata* L. b. habit; c. portion of inflorescence; d. male flower; e. tepal of male flower; f. tepal of female flower; g. T.S. of ovary.

## 23. TREWIA L.

**Trewia nudiflora** L., Sp. Pl. 1193.1753 (*Trevia*); Hook. f., Fl. Brit. India 5 : 423.1877 ; Haines, Bot. Bihar & Orissa 1 : 109. 1921.

Leaves ovate, 7–13.2 × 3.2–5.5 cm, acuminate, entire. Male spikes to 15 cm or more long. Drupe green, depressed globose, to 2.5 cm across.

Along forest margins and road sides. Fl. : March–April ; Fr. : December–January. PITULI. Sarkar & Bhatta., 768, 785, 1062.

Wood use for packing-cases and matches. Seeds yield a fatty oil.

## LXXVIII. RHAMNACEAE

- |  |     |              |
|--|-----|--------------|
| 1a. Small trees or erect shrubs ; fruit drupaceous | ... | 2. ZIZIPHUS  |
| 1b. Climbing shrubs ; fruit samaroid               | ... | 1. VENTILAGO |

## 1. VENTILAGO Gaertn.

**Ventilago denticulata** Willd. in Ges. Naturf. Fr. Neue Schr. 3 : 417.1801 ; Banerjee & Mukherjee in Ind. For. 96 : 209.1970. *V. maderaspatana* Roxb., Pl. Cor. 1 : 55.t. 76.1796–98 ; non Gaertn. 1788. *V. calyculata* Tul. in Ann. Sc. Nat. Ser. 4.8 : 124. 1857 ; Lawson in Hook. f., Fl. Brit. India 1 : 631.1875 ; Haines, Bot. Bihar & Orissa 1 : 200.1921. *V. maderaspatana* Gaertn. var. *calyculata* (Tul.) King in J. As. Soc. Bengal 65 : 378.1896.

Sarmentose shrubs. Leaves bifarious, elliptic-oblong, 7–15 × 3.7 cm, acuminate. Flowers in terminal leafless panicle. Fruit glabrous, to 0.6 cm across ; wing linear-oblong, 3–5 cm long.

Mixed forests. Sub-Himalayan tract, Fl. : August–September ; Fr. : October–June. Sarkar & Bhatta., 245, 1374.

## 2. ZIZIPHUS Mill.

- |   |     |                       |
|---|-----|-----------------------|
| 1a. Shrubs or small trees ; Leaves not very oblique ;<br>fruit more than 0.5 cm across. | ... | 2                     |
| 1b. Subscandent shrubs ; leaves very oblique ;<br>fruit to 0.5 cm across, black         | ... | 3. <i>Z. oenoplia</i> |
| 2a. Petals 5 ; stone hard and thick.  | ... | 3                     |
| 2b. Petals absent ; stone crustaceous and thin  | ... | 4. <i>Z. rugosa</i>   |

- 3a. Leaves pubescent above, stipular spines straight  
and as long as or longer than the leaves ... 2. *Z. nummularia*
- 3b. Leaves glabrous above and tomentose beneath;  
stipular spines smaller than leaves ... 1. *Z. mauritiana*

1. *Ziziphus mauritiana* Lamk., Encycl. 3 : 319.1789 ; Bailey, Man. Cult. Pl. 646. 1949. *Z. jujuba sensu* Lawson in Hook.f., Fl. Brit. India 1 : 632.1875 ; Haines, Bot. Bihar & Orissa 1 : 201. 1921. non(L.) P. Mill., 1768.

Small trees. Leaves ovate-elliptic, 4.5–6.5 × 3–4 cm, conspicuously 3 nerved from the base ; stipular spines 2, one straight, the other curved back. Flowers in axillary fascicles or cymes, to 0.4 cm across, greenish–yellow. Drupe fleshy, to 1.5 cm across, yellow to red.

Wild and also cultivated. May–January. BAER. Sarkar & Bhatta., 133, 243, 426.

Drupe edible.

2. *Ziziphus nummularia* (Burm. f.) Wt. & Arn., Prodr. 162. 1834 ; Lawson in Hook. f., Fl. Brit. India 1 : 633. 1875 ; Haines, Bot. Bihar & Orissa 1 : 202. 1921. *Rhamnus nummularius* Burm. f., Fl. Indica. 61. 1768. *Z. rotundifolia* Lamk., Encycl. 3 : 319.1789.

Shrubs, to 2 m high. Leaves orbicular. Flowers to 0.3 cm across. Drupe globose to 0.7 cm across.

Occasional in mixed forests. India. Fl. : May–June ; Fr. : Nov–January. Sarkar & Bhatta., 872.

Drupes eaten. Dried spiny twigs are collected in heaps for fencing cattle-yards, fields etc.

3. *Ziziphus oenoplia* (L.) P. Mill. Gard. Dict. ed 8,3. 1768 ; Lawson in Hook. f., Fl. Brit. India 1 : 634. 1875 ; Haines, Bot. Bihar & Orissa 1 : 203.1921. *Rhamnus oenoplia* L., Sp. Pl. 194.1753.

Straggling, thorny shrubs. Leaves very obliquely elliptic–oblong, 2–5 × 1–3 cm, subentire. Cymes axillary. Flowers 0.2–0.3 cm across, greenish–yellow.

Common in mixed forests. June–December. Sarkar & Bhatta., 447.

Drupe edible.

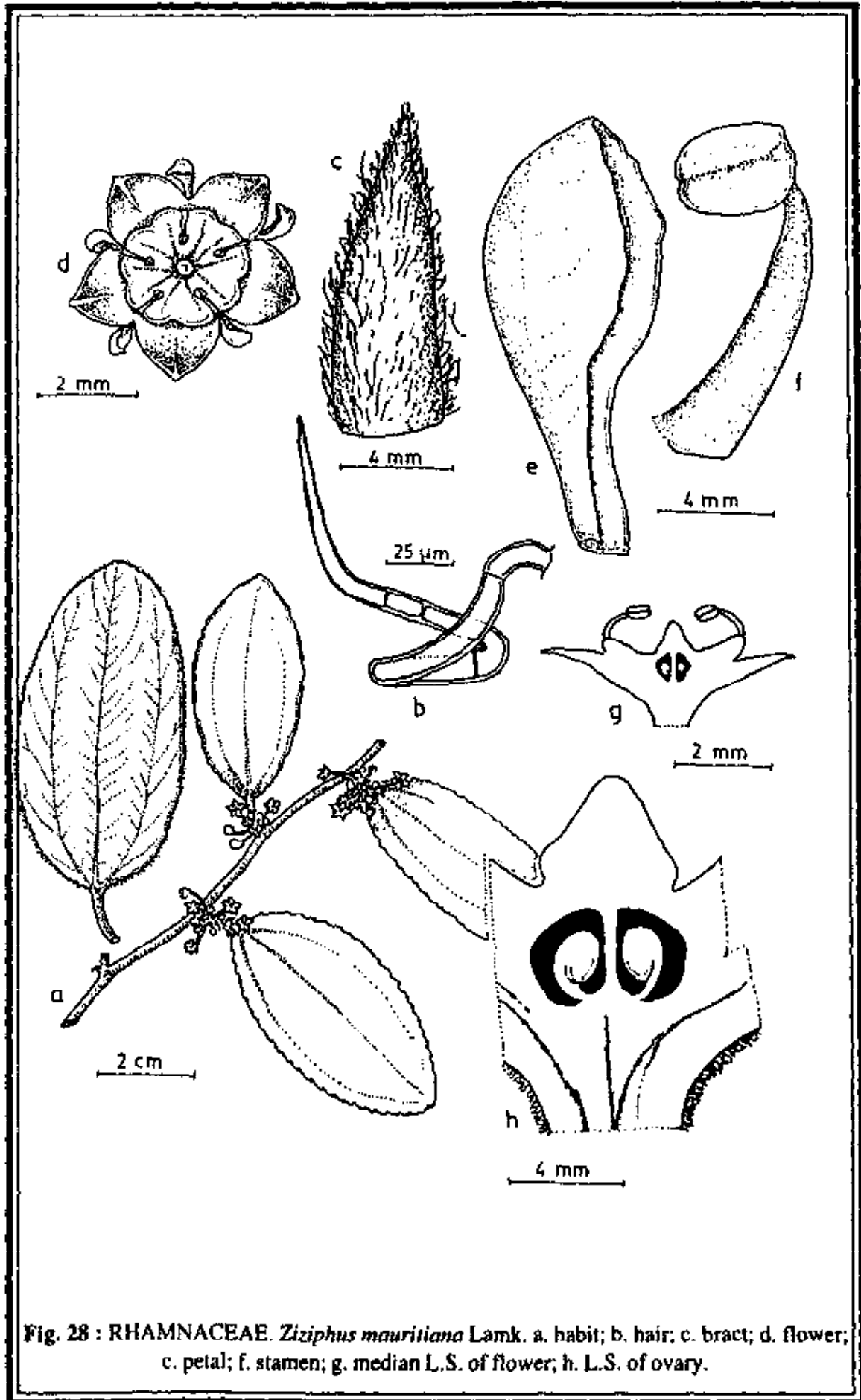


Fig. 28 : RHAMNACEAE. *Ziziphus mauritiana* Lamk. a. habit; b. hair; c. bract; d. flower; e. petal; f. stamen; g. median L.S. of flower; h. L.S. of ovary.

4. *Ziziphus rugosa* Lamk., Encycl. 3 : 319.1789 ; Lawson in Hook.f., Fl. Brit. India 1 : 636.1875 ; Haines, Bot. Bihar & Orissa 1 : 203.1921.

Shrubs, branches sometimes subscandent. Leaves elliptic, 5-12 × 4-8 cm, serrulate. Flowers to 0.5 cm across, greenish-yellow. Fruit globose, to 1 cm across, white fleshy.

Occasional in mixed forests. Throughout India & Sri Lanka. February-July. Sarkar & Bhatta., 243.

Drupe eaten.

Note : The spelling of the generic name of the taxon has raised controversy in the past. The present spelling, however has been adopted from Dandy (1967) in Reg. Veg. Vol. 51.

#### LXXIX. LEEACEAE

LEEAE D. van Royen ex L., *nom. cons.*

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Petiolar stipule a narrow wing,<br>1.5-4.0 × 0.5 cm, scar narrow | ... | 1. <i>L. crispa</i>      |
| 1b. Petiolar stipule obovate, 2-6 × 1-4 cm,<br>scar broad            | ... | 2. <i>L. macrophylla</i> |

1. *Leea crispa* Royen ex L., Syst. ed. 12, 2 : 627.1767 ; Lawson in Hook. f., Fl. Brit. India 1 : 655.1875 ; Haines, Bot. Bihar & Orissa 1 : 215.1921; *L. aspera* Edgew. in Trans. Linn. Soc. 20 : 36. 1846 ; Lawson in Hook. f. *l.c.* 655 ; Haines, *l.c.*

Subshrubs ; stems sometimes winged. Leaves 1- or 2 - pinnate, sometimes unifoliolate or trifoliolate ; leaflets ovate-oblong, 10-25 cm long. Flowers greenish-white. Fruit to 1.1 cm across, purple-black.

Very common along the forest areas. Indomalesia. June-October. Sarkar & Bhatta., 340.

2. *Leea macrophylla* Roxb. ex Horn., Hort. Hafn. 1 : 231.1831 ; Lawson in Hook. f., Fl. Brit. India 1 : 664. 1875 ; Haines, Bot. Bihar & Orissa 1 : 215.1921; *L. robusta* Roxb. Fl. Indica 2 : 468. 1824. *L. cinerea* Lawson in Hook. f., *l.c.* 665. *L. diffusa* Lawson in Hook. f., *l.c.* 664 *L. angustifolia* Lawson in Hook.f., *l.c.* 665. *L. parallela* Wall. ex Lawson in Hook. f., *l.c.* 666.

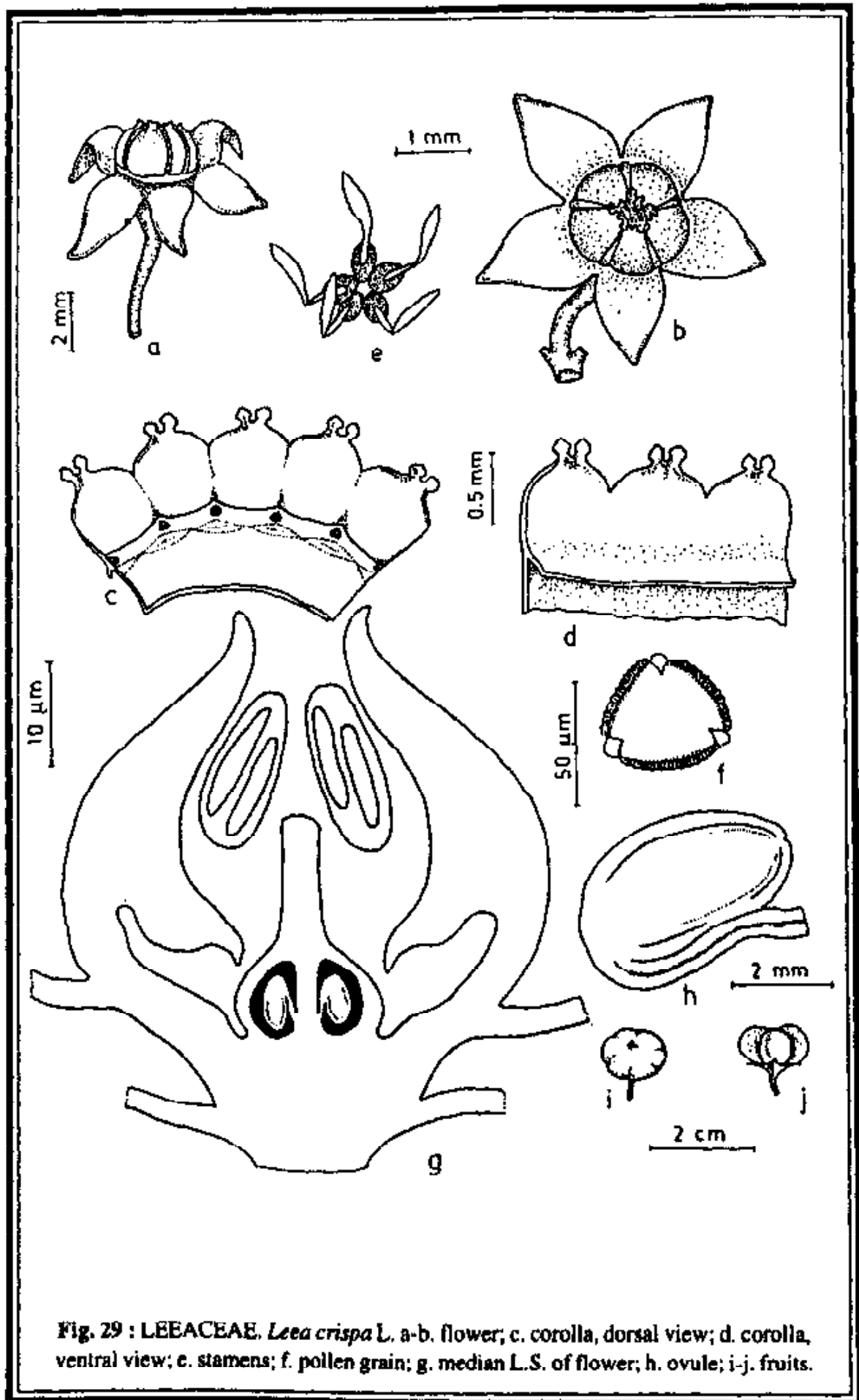


Fig. 29 : LEEACEAE. *Leea crispa* L. a-b. flower; c. corolla, dorsal view; d. corolla, ventral view; e. stamens; f. pollen grain; g. median L.S. of flower; h. ovule; i-j. fruits.

Shrubs. Leaves unifoliolate or trifoliolate, or 1-3-pinnate, 20-65 cm × 12-60 cm, sub-orbicular. Flowers greenish-white. Fruit globose, 1-1.5 cm across, purple-black.

Occasional in the sandstone areas. Indomalaysia. July-January. Sarkar & Bhatta., 1208, 1555.

LXXX. VITACEAE

- 1a. Tendrils on the peduncles, opposite the inflorescence ... 1. AMPELOCISSUS
- 1b. Tendrils on the branches, opposite the leaves... 2
- 2a. Flowers unisexual ; stigma 4-lobed ... 4. TETRASTIGMA
- 2b. Flowers bisexual ; stigma not as above. ... 3
- 3a. Leaves pedately 3-many-lobed ... 2. CAYRATIA ✓
- 3b. Leaves not as above ... 3. CISSUS

1. AMPELOCISSUS Planch., *nom. cons.*

- 1a. Leaves glabrous beneath ... 2. *A. latifolia*
- 1b. Leaves cottony-tomentose beneath ... 1. *A. divaricata*

1. *Ampelocissus divaricata* (Wall. ex Lawson) Planch. in DC., Monog. Phan. 5 : 378.1887 ; Momiyama in Enum. Fl. Pl. Nepal 2 : 93. 1979. *Vitis divaricata* Wall. ex Lawson in Hook. f., Fl. Brit. India 1 : 657.1875 ; Haines, Bot. Bihar & Orissa 2 : 211. 1921.

Extensive climbers. Leaves 3-foliolate ; leaflets oblong-lanceolate or ovate-lanceolate, to 20 cm long. Cymes to 5 cm across. Berry rounded.

Someswar hills. October-December. Sarkar & Bhatta., 1477.

2. *Ampelocissus latifolia* (Roxb.) Planch. in J. Vigne Am. 374.1884; Momiyama in Enum. Fl. Pl. Nepal 2 : 93. 1979. *Vitis latifolia* Roxb., Fl. Indica ed. 2. 1 : 661. 1832 ; Lawson in Hook. f., Fl. Brit. India 1 : 652.1875 ; Haines, Bot. Bihar & Orissa 1 : 210. *V. montana* Lawson in Hook. f., Fl. Brit. India 1 : 652. 1875.

Extensive climbers with tuberous rootstock. Leaves 3-7 angled or lobed.

to 20 cm long. Flowers red. Petals to 0.15 cm long. Berry to 0.6 cm across, black.

Common. May–September. Sarkar & Bhatta., 1114.

## 2. CAYRATIA JUSS., *nom. cons.*

- 1a. Leaves mostly 5–foliolate ; berries red ... 1. *C. auriculata*  
 1b. Leaves 3–foliolate ; berries black ... 2. *C. trifolia*

1. **Cayratia auriculata** (Wall. ex Roxb.) Gamble, Fl. Madras Pres. 1 : 237. 1918 ; Verma et al. in Fl. Raipur, Durg & Rajnandgaon 76. 1985. *Cissus auriculata* Wall. ex Roxb., Fl. Indica 430.1820. *Vitis auriculata* Wt. & Arn., Prodr. 129. 1834 ; Haines, Bot. Bihar & Orissa 1 : 213. 1921.

Tendrils 2–3–fid. Leaflets elliptic-obovate, to 10 cm long. acuminate, crenate. Flowers greenish–white.

Someswar hills (Haines, *l.c.*).

2. **Cayratia trifolia** (L.) Domin in Bibl. Bot. 89 : 371. 1927 ; Morniyama in Enum. Fl. Pl. Nepal 2 : 94.1879. *Vitis trifolia* L., Sp. Pl. 203. 1753 ; Haines, Bot. Bihar & Orissa 1 : 213. 1921. *V. carnos*a (Roxb.) Wall. Cat. 206, n. 6018. 1831–32 ; Lawson in Hook. f., Fl. Brit. India 1 : 654. 1875.

Terminal leaflet elliptic–obovate ; laterals ovate, to 10 cm long. crenate. Cymes to 10 cm across. Flowers greenish white, to 0.25 cm across. Berry to 1.5 cm across, purplish–black.

Very common along waste lands. Indomalaysia. August–November. Sarkar & Bhatta., 479.

## 3. CISSUS L.

**Cissus repanda** Vahl, Symb. 3 : 18.1794 ; Deb, Fl. Tripura 1 : 413.1981. *Vitis repanda* (Vahl) Wt. & Arn., Prodr. 125.1834 ; Lawson in Hook. f., Fl. Brit. India 1 : 641. 1875 ; Haines, Bot. Bihar & Orissa 1 : 209. 1921.

Leaves broadly ovate or suborbicular, to 20 cm across, cordate. Flowers to 0.15 cm across. Berry to 0.8 cm long, purplish–black.

In moist forests, India, Sri Lanka. May–June. Sarkar & Bhatta., 232.

4. TETRASTIGMA Planch.

- |                                   |     |                           |
|-----------------------------------|-----|---------------------------|
| 1a. Leaves 3-foliolate.           | ... | 2                         |
| 1b. Leaves 5-foliolate            | ... | 2. <i>T. lanceolarium</i> |
| 2a. Disk 0 ; ovary glabrous       | ... | 1. <i>T. alcicorne</i>    |
| 2b. Disk thick ; ovary pubescent. | ... | 3. <i>T. thomsonianum</i> |

1. *Tetrastigma alcicorne* Haines in Kew Bull. 2. 1920. *Vitis alcicorne* Haines, Bot. Bihar & Orissa 1 : 212. 1921.

Leaves 3-foliolate : leaflets crenate ; laterals elliptic, terminal obovate, to 11 cm long.

Someswar hills. Endemic. November–December. Sarkar & Bhatta., 223.

2. *Tetrastigma lanceolarium* (Roxb.) Planch. in DC., Monog. Phan. 5 : 423. 1887 ; Matthew, Fl. Pl. Kurseong 23, 1981. *Cissus lanceolaria* Roxb., Fl. Indica 1 : 412. 1820. *Vitis lanceolaria* (Roxb.) Lawson in Hook. f., Fl. Brit. India 1 : 660. 1875 *p.p.* ; Haines, Bot. Bihar & Orissa 1 : 212. 1921.

Extensive climbers. Leaflets oblong–lanceolate, 7.5–12.5 cm long, acuminate, distantly serrate. Berry subglobose.

Along moist areas near Bhikhna Thori. January–July. Sarkar & Bhatta., 1645.

3. *Tetrastigma thomsonianum* Planch. in DC., Monog. Phan. 5. 438. 1887 ; Balakrishnan, Fl. Jowai 1 : 137. 1981. *Vitis angustifolia* (Roxb.) Wt., Ic. 1 : 9, t. 176. 1839 ; Lawson in Hook. f., Fl. Brit. India 1 : 654. 1875 ; Haines, Bot. Bihar & Orissa 1 : 212. 1921.

Climbers. Leaflets narrow–lanceolate, to 13 cm long. Flowers greenish yellow. Berry spherical, yellowish–red when ripe.

Moist forest areas. February–January. Sarkar & Bhatta., 595.

LXXXI. LINACEAE

- |   |     |                |
|---|-----|----------------|
| 1a. Leaves sessile, linear–lanceolate ;<br>flowers blue, to 1.2 cm across | ... | 1. LINUM       |
| 1b. Leaves stalked, elliptic–ovate ;<br>flowers yellow, to 3 cm across    | ... | 2. REINWARDTIA |

## 1. LINUM L.

*Linum usitatissimum* L., Sp. Pl. 277.1753 ; Haines, Bot. Bihar & Orissa 1 : 155.1921.

Annual herbs, to 50 cm high. Leaves 1–2.5 × 0.5–0.7 cm. Capsule globose, to 1 cm across. Seeds compressed, smooth, to 0.3 cm long, dark brown.

Cultivated as a winter crop for its oil-yielding seeds. TISI. Sarkar & Bhatta., 661.

## 2. REINWARDTIA Dumort.

*Reinwardtia indica* Dumort., Comm. Bot. 19.1822 ; Duthie, Fl. Upper Gangetic Plain 1 : 116. 1903. *Linum trigynum* Roxb., Asiat. Res. 6 : 357.1799. non L., 1753. *Reinwardtia trigyna* Planch., Lond. J. Bot. 7 : 522.1848, *nom. superfl.* ; Hook.f., Fl. Brit. India 1 : 412.1875 ; Haines, Bot. Bihar & Orissa 1 : 155. 1921.

Undershrubs, to 75 cm high. Leaves 2–10 × 1–6 cm, entire. Capsule globose, to 1.1 cm across. Seeds compressed, sub-reniform, to 0.3 cm long.

In moist forest floors. October–February. Sarkar & Bhatta., 987, 1643.

## LXXXII. MALPIGHIACEAE

- |                                 |     |                 |
|---------------------------------|-----|-----------------|
| 1a. Style 1 ; calyx glandular   | ... | 2. HIPTAGE      |
| 1b. Styles 3 ; calyx eglandular | ... | 1. ASPIDOPTERYS |

## 1. ASPIDOPTERYS Juss.

*Aspidopterys nutans* (Roxb. ex DC.) Juss. in Ann. Sci. Nat. Ser. 2, B.13 : 267.1840 ; Press in Enum. Fl. Pl. Nepal 2 : 74. 1979. *Hiraea nutans* Roxb. ex DC., Prodr. 1 : 585.1824. *A. nutans* (Roxb. ex DC.) Hook. f., Fl. Brit. India 1 : 421.1874.

Slender climbers. Leaves suborbicular, 17 × 12 cm, acuminate, rusty tomentose beneath. Samaras somewhat oblong.

Along the northern boundary. November–March. Sarkar & Bhatta., 1356.

2. HIPTAGE Gaertn., *nom. cons.*

*Hiptage benghalensis* (L.) Kurz, J. Asiat. Soc. Bengal 43(2) : 136.1874 ; Jacobs in Steenis, Fl. Mal. 1, 5 : 132.1955. *Banisteria benghalensis* L., Sp. Pl.

427.1753. *H. madhablata* Gaertn., Fruct. 2 : 169, t. 116.1791 ; Haines, Bot. Bihar & Orissa 1 : 157. 1921.

Robust climbers. Leaves elliptic-ovate, acute, to 20 cm long. Flowers 2.0–2.5 cm across, pinkish, fragrant.

Cultivated. November–May. MADHABI LATA. Sarkar & Bhatta, 1722.

### LXXXIII. POLYGALACEAE

1a. Two inner sepals larger ; stamens 8 ... 1. POLYGALA

1b. All sepals petaloid, subequal ; stamens 4–5 ... 2. SALOMONIA

#### 1. POLYGALA L.

1a. Wings petaloid ; flowers pink ... 2. *P. crotalarioides*

1b. Wings not petaloid ; flowers yellow ... 1. *P. arvensis*

1. ***Polygala arvensis*** Willd., Sp. Pl. 3(2) : 876. 1802. *P. chinensis* auct.; Bennett in Hook. f., Fl. Brit. India 2 : 204.1872; Haines, Bot. Bihar & Orissa 1 : 42.1921. non L.

Annual, erect or procumbent herbs ; branches 10–20 cm long. Leaves narrow, linear-lanceolate, obovate, or suborbicular, 1.5–2.5 × 0.5–1 cm. Flowers in dense racemes or solitary, axillary, yellow. Capsules 0.3–0.5 × 0.2–0.4 cm. Caruncle 3-lobed.

Common in waste lands. August–September. MERADU. Sarkar & Bhatta., 1070.

Infusion of leaves given in asthma, chronic bronchitis etc. Roots used for fevers.

2. ***Polygala crotalarioides*** Buch.–Ham. ex DC., Prodr. 1 : 372.1824 ; Bennett in Hook. f., Fl. Brit. India 1 : 202.1872 ; Haines, Bot. Bihar & Orissa 1 : 43.1921.

Herbs ; stems woody ; roots tuberous, articulated. Leaves obovate or oblanceolate, 4.5–8 × 2–3.5 cm. Flowers in dense terminal spikes. Wings obovate, ciliate, rounded. Capsule orbicular. Seeds with 3-lobed caruncle, brown, 0.2–0.3 cm long.

Common in sandstone areas. May–October. Sarkar & Bhatta., 1098.

Used for cough and pulmonary catarrh.

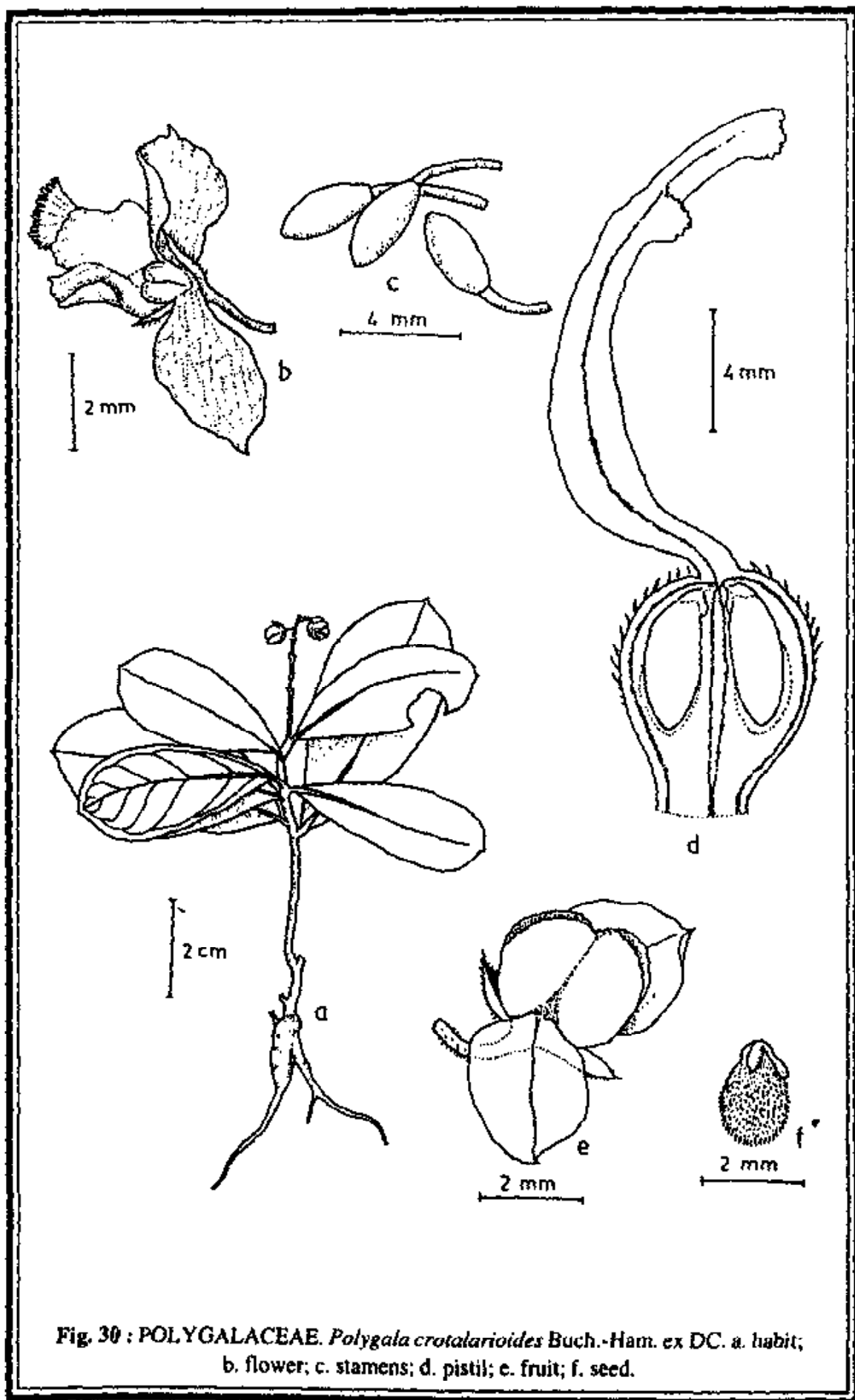


Fig. 30 : POLYGALACEAE. *Polygala crotalarioides* Buch.-Ham. ex DC. a. habit; b. flower; c. stamens; d. pistil; e. fruit; f. seed.

2. SALOMONIA Lour., *nom. cons.*

*Salomonina ciliata* (L.) DC., Prodr. 1 : 334.1824 ; Bennett in Hook. f., Fl. Brit. India 1 : 206.1872. *Polygala ciliata* L., Sp. Pl. 705.1753. *S. oblongifolia* DC., Prodr. 1 : 354.1824 ; Haines, Bot. Bihar & Orissa 1 : 44. 1921.

Stem angular, slightly winged, to 28 cm long. Leaves 1–2.5 × 0.2–0.4 cm. Flowers pink. Capsule dentate-margined. Seeds black.

Common in the sandstone areas. September–January. Sarkar & Bhatta., 1216, 1388.

LXXXIV. SAPINDACEAE

1a. Tendrilled climbers ; leaves biternate	...	2. CARDIOSPERMUM
1b. Shrubs or trees ; leaves not biternate.	...	2
2a. Erect or subscaudent shrubs.	...	3
2b. Trees.	...	4
3a. Leaves simple ; fruit winged	...	3. DODONAEA
3b. Leaves 3–foliolate ; fruit not winged	...	1. ALLOPHYLUS
4a. Leaflets oblong–lanceolate, acuminate	...	4. LITCHI
4b. Leaflets oblong–elliptic, obtuse or acute	...	5. SCHLEICHERA

1. ALLOPHYLUS L.

*Allophylus serratus* (Roxb.) Kurz in J. Asiat. Soc. Beng. 44(2) : 185.1876. ; Mukerjee in J. Econ. Tax. Bot. 1 : 79.1980. *Ornitrophe serrata* Roxb., Pl. Cor. 1 : 44. t. 61. 1795. *A. cobbe* forma *serratus* Hiern in Hook. f., Fl. Brit. India 1 : 674. 1875. *A. cobbe* var. *serrata* Prain, Bengal Pl. 1 : 241. 1903.

Leaflets elliptic, 5–7 × 3–4 cm, acuminate, serrate–denticulate. Flowers white, to 0.2 cm across. Fruits 0.3–0.5 cm across, orange-red.

Occasional in bushes near Bettiah. June–September. Sarkar & Bhatta., 853.

Bark and leaves medicinal.

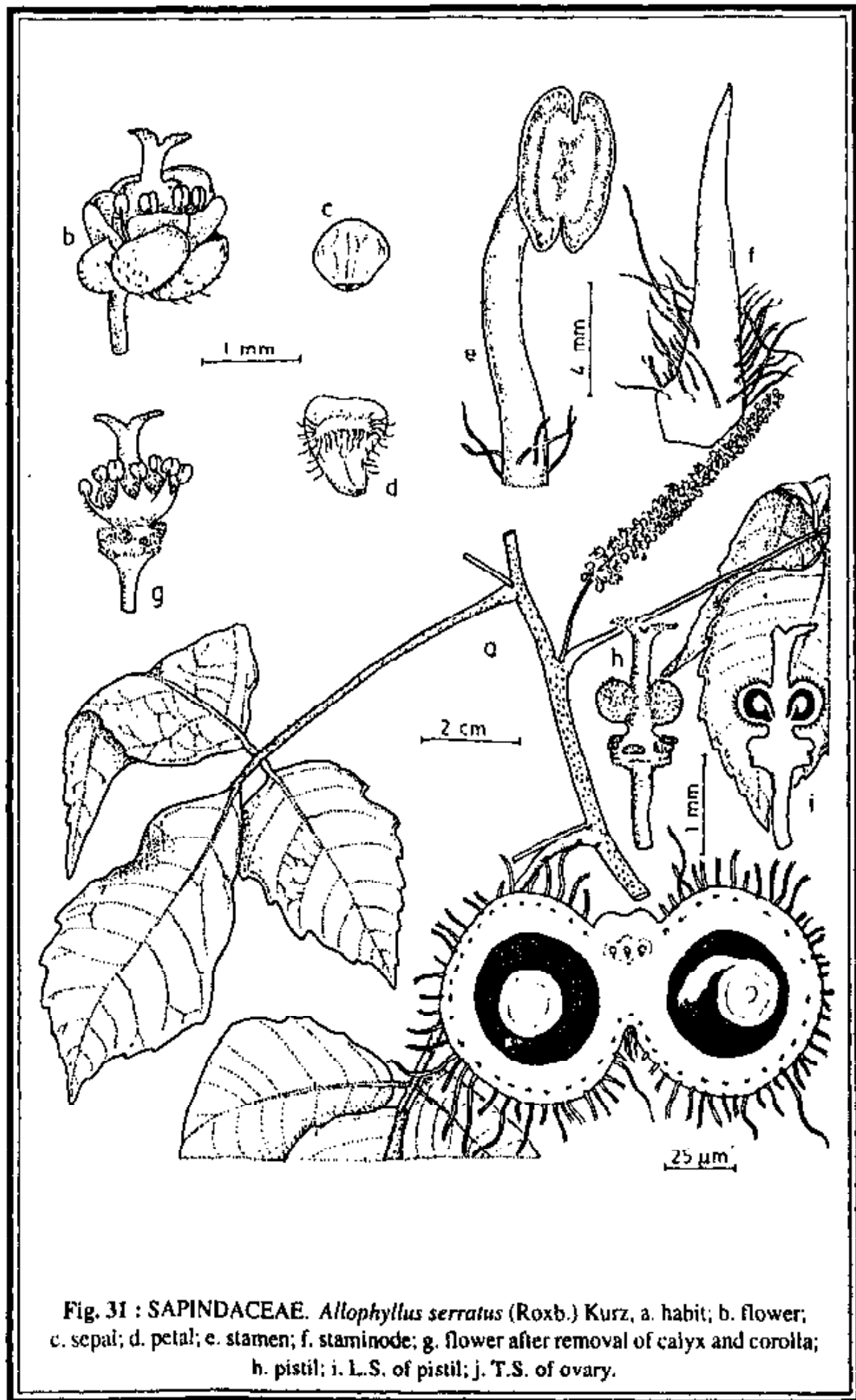


Fig. 31 : SAPINDACEAE. *Allophyllus serratus* (Roxb.) Kurz, a. habit; b. flower; c. sepal; d. petal; e. stamen; f. staminode; g. flower after removal of calyx and corolla; h. pistil; i. L.S. of pistil; j. T.S. of ovary.

## 2. CARDIOSPERMUM L.

**Cardiospermum halicacabum** L., Sp. Pl. 366.1753 ; Hiern in Hook. f., Fl. Brit. India 1 : 670. 1875 ; Haines, Bot. Bihar & Orissa 1 : 218.1921.

Perennial climbing herbs. Leaflets ovate-lanceolate, 2.5-5 × 1-3 cm, acuminate, serrate. Flowers to 0.3 cm across, white. Capsule trigonous, subglobose, to 2 cm across.

Common in hedges. Tropics. April -January. Sarkar & Bhatta., 965.

Roots diuretic, laxative ; also used for rheumatism, nervous diseases. Leaves rubefacient.

## 3. DODONAEA P. Mill.

**Dodonaea viscosa** N. Jacq., Enum Pl. Garib. 10.1760 ; Hiern in Hook. f., Fl. Brit. India 1 : 697.1875 ; Haines, Bot. Bihar & Orissa 1 : 225. 1921. *Ptelea viscosa* (N. Jacq.) L. Sp. Pl. ed. 2 : 173.1762, non L. 1753.

Shrubs or small trees. Leaves linear-lanceolate, 3.5-7 × 0.5-1.7 cm, subapiculate, entire, cuneate. Flowers greenish. Fruit to 1.5 cm long.

Grown as hedge plant, Valmikinagar. October-January. Sarkar & Bhatta., 194.

Leaves febrifuge ; also used on burns, swellings and wounds. Tannin content of bark 5.8%. Seeds edible.

## 4. LITCHI Sonner.

**Litchi chinensis** (Gaertn.) Sonner., Voy. Ind. 2 : 230. t. 129.1782 ; Mukerjee in J. Eco. Tax Bot 1:80.1980. *Nephelium litchi* Camb in Mem. Mus. Hist. Nat. 18 : 30.1829 ; Haines, Bot. Bihar & Orissa 1 : 222.1921. *Scyotalia chinensis* Gaertn. Fruct. 1 : 197, t. 142, f. 3.1788.

Small trees. Leaves imparipinnate; leaflets oblong-lanceolate, acuminate. Flowers in panicles, polygamous. Ovary 2-lobed. Fruit a tubercled cocci. Seed with fleshy aril.

Planted for its edible fruit LITCHI. Sarkar & Bhatta., 189.

5. SCHLEICHERA Willd., *nom. cons.*

**Schleichera oleosa** (Lour.) Oken, Allg. Naturgesch. 3(2) : 1341. 1841; Merrill in J. Arn. Arb. 31:284. 1950. *Pistacia oleosa* Lour., Fl. Cochinch. 615.1790 *S. trijuga* Willd. Sp. Pl. 4 : 1096.1806 ; Hiern in Hook. f. Fl. Brit. India 1 : 681. 1875 ; Haines, Bot. Bihar & Orissa 1 : 221.1921.

Leaves to 30 cm long ; leaflets 2–3 pairs, opposite, elliptic–oblong 10–20 cm long, acute or apiculate or rounded at apex. Raceme to 20 cm long. Flowers 0.2–0.3 cm across, yellowish green. Fruits oblong, 2.5–4 cm long. smooth, greyish green.

Common in mixed forest. Fl. : March ; Fruits mature October–November. New crimson–coloured leaves appear in March. KUSUM Sarkar & Bhatta., 1604.

Useful timber. Seeds yield a fatty oil called Macassar oil. It is used for hair dressing, skin troubles, massage in rheumatism, also used as a lubricant for machinery. Flowers yield a dye. Bark medicinal. The plant is an important host for kusmi lac.

## LXXXV. BURSERACEAE

PROTIUM Burm. f., *nom. cons.*

**Protium serratum** (Wall. ex Colebr.) Engl. in DC., Monogr. Phan. IV, 61. 1883. *Bursera serrata* Wall. ex. Colebr. in Trans Linn. Soc., 15 : 361.t. 4.1827; Bennett in Hook. f. Fl. Brit. India 1: 530.1875; Haines, Bot. Bihar & Orissa 1:177.1921.

Large evergreen trees with exstipulate leaves and balsaminous juice. Bark pinkish or greenish white, papery. Leaflets 9–16 pairs, serrate. Flowers white.

Haines (*l.c.*) reported this plant from Champaran. Rare. Haines 526 (CAL!).

## LXXXVI. ANACARDIACEAE

1a. Leaves simple.	...	2
1b. Leaves compound.	...	5

- |  |     |               |
|--|-----|---------------|
| 2a. Leaves lanceolate, apex shortly acuminate ;<br>fruit large, juicy  | ... | 4. MANGIFERA  |
| 2b. Leaves oblong or obovate apex rounded ;<br>fruit never juicy.  | ... | 3             |
| 3a. Carpels 3 ; style 1 ; fruits a reniform nut  | ... | 1. ANACARDIUM |
| 3b. Carpels 3 or 5-6 ; styles 3-more ;<br>fruit an ovoid or subglobose drupe.  | ... | 4             |
| 4a. Flowers unisexual ; carples 3 ; drupe ovoid,<br>2-3 cm long, on 0.5-0.6 cm long, fleshy<br>cupular hypanthium            | ... | 6. SEMECARPUS |
| 4b. Flowers bisexual ; carples 5-6 ;drupe<br>sub-globose, to 1 cm long, hypanthium<br>not well defined                       | ... | 2. BUCHANANIA |
| 5a. Rachis winged ; armed shurbs or small trees  | ... | 5. RHUS       |
| 5b. Rachis not winged ; unarmed trees.   | ... | 6             |
| 6a. Plants glabrous ; intramarginal nerve present<br>in leaflets ; carpels free above, united below.<br>Drupe to 3 cm across | ... | 7. SPONDIAS   |
| 6b. Plants stellate hairy ; intramarginal nerve absent ;<br>drupe to 0.6 cm across   | ... | 3. LANNEA     |

1. ANACARDIUM L.

**Anacardium occidentale** L. Sp. Pl. 383.1753 ; Haines Bot. Bihar & Orissa 1 : 288.1921.

Small trees ; branches spreading. Leaves obovate, to 16 cm long, coriaceous, rounded or emarginate . Flowers polygamous, pinkish-white. Pedicel fleshy, bright red, with terminal reniform nut.

Sometimes planted. Native of America. January-June. KAJU. Sarkar & Bhatta., 1718.

Seeds eaten raw or roasted.

## 2. BUCHANANIA Spreng.

**Buchanania lanzan** Spreng. in J. Bot. (Schrader). 2 : 234.1800 ; Ramamoorthy in Fl. Hassan Dist. 374.1976. *B. latifolia* Roxb., Fl. Indica 2 : 385.1824. Hook. f., Fl. Brit. India 2 : 23. 1876 ; Haines, Bot. Bihar & Orissa 1 : 229.1921.

Bark rough, greyish black. Leaves ovate-oblong, 15-22 × 8-12 cm, obtuse, pubescent beneath ; petioles fleshy. Panicles rusty-tomentose. Flowers to 0.4 cm across, white. Disc fleshy villous. Drupe black.

Common in the sal forests. February-May. PIYAL. Sarkar & Bhatta., 1061.

Seeds eaten.

3. LANNEA A. Rich., *nom. cons.*

**Lannea coromandelica** (Houtt. ) Merrill in J. Arn. Arb. 19 : 353.1939; Hara & Press in Enum. Fl. Pl. Nepal 2 : 101. 1979, *Dialium coromandelicum* Houtt. in Nat. Hist. ser. 2, 2 : 39. t. 5. f. 2.1774. *Odina wodier* Roxb., Fl. Indica. 2:293.1832; Hook. f. Fl. Brit. India 2 : 29.1876 ; Haines, Bot. Bihar & Orissa 1 : 231.1921.

Deciduous trees Leaflets usually 7, ovate, 7-13 × 4-6 cm, oblique at base, stellate hairy beneath. Flowers to 0.3 cm across, greenish-white. Drupes 1-1.3 cm long, greenish yellow.

Common in forest margins. March-June JHINGNA. Sarkar & Bhatta., 404.

Wood yields paper-pulp. Source of Jhingan Gum.

## 4. MANGIFERA L.

**Mangifera indica** L., Sp. Pl. 200.1753 ; Hook f. Fl. Brit. India 2:13. 1876 ; Haines, Bot. Bihar & Orissa 1 : 228.1921.

Evergreen trees. Leaves lanceolate, 9-20 × 3-5 cm, sub-acuminate, coriaceous. Flowers greenish white, to 0.3 cm across.

Wild in the northern sandstone areas, also planted throughout the district. Fl.: February-March ; Fr. May-July AAM. Sarkar & Bhatta., 1505, 1827.

## 5. RHUS L.

**Rhus javanica** L. Sp. Pl. 265.1753 ; Balakrishnan in Fl.Jowai 1:147.1981.  
*R. semialata* Murray in Comm. Soc. Goetting. 5 : 27, t. 3.1784 ; Hook f.,  
 Fl. Brit India 2:10.1876; Haines Bot. Bihar & Orissa 1 : 231. 1921.

Small trees. Leaflets opposite, elliptic-oblong ; rachis winged Flowers  
 small, white. Drupe orbicular-compressed, red.

Haines ( *l.c*) reported the plant from the "top of the Someswar Hills ( 2500  
 ft.)" Haines, 818. (CAL.!)

Acid fruits edible.

## 6. SEMECARPUS L.f.

**Semecarpus anacardium** L. f. Suppl. 182. 1782 ; Hook. f., Fl. Brit.  
 India 2 : 35.1876 ; Haines, Bot. Bihar & Orissa 1 : 230.1921.

Leaves obovate-oblong, 20-40 cm long. Flowers to 0.6 cm across, greenish  
 yellow. Drupe to 2.5 cm long, black.

Common in the sal forests BHELWA. Sarkar & Bhatta., 197.

Ripe hypocarp eaten. Juice from the pericarp is an ingredient of marking inks.

## 7. SPONDIAS L.

**Spondias pinnata** (L.f.) Kurz, Prelim. Rep For.& Veg. Pegu, Append.  
 A. 44, App. B., 42, 1875; Airy Shaw & Forman in Kew Bull. 21 : 8.1967.  
*Mangifera pinnata* L. f. Suppl. 156.1782. *Spoundias mangifera* Willd., Sp.Pl.  
 2 : 754.1799 ; Hook. f. Fl. Brit. India 2 : 42. 1876 ; Haines, Bot. Bihar &  
 Orissa 1 : 232.1921.

Leaflets broadly elliptic or oblong. 5-20 × 3-8 cm acuminate Flowers  
 to 0.6 cm across. Drupe fleshy, yellowish green.

Planted and selfsown January -August. AMRA. Sarkar & Bhatta., 1703.

Acid fruits are used in the preparation of 'chutney'.

## LXXXVII. SIMAROUBACEAE

AILANTHUS Desf., *nom. cons.*

**Allanthus excelsa** Roxb. Pl. Cor. 1.24.t. 23.1795 ; Bennet in Hook.  
 f., Fl. Brit. India 1 : 518.1875 ; Haines Bot. Bihar & Orissa 1 : 174.1921.

Deciduous trees ; stems with prominent leaf-scars. Leaves to 0.4-1 cm long ; leaflets ovate-lanceolate, 8-16 × 4-6 cm, toothed. Flowers unisexual., to 0.3 cm across, greenish. Samaras 4-6 cm long, brown

Planted as well as self-sown. India. January-March. Sarkar & Bhatta., 1879.

Wood used in plywood and match stick industries. Bark anthelmintic, febrifuge, expectorant and anti-spasmodic. Leaves and shoots used as fodder.

### LXXXVIII. MELIACEAE

1a. Filaments connate into a tube	...	2
1b. Filaments free	...	6. TOONA
2a. Seeds winged.	...	3
2b. Seeds not winged.	...	4
3a. Seeds winged at only at upper end	...	5. SWIETENIA
3b. Seeds winged at both ends	...	4. SOYMIDA
4a. Fruit capsular.	...	5
4b. Fruit a drupe.	...	6
5a. Seeds with scarlet aril	...	1. APHANAMIXIS
5b. Seeds with white aril	...	7. TRICHILIA
6a. Leaves 2-3-pinnate	...	3. MELIA
6b. Leaves 1-pinnate	...	2. AZADIRACHTA

#### 1. APHANAMIXIS Bl.

**Aphanamixis polystachya** ( Wall. ) Parker in Ind. Forest. 57 : 486.1931; Bennet, Fl. Howrah 199.1979. *Aglaia polystachya* Wall. in Roxb. , Fl. Indica 2 : 429.1824 *Amoora rohituka* (Roxb.) Wt. & Arn ; Prodr. 119.1834 ; Hiern in Hook. f., Fl. Brit. India 1 : 559.1875 ; Haines, Bot. Bihar & Orissa 1 : 185.1921.

Small trees. Leaflets elliptic or oblong-lanceolate, 8-15 cm long. Inflorescence drooping. Capsule to 3 cm across, globose.

Near Kotraha. March–August. HARINHARA. Sarkar & Bhatta., 1601.

Bark used in diseases of liver and spleen.

## 2. AZADIRACHTA A. Juss.

*Azadirachta indica* A. Juss. in Mem Mus. Hist. Nat. Paris 19 : 221. t. 2. f. 5. 1830 ; Haines, Bot. Bihar & Orissa 1 : 182. *Melia azadirachta* L., Sp. Pl. 385. 1753 ; Hiern in Hook. f., Fl Brit. India 1 : 544. 1875.

Medium trees. Leaflets obliquely-lanceolate, 4–6 cm long. Flowers white, to 1 cm across, fragrant. Drupe 1–1.3 × 0.7 cm, yellowish-green.

Common. March–August NIM. Sarkar & Bhatta., 1725.

Bark used in skin troubles. Bitter leaves medicinal. Oil extracted from seeds used in soaps, toothpaste etc.

## 3. MELIA L.

*Melia azedarach* L. Sp. Pl. 384. 1753 ; Hiern in Hook. f., Fl. Brit. India 1 : 544. 1875 ; Haines, Bot. Bihar & Orissa 1 : 183. 1921.

Medium trees, with black bark. Leaflets lanceolate, 1.5–3.5 cm long, acunimate serrate. Flowers to 0.7 cm across, lilac. Drupe ellipsoid, to 1.3 cm long.

Planted. Baluchistan & Persia. March–December. BAKAIN. Sarkar & Bhatta., 1721.

Wood durable. Leaves, bark & fruits medicinal.

## 4. SOYMIDA A. Juss.

*Soyimida febrifuga* (Roxb.) A. Juss. in Mem. Mus. Hist. Nat. Paris 19 : 251. t. 22. f. 26. 1832. *Swietenia febrifuga* Roxb., Bot. Descr. *Swietenia* : 1. 1793, et. in Med. Facts Obs. 6:129. 1795 & in Pl. Cor 1:18. t. 17. 1795.

Leaflets obliquely-elliptic, to 10 cm long. Flowers to 0.8 cm across, white. Capsule to 8 cm long.

Planted. Chotanagpur, Sri Lanka. April–August. ROHUN. Sarkar & Bhatta., 1878.

Wood used for furniture.

## 5. SWIETENIA Jacq.

1a. Leaflets up to 4 cm long ... 2. *S. mahagoni*

1b. Leaflets larger ... 1. *S. macrophylla*

1. **Swietenia macrophylla** King in Hook. Icon pl. 16 : t 1550.1886 ; Prain, Bengal Pl. 1 :223 1903.

Large trees. Capsule up to 10 cm long, woody. Planted. Native of Honduras. Fl.: March. BARA MAHAGANI Sarkar & Bhatta., 1772.

Wood highly prized for decorative furniture.

2. **Swietenia mahagoni** Jacq Enum, Pl. Carib. 20. 1760 ; L., Sp. Pl. ed. 2. 271.1762 ; Hiern in Hook. f., Fl. Brit. India 1 : 540.1875.

Large trees. Capsule to 18 cm long, woody.

Planted. Native of West Indies & Honduras. MAHAGANI. Sarkar & Bhatta., 398,1785.

Uses as the previous.

## 6. TOONA (Endl. ) Roem.

**Toona ciliata** Roem Syn. Hesper. 139.1846; Sant in Bull. Bot. Surv. India 3:13.1962, *Cedrela toona* Roxb. ex ; Rottl & Willd. Ges. Naturf. Fr. Neue Schr. 4:198.1803 ; Hiern in Hook. f., Fl. Brit. India 1 : 568.1875 ; Haines, Bot. Bihar & Orissa 1: 179.1921.

Leaflets 5–12 pairs, ovate-oblong, 6–15 cm long, entire or undulate. Flowers to 0.5 cm long, white. Capsule ellipsoid.

Along canal-banks . India–Australia. March–July. TUN. Sarkar & Bhatta., 348.

Wood used for furniture.

## 7. TRICHILIA P. Br.

**Trichilia connaroides** (Wt. & Arn. ) Bentvelzen in Acta Bot. Neerl. 11:13 .1962 ; Saldanha, Fl. Hassan 396. 1976. *Zanthoxylum connaroides* Wt. & Arn, Prodr. 148.1834. *Heynea trijuga* Roxb. ex Sims in Curtis Bot. Mag. 41 : t, 1738. 1815 ; Hiern in Hook f., Fl. Brit. India 1 : 565.1975 ; Haines, Bot. Bihar & Orissa 1:185.1921; non *Trichilia trijuga* Vell., 1825.

Leaflets ovate-oblong or lanceolate, entire acuminate. Flowers white.

Haines (*l.c.*) reported this plant from Someswar hills. Indomalasia. Haines 312 (CAL!). The red capsules are conspicuous.

Note : Bentvelzen (*l.c.*) has sunk *Heynea* Roxb. ex Sims (815) under *Trichilia* P.Br. (1756).

### LXXXIX. RUTACEAE

1a. Armed trees or shrubs.	...	2
1b. Unarmed trees or shrubs.	...	4
2a. Leaves imparipinnate	...	4. LIMONIA
2b. Leaves palmate.	...	3
3a. Leaves 1-foliolate	...	2. CITRUS
3b. Leaves 3-foliolate	...	1. AEGLE
4a. Petals valvate	...	6. MICROMELUM
4b. Petals imbricate.	...	5
5a. Leaves pinnate or 1-foliolate ; ovules solitary per locule	...	5. GLYCOSMIS
5b. Leaves pinnate ; ovules usually 2.	...	6
6a. Stamens all equal	...	3. CLAUSENA
6b. Alternating stamens large	...	7. MURRAYA

#### 1. AEGLE Corrêa, *nom. cons.*

*Aegle marmelos* (L.) Correa, Trans Linn. Soc. London 5 : 223.1800 ; Hook. f. , Fl. Brit. India 1 : 516.1875 ; Haines, Bot. Bihar & Orissa 1 : 173.1921. *Crateva marmelos* L. Sp. Pl. 444.1753.

Leaflets petiolate, ovate-lanceolate, 5-10 × 2.5-4.5 cm Flowers whitish, to 2 cm across Fruit globose or oblong, to 7 cm across ; pulp yellow, aromatic, sweet in taste.

Frequent and wild in the sandstone hills. Haines (*l.c.*) stated the plant as "apparently wild in the Champaran hills" May-August. BEL. Sarkar & Bhatta., 1002, 1707.

Fruits laxative, diuretic ; active principle 'marmelosin'.

## 2. CITRUS L.

- 1a. Young shoots and leaves glabrous and purple ;  
petals tinged with red ; flowers often unisexual ;  
fruits small or medium ; transverse vesicles of  
pulp concrete ... 1. *C. medica*
- 1b. Young shoots and leaves pubescent and green ;  
petals white ; flowers often bisexual ; white ;  
fruits large, transverse vesicles of pulp distinct ... 2. *C. maxima*

1. *Citrus medica* L., Sp. Pl. 782. 1753 ; Hook. f., Fl. Brit. India 1 : 514.1875 ; Haines, Bot. Bihar & Orissa 1 : 172.1921.

A shrub or small tree, flowering and fruiting almost the whole year. Leaves 1-folioate; petioles naked or winged ; leaflets 7-15 cm long, elliptic-ovate or ovate-lanceolate, usually obtuse, crenate-serrate, base acute. Flowers 5-10 in a raceme. Stamens 20-40. Fruit globose or oblong often mammillate at the apex ; rind thick or thin.

Cultivated throughout the district. It is frequently wild in the moisture valleys of the Sub-Himalayas. Bhatta. & Sarkar 1163.

The cultivated varieties include the Citron, Lemon and Limes. The wild plant has a large ellipsoid very thick-skinned fruit.

2. *Citrus maxima* (Burm.) Merr., Interpr. Herb. Amboin. 46.1917. *Aurantium maximum* Burm. in Rumph. Herb. Amboin. 16.1755. *C. decumana* L., Syst. Veg. ed. 12 : 508 .1767 ; Hook. f. Fl. Brit. India 1 : 516. 1875 ; Haines, Bot. Bihar & Orissa 1:172-173. 1921.

A tree 9-12 m high ; young shoots pubescent. Leaflets large, 15-22 cm long, ovate-oblong, frequently emarginate, pubescent beneath; petioles broadly winged. Flowers large, white. Stamens 16-24. Fruit large, globose or pyriform ; rind thick ; pulp varying in colour from crimson to pale pink or yellow.

Cultivated very largely. A native of the Malayan and Polynesian Islands. March-February. Bhatta., & Sarkar 1162.

Note : The species name published by J. Burman (1755) is accepted as validly published under the Tokyo Code (App. V, p. 335.1994).—Bhatta.

3. *CLAUSENA* Burm. f.

***Clausena kanpurensis*** Molina, Bull. Mus. (Paris) 16 : 117.8-9. 1994. *C. pentaphylla sensu* Hook. f., Fl. Brit. India 1 : 503.1875 ; Haines Bot. Bihar & Orissa 1 : 171.1921. non DC. 1824. *Amyris pentaphylla* Roxb. Fl. Indica 2:247.1832.

Leaflets 3-7, ovate-lanceolate, to 8 cm long acuminate, entire. Flowers to 1.2 cm across, yellowish-white. Berry ovoid, papillose, 0.8 cm across, pale orange.

Common in the northern area. May-July. Sarkar & Bhatta., 1205, 1561.

Crushed herbage has a strong smell. Medicinal.

4. *LIMONIA* L.

***Limonia acidissima*** L., Sp. Pl. ed. 2 : 554.1762 ; Brummit Taxon 31 : 504. 1982. *Feronia limonia* (L.)Swingle in J. Washington Acad. Sci. 4 : 328.1914 ; Verma et al. in Fl. Raipur, Durg & Rajnandgaon 66.1985. *Schinus limonia* L. Sp. Pl. 389.1753. *Feronia elephantum* Corrêa in Trans. Linn. Soc. 5 : 224. 1800; Hook. f., Fl. Brit.India 1 : 516.1875 ; Haines, Bot. Bihar & Orissa 1 : 173.1921.

Leaflets 5-7, elliptic-obovate, 1-3 cm long, crenate ; rachis narrowly winged. Flowers to 0.9 cm across, pale-reddish. Berry rough, greyish, to 7 cm across; pulp sour, pale chocolate.

Planted Fl. : February-April ; Fr.: October-November. KATBEL. Sarkar & Bhatta., 396.

Pulp edible. Wood used for house building.

5. *GLYCOSMIS* Corrêa, *nom. cons.*

***Glycosmis arborea*** (Roxb.) DC., Prodr. 1 : 538.1824 ; Brizicky in J. Arn. Arb. 43 : 90.1962. *Limonia arborea* Roxb., Pl. Cor. t. 85.1798. *G. pentaphylla* auct. Plur. non (Roxb.) DC. 1824 ; Hook. f., Fl. Brit India 1 : 500.1875 ; Haines, Bot. Bihar & Orissa 1 : 169. *Limonia pentaphylla* Retz. Obs. Bot. 5 : 24.1788.

Shrubs. Leaflets 3-5, oblong-lanceolate, 16 × 5 cm, obtuse, subentire. Flowers to 0.3 cm across. Berry globose, compressed, to 0.8 cm across, pale yellow.

Common in moist places near villages. Fl. & Fr. throughout the year. Sarkar & Bhatta., 811, 1541.

Note : Roxburgh misapplied the name, *Limonia pentaphylla*, in his Pl. Cor. t. 84.1798. Moreover Corrêa did not make any combination, though Hook.f. (*l. c.*) assumed it. Hence the confusion.

#### 6. MICROMELUM Blume, *nom. cons.*

**Micromelum integerrimum** (Roxb. ex DC.) Voigt, Hort. Sub. Cal. 140.1845; Roem., Syn. Mon. Hesper. 1:47. 1846, *Bergera integerrima* Roxb. ex DC., Prodr. 1 : 537.1824. auct. non Bl. 1825; Hook. f. Fl. Brit. India 1 : 501. 1875, p.p. excl. vars. 1 & 3 ; Haines, Bot. Bihar & Orissa 1 : 170. 1921.

Leaflets obliquely ovate-lanceolate, 6.5-17 × 3.5-7 cm. acuminate, margins undulate. Flowers white, fragrant, 0.8-1.2 cm across. Calyx small, lobes triangular. Petals narrow-oblong. Stamens alternately long and short. Berry oblong, orange yellow, when ripe.

Occasional, Bikhna Thori. December-February. Sarkar & Bhatta., 1672, 1684.

Note : Under Art. 33.1, Ex. 2. Wight & Arnott (1834) did not definitely associate the epithet *integerrima* with the generic name *Micromelum* Bl. Under Art. 33.3, Voigt (1845) may be regarded as the author of this new combination.—Bhatta.

#### 7. MURRAYA Koenig ex L., *nom. cons.*

1a. Crushed herbage has a strong smell ;  
leaflets pubescent ... 2. *M. koenigii*

1b. Crushed herbage has no such strong smell ;  
leaflets glabrous ... 1. *M. paniculata*

1. **Murraya paniculata** ( L. ) Jack, Mal. Misc. 1 : no. 5.31.1820 ; Tanaka in J. Ind. Bot. Soc. 16 : 231. 1937. *Chalcas paniculata* L. Mant. 68.1767. *Murraya exotica* L. Mant. Alt. 563.1771 ; Hook. f., Fl. Brit. India 1 : 502.1875 ; Haines, Bot. Bihar & Orissa 1 : 170. 1921.

Small evergreen trees. Leaves 10-17 cm long, leaflets elliptic-ovate, to 3-6 × 1-1.5 cm, unequal at base. Flowers to 1.5 cm across. Berry elliptic, epiculate, 1-1.5 cm long, bright red.

Frequent in the sandstone hills. May-August. Sarkar & Bhatta., 609.

Often planted for its fragrant flowers. Leaves medicinal.

2. *Murraya koenigii* ( L. ) Spreng. Syst. Veg. 2 : 315.1825 ; Hook. f., Fl. Brit. India 1 : 503.1875 ; Haines, Bot. Bihar & Orissa 1 : 170. 1921. *Bergera koenigii* L. Mant. 563. 1771.

Small deciduous trees. Leaves 15–30 cm long ; leaflets obliquely lanceolate, 2–5 × 1 cm. Flowers to 1 cm across. Berry ellipsoid, about 1.2 cm long, blackish.

Frequent throughout the northern part in dry deciduous forest. Fl. February; Fr. : May–June. Sarkar & Bhatta., 210, 1602.

Leaves used in curries.

### Xc. ZYGOPHYLLACEAE

#### TRIBULUS L.

*Tribulus terrestris* L., Sp. Pl. 387.1753 ; Hook. f., Fl. Brit. India 1 : 423.1874 ; Haines, Bot. Bihar & Orissa 1 : 159.1921.

Diffuse herbs, densely white hairy ; branches 10–35 cm long. Leaflets 5–7 pairs, oblong, 1–2 cm × 0.5–0.7 cm. Flowers pale yellow to 1 cm across. Cocci with 2 long and 2 short spines.

In waste lands. June–July. GOKHRUKALAN. Sarkar & Bhatta., 1223.

Young plants used as a pot-herb. Fruits diuretic and tonic, used in genito-urinary disorders.

### Xci. OXALIDACEAE

- |                         |     |              |
|-------------------------|-----|--------------|
| 1a. Leaves pinnate      | ... | 1. BIOPHYTUM |
| 1b. Leaves trifoliolate | ... | 2. OXALIS    |

#### 1. BIOPHYTUM DC.

*Biophytum sensitivum* ( L. ) DC. Prodr. 1 : 690.1824 ; Edgew. & Hook. f., in Hook. f., Fl. Brit. India 1 : 436.1874 ; Haines, Bot. Bihar & Orissa 1 : 161.1921. *Oxalis sensitiva* L. Sp. Pl. 434.1753.

Slender herbs ; stems reduced, to 5–10 cm long. Leaves to 8 cm long ; leaflets oblong, 0.6–1 cm long, lower shorter, apiculate. Flowers to 0.3 cm across, orange-yellow. Capsule loculicidal. Seeds ovoid, striate.

In waste lands. June–September. Sarkar & Bhatta. 1135, 1886.

Decoction of leaves given for diabetes and asthma. Leaves contain an insulin-like principle.

## 2. OXALIS L.

*Oxalis corniculata* L., Sp. Pl. 435. 1753 ; Edgew. & Hook. f., in Hook. f., Fl. Brit. India 1 : 436.1874 ; Haines, Bot. Bihar & Orissa 1 : 162. 1921.

Creeping herbs, to 20 cm long. Leaflets obovate, bilobed, 0.5–1.5 cm long. Flowers to 0.7 cm across. Petals yellow, oblong-oblancheolate. Capsule sub-cylindric, pubescent, 0.8–2 × 0.2–0.3 cm. Seeds many.

Common in moist wastelands. October–May. AMBOTI. Sarkar & Bhatta., 1515.

Leaves a good source of vitamin C and carotene. Leaves also eaten as salad or cooked as vegetable.

## XCII. BALSAMINACEAE

## IMPATIENS L.

*Impatiens balsamina* L., Sp. Pl. 938.1753 ; Haines, Bot. Bihar & Orissa 1 : 163.1921.

Annual herbs. Leaves alternate, linear-lanceolate. Flowers solitary or in axillary cymes, irregular, resupinate, showy. Sepals 3 or rarely 5, posterior one spurred. Petals 5 or 3. Stamens 5 ; anthers connate. Carpels 5 ; ovary 5-locular; ovules many. Capsule loculicidal.

Cultivated in the rainy season as a garden ornament also in waste grounds. Sarkar & Bhatta., 1302.

XCIII. APIACEAE (UMBELLIFERAE *nom. alt.*)

1a. Flowers in simple umbels.	...	2
1b. Flowers in compound umbels.	...	3
2a. Leaves simple ; mericarps 7–9-ribbed	...	1. CENTELLA
2b. Leaves 3–5-lobed or partite ; mericarps 4-ribbed	...	2. HYDROCOTYLE
3a. Fruit elliptic, winged	...	3. PEUCEDANUM
3b. Fruit globose, not winged.	...	4
4a. Stoloniferous, subaquatic or aquatic herbs	...	3. OENANTHE
4b. Herbs not stoloniferous.	...	5

- 5a. Herbs, 0.9–1.2 m high ... 6. TRACHYSPERMUM  
 5b. Herbs, to 35 cm high ... 5. SESELI

### 1. CENTELLA L.

**Centella asiatica** ( L. ) Urb. in Mart. & Eichl. Fl. Brasil 11. 1 : 287.t. 78.f.1.1879 ; Buwalda in Fl. Mal. 4(2) : 117.1949. *Hydrocotyle asiatica* L. Sp. Pl. 1 : 234.1753 ; Cl. in Hook. f. Fl. Brit. India 2 : 669. 1879 ; Haines, Bot. Bihar & Orissa 2 : 423.1922.

Leaves reniform, 1–5 cm broad, crenate–dentate. Peduncles to 4 cm long. Flowers to 0.15 cm across, reddish. Mericarps to 0.2 cm long.

Along moist grounds. September–March. Sarkar & Bhatta., 566.

Leaves medicinal.

### 2. HYDROCOTYLE L.

**Hydrocotyle sibthorpioides** Lamk. Encycl. 3 : 153.1789 ; Nasir, Fl. W. Pakistan 20 : 13.1972. *H. rotundifolia* Roxb. Fl. Indica 2 : 38.1824 ; Cl. in Hook. f. Fl. Brit. India 2 : 668.1879 ; Haines, Bot. Bihar & Orissa 2 : 423. 1922.

Leaves rounded or 3 to 5–palmately lobed or partite, to 2.5 cm broad. Flowers 10–15 in umbel. Fruits 0.1 – 0.12 cm long.

Along moist forest floors. Indomalesia, Torpical Africa. December–March. Sarkar & Bhatta., 735.

### 3. OENANTHE L.

**Oenanthe javanica** ( Bl. ) DC., Prodr. 4 : 138.1830 ; Buwalda in Fl. Mal. 4(2) : 136.1949. *Sium javanicum* Bl., Bijdr. 15 : 881.1826. *Oenanthe stolonifera* DC. , Prodr. 4 : 138.1830 ; Cl. in Hook.f. , Fl. Brit. India 2 : 696. 1879 ; Haines, Bot. Bihar & Orissa 2 : 429. *O. benghalensis* ( DC. ) Benth. & Hook.f., Gen. Pl. 1 : 906.1867 ; Cl. in Hook.f., l. c. ; Haines, l. c. ; *O. linearis* DC., Prodr. l. c. ; Cl. in Hook. f., l. c.

Herbs to 70 cm high. Secondary pinnae lanceolate or rhomboid lanceolate, serrate or lobbed. Flowers white.

Marshy places, along nalas etc. Indomalesia, China, Japan. March–June. Sarkar & Bhatta., 440.

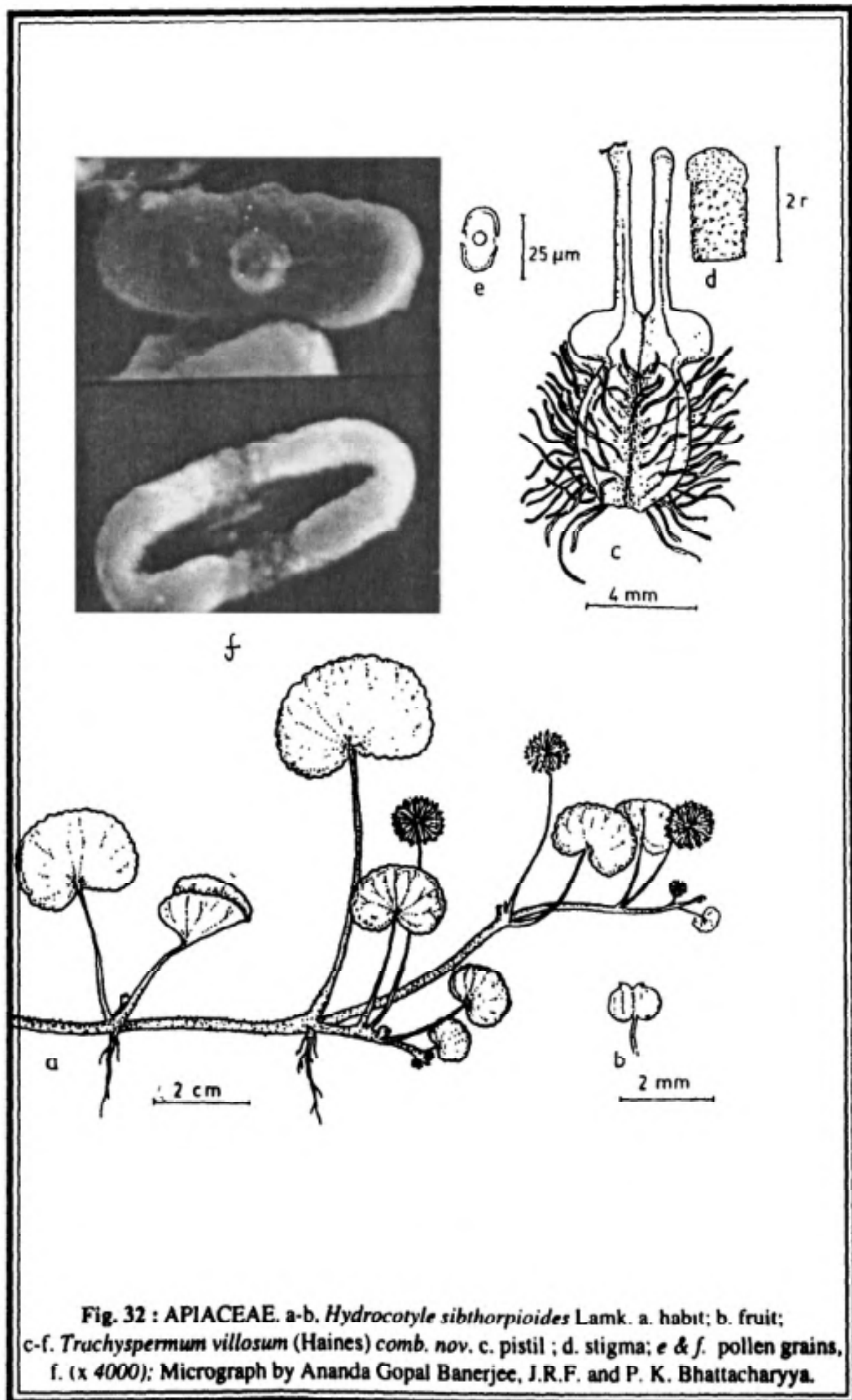


Fig. 32 : APIACEAE. a-b. *Hydrocotyle sibthorpioides* Lamk. a. habit; b. fruit; c-f. *Trachyspermum villosum* (Haines) comb. nov. c. pistil; d. stigma; e & f. pollen grains, f. (x 4000); Micrograph by Ananda Gopal Banerjee, J.R.F. and P. K. Bhattacharyya.

## 4. PEUCEDANUM L.

*Peucedanum nagpurensis* ( Cl. ) Prain, Bengal Pl. 540.1903 ; repr. ed. 1 : 394. 1963. Haines, Bot. Bihar & Orissa 2 : 431.1922. *P. glaucum* var. *nagpurensis* Cl. in Hook. f., Fl. Brit. India 2 : 710.1879.

Tall herbs, to 2 m high ; stem striate. Lower leaves ovate acuminate, serrate. Flowers greenish-white. Fruit to 0.6 cm long.

Sandstone areas. October-December. Sarkar & Bhatta., 1219.

## 5. SESELI L.

1a. Erect annual herbs ; schizocarp glabrous ... 1. *S. daucifolium*

1b. Annual herbs with spreading branches ; schizocarp hairy. ... 2. *S. diffusum*

1. *Seseli daucifolium* Cl. in Hook. f., Fl. Brit. India 2 : 693.1879.

Herbs, to 35 cm high. Leaves 2-3-pinnate, ultimate segments linear-lanceolate. Petals white. Fruit subglobose, subglabrous.

Moist forest margins. March-May. Sarkar & Bhatta., 475.

2. *Seseli diffusum* ( Roxb. ex Sm. ) Sant. & Wagh in Bull. Bot. Surv. India 5 : 108. 1963 ; Verma & Chandra in Fl. Raipur, Durg & Rajnandgaon 165.1985. *Ligusticum diffusum* Roxb. ex Sm. in Rees, Cyclop. 21, no. 11. 1812, non Roxb. Fl. Indica 1824. *Seseli indicum* Wt. & Arn, Prodr. 371. 1834 ; Cl. in Hook. f. , Fl. Brit. India 2 : 693.1879 ; Haines, Bot. Bihar & Orissa 2 : 428. 1922.

Annual herbs ; branches to 10 cm long. Leaves decompose, lobes obtuse, apiculate. Flowers white. Fruit subglobose, ridges thick.

Waste lands, also as weed of cultivated fields. March-May. Sarkar & Bhatta., 494.

6. TRACHYSPERMUM Link, *nom. cons.*

*Trachyspermum villosum* (Haines) *comb. nov.* ; *Carum villosum* Haines, J. As. Soc. Beng. 15(7) ; Pl. 9 : 1919, *nom. nud.* ; & Bot. Bihar & Orissa 2 : 408 (426). 1922 (1961) ; Mukherjee P. K. & Constance L., (Umbelliferae 'Apiaceae') of India. Oxford & IBH Pub. Co. 119, 1993.

Herbs. Leaves to 30 cm long. Umbels to 5 cm across ; bracts linear :

bracteoles filiform, to 0.2 cm long. Petals white.

Rare, along sandstone hills. Endemic. Fl. & Fr. : December-March. Sarkar & Bhatta., 1410, 1812, (BURD) ; Haines 4744 (K).

A shade loving plant.

#### XCV. ARALIACEAE

- |                                |     |                |
|--------------------------------|-----|----------------|
| 1a. Leaves palmate or digitate | ... | 2. TREVESIA    |
| 1b. Leaves tripinnate          | ... | 1. HETEROPANAX |

##### 1. HETEROPANAX Seem.

**Heteropanax fragrans** (Roxb.) Seem. Fl. Vit. 114.1866 ; Hook. f. Fl. Brit. India 2 : 734.1879 ; Haines, Bot. Bihar & Orissa 2 : 436. 1922. *Panax fragrans* Roxb., Fl. Indica 2 : 76.1824.

Small trees. Leaves 1-2 cm long ; leaflets shortly petiolate or sessile ovate or elliptic, 16-21 × 7-8.2 cm, shortly acuminate, entire, glabrous. Flowers in terminal paniculate umbels, yellow, fragrant. Fruit laterally compressed.

Gobardhana, rare. Fl. : January-February. Sarkar & Bhatta., 1557.

##### 2. TREVESIA Vis.

**Travesia palmata** ( Roxb. ) Vis. in Mem. Acad. Torino, ser. 2, 4 : 262.1842 ; Hook. f. Fl. Brit. India 2 : 732.1879 ; Haines, Bot. Bihar & Orissa 2 : 435.1922. *Gastonia palmata* Roxb., Fl. Indica 2 : 407.1824.

Prickly, shrubs or trees, to 3-5 m long. Leaves many-lobed, 30-60 cm across. Inflorescence to 45 cm long. Petals thick, triangular. Stamens as many as petals. Fruit to 1.5 cm long, crowned by a stout style.

Haines (*l. c.*) reported the plant from Champaran. C. Nepal to S. W. China, Burma, S. E. Asia. March-June. Haines 432 (CAL!).

#### XCV. LOGANIACEAE

- |   |     |              |
|---|-----|--------------|
| 1a. Annual herbs ; cymes unilateral               | ... | 1. MITREOLA  |
| 1b. Shrubs or medium trees ; cymes not unilateral | ... | 2. STRYCHNOS |

1. MITREOLA L.

*Mitreola petiolata* ( Gmel. ) Torr. & A. Gray, Fl. N. Am. 2 : 45. 1841 ; Merrill in Philip. J. Sci. ( Bot. ) 11 : 307.1917. *Cynoctonum petiolatum* Gmel., Syst. Nat. ed. 13.2 : 443.1791. *C. mitreola* (L.) Britton in Mem. Torr. Bot. Club 5 : 258.1884. *Mitreola oldenlandioides* G. Don, Gard. Dict. 4 : 172.1837, *nom. illeg.* ; Cl. in Hook. f., Fl. Brit. India 4 : 79.1883 ; Haines, Bot. Bihar & Orissa 2 : 592.1922.

Herbs to 5 cm high. Leaves ovate-oblong. Subsessile flowers in terminal, branched cymes. Corolla white. Stigmas 2, horn-like. Capsule to 0.3 cm across. Seeds ellipsoid.

Occasionally on forest undergrowth. Indomalesia, China, N. Australia. September-October. Shetty 122 (CAL!).

2. STRYCHNOS L.

*Strychnos nux-vomica* L. Sp. Pl. 189. 1753 ; Cl. in Hook. f. Fl. Brit. India 4 : 90.1883 ; Haines, Bot. Bihar & Orissa 2 : 592.1922.

Leaves broadly ovate or elliptic, 6-10 x 6-7 cm, palmi-nerved, obtuse or acute, entire. Flowers greenish white. Sepals ovate, tomentose. Corolla lobes narrowly oblong. Berry bright orange. Seeds flat, orbicular.

Common along forest edges and road sides. Fl. : March-April ; Fr. : August-November. KUCHLA. Sarkar & Bhatta., 765, 1811.

"Nux-vomica" is obtained from dry ripe seeds. Bark and leaves also medicinal. Wood is not attacked by termites and used for agricultural implements.

XCVI. GENTIANACEAE

- |   |     |            |
|---|-----|------------|
| 1a. Plants 50 cm or more long ; ovary 2-locular                                 | ... | 3. EXACUM  |
| 1b. Plants smaller ; ovary 1-locular.   | ... | 2          |
| 2a. Leaves to 0.5 cm long ; flowers subsessile, irregular ; style almost absent | ... | 5. HOPPEA  |
| 2b. Plants not as above.  | ... | 3          |
| 3a. Corolla lobes glandular inside at the base                                  | ... | 6. SWERTIA |
| 3b. Corolla lobes eglandular.   | ... | 4          |

- |  |     |               |
|--|-----|---------------|
| 4a. Corolla irregular                    | ... | 1. CANSCORA   |
| 4b. Corolla regular.                     | ... | 5             |
| 5a. Style linear ; flowers—white or pink | ... | 2. CENTAURIUM |
| 5b. Style short or none ; flowers blue   | ... | 4. GENTIANA   |

#### 1. CANSCORA Lamk.

- |                      |     |                        |
|----------------------|-----|------------------------|
| 1a. Stems winged     | ... | 1. <i>C. decussata</i> |
| 1b. Stems not winged | ... | 2. <i>C. diffusa</i>   |

1. *Canscora decussata* ( Roxb. ) J. A. & J. H. Schult. Mant. 3 : 229.1827 ; Cl. in Hook. f., Fl. Brit. India 4 : 104.1883 ; Prain, Bengal Pl. 2 : 526.1903. ; Haines, Bot. Bihar & Orissa 2 : 597.1922. *Pladara decussata* Roxb. , Fl. Indica 1 : 418.1820.

Erect herbs, 15–30 cm high. Leaves ovate–lanceolate, 2–3 cm long. Flowers in cymes ; pedicel 4–winged, to 2 cm long. Corolla white. Capsule oblong, to 0.6 cm long.

Common. Sri Lanka, Tropical Africa. July–October. Sarkar & Bhatta., 1079, 1540.

2. *Canscora diffusa* ( Vahl ) R. Br. ex Roem. & Schult. Syst. Veg. 3 : 301.1820 ; Cl. in Hook. f., Fl. Brit. India 4 : 103.1883 ; Prain, Bengal Pl. 525.1903. ; Haines, Bot. Bihar & Orissa 2 : 597. 1922. *Gentiana diffusa* Vahl, Symb. Bot. 3 : 47.1794.

Dichotomously branched herbs. Leaves ovate–elliptic, 1.5–4 × 0.5–1.2 cm. Flowers in paniculate cymes ; pedicels 1.5–2 cm long. Corolla pinkish–white. One stamen longer than the others. Capsule to 1 cm long.

Abundant in wet places. Fl. & Fr. : Throughout the year. Sarkar & Bhatta., 1218, 1687.

#### 2. CENTAURIUM Hill

*Centaurium centaurioides* ( Roxb. ) Rolla Rao & Hemadri in J. Bombay Nat. Hist. Soc. 67. 357.1970 ; *Chironia centaurioides* Roxb. Fl. Indica 1 : 585.1832. *Erythraea roxburghii* G. Don. , Syst. Gard. 4 : 206.1837–38 ; Cl. in Hook. f. Fl. Brit. India 4 : 102.1883 ; Prain, Bengal Pl. 2 : 525.1903 ; Haines, Bot. Bihar & Orissa 2 : 596.1922.

Small herbs, to 7.5 cm long. Leaves oblong-lanceolate to linear-lanceolate, 1.22 × 0.2–0.4 cm, obtuse or acute. Flowers to 0.7 cm across. Capsule to 0.8 cm long.

On exposed grounds. June–August. Sarkar & Bhatta., 318.

### 3. EXACUM L.

**Exacum tetragonum** Roxb. Fl. Indica. 1 : 413.1820 ; Cl. in Hook. f., Fl. Brit. India 4 : 95. 1883 ; Prain, Bengal Pl. 2 : 524. 1903 ; Haines, Bot. Bihar & Orissa. 2 : 594. 1921 (1961).

Herbs to 80 cm long ; stems tetragonous, to 0.8 cm across, hollow. Leaves elliptic or ovate-elliptic, 5.5–15.2 × 1.9–2.9 cm. Flowers to 2.4 cm across, blue. Capsule 1.1 × 0.8 cm.

On grassy banks of rivers, Gobardhana. September–October. Sarkar & Bhatta., 1553.

### 4. GENTIANA L.

**Gentiana aprica** Decne. in Jacq. Voy. 4 (Bot) : 112.t.118.1844 ; *G. decemfida* var. *aprica* (Decne.) Cl. in Hook. f., Fl. Brit. India 4 : 112. 1883.

Herbs to 16 cm long ; stems to 0.1 cm across. Leaves ovate-elliptic, 1.5–2 × 0.6–1.1 cm, subsucculent, silvery, acuminate. Bracts foliaceous, 0.4–0.6 cm long ; pedicel to 1 cm long. Flowers to 1 cm long. Corolla blue.

On damp, shady mountain slope. January–March. Sarkar & Bhatta., 1415, 1666.

### 5. HOPPEA Willd.

**Hoppea dichotoma** Willd., Ges. Naturf. Freunde Berlin Neue Schrift. 3 : 435.1801 ; Cl. in Hook. f. Fl. Brit. India 4 : 100.1883 ; Prain, Bengal Pl. 2 : 252.1903. Haines, Bot. Bihar & Orissa 2 : 598.1922.

Small annual herbs, 5–7 cm high. Leaves ovate-lanceolate, 0.4–0.5 cm long. Flowers greenish-white, irregular. Capsule 0.3 cm long. Seeds black.

On exposed river banks along grasses. Sarkar & Bhatta., 1300.

### 6. SWERTIA L.

**Swertia angustifolia** Buch.- Ham. ex D. Don var. *pulchella* Burkill in J. & Proc. As. Soc. Bengal (n.s.) 2 : 375.1906 ; Haines, Bot. Bihar & Orissa 2 :

596. 1922. *S. pulchella* Cl. in Hook. f. Fl. Brit. India 4 : 125.1883. *S. affinis* Cl. in Hook. f., l. c. ; Prain, Bengal Pl. 2 : 526.1903.

Herbs to 60 cm high. Leaves narrowly-lanceolate, minute or 6 cm or more long. Flowers to 0.8 cm across. Corolla greenish yellow. Capsule 0.7 × 0.4 cm.

Common in grass lands and sandstone areas. October–December. Sarkar & Bhatta., 79, 601,1443.

Notes : Plants in the sandstone areas are only 8 cm high.

### XCVII. APOCYNACEAE

1a. Herbs or undershrubs.	...	2
1b. Shrubs, climbers or trees.	...	3
2a. Leaves usually in whorls ; capsule a drupe	...	11. RAUVOLFIA
2b. Leaves opposite, fruit a paired follicle	...	5. CATHARANTHUS
3a. Leaves whorled or alternate.	...	3
3b. Leaves opposite.	...	7
4a. Leaves alternate	...	10. PLUMERIA
4b. Leaves whorled.	...	5
5a. Flowers to 5.3 cm across	...	2. ALLAMANDA ~
5b. Flowers less than 5.3 cm across.	...	6
6a. Shrubs ; leaves linear-lanceolate	...	9. NERIUM
6b. Medium trees ; leaves oblong-elliptic	...	3. ALSTONIA
7a. Plants armed with spines, fruit a berry	...	4. CARISSA
7b. Plants not armed ; fruit a paired follicle	...	8
8a. Climbers.	...	9
8b. Shrubs or trees.	...	12

9a. Corolla more than 5 cm long	...	6. CHONEMORPHA
9b. Corolla less than 5 cm long.	...	10
10a. Corolla to 3 cm across	...	1. AGANOSMA
10b. Corolla less than 3 cm across.	...	11
11a. Branches rusty-tomentose ; flowers to 0.6 cm across	...	8. ICHNOCARPUS
11b. Branches not rusty-tomentose ; flowers to 1.5 cm across	...	14. VALLARIS
12a. Fruit a follicle or a paired follicle.	...	13
12b. Fruit a drupe	...	13. THEVETIA
13a. Seeds usually comose, not arillate.	...	14
13b. Seeds arillate, not comose	...	12. TABERNAEMONTANA
14a. Anthers spurred	...	15. WRIGHTIA
14b. Anthers not spurred	...	7. HOLLARRHENA

### 1. AGANOSMA G. DON

**Aganosma caryophyllata** G. Don, Gen. Syst. 4 : 77. 1837-1838 ; Hook. f., Fl. Brit. India 3 : 664. 1882 ; Haines, Bot. Bihar & Orissa 2 : 571. 1922.

Woody climbers. Leaves opposite, elliptic. Flowers in terminal corymbose cymes, to 3 cm across, white, fragrant. Stamens with obsolete filaments. Ovaries separate.

Planted in gardens. Fl. : July-September. Sarkar & Bhatta., 523.

### 2. ALLAMANDA L.

**Allamanda cathartica** L., Mant. 2 : 214. 1771 ; Prain, Bengal Plants 2 : 493. 1903 ; Haines, Bot. Bihar & Orissa 2 : 559. 1922.

Sub-scandent shrubs. Leaves 2-(3)-4 per node. Flowers yellow, 7 × 5.3 cm.

Planted in gardens for its showy flowers. Native of Brazil. February-August. Bhatta., & Sarkar 550.

3. ALSTONIA R. Br., *nom. cons.*

**Alstonia scholaris** (L.) R. Br., Mem. Wern. Nat. Hist. Soc. 1 : 76.1811(1810) ; Hook. f., Fl. Brit. India 3 : 642.1882 ; Haines, Bot. Bihar & Orissa 2 : 566.1922. *Echites scholaris* L., Mant. 53.1767.

Trees. Leaves oblong-lanceolate, to 15 cm long, whitish beneath. Corolla greenish-white ; lobes ovate, obtuse, to 0.25 cm long. Follicles to 40 cm long. Seeds compressed.

A road side tree. December-March. CHATAWAN. Sarkar & Bhatta., 467.

4. CARISSA L., *nom. cons.*

1. **Carissa carandas** L., Mant. 52.1767 ; Hook. f., Fl. Brit. India 3 : 630.1882 ; Haines, Bot. Bihar & Orissa 2 : 561. 1922.

A large shrub or a small tree. Leaves elliptic or obovate, to 7.5 cm long. Flowers white or pinkish. Corolla tube to 1.5 cm long ; lobes to 1 cm long. Berry ellipsoid, to 2.2 cm long, 4-or more seeded, purplish-black.

Wild in the Madanpur forest, also cultivated for its edible fruits. January-April. Sarkar & Bhatta., 622.

## 5. CATHARANTHUS G. Don

Notes : Stearn (Lloydia 29 : 196-200. 1966), Airy Shaw (1973) and Huber (Rev. Handb. Pl. Ceylon 4 :43. 1983) reduce *Lochnera* Reichb. f.(Conspect Reg. Veg. : 134. 1828) as a congeneric synonym of *Catharanthus* G. Don (1837) but the latter is not listed as *nom. cons.*

1a. Leaves lanceolate ; corolla tube less than 1 cm long ... 1. *C. pusillus*

1b. Leaves obovate- oblong ; corolla tube more than 2 cm long ... 2. *C. roseus*

1. **Catharanthus pusillus** (Murr.) G. Don, Gen. Syst. 4, 95.1837 ; Verma & Lal in Fl. Raipur, Durg & Rajnandgaon 218. 1985. *Vinca pusilla* Murr. Novi Comment. Soc., Reg. Sci. Gott 3 : 66.t. 2.f.1.1773 ; Hook. f., Fl. Brit. India 3 : 640.1882 ; Haines, Bot. Bihar & Orissa 2 : 563.1922. *Lochnera pusilla* (Murr.) K. Schumann in E. & P. Pflanzenfam. 4(2) : 145. 1895.

Erect herbs, to 30 cm high. Leaves lanceolate, 4-7 × 1-2 cm, acuminate. Flowers white. Follicles slender, glabrous, to 5 cm long.

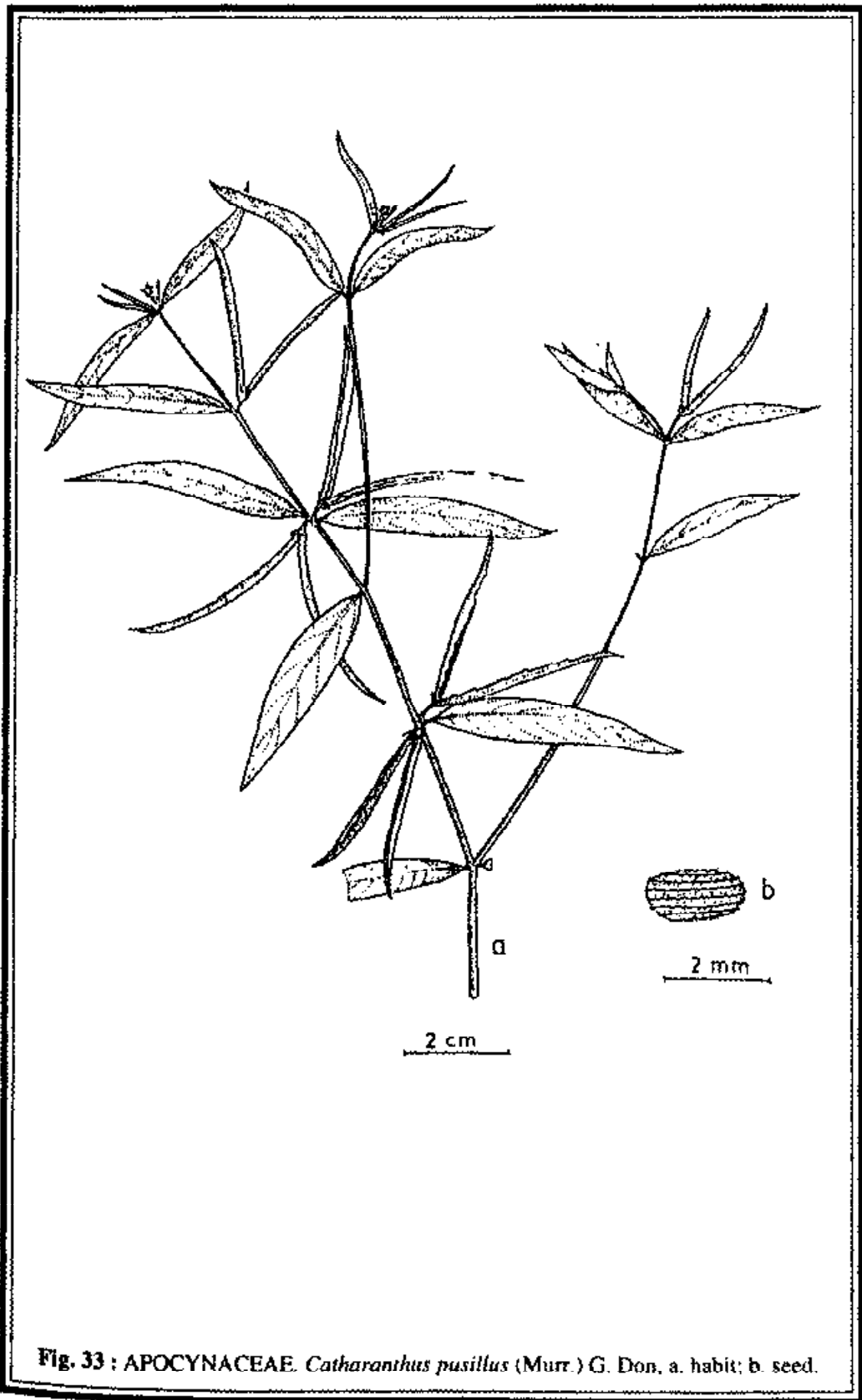


Fig. 33 : APOCYNACEAE. *Catharanthus pusillus* (Murr.) G. Don, a. habit; b. seed.

Weed of cultivation. Native of the Indian region. August–November. Sarkar & Bhatta., 646.

2. *Catharanthus roseus* (L.) G. Don, Gen. Syst. 4 : 95.1837 ; Verma & Lal in Fl. Raipur, Durg & Rajnandgaon 218.1985 *Vinca rosea* L. Syst. ed. 10. 944. 1759 ; Hook. f. Fl. Brit. India 3 : 640.1882 ; Haines, Bot. Bihar & Orissa 2 : 563. *Lochnera rosea* (L.) Reichb. f. Consp. Reg. Veg. 134.1828.

Perennial herbs. Leaves obovate–oblong, 3–8 × 1–2.3 cm, pubescent, olive green ; petiole sometimes reddish. Flowers white or rose coloured. Follicle somewhat curved, 2–3 cm long.

Cultivated, also naturalised. Probably a native of Madagascar. May–October. NAYANTARA. Sarkar & Bhatta., 1058.

Medicinal.

#### 6. CHONEMORPHA G. Don, *nom. cons.*

*Chonemorpha fragrans* (Moon) Alston, Ann. Roy. Bot. Gard. (Peradeniya) 11 : 203.1929 ; Stevens in Fl. Hassan Dist. 433. 1976. *Echites fragrans* Moon, Cat. Pl. Ceylon 20.1824. *E. macrophylla* Roxb. Fl. Indica 2 : 13. 1832. *Chonemorpha macrophylla* (Roxb.) G. Don, Gen. Syst. 4 : 76.1837 ; Hook. f., Fl. Brit. India 3 : 661.1882 ; Haines, Bot. Bihar & Orissa 2 : 571.1922.

Climbers. Leaves broadly oblong–ovate, large, cordate, tomentose beneath. Flowers white. Calyx lobes lanceolate. Corolla lobes obovate.

Haines (*l.c.*) reported the plant from the ravines of Ramnagar Hills. Haines 329 (CAL!).

#### 7. HOLARRHENA R. Br.

*Holarrhena pubescens* (Buch.–Ham.) Wall. ex G. Don, Syst. 4 : 78.1838 ; Panigrahi in Taxon 36(2) : 464. 1987. *Echites pubescens* Buch.–Ham. in Trans. Linn. Soc. 13 : 521.1822. *Holarrhena antidysenterica* sensu Wall. Cat. No. 1672.1829, non (L.) Wall. (1829) : Hook. f. Fl. British India 3 : 644.1882 ; Haines, Bot. Bihar & Orissa 2 : 564.1922. *Nerium antidysentericum* L. Sp. Pl. 209.1753 *nom. ambig.*

Trees. Leaves broadly ovate to elliptic–oblong, 17–20 × 6–9 cm, rounded or obtuse at the base. Flowers to 2.5 cm across, white, fragrant. Follicles cylindrical, to 40 cm long.

Common in the sal forests. Fl. : April–July ; Fr. December–February.  
KURCHI. Sarkar & Bhatta., 477, 1112, 1606.

Medicinal.

#### 8. ICHNOCARPUS R. Br., *nom. cons.*

**Ichnocarpus frutescens** (L.) R. Br. in Ait., Hort. Kew. ed. 2, 2 : 69.1811 ; Hook. f. Fl. Brit. India 3 : 669. 1882 ; Haines, Bot. Bihar & Orissa 2 : 573.1922. *Apocynum frutescens* L., Sp. Pl. 213. 1753.

Climbers. Leaves elliptic or broadly oblong, 5–12 × 3–4 cm, acute or shortly acuminate, sparsely pubescent. Flowers to 0.7 cm across, white. Corolla tube swollen in the middle. Follicles linear, divaricate, 5–17 cm long.

Very common in the hedges. Fl. : September–December ; Fr. : January–April. Sarkar & Bhatta., 1122.

Medicinal.

#### 9. NERIUM L.

**Nerium indicum** Mill. Gard. Dict. ed. 8, n. 2.1768. *N. odorum* Soland. in Ait. Hort. Kew, ed. 1,1 : 297.1789 ; Haines, Bot. Bihar & Orissa 2 : 567.1922.

Shrubs. Leaves linear–lanceolate. Cymes terminal, corymbose. Flowers red or white. Corolla tube small, with laciniate scales at the mouth. Ovaries 2. Follicles ribbed. Seeds comose.

Planted for its showy flowers. Probably a native of the Western Himalayas. Fl. April–June. KARABI. Sarkar & Bhatta., 468.

#### 10. PLUMERIA L.

**Plumeria rubra** L. Sp. Pl. 209.1753 ; Haines, Bot. Bihar & Orissa 2 : 563.1922. *P. acuminata* R. Br. in Ait. Hort. Kew. ed. 2,2 : 70.1811. *P. acutifolia* Poir. in Lamk. Encycl. Suppl. 2.667.1812.

A small tree with fleshy stems. Leaves oblong–lanceolate to obovate. Corymbs terminal. Corolla white with yellow throat, or rose and yellow.

Found in occasional plantation. Native of tropical America. Fl. : April–June. GULANCHA. Sarkar & Bhatta., 586.

## 11. RAUVOLFIA L.

- 1a. Leaves glabrous ; pedicels and calyx red ... 1. *R. serpentina*  
 1b. Leaves pubescent ; pedicel and calyx green ... 2. *R. tetraphylla*

1. **Rauvolfia serpentina** (L.) Benth. ex Kurz, For. Fl. Brit. Burma 2 : 171.1877 ; Hook, f. Fl. Brit. India 3 : 632.1882 ; Haines, Bot. Bihar & Orissa 2 : 565.1922. *Ophioxylon serpentinum* L. Sp. Pl. 1043. 1753.

Perennial from a woody rootstock. Leaves lanceolate or oblanceolate, 13–18 × 6–8 cm, acute or acuminate, shining. Calyx lobes lanceolate. Corolla white ; tube swollen above the middle ; lobes elliptic–oblong. Drupes 0.5–0.7 cm across, purplish black.

Bettiah. May–September. SARPAGANDHA. Sarkar & Bhatta., 1125.

Medicinal.

2. **Rauvolfia tetraphylla** L. Sp. Pl. 208.1753 ; Rendle in Proc. Linn. Soc. Lond. 149 : 109.1936. *R. canescens* L. Sp. Pl. ed. 2, 303. 1762 ; Haines, Bot. Bihar & Orissa 2 : 565. 1922.

Herbs. Branches spreading. Leaves of a node unequal, obovate–elliptic. Flowers small, white. Drupes red.

Bettiah. Probably a native of West Indies. April–June. Sarkar & Bhatta., 372.

Madical.

## 12. TABERNAEMONTANA L.

**Tabernaemontana divaricata** (L.) R. Br. in R. & S. Syst. 4 : 427. 1819; Bennet, Fl. Howrah 282.1979. *Nerium divaricatum* L. Sp. Pl. 209. 1753. *Tabernaemontana coronaria* (Jacq.) Willd., Enum. Hort. Berol. 275.1809. *Ervatamia coronaria* (Jacq.) Stapf in Thiselton–Dyer, Fl. Trop. Afr. 4 : 127.1902.

Shrubs. Flowers in axillary or terminal corymbose cymes. Calyx glandular within. Corolla tube to 2.2 cm long ; lobes 1.9 cm long, white. Stamens inserted near the middle of the tube. Ovaries 2 ; stigma conical.

A garden shrub. Fl. : throughout the year. TAGAR. Sarkar & Bhatta., 755.

Notes : There is no reasonable degree of distinction between *Tabernaemontana* L. (1753) and *Ervatamia* Stapf (1902).

### 13. THEVETIA L., *nom. cons.*

*Thevetia peruviana* (Pers.) K. Schum. in Engl. & Prantl. Pflanzenfam. II. 4 : 159.1895. *Thevetia nerifolia* Juss. ex Steud., Nom. ed. 2, 2 : 680.1841 ; Haines, Bot. Bihar & Orissa 2 : 562.1922. *Cerbera thevetia* L. Sp. Pl. 209. 1753 ; *C. peruviana* Pers. Syn. Pl. I : 267. 1805.

A medium tree. Leaves linear-lanceolate. Cymes usually 1-flowered. Flowers large. Corolla funnel-shaped, yellow, cream or orange-yellow. Drupe solitary, subglobose, green.

Planted, also self-sown. Native of tropical America. Fl. : Throughout the year. Sarkar & Bhatta., 623.

Notes : Sometimes segregated into a different genus *Cascabela* Rafin. (1838).

### 14. VALLARIS Burm. f.

*Vallisneria spiralis* (L.) O. Kuntze, Rev. Gen 417.1891 ; Nair, Fl. Punjab Plain 159. 1978. *Peltanthera solanacea* Roth, Nov. Pl. Sp. 132. 1821. *V. heynei* Spreng. Syst. 1 : 35.1825 ; Hook. f. Fl. Brit. India 3 : 650. 1882 ; Haines, Bot. Bihar & Orissa 2 : 570. 1922.

Climbers. Leaves elliptic-oblong, to 10 cm long, acuminate. Flowers to 1.6 cm across. Calyx lobes lanceolate. Corolla tube short ; lobes obovate, obtuse, white. Follicles sub-cylindric, to 12 cm long, base truncate.

Very common in the moist forest areas. Fl. : April-May ; Fr. : December. Sarkar & Bhatta., 1393, 1492.

### 15. WRIGHTIA R. Br.

1a. Corona orange-red ; follicles connate

throughout its length ... 1. *W. arborea*

1b. Corona white ; follicles connate only at the tip ... 2. *W. tinctoria*

1. *Wrightia arborea* (Dennst.) Mabb. in Taxon 26 : 533.1977 ; Verma & Lal in Fl. Raipur Durg & Rajnandgaon 220.1985. *Periploca arborea* Dennst.,

Schleussel 13, 23, 25, 1818 & in Forest. Allg. Teutsch. Gaert.-Mag. 3 : 32, 41, 83, 1818; *Wrightia tomentosa* R. & S. Syst. Veg. 4 : 414, 1819 ; Hook. f., Fl. Brit. India 3 : 653, 1882 ; Haines, Bot. Bihar & Orissa 2 : 568, 1922.

Trees. Leaves elliptic-oblong, 5-15 × 4-6 cm, caudate-acuminate. Flowers to 2.3 cm across, cream coloured, foetid. Calyx lobes ovate. Follicles slender, sub-cylindric, 15-30 cm long.

In deciduous forest. May-June. Sarkar & Bhatta., 547.

2. *Wrightia tinctoria* (Roxb.) R. Br. in Mem. Warr. Soc. 1 : 74, 1811; Hook. f. Fl. Brit. India 3 : 653, 1882 ; Duthie, Fl. U.G.P. 1 : 489 ; Haines, Bot. Bihar & Orissa 2 : 568, 1922. *Nerium tinctorium* Roxb., Orient. Repert. 1 : 39, 1791.

Trees. Leaves elliptic-ovate or lanceolate, 8-12 × 3-5 cm, caudate or acuminate ; petiole very short. Flowers white, fragrant. Follicles slender, to 5.0 cm long.

In deciduous forests. May-June. Thothathri 10921 (CAL).

### XCVIII. ASCLEPIADACEAE

Note : *Hemidesmus* R. Br., *Periploca* L., *Cryptolepis* R. Br., and *Cryptostegia* R. Br. are included in the family Periplocaceae Schlechter (App. II B, ICBN 1994, Airy Shaw, 1973 and Huber in Abeywickrama, Fl. Ceylon 1: 50, 1983). This family may be distinguished for their pollination mechanism, free stamens, spatulate pollen carriers and granular pollen.—Bhatta.

- |  |     |               |
|--|-----|---------------|
| 1a. Stems erect  | ... | 2             |
| 1b. Climbers with rambling and twining stems.                      | ... | 3             |
| 2a. Leaves thick and fleshy ; coronal process laterally compressed | ... | 2. CALOTROPIS |
| 2b. Leaves not thick and fleshy ; coronal process spatulate        | ... | 1. ASCLEPIAS  |
| 3a. Anthers with a membranous tip.                                 | ... | 4             |
| 3b. Anthers without membranous tip                                 | ... | 7. LEPTADENIA |

4a. Leaves with very numerous lateral nerves united to form an intramarginal vein	...	3. CRYPTOLEPIS
4b. Leaves without very numerous lateral nerves.	...	5
5a. Flowers 2.5–3.25 cm across	...	10. TELOSMA
5b. Flowers less than 2.5 cm across.	...	6
6a. Corolla rotate or cup-shaped.	...	7
6b. Corolla campanulate.	...	9
7a. Flowers to 3 cm across	...	12. WATTAKAKA
7b. Flowers to 1.5 cm across.	...	8
8a. Cymes sessile ; filaments free	...	11. TYLOPHORA
8b. Cymes stalked ; filaments connate	...	5. HEMIDESMUS
9a. Corona attached to the corolla	...	4. GYMNEMA
9b. Corona attached to the staminal column.	...	10
10a. Leaves linear or linear-lanceolate, acute at base	...	8. OXYSTELMA
10b. Leaves otherwise.	...	11
11a. Follicles tubercled	...	9. PERGULARIA
11b. Follicles not as above	...	7. MARSDENIA

1. ASCLEPIAS L.

*Asclepias curassavica* L. Sp. Pl. 215.1753 ; Hook. f. Fl. Brit. India 4 : 18.1883.

Subshrubs or erect undershrubs, to 60 cm high. Leaves lanceolate or oblong-lanceolate, 4.6–8.3 × 0.7–1.7 cm. Flowers red with yellow gynostegium, 0.7 cm across.

Collected near Bhikhna Thori. Native of West Indies. April–October. Sarkar & Bhatta., 1637.

## 2. CALOTROPIS R. Br.

- |   |     |                         |
|---|-----|-------------------------|
| 1a. Erect herbs ; leaves petiolate          | ... | 1. <i>C. acia</i>       |
| 1b. Undershrubs or shrubs ; leaves sessile. | ... | 2                       |
| 2a. Corolla lobes spreading                 | ... | 2. <i>C. gigantea</i>   |
| 2b. Corolla lobes erect                     | ... | 3. <i>C. hamiltonii</i> |

1. *Calotropis acia* Buch.-Ham., Trans. Linn. Soc. 14 : 247.1822 ; Hook. f., Fl. Brit. India 4 : 18.1883 ; Haines, Bot. Bihar & Orissa 2 : 578.1922.

Herbs. Leaves petiolate, obovate-oblongate or oblong. Calyx lobes lanceolate. Corolla purplish green. Follicles subglobose.

Haines (*l.c.*) reported the plant from Bettiah. Fl. & Fr., April-June. Haines 2101 (CAL!).

2. *Calotropis gigantea* (L.) R. Br. in W.T. Ait. Hort. Kew. ed. 2, 2 : 78.1811. Hook. f. Fl. Brit. India 4 : 17.1883 ; Haines, Bot. Bihar & Orissa 2 : 577.1922. *Asclepias gigantea* L., Sp. Pl. 214.1753.

Shrubs, to 2 m high. Stems with well-developed periderm. Leaves elliptic-oblong, 7-13 × 3-6 cm, subsucculent, cordate, acute, white pubescent beneath. Flowers 2-2.5 cm across. Petals pinkish-white. Follicles paired, 7-10 × 3-4 cm. Seeds flat, coma to 2.5 cm long.

Common. Throughout the year. AKAND. Sarkar & Bhatta., 466.

Bark yields a fibre. The floss from seeds used for stuffing pillows & mattresses. Bark and leaves medicinal.

3. *Calotropis hamiltonii* Wt., Contrib. 53. 1834; Voigt Hort. Sub. Cal. 543.1845; *C. procera* sensu Hook. f. Fl. Brit. India 4 : 18.1883 ; Haines, Bot. Bihar & Orissa 2 : 578.1922; *non* (W. Ait. Hort. Kew. ed. 1, 1 : 305.1789) R. Br. 1811.

Shrubs, 1-1.5 m high. Leaves ovate-oblong, cordate, acute or sub-mucronate, 12-17 × 7-11 cm. Follicles recurved, somewhat sausage-shaped, 8-10 × 4-5 cm. Seeds obovate, to 0.6 cm long.

Common in the Sub-Himalayan region. March-June. AKAND. Sarkar & Bhatta., 585, 756.

Uses same as the previous.

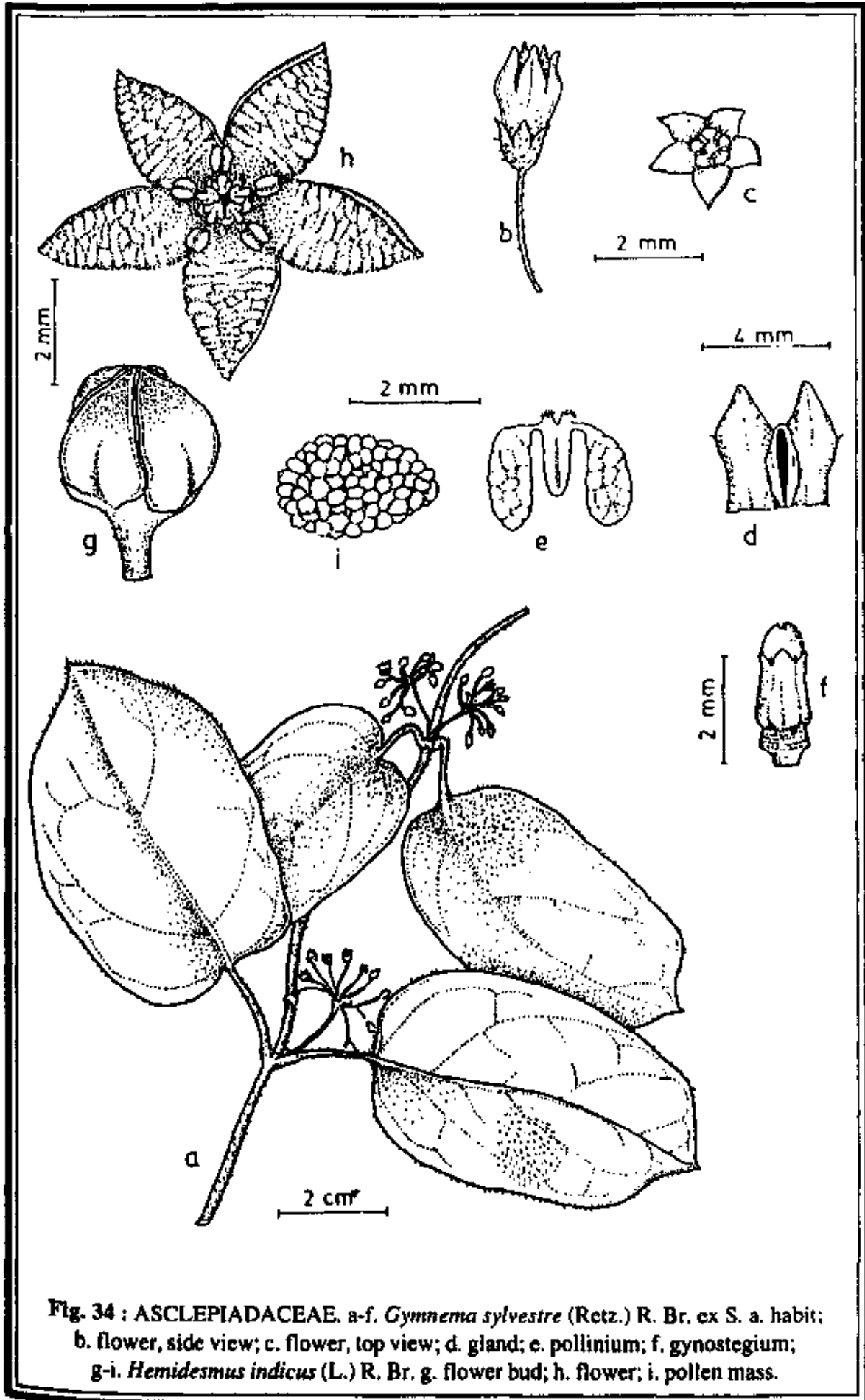


Fig. 34 : ASCLEPIADACEAE. a-f. *Gymnema sylvestre* (Retz.) R. Br. ex S. a. habit; b. flower, side view; c. flower, top view; d. gland; e. pollinium; f. gynostegium; g-i. *Hemidesmus indicus* (L.) R. Br. g. flower bud; h. flower; i. pollen mass.

## 3. CRYPTOLEPIS R. Br.

**Cryptolepis buchananii** R. Br. ex R. & S., Syst. Veg. 4 : 409.1819 ; Hook. f., Fl. Brit. India 4 : 5.1883 ; Haines, Bot. Bihar & Orissa 2 : 576.1922.

Climbers. Leaves elliptic oblong, 9–18. 2 × 3.2–9.1 cm, glabrous, apiculate. Corolla pale greenish–yellow. Follicles stout, straight, terete, pointed, 6.1 × 1.3 cm.

Common throughout the forest areas. Sarkar & Bhatta., 521, 621.

Yields a fibre.

## 4. GYMNEMA R. Br.

**Gymnema sylvestre** (Retz.) R. Br. ex S. in R. & S. Syst. Veg. ed. 15, 6 : 57.1820 ; Hook. f., Fl. Brit. India 4 : 29.1883 ; Haines, Bot. Bihar & Orissa 2 : 583. *Periploca sylvestris* Retz. Obs. Bot. 2 : 15.1781.

Twiners. Branchlets densely yellow pubescent or hirsute. Leaves ovate or oblong, 2–5 × 2–3 cm, acuminate, densely pubescent beneath. Flowers pale yellow. Follicles usually solitary, 6–7 cm long.

Common. Fl. : April–May. GURMARA. Sarkar & Bhatta., 545.

Leaves, when chewed paralyse for few hours the sense of taste for sweet and bitter substances.

## 5. HEMIDESMUS R. Br.

**Hemidesmus indicus** (L.) R.Br. in Ait., Hort, Kew. ed. 2, 2 : 75.1811 ; Hook. f., Fl. Brit. India 4 : 5.1883 ; Haines, Bot. Bihar & Orissa 2 : 575.1922. *Periploca indica* L. Sp. Pl. 211. 1753.

Climbers. Leaves linear, linear–lanceolate, lanceolate, elliptic–oblong or ovate–oblong, 5–10 × 1–5 cm, apiculate. Flowers to 0.6 cm across. Corolla purple–violet. Follicles slender, striate, 17–22 cm long.

Common. Fl. : August–November. Fr. : January–April. Sarkar & Bhatta., 1104.

Dried roots medicinal.

## 6. LEPTADENIA R. Br.

**Leptadenia reticulata** (Retz.) Wt. & Arn. in Wt. Contr. Bot. India 47.1834 ; Hook. f., Fl. Brit. India 4 : 63.1883 ; Haines, Bot. Bihar & Orissa

2 : 588.1922 ; *Cynanchum reticulatum* Retz., Obs. Bot. 2 : 15.1781.

Slender climbers with watery sap. Leaves ovate or lanceolate, 4-7×2-3 cm acuminate. Flowers in axillary peduncled clusters, pedicelled, green, to 1 cm across. Petals stellately spreading. Follicles ovate-lanceolate, to 15 cm long.

Grow in the Sub-Himalayan region. July-April. Sarkar & Bhatta., 1019.

Plant has been clinically tested and found useful in the treatment of habitual abortion.

#### 7. MARSDENIA R. Br., *nom. cons.*

*Marsdenia tenacissima* (Roxb.) Moon, Cat. Pl. Ceylon 21.1824 ; Hook. f., Fl. Brit. India 4 : 35.1883 ; Haines Bot. Bihar & Orissa 2 : 586.1922. *Asclepias tenacissima* Roxb. Pl. Cor. 3 : 35. t. 24.1818.

Climbers to 30 m high, pubescent or tomentose throughout. Leaves broadly ovate, deeply cordate, acuminate or cuspidate, 10-18 × 8-13 cm, villous on both the surfaces. Flowers deep yellow. Follicles solitary, 13-15 cm long.

In the northern area. India, Burma, Sri Lanka, Java. Bark yields a strong fibre. Sarkar & Bhatta., 1434.

Notes : The genus *Dregea* Meyer (1838) was merged in *Marsdenia* R. Br.(1810) by N. E. Brown (1903) but Bullock (Kew Bull. 19:512. 1965) and Hara *et. al.* (1982) treat them distinct. Huber (1983) segregates *Wattakaka* Hassk. (1857) as distinct from *Dregea* Meyer.

#### 8. OXYSTELMA R. Br.

*Oxystelma secamone* (L.) Karst. Deut. Fl. 1031. 1880-83 ; Verma & Lal in Fl. Raipur, Durg & Rajnandgaon 226.1985. *Periploca secamone* L. Mant. 2 : 216.1771. *Oxystelma esculentum* R. Br. Mem. Wern. Soc. 1 : 40. 1810 ; Hook. f., Fl. Brit. India 4 : 17.1883 ; Haines, Bot. Bihar & Orissa 2 : 579.1922. *Periploca esculenta* L.f., Suppl. Pl. :168.1782.

Climbers. Leaves linear or narrowly lanceolate, 5-9 × 0.4-0.7 cm, acuminate. Peduncle long, to 4.2 cm. Sepals linear, to 0.3 cm long. Corolla-lobes white. Fruit to 4.2 cm long.

Occasionally on the northern part of the district. September-December. Sarkar & Bhatta., 218.

Medicinal.

## 9. PERGULARIA L.

*Pergularia daemia* (Forssk.) Chiov. in Result. Sci. Miss. Stefan. Paoli. Somal. Ital. 1 : 115. 1916 ; Sant. & Irani. Bot. Mem. Univ. Bombay 4 : 74.1962. *Asclepias daemia* Forssk. Fl. Aegypt.-Arab. 51. 1775. *Daemia extensa* (N.J. Jacq.) R. Br. in Ait., Hort. Kew. ed. 2. (2) : 76.1811 ; Hook. f., Fl. Brit. India 4 : 20.1883 ; *Pergularia extensa* (N.J. Jacq.) N.E. Br. in Thistleton.-Dyer, Fl. Cap. 4 : 758.1908 ; Haines, Bot. Bihar & Orissa 2 : 579.1922.

Climbers. Leaves ovate or sub-orbicular, deeply cordate with rounded basal lobes, 8-12 × 6-10 cm. Flowers greenish-white, to 1.5 cm across. Follicles paired, tubercled, recurved, to 6 cm long.

Common in the villages. July-January. Sarkar & Bhatta., 568.

Medicinal.

## 10. TELOSMA COV.

*Telosma pallida* (Roxb.) Craib in Bull. Misc. Inf. Kew. 1911 : 418. 1911 ; Sant. & Irani, Bot. Mem. Univ. Bombay 4:83:1962 ; Haines, Bot. Bihar & Orissa 2 : 584.1922. *Asclepias pallida* Roxb., Fl. Indica 2 : 48.1832. *Pergularia pallida* Wt. & Arn. in Wt. Contr. Ind. Bot. 42. 1834 ; Hook. f., Fl. Brit. India 4 : 38. 1883.

Climbers. Leaves ovate, acute or acuminate, cordate. Flowers pale yellow. Corona scales linear. Follicles glabrous.

Rare. May-July. Banerjee 991 (CAL!).

## 11. TYLOPHORA R. BR.

*Tylophora rotundifolia* Buch.-Ham, ex Wt., Contr. Ind. Bot. 50.1834 ; Sant. & Irani, Bot. Mem. Univ. Bombay 4:86. 1962 ; Hook. f. Fl. Brit. India 4 : 43.1883 ; Haines, Bot. Bihar & Orissa 2 : 578.1922.

Climbers. Leaves rotundate, 4-5 × 5-6 cm, pilose on margins, rounded to slightly cordate, apex rounded to obtuse, sometimes mucronate. Flowers to 1 cm across. Sepals lanceolate, pilose. Corolla lobes ovate, pale greenish-purple.

In the forests near Bhikhna Thori, India. May-September. Sarkar & Bhatta., 1132.

Leaves and roots used medicinally.

## 12. WATTAKAKA Hasskarl

*Wattakaka volubilis* (L. f.) Stapf, Bot. Mag. 148. Sub.t.8976.1923. *Dregea volubilis* (L. f.) Benth. ex Hook. f. Fl. Brit. India 4 : 46.1883 ; Haines,

Bot. Bihar & Orissa 2 : 586.1922. *Asclepias volubilis* L. f. Suppl. 170.1781. *Marsdenia volubilis* (L. f.) Cooke, Fl. Bombay 2 : 116.1904 ; *Wattakaka viridiflora* Hasskarl, Flora 40. 99. 1857, *nom illeg. superfl.* ; *Hoya viridiflora* R. Br., Mem. Wern. Nat. Hist. Soc. 1 : 27. 1811 ; Wt. Icon.t. 586.1842.

Perennial woody twiners ; latex watery. Leaves broadly ovate, 7–10 × 5–7 cm, cordate, acuminate. Flowers in drooping umbels, greenish. Follicles paired, divaricate, slightly bottle-shaped with rounded apex, to 10 cm long, velvety reddish-brown, wrinkled when ripe.

Large climber in the forests. Fl. : April–June ; Fr. : November–December. Sarkar & Bhatta., 569.

Medicinal.

XCIX. SOLANACEAE

- |  |                 |
|--|-----------------|
| 1a. Flowers less than 2 cm long ; fruit a berry. ...   | 2               |
| 1b. Flowers more than 2 cm long ; fruit a capsule. ...                                       | 6               |
| 2a. Fruiting calyx inflated, enclosing the berry ...   | 6. PHYSALIS     |
| 2b. Fruiting calyx not inflated, always shorter than the berry.                              | 3               |
| 3a. Anthers connivent in a cone around the style, poricidal.                                 | 4               |
| 3b. Anthers not connivent ; dehiscence longitudinal. ...                                     | 5               |
| 4a. Leaves pinnate ; accrescent calyx free from berry  | 4. LYCOPERSICON |
| 4b. Leaves simple or sometimes pinnate ; berry<br>partially enclosed by accrescent calyx ... | 7. SOLANUM      |
| 5a. Shrubs ; corolla tubular ...   | 2. CESTRUM      |
| 5b. Annual or perennial herbs ; corolla rotate ...   | 1. CAPSICUM     |
| 6a. Flowers solitary, axillary ; capsule spiny ...   | 3. DATURA       |
| 6b. Flowers in paniculate racemes ;capsule not spiny ...                                     | 5. NICOTIANA    |

1. CAPSICUM L.

- |  |                         |
|--|-------------------------|
| 1a. Fruits erect or pendent, longer than pedicel,<br>annual plant. ... | 1. <i>C. annum</i>      |
| 1b. Fruits erect, shorter than pedicel ; perennial plant ...           | 2. <i>C. frutescens</i> |

1. *Capsicum annum* L., Sp. Pl. 188. 1753 ; Haines, Bot. Bihar & Orissa 2: 638.1922.

Herbs. Leaves elliptic-ovate, acute. Berry pungent.

Cultivated. Native of tropical America. Fl. & Fr. throughout the year. MIRCH. Sarkar & Bhatta., 912.

2. *Capsicum frutescens* L. Sp. Pl. 1 : 189. 1753 ; Haines, Bot. Bihar & Orissa 2 : 639.1922 (1961).

Subshrubs. Cultivated. Native of tropical America. MIRCH. Sarkar & Bhatta., 1735.

## 2. CESTRUM L.

1a. Flowers fragrant ; corolla lobes acute ;

berry pearly white ... 2. *C. nocturnum*

1b. Flowers not fragrant ; corolla lobes obtuse ;

berry whitish violet ... 1. *C. diurnum*

1. *Cestrum diurnum* L. Sp. Pl 191. 1753 ; Bailey, Man. Cult. Pl. 874.1949.

Shrubs, to 1.5 m high. Leaves elliptic, to 11 cm long. Flowers to 1.5 cm long, white. Berry to 0.5 cm across.

Exotic but now quite naturalized. Fl. & Fr. throughout the year. Sarkar & Bhatta., 922.

2. *Cestrum nocturnum* L., Sp. Pl. 191. 1753 ; Bailey, Man. Cult. Pl.874.1949.

Shrubs, sometimes subscandent. Leaves ovate-oblong, 8-11 × 2-3 cm, acute. Flowers greenish-white, to 2 cm long, fragrant. Berry to 0.7 cm long.

Cultivated in gardens. Native of West Indies. Flowers throughout the year. HASNUHANA. Sarkar & Bhatta., 1831.

## 3. DATURA L.

1a. Capsule dehiscent by 4 valves ; seeds black ... 2. *D. stramonium*

1b. Capsule dehiscent irregularly ; seeds pale-brown ... 1. *D. metel*

1. **Datura metel** L. Sp. Pl. 179. 1753 ; Sant. in J. Bombay Nat. Hist. Soc. 47 : 657.1948. *D. fastuosa* L. Syst. ed. 10:932.1759 ; Cl. in Hook. f., Fl. Brit. India 4 : 242.1883 ; Prain, Bengal Pl. 2 : 559.1903; Haines, Bot. Bihar & Orissa, 2 : 645.1922. *D. alba* Nees in Trans. Linn. Soc. 17:73.1837. *D. fastuosa* var. *alba* Cl. l.c.

Branches purplish. Leaves elliptic or ovate, 7–15 cm long, margins sinuate. Flowers white, with purplish tinge outside ; corolla sometimes double, to 16 cm long. Capsule with recurved pedicel and reflexed calyx.

In waste places. August–November. DHUTURA. Sarkar & Bhatta., 1543.

Leaves narcotic and antispasmodic.

2. **Datura stramonium** L. Sp. Pl. 179.1753 ; Cl. in Hook. f. Fl. Brit. India 4 : 242.1883 ; Prain, Bengal Pl. 2 : 559.1903; Haines, Bot. Bihar & Orissa 2 : 644.1922. *D. stramonium* var. *tatula* (L.) Cl. l.c.

Annual subshrubs. Leaves sinuate, elliptic–ovate, to 6–12 cm. Corolla white. Capsule sub–globose ; spines sharply pointed. Seeds suborbicular to reniform.

Common in waste places. Introduced and naturalized. July–November. DHUTURA. Sarkar & Bhatta., 794.

Leaves and flowers contain an alkaloid hyoscyamine ; narcotic ; antispasmodic, mydriatic and anodyne.

#### 4. LYCOPERSICON Mill.

**Lycopersicon esculentum** Mill. Gard. Dict. ed. 8 : n 2.1768 ; Terell, Taxon. 26 : 129.1977. Anonymous, Englera 9 : 215.1989. Tokyo Code, 329.1994. *nomen specifica conservandum*.

Leaves pinnate. Flowers in peduncled cymes, yellowish–white. Berry shining, bright red.

A cold season crop. Native of S. America. TOMATO. Sarkar & Bhatta., 773.

#### 5. NICOTIANA L.

- |                                    |     |                              |
|------------------------------------|-----|------------------------------|
| 1a. Capsule 0.7 cm long            | ... | 1. <i>N. plumbaginifolia</i> |
| 1b. Capsule more than 0.7 cm long. | ... | 2                            |

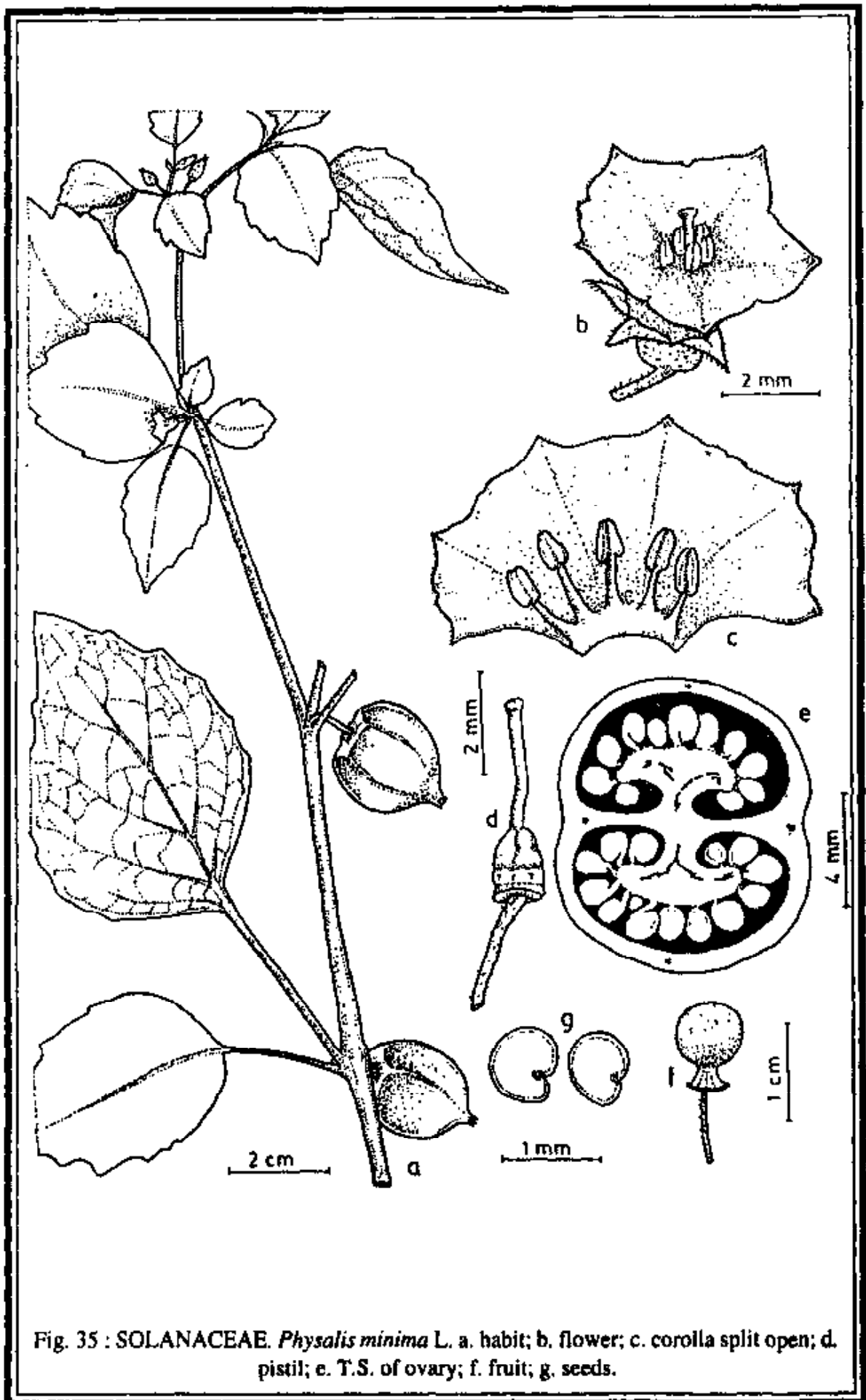


Fig. 35 : SOLANACEAE. *Physalis minima* L. a. habit; b. flower; c. corolla split open; d. pistil; e. T.S. of ovary; f. fruit; g. seeds.

- 2a. Corolla tube narrow ... 3. *N. tabacum*  
 2b. Corolla tube campanulate ... 2. *N. rustica*

1. *Nicotiana plumbaginifolia* Viv., Elench. Pl. Hort. Bot. 26, t. 5, 1802; Cl. in Hook. f. Fl. Brit. India 4 : 246.1883 ; Prain, Bengal Pl. 2 : 559.1903; Haines, Bot. Bihar & Orissa 2 : 647.1922(1961).

Annual, scabridly hairy herbs. Leaves; radical spreading ; cauline alternate, sessile, entire, lower spatulate, upper oblong-lanceolate, semi-amplexicaule, acute. Flowers in terminal racemes. Corolla white or with purple tinge. Capsule ovoid.

In waste places. Native of Mexico and West Indies. Fl. February-May. Sarkar & Bhatta., 988.

2. *Nicotiana rustica* L., Sp. Pl. 180.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 245.1883 ; Haines, Bot. Bihar & Orissa 2 : 647.1922.

Cultivated. Leaves are used in the preparation of snuff. Sarkar & Bhatta., 685.

3. *Nicotiana tabacum* L. Sp. Pl. 180.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 245.1883 ; Haines, Bot. Bihar & Orissa 2 : 647.1922.

Leaves used as the tobacco of commerce. Cultivated as a cold season crop in the southern part of the district. TAMAKU. Sarkar & Bhatta., 684.

#### 6. *PHYSALIS* L.

- 1a. Small herbs, flowers to 0.7 cm across. ... 2  
 1b. Stout herbs ; flowers to 1.2 cm across ... 3. *P. peruviana*  
 2a. Calyx obscurely 5-angled ... 1. *P. minima*  
 2b. Calyx distinctly 5-angled ... 2. *P. minima* var. *indica*

1. *Physalis minima* L., Sp. Pl. 183.1753 ; Cl. in Hook. f. Fl. Brit. India 4 : 238.1883 ; Prain, Bengal Pl. 2 : 558.1903 ; Haines, Bot. Bihar & Orissa 2 : 637.1922.

Herbs, to 30 cm high. Leaves ovate, 2-3 cm long, toothed and slightly lobed. Flowers yellow, with dark spots. Fruit globose, to 0.6 cm across, enclosed within 2 cm long inflated calyx.

Weed of waste places and cultivated lands. Naturalized from neotropics. August–January. Sarkar & Bhatta., 1041.

2. *Physalis minima* var. *indica* Cl. in Hook. f., Fl. Brit. India, 4 : 238. 1883. ; Haines, Bot. Bihar & Orissa 2 : 637.1922.

Leaves subentire. Calyx with 5 distinct angles or wings.

3. *Physalis peruviana* L., Sp. Pl. ed. 2. 1670.1763. Cl in Hook. f., Fl. Brit. India 4 : 236.1883.

Cultivated for its edible fruits. A native of tropical America. Fr. December–January. TAPARI. Sarkar & Bhatta., 923.

#### 7. SOLANUM L.

1a. Prickly herbs or subshrubs.	...	2
1b. Unarmed herbs or subshrubs.	...	7
2a. Erect subshrubs.	...	3
2b. Diffuse herbs	... 7. <i>S. surattense</i>	
3a. Corolla white.	...	4
3b. Corolla blue or violet.	...	6
4a. Leaves shallowly lobed.	...	5
4b. Leaves pinnatifid	... 6. <i>S. sisymbriifolium</i>	
5a. Berry to 4 cm across	... 10. <i>S. viarum</i>	
5b. Berry to 1 cm across	... 8. <i>S. torvum</i>	
6a. Prickles curved ; berry within 1.2 cm across	... 1. <i>S. anguivi</i>	
6b. Prickles straight or 0 ; berry large	... 3. <i>S. melongena</i>	
7a. Plants tuberous	... 9. <i>S. tuberosum</i>	
7b. Plants not tuberous	...	8
8a. Densely stellate tomentose shrubs	... 2. <i>S. erianthum</i>	
8b. Glabrous herbs ; hairs when present simple	... 5. <i>S. nigrum</i>	

1. *Solanum anguivi* Lamk., Tabl. Encycl. Meth. Bot. 2 : 23.1794 ; Hepper (in Hawkes) in Bot. J. Linn. Soc. 76 : 290.1978. *S. indicum* auct. pl.; Cl. in Hook. f. Fl. Brit. India 4 : 234.1883 ; Prain, Bengal Pl. 2 : 555.1903; Haines, Bot. Bihar & Orissa 2 : 642.1922 ; non L. 1753.

Stout undershrubs, to 1.3 m high. Leaves ovate-oblong, 6-12 × 5-9 cm, sinuate-subpinnatifid. Flowers bluish-violet ; stellate pubescent. Fruits globose, glabrous, orange-yellow.

Common in open wastelands. Tropics Fl. & Fr. throughout the year. Sarkar & Bhatta., 43.

Note : *S. indicum* L., is a *nom. rej.* The correct name for *S. indicum* L. should be *S. ferox* L. (Tokyo Code 65, 332. 1994).—Bhatta.

2. *Solanum erianthum* D. Don, Prodr. 96.1825 ; Roe in Brittonia 19 : 358. 1967 & in Taxon 17 : 179.1968. *S. verbascifolium* auct. pl. Cl. in Hook. f., Fl. Brit India 4 : 230.1883 ; Prain, Bengal Pl. 2 : 554.1903. Haines, Bot. Bihar & Orissa 2 : 641.1922 ; non L. 1753.

Unarmed shrubs, densely stellate tomentose. Leaves elliptic lanceolate or ovate-oblong, 15-25 × 5-10 cm, entire, acuminate. Flowers in terminal, corymbose cyme. Corolla to 1.3 cm long. Berry globose, to 0.7 cm yellow. Seeds slightly papillose.

Occasional in the northern part. August-December. Sarkar & Bhatta., 326.

3. *Solanum melongena* L, Sp. Pl. 186.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 235.1883 ; Prain, Bengal Pl. 2 : 554.1903. Haines, Bot. Bihar & Orissa 2:642.1922.

Prickly or unarmed shrubs or subshrubs, tomentose. Leaves shallowly lobed. Fruits large, oval or spheroidal, sometimes cylindrical, white or purple-violet.

Cultivated for its fruits. Fl. & Fr. throughout the year. BAIGUN. Sarkar & Bhatta., 330.

4. *Solanum melongena* L. var. *incanum* (L.) O. Kuntze, Rev. Gen. Pl. 454.1891 ; Deb in J. Econ. Tax. Bot. 1 : 49.1980. *S. incanum* L., Sp. Pl. 188.1753. *S. coagulans* Forssk., Fl. Aeg.-Arab. 47.1775 ; Cl. in Hook. f., Fl. Brit. India. 4 : 236.1883.

Flowers unisexual ; male flowers racemose ; female flowers solitary.

Fruits ovoid or globose, to 1.8 cm across, yellow.

In waste places. Fl. : January–May. Sarkar & Bhatta., 955.

5. *Solanum nigrum* L., Sp. Pl. 186.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 229.1883 ; Prain, Bengal Pl. 2 : 554.1903 ; Haines, Bot. Bihar & Orissa 2 : 640.1922.

Annual herbs. Leaves ovate or ovate-oblong, 6–10 × 3–5, cm entire or slightly toothed. Flowers in extra axillary, umbelliform inflorescence. Fruit globose, 0.7 cm across, purplish–black, rarely yellow–red.

A widely distributed common weed. Fl. & Fr. throughout the year. Sarkar & Bhatta., 903.

6. *Solanum sisymbriifolium* Lamk., Tab. Encycl. Meth. Bot. 2 : 23.1794; Prain, Bengal Pl. 2 : 555.1903.

Prickly herbs, to 50 cm high. Leaves pinnatifid, with straight yellow prickles. Flowers white, to 1.5 cm across. Fruit globose.

Frequent beside the railway track. A native of tropical America. May–October. Sarkar & Bhatta., 1231.

7. *Solanum surattense* Burm. f., Fl. Indica 57.1768 ; Venkatareddi in Bull. Bot. Surv. India 11 : 209.1969. *S. xanthocarpum* Schrad. & Wendl, Sert. Hanov. 1 : 8, t. 2 .1795 ; Cl. in Hook. f., Fl. Brit. India 4 : 236.1883 ; Prain, Bengal Pl. 2 : 555.1903 ; Haines, Bot. Bihar & Orissa 2 : 643.1922.

Diffuse, annual herbs. Leaves ovate–elliptic, pinnatifid, irregularly dentate; prickles yellowish–white, straight. Flowers in a few–flowered cymes. Berry globose, to 2 cm across, yellow with whitish striations.

In open waste places. Fl. & Fr. throughout the year. Sarkar & Bhatta., 1601.

8. *Solanum torvum* Sw., Prodr, 47.1788 ; Cl. in Hook. f., Fl. Brit. India 4 : 234.1883 ; Prain, Bengal Pl. 2 : 555.1903 ; Haines, Bot. Bihar & Orissa 2 : 642.1922. Tokyo Code 65.1994.

Armed shrubs, stellate hairy. Leaves ovate–lanceolate, 15–25 × 9–18 cm, lobed ; lobes triangular, shallow. Cymes few–many–flowered. Berry globose, glabrous, to 1.2 cm across, yellow.

Frequent in the forest margins. Tropical America, Indomalaysia. Fl. & Fr. throughout the year. Sarkar & Bhatta., 421.

9. *Solanum tuberosum* L., Sp. Pl. 185.1753 ; Haines, Bot. Bihar & Orissa 2 : 640.1922.

Sub-succulent herbs, with pinnatisect leaves ; segments unequal.

Widely cultivated in the rabi season for its tubers. Native of S. America. ALU. Sarkar & Bhatta., 551.

10. *Solanum vilarum* Dunal, in DC., Prodr. 13 : 240.1852 ; Babu & Hepper in Kew Bull. 34 : 407.1979. *S. khasianum* Cl. in Hook. f., Fl. Brit. India 4 : 234.1883.

Prickly herbs. Leaves ovate-lanceolate, subcordate at base. Cyme 1-4-flowered. Flowers to 1 cm across. Corolla sparsely pubescent. Berry globose, 3-4 cm across, glabrous.

Occasional in the northern part. October-May. Sarkar & Bhatta., 429.

### C. CONVULVULACEAE

1a. Prostrate herbs ; styles 2	...	3. EVOLVULUS
1b. Climbing herbs or erect shrubs ; style 1 or absent.		2
2a. Corolla lobes bifid ; style absent	...	4. ERYCIBE
2b. Corolla lobes entire or subentire ; styles present....		3
3a. Fruits indehiscent, baccate or dry.	...	4
3b. Fruits usually dehiscent, dry.	...	5
4a. Stigmas linear or oblong	...	9. RIVEA
4b. Stigmas globular	...	1. ARGYREIA
5a. Sepals enlarged into wings in fruit ; flowers to 0.6 cm long	...	8. PORANA
5b. Sepals not as above, flowers large.	...	6
6a. Corolla campanulate.	...	7
6b. Corolla funnelform or salverform.	...	8

- 7a. Flowers 3.5–5 cm long ; capsule circumscissile ... 7. OPERCULINA  
 7b. Flowers small ; capsule 4-valved  
 or opening irregularly ... 6. MERREMIA  
 8a. Pollen grains 3-zonocolpate, smooth ... 2. CONVULVULUS  
 8b. Pollen grains pantoporate, spinulose ... 5. IPOMOEA

## 1. ARGYREIA LOUR.

- 1a. Ovary 2-locular. ... 2  
 1b. Ovary 4-locular. ... 4  
 2a. Stamens exserted ; flowers to 0.7 cm long ... 1. *A. bella*  
 2b. Stamens included ; flowers more than 1.5 cm long. ... 3  
 3a. Peduncle not exceeding the petiole ; berry fleshy... 5. *A. setosa*  
 3b. Peduncle exceeding the petiole ; fruit dry ... 3. *A. nasirii*  
 4a. Leaves broadly cordate ; berry to 2 cm across ... 4. *A. roxburghii*  
 4b. Leaves ovate ; berry large ... 2. *A. involucrata*

1. *Argyreia bella* (Cl.) Raizada in Ind. For. 93 : 754.1967 ; Vickery in Eneu. Fl. Pl. Nepal 3 : 105.1982. *Lettsomia bella* Cl. in Hook. f., Fl. Brit. India 4 : 192.1883 ; Prain, Bengal Pl. 2 : 552.1903 ; Haines, Bot. Bihar & Orissa 2 : 617.1922.

Climbers. Leaves ovate-cordate, to 14 cm long, densely silky-pubescent beneath. Sepals oblong. Corolla pinkish-white, to 2 cm across. Fruit to 0.7 cm across, scarlet. Seeds brown.

Occasional. Fr. December. Sarkar & Bhatta., 369.

2. *Argyreia involucrata* Cl. in Hook. f., Fl. Brit. India 4 : 187.1883.

Climbers. Leaves ovate, 5–18 × 5–10 cm, acuminate, more or less hairy. Flowers in sub-capitate cymes ; peduncles 3–12 cm long. Sepals ovate-lanceolate. Corolla funnel-shaped. Capsule oblong, 4–6 cm across.

Ramnagar hills. October–January. Thothathri 10049. (CAL.!)

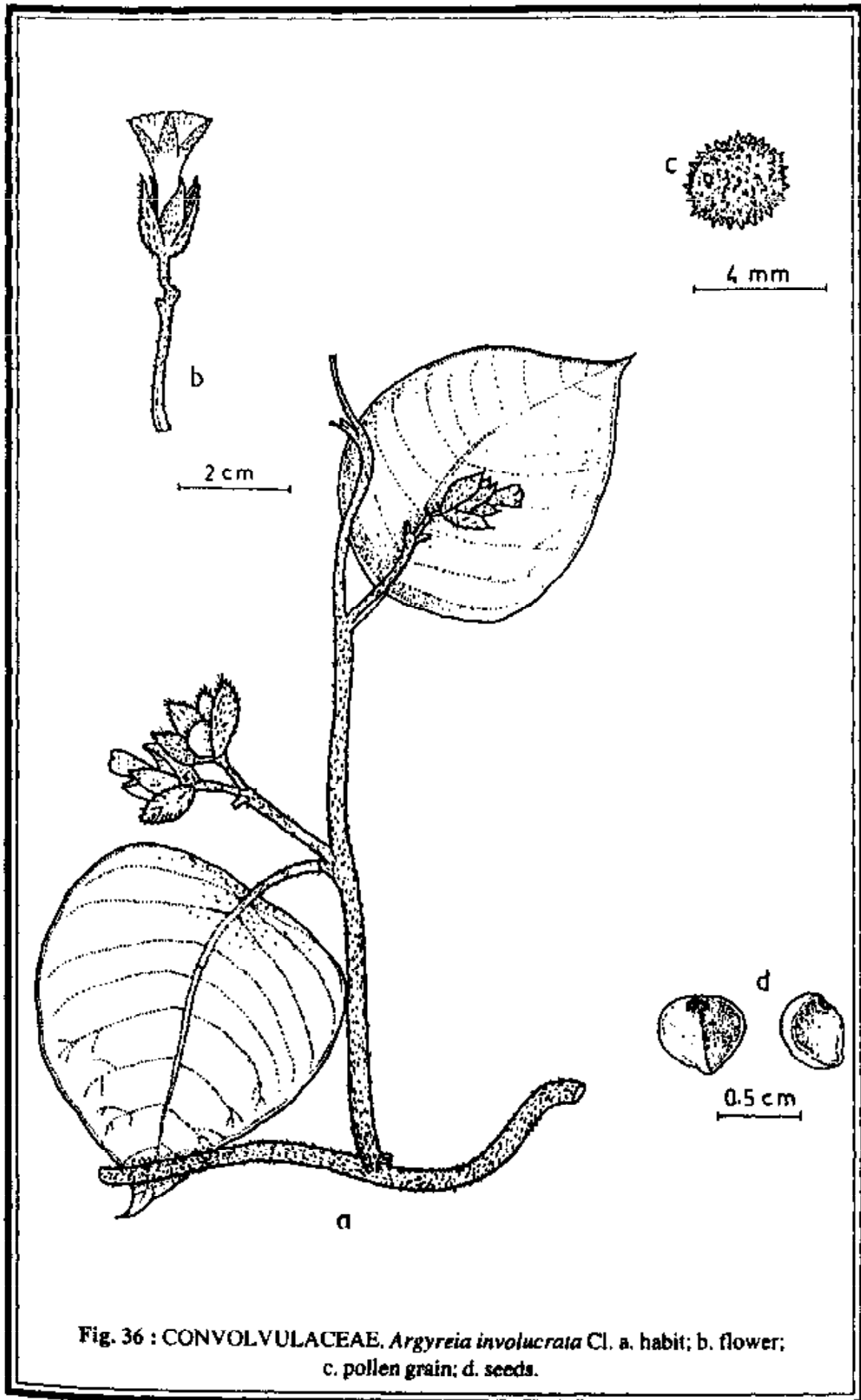


Fig. 36 : CONVULVULACEAE. *Argyreia involucrata* Cl. a. habit; b. flower; c. pollen grain; d. seeds.

3. *Argyrea nasirii* Austin in Fl. W. Pakistan 126: 4.1979 ; Vickery in Eneu. Fl. Pl. Nepal 3 : 105.1982. *Lettsomia thomsonii* Cl., in Hook. f., Fl. Brit. India 4 : 193.1883 ; Haines, Bot. Bihar & Orissa 2 : 617.1922.

Climbers. Leaves ovate-lanceolate, 8-12 cm long, cordate, somewhat strigose on both sides. Flowers on long peduncles. Sepals ovate-acute. Corolla purple, hairy outside. Fruit to 0.8 cm across, 1-4-seeded.

Northern area. October-January. Sarkar & Bhatta., 217.

4. *Argyrea roxburghii* Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6 : 419.1834 ; Cl. in Hook. f., Fl. Brit. India 4 : 185.1883 ; Prain, Bengal Pl. 2 : 551.1903 ; Haines, Bot. Bihar & Orissa 2 : 616.1922 ; *A. roxburghii* var. *ampla* (Choisy) Cl. in Hook. f., Fl. Brit. India 4.185.1883.

Huge climbers. Leaves broadly cordate, to 14.5 cm long, acuminate. Cymes few-flowered. Sepals to 1.5 cm long. Corolla hairy outside. Fruit to 2 cm across, yellow.

Bikhna Thori. Fl. : August-September ; Fr. : November-December. Sarkar & Bhatta., 770.

5. *Argyrea setosa* (Roxb.) Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6 : 425.1834 ; Vickery in Enum. Fl. Pl. Nepal 3 : 105.1982. *Lettsomia setosa* Roxb., Fl. Indica 2 : 80.1824 ; Cl. in Hook. f., Fl. Brit. India 4 : 194.1883 ; Prain, Bengal Pl. 2 : 552.1903 ; Haines, Bot. Bihar & Orissa 2 : 618.1922.

Large climbers. Leaves ovate-cordate, 8-15 cm long, acute or acuminate, sparsely hairy. Flowers in dense corymbose cymes ; peduncle stout. Sepals somewhat fleshy. Corolla to 2.5 cm long, rose-coloured. Berry to 0.9 cm across, red.

Common. October-January. Sarkar & Bhatta., 216, 1096.

Pliable stems are substituted for ropes for tying bundles.

## 2. CONVULVULUS L.

*Convolvulus arvensis* L., Sp. Pl. 153.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 219.1883. ; Haines, Bot. Bihar & Orissa 2 : 633.1922.

Climbers. Leaves ovate or oblong-lanceolate, to 6 cm long, apiculate, entire or somewhat lobed, auricled or hastate. Flowers to 2.1 cm long, pinkish-white. Calyx lobed to 0.5 cm long. Corolla to 2.2 cm across. Capsule

to 0.65 cm across. Seeds more or less trigonous.

A Common Weed. December–March. Sarkar & Bhatta., 512.

Roots cathartic. Seeds contain an oil.

### 3. ERYCIBE Roxb.

*Erycibe paniculata* Roxb., Pl. Cor. 2 : 31. t. 159.1798 ; Cl. in Hook. f., Fl. Brit. India 4 : 180.1883 ; Prain, Bengal Pl. 2 : 538.1903 ; Haines, Bot. Bihar & Orissa 2 : 634.1922.

Climbers. Leaves oblong–obovate, 5–10 cm long. Flowers pale white, to 1.8 cm across. Sepals suborbicular, to 0.2 cm long. Corolla to 0.8 cm long. Berry, 1.4–2 × 1 cm.

Occasional in the northern part. May–November. Thothathri 10040 (CAL!).

The Bark is given for cholera.

### 4. EVOLVULUS L.

- 1a. Flowers blue ; ovary 2–locular ... 1. *E. alsinoides*  
 1b. Flowers white ; ovary 1–locular ... 2. *E. nummularius*

1. *Evolvulus alsinoides* (L.) L., Sp. Pl. ed. 2, 2 : 392. 1762 ; Cl. in Hook. f., Fl. Brit. India 4 : 220.1883 ; Prain, Bengal Pl. 2 : 539.1903 ; *Convolvulus alsinoides* L., Sp. Pl. 157.1753.

Herbs. Leaves sessile, 1–2–cm long, acute or rounded at both ends. Sepals lanceolate or ovate–lanceolate, to 0.4 cm long. Corolla blue, to 0.6 cm across. Capsule globose, 0.3–0.4 cm long.

Common. July–December. Sarkar & Bhatta., 628.

Tonic and febrifuge.

2. *Evolvulus nummularius* (L.) L., Sp. Pl. ed. 2, 381.1762 ; Prain, Bengal Pl. 2 : 539.1903. *Convolvulus nummularius* L., Sp. Pl. ed. 1.157.1753. *Volvulopsis nummularius* (L.) Roberty in Candollea 14 : 28.1952.

Leaves suborbicular, to 1.5 cm long, sessile, apex emarginate. Flowers 0.5–0.7 cm across. Sepals elliptic–ovate. Corolla white. Capsule globose.

Common. July–January. Sarkar & Bhatta., 511.

5. IPOMOEA L., *nom. cons.*

1a. Twining or creeping herbs.	...	2
1b. Shrubs	...	4. <i>I. fistulosa</i>
2a. Leaves pinnately lobed ; segments filiform	...	8. <i>I. quamoclit</i>
2b. Leaves entire or palmately lobed ; segments broad.		3
3a. Leaves palmately lobed.	...	4
3b. Leaves entire.	...	5
4a. Leaves palmately 3-lobed	...	5. <i>I. nil</i>
4b. Leaves palmately 5-9-lobed, flowers pink	...	7. <i>I. pes-tigridis</i>
5a. Ovary 2-locular ; roots not tuberous.	...	6
5b. Ovary 4-locular ; roots tuberous	...	2. <i>I. batatas</i>
6a. Leaves linear-lanceolate to narrowly oblong-lanceolate with hastate or cordate bases...		7
6b. Leaves ovate or broadly oblong lanceolate, with cordate bases.	...	8
7a. Flowers solitary or in peduncled cymes ; peduncle more than 1 cm long	...	1. <i>I. aquatica</i>
7b. Flowers in subcapitate cymes ; peduncle less than 0.3 cm long	...	3. <i>I. eriocarpa</i>
8a. Stems warty ; peduncles muricate	...	9. <i>I. turbinata</i>
8b. Stems not warty ; peduncles smooth	...	6. <i>I. obscura</i>

1. *Ipomoea aquatica* Forssk., Fl. Aegypt. – Arab, 44.1775 ; Cl. in Hook. f., Fl. Brit. India 4.210. 1883. *I. reptans* Poir. in Lamk., Encycl. Suppl. 3 : 460.1814 ; Prain, Bengal Pl. 2 : 547.1903; Haines, Bot. Bihar & Orissa 2 : 626.1922.

Aquatic herbs ; stems hollow. Leaves various, 3–10 × 0.5–6.5 cm. Peduncle 1–5-flowered. Sepals ovate–blong, glabrous, to 0.8 cm long. Corolla to 6 cm long, purple–white. Capsule globose, to 0.9 cm across.

Common weed of water bodies. October–February. KALMI. Sarkar & Bhatta., 939.

Used as a pot herb.

2. *Ipomoea batatas* Lamk., *Encycl.* 6 : 14.1792 ; Haines, *Bot. Bihar & Orissa* 2 : 632.1922.

Creeping herbs ; roots tuberous, red or sometimes white. Leaves usually ovate with cordate bases, to 10 cm long. Flowers purplish, to 6 cm long.

Cultivated for its sweet tuberous roots. Native of America. Sarkar & Bhatta., 619.

3. *Ipomoea fistulosa* Mart. ex Choisy in DC., *Prodr.* 9 : 349.1845 ; Bhattacharyya in *J. Bombay Nat. Hist. Soc.* 73 : 318.1976 ; Fosberg & Sachet in *Smiths. Contrib. Bot.* 36 : 11.1977 ; Bhattacharyya & Medda, *Bull. Bot. Soc. Beng.* 1979. *I. carnea* ssp. *fistulosa* (Mart. ex Choisy) Austin, *Taxon* 26 : 237.1977.

Shrubs, 1–6 m high. Leaves ovate–cordate to lanceolate, 4–21 × 3–10 cm. Flowers in cymose paniculate clusters ; corolla deep pink to purple, 5–9 cm long. Stigma biglobular. Capsules ovoid, sub–globose, to 1.5 cm across. Seeds covered with brownish hairs.

Common on roadsides and in marshy places. April–January. Sarkar & Bhatta., 643.

Notes : In *I. fistulosa* Mart. ex Choisy the 5th node from the apex where leaf is fully expanded, pith region is hollow, but it is solid in *I. carnea*. *I. fistulosa* is widely distributed in India, but *I. carnea* is restricted within the parks and gardens of Calcutta.—Bhatta.

3. *Ipomoea eriocarpa* R. Br., *Prodr.* 484.1810 ; Cl. in Hook. f., *Fl. Brit. India* 4 : 204.1883. *I. hispida* R. & S., *Syst. Veg.* 4 : 238.1819 ; non Zucc. 1809; Prain, *Bengal Pl.* 2 : 545.1903 ; Haines, *Bot. Bihar & Orissa* 2 : 624.1922. *Convolvulus hispidus* Vahl, *Symb. Bot.* 3 : 29.1794.

Twining or creeping, hairy herbs. Leaves ovate, oblong, lanceolate or linear–lanceolate, 5–8 cm long. Flowers in axillary, sessile cymose heads. Sepals linear, to 0.6 cm long. Corolla to 1.5 cm long, pinkish–white. Capsule globular, to 0.8 cm across, pubescent. Seeds glabrous.

In waste lands. September–December. Sarkar & Bhatta., 1580.

Used as a fodder.

5. *Ipomoea nil* (L.) Roth, Cat. Bot. 1 : 36.1797 ; Prain, Bengal Pl. 2 : 546.1903 ; *Convolvulus nil* L., Sp. Pl. ed. 2, 1 : 219. 1762. *Ipomoea hederacea* auct. ; Cl. in Hook. f., Fl. Brit. India 4 : 199.1883 ; non (L.) Jacq. 1786.

Twining, sparsely pubescent. Leaves usually palmately 3-lobed, sometimes entire, ovate-suborbicular, 5–15 cm long. Cymes usually 1-flowered. Sepals lanceolate, to 2.5 cm long. Corolla to 5 cm long, blue or pink. Capsule globose or subglobose, 0.6–0.8 cm long.

Collected near Bettiah Railway station. Tropics. October–December. Sarkar & Bhatta., 1222, 1266.

Dried seeds used as a purgative.

6. *Ipomoea obscura* (L.) Ker-Gawl., Bot. Reg. 3 : t. 239.1817 ; Cl. in Hook. f., Fl. Brit. India 4 : 207.1883 ; Prain, Bengal Pl. 2 : 547.1903 ; Haines, Bot. Bihar & Orissa 2 : 626.1922 ; *Convolvulus obscurus* L., Sp. Pl. ed. 2, 1 : 220.1762.

Slender, twining herbs. Leaves ovate-cordate, 2.5–6 × 1.5–4.5 cm, acute or acuminate, entire, glabrous. Flowers in axillary, 1 or 2–3-flowered cymes. Sepals to 0.35 cm long. Corolla pale yellow with purple base, to 3 cm across. Capsule globose, to 0.8 cm across. Seeds softly pubescent.

Common in waste lands. October–January. Sarkar & Bhatta., 483.

7. *Ipomoea pes-tigridis* L., Sp. Pl. 162.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 204.1883 ; Prain, Bengal Pl. 2 : 546.1903 ; Haines, Bot. Bihar & Orissa 2 : 624.1922.

Twining pubescent herbs. Leaves sub-orbicular, palmately 5–9-lobed. Flowers in compact, few-flowered heads. Corolla purple, to 4 cm long. Capsule ovoid, to 0.8 cm across. Seeds minutely hairy.

On hedges. August–December. Sarkar & Bhatta., 1465.

Astringent, tonic, stomachic and diuretic.

8. *Ipomoea quamoclit* L., Sp. Pl. 156.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 199.1883.

Slender twiner. Leaves deeply pinnatisect with 6–19 pairs of linear lobes,

to 5 cm long. Cymes 1 or 2-5 flowered. Corolla salver-shaped, red or white, to 3 cm long. Capsule ovoid, to 0.8 cm across.

Cultivated, sometimes as escape. August-October. Sarkar & Bhatta., 939.

9. **Ipomoea turbinata** Lag., Gen. & Sp. Pl. 10. 1816 ; Gunn in Brittonia 24 : 163. f.5.1972. *Convolvulus muricatus* L., Mant. 44.1767. *Ipomoea muricata* (L.) Jacq., Moeb. Schoenb. 3(2) : 40.t. 323.1803, non Cav. 1799 ; Cl. in Hook. f., Fl. Brit. India 4 : 197.1883. *Calonyction muricatum* (L.) G.Don, Gen. Syst. 4 : 264.1838 ; Prain, Bengal Pl. 2 : 549.1903 ; Haines, Bot. Bihar & Orissa 2 : 620. 1922.

Slender twiner ; stems often muricate. Leaves broadly ovate, entire, glabrous. Cymes 1-5-flowered. Pedicel very clavate in fruit. Sepals elliptic-lanceolate. Corolla pale pink or purple. Capsule globose. Seeds smooth.

Occasional. September-December. Haines 1006 (CAL!).

6. **MERREMIA** Dennst. ex Endl., *nom. cons.*

1a. Creeping herbs ; leaves entire ; flowers to 1.2 cm across ... 1. *M. gangetica*

1b. Twining herbs ; leaves palmately lobed ; flowers to 7 cm across ... 2. *M. vitifolia*

1. **Merremia gangetica** (L.) Cufod. Bull. Jard. Bot. Etat. Suppl. 31 : 743.1961. *Merremia emarginata* (Burm. f.) Hall. f., Bot. Jahrb. Syst. 16 : 552.1893; Prain, Bengal Pl. 2 : 543.1903 ; *Evolvulus emarginatus* Burm. f., Fl. Indica 77.t. 30.1768. *Ipomoea reniformis* Choisy, Mem. Soc. Phys. Geneve 6 : 446. 1834 ; Cl. in Hook. f., Fl. Brit. India 4 : 206.1883 ; Haines, Bot. Bihar & Orissa 2 : 625.1922. *Convolvulus gangeticus* L. in Torner, Cent. Pl. 2 : 9.1756.

Stems glabrescent, rooting at nodes. Leaves reniform or ovate-cordate, 0.5-3.0 cm long, obtuse, entire, cordate. Cymes 2-3-flowers. Corolla yellow. Capsule subglobose, 0.5-0.6 cm across.

On banks of rivers & ponds. November-April. Sarkar & Bhatta., 1144.

Medicinal.

2. **Merremia vitifolia** (Burm.f.) Hall. f. in Bot. Jahrb. 16 : 552.1893 ; Prain, Bengal Pl. 2 : 542.1903 ; Ooststroom in Blumea 3 : 329 & Fl. Mal, Ser. I., 4 : 448.1953. *Convolvulus vitifolius* Burm. f., Fl. Indica 45, t. 18, f. 1 : 1768. *Ipomoea vitifolia* (Burm.f.) Bl., Bijdr. 709.1825 ; Cl. in Hook. f., Fl. Brit. India

4 : 213.1883 ; Haines, Bot. Bihar & Orissa 2 : 630.1922.

Climbing herbs, hairy. Leaves broadly ovate, lobed, to 10 cm long ; lobes triangular, toothed. Cymes 1–7-flowered. Sepals to 1.3 cm long. Corolla bright yellow. Capsule ovoid, to 1.2 cm across.

Forest margins, on trees. October–March. Sarkar & Bhatta., 1636.

Medicinal.

#### 7. OPERCULINA S. Manso

**Operculina turpethum** (L.) S. Manso, Enum. Subst. Bras. 16.1836 ; Prain, Bengal Pl. 2 : 543.1903 ; *Convolvulus turpethum* L., Sp. Pl. 155.1753. *Ipomoea turpethum* (L.) R. Br., Prodr. 1 : 485.1810 ; Cl. in Hook. f., Fl. Brit. India 4 : 212.1883 ; Haines, Bot. Bihar & Orissa 2 : 629.1922.

Climbers. Leaves ovate–oblong, to 13 cm long, pubescent. Flowers to 4 cm across. Corolla white. Capsule globose, to 1.7 cm across. Seeds 0.4 cm long, black.

Occasional in waste places. March–December. Sarkar & Bhatta., 938.

Source of a purgative called Turpeth or India–Jalap.

Note : The generic name *Merremia* Endl. (1841) is conserved against the earlier name *Operculina* S. Manso (Tokyo Code 291. 1994). However, *Operculina* is considered to be a separate genus and the name *Operculina* is retained herewith (Tokyo Code, Art. 14.6 Ex. 5), for its specialization in stem, pollen and fruit characters.—Bhatta.

#### 8. PORANA Burm. f.

**Porana paniculata** Roxb., Pl. Cor. 3 : 31, t. 235.1819 ; Cl. in Hook. f., Fl. Brit. India 4 : 222. 1883 ; Prain, Bengal Pl. 2 : 538.1903 ; Haines, Bot. Bihar & Orissa 2 : 619.1922.

Climbers. Leaves ovate–cordate, to 13 cm long, acuminate, entire, cordate, pubescent. Flowers white, fragrant. Corolla to 0.6 cm long. Capsule to 0.5 cm across.

Common in the forests. October–January. Sarkar & Bhatta., 464.

Stems used for making coarse baskets.

9. RIVEA Choisy

- 1a. Erect or scandent shrubs ; sepals lanceolate... 2. *R. ornata*  
 1b. Scandent shrubs ; sepals ovate ...1. *R. hypocrateriformis*

1. *Rivea hypocrateriformis* (Desr.) Choisy in Mem. Soc. Phys. Geneve 6 : 408.1834 ; Cl. in Hook. f., Fl. Brit. India 4 : 184. 1883 ; Prain, Bengal Pl. 2 : 550.1903 ; Haines, Bot. Bihar & Orissa 2 : 614.1922 ; *Convolvulus hypocrateriformis* Desr. in Lamk., Encycl. 3 : 561. 1792.

Pubescent, woody climbers. Leaves rotundate, to 5-9 cm across, mucronate, cordate at base, adpressed-silky beneath. Flowers usually solitary. Corolla 6-9 cm long, white, fragrant, nocturnal. Fruit circumscissile dehiscent, to 1.2 cm across.

Madanpur. September-December. Sarkar & Bhatta., 1399, 1449.

2. *Rivea ornata* (Desr.) Choisy in Mem. Soc. Phys. Geneve 6 : 408.1834; Prain, Bengal Pl. 2 : 550.1903 ; *R. ornata* var. *griffithii* Cl. in Hook. f., Fl. Brit. India 4 : 183. 1883 ; Haines, Bot. Bihar & Orissa 2 : 614.1922 ; *Convolvulus ornata* Desr. in Lamk., Encycl. 3 : 561.1792.

Leaves suborbicular, to 12 cm across, emarginate, silky pubescent beneath. Cymes usually 7-flowered. Flowers white, fragrant. Corolla tube to 5 cm long. Fruit 1-locular, dehiscing irregularly. Seeds usually solitary.

Common on hedges. November-January. Sarkar & Bhatta., 771.

Flowers and Seeds eaten.

CI. CUSCUTACEAE

CUSCUTA Tourn. ex L.

- 1a. Stamens with distinct filaments ; styles free ; pollen grains scrobiculate ; secondary xylem absent ... 1. *C. campestris*  
 1b. Stamens with almost sessile anthers and situated at or below the sinuses ; styles united ; pollen grains reticulate ; secondary xylem present. ... 2  
 2a. Flowers 0.3-0.4 cm long ; stigma globose ... 2. *C. monogyna*  
 2b. Flowers more than 0.6 cm long ; stigma elongated, pointed ... 3. *C. reflexa*

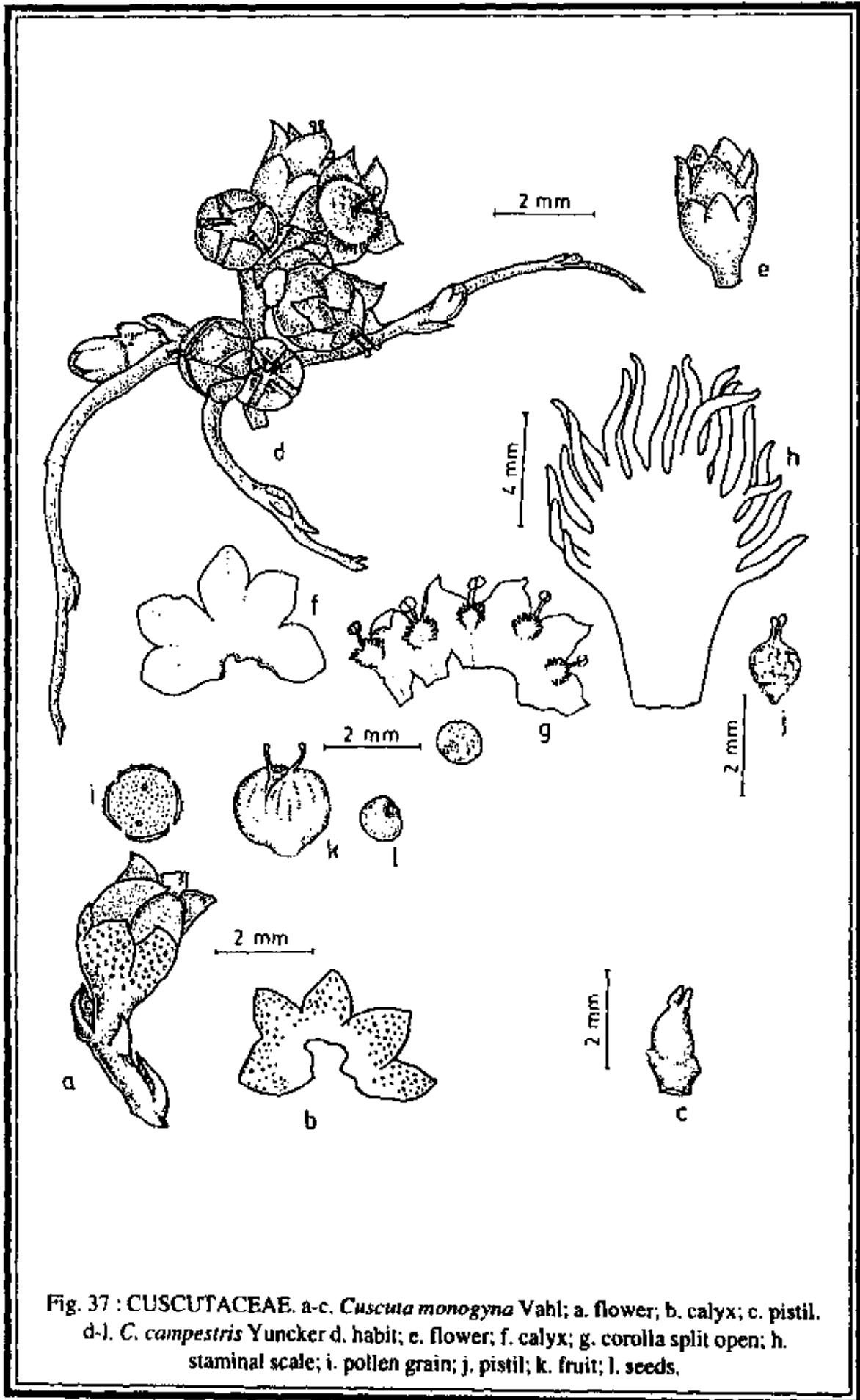


Fig. 37 : CUSCUTACEAE. a-c. *Cuscuta monogyna* Vahl; a. flower; b. calyx; c. pistil. d-l. *C. campestris* Yuncker d. habit; e. flower; f. calyx; g. corolla split open; h. staminal scale; i. pollen grain; j. pistil; k. fruit; l. seeds.

1. *Cuscuta campestris* Yuncker, Mem. Torrey Bot. Club. 18 : 138.1932; Bhattacharyya & Mukerjee, Indian J. Forestry 1(2) : 160.1978.

Flowers in dense clusters. Calyx not thickened below the sinuses. Corolla campanulate. Infrastaminal scales usually exceeding the corolla tube. Styles slender, stigmas globose. Capsule not opening by circumscission.

On roadside shrubs. October–March. Sarkar & Bhatta., 439.

2. *Cuscuta monogyna* Vahl, Symb. Bot. 2 : 32.1791 ; Bhattacharyya & Mukerjee, Indian J. Forestry 1(2) : 162.1978.

Flowers in dense clusters. Calyx medianly thickened. Corolla campanulate. 0.3-0.4 cm long, cream–white.

Common near Bettiah on hedges. September–February. Sarkar & Bhatta., 1337, 1611.

3. *Cuscuta reflexa* Roxb., Pl. Cor. 2 : 3. t. 104.1798 ; Cl. in Hook. f., Fl. Brit. India 4 : 225. 1883 ; Prain, Bengal Pl. 2 : 537.1903; Haines, Bot. Bihar & Orissa 2 : 635.1922.

Stem tip attenuate, reddish ; mature stem glabrous. Flowers solitary or in cymes. Corolla tubular–campanulate, white or pale cream in colour, 0.8 cm long. Infrastaminal scales not fimbriate. Capsule circumscissile near the base.

Occasional. Shetty 201 (CAL!).

## CII. MENYANTHACEAE

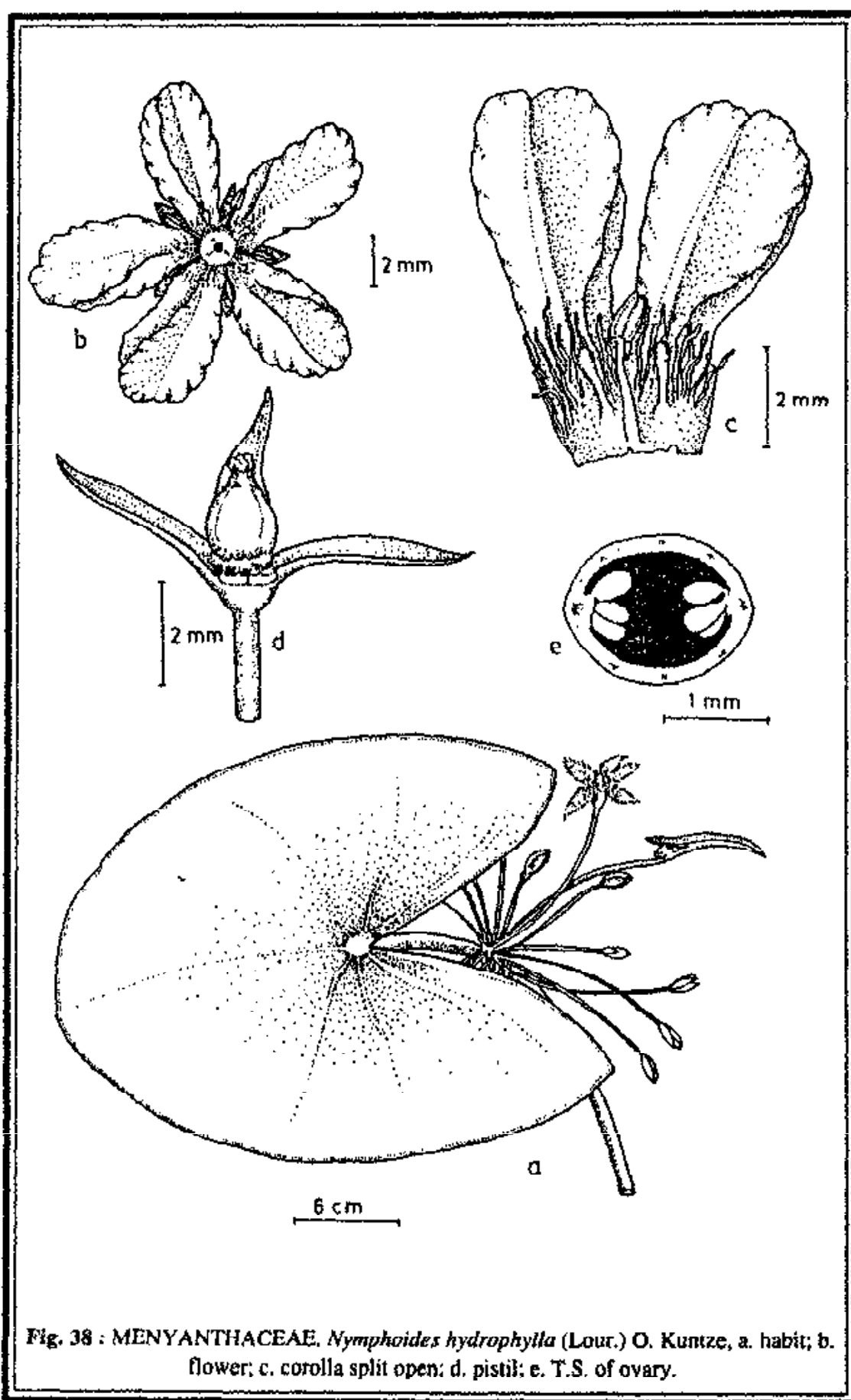
### NYMPHOIDES Séguier

1a. Corolla with longitudinal keel ; seeds not smooth ... 1. *N. hydrophylla*

1b. Corolla not with keel ; seeds smooth ... 2. *N. indica*

1. *Nymphoides hydrophylla* (Lour.) O.Kuntze, Rev. Gen. Pl. 429.1891; Kramer in Dassan. & Fosb., Rev. Handb. Fl. Ceylon 3 : 208. 1981. *Menyanthes hydrophylla* Lour., Fl. Cochinch. 1 : 129.1790. *Nymphoides cristata* O.Kuntze, Rev. Gen. Pl. 2 : 429.1891. *Limnanthemum cristatum* Griseb., Gen. Sp. Gent. 342. 1839. Cl. in Hook. f., Fl. Brit. India 4 : 131.1883 ; Prain, Bengal Pl. 2 : 527.1903; Haines, Bot. Bihar & Orissa 2 : 599.1922.

Aquatic stoloniferous herbs. Leaves to 10 cm across. Flowers to 2 cm across. Corolla white, fimbriate. Capsule globose.



Common along water-bodies. June–December. Sarkar & Bhatta., 337.

2. *Nymphoides indica* (L.) O.Kuntze, Rev. Gen. Pl. 429.1891 ; Sant. in Bull. Bot. Surv. India 3 : 20.1961. *Menyanthes indica* L., Sp. Pl. 145.1753. *Limnanthemum indicum* (L.) Griseb. emend. Thw., Enum. 205.1860 ; Cl. in Hook. f., Fl. Brit. India 4 : 131.1883 ; Prain, Bengal Pl. 2 : 527.1903 ; Haines, Bot. Bihar & Orissa 2 : 598.1922.

Aquatic stoloniferous herbs. Leaves to 20 cm across. Flowers to 2.5 cm across. Corolla white with yellow mouth, fimbriate. Capsule ellipsoid.

Common along shallow water-bodies. June–November. Sarkar & Bhatta., 354.

### CIII. POLEMONIACEAE

#### PHLOX L.

*Phlox drummondii* Hook. Bot. Mag. t. 344. 1820 ; Bailey, Man. Cult. Pl. 826.1949.

Erect, annual herbs, to 50 cm high. Flowers to 2 cm across, variously coloured. Capsule to 0.4 cm across. Seeds discoid, brownish.

Garden escape and a cold season ornamental. Native of N. America. Sarkar & Bhatta., 381.

### CIV. HYDROPHYLLACEAE

#### HYDROLEA L., *nomen. cons.*

*Hydrolea zeylanica* (L.) Vahl, Symb. Bot. 2 : 49.1791 ; Hook. f., Fl. Brit. India 4 : 133.1883 ; Prain, Bengal Pl. 2 : 711.1903 ; *Nama zeylanica* L., Sp. Pl. 226. 1753.

Annual herbs. Leaves oblong–lanceolate, entire, acute–acuminate, 1.5–5 × 0.5–1.5 cm. Flowers in racemes. Calyx persistent. Corolla bluish, 0.5 cm long. Stamens exerted. Capsule dehiscent loculicidally or irregularly, 0.5 × 0.2–0.3 cm. Seeds oblong, minute.

Common in rice fields as weeds. October–December. Sarkar & Bhatta., 813,1286.

Leaves considered to possess cleaning and antiseptic properties.

## CV. BORAGINACEAE

1a. Shrubs or medium trees.	...	2
1b. Herbs or undershrubs.	...	3
2a. Style twice forked ; calyx shortly lobed ; drupe more than 0.8 cm across	...	4. CORDIA
2b. Style bifid ; calyx deeply lobed; drupe less than 0.8 cm across	...	6. EHRETIA
3a. Style terminal on entire ovary.	...	4
3b. Style simple or bifid, rising from between the ovary lobes.	...	6
4a. Leaves 0.6-12 cm ; flowers 0.2 cm across fruiting calyx not accrescent	...	5
4b. Leaves 1.25-12 cm ; flowers 1.8-2.5 cm across; fruiting calyx accrescent	...	8. TRICHODESMA
5a. Style bifid ; leaves dentate, oblique	...	3. COLDENIA
5b. Style 1 undivided; leaves entire, symmetric	...	7. HELIOTROPIMUM
6a. Receptacle flat, scars of nutlets basal; corolla yellow	...	1. ARNEBIA
6b. Receptacle prolonged in the form of a conical or elongated column amidst carpel and base of style; corolla otherwise	...	7
7a. Nutlets granular-scabrid; flowers long pedicelled	...	2. BOTHRIOSPERMUM
7b. Nutlets glochidiate; flowers sessile or shortly pedicelled	...	5. CYNOGLOSSUM

## 1. ARNEBIA FORSSK.

*Arnebia hispidissima* DC., Prodr. 10:94.1847 ; Cl. in Hook. f., Fl. Brit. India 4 : 176. 1883.

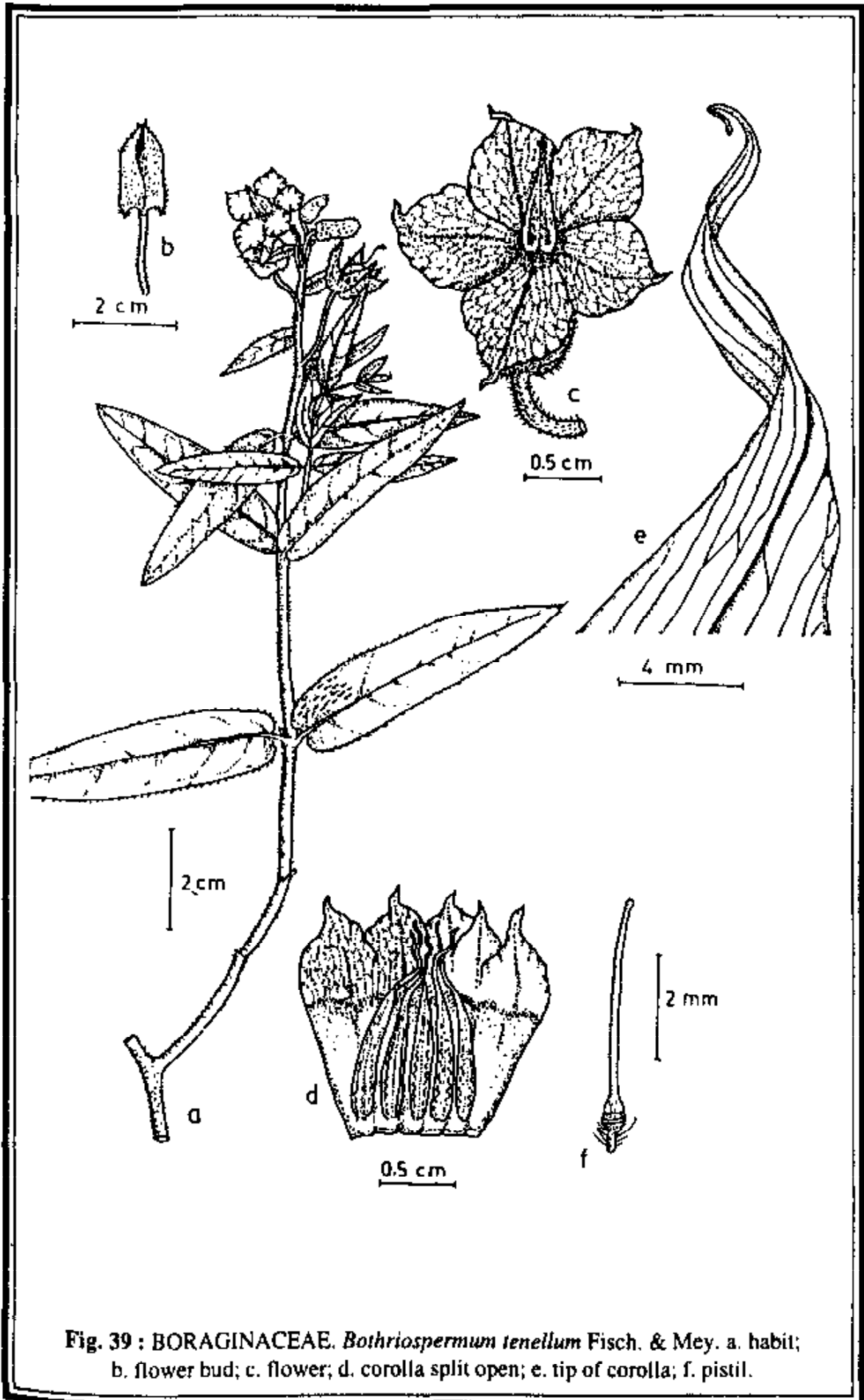


Fig. 39 : BORAGINACEAE. *Bothriospermum tenellum* Fisch. & Mey. a. habit; b. flower bud; c. flower; d. corolla split open; e. tip of corolla; f. pistil.

Diffuse herbs. Leaves linear-lanceolate, sub-obtuse, densely hispid, to 5 cm long. Flowers yellow, to 0.5 cm across. Nutlets tubercled.

Occasional on the northern areas. March. Sarkar & Bhatta., 457.

## 2. BOTHRIOSPERMUM Bunge

**Bothriospermum tenellum** Fisch. & Mey., Ind. Sem. 1 : 24.1835. Cl. in Hook. f., Fl. Brit. India 4 : 167.1883 ; Prain, Bengal Pl. 2 : 535.1903 ; Haines, Bot. Bihar & Orissa 2 : 611.1922.

Hirsute herbs to 30 cm long. Leaves lanceolate or elliptic-lanceolate, to 5 cm long. Calyx accrescent. Nutlets minutely tubercled.

Bettiah. Thothathri 9934 (CAL!).

## 3. COLDENIA L.

**Coldenia procumbens** L., Sp. Pl. 125. 1753 ; Cl. in Hook. f., Fl. Brit. India. 4 : 141.1883 ; Prain, Bengal Pl. 2 : 534.1903 ; Haines, Bot. Bihar & Orissa 2 : 606.1922.

Scabrid herbs. Leaves thick, elliptic-ovate, 1.5 × 0.8 cm. Flowers solitary, axillary, sessile ; calyx-lobes persistent. Fruit ovoid.

A common weed. February-April. Sarkar & Bhatta., 600.

Fresh leaves ground and applied to rheumatic swellings.

## 4. CORDIA L.

**Cordia dichotoma** Forst. f., Prodr. 18.1786 ; Kazmi J. Arn. Arb. 51 : 141.1970; *C. indica* Lamk., Encycl. 1 : 442.1792. *C. myxa* auct. Pl.; Cl. in Fl. Brit. India 4 : 136.1883 ; Prain, Bengal Pl. 2 : 530.1903; Haines, Bot. Bihar & Orissa 2 : 602.1922 ; non L. 1753.

Trees. Leaves ovate or suborbicular, to 10 cm long, entire or sinuately dentate. Flowers to 0.45 cm across. Petals white. Drupe ovoid, yellowish green, to 1.2 cm across, 1-seeded, pulp viscous.

Common. March-July. Sarkar & Bhatta., 470.

Fruits edible and medicinal. Wood durable.

5. CYNOGLOSSUM L.

**Cynoglossum lanceolatum** Forssk., Fl. Aegypt.-Arab. 41.1775 ; Cl. in Hook. f., Fl. Brit. India 4 : 156. 1883 ; Prain, Bengal Pl. 2 : 535.1903 ; Haines, Bot. Bihar & Orissa 2 : 610.1922.

Perennial hairy herbs or undershrubs with slender, spreading branches, upto 2 m long. Leaves linear-lanceolate, 3-12 × 1-4 cm, white dotted above. Flowers white, in long slender branches. Nutlets to 0.25 cm across.

In the forest margins. May-June. Sarkar & Bhatta., 385.

6. EHRETIA L.

- 1a. Leaves serrate ; flowers 0.37-0.4 cm  
across ... 1. *E. acuminata* var. *serrata*
- 1b. Leaves entire ; flowers 0.75-1.2 cm  
across ... 2. *E. laevis*

1. **Ehretia acuminata** R. Br., Prodr., Fl. Novae Holl. 497.1810. var. *serrata* (Roxb.) Johnston in J. Arn. Arb. 32 : 23.1951 ; *E. acuminata* auct. Pl. non R. Br.1810 ; sensu Cl. in Hook. f., Fl. Brit. India 4 : 141. 1883 ; Prain, Bengal Pl. 2 : 533.1903 ; Haines, Bot. Bihar & Orissa 2 : 604.1922.

Medium trees. Leaves ovate-oblong, serrate, acuminate, to 12 cm long. Flowers to 0.4 cm across, white. Drupe somewhat ellipsoid.

Bhikhna Thori. March-July. Thothathri 10079 (CAL!).

2. **Ehretia laevis** Roxb., Pl. Cor. 1 : 42, t. 56.1796 Cl. in Hook. f., Fl. Brit. India 4 : 141. 1883 ; Prain, Bengal Pl. 2 : 533.1903 ; Haines, Bot. Bihar & Orissa 2 : 605.1922.

Small trees. Leaves variable, ovate, elliptic or obovate, 7-12 × 3-8 cm, glabrous or pubescent beneath, secondary veins forked and reticulate below the margins. Flowers in scorpioid cymes. Drupe to 0.5 cm across, orange coloured.

Common in open areas. April-May. Sarkar & Bhatta., 796.

7. Heliotropium L.

- 1a. Fruits prominently ribbed ... 1. *H. indicum*
- 1b. Fruits not ribbed. ... 2

- 2a. Inflorescence ebracteate ; calyx-lobes  
distinctly unequal ... 2. *H. ovalifolium*
- 2b. Inflorescence bracteate ; calyx-lobes subequal ... 3. *H. strigosum*

1. ***Heliotropium indicum*** L., Sp. Pl. 130.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 152.1883 ; Prain, Bengal Pl. 2 : 532.1903 ; Haines, Bot. Bihar & Orissa 2 : 607.1922.

Herbs, slightly strigose to woolly, 15–25 cm high. Leaves alternate or rarely sub-opposite, ovate or ovate-oblong, 3–9 × 2–5 cm. Cymes coiling at the tip, to 15 cm long. Flowers white.

Common in moist places. September–March. HATISUNR. Sarkar & Bhatta., 1183.

Herbs medicinal. Leaves yield a dye.

2. ***Heliotropium ovalifolium*** Forssk., Fl. Aegypt–Arab. 38. 1775 ; Cl. in Hook. f., Fl. Brit. India 4 : 150.1883 ; Prain, Bengal Pl. 2 : 532.1903 ; Haines, Bot. Bihar & Orissa 2 : 607.1922.

Annual herbs, to 15 cm high. Leaves elliptic-obovate, sub-succulent, 1.0–1.3 × 0.5–0.8 cm. Cymes coiled. Corolla hairy in the mouth. Fruits hairy.

In waste places. Old world tropics. August–June. Sarkar & Bhatta., 1097.

Applied to syphilitic ulcers.

3. ***Heliotropium strigosum*** Willd., Sp. Pl. 1 : 743.1798 ; Cl. in Hook. f., Fl. Brit. India 4 : 150.1883 ; Prain, Bengal Pl. 2 : 532.1903 ; Haines, Bot. Bihar & Orissa 2 : 608.1922.

Prostrate, diffuse herbs, branches to 30 cm long. Leaves linear-lanceolate, 1.0–1.2 × 0.2–0.3 cm. Cymes 2–5 cm long. Flowers white. Corolla strigose, connective produced into a long acumen.

Near ponds, river beds. August–June. Sarkar & Bhatta., 1037

Laxative and diuretic.

#### 8. *TRICHODESMA* R. Br., *nom. cons.*

***Trichodesma indicum*** (L.) R. Br. ex Lehmann, Pl. Fam. Asperif. : 193.1818 ('*indica*') ; Cl. in Hook. f., Fl. Brit. India 4 : 154.1883 ; Prain, Bengal Pl.

2 : 535.1903 ; Haines, Bot. Bihar & Orissa 2 : 608.1922 ; *Borago indica* L., Sp. Pl. 137.1753.

Annual hirsute herbs, to 30 cm high. Leaves lanceolate, 3-8 × 0.7-1.5 cm, strigose on both the surfaces with white bulbous-based hairs. Flowers pinkish-white, to 1.8 cm across.

In open lands. Fl. & Fr. August-April. Sarkar & Bhatta., 505.

CVL VERBENACEAE

1a. Leaves digitately 3-5-foliolate	...	10. VITEX
1b. Leaves simple.	...	2
2a. Annual or perennial creeping herbs	...	8. PHYLA
2b. Shrubs or small trees.	...	3
3a. Flowers in spikes or racemes.	...	4
3b. Flowers in cymes.	...	6
4a. Prickly shrubs.	...	5
4b. Unarmed subshrubs ; leaves strongly aromatic	...	7. LIPPIA
5a. Flowers in lax terminal and axillary racemes	...	4. DURANTA
5b. Flowers in dense spikes	...	6. LANTANA
6a. Flowers less than 0.5 cm long.	...	7
6b. Flowers more than 1 cm long.	...	8
7a. Flowers distinctly zygomorphic ; stamens didynamous	...	9. PREMNA
7b. Flowers almost regular ; stamens not didynamous	...	1. CALLICARPA
8a. Fruit a drupe.	...	8
8b. Fruit capsular, dry	...	2. CARYOPTERIS
9a. Calyx rotate	...	5. HOLMSKIOLDIA
9b. Calyx campanulate	...	3. CLERODENDRUM

1. *CALLICARPA* L.

*Callicarpa macrophylla* Vahl, Symb. Bot, 3 : 13. t. 53. 1885 ; Cl. in Hook. f., Fl. Brit. India 4 : 568.1885 ; Prain, Bengal Pl. 2 : 618.1903 ; Haines, Bot. Bihar & Orissa 2 : 744.1922.

Shrubs. Leaves ovate-lanceolate, to 23 cm long, acuminate, white-tomentose beneath. Corolla pinkish. Drupe pearly white, to 0.4 cm across.

Along waste lands. August-December. Sarkar & Bhatta., 688.

2. *CARYOPTERIS* Bunge

*Caryopteris bicolor* (Hardw.) Mabberley in Bot. Hist. Hort. Mal. 83. 1980. *Volkameria bicolor* Hardw. in Asia Res. 6 : 366.1799. *Caryopteris wallichiana* Schauer in DC., Prodr. 11 : 625.1847. *nom. illeg.*; Cl. in Hook. f., Fl. Brit. India 4 : 597.1885 ; Prain, Bengal Pl. 2 : 624.1903 ; Haines, Bot. Bihar & Orissa 2 : 758.1922.

Shrubs, to 3.5 m high. Leaves elliptic-lanceolate or ovate-lanceolate, to 10 cm long, subserrate, acuminate. Flowers light-purple. Stamens long exserted.

Sandstone areas. Outer Himalayas from Punjab to Bhutan. December-April. Sarkar & Bhatta., 1679.

3. *CLERODENDRUM* L.

- |                                   |     |                       |
|-----------------------------------|-----|-----------------------|
| 1a. Corolla tube under 5 cm long. | ... | 2                     |
| 1b. Corolla tube over 5 cm long   | ... | 1. <i>C. indicum</i>  |
| 2a. Straggling shrubs             | ... | 2. <i>C. inerme</i>   |
| 2b. Erect shrubs.                 | ... | 3                     |
| 3a. Leaves opposite               | ... | 4. <i>C. viscosum</i> |
| 3b. Leaves in whorls              | ... | 3. <i>C. serratum</i> |

1. *Clerodendrum indicum* (L.) O. Kuntze, Rev. Gen. Pl. 586.1891 ; Moldenke in Lilloa 4 : 329.1939. *Siphonanthus indica* L., Sp. Pl. 109.1753. *Clerodendrum siphonanthus* R. Br. in Ait, f., Herb. Kew, 4 : 65.1812 ; Cl. in Hook. f., Fl. Brit. India 4 : 595.1885 ; Prain, Bengal Pl. 2 : 624.1903 ; Haines, Bot. Bihar & Orissa 2 : 757.1922.

Tall shrubs, to 2.5 m high. Leaves elliptic-lanceolate, 10–20 × 1.5–4 cm, subsessile. Flowers in terminal panicles, white. Drupe globose, subtended by red, accrescent calyx.

Along grass lands. Indomalesia. June–October. BHARANGI, Sarkar & Bhatta., 982.1390.

2. *Clerodendrum inerme* (L.) Gaertn., Fruct. 1. 271.1788 ; Cl. in Hook. f., Fl. Brit. India 4 : 589.1885 ; Prain, Bengal Pl. 2 : 623.1903; Haines, Bot. Bihar & Orissa 2 : 755.1922. *Volkameria inermis* L., Sp. Pl. 637.1753.

Straggling shrubs. Leaves obovate-ovate, to 3.5 cm long, obtuse, entire. Cymes axillary, 3-flowered. Flowers white. Corolla to 4 cm long.

Along hedges near villages. India, Sri Lanka. December–April. Sarkar & Bhatta., 1338.

3. *Clerodendrum serratum* (L.) Moon, Cat. Pl. Ceylon 46. no. 382.1824; Cl. in Hook. f., Fl. Brit. India 4 : 592.1885 ; Haines, Bot. Bihar & Orissa 2 : 757.1922 *Volkameria serrata* L., Mant. 90. 1767.

Shrubs. Leaves elliptic-ovate, to 25 cm long, serrate, subsessile. Flowers in terminal paniculate cymes, blue. Drupes ovoid.

Sandstone areas, occasional. India, Sri Lanka, Malesia. August–October. Sarkar & Bhatta., 1454.

4. *Clerodendrum viscosum* Vent., Jard, Malm. 1 : t. 25.1803 ; Moldenke in Fl. Ceylon 4 : 473.1983. *C. infortunatum* auct. Pl. ; Cl. in Hook. f., Fl. Brit. India 4 : 594.1885 ; Haines, Bot. Bihar & Orissa 2 : 756.1922 ; non L. 1753.

Shrubs to 1 m high. Leaves ovate, 10–15 cm long, acuminate, denticulate, scabrous above and pubescent beneath. Flowers white, fragrant. Drupe globose, subtended by red accrescent calyx.

Abundant along waste lands. February–July. BHANT, Sarkar & Bhatta., 930.

#### 4. DURANTA L.

*Duranta repens* L., Sp. Pl. 637.1753 ; Moldenke in Lilloa 4 : 314. 1939. Prain, Bengal Pl. 2 : 617. 1903.

Straggling shrubs. Leaves elliptic-ovate, to 5 cm long, serrate. Flowers

blue. Drupe to 0.8 cm across, orange-yellow when ripe.

Planted as a hedge plant. Native of S. America. All seasons. Sarkar & Bhatta., 1304.

#### 5. HOLMSKIOLDIA Retz.

**Holmskioldia sanguinea** Retz., Obs. 6 : 31.1791 ; Cl. in Hook. f., Fl. Brit. India 4 : 596.1885 ; Haines, Bot. Bihar & Orissa 2 : 758.1922.

Leaves ovate, to 12 cm long, acuminate, crenate, truncate or rounded at base. Flowers scarlet red. Corolla tube to 2.1 cm long. Drupe to 0.6 cm across.

Someswar Hills. India, Burma. October-May. Sarkar & Bhatta., 616.

#### 6. LANTANA L.

- |  |     |                     |
|--|-----|---------------------|
| 1a. Bracts lanceolate ; usually armed with curved prickles | ... | 1. <i>L. camara</i> |
| 1b. Bracts ovate ; usually unarmed                         | ... | 2. <i>L. indica</i> |

1. **Lantana camara** L., Sp. Pl. 627.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 562.1885 ; Haines, Bot. Bihar & Orissa 2 : 739.1922; *L. camara* L. var. *aculeata* (L.) Moldenke in Torreya 34 : 9.1974. *L. aculeata* L., Sp. Pl. 627.1753.

Subscandent shrubs. Leaves ovate, 2-9 × 1-6 cm, acuminate, rounded or cordate. Flowers of various colours. Drupe to 0.3 cm across, black when ripe.

Serious pest of waste places. Native of tropical America. All seasons. Sarkar & Bhatta., 615.

2. **Lantana indica** Roxb., Fl. Indica 3 : 89.1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 562.1885 ; Prain, Bengal Pl. 2 : 615.1903 ; Haines, Bot. Bihar & Orissa 2 : 739.1922.

Unarmed shrubs. Leaves ovate, to 2.3 cm long, acuminate. Flowers purplish. Drupe to 0.5 cm across, purple when ripe.

Along the sides of railway track. September-January. Sarkar & Bhatta., 1312. Native of Tropical Africa and South Asia.

#### 7. LIPPIA L.

**Lippia alba** (Mill.) N.E. Br. ex. Britton & Wilson in Sci. Surv. Porto Rico 6 : 141.1925 ; *L. javanica* (Burm. f.) Spreng., Syst. 2 : 752.1825 ; Meeuse in

Blumea 5 : 68.1942. *Verbena javanica* Burm. f., Fl. Indica 12.t. 6.f.2.1768. *Lippia geminata* H.B. & K., Nov. Gen. et Sp. 2 : 214.1817 ; Cl. in Hook. f., Fl. Brit. India 4 : 563.1885 ; Haines, Bot. Bihar & Orissa 2 : 740. 1922.

Aromatic shrubs. Branches to 1 m long. Leaves lanceolate, to 6 cm long, crenate-serrate. Flowers pink. Fruit breaking up into 2 one-seeded pyrenes.

Along river banks. March-December. Sarkar & Bhatta., 949.

#### 8. PHYLA Lour.

**Phyla nodiflora** (L.) Greene, Pittonia 4 : 46.1899 ; Sant., Fl. Khandala ed. 3, 211.1967. *Verbena nodiflora* L., Sp. Pl. 20.1753. *Lippia nodiflora* (L.) Rich. in Michx., Fl. Bor. Amer. 2 : 15.1803 ; Cl. in Hook. f., Fl. Brit. India 4 : 563.1885 ; Haines, Bot. Bihar & Orissa 2 : 740.1922.

Perennial herbs. Leaves obovate or spatulate, 0.5-2.8 × 0.2-1.2 cm, serrate in upper part. Flowers pink. Drupe globose.

Along moist lands. All seasons. Sarkar & Bhatta., 687.

#### 9. PREMNA L., *nom. cons.*

**Premna mucronata** Roxb., Fl. Indica 3 : 80.1832 ; *P. latifolia* Roxb. var. *mucronata* Cl. in Hook. f., Fl. Brit. India 4 : 578. 1885 ; Haines, Bot. Bihar & Orissa 2 : 752. 1922.

Small trees. Leaves broadly ovate, to 13 cm long, acuminate, entire, drying black. Corymbs rusty pubescent. Flowers white. Drupe globose.

Bikhna Thori. Outer Himalayas extending to Khasi Hills. April-June. Sarkar & Bhatta., 1097, 1569.

#### 10. VITEX L.

**Vitex negundo** L., Sp. Pl. 638.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 583.1885 ; Haines, Bot. Bihar & Orissa 2 : 746. 1922.

Shrubs, to 2.5 m high. Leaflets elliptic or lanceolate, 2-10 × 1-3 cm, silvery tomentose beneath. Panicle of cymes to 20 cm long. Flowers blue, to 0.6 cm long. Drupe globose, black.

Common near villages, sometimes planted for fencing. July-November. Sarkar & Bhatta., 1313.

CVII. LAMIACEAE (LABIATAE *nom. alt.*)

1a. Leaves palmatifid	...	8. LEONURUS
1b. Leaves simple or shallowly incised	...	2
2a. Stamens 4, declinate (lying on the lower lip or enclosed by it); anther-cells confluent	...	3
2b. Stamens not declinate; anther-cells 1-2	...	7
3a. Anterior corolla-lobe scarcely longer than posterior, neither deeply concave nor constricted at base	...	4
3b. Anterior corolla-lobe deeply concave in front or constricted at base	...	6
4a. Posterior calyx-lobe broader than the others, decurrent on the tube and enlarged in fruit.	...	11. OCIMUM
4b. Posterior calyx-lobe larger than the others, but not decurrent on the tube	...	5
5a. Flower whorls crowded in terminal and axillary globose or ovoid heads with imbricate bracts; fruiting calyx suberect	...	1. ACROCEPHALUS
5b. Flower whorls forming long terminal spicate racemes; bracts, white, conspicuous; fruiting calyx usually declinate, rugosely pitted near base	...	5. GENIOSPORUM
6a. Anterior lip of corolla elongated, not sharply deflexed	...	13. PLECTRANTHUS
6b. Anterior lip of corolla short; sharply deflexed	...	6. HYPTIS
7a. Stamens suberect, diverging and distant; corolla lobes flat	...	8
7b. Stamens ascending, usually in unequal pairs; anther-cells distinct; corolla lipped, upper erect, concave or hooded, lower spreading	...	11

- |  |     |                 |
|--|-----|-----------------|
| 8a. Anthers subglobose, 1-celled, widely expanded after shedding pollen; corolla subequally 4-fid or lower lobe larger                         | ... | 9               |
| 8b. Anthers 2-celled, at least when young; corolla often weakly 2-lipped, lobes 5, calyx, 2-lipped   | ... | 12. PERILLA     |
| 9a. Calyx 5-toothed, lobes not plumose; stamens, exerted, filaments bearded  | ... | 10              |
| 9b. Calyx 5-fid but segments plumose; stamens included, filaments naked  | ... | 3. COLEBROOKEA  |
| 10a. Inflorescence of paniced sub-capitate cymes; calyx tubular-ovoid; corolla sub-2-lipped  | ... | 14. POGOSTEMON  |
| 10b. Inflorescence spicate; calyx minute, ovoid; corolla subequally 4-fid  | ... | 4. DYSOPHYLLA   |
| 11a. Perfect stamens 2; connectives slender, jointed on the filament   | ... | 15. SALVIA      |
| 11b. Perfect stamens 4, didynamous   | ... | 12              |
| 12a. Posterior pairs of stamens longer; upper lip not galeate  | ... | 13              |
| 12b. Anterior pair of stamens longer, ascending under the galeate upper lip  | ... | 14              |
| 13a. Anthers all 2-celled, cells diverging; calyx tubular, 15-ribbed, 5 toothed; stamens not exerted; weak herbs                               | ... | 10. NEPETA      |
| 13b. Upper pair of stamens with 1-celled anthers; calyx 5-10 nerved; stamens exerted; suffruticose shrubs                                      | ... | 2. ANISOMELES   |
| 14a. Anterior pair of stamens with 1-celled anthers; calyx 2-lipped with a broad plate or pouch at the back, the mouth closed after flowering  | ... | 16. SCUTELLARIA |
| 14b. Both pairs of stamens with 2-celled anthers; upper (galeate) corolla-lip pubescent or villous; anther-cells divergent; calyx 8-10 toothed | ... | 15              |

- 15a. Lower lip of corolla shorter than the hood;  
calyx-teeth sharply spinescent; flowers red ... 7. LEONOTIS
- 15b. Lower lip of corolla longer than the hood;  
calyx-teeth not spinescent; flowers white ... 9. LEUCAS

### 1. ACROCEPHALUS Benth.

**Acrocephalus hispidus** (L.) Nicolson & Sivadasan in Taxon 29 : 324.1980. *Gomphrena hispida* L., Sp. Pl. ed. 2 : 326.1762. *Ocimum capitatum* Roth, Nov. Pl. Sp. 276. 1821. *Acrocephalus capitatus* (Roth.) Benth. Bot. Reg. 15: t. 1300.1830 ; Hook. f., Fl. Brit. India 4 : 611. 1885 ; Haines, Bot. Bihar & Orissa 2 : 768.1922.

Herbs, to 25 cm high. Leaves ovate-lanceolate, 2-4 cm long, coarsely serrate, tapering at the base. Heads to 1.2 cm across. Calyx pubescent outside ; upper lip entire; lower lip with 4 lanceolate teeth. Corolla pale purple. Nutlets oblong-ellipsoid.

Exposed forest margins, sandstone areas. September-November. Sarkar & Bhatta., 1099.

### 2. ANISOMELES R. Br.

**Anisomeles indica** (L.) O.Kuntze, Rev. Gen. Pl. 2 : 512. 1891 ; Haines, Bot. Bihar & Orissa 2 : 782.1922 ; King in Gard. Bull Straits Settlem. 24: 34. 1969. *Nepeta indica* L, Sp. Pl. 571.1753 *Anisomeles ovata* Ait. f., Hort. Kew. (ed.2), 3 : 364.1811 ; Hook. f., Fl. Brit. India 4 : 672.1885.

Subshrubs, to 1.5 m high ; stem acutely tetragonous, greyish-tomentose. Leaves ovate, 3-8 cm long, serrate, hirsute on both the surfaces. Cymes sessile. Corolla pink. Nutlets to 0.25 cm long, shining black.

Common along waste places. September-January. Sarkar & Bhatta., 931.

Herb used as an astringent and carminative.

### 3. COLEBROOKEA Sm.

**Colebrookea oppositifolia** Sm. Exot. Bot. 2. t. 115.1805 ; Hook. f., Fl. Brit. India 4 : 642.1885 ; Haines, Bot. Bihar & Orissa 2 : 777.1922

Shrubs, 2-3m high, whitish-tomentose throughout. Leaves elliptic-oblong, 10-20 × 4-5 cm, strongly nerved. Spikes to 10 cm long, with dense flowers. Corolla white. Nutlets oblong,-ovoid, hairy at the tip.

Very common along waste grounds & forest margins. January–March. Sarkar & Bhatta., 213, 978.

Roots and leaves medicinal.

#### 4. *DYSOPHYLLA* Bl., *nom. cons.*

*Dysophylla cruciata* Benth. in Wall., Pl. As. Rar. 1 : 30. 1830 ; Hook. f., Fl. Brit. India 4 : 639.1885 ; Haines, Bot. Bihar & Orissa 2 : 775.1922. *Eusteralis cruciata* Panig., Phytologia 32 : 478.1976.

Erect herbs, to 50 cm high ; stems densely villose. Leaves in whorls, linear, sessile, to 5 cm long, margins somewhat revolute. Flowers purplish.

Open grass lands. October–March. Sarkar & Bhatta., 1644.

#### 5. *GENIOSPORUM* Wall. ex Benth.

*Geniosporum coloratum* (D. Don) Kuntze, Rev. Gen. Pl. 2 : 517.1891 ; Mukerjee in Rec. Bot. Surv. India 14 : 32.1940. *Plectranthus coloratus* D. Don, Prodr. 116. 1825. *Geniosporum strobiliferum* Wall., Pl. As. Rar. 2 : 18. 1831 ; Hook. f., Fl. Brit. India 4 : 610.1885 ; Haines, Bot. Bihar & Orissa 2 : 767.1922.

Herbs to 70 cm high, obtusely angled. Leaves lanceolate, 5–12 × 2.5–4 cm, coarsely serrate. Spikes to 14 cm long ; bracts foliaceous, white, deciduous. Calyx with two black glands on the lower lip. Corolla white. Nutlets ellipsoid.

Sandstone areas. August–November. Sarkar & Bhatta., 1088, 1242.

#### 6. *HYPTIS* Jacq., *nom. cons.*

*Hyptis suaveolens* (L.) Poir. in Ann. Mus. Nat. Hist. Paris, 7 : 472. t. 29. f. 2.1806 ; Hook. f., Fl. Brit. India 4 : 630.1885 ; Haines, Bot. Bihar & Orissa 2 : 772.1922. *Ballota suaveolens* L., Syst. ed. 10, 1100, 1759.

Sweet-scented undershrubs, 0.7–1.5 m ; branches 4-angled, white hairy. Leaves ovate, crenate-denticulate, 3.0–9.5 cm, purplish-green when young. Flowers purple. Calyx somewhat deflexed. Nutlets to 0.3 cm long.

Along waste places. Introduced from Tropical America October–January. GANGA TULSI. Sarkar & Bhatta., 1360.

Yields an essential oil. Roots and leaves medicinal, stimulant, carminative, sudorific and lactagogue.

## 7. LEONOTIS (Pers.) R. Br.

**Leonotis nepetifolia** (L.) R. Br., Prodr. 504. 1810 ; Hook. f., Fl. Brit. India 4 : 691.1885 ; Haines, Bot. Bihar & Orissa 2 : 789.1922; *Phlomis 'nepetifolia'* L., Sp. Pl. 586. 1753.

Annuals to 1.5 m high. Leaves ovate, 4–20 cm long, crenate. Flowers bright orange–red, velvety; bracts many, spinescent. Corolla–tube exserted. Nutlets oblong–ovoid, black.

In waste lands. October–January. Sarkar & Bhatta., 681.

Used in skin affections. Leaves used for rheumatism. Seeds yield a fatty oil, similar to olive oil.

## 8. LEONURUS L.

**Leonurus japonicus** Houtt., Nat. Hist. Pl. 9 : 366. t. 57.f. 1.1788 ; Hara in J. Japanese Bot. 51 : 226. 1976. *L. sibiricus* auct. pl. ; Hook. f., Fl. Brit. India 4 : 678.1885 ; Haines, Bot. Bihar & Orissa 2 : 783 ; non L. 1753.

Herbs to 1 m high. Leaf–segments irregularly incised. Flowers pink. Corolla tube annulate within. Nutlets to 0.2 cm long.

Common in waste places. Pantropical. Sarkar & Bhatta., 1305.

Leaf contains 'leonurine', an alkaloid, effective for uterus contraction. Seeds contain fatty and volatile oil.

## 9. LEUCAS R. Br.

- |  |     |                             |
|--|-----|-----------------------------|
| 1a. Calyx–mouth regular, not oblique.                            | ... | 2                           |
| 1b. Calyx–mouth oblique.   | ... | 3                           |
| 2a. Leaves broadly ovate or elliptic ;<br>margin crenate serrate | ... | 1. <i>L. biflora</i>        |
| 2b. Leaves oblong–lanceolate ; margin serrulate                  | ... | 3. <i>L. helicterifolia</i> |
| 3a. Calyx–mouth with erect villi ; teeth slender                 | ... | 2. <i>L. cephalotes</i>     |
| 3b. Calyx–mouth not villous ; teeth smaller.                     | ... | 4                           |
| 4a. Calyx–smooth below ; bracts long, linear, filiform           | ... | 5. <i>L. plukenetii</i>     |
| 4b. Calyx–smooth throughout ; bracts short                       | ... | 4. <i>L. indica</i>         |

1. **Leucas biflora** (Vahl) R. Br., Prodr. 504.1810 ; Hook.f., Fl. Brit. India 4 : 683. 1885 (excl. syn. *L. procumbens* Thw.). *Phlomis biflora* Vahl, Symb. Bot. 3 : 77.1794.

Procumbent or trailing herbs. Stem 4-angular, retrorsely pubescent. Leaves broadly ovate or elliptic, 1.5–5 cm long, obtuse, serrate or crenate ; bracts setaceous. Calyx to 0.8 cm long. Nutlets to 0.15 cm long.

Sandstone areas and waste lands. October–December. Sarkar & Bhatta., 1404.

2. **Leucas cephalotes** (Roth) Spreng., Syst. 2 : 743.1825 ; Hook. f., Fl. Brit. India 4 : 689.1885 ; Haines, Bot. Bihar & Orissa 2 : 787.1922; *Phlomis cephalotes* Roth, Nov. Pl. Sp. 262.1821.

Annual herbs, obtusely 4-angled, pubescent. Leaves elliptic–lanceolate or ovate–lanceolate, 3–10 cm long, crenate–serrate, glandular–punctate–beneath. Calyx to 2 cm long, ciliate. Corolla white, woolly. Nutlets to 0.3 cm long.

Along waste grounds. India, Afganistan. September–December. Sarkar & Bhatta., 375.

Stimulant, diaphoretic, laxative and anthelmintic. Seeds yield an oil.

3. **Leucas helicterifolia** Haines, Kew Bull. 6 : 188.1922 & Bot. Bihar & Orissa 2 : 784.1922.

Suberect herbs ; stems 4-angled, covered with dense spreading hairs. Leaves oblong lanceolate, serrulate. Calyx obconic. Corolla white; tube exerted; upper lip densely bearded on the margins.

Common in the sandstone areas. Endemic in the area. November–December. Sarkar & Bhatta., 1487.

4. **Leucas indica** (L.) R. Br. ex Vatke in Oesterr. Bot. Zeits. 25 : 95.1875; Press in Enum. Fl. Pl. Nepal 3 : 157. 1982. *Leonurus indicus* L., Syst. ed. 10 : 1101. 1760. *Leucas linifolia* (Roth) Spreng. Syst. 2 : 743.1825 ; Hook. f., Fl. Brit. India 4 : 690. 1885 ; Haines, Bot. Bihar & Orissa 2 : 788.1922.

Perennial herbs, to 30 cm high, softly pubescent. Leaves linear–lanceolate, 5–10 cm long. Flowers subsessile or shortly pedicelled, white, in axillary and terminal clusters. Calyx–teeth minute, somewhat spinulose. Nutlets oblong, to 0.2 cm long.

Very common along river-beds and cultivated fields. May–December. Shetty 371 (CAL!).

5. *Leucas plukenetii* (Roth) Spreng., Syst. Veg. 2 : 743.1825 ; Press in Enum. Fl. Pl. Nepal 3 : 157. 1982. *Phlomis plukenetii* Roth, Nov. Sp. 261.1821. *Leucas aspera* Link, Enum. H. Berol 2 : 113.1822 ; Hook.f., Fl. Brit. India 4 : 690.1885 ; Haines, Bot. Bihar & Orissa 2 : 788.1922.

Annual herbs ; branches 4-angled, hispid or scabrid. Leaves linear or oblong, entire or crenate. Flowers sessile in axillary or terminal whorls. Calyx-tube curved ; teeth small, spinescent. Corolla tube annulate within. Nutlets oblong, brown.

Common in waste places. July–January. Sarkar & Bhatta., 1741.

Flowers given with honey for coughs and colds. Juice of leaves applied externally in chronic skin eruptions.

#### 10. NEPETA L.

*Nepeta hindostana* (Roth) Haines, Bot. Bihar & Orissa 744.1922 ; (repr. 2 : 781) *Glechoma hindostana* Roth, Nov. Sp. Pl. 259.1821. *Nepeta ruderalis* Buch.–Ham. ex Benth. in Wall., Pl. As. Rar. 1 : 64. 1860 ; Hook. f., Fl. Brit. India 4 : 661.1885.

Herbs to 40 cm high. Leaves ovate, 1.5–6.0 cm long, crenate-serrate ; petiole slender, to 2 cm long. Corolla purple-blue, to 0.6 cm long. Nutlets oblong-ellipsoid, spotted with white.

Moist grounds, India to Afghanistan. March–June. Sarkar & Bhatta., 221.

Cardiac tonic. Leaves yield an essential oil.

#### 11. OCIMUM L.

- 1a. Fruiting calyx 0.4–0.5 cm long ;  
corolla 0.5–0.7 cm long ... 1. *O. americanum*
- 1b. Fruiting calyx 0.6–0.8 cm long ;  
corolla 0.7–1 cm long ... 2. *O. basilicum*

1. *Ocimum americanum* L., in Juslenius, Cent. 1 : Pl. 15,1755 ; Keng. in Gard. Bull. Straits Settlements 24 : 126.1969. *O. canum* Sims in Bot. Mag. 51., Pl. 2452. 1823 ; Hook. f., Fl. Brit. India 4 : 607.1885 ; Haines, Bot. Bihar & Orissa 2 : 764.1922.

Annual herbs, to 50 cm high. Leaves elliptic-lanceolate, 1.5–3.5 cm long, entire or faintly toothed ; pedicels 1–2 cm long. Calyx villous. Corolla white.

Along roadside waste places. July–December. BANTULASI. Sarkar & Bhatta., 1026.

Yields a volatile oil used in soaps and cosmetics. Seeds medicinal.

2. *Ocimum basilicum* L., Sp. Pl. 597.1753 ; Benth. in DC., Prodr. 12 : 32.1848 ; Hook. f., Fl. Brit. India 4 : 608.1885 ; Haines, Bot. Bihar & Orissa 2 : 763.1922.

Annual or perennial herbs, to 1 m high. Leaves ovate-lanceolate, acute, 2–4 cm long, entire or serrate ; petioles 1–2 cm long, hairy. Corolla white or slightly bluish. Nutlets ellipsoid, 0.2–0.3 cm long, black.

In waste lands, also cultivated. August–March. RAM TULSI. Sarkar & Bhatta., 1470.

Yields a volatile oil.

## 12. PERILLA L.

*Perilla frutescens* (L.) Britt. in Mem. Torrey Bot. Cl. 5 : 277.1894 ; Murata, Fl. East. Himalaya 280. 1966. *Ocimum frutescens* L., Sp. Pl. 1 : 597.1753. *Perilla ocimoides* auct. Hook. f., Fl. Brit. India 4 : 646.1885 ; Haines, Bot. Bihar & Orissa 2 : 778.1922 ; non L.1764.

Shrubs, to 1.25 m high. Leaves ovate, 6–10 cm long, coarsely serrate, densely hairy. Racemes to 10 cm long. Corolla white.

In forest areas. India. October–December. Sarkar & Bhatta., 1185.

Leaves and flowering tops used as flavourings. Herbs sedative, antispasmodic. Yields a volatile oil.

## 13. PLECTRANTHUS L' Her., *nom. cons.*

*Plectranthus mollis* (Ait.) Spreng. Syst. Veg. 2 : 690.1825 ; Gandhi in Fl. Hassan Dist. 506.1976. *Ocimum molle* Ait., Hort. Kew 2 : 322.1789. *Plectranthus incanus* Link, Enum. Hort. Berol. 2 : 120.1822 ; Hook. f., Fl. Brit. India 4 : 621.1885 ; Haines, Bot. Bihar & Orissa 2 : 771.1922.

Herbs, to 50 cm high. Leaves ovate-cordate, 5–10 cm long, crenate ; petiole 3–8 cm long. Corolla bluish-white.

In waste lands. India. August–October. Sarkar & Bhatta. 1417.

Crushed leaves used to stop bleeding and as a febrifuge ; also used as a mosquito repellent. Leaves yield an essential oil.

14. *POGOSTEMON* Desf., *nom. cons.*

***Pogostemon benghalense*** (Burm.f.) O.Kuntze, Rev. Gen. Pl. 529.1891; Merrill in Philip. J. Sci. 19 : 379. 1921. *Origanum benghalense* Burm. f., Fl. Indica 128.t.38.f. 3.1768. *Pogostemon plectranthoides* Desf. in Ann. Mus. Paris 2 : 155. 1803 ; Hook. f., Fl. Brit. India 4 : 632.1885 ; Haines, Bot. Bihar & Orissa 2 : 773.1922.

Leaves ovate, 5–12 × 3–7 cm, double serrate, truncate at base, white tomentose beneath. Bracts softly pubescent. Calyx ciliate, to 0.5 cm long. Corolla pinkish–white. Nutlets minute, brownish.

Very common along the forests. January–April. ISHWAR JATA. Sarkar & Bhatta., 212,259.

Leaves contain an essential oil. Roots stimulant and antihaemorrhagic.

15. *SALVIA* L.

***Salvia plebeia*** R. Br., Prodr. 501. 1810 ; Hook. f., Fl. Brit. India 4 : 655.1885 ; Haines, Bot. Bihar & Orissa 2 : 780.1922.

Herbs to 25 cm high. Leaves oblong-lanceolate, ovate, 2.5–7.5 cm long. Crenate, wrinkled. Flowers minute. Corolla white or bluish, tube exserted. Nutlets ovoid, brown.

Common in sandy river–beds. February–April. Sarkar & Bhatta., 376.

Seeds mucilaginous, used in menorrhagia, diarrhoea and hemorrhoids. Mucilage employed to give gloss to the hair.

16. *SCUTELLARIA* L.

***Scutellaria repens*** Buch.–Ham. ex D. Don, Prodr. Fl. Nepal. 110.1825; Hook. f., Fl. Brit. India 4 : 669.1885 ; Mukerjee Rec. Bot. Surv. India 14(1) : 229.1940.

Stems somewhat woody, 4–angled. Leaves ovate, to 4 cm long, crenate-serrate or entire, acute or truncate at base. Racemes to 25 cm long ; bracts foliaceous. Corolla white.

On the sandstone areas. October–December. Sarkar & Bhatta., 1242.

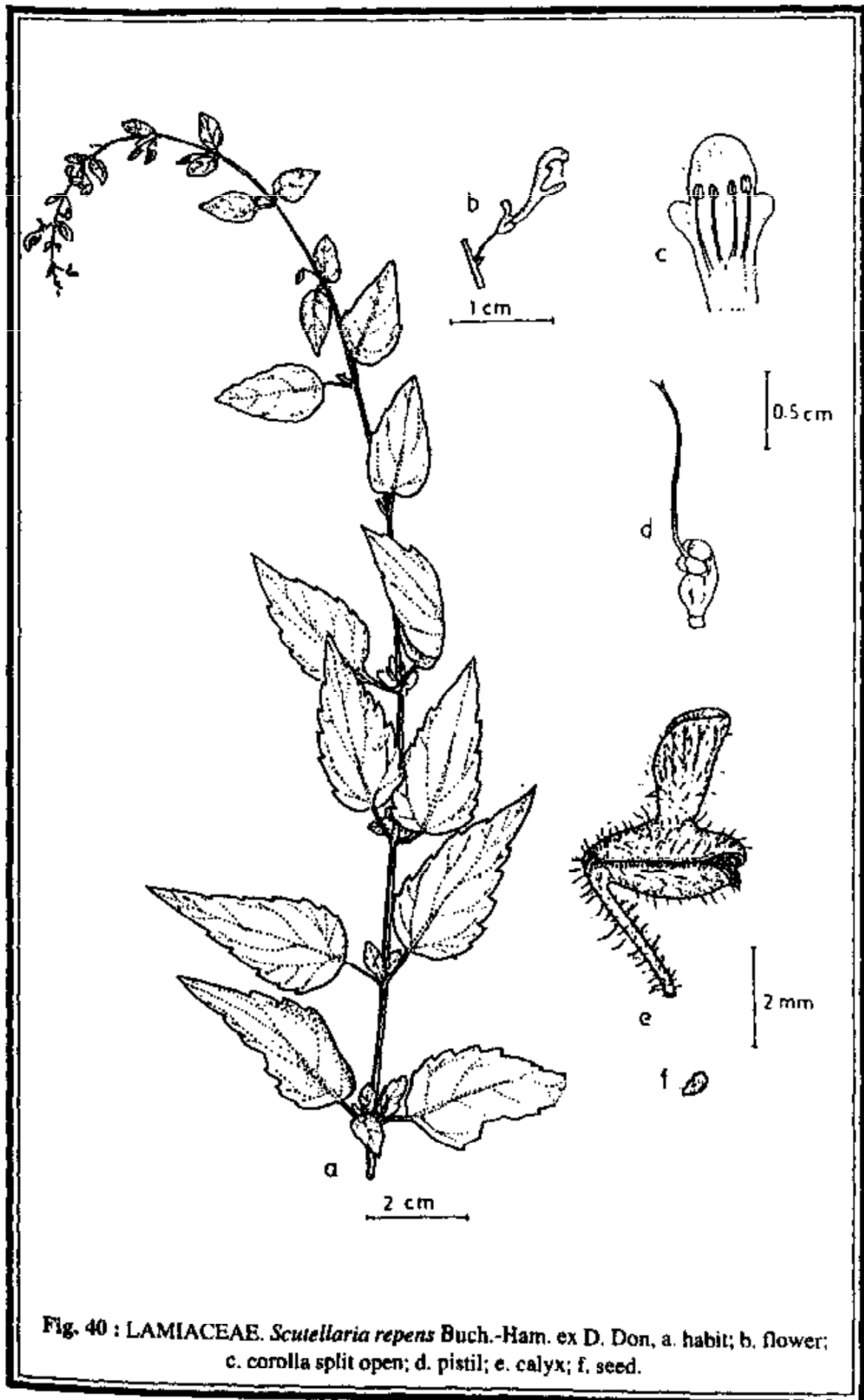


Fig. 40 : LAMIACEAE. *Scutellaria repens* Buch.-Ham. ex D. Don, a. habit; b. flower; c. corolla split open; d. pistil; e. calyx; f. seed.

## CVIII. BUDDLEJACEAE

## 1. BUDDLEJA L.

**Buddleja asiatica** Lour., Fl. Cochinch. 72. 1790 ; Cl. in Hook. f., Fl. Brit. India 4 : 82. 1883 ; Haines, Bot. Bihar & Orissa 2 : 591.1922.

Shrubs 2-5m high. Young branches densely hairy. Leaves on long branches ovate-lanceolate, 7-15 × 1-1.9 cm, sub-acuminate, subentire, undersurface, densely tomentose. Calyx tomentose. Corolla white, externally stellate hairy. Capsule ovoid, brown. Seeds linear-ellipsoid.

Common in the sandstone hills along ravines. May-June. NEEMDA. Sarkar & Bhatta., 1354.

Roots used in the preparation of a fermented liquor. Flowers eaten.

## CIX. OLEACEAE

## JASMINUM L.

1a. Leaves simple.	...	2
1b. Leaves 3-foliolate.	...	5
2a. Cymes lax, few-flowered.	...	3
2b. Cymes dense, many-flowered.	...	4
3a. Cymes 7-many-flowered	...	1. <i>J. arborescens</i>
3b. Cymes 3-5-flowered	...	<i>J. sambac</i>
4a. Leaves pubescent	...	4. <i>J. multiflorum</i>
4b. Leaves glabrous	...	6. <i>J. scandens</i>
5a. Lateral leaflets very small	...	2. <i>J. auriculatum</i>
5b. Lateral leaflets not much smaller than the terminal one	...	3. <i>J. caudatum</i>

1. **Jasminum arborescens** Roxb., Fl. Indica. 1 : 94.1820 ; Cl. in Hook. f., Fl. Brit. India 3 : 594.1882 ; Haines, Bot. Bihar & Orissa 2 : 552. 1922.

Climbers, 5–20 m high. Leaves ovate–acuminate, tomentose when young. Flowers white, fragrant, in lax trichotomous cymes ; bracts oblong, green, turning purplish black with age. Corolla lobes usually 9. Fruit oblong, with membranous pericarp, black when ripe.

On roadside trees and sal forests. April–June. SAPTALA.

2. *Jasminum auriculatum* Vahl, Symb. Bot. 3 : 1.1794 ; Cl. in Hook. f., Fl. Brit. India 3 : 600.1882 ; Haines, Bot. Bihar & Orissa 2 : 551.1922.

Cultivated in gardens. Fl. : March–September. JUI. Sarkar & Bhatta., 975.

3. *Jasminum caudatum* Wall. ex DC., Prodr. 8 : 307. 1844 ; Cl. in Hook. f., Fl. Brit. India 3 : 595. 1882 ; Haines, Bot. Bihar & Orissa 2 : 552.1922.

Climbing shrubs. Leaves 3–foliolate. Leaflets lanceolate. Flowers in slender 1–7–flowered cymes.

Occasional in the Ramnagar Hills. Haines 882 (CAL).

4. *Jasminum multiflorum* (Brum.f.) Andrews in Bot. Repos. 8.t. 496. 1807 ; Grohmann in Fl. W. Pakistan 59 : 23. 1974. *Nyctanthes multiflora* Burm. f., Fl. Indica 5. t. 3. f. 1.1768. *N. pubescens* Retz., Obs. 5 : 9. 1789. *Jasminum pubescens* (Retz.) Willd., Sp. Pl. ed. 4.1 : 37. 1797 ; Cl. in Hook. f., Fl. Brit. India 3 : 592.1882 ; Haines, Bot. Bihar & Orissa 2 : 550.1922.

Scandent shrubs. Leaves ovate, acuminate, upper surface pubescent. Flowers fragrant, in dense capitate cymes. Corolla lobes 6–9. Fruit ellipsoid, simple or didymous, black when ripe, surrounded by long hairy accrescent calyx.

Common in the forest areas, also planted. December–September. Sarkar & Bhatta., 228.

5. *Jasminum sambac* Ait., Hort. Kew. 1 : 8.1789 ; Cl. in Hook. f., Fl. Brit. India 3 : 591. 1882 ; Haines, Bot. Bihar & Orissa 2 : 549.1922.

Climbing or bushy shrubs. Leaves ovate to elliptic–lanceolate. Flowers to 2.3 cm across. Sepals subulate. Corolla lobes narrowly oblong, acute or obtuse. Berry globose, black, to 0.5 cm across.

Wild and also cultivated. April–July. BELI. Sarkar & Bhatta., 945.

6. *Jasminum scandens* Vahl, Symb. Bot. 3 : 1.1794 ; Cl. in Hook. f., Fl. Brit. India 3 : 595. 1882 ; Haines, Bot. Bihar & Orissa 2 : 550. 1922.

Climbing shrubs. Leaves ovate-lanceolate, acuminate, glabrous. Cymes 3-chotomous, each branch 3-flowered. Sepals subulate. Corolla lobes linear-oblong.

Haines (*l.c.*) reported the plant from Champaran. Haines 1630 (CAL !).

Note : *Nyctanthes arbor-tristis* L. is a very common, drought resistant, small tree at Bhikna-Thari. It prefers steep banks and warm-humid weather. Linnaeus placed it in the class DIANDRIA order MONOGYNIA along with the capsular fruit bearing genus *Syringa*. As its fragrant essential oil is expressed out of the flowers and not of the pericarp and as its ovules are erect, Voigt (1845) included it in the natural order JASMINACEAE Juss., 1789 but not in OLEACEAE Hoffm. & Link, 1813-1820. Kundu & De (Bull. Bot. Surv. India 10 : 397-408, 1968) proposed a new monogeneric-monotypic family NYCTANTHACEAE but Cronquist (1981) placed it in VERBENACEAE J. St.-Hil., 1805. However, for the want of a reasonable degree of distinction, traditionally it belongs to the family Oleaceae in Indian Flora. —Bhatta.

#### CX. SCROPHULARIACEAE

1a. Leaves all alternate	...	12. VERBASCUM
1b. Leaves all opposite or the lower only.	...	2
2a. Corolla spurred at the base ; capsule poricidal	...	2. ANTIRRHINUM
2b. Corolla not spurred ; capsule not as above.	...	3
3a. Corolla distinctly 2-lipped ; upper two lobes smaller ; partial root parasite	...	11. STRIGA
3b. Corolla not distinctly 2-lipped ; plants not parasitic.		4
4a. Stamens 2 ; capsule didymous	...	13. VERONICA
4b. Stamens 4 ; capsule not didymous.	...	5
5a. Stamens 2 fertile	...	7. LINDERNIA
5b. Stamens 4, perfect, included in the tube.	...	6
6a. Leaves entire	...	3. BACOPA
6b. Leaves crenate, serrate or dentate.	...	7

- |  |                 |
|--|-----------------|
| 7a. Aromatic marsh herbs ; submerged levels pectinate ...  | 5. LIMNOPHILA   |
| 7b. Plants not as above. ...                               | 8               |
| 8a. Flowers yellow or pinkish. ...                         | 9               |
| 8b. Flowers bluish or white. ...                           | 11              |
| 9a. Leaves sub-sessile or sessile ...                      | 10              |
| 9b. Leaves distinctly petiolate ...                        | 6. LINDENBERGIA |
| 10a. Calyx entire or 3-5-lobed ...                         | 4. CENTRANTHERA |
| 10b. Calyx deeply 5-partite ...                            | 9. MECARDONIA   |
| 11a. Corolla sub-rotate ; tube short ...                   | 10. SCOPARIA    |
| 11b. Corolla more or less bilabiate ; tube long. ...       | 12              |
| 12a. Small herbs, to 8 cm long ; leaves mainly radical ... | 8. MAZUS        |
| 12b. Herbs to 50 cm high ; leaves cauline ...              | 1. ADENOSMA     |

1. ADENOSMA R. Br.

*Adenosma indiana* (Lour.) Merr., in Trans. Amer. Philos. Soc. n. s. 24(2) : 351. 1935 ; Yamazaki in Fl. E. Himalaya 285.1966. *Manulea indiana* Lour., Fl. Cochinch. 386.1790. *Adenosma capitatum* Benth. ex Hance, in J. Linn. Soc. 13 : 114.1873 ; Hook. f., Fl. Brit. India 4 : 264.1884 ; Haines, Bot. Bihar & Orissa 2 : 655.1922.

Glandular-pubescent herbs. Leaves ovate or ovate-oblong, 2.5-5 cm long, crenulate. Corolla bluish. Capsule loculicidal. Seeds smooth.

Along river beds. June-December. Sarkar & Bhatta., 1816.

2. ANTIRRHINUM L.

- |                                |                       |
|--------------------------------|-----------------------|
| 1a. Flowers to 1.2 cm long ... | 2. <i>A. orontium</i> |
| 1b. Flowers to 2.5 cm long ... | 1. <i>A. majus</i>    |

1. *Antirrhinum majus* L., Sp. Pl. 617. 1753 ; Haines, Bot. Bihar & Orissa 2 : 650. 1922. Bailey, Man. Cult. Pl. 895. 1949.

Herbs, to 1 m high. Leaves lanceolate or oblong lanceolate. Flowers showy.

A winter season garden ornamentals. Sarkar & Bhatta., 417.

2. *Antirrhinum orontium* L., Sp. Pl. 617. 1753 ; Hook. f., Fl. Brit. India 4 : 253. 1884.

Annual herbs, to 30 cm high. Leaves linear-lanceolate, to 5 cm long. Capsule to 1 cm long.

Weed of wheat cultivation. December-March. Sarkar & Bhatta., 1296.

### 3. *BACOPA* Aubl., *nom. cons.*

*Bacopa monnieri* (L.) Wettst. in Pflanzenfam. 4(3b) : 77.1891 ('monniera'); Pennell. in Proc. Acad. Nat. Sci. Philad. 98 : 94.1946; Philcox in Kew Bull. 33 : 679.1979. *Lysimachia monnieri* L., in Torner Cent. Pl. 2 : 9. 1756. *Herpestis monniera* (L.) H. B. & K., Nov. Gen. & Sp. 2 : 366.1818 *nom. illeg* ; Hook. f., Fl. Brit. India 4 : 272.1884 ; Haines, Bot. Bihar & Orissa 2 : 652.1922.

Branches to 25 cm long. Leaves oblanceolate, 1.1-1.9 × 0.4-0.7 cm. Corolla bluish-white or pinkish.

Along muddy or damp soil, July-October. BRAHMI. Sarkar & Bhatta., 1178.

Medicinal, used as a brain-tonic.

### 4. *CENTRANTHERA* R. Br.

*Centranthera nepalensis* D. Don. Prodr. 88. 1825 ; Manilal & Sivarajan. Fl. Calicut 206.1982. *C. hispida* auct. Pl. ; Hook. f., Fl. Brit. India 4 : 301. 1884 ; Haines, Bot. Bihar & Orissa 2 : 668.1922 ; non R. Br. 1810.

Erect, somewhat hispid or hoary herbs. Leaves clothed with white tubercles. Flowers to 1.5 cm long. Capsule 0.5-0.6 cm long.

In grasslands. Indomalesia, China, Philippine, Australia. June-October. Sarkar & Bhatta., 1252.

Note : Cook treated this taxon under *Centranthera indica* (L.) Gamble, Fl. Madras 971 (683). 1924; *Rhinanthus indicus* L., Sp. Pl. 603.1753. —Bhatta.

### 5. *LIMNOPHILA* R. Br., *nom. cons.*

- |  |     |                           |
|--|-----|---------------------------|
| 1a. Leaves all entire                      | ... | 2. <i>L. rugosa</i>       |
| 1b. Lower or submerged leaves pectinate.   | ... | 2                         |
| 2a. Flowers pedicellate, longer than calyx | ... | 1. <i>L. indica</i>       |
| 2b. Flowers sessile or subsessile          | ... | 3. <i>L. sessiliflora</i> |

1. *Limnophila indica* (L.) Druce in Rep. Bot. Exch. Club. Brit. Isl. 3 : 420.1914 ; Philcox in Kew Bull. 24 : 115.1970. *Hottonia indica* L., Syst. ed. 10. 919. 1759. *Limnophila gratioloides* R. Br., Prodr. 442.1810 ; Hook. f., Fl. Brit. India 4 : 271.1884 ; Haines, Bot. Bihar & Orissa 2 : 658.1922.

Herbs, to 18 cm long. Flowers solitary, axillary or in short racemes. Corolla 0.9–1.3 cm long, bluish–white. Capsule ellipsoid or globose.

Along the margins of marshes. September–February. Sarkar & Bhatta., 1177.

2. *Limnophila rugosa* (Roth) Merr., Interpret. Herb. Amb. 466.1917 ; Philcox in Kew Bull. 24 : 135.1970. *Herpestis rugosa* Roth, Nov. Pl. Sp. 290.1821. *Limnophila roxburghii* auct. pl. ; Hook. f., Fl. Brit. India 4 : 265.1884 ; Haines, Bot. Bihar & Orissa 2 : 656.1922 ; non G. Don, 1838.

Erect herbs, to 35 cm high. Leaves opposite, elliptic to ovate, 5–7 cm long, pubescent, somewhat succulent. Flowers to 1 cm long, bluish–white. Capsule compressed, grooved, to 0.5 cm long.

In marshy places, India. August–December. Sarkar & Bhatta., 184, 1239.

3. *Limnophila sessiliflora* (Vahl) Bl., Bijdr. 749. 1826 ; Hook.f., Fl. Brit. India 4 : 270.1884 ; Haines, Bot. Bihar & Orissa 2 : 659.1922. *Hottonia sessiliflora* Vahl, Symb. Bot. 2 : 36.1791.

Partially submerged herbs. Flowers axillary, to 1.3 cm long, purplish–white. Capsule orbicular, 0.4 cm across.

In marshes, August–October. Sarkar & Bhatta., 1618.

#### 6. LINDENBERGIA Lehm.

*Lindenbergia muraria* (Roxb. ex D. Don) Bruehl, J. Dept. Sci; Cal. Univ. (Bot.) 2 : 27.1920 ; Sharma and Tiagi, Fl. N. E. Rajasthan 290.1979. *Stemodia muraria* Roxb. ex D. Don, Prodr. 89. 1825. *Lindenbergia urticaefolia* Lehm, in Link & Otto, Icon. Pl. Rar. 95. t. 48. 1828 ; Hook. f., Fl. Brit. India 4 : 262.1884 ; Haines, Bot. Bihar & Orissa 2 : 654.1922.

Herbs, to 20 cm high. Leaves ovate, 2.5–4 cm long, serrate. Flowers yellow, to 0.8 cm long.

Common. Indomalaysia. May–October. Sarkar & Bhatta., 1201.

## 7. LINDERNIA ALL.

Note : *Lindernia* All. (1766), *Vandellia* L. (1767), *Bonnaya* Link & Otto (1828) and *Ilysanthes* Rafin. (1820) are congeneric.

- |   |     |                            |
|---|-----|----------------------------|
| 1a. Flowering calyx lobed to about half-way down, or less ; capsule ellipsoid or ovoid-globose, about as long as the calyx. | ... | 2                          |
| 1b. Flowering calyx lobed to about two-third way down, or more ; capsule subcylindric, 2-3-times as long as the calyx.      | ... | 3                          |
| 2a. Flowers mostly solitary, bluish   | ... | 4. <i>L. crustacea</i>     |
| 2b. Flowers in racemes, white   | ... | 5. <i>L. multiflora</i>    |
| 3a. Leaf-margins closely denticulate with apices of the teeth developed into fine aristae almost as long as the teeth       | ... | 3. <i>L. ciliata</i>       |
| 3b. Leaf-margins entire, or if serrate-dentate then the teeth subacute.   | ... | 4                          |
| 4a. Leaves entire, cordate at base  | ... | 7. <i>L. parviflora</i>    |
| 4b. Leaves serrate, not cordate at base.  | ... | 5                          |
| 5a. Leaves distantly serrate.   | ... | 6                          |
| 5b. Leaves closely serrate  | ... | 6. <i>L. oppositifolia</i> |
| 6a. Perfect stamens 4   | ... | 1. <i>L. anagallis</i>     |
| 6b. Perfect stamens 2   | ... | 2. <i>L. antipoda</i>      |

1. *Lindernia anagallis* (Burm. f.) Pennell in J. Arn. Arb. 24 : 252.1943; Philcox, Kew Bull. 22 : 45.1968. *Ruellia anagallis* Burm. f., Fl. Indica 135. 1768. *Vandellia pedunculata* Benth., Scroph. Ind. 37.1835 ; Hook. f., Fl. Brit. India 4 : 282.1884 ; *V. cordifolia* (Colsm.) G. Don, Gen. Syst. 4 : 549.1838; Haines, Bot. Bihar & Orissa 2 : 663.1922.

Annual, creeping herbs. Leaves oblong or obovate-lanceolate upto 4.0 × 1.3 cm. Flowers 1-1.3 cm long, bluish, pinkish or violate. Capsule linear-subulate, to 1.5 cm long, septicial.

In moist places. Indomalesia. June–July. Sarkar & Bhatta., 1179.

2. *Lindernia antipoda* (L.) Alston in Trim., Handb. Fl. Ceylon 6 (Suppl.) : 214.1931. Philcox in Kew Bull. 17 : 484.1964 & 22 : 58.1968. *Ruellia antipoda* L., Sp. Pl. 635.1753. *Bonnaya veronicifolia* (Retz.) Spr., Syst. 1 : 41.1824 ; Hook. f., Fl. Brit. India 4 : 285.1884 ; Haines, Bot. Bihar & Orissa 2 : 664.1922.

Decumbent herbs, to 20 cm long. Leaves elliptic–lanceolate, subentire or serrulate. Flowers about 0.8 cm long. Corolla blue–purple. Capsule linear, to 1.2 cm long.

In moist places. June–August. Sarkar & Bhatta., 827, 1244.

3. *Lindernia ciliata* (Colsm.) Pennell in Brittonia 2 : 182. 1936 ; Philcox in Kew Bull. 22 : 51. 1968. *Gratiola ciliata* Colsm., Prodr. Descrip. Grat. 14.1793. *Bonnaya brachiata* Link & Otto, Icon. Pl. Select. 25. t. 11. 1820 ; Hook. f., Fl. Brit. India 4 : 284.1884 ; *Vandellia brachiata* Haines, Bot. Bihar & Orissa 2 : 663.1922.

Annual herbs, to 10 cm long. Leaves broadly oblong, 2–3 × 0.5–1 cm, sessile, obtuse or subacute. Flowers to 0.8 cm long. Corolla pinkish–white. Capsule linear–oblong.

Common along moist, waste places. June–October. Sarkar & Bhatta., 1186.

4. *Lindernia crustacea* (L.) F. V. Muell., Syst. Cens. Aust. Pl. 97.1882 ; Philcox in Kew Bull. 22 : 17.1968. *Capraria crustacea* L., Mant. 87.1767. *Vandellia crustacea* (L.) Benth., Scroph. Ind. 35. 1835 ; Hook. f., Fl. Brit. India 4 : 279.1884 ; Haines, Bot. Bihar & Orissa 2 : 661.1922.

Erect or decumbent herbs, to 15 cm long. Leaves ovate, 1.4×0.7 cm, petiolate, subentire. Flowers to 0.8 cm long. Corolla purple or blue–violet. Capsule oblong–ovoid, slightly exceeding calyx.

In open moist places. July–September. Sarkar & Bhatta., 1247.

5. *Lindernia multiflora* (Roxb.) Mukerjee in J. Ind. Bot. Soc. 24 : 131. 1945 ; Philcox in Kew Bull. 22 : 36.1968. *Torenia multiflora* Roxb., Fl. Indica 3 : 96.1832. *Vandellia multiflora* (Roxb.) G. Don, Gen. Syst. 4 : 549.1838 ; Hook. f., Fl. Brit. India 4 : 280.1884 ; Haines, Bot. Bihar & Orissa 2 : 662.1922.

Erect herbs, to 15 cm high, branched from the base. Leaves ovate,

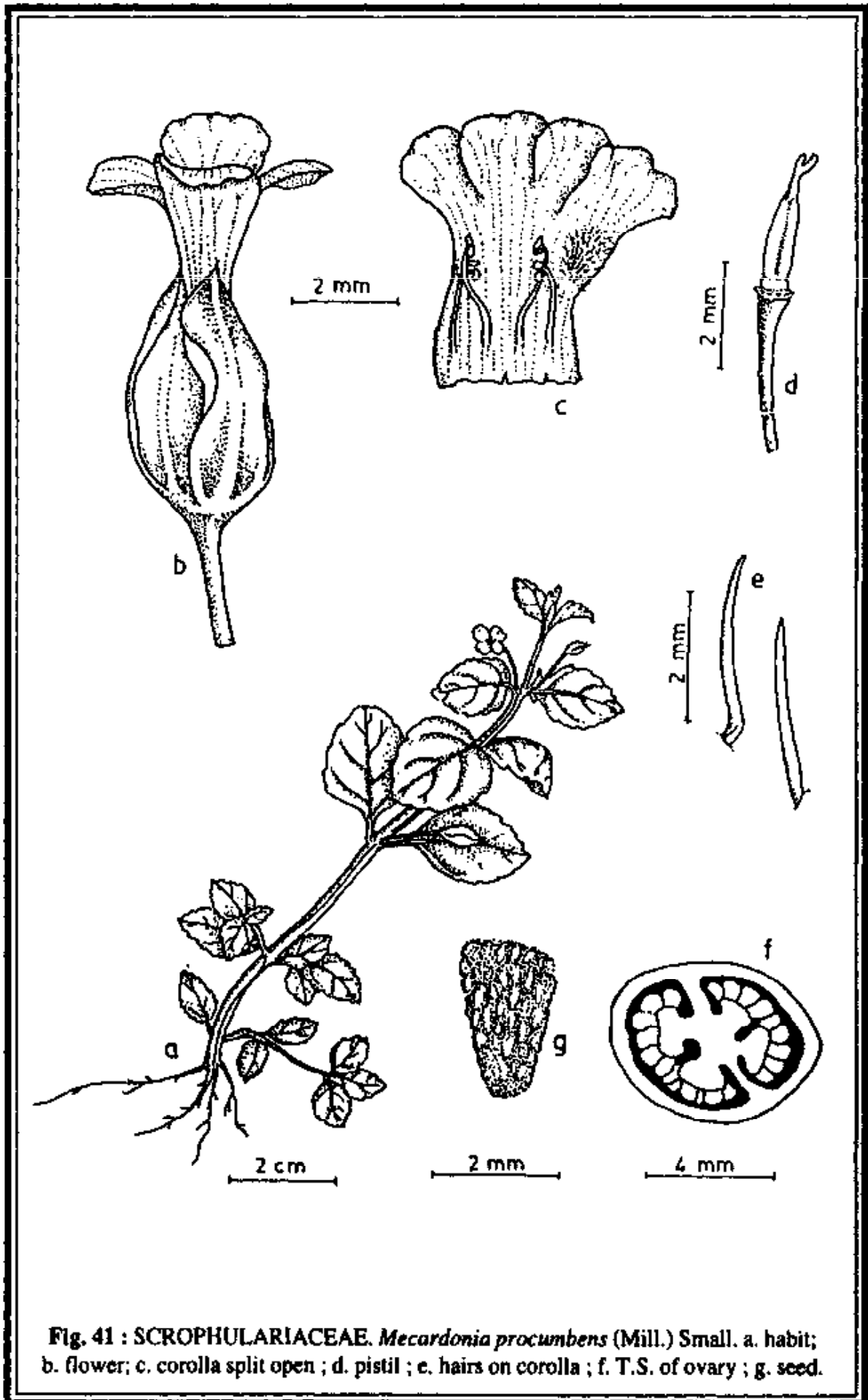


Fig. 41 : SCROPHULARIACEAE. *Mecardonia procumbens* (Mill.) Small. a. habit; b. flower; c. corolla split open; d. pistil; e. hairs on corolla; f. T.S. of ovary; g. seed.

1.6–2.2 × 0.8–1.1 cm. Corolla pinkish–violet. Capsule suborbicular, not exceeding calyx.

In forest clearings and along the margins of rice fields. July–October. Sarkar & Bhatta., 1198.

Note : Cook (1996) reduced *Lindernia multiflora* to synonymy under *Lindernia viscosa* (Hornem.) Boldingh *sensu lato*.

6. ***Lindernia oppositifolia*** (Retz.) Mukerjee in J. Ind. Bot. Soc. 24 : 134.1945 ; Sant. in J. Bombay Nat. Hist. Soc. 49 : 50.1950. *Gratiola oppositifolia* Retz., Obs. 4 : 8. 1786. *Bonnaya oppositifolia* (Retz.) Spreng. Syst. Veg. 1 : 41. 1825 ; Hook. f., Fl. Brit. India 4 : 286.1884. *Vandellia oppositifolia* Haines, Bot. Bihar & Orissa 2 : 664.1922.

Erect annual herbs. Leaves oblong–lanceolate, to 2 cm long, serrate. Flowers bluish. Capsule to 0.5 cm long.

In moist places. June–September. Sarkar & Bhatta., 1248, 1358.

7. ***Lindernia parviflora*** (Roxb.) Haines, Bot. Bihar & Orissa 635 (665).1922; *Gratiola parviflora* Roxb., Pl. Cor. 3 : 3, t.203.1811 & Fl. Indica 1 : 140.1820. *Ilysanthes parviflora* Benth. in DC., Prodr. 10 : 419.1846 ; Hook. f., Fl. Brit. India 4 : 283.1884.

Small, erect herbs, to 10 cm long. Leaves ovate, to 1.2 cm long, palmately 3–5–nerved. Corolla to 0.5 cm long, white. Capsule elongated.

Common in cultivated ricefields. August–October. Sarkar & Bhatta., 1289.

#### 8. MAZUS Lour.

***Mazus pumilus*** (Burm.f.) Steen., Nova Guinea n.s. 9 : 31. 1958. *Mazus rugosus* Lour., Fl. Cochinch. 385.1790 ; Hook. f., Fl. Brit. India 4 : 259.1884; Haines, Bot. Bihar & Orissa 2 : 651. 1922. *Lobelia pumila* Burm.f., Fl. Indica 186.t.60.f.3.1768.

Annual herbs, to 11 cm long. Leaves oblong or obovate–spathulate, serrate, 2.5–6 cm long. Flowers white with blue spots. Capsule to 0.6 cm long.

In wet places, very common. Palaeotropics. Fl. : July–November. Sarkar & Bhatta., 499.

#### 9. MECARDONIA Ruiz & Pavon

***Mecardonia procumbens*** (Mill.) Small, Fl. Southeast U.S. 1065.1903 ; D'Arcy in Ann. Missouri Bot. Gard. 66 : 240.1979. *Erinus procumbens* Mill., Gard. Dict. ed. 8 : No. 6. 1768. *Herpestis chamaedryoides* H.B. & K., Nov.

Gen. Sp. 2 : 369.1818 ; *Mecardonia dianthera* (SW.) Millsp., Field Mus. nat. Hist. Bot. Ser. 2 : 98.1900.

Herbs, to 20 cm long. Leaves ovate-lanceolate,  $1.5 \times 0.7$  cm, crenate-serrate. Corolla yellow. Capsule to 0.6 cm long.

In exposed grounds. Neotropics. July–November. Sarkar & Bhatta., 814.

#### 10. SCOPARIA L.

*Scoparia dulcis* L., Sp. Pl. 116. 1753 ; Hook. f., Fl. Brit. India 4 : 289. 1884 ; Haines, Bot. Bihar & Orissa 2 : 668. 1922.

Much branched herbs, to 40 cm high. Leaves elliptic-obovate,  $2.5-3.5 \times 0.8-1.1$  cm. Corolla lobes 4, white. Capsule to 0.3 cm across.

Common along waste places. June–November. Sarkar & Bhatta., 947.

#### 11. STRIGA Lour.

- |  |     |                           |
|--|-----|---------------------------|
| 1a. Calyx ribs terminating into sinuses<br>between the sepals ; corolla yellow   | ... | 2. <i>S. asiatica</i>     |
| 1b. Calyx rib not terminating into sinuses<br>between the sepals ; corolla white | ... | 1. <i>S. angustifolia</i> |

1. *Striga angustifolia* (D. Don) Sald. in Bull. Bot. Surv. India. 5 : 70.1963; Sald., Fl. Hassan Dist. 526.1976. *Buchnera angustifolia* D. Don., Prodr. 91. 1825. *B. euphrasioides* Roxb., Fl. Indica 3 : 32.1832, *Striga euphrasioides* (Vahl) Benth., Companion Bot. Mag. 1 : 364. 1836 ; Hook. f., Fl. Brit. India 4 : 299. 1884 ; Haines, Bot. Bihar & Orissa 2 : 671. 1922. *nom. utique rej.* Tokyo Code 1994.

Herbs, usually to 15 cm high. Leaves  $1-5 \times 0.1-0.2$  cm. Corolla 1.5 cm long. Capsule  $0.3-0.6 \times 0.15-0.3$  cm.

In grass lands. Indomalaysia. July–August. Sarkar & Bhatta., 1027.

2. *Striga asiatica* (L.) Kuntze, Rev. Gen. Pl. 2 : 466.1891 ; Hepper in Rhodora 76 : 46.1974, *Buchnera asiatica* L., Sp. Pl. 630.1753. *Striga lutea* Lour., Fl. Cochinch. 22.1790 ; Hook. f., Fl. Brit. India 4 : 299.1884 ; Haines, Bot. Bihar & Orissa 2 : 671. 1922.

Herbs, 14–32 cm long. Leaves linear,  $1.5-3 \times 0.15-0.2$  cm. Calyx to 0.5 cm long. Corolla to 1 cm long. Capsule cylindrical, to 0.5 cm long.

In grass lands, not very common. Palaeotropics. October–November. Banerjee 713 (CAL !).

## 12. VERBASCUM L.

*Verbascum chinense* (L.) Sant., Fl. Purandhar 90.1958 ; Sharma & Tiagi, Fl. N. E. Rajasthan 300. 1979. *Scrophularia chinense* L. Mant. 2 : 250.1771. *Celsia coromandeliana* Vahl, Symb. Bot. 3 : 79. 1794 ; Hook.f. Fl. Brit. India 4 : 251. 1884 ; Haines, Bot. Bihar & Orissa 2 : 649. 1922.

Herbs, 40–60 cm high. Basal leaves in rosette, lyrate, 5–10 × 1.5–4.5 cm petiolate ; petiole to 5 cm long ; leaves on axis elliptic, 2.5 × 1.8 cm, sessile, serrate. Capsule glandular.

In river beds and road-sides. India to Afganistan, Burma, China, Sri Lanka. September–March. Sarkar & Bhatta., 1730.

Juice of this plant used for dysentery and as a sedative.

## 13. VERONICA Tourn. ex. L.

*Veronica anagallis-aquatica* L., Sp. Pl. 12.1753 ; Sharma & Tiagi, Fl. N. E. Rajasthan 303.1979. *V. anagallis* L., I. c. ; Hook. f., Fl. Brit. India 4 : 293.1884 ; Haines, Bot. Bihar & Orissa 2 : 667.1922.

Herbs, to 50 cm long ; stems hollow. Leaves linear-oblong, 5–13 × 0.7–1.5 cm, serrate, amplexicaule at base. Corolla white, to 0.5 cm across. Capsule to 0.3 cm long.

In swamps, margin of canals or other aquatic bodies. Fl.: October–December. Sarkar & Bhatta., 455.

## CXI. OROBANCHACEAE

- |   |     |              |
|---|-----|--------------|
| 1a. Flowers terminal and solitary on the scape ;<br>corolla-lobes broad, subequal | ... | 1. AEGINETIA |
| 1b. Flowers in spike ; corolla bilabiate  | ... | 2. OROBANCHE |

## 1. AEGINETIA L.

*Aeginetia indica* L., Sp. Pl. 632.1753 ; Hook. f., Fl. Brit. India 4 : 321. 1884 ; Haines, Bot. Bihar & Orissa 2 : 673. 1922.

Aerial portion to 15–30 cm high. Peduncle curved. Flowers to 3.5 × 2.5 cm. Corolla purple with white throat. Fruit ovoid – globose, 1.5–2.0 cm long.

Common in undergrowth of sal forests. Indomalesia to Japan. September–October. Sarkar & Bhatta., 959.

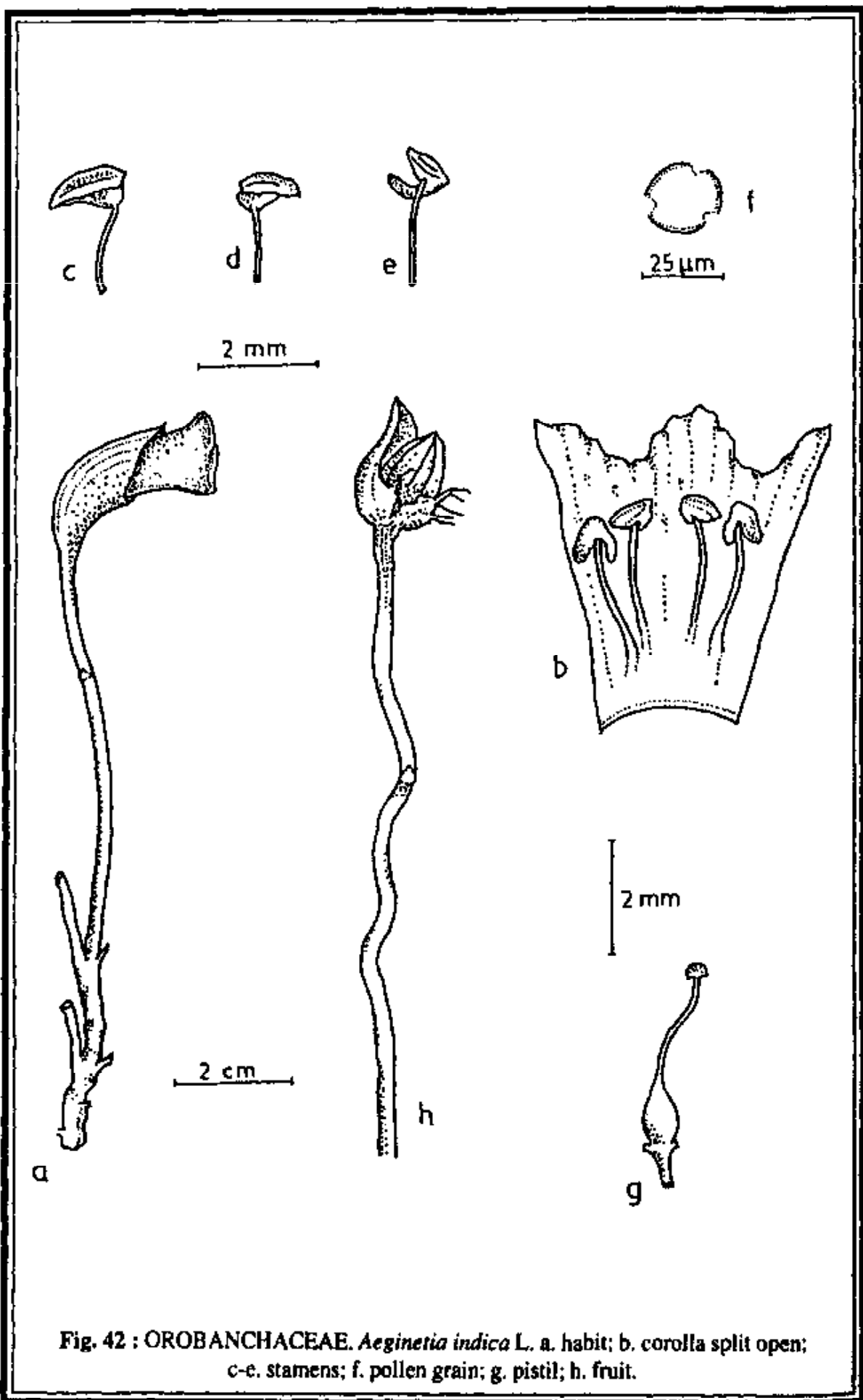


Fig. 42 : OROBANCHACEAE. *Aeginetia indica* L. a. habit; b. corolla split open; c-e. stamens; f. pollen grain; g. pistil; h. fruit.

2. OROBANCHE L.

*Orobanche aegyptiaca* Pers. Syn. Pl. 2 : 181.1807 ; Hook. f. Fl. Brit. India 4 : 324. 1884 ; Haines, Bot. Bihar & Orissa 2 : 673. *O. indica* Buch.-Ham. ex Roxb. Fl. Indica 3 : 27. 1832.

Spike to 17 cm long. Flowers bluish, to 2 cm long. Capsule enclosed within persistent calyx.

A harmful weed of mustard fields. Tropics and sub-temperate regions. December-February. Sarkar & Bhatta., 446.

CXII. ACANTHACEAE

1a. Woody climbers ; leaves palmately veined	...	20. THUNBERGIA
1b. Herbs or shrubs ; leaves pinnately veined.	...	2
2a. Calyx 4-lobed.	...	3
2b. Calyx 5-lobed.	...	7
3a. Stamens 2.	...	4
3b. Stamens 4.	...	6
4a. Bracteoles 0.	...	12. NELSONIA
4b. Bracteoles present.	...	5
5a. Corolla bilabiate	...	10. JUSTICIA
5b. Corolla lobes 5, spreading	...	2. BARLERIA
6a. Corolla bilabiate	...	3. BLEPHARIS
6b. Corolla lobes spreading	...	2. BARLERIA
7a. Stamens 4.	...	8
7b. Stamens 2.	...	15
8a. Bracts and bracteoles similar	...	11. LEPIDAGATHIS
8b. Bracts and bracteoles dissimilar.	...	9

9a. Ovules more than 2 per locule.	...	10
9b. Ovules 2 per locule.	...	14
10a. Inflorescence a raceme ; staminodes usually present	...	18. STAUROGYNE
10b. Inflorescence various ; staminodes 0.	...	11
11a. Corolla bilabiate	...	9. HYGROPHILA
11b. Corolla not as above.	...	12
12a. Bracteoles small or absent.	...	13
12b. Bracteoles foliaceous	...	16. RUELLIA
13a. Spikes paniced	...	6. ECHINACANTHUS
13b. Spikes capitate	...	8. HEMIGRAPHIS
14a. Bracteoles large, foliaceous	...	13. PETALIDIUM
14b. Bracteoles narrow or 0.	...	19. STROBILANTHES
15a. Anther cells placed at different levels, not parallel.		16
15b. Anther cells parallel.	...	19
16a. Anther cells spurred.	...	17
16b. Anther cells not spurred.	...	18
17a. Inflorescence secund	...	17. RUNGIA
17b. Inflorescence not secund	...	10. JUSTICIA
18a. Bracts 1-2-flowered ; placentae not separating elastically.	...	14. PERISTROPHE
18b. Bracts 1-flowered ; placentae separating elastically	...	4. DICLIPTERA
19a. Upper lip reduced	...	21. RHINACANTHUS
19b. Upper lip not reduced.	...	20

20a. Ovules 2 per locule.	...	21
20b. Ovules 3-many per locule.	...	22
21a. Staminodes absent	...	5. ECBOLIUM
21b. Staminodes present	...	7. ERANTHEMUM
22a. Flowers white	...	1. ANDROGRAPHIS
22b. Flowers scarlet	...	15. PHLOGACANTHUS

1. ANDROGRAPHIS Wall. ex Nees

**Andrographis paniculata** (Burm. f.) Wall. ex Nees in Wall., Pl. As. Rar. 3 : 116.1832 ; Cl. in Hook. f. Fl. Brit. India 4 : 501. 1884 ; Haines, Bot. Bihar & Orissa 2 : 733. 1922; *Justicia paniculata* Burm. f., Fl. Indica 9 : 1768.

Herbs to 50 cm high. Leaves linear-lanceolate, 6-10 × 1.3-2 cm. Flowers to 1.1 cm long. Corolla glandular-pubescent outside, white with deep pink or purplish-violet markings inside and at the base of the lower lip. Capsule linear-oblong, 1×0.3 cm. Seeds rugose.

Common in moist places. India, Sri Lanka. April- June. KALMEGH. Sarkar & Bhatta., 633.

2. BARLERIA L.

1a. Plants armed with 1-2 cm long spines; flowers yellow.	...	2
1b. Plants unarmed ; flowers other than yellow.	...	4
2a. Flowers in dense terminal spike	...	2. <i>B. lupulina</i>
2b. Flowers axillary or in terminal spikes	...	3. <i>B. prionitis</i>
3a. Spikes secund ; bracteoles ovate - lanceolate ; outer sepals ciliate on the margins	...	4. <i>B. strigosa</i>
3b. Spikes not secund ; bracteoles linear ; outer sepals spinulose—dentate	...	1. <i>B. cristata</i>

1. **Barleria cristata** L., Sp. Pl. 636. 1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 488.1884 ; Haines, Bot. Bihar & Orissa 2:716.1922.

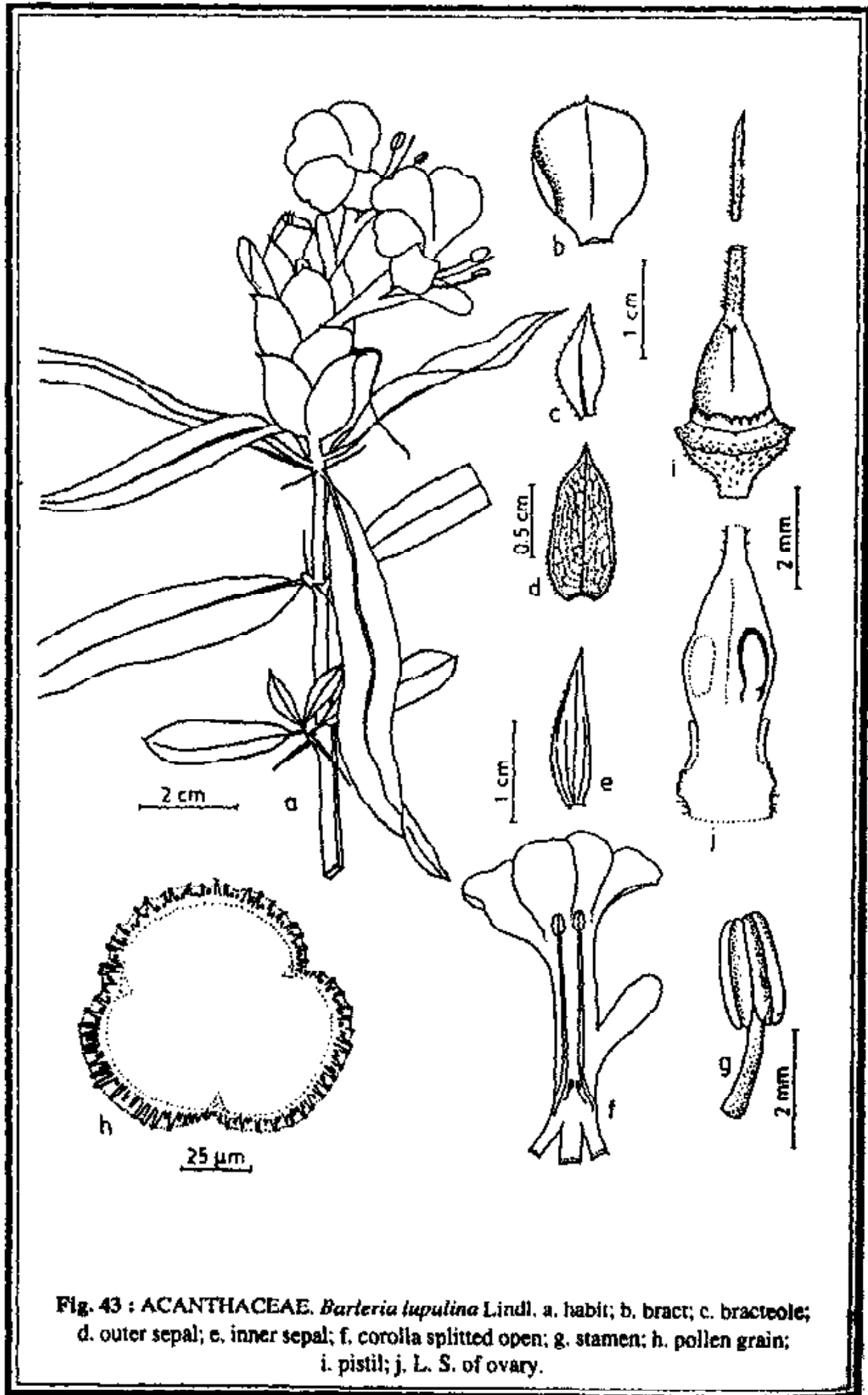


Fig. 43 : ACANTHACEAE. *Barleria lupulina* Lindl. a. habit; b. bract; c. bracteole; d. outer sepal; e. inner sepal; f. corolla splitted open; g. stamen; h. pollen grain; i. pistil; j. L. S. of ovary.

Undershrubs 0.5–1m high. Leaves elliptic or oblong – lanceolate, 5–15 × 0.9–3 cm. Spikes axillary or terminal ; bracts absent ; bracteoles 1–1.5 cm long. Corolla purple or pinkish–white. Capsule ellipsoid, 4–seeded. Seeds 0.25–0.3 cm across.

Common in the forest areas. September–June. JATI.Sarkar & Bhatta., 1570.

2. *Barleria lupulina* Lindl. in Bot. Reg. t. 1483 ; Haines, Bot. Bihar & Orissa 2 : 715.1922.

Undershrubs, to 1.5 m high. Leaves linear–lanceolate, 12 × 2 cm. Flowers in terminal dense spikes, bracts large. Capsule compressed.

Planted in gardens, also an escape. October–December, Sarkar & Bhatta., 481.

3. *Barleria prionitis* L., Sp. Pl. 636.1753 ; Cl. in Hook. f., Fl. Brit. India 4 : 482.1884 ; Haines, Bot. Bihar & Orissa 2 : 714.1922.

Undershrubs, to 80 cm high. Leaves elliptic, bristle–tipped. Flowers in terminal spikes or sometimes 1–2 in lower axils. Bracts 1–2 cm long. Seeds to 0.6 cm across.

Occasional near villages. January–March. Sarkar & Bhatta., 1803.

4. *Barleria strigosa* Willd., Sp. Pl. 3 : 379.1800 ; Cl. in Hook f. Fl. Brit. India 4 : 489.1884 ; Haines, Bot. Bihar & Orissa 2 : 715.1922.

Undershrubs ; young branches fulvous–strigose. Leaves ovate, acuminate, 10–22 × 2.8–6.5 cm. Calyx densely strigose. Corolla 3.5–5.0 cm long, blue. Capsule to 1.7 cm long, 4–seeded. Seeds silky hairy.

On moist, shady places near the ravines. September–March. Sarkar & Bhatta., 972.

### 3. BLEPHARIS Juss.

*Blepharis repens* (Vahl ) Roth, Nov.Pl. Sp. 321.1821 ; Ramamoorthy in Fl. Hassan Dist. 545.1976. *Acanthus repens* Vahl, Symb. 2 : 76.1791. *Blepharis molluginifolia* Pers., Syn. Pl. 2 : 180. 1806 ; Cl. in Hook. f. Fl. Brit. India 4 : 479.1884 ; Haines, Bot. Bihar & Orissa 2 : 736.1922.

Prostrate herbs ; branches to 20 cm long. Leaves oblong-ovate, to 1.7 cm long, mucronate. Bracts spinose-ciliate. Flowers to 0.9 cm long. Corolla blue or violet. Capsule compressed, elliptic enclosed by accrescent calyx. Seeds hairy.

Common on dry, exposed grounds. India, Sri Lanka, Africa, September-January. Sarkar & Bhatta., 1192.

#### 4. DICLIPTERA Juss., *nom. cons.*

*Dicliptera bupleuroides* Nees in Wall., Pl. As. Rar. 3 : 111. 1832 ; Merrill in Brittonia 4 : 175. 1941. *D. roxburghiana* auct. Pl. ; Cl. in Hook. f. Fl. Brit. India 4 : 553. 1885 ; Haines, Bot. Bihar & Orissa 2 : 731; non Nees.

Herbs, to 1m high. Leaves elliptic, to 6 cm long, puberulous. Bracts to 1.2 cm long. Corolla rose-purple, to 1.6 cm long. Capsule to 1.8 cm long. Seeds verrucose.

In waste lands. May-June. Sarkar & Bhatta., 480.

#### 5. ECBOLIUM Kurz

*Ecbolium viride* (Forssk.) Alst. var. *dentata* (Klein ex Link) Raiz. Indian Forester 84 : 482. 1958 ; *Justica dentata* Klein ex Link in Jahrb 1 (3) : 48. 1820. *Ecbolium linneanum* Kurz, in J. As. Soc. 40 (2) : 75. 1871 ; Cl. in Hook. f., Fl. Brit. India 4 : 545. 1885 ; Haines, Bot. Bihar & Orissa 2 : 728. 1922; *Justicia virides* Forssk., Fl. Aegypt. Arab 5. 1795.

Shrubs. Leaves ovate-lanceolate, 15-22 cm long, acuminate at both ends. Terminal spikes 6-10 cm long. Corolla tube to 2.3 cm long, bluish-green. Filaments hairy at the base. Capsule to 1.6 cm long.

Common near villages. India, Sri Lanka. Fl. : October-January. Sarkar & Bhatta., 1191.

#### 6. ECHINACANTHUS Nees

*Echinacanthus attenuatus* Wall. ex Nees in Wall., Pl. As. Rar. 3 : 107. 1832 ; Haines, Bot. Bihar & Orissa 2 : 708. 1922.

Undershrubs. Leaves oblong-lanceolate, or oblong-ovate to 20 cm long, subsucculent, more or less toothed. Flowers violet, about 3 cm long. Bracts small. Corolla tubular, unequally swollen, with 5 rounded lobes. Capsule oblong.

Common in the wet forest floor near Madanpur. Nepal to Sikkim. October–March. Sarkar & Bhatta., 1018.

#### 7. ERANTHEMUM L.

- 1a. Spikes usually in threes ... 1. *E. pulchellum*  
 1b. Spikes solitary ... 2. *E. purpurascens*

1. *Eranthemum pulchellum* Andr. Bot. Repos. 2 : t. 88. 1798 ; non Roxb. 1832 ; Fosberg & Sachet in Taxon 2 : 135. 1953. *E. nervosum* (Vahl) R. Br. Prodr. 1 : 476. 1810. *Daedalacanthus nervosus* (Vahl) Anders. in J. Linn. Soc. Bot. 9 : 487. 1867. Cl. in Hook. f., Fl. Brit. India 4 : 420. 1884 ; Haines, Bot. Bihar & Orissa 2 : 712. 1922.

Shrubs to 0.6–2m high, branches hairless or nearly so. Leaves elliptic, long pointed, 29 × 10.2 cm, entire or obscurely toothed. Spikes 2.5–8 cm, bracts elliptic, concave, overlapping. Corolla to 3.5 cm long ; lobes 0.8– 1.2 cm long. Capsule to 1.2 cm long.

Occasional in the forests. S.E. Asia, S. W. China, Burma. February–March. Sarkar & Bhatta., 1197.

2. *Eranthemum purpurascens* Nees in Wall., Pl. As. Rar. 3 : 106. 1832 ; *Daedalacanthus purpurascens* (Nees) Anders., in J. Linn. Soc. Bot. 9 : 488. 1867 ; Cl. in Hook. f., Fl. Brit. India 4 : 420. 1884 ; Haines, Bot. Bihar & Orissa 2 : 713. 1922.

Subshrubs, to 1m high. Leaves ovate, acuminate. Spikes solitary, oblong, very dense, 3–8 cm long ; bracts glandular–pubescent, to 2.5 cm long ; bracteoles smaller, linear–lanceolate. Corolla to 3 cm long, bluish–purple or lilac. Capsules 1.2–1.6 cm long.

In miscellaneous forests. October–April. Sarkar & Bhatta., 1075.

#### 8. HEMIGRAPHIS Nees

*Hemigraphis hirta* (Vahl) Anders. in J. Linn. Soc. Bot. 9 : 462. 1867 ; Cl. in Hook. f., Fl. Brit. India 4 : 422. 1884 ; Haines, Bot. Bihar & Orissa 2 : 704. 1922 ; *Ruellia hirta* Vahl, Symb. Bot. 3 : 84. t. 67. 1794.

Leaves ovate or elliptic, acute or obtuse, 1.1–4.5 × 0.4–2 cm. Heads 2–6–flowered ; bracts 1.0–1.5 cm long. Corolla to 1.4 cm long, greyish–violet

with violet throat. Capsule linear-cylindric, to 1 cm long, usually 12-seeded.

Hirsute herbs in waste lands, India. January-April. Sarkar & Bhatta., 551.

#### 9. HYGROPHILA R. Br.

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Armed herbs ; flowers in whorls                    | ... | 1. <i>H. schulli</i>    |
| 1b. Unarmed herbs ; flowers axillary or in spikes.     | ... | 2                       |
| 2a. Leaves entire ; flowers to 0.6 cm long, white      | ... | 3. <i>H. polysperma</i> |
| 2b. Leaves pinnatifid ; flowers to 1.2 cm long, purple |     | 2. <i>H. difformis</i>  |

Note : *Asteracantha* Nees (1832) is congeneric with *Hygrophila* R. Br. (1810).

1. ***Hygrophila schulli*** (Buch.-Ham.) M.R. et S.M. Almeida J. Bombay Nat. Hist. Soc. 83 (supple.) 221-222.1987. *Bahel schulli* Buch.-Ham., Trans. Linn. Soc. London, 14 : 289.1824. *H. auriculata* (Schumach.) Heine in Kew Bull.16 : 172.1962; Ramamoorthy in Fl. Hassan Dist. 549.1976. *Barleria auriculata* Schumach. in Schumach. & Thonn., Beskr. Guin. Pl. 285.1827. *Asteracantha longifolia* (L.) Nees in Wall. Pl. As. Rar. 3 : 90.1832 ; Haines, Bot. Bihar & Orissa 2 : 704.1922 ; *Hygrophila spinosa* Anders. in Thw., Enum. 225.1860 ; Cl. in Hook.f., Fl. Brit. India 4 : 403.1884.

Armed herbs ; axillary spines 1.5-3 cm long. Leaves linear-lanceolate, subsessile, 3-10× 0.5-1 cm. Flowers about 8 in each whorl. Corolla 3-3.5 cm long. Capsule linear-oblong, to 0.8 cm long, 4-8-seeded.

Common along the margins of water bodies. India, Sri Lanka. September-June. Sarkar & Bhatta, 843.

Note : Under Art. 55.1, The name *B. schulli* Buch.-Ham. is legitimate.

2. ***Hygrophila difformis*** (L.f.) Bl. Bijdr. 804. 1826 ; Sreem. & Bennet in Bull. Bot. Surv. India. 10 :222.1968. *Ruellia difformis* L.f., Suppl. 289.1781. *Cardanthera triflora* Buch.-Ham. ex Benth. in Benth. & Hook, Gen. Pl. 2 : 1074.1876 ; Cl.in Hook. f., Fl. Brit. India 4 : 405. 1884 ; Haines, Bot. Bihar & Orissa 2 : 701.1922.

Aquatic herbs. Leaves pinnatifid, lobes linear-oblong. Flowers usually solitary, axillary. Calyx lobes linear-spathulate. Stamens 4 ; posterior pair smaller ; pollen grains with 4-5-colpoid streaks, sexine suprareticulate. Capsule narrowly oblong, many-seeded.

Common in the swamps and rice fields. August-January. Sarkar & Bhatta., 665.

3. *Hygrophila polysperma* (Roxb.) Anders. in J. Linn. Soc. Bot. 9 : 456.1867 ; Cl., in Hook. f. ; Fl., Brit. India 4 : 406.1884 ; Haines, Bot. Bihar & Orissa 2 : 702.1922. *Justicia polysperma* Roxb., Fl. Indica 1 : 119.1832.

Procumbent herbs. Leaves ovate or elliptic-oblong. 0.3–1.3 × 0.2–0.5 cm. Flowers in dense terminal spikes. Corolla to 0.7 cm long, white. Capsules 0.8 × 0.1 cm, about 20-seeded. Seeds minute, brownish.

A weed of cultivated fields and marshes. October–April. Sarkar & Bhatta., 852, 1316.

#### 10. JUSTICIA L.

- |                                   |     |                        |
|-----------------------------------|-----|------------------------|
| 1a. Calyx 4-lobed.                | ... | 2                      |
| 1b. Calyx 5-lobed                 | ... | 1. <i>J. adhatoda</i>  |
| 2a. Diffuse herbs ; bracts obtuse | ... | 2. <i>J. peploides</i> |
| 2b. Erect herbs ; bracts acute    | ... | 3. <i>J. simplex</i>   |

Note : *Justicia* L. (1753) and *Adhatoda* Mill. (1754) are congeneric.

1. *Justicia adhatoda* L., Sp. Pl. 15.1753 ; Stearn in J. Arn. Arb. 52 : 640.1971. *Adhatoda zeylanica* Medic. in Hist. Comm. Acad. Theod. Palat. 6 : Phys. 393.1790. *A. vasica* Nees in Wall., Pl. As. Rar. 3 : 103. 1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 540. 1885 ; Haines, Bot. Bihar & Orissa 2 : 728.1922.

Shrubs. Leaves elliptic-lanceolate, 9–13 × 2.4–3.5 cm, acuminate. Flowers in short, bracteate pedunculate spikes, clustered towards the end of the branches. Corolla 2.3 cm long and 1 cm across, white with purple lines and dots in the throat. Capsule clavate, 2–3 cm long.

In waste exposed grounds, sometimes planted. January–March. BASAK. Sarkar & Bhatta., 801.

2. *Justicia peploides* (Nees) Anders., J. Linn. Soc. 9 : 511.1867 ; Haines, Bot. Bihar & Orissa 2 : 726.1922 ; *Rostellularia peploides* Nees in Wall., Pl. As. Rar. 3 : 101. 1832. *Justicia quinqueangularis* Koen. var. *peploides* (Nees) Cl. in Hook. f., Fl. Brit. India 4 : 536.1885 ; Haines, Bot. Bihar & Orissa 2 : 77. 1922.

Diffuse or ascending herbs. Stem 4–5-angled. Leaves linear or linear or lanceolate, 2–8 cm long. Spikes terminal ; bracts linear. Corolla white with

purple marks. Capsule oblong, 4-seeded.

In waste lands. August–April. Sarkar & Bhatta., 524.

3. *Justicia simplex* D. Don, Prodr. 118.1825 ; Cl. in Hook.f., Fl. Brit. India 4 : 539.1885 ; Haines, Bot. Bihar & Orissa 2 : 727.1922.

Erect or prostrate herbs ; branches 4-angled, hairy, swollen above the nodes. Leaves variable, 2–5 cm long. Flowers in dense cylindric terminal or axillary spikes. Calyx lobes unequal, ciliate. Corolla pale-purple or whitish. Capsule elliptic.

Occasional on the margins of ricefields. September–January. Sarkar & Bhatta., 1159.

#### 11. LEPIDAGATHIS Willd.

*Lepidagathis incurva* Buch.-Ham. ex D. Don, Prodr. 119.1825 ; Yamazaki. Fl. E. Him. 303.1966. *L. hyalina* Nees in Wall., Pl. As Rar. 3 : 95. 1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 521.1885 ; Haines, Bot. Bihar & Orissa 2 : 721.1922.

Stems 2–4-ribbed, to 50 cm high. Leaves variable, lower ovate, upper narrower. Bracts lanceolate, acuminate-mucronate, to 1.2 cm long. Calyx lobes linear-lanceolate. Corolla to 0.6 cm long, white with brown spots. Capsule 4-seeded.

In forest floor. January–June. Sarkar & Bhatta., 1640.

#### 12. NELSONIA R.Br.

*Nelsonia canescens* (Lamk.) Spreng., Syst. 1 : 42, 1825 ; Bremekamp in Reinwardtia 3 : 248.1955. *Justicia canescens* Lamk., Encycl. 1 : 1141.1783. *Nelsonia campestris* R. Br. Prodr. 481.1810 ; Cl. in Hook. f., Fl. Brit. India 4 : 394. 1885 ; Haines, Bot. Bihar & Orissa 2 : 700. 1922.

Diffuse herbs. Leaves elliptic-oblong, lower 10–20 cm long, with long petioles. Spikes 1–5 cm long ; bracts 0.4–0.6 cm long ; bracteoles represented by 2 opposite tufts of hairs. Calyx strongly nerved. Corolla purplish, to 0.6 cm long. Capsule 8–12-seeded.

Occasional on the moist forest floor. Tropics. April–June. Sarkar & Bhatta., 495.

## 13. PETALIDIUM Nees

**Petalidium barlerioides** (Roth) Nees in Wall., Pl. As. Rar. 3 : 82.1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 416. 1884 ; Haines Bot. Bihar & Orissa 2 : 710. 1922. *Ruellia barlerioides* Roth, Nov. Pl. Sp. 310.1821.

Straggling shrubs or undershrubs, to 1m high. Leaves on the main stem petaloid, broadly ovate, 5–10 cm long, crenate–serrate. Calyx glandular hairy. Corolla to 3.5 cm long, yellowish–white, pale blue or white. Capsule to 1.2 cm long.

In the forest areas. Throughout India. January–May. Sarkar & Bhatta., 1642.

## 14. PERISTROPHE Nees

**Peristrophe paniculata** (Forssk.) Brummitt in Kew Bull. 38 : 451.1983. *Dianthera paniculata* Forssk., Fl. Aeg.–Arb. 7.1775 June–July. *D. bicalyculata* Retz. in Acta Holm. 1775 : 279. 1776. *Peristrophe bicalyculata* (Retz.) Nees in Wall. Pl. As. Rar. 3 : 113. 1832 ; Cl. in Hook. f. Fl. Brit. India 4 : 554.1885 ; Haines, Bot. Bihar & Orissa 2 : 730.1922.

Spreading herbs. Leaves ovate–lanceolate, 2.3–5 × 0.5–1.5 cm, petioled. Bracts longer than the calyx. Calyx lobes linear–lanceolate with ciliate margins. Corolla to 1.2 cm long, pink. Capsule 1 cm long.

Common in waste places. Throughout India, January–March. Sarkar & Bhatta., 875.

## 15. PHLOGACANTHUS Nees

**Phlogacanthus thyrsiformis** (Hardw.) Mabberley in Bot. Hist. Hort. Malab. 83. 1980. *Justicia thyrsiformis* Hardw. in Asiat. Res. 6 : 349.1799. *Phlogacanthus thyrsiflorus* (Roxb.) Nees in Wall., Pl. As. Rar. 3 : 99.1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 512.1885 ; Haines, Bot. Bihar & Orissa 2 : 735.1922.

Shrubs to 2.5 m high ; branches 4–angled. Leaves elliptic–lanceolate, 10–27 × 3.2–9 cm, drooping. Thyrses 12–16 cm long ; bracts subulate, outer one to 1.5 cm long, caducous, inner 2 persistent. Calyx lobes to 0.5 cm long, linear. Corolla bilabiate, to 2 cm long. Scarlet. Capsule linear–clavate, to 3.5 cm long. Seeds hairy.

Occasional in the Ramnagar Hills. Fl. : March. Sarkar & Bhatta., 1806.

## 16. RHINACANTHUS Nees

**Rhinacanthus nasutus** (L.) Kurz, in J. Asiat. Soc. Beng. 39 : 79.1870 ; Haines, Bot. Bihar & Orissa 2 : 729. 1922 ; *Justicia nasuta* L., Sp. Pl. 16.1753.

Subshrubs. Leaves elliptic to 6.5 cm long. Flowers in axillary cymes. Corolla bilabiate, tube long, white. Stamens 2. Ovules 2 per locule. Capsule stalked.

Planted as a hedge plant. March–April. Sarkar & Bhatta., 1657.

## 17. RUELLIA L.

- |   |     |                        |
|---|-----|------------------------|
| 1a. Roots not tuberous ; capsule clavate.   | ... | 2                      |
| 1b. Roots tuberous ; capsule cylindrical    | ... | 3. <i>R. tuberosa</i>  |
| 2a. Erect herbs ; flowers to 7 cm long      | ... | 1. <i>R. beddomei</i>  |
| 2b. Creeping herbs ; flowers to 2.3 cm long | ... | 2. <i>R. prostrata</i> |

1. **Ruellia beddomei** Cl. in Hook. f., Fl. Brit. India 4 : 413.1884 ; Haines, Bot. Bihar & Orissa 2 : 707.1922.

Leaves elliptic–lanceolate, to 15 cm long, long–acuminate ; petiole long. Bracteoles to 2 cm long, foliaceous. Calyx lobes linear. Corolla bluish–purple. Capsule clavate. Seeds with whitish margins, 0.4 cm across.

Common in the Ramnagar Hills. Fl. December. Sarkar & Bhatta., 1259.

2. **Ruellia prostrata** Poir. in Lamk. Encycl. 6 : 349.1804 ; Cl. in Hook. f., Fl. Brit. India 4 : 411.1884 ; Haines, Bot. Bihar & Orissa 2 : 706.1922.

Leaves ovate–elliptic, 3–8.5 × 0.9–3 cm, adpressed and sparsely hairy. Flowers axillary, solitary. Calyx lobes linear subulate. Corolla bluish–violet. Capsule to 1.8 cm long. Seeds to 0.3 cm across.

Very common throughout the district. August–March. Sarkar & Bhatta., 517.

3. **Ruellia tuberosa** L., Sp. Pl. 635.1753 ; Haines, Bot. Bihar & Orissa 2 : 707.1922.

Undershrubs. Leaves elliptic–obovate, apex obtuse or rounded. Flowers in axillary and terminal cymes. Calyx lobes linear, glandular, to 2 cm long. Corolla

blue or white. Capsule to 2 cm long.

In waste lands, naturalised. Tropical America. August–March. Sarkar & Bhatta., 578.

#### 18. RUNGIA Nees

1a. Bracts dimorphic ; flowers 0.3–0.5 cm long ... 1. *R. pectinata*

1b. Bracts all similar ; flowers 0.8–1 cm long ... 2. *R. repens*

1. *Rungia pectinata* (L.) Nees in DC. Prodr. 11 : 470. 1841 ; Sant. in Univ. Bombay Bot. Mem. 2 : 77.1951. *Justicia pectinata* L. Amoen. Acad. 4 : 299.1759. *Rungia parviflora* (L.) Nees var. *pectinata* (L.) Cl. in Hook. f. Fl. Brit. India 4 : 550. 1885 ; Haines, Bot. Bihar & Orissa 2 : 723. 1922.

Leaves lanceolate or elliptic, 1.5–2.5 × 0.4–0.6 cm, sessile or petioled. Flowering bracts ovate–orbicular, to 0.4 cm long, broadly scarious–margined ; barren bracts oblong– lanceolate. Corolla bluish with 2 rows of darker patches in the lower lip.

Common weed of exposed grounds. January–April. Sarkar & Bhatta., 825.

2. *Rungia repens* (L.) Nees in Wall., Pl. As. Rar. 3 : 110.1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 549.1885 ; Haines, Bot. Bihar & Orissa 2 : 724.1922; *Justicia repens* L. Sp. Pl. 15. 1753.

Stem 4–angled. Leaves elliptic–lanceolate or oblong, 4 × 1 cm, subsessile. Spikes erect, 1–3 cm long; bracts all ovate–orbicular, broadly scarious –margined. Calyx to 0.4 cm long. Corolla pink. Capsule ovoid–oblong, compressed, 0.4–0.5 cm long. Seeds to 0.1 cm across.

Common. India, Sri Lanka. November–February. Sarkar & Bhatta., 179.

#### 19. STAUROGYNE Wall.

*Staurogyne glutinosa* O.Kuntze, Rev. Gen. Pl. 1 : 497.1891 ; Haines, Bot. Bihar & Orissa 2 : 700.1922.

Diffuse trailing herbs. Leaves elliptic, to 3 cm long, shortly stalked. Cymes 2–8–flowered ; bracts narrowly ovate oblong. Calyx segments subequal. Corolla bluish–white. Capsule many seeded.

Common on moist grounds. India. September–December. Sarkar & Bhatta., 557.

## 20. STROBILANTHES Bl.

**Strobilanthes auriculatus** Nees in Wall. Pl. As. Rar. 3 : 86.1832 ; Cl. in Hook. f., Fl. Brit. India 4 : 453. 1884 ; Haines, Bot. Bihar & Orissa 2 : 711.1922.

Leaves elliptic-lanceolate or ovate-oblong, 7-20 cm long, sessile. Spikes to 8 cm long. Flowers to 2 cm long. Corolla pale blue. Capsule to 1.2 cm long.

Occasional shrubs. India. Sarkar & Bhatta., 1817.

21. THUNBERGIA Retz., *nomen. cons.*

1a. Flowers scarlet, to 1 cm across ... 1. *T. coccinea*

1b. Flowers bluish-white, to 6 cm across ... 2. *T. grandiflora*

1. **Thunbergia coccinea** Wall. ex D. Don, Prodr. 120. 1825 ; Cl. in Hook. f., Fl. Brit. India 4 : 393 .1884 ; Haines, Bot. Bihar & Orissa 2 : 698.1922.

Leaves ovate-cordate, margins wavy, 8-15 cm long-stalked. Calyx 2-lobed, lobes ovate, nearly as long as corolla. Corolla tube to 2.5 cm long, lobes rounded, scarlet. Fruit to 4 cm long.

Ramnagar Hills. Uttar Pradesh to S. W. China. August-March. Sarkar & Bhatta., 1411.

2. **Thunbergia grandiflora** Roxb., Fl. Indica 3 : 34.1832 ; Haines, Bot. Bihar & Orissa 2 : 698.1922.

Extensive climber. Leaves cordate-ovate. Flowers bluish -white, to 6 cm across.

Usually planted in gardens for its showy flowers. September-December. Sarkar & Bhatta., 1189.

## CXIII. PEDALIACEAE

1a. Flowers in terminal racemes ; fruits with 2 apical hooks ... 1. **MARTYNIA**

1b. Flowers solitary axillary ; fruits apiculate ... 2. **SESAMUM**

1. **MARTYNIA** L.

**Martynia annua** L. Sp. Pl. 618. 1753 ; Baker in Fl. Mal. 4 : 221. 1951. *M. diandra* Gloxin. Obs. Bot. 14. t. 1. 1785 ; Cl. in Hook.f. Fl. Brit. India

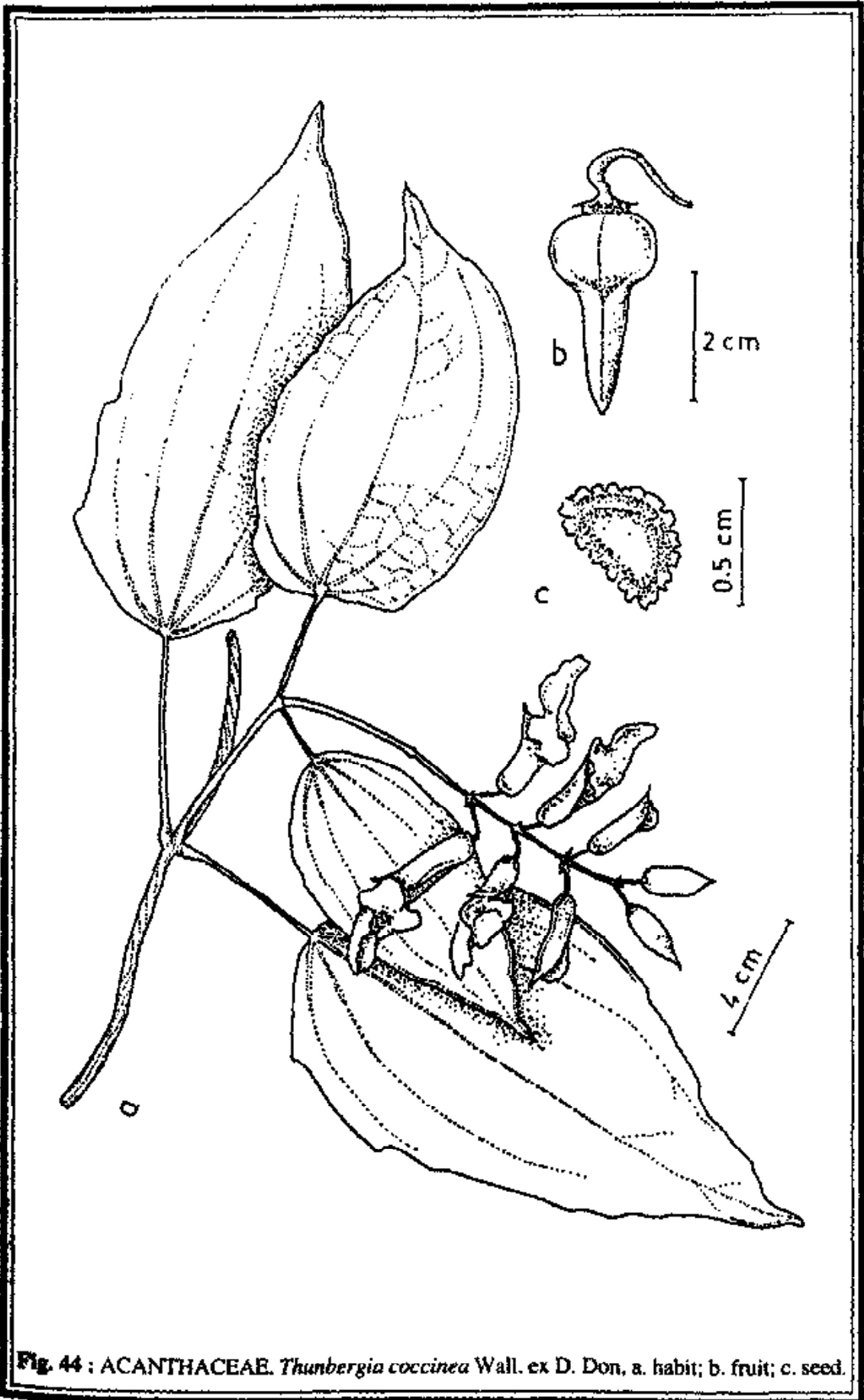


Fig. 44 : ACANTHACEAE. *Thunbergia coccinea* Wall. ex D. Don. a. habit; b. fruit; c. seed.

4 : 386.1884; Haines, Bot. Bihar & Orissa 2 : 694.1922.

Annual herbs, to 1 m high. Leaves ovate-orbicular, 20-45 cm across, dentate ; petiole fistular. Flowers mauve with deep purple blotches on the inside of the corolla lobes. Fruit ovoid, green, drying black.

An occasional road-side weed. Pantropical. August-November. BAGH NOKH. Sarkar & Bhatta., 1010, 1478.

## 2. SESAMUM L.

*Sesamum orientale* L. Sp. Pl. 634. 1753 ; Graham, Cat. Pl. Bombay 126.1839; Bennet, Fl. Howrah 333.1979. *S. indicum* L. Sp. Pl. 634.1753 ; DC., Prodr. 9 : 250.1845; Cl. in Hook. f., Fl. Brit. India 4 : 387.1884.

Annual herbs, to 1 m high. Lower leaves opposite and lobed, upper ones alternate, ovate-lanceolate. Flowers to 2.4 cm long, pinkish-white. Capsule to 3 cm long, subcylindric. Seeds flat, many.

Cultivated and escape. SISAM. Sarkar & Bhatta., 438.

Seeds produce "sesam oil".

## CXIV. BIGNONIACEAE

- 1a. Leaves 1-pinnate ; flowers 2-3 cm long ;  
capsule cylindrical ... 2. STEREOSPERMUM
- 1b. Leaves 2-3-pinnate ; flowers larger ;  
capsule sword-like ... 1. OROXYLUM

### 1. OROXYLUM Vent.

*Oroxylum indicum* (L.) Vent. Dec. Gen. Nov. 8.1808 ; Cl. in Hook. f., Fl. Brit. India 4 : 378.1884 ; Haines, Bot. Bihar & Orissa 2 : 681.1922; *Bignonia indica* L. , Sp. Pl. 625.1753.

Trees to 4 m high. Leaves large ; petiole to 1.5 m long ; leaflets ovate-oblong, 4-11 × 3-9 cm, acuminate. Racemes to 70 cm long. Calyx 2-5 cm long, more or less woody. Corolla 10-12 × 6-8 cm, yellowish, crisped. Capsule 60 × 7 cm, flat, curved, pendulous. Seeds to 2.5 cm across, very thin, white.

In mixed forests. Fl. : July-September ; Fr. : December-March. URRU. Sarkar & Bhatta., 1287, 1503.

Root-bark, leaves, young fruits medicinal.

2. STEREOSPERMUM Cham.

- 1a. Leaves hairy ; capsules 1-2 cm across ... 1. *S. chelonoides*  
 1b. Leaves glabrous ; capsules 0.5-0.7 cm across ... 2. *S. colais*

1. *Stereospermum chelonoides* (L.f.) A. DC. in Bibl. Univ. Geneve II. 17 (Rev. Bignon. 8) : 125. 1838 & Prodr. 9 : 210. 1845 ; Haines, Bot. Bihar & Orissa 2 : 657. 1922; Santisuk in Kew Bull. 28 : 176. 1973 ; Steenis, Fl. Mal. 8(2) : 147.1977. *Bignonia chelonoides* L.f., Suppl. 282.1781. *B. suaveolens* Roxb., Fl. Indica 3:104.1832. *Stereospermum suaveolens* (Roxb.) A. DC., in DC. Prodr. 9:211. 1845 ; Cl. in Hook. f. Fl.Brit. India 4 : 382.1884.

Deciduous trees. Leaves 30-50 cm long ; leaflets 3-4 pairs, obovate-oblong. 5-23 × 3-10 cm, viscid hairy. Inflorescence to 30 cm long. Flowers 2-3 cm long, fragrant. Capsule to 35 cm long. Seeds to 3.5 cm long.

Common in the forests and villages. Fl. : March-April ; Fruit ripens in the next winter. ADH, KAPARI, PARUL Sarkar & Bhatta., 359.

2. *Stereospermum colais* (Dillw.) Mabberley in Taxon 27 : 553. 1978 ; Verma et al. in Fl. Raipur, Durg & Rajnandgaon 269.1985. *Bignonia colais* Buch. -Ham. ex Dillw., Rev. Ref. Hort. Mal. 28.1839. *Stereospermum chelonoides* auct. pl.; Cl. in Hook. f. Fl. Brit. India 4 : 382 ; non (L.f.) DC. 1845 ; *S. tetragonum* DC., Prodr. 9 : 210. 1845 ; Haines, Bot. Bihar & Orissa 2 : 655. 1922.

Deciduous trees. Leaves 20-40 cm long ; leaflets 3-6 pairs, elliptic-oblong. 5-15 × 2-6 cm, caudate-acuminate. Inflorescence to 40 cm long. Flowers to 3 cm long. Capsules 8-45 cm long. Seeds to 2 cm long.

Occasional in forests. India, Sri Lanka, Burma. Sarkar & Bhatta. 1506.

CXV. LENTIBULARIACEAE

UTRICULARIA L.

- 1a. Primary leaf segments two ; peduncle with a scale in the middle ... 2. *U. exoleta*  
 1b. Primary leaf segments 3 or more ; peduncle naked ... 1. *U. aurea*

1. *Utricularia aurea* Lour., Fl. Cochinch. 1 : 26.1790 ; Backer & Bakh. f., Fl. Java 2 : 517.1965 ; Bhattacharyya, Vistas in Botany of Bangal, Unpubl. P.R.S. Thesis, Calcutta University 1 : 222. 1974 ; 3 : 106.1980 ; Taxon 35 (4) : 751. 1986. *U. flexuosa* Vahl, Enum. 1 : 198.1804 ; Cl. in Hook. f., Fl. Brit. India 4 : 329.1884 ; Haines, Bot. Bihar & Orissa 2 : 676.1922.

Floating herbs. Leaf segments capillary, setulose. Bladders numerous, 0.1–0.4 cm long. Peduncle stout. Corolla yellow, 3–9 cm long. Seeds narrowly winged.

Common in shallow water boies. Throghout India, S.E. Asia, China, Japan and N. Australia. August–January. Sarkar & Bhatta., 983.

2. *Utricularia exoleta* R. Br. Prodr. 430.1810 ; Cl. in Hook. f. Fl. Brit India 4 : 329.1884 ; Haines, Bot. Bihar & Orissa 2 : 676.1922 Bhattacharyya, Vistas in Botany of Bangal, Unpubl. P.R.S. Thesis, Calcutta University, 1 : 223.1974 & 3 : 105.1980. *U. gibba* L., ssp. *exoleta* (R.Br.) Taylor in Mitt. Bot. Staatss. Munchen. 4 : 101.1961 ; Kew Bull. 18 : 204.1964.

Aquatic to semiaquatic herbs, often stranded and rooted on mud. Leaf segments capillary, setulose. Bladder to 0.1 cm long. Flower 1–3 on peduncle. Corolla 0.5–0.8 cm long, yellow. Capsules 0.2–0.3 cm across. Seeds with irregular corky wing.

On mud, near stream, Bhikhna Thori. Pantropical. September–October. Sarkar & Bhatta., 929.

## CXVI. SPHENOCLEACEAE

### SPHENOCLEA Gaertn., *nom. cons.*

*Sphenoclea zeylanica* Gaertn. Fruct. 1 : 113. t. 24.1788 ; Hook. f. , Fl. Brit. India 3 : 438.1881 ; Haines, Bot. Bihar & Orissa 2 : 528.1922.

Herbs, to 60 cm high. Leaves linear–lanceolate, to 8 cm long. Flowers white, to 0.25 cm across. Seeds minute.

A common weed of rice fields. Tropics. October–December. Sarkar & Bhatta., 1173.

## CXVII. CAMPANULACEAE

- |   |     |            |
|---|-----|------------|
| 1a. Corolla 2–lipped, resupinate; anthers connate     | ... | 2. LOBELIA |
| 1b. Corolla campanulate, regular ; anthers connivent. | ... | 2          |

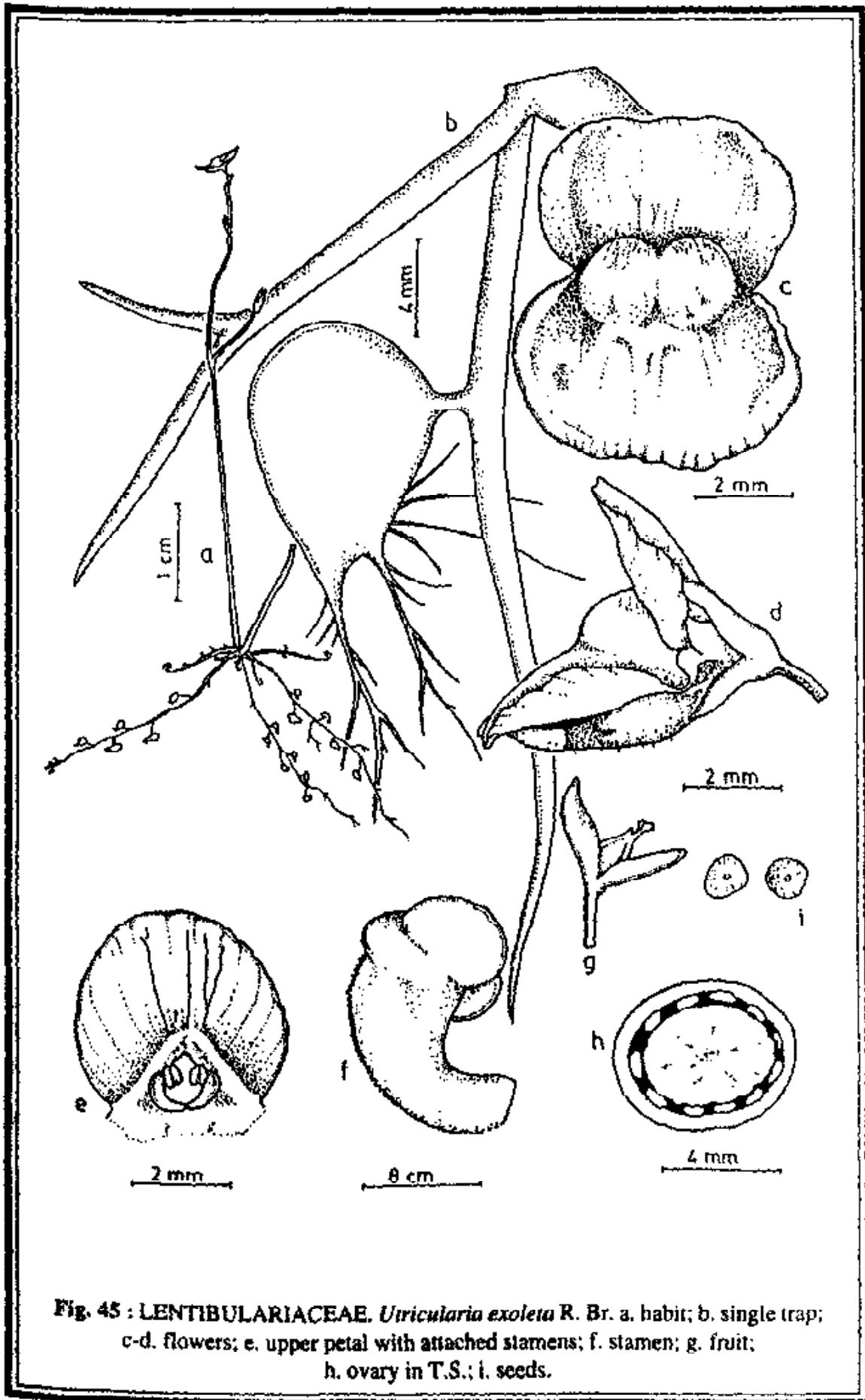


Fig. 45 : LENTIBULARIACEAE. *Utricularia exoleta* R. Br. a. habit; b. single trap; c-d. flowers; e. upper petal with attached stamens; f. stamen; g. fruit; h. ovary in T.S.; i. seeds.

- 2a. Capsule dehiscent at the top ... 3. WAHLENBERGIA  
 2b. Capsule dehiscent by longitudinal slits ... 1. CAMPANULA

#### I. CAMPANULA L.

**Campanula dimorphantha** Schweinf., Beitr. Fl. Aethiop. 140. 1867 ; Sabnis & Bhatta. in Geobios new rep. 3 : 157.1984. Lakshmi. & Sharma, Fl. of Nasik Dist. 285-286. 1991; *C. canescens* Wall. ex DC., Monogr. Camp. 292. 1830 ; Cl. in Hook. f. Fl. Brit. India 3 : 439. 1881 ; Haines, Bot. Bihar & Orissa 2 : 528.1922; non Roth 1827.

Erect herbs to 45 cm high. Leaves elliptic-lanceolate to linear-lanceolate, 2.6 × 0.4-0.9 cm, acute, distantly serrate. Flowers to 0.4 cm across. Corolla pinkish white. Capsule ovoid, 0.3 cm across.

Along riverbeds. Indomalasia. October-December. Sarkar & Bhatta., 142, 419 ; Thothathri 9957 (CAL !).

#### 2. LOBELIA L.

- 1a. Herbs to 30 cm long ; flowers blue ... 1. *L. alsinoides*  
 1b. Subshrubs to 1.5 cm high ; flowers purple ... 2. *L. nicotianaefolia*

**1. Lobelia alsinoides** Lamk. Encycl. Meth. Bot. 3 : 588.1792 ; Moeliono & Tuyn in Fl. Mal. 6(i) : 126. 1960. *L. trigona* Roxb. Fl. Indica 2 : 111.1824; Cl. in Hook. f. Fl. Brit. India 3 : 423. 1881 ; Haines, Bot. Bihar & Orissa 2 : 524. *L. griffithii* Hook. f. & Thoms., J. Proc. Linn. Soc. Bot. 2 : 28.1858; Cl. in Hook. f. l. c. *L. microcarpa* Cl. in Hook. f. l. c. *L. terminalis* Cl. in Hook. f., l. c. ; Haines, Bot. Bihar & Orissa 2 : 525. 1922.

Annual succulent herbs, to 30 cm long. Leaves broadly ovate, 0.5-1.6 × 0.5-1.5 cm, obtuse, serrulate, subsessile. Flowers solitary axillary or in leafy racemes, blue, to 0.4 cm across. Capsules hemispherical, to 0.3 cm across.

In moist places. Indomalasia. September-January. Sarkar & Bhatta., 1585.

**2. Lobelia nicotianaefolia** Roth ex R. & S. Syst. Veg. 5 : 47.1820 ; Cl. in Hook. f. Fl. Brit. India 3 : 427.1881 ; Moeliono & Tuyn in Fl. Mal. 6 : 123. 1960. *L. pyramidalis* Wall. Asiat Res. 13 : 379.1820 ; Cl. in Hook. f., l. c. 3 : 426. 1881. *L. rosea* Wall. in Roxb., Fl. Indica 2 : 115.1824 ; Cl. in Hook. f. l. c. 3 : 427.1881 ; *L. colorata* Wall., Pl. Asiat. Rar. 2 : 42.1831 ; Cl. in Hook. f. l. c. 3 : 426.1881. *L. erecta* Hook. f. & Thoms., J. Proc. Linn. Soc. Bot. 2 : 28.1858, non Deyriese 1845 ; Cl. in Hook. f. l. c.

Perennial subshrubs, to 1.5 m high ; branches spreading drooping. Leaves oblong-lanceolate, 4–11.5 × 1–2.5 cm acute, subentire, sessile. Flowers in racemes. Corolla purple to 2.1 cm long. Staminal column to 1.5 cm long ; anthers densely hairy. Capsule to 0.6 cm across.

Occasional in sandstone hills. Indomalasia. Fl. : March. Sarkar & Bhatta., 1675.

3. WAHLENBERGIA Schrad. ex Roth, *nom. cons.*

**Wahlenbergia marginata** (Thunb.) A. DC. Monogr. Camp. 143. 1830; Moeliono & Tuyn in Fl. Mal. 1,6 : 115.1960. *Campanula marginata* Thunb., Fl. Jap. 89. 1784. *Wahlenbergia gracilis* Schrad. Blumenb. 38.in Obs. 1827 ; Cl. in Hook. f. Fl. Brit. India 3 : 429. 1882 ; Haines, Bot. Bihar & Orissa 2 : 527.1922.

Herbs 6–20 cm long. Leaves linear-lanceolate to oblanceolate, 2–4 × 0.15–0.5 cm. Calyx lobes linear-lanceolate. Corolla to 0.5 cm long, blue. Capsule obconical, to 0.4 cm across.

Common in moist places and cultivated fields. Indomalasia. May–January. Sarkar & Bhatta., 1339, 1652.

RUBIACEAE

- |  |     |                  |
|--|-----|------------------|
| 1a. Flowers in globose heads.  | ... | 2                |
| 1b. Flowers not in globose heads.  | ... | 5                |
| 2a. Ovule solitary in each locule; corolla lobes valvate in bud; calyx tube nearly connate; fruit a syncarpium                         | ... | 16. MORINDA      |
| 2b. Ovules numerous, or if few, at least more than one in each locule.   | ... | 3                |
| 3a. Vegetative buds with laticiferous colleters ; heads with 2 wide bracts   | ... | 15. MITRAGYNA    |
| 3b. Vegetative buds not laticiferous.  | ... | 4                |
| 4a. Ovaries confluent ; fruits forming a globose, solid mass ; corolla lobes imbricate in bud ; flowers ebracteolate ; stigma fusiform | ... | 17. NEOLAMARCKIA |

- |  |     |                |
|--|-----|----------------|
| 4b. Ovaries free or nearly so ; fruits quite separate,<br>capsular ; corolla lobes valvate in bud  | ... | 8. HALDINA     |
| 5a. Leaves exstipulate, stipules replaced<br>by leaves ; calyx limb absent   | ... | 21. RUBIA      |
| 5b. Leaves stipulate, calyx limb evident   | ... | 6              |
| 6a. Herbaceous plants  | ... | 7              |
| 6b. Trees, or, shrubs, rarely climbers   | ... | 14             |
| 7a. Ovules solitary in each locule   | ... | 8              |
| 7b. Ovules numerous, or if few,<br>at least more than one in each locule   | ... | 9              |
| 8a. Stems woody ; inflorescences corymbose   | ... | 12. KNOXIA     |
| 8b. Stems slender ; flowers sessile in axillary<br>or terminal fascicles   | ... | 22. SPERMACOCE |
| 9a. Leaves less than 0.8 cm long ; flowers solitary,<br>subsessile; corolla lobes dentate  | ... | 6. DENTELLA    |
| 9b. Leaves over 0.8 cm, long ; corolla lobes entire  | ... | 10             |
| 10a. Filiform runner present ; anthers connate and<br>their opening by apical pores  | ... | 1. AGROSTEMMA  |
| 10b. Filiform runner absent ; anthers free and<br>their opening lateral  | ... | 11             |
| 11a. Stipules entire. Leaves whorled, linear,<br>upto 0.2 cm broad ; corolla tube more<br>than 3.5 mm long ; seeds ellipsoid   | ... | 13. KHOAUTIA   |
| 11b. Stipules lobed or pectinate. Leaves opposite-<br>decussate, always broader than 0.3 cm ; corolla<br>tube less than 2.5 mm long ; seeds angular<br>or subglobose | ... | 12             |
| 12a. Undershrubs or shrubs with woody roots ;<br>capsule with contiguous calyx teeth   | ... | 9. HEDYOTIS    |

12b. Herb ; capsule with distant calyx teeth	...	13
13a. Leaves linear-lanceolate; seeds angular, testa smooth	...	18. OLDENLANDIA
13b. Leaves ovate or ovate-lanceolate ; seeds subglobose, testa deeply coarsely pitted	...	24. THECAGONUM
14a. Ovules 2 or more per locule	...	15
14b. Ovules solitary in each locule	...	19
15a. Fruit a berry	...	16
15b. Fruit a capsule	...	18
16a. Corolla tube villous within ; ovary 2-locular ; spines either long axillary or short terminal	...	3. CATUNAREGAM
16b. Corolla-tube glabrous within ; ovary 1 locular	...	16
17a. Armed ; flowers dimorphic, monoecious or dioecious ; placentae 5 ; seeds smooth	...	4. CERISCOIDES
17b. Unarmed ; flowers monomorphic ; placentae 2-4 ; seeds rugose;	...	7. GARDENIA
18a. Stipules obtuse ; corolla lobes valvate in bud ; seeds broadly winged	...	10. HYMENODICTYON
18b. Stipules acute ; corolla lobes imbricate in bud ; seeds not winged, testa membranous	...	25. WENDLANDIA
19a. Corolla-lobes contorted in bud	...	20
19b. Corolla-lobes valvate in bud	...	22
20a. Flowers in axillary fascicles ; style-arms 2, linear	...	5. COFFEA
20b. Flowers in large corymbs ; stigma fusiform, exserted	...	21
21a. Stigma 2 - branched, exserted portion of style shorter than corolla lobes	...	11. IXORA
21b. Stigma undivided ; exserted portion of style longer than corolla lobes	...	20. PAVETTA

- 22a. Twining, foetid shrubs ; styles 2, capillary, twisted, papillose ; fruit of 2 dorsally compressed, 1-seeded pyrenes ; flowers paniced ... 19. PAEDERIA
- 22b. Erect shrubs or small trees ... 23
- 23a. Flowers in terminal densely paniced cymes ; corolla not bearded ; fruit capsular ; style 5 fid, papillose ; stigma linear ... 23. SPERMODICTYON
- 23b. Flowers in axillary fascicled cymes ; corolla densely bearded with white hairs in the throat ... 24
- 24a. Plant unarmed; ovary 2 - locular ... 2. CANTHIUM
- 24b. Plant armed; ovary 4-6 locular ... 14. MEYNA

#### 1. AGROSTEMMA Wall.

*Agrostemma sarmentosum* Wall. in Roxb, Fl. Indica 2 : 324. 1824 ; Hook. f., Fl. Brit. India 3:42. 1880; Hara *et al.*, Enum. 2 : 199. 1979.

Delicate herbs, to 10 cm high ; runners to 25 cm long. Leaves opposite, or in whorls, obovate, 3-7 × 1.5-2.5 cm, subacute. Inflorescence a terminal cyme or umbel. Flowers white; pedicel stout. Calyx-lobes ovate, obtuse. Corolla lobes acuminate.

In shady, moist places, sandstone hills. Fl. : July-October. Bhatta., & Sarkar 1217.

#### 2. CANTHIUM Lamk.

Notes : *Plectronia* L. (1767) antedated *Canthium* Lamk. (1785). But *Plectronia* was based on two different elements : one, a specimen (of Oliniaceae), and another, a figure published by Burman (Pl. Afr. 257. t. 94. 1739).

*Canthium dicoccum* (Gaertn.) Teysmann & Binnedijk., Cat. Hort. Bogor. 113. 1806; Balakrishnan, Fl. Jowai 1 : 239. 1981; *Psydrax dicoccos* Gaertn., Fruct. 1 : 125. t. 26. 1788 ; *Canthium didymum* Gaertn. f., Fruct. 3 : 94. t. 196. 1806 ; Hook. f., Fl. Brit. India 3 : 132. 1880 ; Haines, Bot. Bihar & Orissa 2 : 459. 1922.

Small trees. Branches drooping. Leaves ovate or lanceolate ovate, 10–15 × 6.5–7.8 cm, shortly acuminate. Flowers greenish white. Fruit globose, black, to 0.6 cm across.

Madanpur. Common. Fl. : Feb–May. Bhatta., & Sarkar 565.

Wood used for agricultural implements.

### 3. CATUNAREGAM Adans. ex v. Wolf

Notes : *Catunaregam* Adans. ex v. Wolf (1776) is congeneric with *Xeromphis* Rafin. (1838) for their common pollen and floral morphology.

- 1a. Branches terete ; leaves elliptic or elliptic-ovate; flowers 1.5–2 cm across ; corolla pubescent outside ... 1. *C. spinosa*
- 1b. Branches subquadrangular or compressed ; leaves obovate or obovate-oblong ; flowers 4 cm across ; corolla glabrous outside ... 2. *C. uliginosa*

1. *Catunaregam spinosa* (Thunb.) Triven., Taxon 27 : 515.1978 ; *Xeromphis spinosa* (Thunb.) Keay. Bull. Jard. Bot. Brux. 28 : 37.1958 ; *Gardenia spinosa* Thunb. Diss. Gard. 7 : 16. t. 2. f. 4. 1780 ; *Randia dumetorum* (Retz.) Lamk. Encycl. 2 : 227. 1794 ; Hook. f., Fl. Brit. India 3 : 110. 1880 ; Haines, Bot. Bihar & Orissa 2 : 453. 1922; *Gardenia dumetorum* Retz. Obs. Bot. 2 : 14.1781.

Small trees with spreading branches and rough bark. Leaves oblanceolate, 2.5–7 cm long, subcoriaceous, glabrescent, fascicled at ends of branches. Flowers to 1 cm across, creamy-white to yellow, fragrant. Berry to 3.6 cm across, yellow when ripe.

In Sal forests. Fl. : March ; Fr. October. MAINPHAL. Bhatta., & Sarkar 507, 1005.

Ripe fruits used as a fish-poison.

2. *Catunaregam uliginosa* (Retz.) Sivarajan in Manilal & Sivarajan, Fl. Calicut 132. 1982 ; *Tamilnadia uliginosa* (Retz.) Triven. & Sastre in Mauritius Inst. Bull. 8 (4) : 85. 1979. *Gardenia uliginosa* Retz. Obs. Bot. 2 : 14. 1781 ; *Randia uliginosa* (Retz.) DC. Prodr. 4 : 386. 1830 ; Hook. f., Fl. Brit. India 3 : 110. 1880 ; Haines, Bot. Bihar & Orissa 2 : 452. 1922.

Trees, ca 5 m high. Leaves fascicled on suppressed branches, 6–12 ×

3.5—5.0 cm, obovate or obovate-oblong, apex obtuse, shining, base cuneate. Flowers white, at the tips of suppressed branches. Fruits ovoid, crowned with persistent calyx limb. Seeds numerous, smooth, compressed.

Bhikhna Thori. Fl. : March–July, Fr. : October–December. MAINPHAL. Bhatta., & Sarkar 962.

#### 4. CERISCOIDES Triven.

**Ceriscoides turgida** (Roxb.) Triven., Bull. Mus. natn. Hist. nat. Paris 3e no. 521, Bot. 35; 15. 1978. *Gardenia turgida* Roxb. Fl. Indica 2 : 557. 1824 ; Hook. f., Fl. Brit India 3 : 118. 1880 ; Haines, Bot. Bihar & Orissa 2 : 449. 1922.

Trees, to 3m high. Leaves elliptic or obovate, 5.8 × 3.6 cm, obtuse or shortly acuminate at the apex, long cuneate at the base, tomentose beneath. Male flowers in fascicles, female solitary white. Ripe fruits foetid, to 5 cm across, ovoid or globose. Seeds many, small.

In the sandstone hills. Fl. : April–May ; Fr. ; December. Bhatta., & Sarkar 199.

#### 5. COFFEA L.

1a. Calyx many-toothed ; corolla usually 5 lobed ... 1. *C. benghalensis*

1b. Calyx 4 - toothed ; corolla 4 - lobed ... 2. *C. khasiana*

1. **Coffea benghalensis** Heyne ex R. & S. Syst. Veg. 5 : 200. 1819 ; Hook f. Fl. Brit. India 3 : 153.1880 ; Haines, Bot. Bihar & Orissa 2 : 457. 1922 (Repr. ed.).

Shrubs, to 1 m high: branches horizontally spreading. Leaves broadly ovate – oblong, or rhomboid, abruptly acuminate at apex, 5–8 × 3–4 cm. Flowers to 2 cm across, white, corolla tube to 1.7 cm long. Drupe ovoid, to 1.2 cm long, black.

Along damp forests. Fl. & Fr. : September–June. BANAMALI. Bhatta., & Sarkar 454, 1670.

2. **Coffea khasiana** Hook. f. Fl. Brit. India 3 : 154.1880. *Nostolachma khasiana* (Korth.) Deb & Lahiri, Bull. Bot. Surv. India 17:162.1978.

Medium shrubs ; branches spreading. Leaves elliptic–lanceolate. Flowers in axillary dense cymes, white. Drupe globose, smooth, 0.6 cm across, pale green.

Madanpur. Fl. & Fr. March–April. Bhatta., & Sarkar 474.

## 6. DENTELLA J. R. &amp; G. Forster

*Dentella repens* (L.) J. R. & G. Forster, Charact. Gen. 25. t. 13. 1776 ; Hook. f. Fl. Brit. India 3 : 42. 1880. Haines, Bot. Bihar & Orissa 2 : 464. 1922. *Oldenlandia repens* L. Mant. Pl. : 40. : 1767. (*non. illeg.*) non Burm. f. 1768.

Annual herbs, to 15 cm long. Leaves linear-oblongate, 0.3–1.0 × 0.1–0.4 cm. Flowers white, to 0.5 cm across. Capsule globose, to 0.3 cm across.

Along river beds. Fl. & Fr. : July–March. Bhatta., & Sarkar 879.

7. GARDENIA J. Ellis, *nom. cons.*

*Gardenia angusta* (L.) Merr. Interp. Herb. Amb. 485. 1917 ; Triven. Bull. Mus. Hist. nat. Paris 35 : 17. 1978. *Varneria angusta* L., Amoen. Acad 4 : 136. 1759. *Gardenia florida* L. Sp. Pl. ed. 2. 305. 1762 ; Hook. f. Fl. Brit. India 3 : 115. 1880. Haines, Bot. Bihar & Orissa 2 : 451. 1922 (rep. edi).

Small trees. Leaves opposite, obovate or oblanceolate, 10.1 – 16 × 3.8 – 6.5 cm. Flowers solitary, to 7 cm across, white, fragrant.

Cultivated. A native of China. Fl. : September–April. GUNDHA–RAJ. Bhatta., & Sarkar 637.

## 8. HALDINA Ridsd.

*Haldina cordifolia* (Roxb.) Ridsd. Blumea 24 : 361. 1978. *Nauclea cordifolia* Roxb. Pl. Cor. 1 : 40, t. 53. 1795. *Adina cordifolia* (Roxb.) Benth. & Hook. f. ex Brandis For. Fl. 263. t. 33. 1874 ; Hook. f., Fl. Brit. India 3 : 24. 1880 ; Haines, Bot. Bihar & Orissa 2 : 441. 1922.

Trees, 10–20 m high. Leaves ovate – suborbicular, base cordate, appressed pubescent beneath, 4.2–18 × 4–17.8 cm. Flowers yellow in axillary globose heads. Capsules obconical, pubescent. Seeds brown, oblong, winged.

In Sal forests. Fl. : November–June. HALDU, KARAM. Bhatta., & Sarkar 185, 1001, 1491.

The bark is used against stomach disorders and leaf juice for snake bite. A valuable timber yielding plant.

## 9. HEDYOTIS L.

1a. Plant scabrid hairy. Leaves under 0.3 cm broad, narrow-linear. Fruiting calyx 0.3–0.4 cm, much shorter than capsule

... 1. *H. pinifolia*

- 1b. Plant rough hairy. Leaves 0.5–1.5 cm broad, rigid. Fruiting calyx 0.5–0.6 cm ... 2. *H. verticillata*

1. *Hedyotis pinifolia* Wall. ex G. Don, Gen. Syst. 3 : 525. 1834 ; Hook. f. Fl. Brit. India 3 : 60. 1880 ; Haines, Bot. Bihar & Orissa 2 : 467. 1922.

A diffuse, prostrate much branched wiry herb ; root woody. Stem slender 15–30 cm long. Leaves sub-acicular, to 2.5 cm long. Cymes few-flowered, white. Capsule 2-lobed.

Along forest margins. Fl. & Fr. : July–October. Bhatta., & Sarkar 1025.

2. *Hedyotis verticillata* (L.) Lamk. Encycl Meth. Bot. 1 : 271. 1792 ; T. Yamazaki, Fl. E. Himal. 1 : 310. 1966. Chowdhery & Wadhwa, Fl. Himachal Pra., 2 : 346. 1984. *Oldenlandia verticillata* L. Mant. 1 : 40. 1767. *Hedyotis hispida* Retz. Obs. Bot. 4 : 23. 1786 ; Hook. f., Fl. Brit. India 3 : 60. 1880 ; Haines, Bot. Bihar & Orissa 2 : 466. 1922.

Erect herbs, to 30 cm long. Root sometimes woody. Leaves elliptic or linear-lanceolate. Flowers in axillary clusters, 2–6-flowered, white, capsule ovoid.

Along waste places. Fl. & Fr. : July–January. Bhatta., & Sarkar 1246.

#### 10. HYMENODICTYON Wall., *nom. cons.*

*Hymenodictyon orixense* (Roxb.) Mabberley in Taxon 31 : 66. 1982, *Cinchona orixensis* Roxb., Bot. Deser. Swietenia : 21. 1793 & Med. Facts Obs. 6 : 152. 1795 ; *Hymenodictyon excelsum* (Roxb.) Wall. in Roxb. Fl. Indica 2 : 149. 1824 ; Hook. f. Fl. Brit. India 3 : 35. 1880 ; Haines, Bot. Bihar & Orissa 2 : 446. 1922. *Cinchona excelsa* Roxb. Pl. Cor. t. 106. 1799.

Medium deciduous trees, branches spreading. Leaves ovate – elliptic ; leaf blade 10–15 × 7–10 cm ; petiole to 7 cm long. Bract to 10 cm long. Spikes to 18 cm long. Flowers greenish-white, in fascicles ; bracts leafy, reticulate, persistent conspicuous. Corolla pubescent. Capsules ellipsoid ; pedicels recurved. Seeds thin, winged.

In Sal forests. Fl. : June–July ; Fr. : December. Bhatta., & Sarkar 186, 119.

Bark is used as febrifuge and antiperiodic. Valuable timber is used for match-splints, pencils, picture frames, planking and cheap quality cricket bats.

## 11. IXORA L.

- 1a. Small trees ; flowers white, corolla tube upto 1.2 cm ; fragrant ... 1. *I. arborea*
- 1b. Shrubs ; flowers large, bright red, corolla tube 2.5–3.8 cm long ... 2. *I. coccinea*

1. *Ixora arborea* Roxb. ex Smith, Rees cyclop. 19 : 5. 1811 ; Gandhi in Fl. Hassan Dist. 578. 1976. *I. parviflora* Vahl, symb. Bot. 3 : 11, t. 52. 1794, non Lamk. 1791 ; Hook. f. Fl. Brit. India 3 : 142. 1880 ; Haines, Bot. Bihar & Orissa 2 : 455. 1922.

Evergreen, small tree. Leaves oblong or elliptic, 7–12 × 4–6 cm, coriaceous. Flowers 0.5 × 0.4 cm. Fruit to 0.6 cm across, olive green or black.

In Sal forests. Fl. : March–June. Bhatta., & Sarkar 410. Sometimes planted in gardens.

2. *Ixora coccinea* L. Sp. Pl. 110. 1753; Hook. f., Fl. Brit. India 3 : 145. 1880. Haines, Bot. Bihar & Orissa 2 : 455. 1922.

Shrubs to 2 m high. Leaves oval, somewhat amplexicauled at the base. Flowers to 4 cm long.

Planted for its showy flowers. Flowering all along the year. Bhatta., & Sarkar 477.

## 12. KNOXIA L.

- 1a. Leaves petiolate ; mericarps united .... 1. *K. sumatrensis*
- 1b. Leaves sessile ; mericarps separating when ripe ... 2. *K. roxburghii*

1. *Knoxia sumatrensis* (Retz.) DC. Prodr. 4 : 560. 1830 ; Karthikeyan & Kumar, Fl. Yavatmal Dist. 125. 1993. *Spermacoce sumatrensis* Retz. Obs. Bot. 4 : 23. 1786 ; *Knoxia corymbosa* auct. Hook.f. Fl. Brit. India 3 : 128. 1880. Haines, Bot. Bihar & Orissa 3 : 473. 1922. non Willd. 1797.

Herbs, to 40 cm high. Leaves ovate–lanceolate, 5.5–10 cm long, acute, narrowed at the base. Flowers white.

Along forest clearings. Fl. & Fr. : August–December. Bhatta. & Sarkar 1094, 1562.

2. *Knoxia roxburghii* (Spreng.) M.A. Rau, Bull. Bot. Surv. India 10, Suppl. 2 : 40 1969 ; Hara & Gould, Enum. Fl. Pl. Nepal 2 : 203. 1979.

*Spermacece roxburghii* Spreng. Syst. Veg. 1 : 404. 1824. *Knoxia brachycarpa* R. Br. ex Hook. f. Fl. Brit. India 3 : 130. 1880 ; Haines, Bot. Bihar & Orissa 2 : 474. 1922.

Herbs to 60 cm high. Leaves oblong, to 5–10 cm long, obtuse at both ends. Flowers purplish. Mericarps plano-convex.

Gobardhana, rare. Fl. & Fr. September–October. Bhatta. & Sarkar 1567.

### 13. KOHAUTIA Cham. & Schltld., *nom. cons.*

*Kohautia gracilis* (Wall.) DC. Prodr. 4. 431. 1830. *Hedyotis gracilis* Wall. in Roxb. Fl. Indica 1 : 371. 1820, *Oldenlandia gracilis* (Wall.) Hook. f. Fl. Brit. India 3 : 68. 1880; Haines, Bot. Bihar & Orissa 2 : 470. 1922.

Annual herbs, 20–30 cm high. Leaves linear, 15–30 × 0.1–0.2 cm, acute, glabrous. Flowers in terminal, cymose, corymbiform panicles. Corolla tube to 1.5 cm long, pale-brown or purplish. Capsule 0.4 cm long, oblong.

Along grass lands. Fl. & Fr. : February–April. Bhatta., & Sarkar 334, 1288.

### 14. MEYNA Roxb. ex Link

- |  |     |                        |
|--|-----|------------------------|
| 1a. Flowers in axillary, pedunculate lax cymes   | ... | 1. <i>M. laxiflora</i> |
| 1b. Flowers in axillary sessile or shortly peduncled but long pedicelled cymes         | ... | 2                      |
| 2a. Corolla mouth scarcely villous, petals with acuminate tips. Anthers included erect | ... | 2. <i>M. pubescens</i> |
| 2b. Corolla mouth woolly, petals not acuminate. Anthers exerted horizontal             | ... | 3. <i>M. spinosa</i>   |

1. *Meyna laxiflora* Robyns in Bull. Jard. Bot. Etat. 11 : 228. 1928 ; Gandhi in Fl. Hassan Dt. 580. 1976 ; *Vangueria spinosa* Roxb. L., Fl. Indica 2 : 172. 1824 ; Hook. f. Fl. Brit. India 3 : 136. 1880 p.p excl. type et var. ; Haines, Bot. Bihar & Orissa 2 : 460. 1922.

Branches spreading to 5 m high. Leaves elliptic or elliptic-ovate, 6–9 × 3–5 cm, acute. Calyx segments linear. Corolla greenish white. Fruit to 2.5 cm across, a drupe.

In miscellaneous forest. Fl. March., Bhatta., & Sarkar 1729.

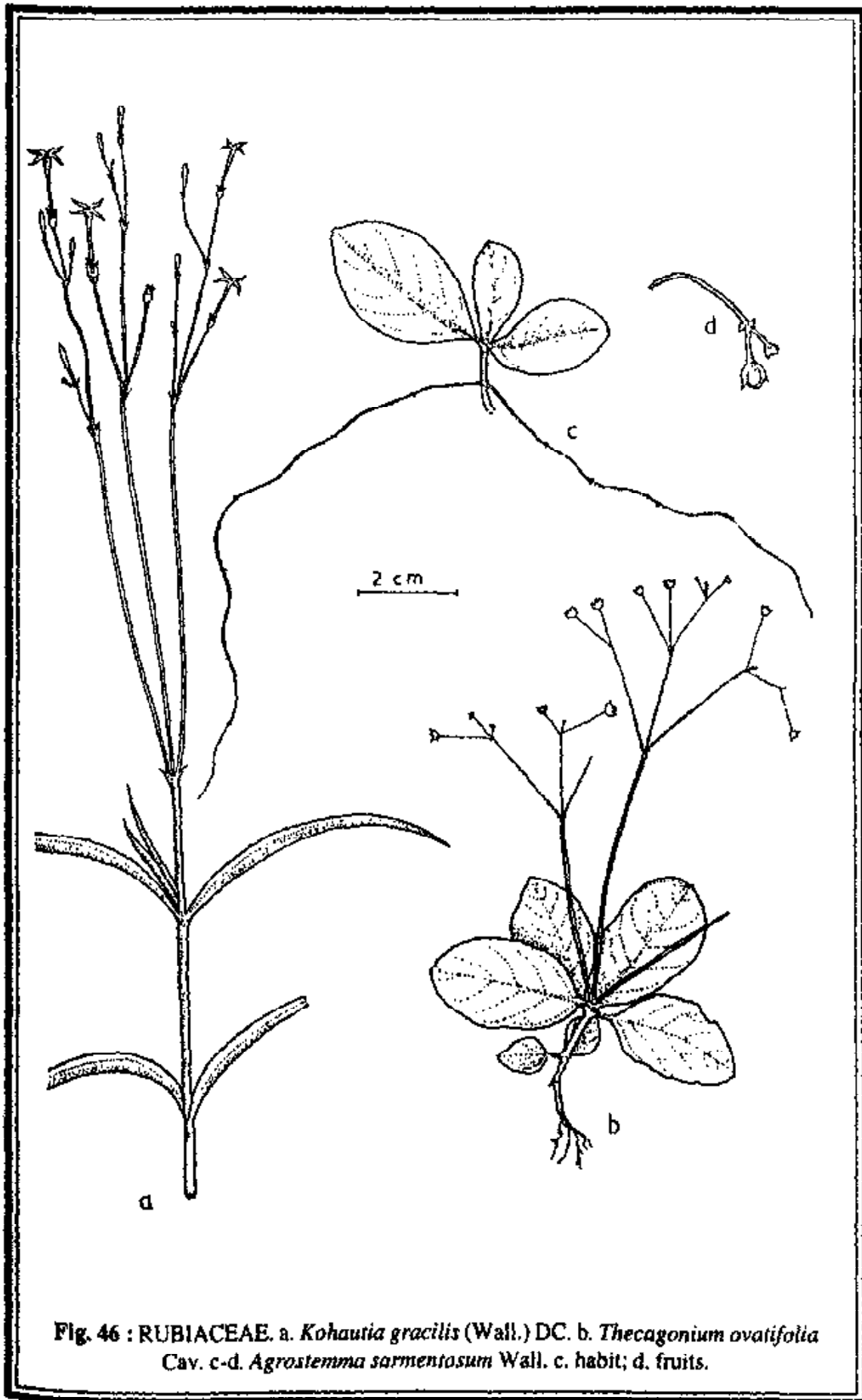


Fig. 46 : RUBIACEAE. a. *Kohautia gracilis* (Wall.) DC. b. *Thecagonium ovatifolia* Cav. c-d. *Agrostemma sarmentosum* Wall. c. habit; d. fruits.

2. *Meyna pubescens* (Kurz) Robyns, Bull. Jord. Bot. Etat. 11 : 228. 1928 ; Hara & Gould. Enum. Flowering Pl. Nepal, 2 : 204. 1979 ; *Vangueria pubescens* Kurz, For. Fl. 2. 34. 1877 ; *V. spinosa* var. *mollis* Wall. ex Hook. f. Fl. Brit. India 3 : 136. 1880. Haines, Bot. Bihar & Orissa 2 : 460. 1922.

Small trees, thorny. Leaves 6-9 × 3-5 cm, acute. Calyx segments linear. Drupe ellipsoid, 2 cm across, dry.

In miscellaneous forest. Fl. : March-April. Fr. : May-February. Bhatta., & Sarkar 2651.

3. *Meyna spinosa* Roxb. ex Link, Jahrb. Gewachsk III. 1 (3) : 32. 1820. Hara & Gould, En. Fl. Pl. Nepal 2 : 204. 1979 ; *Vangueria spinosa* (Roxb. ex Link) Roxb. Fl. Indica 2 : 172. 1824 ; Hook. f., Fl. Brit. India 3 : 136. 1880 p.p. excl. var. ; Haines, Bot. Bihar & Orissa 2 : 460. 1922.

Large shrub with long extra axillary spines. Leaves 3-6 × 1-3 cm. Cymes 2.5-4 cm, shortly peduncled. Flowers pedicelled greenish-white. Corolla tube subglobose, lobes triangular acute. Drupe 0.8-1.0 cm in diameter, obovoid, ribbed, dry at maturity. Pyrenes 4-6, woody, smooth. Seeds with ventral cavity.

In deciduous forest, frequent. Fl. : March-April. Fr. : May-February. Bhatta., & Sarkar 2652.

#### 15. MITRAGYNA Korth., *nom. cons.*

1. *Mitragyna parvifolia* (Roxb.) Korth., Obs. Naocl. Ind. 19. 1839; Haines, Bot. Bihar & Orissa 2 : 442. 1922. *Nauclea parvifolia* Roxb. Pl. Cor. 1 : 40. t. 52. 1795 ; *Stephegyne parvifolia* (Roxb.) Korth. Verth. Nat. Ges. Bot. 161. 1840. p.p. ; Hook. f., Fl. Brit. India 3 : 25. 1880.

Large trees. Bark greyish-brown, Latex bearing, rough. Leaves broadly ovate or sub-orbicular, 5-9 × 4-6 cm obtuse - acute. Heads shortly peduncled, to 5 cm across, creamy white, solitary. Fruiting heads globose, black. Persistent.

Common along forests. Fl. & Fr. April-September. KALI KADAM. Bhatta. & Sarkar 409, 1498.

Valuable timber.

#### 16. MORINDA L.

*Morinda pubescens* Smith in Rees, Cyclop. 24 : n. 3. 1813 ; Verdc., Kew Bull. 37 : 543. 1983 ; *M. tomentosa* Heyne ex Roth, Nov. Pl. Sp. 147. 1821

; Backer & Bakh. f. Fl. Java 2 : 351. 1965. *M. tinctoria* Roxb. Fl. Indica 2 : 197. 1824 ; non Noronha, 1790. *M. tinctoria* var. *tomentosa* (Roth) Hook. f. Fl. Brit. India 3 : 156. 1880 ; Haines, Bot. Bihar & Orissa 2 : 444. 1922.

Trunk to 30 cm across. Leaves elliptic-lanceolate, acuminate, 10-12 × 4-5 cm, acute, corolla cream-white to 2.5 cm long. Syncarp globose, to 2.5 cm across.

Occasional. Fl. & Fr. May-September. Bhatta. & Sarkar 1179.

Root is a source of dye.

Note : Verdcourt (1983) has demonstrated that the extinct Mascarene endemic *Morinda pubescens* and *M. tomentosa* are conspecific. She has adopted Art. 57. But such a change in the application of name is not appreciated in the Code (p. XIV, 1994).—Bhatta.

#### 17. NEOLAMARCKIA BOSSER

*Neolamarckia cadamba* (Roxb.) Bosser in *Adansonia* 6 (3) : 245-248. 1984. *Anthocephalus chinensis* sensu A. Rich. ex Walp. *Repert.* 2 : 491. 1843 non *Cephalanthus chinensis* Lamk. *Encycl. Meth. Bot.* 1 : 678. 1785. Ridsdale, *Blumea* 24 : 334. 1978. *Anthocephalus indicus* A. Rich, *Mem Soc. Hist. Nat. Paris* 5 : 238. 1834. *nom illeg.* ; *Nauclea cadamba* Roxb. Fl. Indica 2 : 121. 1824 ; *Anthocephalus cadamba* (Roxb.) Miq. Fl. Ind. Bat. 2 : 135. 1856 ; Hook. f. Fl. Brit. India 3 : 23. 1880 ; Haines, Bot. Bihar & Orissa 2 : 441. 1922.

Large trees with spreading subwhorled branches. Trunk to 80 cm across. Leaves elliptic-oblong or ovate, 12-25 × 6-11 cm. Flowers small, yellow. Sepals to 0.3cm long. Corolla to 0.7 cm long. Pseudocarps orange, 5-6 cm across.

Occasional in the villages. Fl. : May-June. Fr. : August-October. KADAM, Bhatta., & Sarkar 1175, 1771.

Planted for its showy flowers.

#### 18. OLDENLANDIA L.

- |  |     |                      |
|--|-----|----------------------|
| 1a. Peduncles many flowered, pedicels filiform.                                      |     |                      |
| Corolla-tube long, far longer than the sepals  | ... | 1. <i>O. affinis</i> |
| 1b. Peduncles 1-4 flowered. Corolla-tube short or only slightly exceeding the sepals | ... | 2                    |

- 2a. Erect, corymbosely branched herbs. Pedicel slender, solitary, axillary. Sepals very short, distant. Top of capsule rounded protruded ... 4. *O. herbacea*
- 2b. Diffuse or suberect small herbs. Top of capsules flat, not protruded ... 3
- 3a. Pedicels very short. Flowers solitary ; sessile ... 3. *O. diffusa*
- 3b. Pedicels long slender, usually paired on a slender peduncle (flowers 2-3 together). ... 4
- 4a. Sepals triangular-subulate. Calyx bases not touching in fruits (distant) ... 2. *O. corymbosa*
- 4b. Sepals broadly lanceolate. Calyx bases touching in fruits (contiguous) ... 5. *O. pumila*

1. *Oldenlandia affinis* (R. & S.) DC. Prodr. 4 : 428. 1830. *Hedyotis affinis* R. & S. Syst. Veg. 3 : 194. 1819 ; *O. dichotoma* (Koen. ex Roth) Hook. f., Fl. Brit. India 3 : 67. 1880 ; Haines, Bot. Bihar & Orissa 2 : 470. 1922.

Slender herbs to 15 cm high. Leaves linear-lanceolate, 5 × 0.5 cm. Cymes in upper axils paniced. Flowers minute, bluish, on hair-like pedicels upto 1.5 cm long. Capsule globose.

In waste land. Fl. & Fr. : September. Banerjee 308 (CAL!).

2. *Oldenlandia corymbosa* L. Sp. Pl. 119. 1753 ; Hook. f., Fl. Brit. India 3 : 64. 1880 excl. syn. *O. burmanniana* R. Br. ; Haines, Bot. Bihar & Orissa 2 : 468. 1922. *Hedyotis corymbosa* (L.) Lamk. Encycl. Meth. Bot. 1 : 272. 1792.

Profusely branched herbs, to 30 cm high. Leaves linear or narrowly elliptic-lanceolate, 3 × 0.2 cm. Peduncles solitary, 1-4 flowered. Flower white. Capsule globose, greyish white.

In waste places. Fl. & Fr. : June-October. Bhatta. & Sarkar 1243.

3. *Oldenlandia diffusa* (Willd.) Roxb. Fl. Indica 1 : 444. 1820 ; Hook. f. Fl. Brit. India 3 : 65. 1880 ; Haines, Bot. Bihar & Orissa 2 : 468. 1922 ; *Hedyotis diffusa* Willd., Sp. Pl. 1 : 566. 1798. T. Yamazaki, Fl. E. Himal. 1 : 309. 1966.

Diffuse annual herbs. Leaves linear, to 3 cm long. Peduncles axillary,

solitary, usually 1-flowered. Corolla white. Capsule subglobose, smooth.

In waste places. Fl. & Fr. : June–September. Bhatta. & Sarkar 1249.

4. *Oldenlandia herbacea* (L.) Roxb., Fl. Indica 1 : 423. 1820 ; Haines, Bot. Bihar & Orissa 2 : 469. 1922. *O. heynei* R. Br. ex G. Don, Gen. Syst. 3: 531. 1834 ; Hook. f., Fl. Brit. India 3 : 65. 1880 ; *Hedyotis herbacea* L. Sp. Pl. 102. 1753.

Stem 4-angled. Leaves linear-lanceolate, to 3 × 0.2 cm. Corolla white. Anthers partially exerted. Capsule loculicidal, ellipsoid.

In waste places. Fl. & Fr. : September–January. Bhatta., & Sarkar 851.

Medicinal plant.

5. *Oldenlandia pumila* (L.f.) DC., Prodr. 4 : 425. 1830. Kothari & Moorthy, Fl. Raigad Dist. 189. 1993. *Hedyotis pumila* L. f., Suppl. 119. 1781; *Oldenlandia crystallina*. Roxb., Fl. Indica 1 : 422. 1820 ; Hook. f., Fl. Brit. India 3 : 65. 1880 ; Haines, Bot. Bihar & Orissa 2 : 468. 1922.

Annual diffuse herbs. Leaves elliptic or elliptic-lanceolate, 6–15 × 2–3 mm. Flowers greenish-white, axillary, solitary or in pairs, pedicellate. Capsules obovoid-pyriform, glabrous. Seeds many, minute, brownish.

In moist places. Fl. & Fr. : August–October. Bhatta., & Sarkar 390.

#### 19. PAEDERIA L., *nom. cons.*

*Paederia foetida* L. Mant 1.52. 1767 ; Hook. f., Fl. Brit. India 3 : 195. 1880 ; Haines, Bot. Bihar & Orissa 2 : 463. 1922. Hara & Gould Enum. Fl. Pl. Nepal 2 : 206. 1979.

Twining herbs ; crushed herbage with foul smell. Leaves oblong-ovate, 5–14 × 2–7.5 cm, acute ; petiole 1.3 –2.5 cm. Flowers in paniced cymes, purplish ; corolla 1.3–1.7 cm, tomentose Ovary 2-locular, each 1-ovuled. Fruit compressed, elliptic ovate, polished, 0. 6–0.8 × 0. 5 cm. Seeds flat, to 0.5 cm long, winged.

Very common along moist forest areas. Fl. & Fr. : August–December. GANDHAL. Bhatta., & Sarkar 286.

Leaves medicinal.

Notes : Babu (Herbaceous Fl. Dehradun 229. 1977) considered that

*Paederia foetida* sensu Hook. f. non L. is conspecific with *P. scandens* (Lour.) Merr., 1934.

#### 20. PAVETTA L.

*Pavetta indica* L., Sp. Pl. 110. 1753 ; Hook. f., Fl Brit. India 3 : 150. 1880 ; Haines, Bot. Bihar & Orissa 2 : 456. 1922. *Pavetta crassicaulis* Bremek. in Fedde Report. 37. 112.1934.

Shrubs to 2 m high. Leaves elliptic-lanceolate or obovate, 7.5–16×3.5 cm, glabrous on both surfaces. Corymb terminal, minutely puberulous. Corolla white ; tube to 1.5 cm long. Drupe to 0.5 cm across.

Common along forest margins. Fl. & Fr. : June–October. Bhatta., & Sarkar 892, 1433.

Herbs medicinal.

#### 21. RUBIA L.

*Rubia angustissima* Wall. in Roxb., Fl. Indica 1 : 382. 1820. Hook.f., Fl. Brit. India 3 : 203. 1880 ; Haines, Bot. Bihar & Orissa 2 : 474. 1922.

Scandent herbs. Leaves in whorls, linear-acicular. Flowers in axillary, peduncled cymes, calyx 0. Corolla bell shaped, 4–6-lobed, cream coloured. Stamens 4–6. Ovary 2-locular. Berry globose.

Haines (l.c.) reported the plant from sandstone areas. Haines 2019 (CAL !).

#### 22. SPERMACOCE L.

Notes : The only difference between *Borreria* G. F. W. Meyer and *Spermacoce* L. rests on one character, viz. whether the fruits dehisce or not, which can not be treated sufficient for keeping them distinct.

- 1a. Stem procumbent. Leaves 2–3 times longer than broad ... 1. *S. articularis*  
 1b. Stem erect; leaves 7–9-times longer than broad ... 2. *S. ramanii*

1. *Spermacoce articularis* L. f., Suppl. Pl. 1 : 119. 1782 ; Wall. in Roxb. Fl. Indica 1 : 378. 1820 ; Sivarajan & R. V. Nair, Taxon 35. 366. figs. 5–10. 1986 ; *Spermacoce hispida* sensu Hook. f., Fl. Brit. India 3 : 200. 1881 ; Haines, Bot. Bihar & Orissa 2 : 472 (451). 1922 ; non L. 1753 ; *Borreria articularis* (L.f.) F. N. Williams, Bull. Herb. Boiss. Ser. 5.2 : 956. 1905.

Herbs, sometimes suffruticose. Stipules interpetiolar, connate with the base of leaves into a sheath, pectinate. Branches 5–20 cm long. Leaves

lanceolate-oblong or obovate, 0.5–3.0 × 0.4–1.5 cm. Flowers clustered at the end of reduced axillary branches. Corolla to 0.4 cm long, white or purplish-white, corolla lobes valvate, corolla tube with a ring of hairs within, at base. Ovary 2-locular, each with 1 axile ovule. Fruit a paired mericarps. Seeds ventrally grooved.

In waste lands. Fl. & Fr. : June–November. Bhatta., & Sarkar 899, 1154.

2. *Spermacoce ramanli* Sivarajan et R. V. Nair, *Taxon* 35 : 376. figs. 11–18. 1986 ; *S. stricta* auct. pl. ; Hook. f., *Fl. Brit. India* 3 : 200. 1880 ; Haines, *Bot. Bihar & Orissa* 2 : 472. 1922 ; non L. f. 1782 ; *S. pusilla* auct. pl, non Wall. 1820 ; *Borreria pusilla* auct. pl. non ( Wall.) DC. 1830.

Annual herbs, 10–20 cm high. Leaves linear-lanceolate or oblong, 2–6 × 1 cm, glabrous or scabrid. Flowers usually in terminal clusters. Corolla to 0.3 cm long, white or pale purple. Capsule to 0.3 cm long.

In exposed grounds. Fl. & Fr. : July–November. Bhatta., & Sarkar 1042.

### 23. SPERMODICTYON Roxb.

*Spermodictyon suaveolens* Roxb., *Pl. Cor.* 3 : 32. t. 236. 1815. Sant. & Merchant, *Bull. Bot. Surv. India* 3 : 110. 1962. *Hamiltonia suaveolens* Roxb. *Fl. Indica* 2 : 223. 1824 ; Hook. f., *Fl. Brit. India* 3 : 197. 1881 ; Haines, *Bot. Bihar & Orissa* 2 : 463. 1922.

Shrubs to 1.5 m high. Leaves elliptic-lanceolate or ovate, to 15 cm long, acute, glabrous. Flowers lilac, fragrant, to 0.6 cm across. Corolla tube to 1 cm long. Capsules ellipsoid, 1-locular, 5 valved at top.

In the sandstone hills. Fl. & Fr. : October–December. Bhatta., & Sarkar 603, 1438, 1838.

The foul smelling roots are used against diarrhoea and Cholera.

### 24. THECAGONUM Babu

Notes : The genus *Gonotheca* Bl. ex DC., *Prodr.* 4 : 429. 1830, non Rafin. 1808 is a later homonym. Babu ( op. cit.) has provided a new name, *Thecagonum*, which is an anagram of the former. —Bhatta.

- 1a. Herbs, to more than 15 cm high ;  
calyx lobes deltoid ... 1. *T. biflora*
- 1b. Small herbs, to 9 cm high ; calyx lobes slender... 2. *T. ovatifolia*

1. **Thecagonum biflora** (L.) Babu, Bull. Bot. Surv. India 11. 214. 1969 (1971) ; *Oldenlandia biflora* L., Sp. Pl. 119. 1753 ; Kothari & Moorthy, J. Bombay nat. Hist. Soc. 80 : 260. 1983 ; *O. paniculata* L., Sp. Pl. ed 2. 1667. 1763 ; Hook. f., op. cit. 69 ; Haines, op. cit. 470 ; *Hedyotis biflora* (L.) Lamk. Encycl. 1 : 272. 1792.

Annual herbs, to 40 cm long. Leaves elliptic-ovate or oblong, 1.2–5 cm long, subacute, subsucculent. Cymes paniced, few-flowered. Flowers white. Capsule didymous. Seeds many, brownish-black, pitted.

Along waste places. Fl. & Fr. : June–December. Bhatta., & Sarkar 221, 911, 1028, 1250.

2. **Thecagonum ovatifolium** (Cav.) Babu, Bull. Bot. Surv. India 11 : 214. 1971. Karthikeyan & Kumar, Fl. Yavatmal Dist. 131. 1993 ; *Hedyotis ovatifolia* Cav. Deser. Pl. lc. 6 : 52. t. 573. f. 1. 1801. *Oldenlandia nudicaulis* Roth, Nov. Pl. Sp. 95. 1821 ; Hook. f., Fl. Brit. India 3 : 70. 1880 ; Haines, op. cit. 471.

Annual herbs. Stems short. Leaves ovate-oblong, 2.5–5 cm long, sub-sessile, glabrous or pubescent beneath. Flowers in terminal, paniced cymes, white. Fruits globose. Seeds ovoid-globose.

In shady, wet forest floor. Fl. & Fr. : July–October. Bhatta., & Sarkar 1102, 1258.

#### 25. WENDLANDIA Bartl. ex DC., *nom. cons.*

- 1a. Stipules recurved ; grey-tomentose ... 1. *W. heynei*  
 1b. Stipules erect ; nearly glabrous ... 2. *W. tinctoria*

1. **Wendlandia heynei** (R. & S.) Sant. & Merchant, Bull. Bot. Surv. India 3 : 110. 1961 ; Lakshminarasimhan & Sharma, Fl. Nasik Dist. 254. 1991 ; *Rondeletia heynei* R. & S., Syst. 5 : 234. 1819. *W. exserta* (Roxb.) DC., Prodr. 4 : 411. 1830 ; Hook.f., Fl. Brit. India 3 : 37. 1880. Haines, op. cit. 446.

Small trees. Leaves oblong or ovate-lanceolate, acuminate, 8–20 × 2–6 cm, stipules broadly oblong, obovate. Flowers white, to 0.4 cm across. Capsule globose.

Planted on the banks of irrigation canals. Fl. : March– April. Bhatta., & Sarkar 1094, 1562.

Wood used for agricultural implements.

2. **Wendlandia tinctoria** (Roxb.) DC., Prodr. 4 : 411. 1830 ; Hook. f., Fl. Brit. India 3 : 38. 1880 ; Haines op. cit. 447. *Rondeletia tinctoria* Roxb.,

Fl. Indica 2 : 135. 1824.

Small trees. Leaves 10–20 × 5–10 cm, always narrowed into the petiole, opposite elliptic ovate or obovate acuminate. Panicles large spreading, pubescent pilose or tomentose. Flowers sessile, fascicled, white. 0.5 cm long ; corolla tube usually slender. Anthers shortly exerted. Stigmas oblong. Capsule 0.1–0.2 cm diameter, pubescent, reddish.

Rare. Banerjee 189. (CAL!).

Flowers and fruits are source of blue dye. Juice of fresh unripe fruits is used for coagulating milk.

**CXIX. ASTERACEAE (COMPOSITAE *nom. alt.*)**

- |     |  |       |
|-----|--|-------|
| 1a. | Flowers all tubular or only ray florets ligulate ;<br>sap not milky ; herbs, shrubs or twiner ;<br>leaves alternate or opposite  | ... 2 |
| 1b. | Flowers all ligulate ; herbs ; stem fistulose,<br>sap milky ; leaves radical or alternate ;<br>pappus of simple hair like bristles ;<br>anthers cleft at base, rarely appendaged at apex ;<br>florets (in our species ) yellow (CICHORIEAE) ...  | 35    |
| 2a. | Style--arms long, distinct, or if very short or the<br>style subentire then so only in the sterile flowers<br>of heads with dissimilar (heterogamous)florets ...   | 3     |
| 2b. | Style--arms very short, hairy or thickened towards<br>the base, or the style subentire in all the tubular<br>florets ; corolla 5-fid ; anther-cells always<br>appendaged at the apex, either subentire or cleft<br>at the base ; receptacle usually paleaceous ;<br>leaves alternate spinescent or unarmed; achenes<br>glabrous, inserted in the straight areoles<br>of the receptacle (CYNAROIDEAE) ... | 34    |
| 3a. | Flowers red, purple, or white, never yellow ;<br>all the florets similar (homogamous ) and<br>tubular or rarely ( <i>Elephantopus</i> ) cleft laterally ;<br>involucre of bracts always more than 1-seriate ;<br>pappus present, usually setaceous, receptacle<br>naked or rarely ( <i>Ageratum</i> ) paleaceous ...   | 4     |

- 3b. Flowers, if homogamous and tubular, yellow ;  
if dissimilar (heterogamous), at least those of the  
disk yellow; or. if none of the flowers yellow (*Emilia*)  
then with the bracts of the involucre only 1-seriate,  
rarely (some INULOIDEAE) flowers purple with bracts  
many seriate, but if so, with the heads at least  
heterogamous ... 11
- 4a. Anthers cleft at base and appendaged at apex ;  
style-arms subulate, hairy ; leaves alternate ;  
achenes 10-ribbed (VERNONIEAE) ... 5
- 4b. Anthers subentire at base, either truncate or  
appendaged at apex ; style-arms obtuse, papillose ;  
leaves opposite (EUPATORIEAE) ... 8
- 5a. Heads distinct, many flowered ... 6
- 5b. Heads with 2-5 florets, crowded into a dense  
compound head or dispersed on an elongated axis ... 7
- 6a. Pappus short fugacious ... 9. CENTRATHERUM
- 6b. Pappus long copious ... 34. VERNONIA
- 7a. Heads peduncled and collected into a flat  
terminal cluster and always associated with  
a pair or three foliaceous bracts ;  
pappus rigid, shining, chaffy ... 14. ELEPHANTOPUS
- 7b. Heads narrow, axillary, on an elongated axis ;  
bracts linear ; pappus coiled at apex ... 27. PSEUDELEPHANTOPUS
- 8a. Anthers truncate at apex ... 1. ADENOSTEMMA
- 8b. Anthers appendaged at apex ... 9
- 9a. Pappus of 5 paleaceous scales ; receptacle  
nearly flat, naked or with caducous scales ... 2. AGERATUM
- 9b. Pappus of slender hairs, receptacle always naked ... 10
- 10a. Bracts of the involucre several-seriate,  
numerous ; perennial herbs ... 10. CHROMOLAENA
- 10b. Bracts of the involucre 4, with a small  
outer one ; climbers ... 24. MIKANIA

- 11a. Anthers appendaged at the apex ... 12
- 11b. Anthers not appendaged at the apex ;  
 receptacle not paleaceous ; pappus absent  
 or reduced to a raised rim, rarely scaly and short ;  
 flower heads discoid, heterogamous ; filaments  
 of the anther free ; leaves usually alternate,  
 variously lobed (ANTHEMIDEAE) ... 33
- 12a. Receptacle naked, smooth or foveolate but  
 in no case beset with proper paleae ;  
 if pseudopaleaceous (*Caesulia*) then with  
 the anther bases produced into tails ... 13
- 12b. Receptacle paleaceous : anthers subentire at the base ;  
 bracts of the involucre 1-many-seriate heads usually  
 radiate, heterogamous ; style arms truncate or  
 appendaged or those of the sterile florets entire ;  
 pappus of 2-4 awns, or paleaceous, or absent ;  
 leaves at the base usually opposite, those higher  
 up opposite or alternate (HELIANTHOIDEAE) ... 24
- 13a. Bracts of the involucre 1-seriate, subequal,  
 free or united, with sometimes a few short outer  
 bractlets (calycule ) at their base; anther cells  
 subentire at the base ; leaves alternate, radical,  
 a few cauline, and stem clasping, heads all  
 homogamous ; florets all purple ... 15. EMILIA
- 13b. Bracts of the involucre many-seriate,  
 leaves alternate ... 14
- 14a. Anthers subentire at the base ; style-arms flattened  
 or planoconvex, all or atleast those of the  
 diskflorets, tipped by a cone ; all the flower-heads  
 heterogamous (ASTEROIDEAE) ... 15
- 14b. Anther cleft at the base or rarely (*Laggera*)  
 with bases subentire, and if so, with the style-  
 arms of the hermaphrodite florets filiform,  
 linear or obtuse, or those of the sterile  
 florets undivided (INULOIDEAE) ... 17
- 15a. Flower-heads without a proper ray ; achenes  
 flattened or subterete, with a terminal toothed  
 or bristly pappus-ring ... 19. GRANGEA

- |   |     |                  |
|---|-----|------------------|
| 15b. Flower-heads with distinct ray florets ;<br>pappus long, copious   | ... | 16               |
| 16a. Flower-heads of two colours ; ray-florets<br>ligulate, ligules 2-3 seriate   | ... | 17. ERIGERON     |
| 16b. Flower-heads yellow ; ray-florets slender,<br>tubular, or with very short ligules  | ... | 12. CONYZA       |
| 17a. Female florets ligulate ; flower-heads<br>heterogamous but florets usually all<br>fertile, with linear style-arms rounded<br>or dilated at their tips      | ... | 18               |
| 17b. Female florets, if present, filiform   | ... | 19               |
| 18a. Shrubs ; achenes silky ; pappus dirty-white,<br>hairs thickened at the ends  | ... | 21. INULA        |
| 18b. Herbs ; achenes minute, pappus of ray-<br>florets absent   | ... | 26. PENTANEMA    |
| 19a. Style-arms of hermaphrodite florets filiform ;<br>flower-heads androgynous   | ... | 20               |
| 19b. Style-arms of hermaphrodite florets truncate ;<br>bracts of the involucre hyaline  | ... | 23               |
| 20a. Flower-heads small, in dense globose masses ;<br>herbs with winged stems ; pappus absent   | ... | 31. SPHAERANTHUS |
| 20b. Flower-heads medium separate, solitary,<br>in corymbs or panicles, not in globose clusters ;<br>pappus soft copious  | ... | 21               |
| 21a. Anther-cells tailed at the base, the tails<br>of adjacent anthers confluent  | ... | 5. BLUMEA        |
| 21b. Anther-cells subentire at the base, or if<br>tailed the tails short and not united   | ... | 22               |
| 22a. Florets yellow ; stems very slender,<br>not winged ; leaf half-embracing the<br>stem at their base   | ... | 6. BLUMOPSIS     |
| 22b. Florets purplish or pink ; stems rather<br>robust, more or less winged, wings very<br>shortly decurrent from the leaves,<br>which are auricled at the base | ... | 22. LAGGERA      |

- 23a. Achene wingless; flower-heads many-flowered, heterogamous, disciform; hoary or woolly herbs... 18. GNAPHALIUM
- 23b. Achene winged; flower-heads 1-flowered, homogamous, crowded in pseudo-paleaceous, axillary common receptacles, the bracts of the involucre of individual heads simulating paleae; glabrous marsh herbs ... 7. CAESULIA
- 24a. Leaves all alternate; anthers free or nearly so ... 25
- 24b. Leaves all opposite, or rarely only the upper leaves alternate; anther in a tube ... 26
- 25a. Flower heads discoid, heterogamous; ray florets white, definite (5), disc florets bisexual and sterile; achenes with 2 wing like scales ... 25. PARTHENIUM
- 25b. Flower heads 1-sexual; male florets many in globular heads, female florets all apetalous; bracts of the involucre 1-seriate; free; female florets 2 together, united with the involucre in a prickly burr; pappus zero ... 36. XANTHIUM
- 26a. Florets of two colours; pappus of numerous scales, scales of pappus feathery, fringed ... 33. TRIDAX
- 26b. Florets of one colour ... 27
- 27a. Achenes all thick, or those of the ray-florets 3-cornered, and those of the disk laterally compressed; pappus cup like or composed of 2-3 stiff, chaffy, or bristly awns with or without intermediate smaller scales, or altogether absent ... 28
- 27b. Achenes more or less depressed from the top; pappus of 2, rarely 3-4, bristles, or absent ... 32
- 28a. Inner bracts of the involucre embracing and enclosing the achenes of the fertile ray-florets; pappus absent ... 29
- 28b. Inner bracts of the involucre all flat ... 30

- 29a. Outer bracts of the involucre 5, glandular ... 29. SIEGESBECKIA
- 29b. Outer bracts of the involucre 4,  
in two opposite pairs, glabrous ... 16. ENYDRA
- 30a. Scales of the receptacle flat, very narrow, usually few ;  
disk-florets 4-toothed ; ligules small ; pappus absent,  
or if present, shortly 2-awned ; outer bracts of the  
involucre numerous ... 13. ECLIPTA
- 30b. Scales of the receptacle concave or complicate,  
more or less enclosing and embracing the  
disk-florets ... 31
- 31a. Achenes of the disk ciliate or winged on the  
margins, laterally compressed ; heads small ;  
receptacles-raised, conical ... 32. SPILANTHES
- 31b. Achenes wingless, compressed or 4-5 cornered ;  
pappus united at the base into a ring or cup ;  
flower-heads small or medium; ray florets fertile ;  
ligules large ; disk—achenes with 1-2 short,  
deciduous awns ... 35. WEDELIA
- 32a. Outer bracts of the involucre almost equal,  
herbaceous ; inner bracts separate, almost  
resembling the scales of the receptacle ;  
ray-florets fertile ; achenes almost 4-cornered,  
without a pappus but crowned by the densely  
pilose base of corolla ... 20. GUIZOTIA
- 32b. Outer bracts of the involucre few, small ; inner  
bracts connate below, membranous ; style-arms  
truncate, penicillate, or crowned by a short  
appendage ; leaves simple to pinnatisect ; ray  
florets sterile ; achenes with 2-4 stiff awns,  
ultimately finely serrulate on inner side ... 4. BIDENS
- 33a. Florets of the circumference very numerous ;  
achenes flat or concave at top ; flower-heads  
spherical or hemispherical, sessile ; bracts  
of the involucre 2- seriate, spreading in fruit ... 8. CENTIPEDA
- 33b. Florets of the circumference few ; achenes  
obovate or rounded at top ; flower-heads  
very small, in racemes or panicles ... 3. ARTEMISIA

- 34a. Perennial under shrubs, flower-heads dioecious ;  
leaves and bracts of the involucre spinescent,  
thistle-like ; pappus hairs connate at the base into a  
deciduous ring ; filaments free, papillose-hairy ;  
pappus-hairs feathery ; corolla dingy purple ... 11. CIRSIUM
- 34b. Annual or biennial unarmed herbs; flower-heads homogamous;  
florets purple or bluish, all hermaphrodite, fertile ;  
pappus-hairs 2-1-seriate, feathery, or only a few  
of the outer ones simple ; filaments free glabrous ... 28. SAUSSUREA
- 35a. Achenes beaked and also contracted at the  
base, fusiform or oblong, rarely shortly cylindric,  
often slender, ribbed ; ribs rugose or smooth ... 37. YOUNGIA
- 35b. Achenes not beaked ... 36
- 36a. Achenes compressed, narrowed at base,  
truncate at apex, many-ribbed ; ribs smooth  
or rugose ; heads campanulate ... 30. SONCHUS
- 36b. Achenes columnar, truncate at base as  
well as at apex ; heads cylindric ... 23. LAUNEA

#### 1. ADENOSTEMMA J. R. & G. Forst.

*Adenostemma lavenia* (L.) O.Kuntze, Rev. Gen. Pl. 1 : 304.1891 ;  
Panigrahi in Kew Bull. 30 : 648.1975. *Verbesina lavenia* L., Sp. Pl. 1 : 902.  
1753. *A. viscosum* J. R. & G. Forst., Chart Gen. Pl. 90. t. 45. 1776 ; Hook.  
f., Fl. Brit. India 3 : 242. 1882 ; Haines, Bot. Bihar & Orissa 2 : 485.1922.

Herbs. Leaves broadly ovate, to 10 cm long, serrate, glabrescent. Involu-  
cral bracts glandular-hairy.

Along margins of streams. Pantropical. October-January. Sarkar & Bhatta.,  
191, 405.

#### 2. AGERATUM L.

*Ageratum conyzoides* L., Sp. Pl. 839.1753 ; Hook. f., Fl. Brit. India 3 :  
243. 1881 ; Haines, Bot. Bihar & Orissa 2 : 458.1922.

Herbs, to 60 cm high. Leaves ovate, 3-8 cm long, coarsely crenate. Heads  
0.3-0.5 cm broad, blue-purple or white. Achenes black.

In waste places. Pantropical. Throughout the year. OOUCHUNTI. Sarkar & Bhatta., 1181.

Used as a nervine tonic. Sometimes form fungal ascidium in leaves (Sci. Cul. 1959).

### 3. ARTEMISIA L.

*Artemisia nilagirica* (Cl.) Pamp. in Nuov. Giorn. Bot. Ital. 33 : 452. 1926. Verma in Fl. Raipur, Durg & Rajnandgaon 186. 1985. *A. vulgaris* var. *nilagirica* Cl. Comp. Ind. 162. 1876. *A. vulgaris* auct. pl. ; Hook. f. Fl. Brit. India 3 : 325. 1881; non L. 1753. *A. indica* sensu Wt. Ic. t. 1112. 1846 ; non Willd. 1803.

Herbs, to 1.25 m high. Leaves to 14 cm long ; lobes serrate or lobulate. Heads 0.3–0.4 cm across.

Wet forest areas. Indomalesia. October–December. NAGDANA. Sarkar & Bhatta., 75, 504, 607.

Herbs medicinal.

### 4. BIDENS L.

*Bidens biternata* (Lour.) Merr. & Sherff ex Sherff, Bot. Gaz. 88. 293. 1929 ; *Coreopsis biternata* Lour., Fl. Cochinch. 508. 1790. *Bidens pilosa* auct. pl. ; Hook. f. , Fl. Brit. India 3 : 309. 1881 ; Haines, Bot. Bihar & Orissa 2 : 507. 1922; non L. 1753.

Herbs, to 1.5 m high. Leaves 3–5–foliolate ; leaflets ovate–lanceolate. Florets white.

Occasional near Gobardhana. Asia. October–March. Sarkar & Bhatta. 1378.

### 5. BLUMEA DC., *nom. cons.*

- |  |  |
|--|--|
| 1a. Plants densely woolly all over. ...                            | 2  |
| 1b. Plants glabrate or variously pubescent, never woolly all over. | 4  |
| 2a. Outer involucral bracts linear, tapering. ...                  | 3  |
| 2b. Outer involucral bracts oblong–lanceolate acute                | 2. <i>B. hieracifolia</i> var. <i>macrostachya</i> |

- |  |  |                        |
|--|--|------------------------|
| 3a. Herbs not glandular hairy  | ...  | 3. <i>B. lacera</i>    |
| 3b. Herbs glandular hairy  | 4. <i>B. lacera</i> . var. <i>glandulosa</i> |                        |
| 4a. Corolla lobes of bisexual florets with multicellular hairs in addition to colleters            | ...  | 7. <i>B. obliqua</i>   |
| 4b. Corolla lobes of bisexual florets glabrous or with unicellular hairs in addition to colleters. | ...  | 5                      |
| 5a. Heads solitary, axillary and terminal  | ...  | 1. <i>B. bifoliata</i> |
| 5b. Heads glomerulate or variously paniculate.   | ...  | 6                      |
| 6a. Leaves spinous-toothed   | ...  | 8. <i>B. oxyodonta</i> |
| 6b. Leaves not as above.   | ...  | 7                      |
| 7a. Receptacles pilose   | ...  | 5. <i>B. laciniata</i> |
| 7b. Receptacles glabours   | ...  | 6. <i>B. mollis</i>    |

1. *Blumea bifoliata* (L.) DC. in Wt. Contrib. 14.1834 ; Hook. f. Fl. Brit. India 3 : 261. 1881 ; *Conyza bifoliata* L. Sp. Pl. 862. 1753.

Annual herbs, to 40 cm high. Leaves obovate-oblong, distantly serrulate. Heads peduncled, solitary, to 0.8 cm across, yellow. Achenes oblong, pubescent.

In wastelands. Indomalesia. April-June. Sarkar & Bhatta., 299.

2. *Blumea hleracifolia* (D. Don) DC. var. *macrostachya* (DC.) Hook. f., Fl. Brit. India 31. 363. 1881. Randeria, *Blumea* 10 : 248.1960 ; Haines, Bot. Bihar & Orissa 2 : 492.1922; *B. macrostachya* DC. Prodr. 5 : 442. 1836.

Stems to 1 m high. Leaves obovate-elliptic, to 15 cm long dentate, white woolly beneath. Heads to 1.5 cm across, yellow.

Common along wet, shady places. Indomalesia. January-March. Sarkar & Bhatta., 478.

3. *Blumea lacera* (Burm. f.) DC. in Wt. Contrib. 14. 1834 ; Hook. f. Fl. Brit. India 3 : 263. 1881 ; Haines, Bot. Bihar & Orissa 2 : 493.1922 ; *Conyza lacera* Burm. f. , Fl. Indica 180. t. 59. f. .1. 1768.

Aromatic annual herbs, to 70 cm high. Leaves obovate-oblong, to 7 cm

long, serrate. Heads in short panicles, yellow. Achenes terete.

Common. Palaeotropics. December–March. KUKURSHONKA. Sarkar & Bhatta., 298.

Herb yields an essential oil, medicinal.

4. *Blumea lacera* var. *glandulosa* (DC.) Hook. f. Fl. Brit. India 3 : 263. 1881. *B. glandulosa* DC. in Wt., Contrib 14. 1834.

Glandular–pubescent herbs, to 70 cm high. Leaves spatulate. Heads yellow.

Along the margins of wet places. December–March. Sarkar & Bhatta., 85.

5. *Blumea laciniata* (Roxb.) DC. Prodr. 5 : 436. 1836 ; Hook. f., Fl. Brit. India 3 : 264. 1881 ; Haines, Bot. Bihar & Orissa 2 : 494. 1922. *Conyza laciniata* Roxb. Fl. Indica 3 : 427. 1832.

Erect or ascending herbs to 1.1 m high. Leaves obovate–lanceolate, to 18 cm long, serrate–dentate, lyrate-lyobed. Heads to 0.5 cm across, yellow. Achenes pubescent.

In waste places. Indomalaysia. January–April. Sarkar & Bhatta., 1808.

6. *Blumea mollis* (D. Don) Merr. Phillip. J. Sci. (Bot.) 5 : 395. 1910 ; Randeria *Blumea* 10 : 261. 1960. *Erigeron mollis* D. Don, Prodr. Fl. Nepal 172. 1825. *Blumea wightiana* DC. in Wt. Contrib. 14. 1834 ; Hook. f., Fl. Brit. India 3 : 261. 1881 ; Haines, Bot. Bihar & Orissa 2 : 493. 1922.

Herbs, to 50 cm high. Leaves ovate–oblong, 1–10 cm long. Heads in dense terminal panicles, to 0.3 cm across. Florets purplish. Achenes angled, glabrous.

Along moist places. Palaeotropics. February–May. Sarkar & Bhatta., 395.

7. *Blumea obliqua* (L.) Druce in Rep. Bot. Exch. Club. Brit. Isles 4 : 609. 1917 ; Randeria, *Blumea* 10 : 280. 1960 ; *Erigeron obliquum* L., Mant. 2 : 573. 1771. *Blumea amplexans* DC. in Wt. Contrib. 13. 1834 ; Hook. f., Fl. Brit. India 3 : 260. 1881 ; Haines, Bot. Bihar & Orissa 2 : 491. 1922.

Erect herbs, to 50 cm high. Leaves elliptic–oblong, 1–6 cm long, serrate or subentire. Heads solitary, to 0.7 cm across. Florets yellow. Achenes pubescent.

Along sandy river beds. India, Sri Lanka. March–June. Sarkar & Bhatta., 915.

8. *Blumea oxyodonta* DC. in Wt. Contrib. 15.1834 ; Hook. f. Fl. Brit. India 3 : 266 ; Haines, Bot. Bihar & Orissa 2 : 491.1922; Randeria, *Blumea* 10: 280. 1960.

Herbs, to 40 cm high. Leaves obovate—oblong, to 7 cm long, spinescent—serrate. Heads 0.6–0.8 cm across, yellow. Achenes angled, pubescent.

Open grounds. South Asia. March–May. Sarkar & Bhatta., 394.

#### 6. *BLUMEOPSIS* Gagnep.

*Blumeopsis flava* (DC.) Gagnep., Bull. Mus. Hist. Nat. Paris 26 : 76.1920; Babu, Herb. Fl. Dehra Dun 248.1977, *Blumea flava* DC. Prodr. 5 : 439. 1836; Haines, Bot. Bihar & Orissa 2 : 495.1922; *Laggera flava* (DC.) Benth. Gen. Pl. 2 : 290. 1873 ; Hook. f. Fl. Brit. India 3 : 270. 1881.

Erect herbs, to 80 cm high. Leaves obovate, to 6.5 cm long, dentate. Heads to 0.3 cm across.

Waste places, Indomalaysia. January–April. Sarkar & Bhatta., 338.

#### 7. *CAESULIA* Roxb.

*Caesulia axillaris* Roxb., Pl. Corom. 1 : 64. t. 93. 1798 ; Hook. f. Fl. Brit. India 3 : 291. 1881; Haines, Bot. Bihar & Orissa 2 : 499.1922.

Herbs, to 30 cm long. Leaves linear—lanceolate, 5–12 cm long, serrate. Heads to 1.2 cm across, purplish.

Wet places, India. August–March. Sarkar & Bhatta., 315, 1655.

#### 8. *CENTIPEDA* Lour.

*Centipeda minima* (L.) A. Br. & Aschers. Ind. Sem. Hort. Berol. App. 6.1867 ; *Artemisia minima* L. Sp. Pl. 849. 1753. *Centipeda orbicularis* Lour., Fl. Cochinch. 493.1790 ; Hook. f., Fl. Brit. India 3 : 317. 1881 ; Haines, Bot. Bihar & Orissa 2 : 512.1922.

Annual herbs. Branches to 20 cm long. Leaves obovate, 0.5–1.5 × 0.1–0.4 cm, entire or pinnatifid. Heads 0.2–0.3 cm across, yellow.

Fallow fields, South Asia to Pacific Islands. March–January. Sarkar & Bhatta., 397.

#### 9. CENTRATHERUM Cass.

**Centratherum anthelminticum** (L.) O. Kuntze, Rev. Gen. Pl. 1 : 320.1891 ; Prain, Bengal Pl. 1 : 431.1903; *Conyza anthelmintica* L. Sp. Pl. ed. 2 : 1207. 1762. *Vernonia anthelmintica* (L.) Willd. Sp. Pl. 3 : 1634. 1803; Hook. f., Fl. Brit. India 3 : 251.1881 ; Haines, Bot. Bihar & Orissa 2 : 483.1922 *Phyllocephalum anthelminticum* (L.) Paul et al. J. Econ. Tax. Bot. 6(3) : 728. 1985.

Herbs, to 1 m high. Leaves elliptic–obovate, 5–20 cm long. Heads to 1.5 cm across, violet or bluish. Achenes black.

Sandstone hills, common. India. October–December. Sarkar & Bhatta., 80, 1074, 1396.

#### 10. CHROMOLAENA DC.

**Chromolaena odorata** (L.) King & Robins. Phytologia 20 : 204.1970 ; *Eupatorium odoratum* L. Syst. Nat. ed. 10, 2 : 1205. 1759 ; Hook. f. , Fl. Brit. India 3 : 244. 1881.

Undershrubs, branches glandular pubescent. Leaves ovate to rhomboidal, to 13 cm long, crenate–serrate. Heads purplish.

Common along the forest roads. Adventive Neotropical weed. October–February. Sarkar & Bhatta., 1052, 1712.

#### 11. CIRSIUM Mill.

**Cirsium arvense** (L.) Scop. Fl. Carn. 2 : 126.1772 ; Hu in Quart. J. Taiwan Mus. 19 : 52. 1966. *Serratula arvensis* L. Sp. Pl. 820.1753. *Cnicus arvensis* (L.) Roth, Catalecta Bot. 1 : 115. 1797 ; Hook. f. Fl. Brit. India 3 : 362. 1881 ; Haines, Bot. Bihar & Orissa 2 : 515.1922 ; *Breca arvensis* (L.) Less., Syn. Comp. 9. 1832.

Herbs, to 80 cm high. Leaves linear–oblong or obovate, sinuate or pinnaifid. Heads to 1.5 cm across, pinkish.

Along waste places. Tropics and subtropics. January–April. Sarkar & Bhatta., 1357.

12. *CONYZA* Less., *nom. cons.*

*Conyza bonariensis* (L.) Cronq. in Bull. Torrey Bot. Club 70 : 632. 1943; Kitamura & Gould in Enum. Fl. Pl. Nepal 3 : 21. 1982. *Erigeron bonariensis* L., Sp. Pl. 863. 1753. *E. linifolia* Willd., Sp. Pl. 3 : 1955. 1804 ; Hook. f., Fl. Brit. India 3 : 254 1881 ; Haines, Bot. Bihar & Orissa 2 : 488.1922.

Herbs, to 50 cm high. Leaves linear, distally serrate. Heads yellow.

Exposed grounds. Tropics. April–May. Sarkar & Bhatta., 1403.

13. *ECLIPTA* L., *nom. cons.*

*Eclipta prostrata* (L.) L. Mant. Pl. 2 : 286. 1771 ; Roxb. Fl. Indica 3 : 438. 1832, Greuter et al. Regn. Veg.118.Art. 57,ex.5, 1988. *Verbesina prostrata* L. Sp. Pl. 902. 1753 ; *Eclipta alba* (L.) Hassk. , Pl. Jav. Rar. 528.1848; Hook. f. Fl. Brit. India 3 : 304. 1881 ; Haines, Bot Bihar & Orissa 2 : 503.1922. *Verbesina alba* L. Sp. Pl. 902. 1753. *V. pseudo-acmella* L., Sp. Pl. 901. 1753.

Prostrate, ascending or erect herbs. Leaves elliptic–oblong or lanceolate, to 4 cm long, entire or serrate. Heads 0.6–1 cm across, white. Achenes tubercled, to 0.2 cm long.

Common in wet, exposed grounds. Pantropical. All season. KESHUT. Sarkar & Bhatta., 823.

Extract of leaves used as hair tonic.

14. *ELEPHANTOPUS* L.

*Elephantopus scaber* L. Sp. Pl. 814.1753 ; Hook. f., Fl. Brit. India 3 : 242. 1881 ; Haines, Bot. Bihar & Orissa 2 : 484.1922.

Herbs, to 50 cm high. Leaves ovate or oblanceolate, basal 10–15 cm long, upper shorter. Achenes to 0.3 cm long.

Along forest margins, Pantropical. September–March. SAMDULUN. Sarkar & Bhatta., 1149.

15. *EMILIA* Cass.

*Emilia sonchifolia* (L.) DC. in Wt., Contrib. 24.1834 ; Hook. f., Fl. Brit. India 3 : 336. 1881 ; Haines, Bot. Bihar & Orissa 2 : 513.1922. *Cacalia sonchifolia* L. Sp. Pl. 835.1753.

Herbs, 5–40 cm high. Lower leaves usually lyrate and pinnatifid, 7–10 cm long, upper oblong–lanceolate, smaller. Flowers pink–purple.

On exposed grounds. Pantropical. August–May. Sarkar & Bhatta., 917.

#### 16. ENYDRA LOUR.

*Enydra fluctuans* Lour. Fl. Cochinch. 511.1790 ; Hook. f. Fl. Brit. India 3 : 304.1881 ; Haines, Bot. Bihar & Orissa 2 : 503.1922.

Succulent, glabrous herbs ; internodes hollow. Leaves oblong, to 3 cm long, serrate. Heads to 1.2 cm across, yellowish.

Along shallow water bodies. Indomalaysia, China. December–March. Sarkar & Bhatta., 18, 824.

Used as a pot herb, also medicinal.

#### 17. ERIGERON L.

*Erigeron sublyratus* DC. in Wt. Contrib. 9.1834 ; Kitamura & Gould in Enum. Fl. Pl. Nepal 3 : 27.1982. *E. asteroides* Roxb. Fl. Indica 3 : 432. 1832 ; Hook. f. Fl. Brit. India 3 : 254.1881 ; Haines, Bot. Bihar & Orissa 2 : 486.1922. non Andr. ex Besser 1821.

Herbs to 50 cm high. Leaves oblong–ovate, 1–5 cm long, crenate. Heads to 1 cm across.

In waste places. India, October–April. Sarkar & Bhatta., 423.

#### 18. GNAPHALIUM L.

- |   |     |                            |
|---|-----|----------------------------|
| 1a. Heads in corymbs, yellow                    | ... | 1. <i>G. luteo–album</i>   |
| 1b. Heads in leafy spikes or clusters, white.   | ... | 2                          |
| 2a. Heads in clusters ; leaves within 1 cm long | ... | 4. <i>G. pulvinatum</i>    |
| 2b. Heads in spikes ; leaves larger.            | ... | 3                          |
| 3a. Pappus hairs free                           | ... | 3. <i>G. polycaulon</i>    |
| 3b. Pappus hairs united at base                 | ... | 2. <i>G. pensylvanicum</i> |

1. **Gnaphalium luteo-album** L. Sp. Pl. 851.1753 ; Hook f. Fl. Brit. India 3 : 288. 1881 ; Haines, Bot. Bihar & Orissa 2 : 498.1922; *Pseudognaphalium luteo-album* (L.) Hilliard & Burt in J. Linn.Soc. (Bot.) 82: 206.1981.

Erect, weak-stemmed herbs, to 15 cm high. Leaves oblanceolate, to 1.5 cm long.

Common along moist places. Pantropical. September–December. Sarkar & Bhatta., 1639.

Leaves astringent.

2. **Gnaphalium pensylvanicum** Willd. Enum. Hort. Berol. 867. 1809 ; Grierson, Notes Roy. Bot. Gard. Edinburgh 31 : 137. 1972. *G. purpureum* auct. pl. ; Hook. f. Fl. Brit. India 3 : 289. 1881 ; Duthie, Fl. U. G. P. 1 : 421. 1903 ; Haines, Bot. Bihar & Orissa 2 : 498.1922 ; non L. 1753.

Erect herbs, to 30 cm high. : Leaves spatulate, to 8 cm long. Heads 0.2–0.4 cm across.

Weed of cultivated fields. Pantropical. August–December. Sarkar & Bhatta., 201.

3. **Gnaphalium polycaulon** Pers. Syn. 2 : 421. 1807; Grierson, Notes Roy. Bot. Gard. Edinburgh 31 : 137.1972. *G. indicum* auct. pl. ; Hook. f. Fl. Brit. India 3 : 289.1881 ; Haines, Bot. Bihar & Orissa 2 : 498.1922; non L. 1753.

Herbs, to 3–15 cm high. Leaves obovate or oblanceolate, mucronate. Achenes hairy.

In waste places. Pantropical. October–March. Sarkar & Bhatta., 203.

Note : *G. indicum* L. is a S. African species.

4. **Gnaphalium pulvinatum** Delile, Fl. Aegypte 266. t. 44. f. 1. 1812 ; Hook. f. Fl. Brit. India 3 : 289. 1881 ; Haines, Bot. Bihar & Orissa 2 : 498.1922.

Woolly herbs ; branches spreading, to 8 cm long. Leaves spatulate, to 4 cm long.

Along waste lands. Pantropical. October–March. Sarkar & Bhatta., 1345.

### 19. **Grangea** Adans.

**Grangea maderaspatana** (L.) Poir. in Lamk., Encycl. Meth. Bot. 2 : 825.1811 ; Hook. f. Fl. Brit. India 3 : 258.1881 ; Haines, Bot. Bihar & Orissa

2 : 487.1922; *Artemisia maderaspatana* L. , Sp. Pl. 849. 1753.

Herbs, to 25 cm long. Leaves oblong, 1–7 cm long. Heads to 1 cm across, yellow.

Along wet places, Asiatic, now pantropical. October–March. Sarkar & Bhatta., 211, 1533.

Infusion of leaves considered stomachic.

## 20. GUIZOTIA Cass., *nom. cons.*

**Guizotia abyssinica** (L.f.) Cass. Dict. Sci. Nat. 59 :248.1829 ; Hook. f. Fl. Brit. India 3 : 308.1881. *Polymnia abyssinica* L.f. Suppl. 383.1782.

Herbs, to 60 cm high. Leaves lanceolate, semi-amplexicaule, 7–12 cm long, serrate. Heads to 2 cm across, golden–yellow.

Cultivated for its oil–yielding seeds. Native of Tropical Africa. December–March. RAMTIL. Sarkar & Bhatta., 1447, 1629.

## 21. INULA L.

**Inula cappa** (Buch. –Ham.ex D. Don) DC. Prodr. 5 : 469.1836 ; Hook. f., Fl. Brit. India 3 : 295.1881 ; Haines, Bot. Bihar & Orissa 2 : 499.1922; *Conyza cappa* Buch. –Ham. ex D. Don, Prodr. Fl. Nepal 176. 1825.

Shrubs, to 2.5 m high, silky–pubescent. Leaves oblong–lanceolate, 8–15 cm long, acute, obscurely toothed, densely silky–white–tomentose beneath. Heads to 0.8 cm across, yellow.

Sandstone hills. Himalayas to S. W. China. August–February. Sarkar & Bhatta., 190, 392.

## 22. LAGGERA C.H.Sch.–Bip. ex K. H. E. Koch

**Laggera aurita** (L.f.) Sch.–Bip.ex Cl. , Comp. Ind. 82.1876 ; Hook. f., Fl. Brit. India 3 : 271.1881 ; Haines, Bot. Bihar & Orissa 2 : 490.1922; *Conyza aurita* L. f. Suppl. 367, 1781.

Viscid–pubescent herbs. Leaves oblanceolate, toothed lobed or pinnatifid, to 10 cm long, acute. Heads to 1 cm across, pink.

Common along roadsides. India to Burma, extending to tropical Africa. January–March. Sarkar & Bhatta., 948.

## 23. LAUNAEA Cass.

**Launaea procumbens** (Roxb.) Ramayya & Rajagopal in Kew Bull. 23 : 465.1969 ; Verma in Fl. Raipur, Durg & Rajnandgaon 200. 1985. *Prenanthes procumbens* Roxb., Fl. Indica 3 : 404.1832. *Launaea nudicaulis* auct. pl. Hook. f. Fl. Brit. India 3 : 416. 1881, Haines, Bot. Bihar & Orissa 2 : 521.1922; non Less., 1832.

Small herbs. Latex yellow. Leaves spatulate, lobed or pinnatifid, dentate, 5–20 cm long. Heads to 1.5 cm long, yellow. Achenes to 0.35 cm long.

Common in waste lands. India to Afghanistan. November–March. Sarkar & Bhatta., 1370.

24. MIKANIA Willd., *nom. cons.*

**Mikania micrantha** Kunth in H. B. & K., Nov. Gen. Sp. 4 : 134.1820 ; Kitamura & Gould in Enum. Fl. Pl. Nepal 3 : 35. 1982. *M. scandens* auct. pl.; Hook. f., Fl. Brit. India 3 : 244.1881 ; non Willd.

Twining herbs. Leaves cordate-ovate, acuminate, crenate-serrate ; petiole long. Involucral bracts 4. Florets–4, all tubular.

Common. Malesia. Philippines. December–March. Sarkar & Bhatta., 456.

## 25. PARTHENIUM L.

**Parthenium hysterophorus** L., Sp. Pl. 988. 1753 ; var. **tetramera** Bhatta., Proc. 73rd Indian. Sci. Cong. Part III Abs. Sec. Bot. 97–98, 1986. *P. hysterophorus sensu* Roxb., Hort. Beng. 62. 1814 ; Voigt, Hort. Sub. Cal. 413. 1845.

Erect, profusely branched annual herbs. Leaves alternate, bipinnatifid. Heads panicled, white. Tubular corolla of male florets 4-lobed. Stamens 4. Achenes dorsally compressed. Pappus of 2 laterally reflected awns.

Very common along waste places, sides of railway tracks etc. Tropical & subtropical America. Throughout the year. Sarkar & Bhatta., 47, 398, 802.

The obnoxious weed.

## 26. PENTANEMA Cass.

- |                                   |     |                       |
|-----------------------------------|-----|-----------------------|
| 1a. Involucral bracts villous     | ... | 2. <i>P. vestitum</i> |
| 1b. Involucral bracts not villous | ... | 1. <i>P. indicum</i>  |

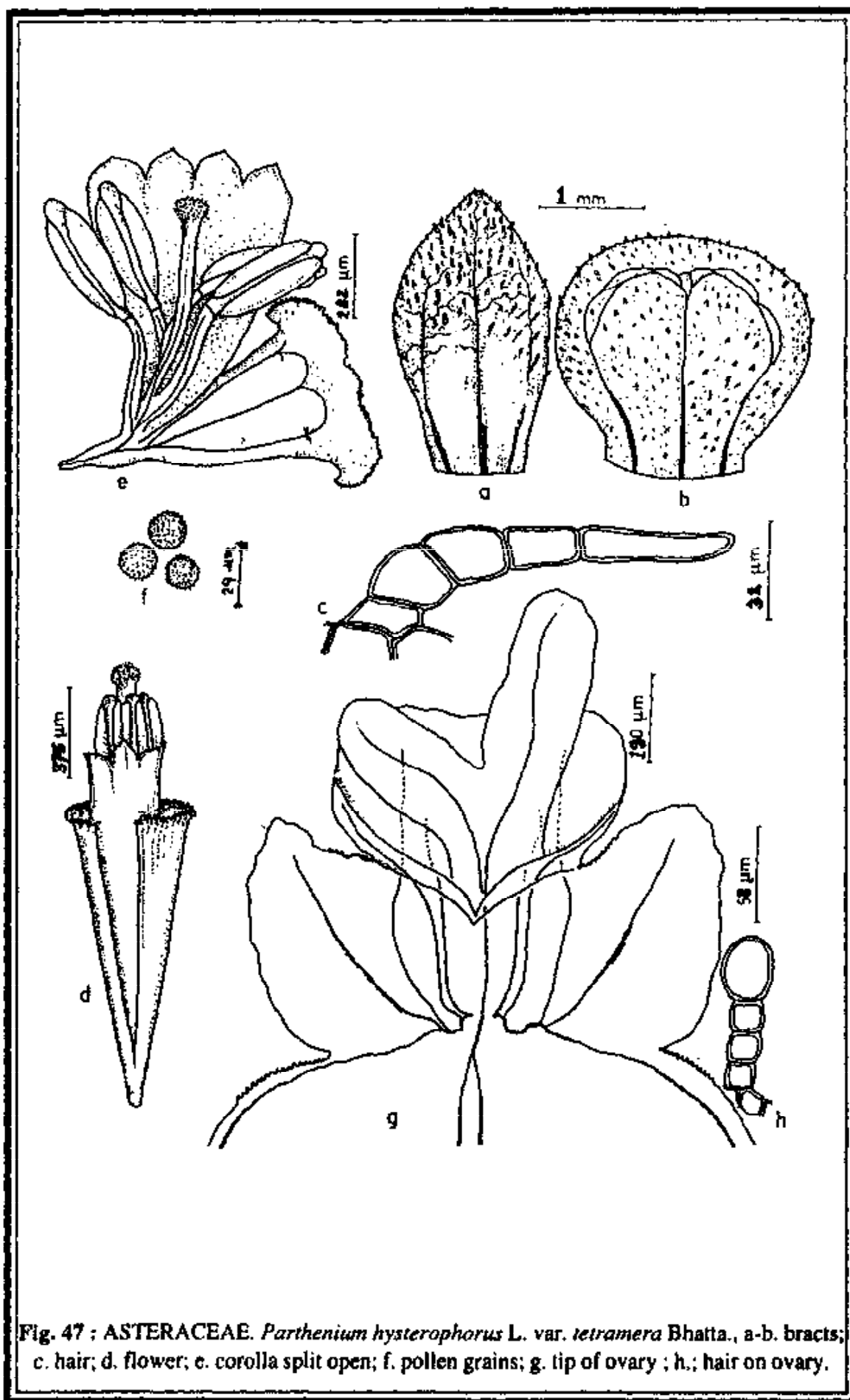


Fig. 47 : ASTERACEAE. *Parthenium hysterophorus* L. var. *tetramera* Bhatta., a-b. bracts; c. hair; d. flower; e. corolla split open; f. pollen grains; g. tip of ovary; h.; hair on ovary.

1. *Pentanema indicum* (L.) Ling in Acta Phyt. Sin. 10 : 179. 1965 ; Kitamura & Gould in Enum. Fl. Pl. Nepal 3 : 35. 1982. *Inula indica* L., Sp. Pl. 2 : 1236. 1763. ; *Vicoa indica* (L.) DC. in Wt., Contrib. 10. 1834 ; Haines, Bot. Bihar & Orissa 2 : 500. *V. auriculata* Cass. in Ann. Sci. Nat. Ser. 1, 17 : 418. 1829 ; Hook. f., Fl. Brit. India 3 : 297. 1881.

Herbs, 50–70 cm high. Leaves lanceolate, 5–10 cm long, broadly auriculate at base. Heads to 0.25 cm across, yellow.

Common along waste places. India, Sri Lanka, Burma. October–March. Sarkar & Bhatta., 1401.

2. *Pentanema vestitum* (Wall. ex DC.) Ling in Acta Phyt. Sin. 10 : 180. 1965 ; Kitamura & Gould in Enum. Fl. Pl. Nepal 3 : 36. 1982. *Inula vestita* Wall. ex DC., Prodr. 5 : 470. 1836 ; Duthie Fl. U.G.P. 1 : 424. 1903 ; *Vicoa vestita* (Wall. ex DC.) Benth. ex Hook. f., Fl. Brit. India 3 : 297. 1881 ; Haines, Bot. Bihar & Orissa 2 : 50. 1922.

Herbs, to 40 cm high. Leaves oblong or linear-oblong, to 5 cm long, serrate. Heads to 1.5 cm across, yellow.

On exposed grounds. India, Tibet, extending to Afghanistan. March–May. Sarkar & Bhatta., 2000.

#### 27. PSEUDELEPHANTOPUS Rohr, *nom. cons.*

*Pseudelephantopus spicatus* (Aubl.) C. F. Baker in Trans. Acad. Sci. St. Louis 12 : 45, 54, 56. 1902 ; N. M. Dutta & D. Mitra, Indian For. 87(5) : 308. 1961. Tokyo Code 314. 1994. *Elephantopus spicatus* Aubl., Hist. Pl. Gui. 2 : 808. 1775.

Herbs, to 80 cm high. Leaves oblong-lanceolate to linear-lanceolate, 5–20 × 0.5–4.5 cm, subentire. Heads to 1.1 cm long ; bracts 2-seriate, 0.5–1 cm long, spinescent. Achenes hairy, to 0.4 cm long.

In waste lands, Bettiah. Native of tropical S. America. December–April. Sarkar & Bhatta., 822.

#### 28. SAUSSUREA DC., *nom. cons.*

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Outer involucrel bracts obtuse ;<br>achenes smooth               | ... | 1. <i>S. affinis</i>     |
| 1b. Involucrel bracts all lanceolate-acuminate ;<br>achenes muricate | ... | 2. <i>S. heteromalla</i> |

1. *Saussurea carthamoides* (Roxb.) DC., Prodr. 6:540. 1838 ; *S. affinis* Spreng. ex DC., Prodr. 6 : 540.1838 ; Hook f., Fl. Brit. India 3 : 373. 1881 ; Haines, Bot. Bihar & Orissa 2 : 516.1922; *Hemistepta lyrata* Bunge ex Fisher et Mey in Index Sem. Hort. Bot. Petrop. 2 : 38. 1835. *Serratula carthamoides* Roxb. Fl. Indica 3 : 407. 1832.

Stems to 1.3 m high. Leaves lyrate-pinnatifid, white-tomentose beneath. Heads on grooved peduncles, to 2.2 cm across. Achenes obovoid, 10-ribbed.

In waste lands. Tropical Himalayas, China, Japan, Burma, E. Australia. February-May. Sarkar & Bhatta., 365.

Note : In the genus *Hemistepta* Bunge, 1833, the combination is *H. carthamoides* (Roxb.) comb. nov.(=*Serratula carthamoides* Roxb. ; *Cirsium lyratum* Bunge, Enum. Pl. Chin. Bor. 36. March, 1833).—Bhatta.

2. *Saussurea heteromalla* ( D. Don) Hand.-Mazz., Symb, Sin. 7 : 1152. 1936 ; Raizada & Saxena, Ind. For. 92 : 322.1966. *Carduus heteromallus* D. Don, Prodr. F. Nepal. 166.1825. excl. syn. Roxb. *Saussurea candicans* ( DC.) C.H. Sch.-Bip. ex K.H.E. Koch in Linnaea 19 : 330.1847 ; Cl., Comp. Ind. 232. 1876 ; Hook. f., Fl. Brit. India 3 : 373. 1881; Haines, Bot. Bihar & Orissa 2 : 516.1922.

Herbs, to 1 m high. Leaves oblong or obovate-oblong, entire, lobed or lyrate, to 20 cm long. Heads to 3 cm across, pinkish. Achenes 5-ribbed or angled, muricate.

In waste lands, common. India, N. W. Asia. December-April. Sarkar & Bhatta., 388.

## 29. SIGESBECKIA L.

*Sigesbeckia orientalis* L., Sp. Pl. 900.1753 : Hook f., Fl. Brit. India 3 : 304.1881 ; Haines, Bot. Bihar & Orissa 2 : 502.1922.

Herbs, to 60 cm high. Leaves broadly ovate, 7-20 × 5 -10 cm 3-ribbed. Heads to 0.5 cm long. yellow. Achenes to 0.3 cm long, viscid.

Waste places. Tropics. November-January. Sarkar & Bhatta., 657.

## 30. SONCHUS L.

1a. Annuals or biennials ; achenes distinctly compressed. 2

1b. Perennials ; achenes scarcely compressed ... 3. *S. wightianus*

- 2a. Leaves with rounded auricles ; achenes not distinctly muricate ... 1. *S. asper*
- 2b. Leaves with acute or acuminate auricles ; achenes distinctly muricate ... 2. *S. oleraceus*

1. ***Sonchus asper* (L.) Hill**, Herb. Brit. 1 : 47.1769 ; Hook. f., Fl. Brit. India 3 : 414. 1881 ; Haines, Bot. Bihar & Orissa 2 : 522.1922.

Glabrous herbs, to 1m high. Leaves elliptic-oblong, entire or pinnatifid, spinous-dentate. Heads yellow. Achenes compressed ; faces 3-ribbed.

Occasional in the Someswara hills. Cosmopolitan. October-December. Sarkar & Bhatta, 1829.

2. ***Sonchus oleraceus* L.**, Sp. Pl. 794.1753 ; Hook. f., Fl. Brit. India 3 : 414.1881 ; Haines, Bot. Bihar & Orissa 2 : 523.1922.

Herbs, to 1.2 m high. Leaves deeply lobed, to 30×15 cm. Heads paniced. 1-2 cm long, yellow.

In waste lands. Tropical and temperate countries. October-March. Sarkar & Bhatta., 393.

3. ***Sonchus wightianus* DC.**, Prodr.7 : 187. 1838 ; Kitamura & Gould, Enum. Fl. Pl. Nepal 3 : 43.1982. *S. arvensis* auct. pl. ; Hook. f., Fl. Brit. India 3 : 414. 1881 ; Haines, Bot. Bihar & Orissa 2 : 522.1922 ; non L. 1753.

Herbs, to 1m high. Leaves 25 cm long, deeply or shallowly lobed. Peduncle and involucral bracts white tomentose with purplish glands. Heads paniced, yellow.

In waste lands. Tropical and temperate countries. September-March. Sarkar & Bhatta., 1807.

### 31. SPHAERANTHUS L.

***Sphaeranthus indicus* L.**, Sp. Pl. 927. 1753 ; Hook. f., Fl. Brit. India 3 : 275. 1881 ; Haines, Bot. Bihar & Orissa 2 : 496.1922.

Viscous-pubescent herbs ; branches to 50 cm long. Leaves obovate-oblancoolate. 2-5 cm long. Heads purple violet.

Fallow fields of rice cultivation. Tropics. January-May. CHHAGUL-NUDI. Sarkar & Bhatta., 625. 1732.

## 32. SPILANTHES N.J. Jacq.

**Spilanthes calva** DC. in Wt. Contrib. 19.1834 ; Kitamura & Gould in Enum. Fl. Pl. Nepal 3 : 45. 1982. *S. acmella* var. *calva* (DC.) Cl., Comp. Ind. 138.1876 ; Hook. f., Fl. Brit. India 3 : 307.1881 ; Haines, Bot. Bihar & Orissa 2 : 506.1922 ; *S. acmella* auct. pl. ; Prain, Bengal Pl. 1 : 451 ; non (L.) Murr. 1774.

Herbs to 35 cm long. Leaves ovate, to 3 cm long. Heads to 0.7 cm across, yellow. Common. Indomalesia. September–March. Sarkar & Bhatta., 44.

## 33. TRIDAX L.

**Tridax procumbens** L. Sp. Pl. 900. 1753 ; Hook. f., Fl. Brit. India 3 : 311. 1881 ; Haines, Bot. Bihar & Orissa 2 : 510.1922.

Herbs, to 50 cm long. Leaves ovate, 2–5 cm long, variously toothed and lobed. Peduncle to 30 cm long ; heads to 1 cm across, yellow.

In waste places. Native of S. America, now pantropical. Throughout the year. Sarkar & Bhatta., 1051, 1732.

34. VERNONIA Schreber, *nom. cons.*

- 1a. Heads to 0.5 cm long ... 1. *V. cinerea*  
 1b. Heads to 1.5 cm long ... 2. *V. squarrosa*

1. **Vernonia cinerea** (L.) Less. in Linnaea 4 : 291. 1829 ; Hook f., Fl. Brit. India 3 : 233. 1881 ; Haines, Bot. Bihar & Orissa 2 : 483.1922 ; *Conyza cinerea* L., Sp. Pl. 862.1753.

Herbs, to 80 cm or more high. Leaves to 5 cm long. Heads purple ; involucre bracts stipulous-tipped.

Along waste lands. Palaeotropics. July–March. Sarkar & Bhatta., 261.

2. **Vernonia squarrosa** (D. Don) Less. in Linnaea 6 : 627.1831 ; Kitamura, Fl. E. Himalaya 346.1966 . *Acilepis squarrosa* D. Don, Prodr. Fl. Nepal. 169. 1825 ; *Vernonia teres* Wall. ex DC., Prodr 5 : 15. 1836 ; Hook f., Fl. Brit. India 3 : 229.1881 ; Haines, Bot. Bihar & Orissa 2 : 482.1922.

Herbs, to 70 cm high, somewhat woody. Leaves narrowly oblong to obovate, to 12.5 cm long.

Along open forest areas. India, Burma. October–December. Sarkar & Bhatta., 1819.

35. WEDELIA Jacq., *nom. cons.*

*Wedelia chinensis* (Osbeck.) Merr. in Philipp. J. Sci, 12 : 111. 1917 ; Kumar & Subra., Chrmo. Atlas Fl. Pl. Indian. Subcont, 80.1986; *Solidago chinensis* Osbeck., Dagb. Ostind. Tesa. 241.1757. *Wedelia calendulacea* Less., Syn. Comp. 222. 1831 ; Hook. f., Fl. Brit. India 3 : 306. 1881 ; Haines, Bot. Bihar & Orissa 2 : 505.1922.

Stems to 30 cm high. Leaves oblong or oblong-lanceolate, to 5 cm long. Florets yellow.

In forest clearings. Indomalesia, China, Japan. March–September. Sarkar & Bhatta., 870. Medicinal plant.

## 36. XANTHIUM L.

*Xanthium strumarium* L., Sp, Pl, 987. 1753 ; Hook. f., Fl. Brit. India 3 : 303. 1881 ; Haines, Bot. Bihar & Orissa 2 : 502.1922. *X. orientale* sensu Voigt., Hort. Sub. Cal. 413. 1845 ; non L.1762 ; *X. indicum* Koenig in Roxb. Fl. Indica 3:601.1832.

Herbs, to 70 cm high. Leaves long-petioled, broadly ovate-triangular, 5–10 cm long, 3–costate. Fruiting involucre with hooked bristles, apical beaks divergent.

In waste lands, Tropics. November–June. Sarkar & Bhatta., 871.

Medicinal. Sudorific and sedative herb.

## 37. YOUNGIA Cass.

*Youngia japonica* ( L. ) DC. Prodr. 7 : 194. 1838 ; Koster in Blumea 23 : 166. 1976. *Prenanthes japonica* L. Mant. 107. 1767. *Crepis japonica* (L.) Benth., Fl. Hong Kong 194. 1861 ; Hook. f., Fl. Brit. India 3 : 395.1881 ; Haines, Bot. Bihar & Orissa 2 : 519.1922.

Annual herbs, glabrous, to 45 cm long. Leaves radical or alternate, entire, toothed or pinnatifid, to 15 cm long. Heads in apical corymbs, homogamous yellow. Florets all ligulate. Achenes more or less fusiform.

Wet places. Pantropical. October–January. Sarkar & Bhatta., 969.

## CLASS : LILIOPSIDA (MONOCOTYLEDONAE)

## CXX. ALISMATACEAE

## SAGITTARIA L.

*Sagittaria guayanensis* H.B. & K. ssp. *lappula* (D. Don) Bogin, Mem. N.Y. Bot. Gard, 9 : 192.1955 ; Hartog in Fl. Mal. 5 : 328.1957. *S. lappula* D. Don, Prodr. Fl. Nepal. 22.1825. *S. guayanensis* sensu Hook. f., Fl. Brit. India 6 : 561. 1893 ; Haines, Bot. Bihar & Orissa 3 : 886.1924.

Scapigerous herbs. Leaves ovate, deeply cordate, 3–10×2–8 cm. Racemes to 45 cm long. Sepals to 1 cm long. Petals obovate–suborbicular, to 1.5 cm long. Achenes to 0.4 cm long, beaked.

Along marshes. China, India to tropical Australia. June–September. Sarkar & Bhatta., 937.

Note : The typical subspecies occurs in tropical America.

## CXXI. HYDROCHARITACEAE

- |   |     |                |
|---|-----|----------------|
| 1a. Stems branched, leafy.  | ... | 2              |
| 1b. Stemless or with stolons or creeping root stock ; leaves radical.                         | ... | 3              |
| 2a. Leaves scattered ; perianth in single whorle ; styles cleft                               | ... | 3. NECHAMANDRA |
| 2b. Leaves whorled ; perianth in 2 whorls ; styles undivided                                  | ... | 2. HYDRILLA    |
| 3a. Leaves petiolate, broad ; spathe winged ; stolons absent ; flowers solitary, bisexual     | ... | 4. OTTELIA     |
| 3b. Leaves sessile, linear ; spathe not winged ; flowers dioecious, male scape many flowered. | ... | 4              |
| 4a. Perianth single ; peduncle of female spathe spirally coiled                               | ... | 5. VALLISNERIA |
| 4b. Perianth in two whorls ; peduncle of female spathe not coiled                             | ... | 1. BLYXA       |

## 1. BLYXA Thouars

**Blyxa octandra** ( Roxb. ) Planch. ex Thw., Enum. Pl. Zeyl. 332.1864 ; Haines, Bot. Bihar & Orissa 3:895.1924; *Vallisneria octandra* Roxb., Pl. Cor. 2 : 34, 5:165.1802. *Blyxa roxburghii* Rich in Mem. Inst. Fr. 77.t.5.1811 ; Hook.f., Fl. Brit. India 5 : 660.1888.

Submerged tufted herbs. Leaves radical, 10–60 × 0.5–1.5 cm. Sepals persistent. Anthers introrsely dehiscent. Pistillodes 3 in male flowers. Staminodes minute in female flowers. Seeds tubercled.

Weeds in ricefield, ditches and ponds. Warmer rigions of the Old World. December–January. PATA SEYALA, Sarkar & Bhatta., 1726.

## 2. HYDRILLA Rich.

**Hydrilla verticillata** (L.f.) Royle, Bot. Himal, 376.1839 Hook. f., Fl. Brit. India 5: 659.1888 ; Haines, Bot. Bihar & Orissa 3 : 893.1924; *Serpicula verticillata* L.f., Suppl. 416.1781.

Submerged leafy herbs. Slender branches to 2 m long and 0.2 cm across. Leaves 1–1.5 cm long. Inflorescence unisexual. Flowers to 0.5 cm long. Fruit subulate, 0.7 × 0.15 cm.

In rice fields, pools, lakes, streams. Widely distributed in warmer regions of the world. October–January. Sarkar & Bhatta., 1727.

## 3. NECHAMANDRA Planch.

**Nechamandra alternifolia** (Roxb.) Thw., Enum. Pl. Zeyl. 332.1864 ; Subra. & Balak. in Bull. Bot. Surv. India. 3:23.1961. *Vallisneria alternifolia* Roxb., Fl. Indica 3 : 750.1832. *Lagarosiphon roxburghii* Benth. in Gen. Pl.3(2): 452.1883 ; Hook. f., Fl. Brit. India 5 : 659.1888; *L. alternifolia* (Roxb.) Haines, Bot. Bihar & Orissa 2 : 894.1922.

Submerged leafy herbs. Branches to 60–90 cm long. Leaves 3–8 × 0.6 cm. Male spathe 2-valved. Female spathe tubular, 2-fid. Fruit included within spathe. Seeds pitted.

In ponds, tanks and lakes. India and S. E. Asia. August–January. Sarkar & Bhatta., 1276.

## 4. OTTELIJA Pers.

**Ottella alismoides** ( L. ) Pers., Syn. Pl. 1 : 400.1805 ; Hook.f., Fl. Brit.

India 5: 662.1888 ; Haines, Bot. Bihar & Orissa 2 : 897.1922. *Stratiotis alismoides* L., Sp. Pl. ed. 1. 535.1753.

Succulent flaccid herbs, submerged or partially floating. Leaves orbicular, undulate, 7-11 nerved, to 50 cm long. Spathe 0.2-2.5 cm long, 5-6-winged ; wings undulate ; peduncle long. Fruits oblong-ellipsoid, 2-4 cm long.

Frequent in shallow water bodies. Warmer parts of the world. December-April. PANEE KULA, Sarkar & Bhatta., 1160.

#### 5. VALLISNERIA L.

*Vallisneria spiralis* L., Sp.Pl.1015.1753 ; Hook.f.,Fl.Brit.India 5 : 660.1888; Haines, Bot. Bihar & Orissa. 2 : 894.1922.

Submerged tyfted stoloniferous herbs. Leaves grass-like, to 30 cm long. Male spathe shortly stalked. Female spathe with a long, slender, spiral peduncle. Fruit included in the spathe.

Found in still or flowing water. Cosmopolitan. April-May. Sarkar & Bhatta., 1626.

### CXXII. POTAMOGETONACEAE

#### POTAMOGETON L.

- |   |     |                         |
|---|-----|-------------------------|
| 1a. Upper or all leaves floating, petiolate | ... | 1. <i>P. nodosus</i>    |
| 1b. All leaves submerged, sessile           | ... | 2. <i>P. pectinatus</i> |

1. **Potamogeton nodosus** Poir. in Lamk., Encycl. Suppl. 4: 535.1816. *P. indicus* Roxb., Fl. Indica 1 : 452.1820, non Roth ex Roem. & Schult., 1818 ; Hook.f., Fl. Brit. India 6 : 565.1893 ; Haines, Bot. Bihar & Orissa 3 : 888.1924.

Leaves alternate, elliptic-lanceolate, 9-12 cm × 3-3.5 cm ; submerged leaves lanceolate with undulate margins. Spike to 5 cm long, dense. Drupelets obliquely truncate, shortly beaked.

Common in ponds near Bettiah. Warm temperate and tropical regions. July-January. Sarkar & Bhatta., 103.

2. **Potamogeton pectinatus** L., Sp. Pl. 127.1753 ; Hook. f., Fl. Brit. India 6 : 567.1893 ; Haines, Bot. Bihar & Orissa. 3 : 890.1924.

Stems filiform, repeatedly distichously branched. Leaves alternate, filiform, 2.5–15 × 0.3 cm, 1–3-nerved. Sheathing at base ; stipule adnate to leaf sheath with free tips. Flowers in interrupted spikes. Drupelets shortly beaked.

In canals near Kotraha. Widespread in tropical and temperate regions. July–January. Sarkar & Bhatta., 501.

CXXIII. ARECACEAE (PALMAE *nom. alt*)

1a. Leaves scattered throughout the stem ; scandent	...	3. CALAMUS
1b. Leaves in an apical crown, not scandent.	...	2
2a. Leaves pinnately divided.	...	3
2b. Leaves palmately divided	...	2. BORASSUS
3a. Soboliferous; leaves bi-pinnate	...	4. CARYOTA
3b. Not soboliferous; leaves 1-pinnate.	...	4
4a. Ovary syncarpous.	...	5
4b. Ovary of 3 free carpels	...	6. PHOENIX
5a. Spadix infrafoliar ; ovary 1-locular	...	1. ARECA
5b. Spadix interfoliar ; ovary 3-locular	...	5. COCOS

1. ARECA L.

*Areca catechu* L., Sp. Pl.1189.1753 ; Beccari & Hook. f. in Hook. f., Fl. Brit.India 6 : 405.1892.

Monoecious. Stem slender, tall, annulate. Leaves unipinnate. Spadix infrafoliar. Male flowers minute on tips of spadix-branches; female flowers large solitary.

Cultivated for its seeds. Seeds chewed with 'Pan' as a masticatory. SUPARI. Sarkar & Bhatta., 1853.

2. BORASSUS L.

*Borassus flabellifer* L., Sp. Pl. 1187.1753 ; Beccari & Hook. f., in Hook.f.,Fl. Brit.India 6 : 482.1892 ; Haines, Bot. Bihar & Orissa 3 : 927.1924.

Leaf blade 1–2 m long ; segments linear–lanceolate. Staminate inflorescence to 2.5 cm across, olive green. Pistillate flowers to 2.6 cm across. Drupe to 15 cm across.

Occasional only on the southern part of the district. Sarkar & Bhatta., 246, 1717.

Fruit edible ; stem used in the construction of mud–houses ; leaves used in Thatching.

### 3. CALAMUS L.

1a. Leaflets equidistant on the rachis ... 1. *C. tenuis*

1b. Leaflets fascicled ... 2. *C. viminalis* var. *fasciculatus*

1. *Calamus tenuis* Roxb., Fl. Indica 3 : 780.1832; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 447.1892 ; Haines, Bot. Bihar & Orissa 3 : 929.1924.

Stem very long, 1.5–2 cm across. Leaves paripinnate ; 50 cm–1 m long ; leaflets linear–lanceolate, 12–28 cm × 1–2 cm, margine spinulose. Fruits subglobose 1–1.5 cm across.

Common in the Tarai Forest of N.W. part, Madanpur and its adjacent areas. India, Burma. July–December. BENT, Sarkar & Bhatta., 264.

Stems used for making baskets, furnitures, mats and screens.

Notes : Unplanned harvesting posing threat to its survival in the district.

2. *Calamus viminalis* var. *fasciculatus* Beccari, Ann. Roy, Bot. Gard. (Cal.) 11.138, t.12.1908 ; Haines, Bot. Bihar & Orissa 3 : 928.1924.

Subscandent. Leaflets linear–lanceolate, 14–30 × 1.5–2 cm, margins and abaxial costae with thin prickles. Fruits globose, 0.8–1.2 cm across.

Cultivated in a small area near Kotraha Forest Range Office. Fl. : September–October; Fr. : April–May. Sarkar & Bhatta., 202.

Uses as the previous.

### 4. CARYOTA L.

*Caryota urens* L., Sp. Pl. 1189.1753 ; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6: 422.1892 ; Haines, Bot. Bihar & Orissa 3 : 921.1924..

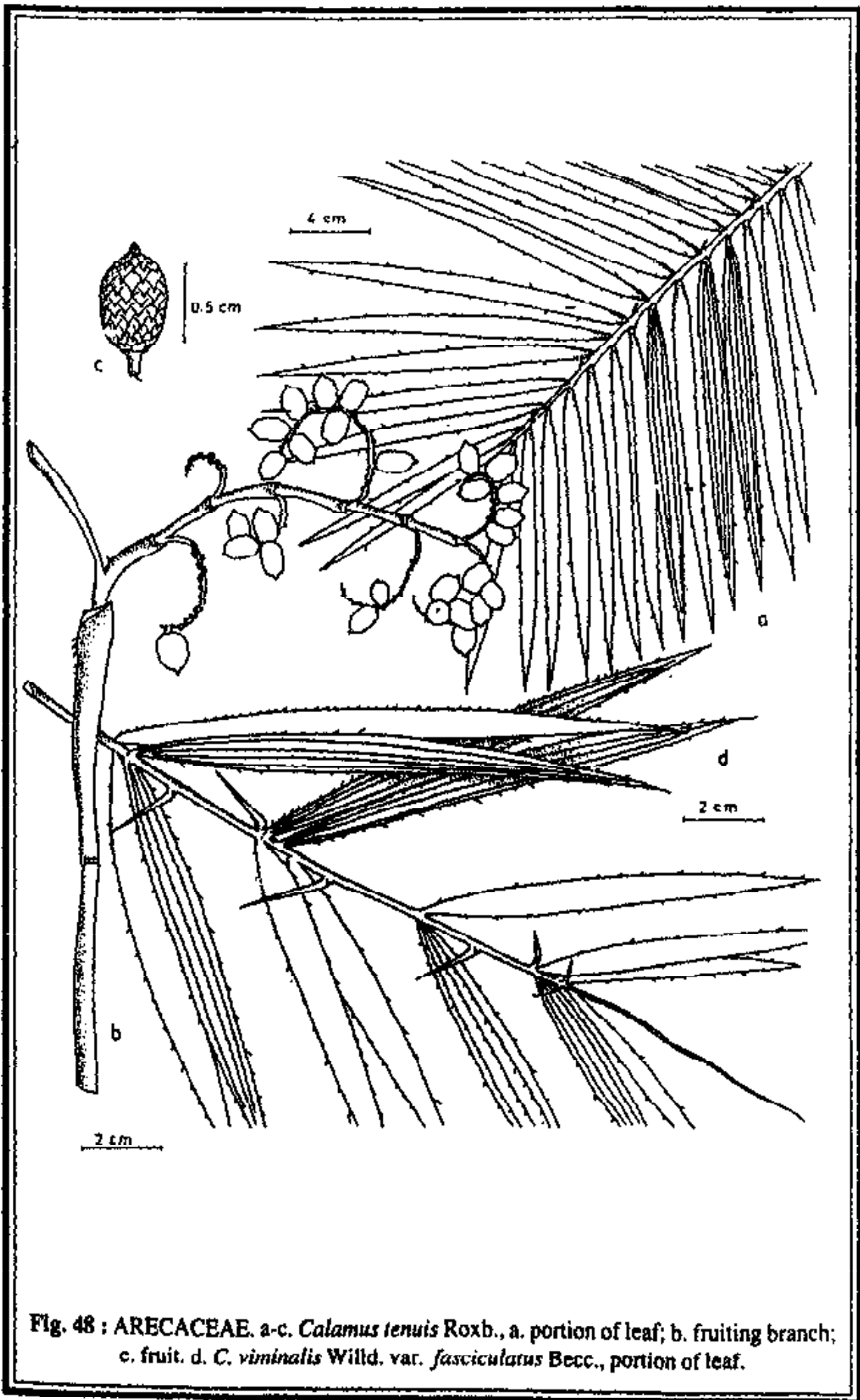


Fig. 48 : ARECACEAE. a-c. *Calamus tenuis* Roxb., a. portion of leaf; b. fructing branch; c. fruit. d. *C. viminalis* Willd., var. *fasciculatus* Becc., portion of leaf.

Stout trees. Leaves large, segments (ultimate pinnae) stiff, stoutly ribbed with a cauda.

The plant is rare in our district, but occurs in the Someswar Hills. Tropical Asia. Sarkar & Bhatta., 1532.

#### 5. Cocos L.

**Cocos nucifera** L., Sp. Pl. 1188.1753 ; Beccari & Hook.f. in Hook.f., Fl. Brit. India 6 : 882.1892.

Tall monoecious trees. Leaves large. Spadix suprafoliar, branched. Flowers unisexual. Fruit large, 1-seeded.

Cultivated for its fruits. NARIYAL. Sarkar & Bhatta., 1874.

#### 6. PHOENIX L.

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Tall trees ; stem slender, long          | ... | 3. <i>P. sylvestris</i> |
| 1b. Stem short.                              | ... | 2                       |
| 2a. Stem very short ; ripe fruit black       | ... | 1. <i>P. acaulis</i>    |
| 2b. Stem somewhat elongated ; ripe fruit red | ... | 2. <i>P. humilis</i>    |

1. **Phoenix acaulis** Buch.-Ham. ex Roxb., Fl. Indica 3 : 783.1832 ; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 424.1892 ; Haines, Bot. Bihar & Orissa 3 : 924.1924.

Stem ovoid, almost underground. Leaves upto 75 cm long ; leaflets almost opposite, 20-30 cm long. Drupes oblong-ellipsoid, 1.5-2 cm long.

Sandstone hills. India, Burma. Fruit ripens during April and May. Sarkar & Bhatta., 1380, 1509.

Leaves used for thatching and mat making ; fruits edible.

2. **Phoenix humilis** Royle, Ill. 394, 397.1839 ; Beccari & Hook. f. in Hook. f., Fl. Brit. India 6 : 426.1892 ; Haines, Bot. Bihar & Orissa 3 : 924.1924.

Stem slender. Leaves 1-1.3 cm long, leaflets to 30 cm long. Drupe ovoid, 1.2-1.9 cm long.

Common in sandstone hills. Outer Himalaya, Central India. Fruit ripens during April-June. Sarkar & Bhatta., 1524.

Uses as the previous.

3. **Phoenix sylvestris** ( L. ) Roxb., Fl. Indica 3 : 787.1832 ; Beccari & Hook.f. in Hook. f., Fl. Brit. India 6 : 425.1892 ; Haines, Bot. Bihar & Orissa 3 : 925. *Elate sylvestris* L., Sp. Pl. 1189.1753.

Tall trees. Leaves 2–4 m long. Leaflets in fascicles, 15–45 × 2–3 cm. Male flowers white, scented, to 0.6 cm long. Pistillate spadix drooping. Drupe oblong–ellipsoid, to 2 cm long, orange red.

Common in the villages. India. Fruit ripens during April–June. Sarkar & Bhatta., 288.

Uses as the previous.

#### CXXIV. PANDANACEAE

##### PANDANUS Parkinson

- 1a. Large shrubs or small trees ;  
leaves spinous dentate ... 2. *P. fascicularis*
- 1b. Small shrubs ; leaves entire ... 1. *P. amaryllifolius*

1. *Pandanus amaryllifolius* Roxb., Fl. Indica 3: 743.1832 ; Voigt, Hortus Sub. Cal. 683.1845.

Unbranched small herb; leaves entire, 30–50 × 2–4 cm.

Planted in gardens for its musk–odoured leaves. A Malaysian plant. Sarkar & Bhatta., 752.

2. *Pandanus fascicularis* Lamk., Encycl. 1 : 372.1785 ; Hook.f., Fl. Brit. India 6 : 485.1893 ; *P. tectorius* auct. non Soland. ex Parkinson 1773 ; Haines, Bot. Bihar & Orissa 3 : 918. 1924.

Branched bushy shrubs. Leaves 1.5–2.5 m × 3–5 cm. Staminate inflorescence fragrant. Stamens spicately arranged on stemonophore. Drupes connate in phalanges, 3.5–5 cm long, deep–orange.

Somewhat naturalised near Bettiah. India and Central Malaysia. Flowers in the rainy season. KEORA. Sarkar & Bhatta., 1620.

Planted for its fragrant flowers. Few varieties produce showy variegated leaves.

Note : *Keura odorifera* Forsskal (1775) is probably a conspecific taxon.

#### CXXV. ARACEAE

- 1a. Free–floating herbs ; leaves in rosette ... 10. PISTIA
- 1b. Plants not free–floating ; leaves not as above. ... 2

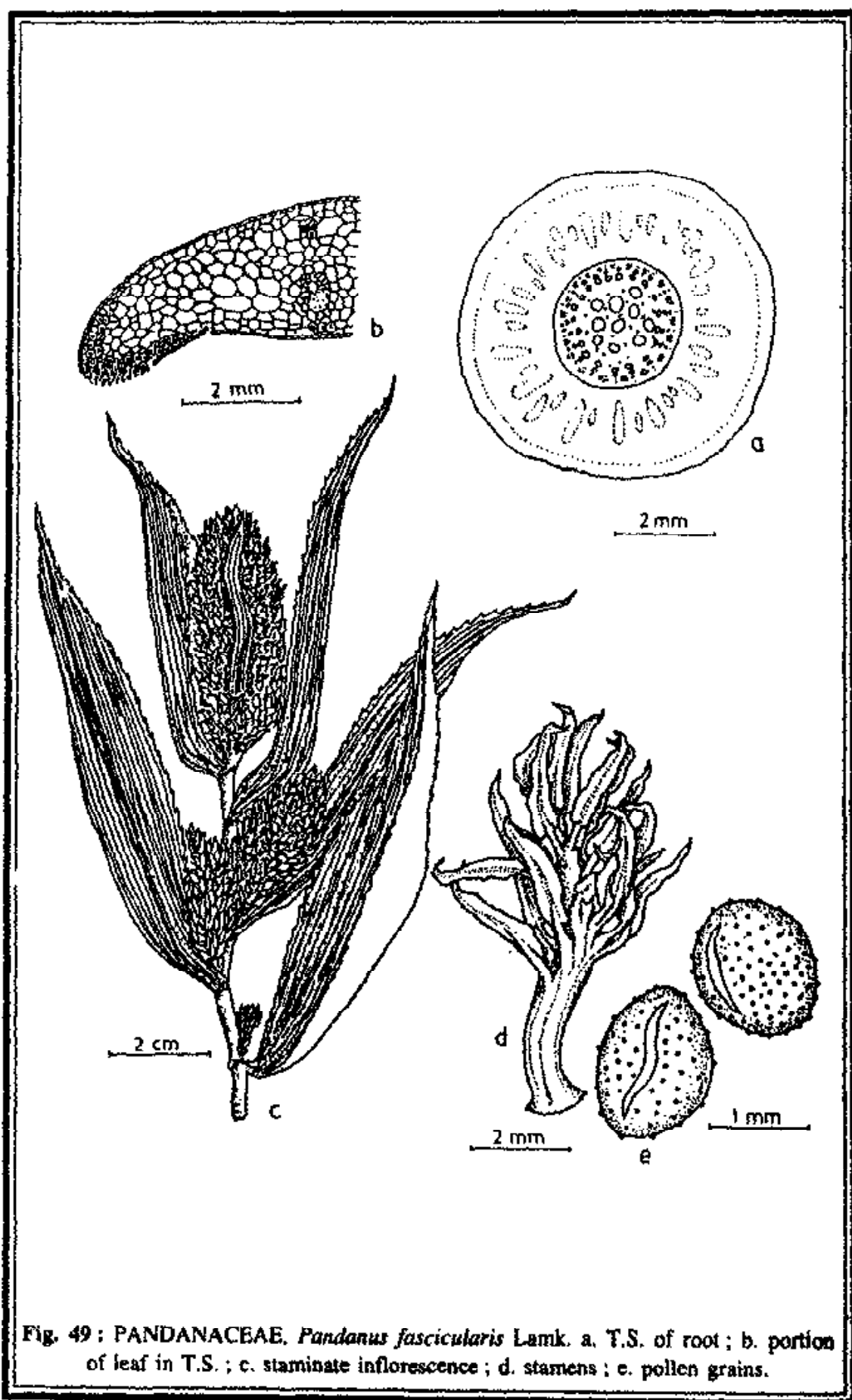


Fig. 49 : PANDANACEAE, *Pandanus fascicularis* Lamk. a. T.S. of root ; b. portion of leaf in T.S. ; c. staminate inflorescence ; d. stamens ; e. pollen grains.

2a. Scandent herbs, climbing by adventitious roots. ...	3
2b. Erect herbs or otherwise, never scandent. ...	6
3a. Perianth present ; tepals 6 ; ovary 3-locular ...	11. POTHOS
3b. Perianth absent. ...	4
4a. Ovary 2-locular ; ovules more than 1 per locule.	5
4b. Ovary 1-locular ; ovule solitary ...	14. SCINDAPSUS
5a. Leaves pinnatifid or perforated ...	9. MONSTERA
5b. Leaves entire ...	13. RHAPHIDOPHORA
6a. Prickly herbs of marshy lands ; flowers bisexual ; Perianth present ...	8. LASIA
6b. Herbs, not prickly ; flowers unisexual ; perianth absent. ...	7
7a. Stems erect. ...	8
7b. Stems tuberous. ...	9
8a. Female flowers with staminodes ...	7. DIEFFENBACHIA
8b. Female flowers without staminodes ...	1. AGLAONEMA
9a. Stolons bulbiferous ...	12. REMUSATIA
9b. Stolons, if present, not bulbiferous. ...	10
10a. Leaves simple.	
10b. Leaves pedately lobed. ...	13
11a. Ovules anatropous in central placentas ...	5. CALADIUM
11b. Ovules orthotropous. ...	12
12a. Ovules numerous in parietal placentas ...	6. COLOCASIA
12b. Ovules few in basal placentas ...	2. ALOCASIA

- 13a. Leaves appearing along with flowers,  
pedatipartite not pinnatisect. ... 14
- 13b. Leaves appearing after flowers ;  
segments pinnatisect ... 3. AMORPHOPHALLUS
- 14a. Leaves hastate, 3-lobed ; ovules 1-2 ... 15. TYPHONIUM
- 14b. Leaves deeply many-lobed ; ovules 2-8 ... 4. ARISAEMA

1. *AGLAONEMA* (Schott) G. Don, *nom. cons.*

*Aglaonema costatum* N.E. Br. in Gard. Chron. 1 : 426. 1892 ; Bailey, Man. Cult. Pl. 182. 1949.

Herbs, branching at base. Leaves succulent, oblong-ovate, midrib and lateral veins whitish green, acuminate. Spadix stipitate ; spathe pale white.

A shade-loving garden ornamental. Native of Malesia. Sarkar & Bhatta., 747.

2. *ALOCASIA* (Schott) G. Don, *nom. cons.*

*Alocasia indica* Schott in Oesterr. Bot. Wochenbl. 410. 1854 ; Hook. f., Fl. Brit. India 6:525. 1893 ; Haines, Bot. Bihar & Orissa 3:912. 1924.

Large herbs ; stems to 12 cm across. Leaf blade to 80 cm long. Berry red.

Occasionally cultivated. Pantropical. April-May. MANKANDA. Sarkar & Bhatta., 769.

Stems and root-stocks used as vegetable.

Note : Many authors treated it under *Alocasia macrohiza* (L.) G. Don (1839).

3. *AMORPHOPHALLUS* Bl. ex Decaisne, *nom. cons.*

*Amorphophallus paeonifolius* (Dennst.) Nicolson var. *campanulatus* (Decaisne) Sivadasan Taxon 32 : 130. 1983 ; *Arum campanulatus* Decaisne, Nouv. Ann. Mus. Paris 3: 366. 1834 ; *Arum campanulatum* Roxb. Pl. Cor. 3: 68, t. 272. 1820 ; *Amorphophallus campanulatus* auct. plur., Hook. f., Fl. Brit. India 6:513. 1893 ; Haines, Bot. Bihar & Orissa 3:903. non Blume ex Decaisne, 1834.

Tubers to 8 cm across. Leaf 3-partite : lobes spreading ; petiole to 1 m long, tubercled. Spathe greenish-purple and white blotched.

Common in the villages and wet shady places. Occasionally cultivated. April–June. OLA. Sarkar & Bhatta., 718.

Tubers and tender petioles used as vegetable.

#### 4. ARISAEMA Mart.

*Arisaema tortuosum* (Wall.) Schott in Schott & Endl. Melet. Bot. 1:17.1832 ; Hook.f. Fl. Brit. India 6:502.1893 ; Haines Bot Bihar & Orissa 3:905.1924 ; *Arum tortuosum* Wall., Pl. Asiat. Rar. 2.10. t.111.1830.

Tuberous herbs, with leaves and flowers contemporaneous. Leaflets 3–few, petiolulate, linear–lanceolate, acuminate, entire. Flowers unisexual.

Exposed forest floor. India. August. Sarkar & Bhatta., 642.

#### 5. CALADIUM Vent.

*Caladium bicolor* Vent. Jard Cels. t. 30.1800 ; Bailey, Man Cult. Pl. 188.1949; Voigt, Hort. Sub. Cal. 691. 1845.

Herbs . Leaves sagittate–ovate , variously spotted, blotched and variegated. Spathe green or whitish–green.

Commonly cultivated in gardens for its showy foliage. Native of West Indies to Brazil and Andes. Sarkar & Bhatta., 689.

#### 6. COLOCASIA Schott, *nom. cons.*

*Colocasia esculenta* (L.) Schott in Schott & Endl., Melet. Bot. 1:18.1832 ; Bailey, Man. Cult .Pl. 188.1949. *Arum esculentum* L. Sp. Pl. 965.1753. *Colocasia antiquorum* Schott in Schott & Endl., Melet. Bot. 1: 18.1832 ; Hook. f., Fl. Brit. India 6: 523.1893 ; Haines, Bot. Bihar & Orissa 3:908. 1924.

Tubers to 2–10 cm across, covered with blackish thin, soft scales. Leaves ovate or triangular, to 30 cm long. Peduncle to 30 cm long ca 1.5 cm across. Distal portion of the spathe convolute, yellow, deciduous.

Frequent in the wet places near nalas, ponds etc. ; also cultivated. Tropical asia or pantropical. KUCHOO. Sarkar & Bhatta., 570.

Tubers & young leaves used as vegetable.

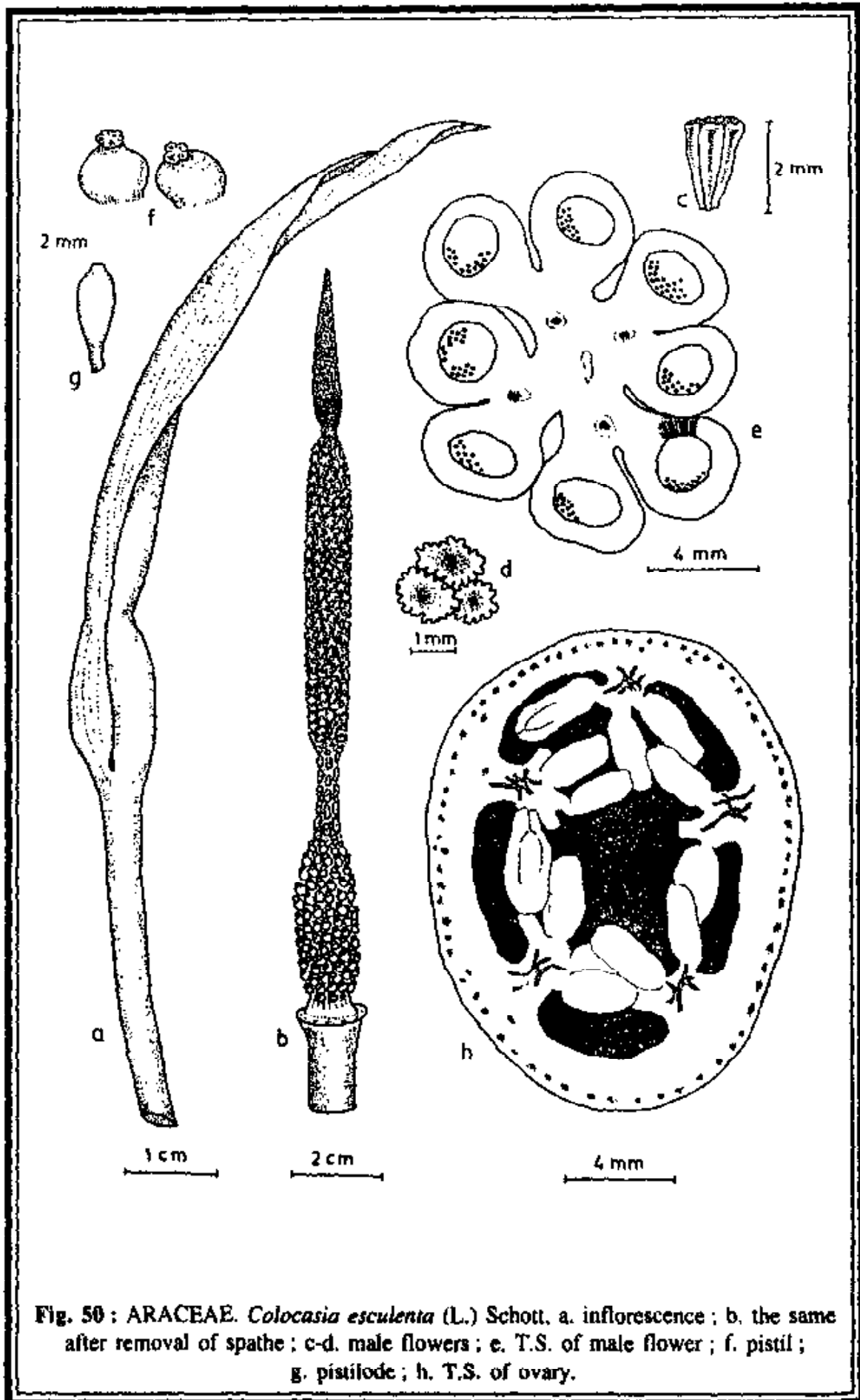


Fig. 50 : ARACEAE. *Colocasia esculenta* (L.) Schott, a. inflorescence ; b. the same after removal of spathe ; c-d. male flowers ; e. T.S. of male flower ; f. pistil ; g. pistilode ; h. T.S. of ovary.

## 7. DIEFFENBACHIA Schott

- 1a. Petiole broadly grooved or channelled ... 1. *D. picta*  
 1b. Petiole not distinctly channelled ... 2. *D. seguine*

1. **Dieffenbachia picta** Schott in Oesterr. Bot. Wochenbe. 2 : 68.1852 ; Bailey, Man Cult. Pl. 182.1949.

Caudex thick creeping at base ; branches thick, erect. Leaves oblong, lanceolate, acuminate, white spotted.

Common in gardens. Native of South America. Sarkar & Bhatta. 534.

2. **Dieffenbachia seguine** Schott, Schott & Endl., Melet. Bot 1:20.1832 ; Bailey, Man. Cult. Pl. 183.1949.

Stems ascending, to 2m high. Leaves ovate-oblong, short-cuspidate at apex.

A garden ornamental. Native of South America and West Indies Sarkar & Bhatta., 484.

## 8. LASIA Lour.

**Lasia spinosa** (L.) Thw. Enum. 336.1864 ; Engler, Pflanzenr Heft 48:24.1911 ; Haines, Bot. Bihar. & Orissa 3 : 901. *Dracontium spinosum* L., Sp. Pl. 967.1753. *Lasia heterophylla* (Roxb.) Schott in Schott & Endl. Melet. Bot. 1: 21.1832 ; Hook. f. Fl. Brit. India 6 : 550.1893.

Stout spinous herbs with branched rhizome. Leafblade to 30 cm long ; segments 9, lanceolate ; spines restricted on the dorsal major venis ; petiole to 60 cm long , prickly. Peduncle to 25 cm long ; heads 8 cm × 3 cm. Berries obpyramidal, 1.3 × 0.3–1.1 cm, warted and truncated at apex.

Occasional in marshy places near nalas. Tropics. November–February. KANTA-MAN. Sarkar & Bhatta., 115.

Tender leaves used as a vegetable. Juice of root–stock used in Sri Lanka for piles.

9. MONSTERA Adans., *nom. cons.*

**Monstera deliciosa** Liebm. in Kjoeb Vidensk. Meddel. 19.1849 ; Bailey, Man. Cult Pl. 183.1949.

Large climbing herbs. Leaves pinnatifid ; lobes acuminate.

Grown for its foliage. A native of Mexico, Central America. Sarkar & Bhatta., 592.

#### 10. *PISTIA* L.

*Pistia stratiotes* L., Sp. Pl. 963.1753 ; Hook. f., Fl. Brit. India 6:497.1893; Haines, Bot. Bihar. & Orissa 3: 915.1924.

Leaf-rosettes 2-10 cm across ; leaves flabellately nerved , brown papillose in the upper part and white-woolly in the lower part, round or retuse at apex. Spathe 1-1.5 cm long, pale green.

Very common aquatic herbs. Pantropics. PANA. Sarkar & Bhatta., 844.

An excellent food for fishes. Juice of leaves useful in chronic skin diseases.

#### 11. *POTHOS* L.

*Pothos scandens* L. Sp. Pl. 968. 1753 ; Hook. f., Fl. Brit India 6 : 551.1893 ; Haines Bot. Bihar & Orissa 3 : 899. 1924.

Epiphytic shrubs with climbing and rooting branches. Leaves elliptic-ovate to 4 cm long, apiculate. Spadix peduncled.

Ramnagar Hills. Madagascar, Indomalesia. Sarkar & Bhatta., 760.

Medicinal in fever. Ornamental.

#### 12. *REMUSATIA* Schott

*Remusatia vivipara* (Lodd.) Schott in Schott and Endl., Melet. Bot. 1: 18.1832 ; Hook. f., Fl. Brit. India 6:521.1893 ; Haines, Bot. Bihar & Orissa 3: 907.1924; *Arum viviparum* Roxb., Hort. Beng. 65.1814. "viviparium" Fl. Indica 3:496.1832. *Caladium viviparum* Lodd.; Bot. Car. t. 281.1818.

Corm about 2-3 cm in diameter. Leafblade to 25 cm long, acuminate, yellowish-green. Spathe to 10 cm long, green ; limb golden-yellow.

Common in shady ravines. India, S. E. Asia, Java. Sarkar & Bhatta., 617.

Aromatic roots are made into an ointment in combination with turmeric, used for itch.

#### 13. *RHAPHIDOPHORA* Hassk.

*Rhaphidophora aurea* (Linden ex Andre )Furtado in Gard. Bull. Singapore 20:379.1964 ; *Pothos aurea* Linden ex Andre in Ill. Hort. 27: 69, Pl. 381. 1880.

*Scindapsus aureus* (Linden ex Andre) Engl in Pflanzenr. 37: 80.1908 ; Bailey, Man. Cult. Pl. 183.1949.

Climbing herbs. Leaves subsucculent, ovate oblong, size variable, cordate at base, acuminate, blotched with pale yellow spots.

A very common ornamental plant. Native of Solomon Islands. MONEY PLANT. Sarkar (1659).

#### 14. SCINDAPSUS Schott

*Scindapsus officinalis* Schott in Schott & Endl., Melet. Bot. 1:21.1832; Hook. f., Fl. Brit. India 6: 541.1893 ; Haines, Bot. Bihar & Orissa 3:900.1924.

Leaves elliptic-ovate, to 25 cm long, acuminate. Spathe boat-shaped, caducous, to 15 cm long. Berry obpyramidal. Seeds subreniform.

Occasional in the northern area, climbing on large trees. Tropical Himalaya, Burma, Andamans. GAJ-PIPAL. Sarkar & Bhatta., 1167.

Fruits medicinal and yield a fatty oil. Stems yield a fibre.

#### 15. TYPHONIUM Schott

*Typhonium trilobatum* Schott in Wien. Zeitschr, 3:72.1829 ; Hook.f., Fl. Brit. India 6:509.1893; Haines, Bot. Bihar & Orissa 3:906. 1924.

Corn to 4 cm across, white. Leaf blade to 14 cm long ; lobes acute ; petiole to 25 cm long. Spathe expanded, to 14 cm long ; limb linear, reddish-purple.

Tender leaves used as a vegetable. Indomalesia. July-September. Sarkar & Bhatta., 776.

### CXXVI. LEMNACEAE

- |                                   |     |              |
|-----------------------------------|-----|--------------|
| 1a. Root solitary on each thallus | ... | 1. LEMNA     |
| 1b. Roots several on each thallus | ... | 2. SPIRODELA |

#### 1. LEMNA L.

*Lemna aequinoctialis* Welw., Apont. 578.1859. Cook, C.D.K., Aquatic and Wetland Plants of India. 227.1996; *L. paucicostata* auct. pl., non Hegelm. in Gray, Man. Bot. ed. 5. 681.1867, Hook. f., Fl. Brit. India 6 :556.1893; Haines, Bot. Bihar, & Orissa 3: 916.1924.

Free-floating plants. Thallus 1.5–4.0 × 0.7–2.5 mm, asymmetrical, pale green, 3-nerved ; daughter thalli several, closely adhering.

Common in stagnant water and margins of flowing water bodies. Cosmopolitan. Sarkar & Bhatta., 541.

## 2. SPIRODELA Schleid.

*Spirodela polyrrhiza* (L.) Schleid. in *Linnaea* 13:392.1839 ; Hook. f. , *Fl. Brit. India* 6:557.1893 ; *Lemna polyrrhiza* L., *Sp. Pl.* 970.1753 ; Haines, *Bot. Bihar & Orissa* 3:916. 1924.

Free-floating plants. Thallus to 0.2 cm across, usually purplish beneath. Flowering pouch with a small open spathe, 2–3 staminate flowers and a solitary pistillate flower.

Common in stagnant water. Cosmopolitan. Sarkar & Bhatta., 1738.

## CXXVII. XYRIDACEAE

### XYRIS L

*Xyris pauciflora* Willd., *Phytogr.* 1:2, t.1.f. 1. 1794 ; Hook. f., *Fl. Brit. India* 6:365.1892 ; Haines, *Bot. Bihar & Orissa* 3:1121. 1924.

Leaves 20 × 0.2 cm. Peduncles ribbed, to 15 cm long ; heads to 0.8 cm across. Bracts broadly oblong, green with brownish shades. Corolla yellow.

Tufted herbs in marshy places. Indomalesia November–March. Sarkar & Bhatta., 424,1795.

## CXXVIII. COMMELINACEAE

1a. Fertile stamens 3 ; staminodes 3.	...	2
1b. Fertile stamens 6 or 5.	...	3
2a. Inflorescence leaf-opposed, enclosed by a spathaceous bract, cincinni 1–2	...	1. COMMELINA
2b. Inflorescence otherwise, paniced	...	4. MURDANNIA
3a. Flowers embedded in hollow leaf sheath	...	6. TONNINGIA
3b. Flowers not embedded within leaf sheath	...	4

- 4a. Stems prostrate or creeping ; cymes from imbricating bracts, scorpioid or 1-few – flowered ; corolla tubular ... 2. CYANOTIS
- 4b. Stems erect or nearly so. ... 5
- 5a. Inflorescence largely terminal, paniced ... 3. FLOSCOPA
- 5b. Inflorescence axillary, flowers many in a dense umbel, inclosed by 2 boat-shaped bracts ... 5. RHOEO

1. COMMELINA L

- 1a. Spathes imbricate, axillary ... 2
- 1b. Spathe cucullate, axillary or terminal ... 3
- 2a. Leaves linear or linear-lanceolate . Seeds appendiculate ... 3. *C. longifolia*
- 2b. Leaves lanceolate. Seeds smooth ... 2. *C. hasskarlii*
- 3a. Capsule 3-locular, 2 antious locules 2-ovulate , posticous locule 1-ovuled ... 1. *C. benghalensis*
- 3b. Capsule 2-locular, each 2-ovuled ... 4. *C. suffruticosa*

1. *Commelina benghalensis* L. , Sp. Pl. 41.1753 ; Wt. Ic. t. 2065.1853 ; Hook. f., Fl. Brit. India 6. 370.1892 ; Haines , Bot. Bihar & Orissa . 3:1125. 1924. Tokyo Code 328. 1994. Typus : India, Herb. Linn. No. 65.16 (LINN) (*typ. cons.*).

Slender ascendering herbs with stems upto 1m long Leaves sessile, base forming sheath, elliptic , ovate or suborbicular, 1-8 × 1-4 cm. Spathes terminal or leaf opposed, 1-3 together, 0.8-1.7 cm. Petals blue. Ovary 3 celled . Cleistogamous flowers present.

Very common in wet fields. Palaeotropics. August-November , KANCHARA, DHOLA . Sarkar & Bhatta., 1032.

Leaves used as a pot herb, also used in leprosy.

2. *Commelina hasskarlii* Cl., Comm.et.Cyrt. Beng.13 .t. 3. 1874 ; Hook Fl. Brit. India 6: 378.1892 ; Haines, Bot Bihar & Orissa 3:1125. 1924; *C. caroliniana* Walter, F. Carol. 68.1788.

Slender diffuse herbs. Leaves lanceolate, 3–8 cm long acute or subacute, margin ciliate. Spathes solitary, leaf-opposed, 1.0–2.5 cm long, cordate at base. Uppermost branch of cymes 2–4-flowered and lower 1–2-flowered. Petals blue. Capsules quadrate, apiculate. Seeds cylindric, 0.3–0.4 cm long.

Occasional in wet places. Indomalaysia. September–November. Sarkar & Bhatta., 1182.

3. *Commelina longifolia* Lamk., *Encycl.* 1:129.1783 & *Ill. Gen.* 1:129.1791. *C. salicifolia* Roxb., *Fl. Indica* 1:176.1820; Hook. f., *Fl. Brit. India* 6: 370 .1892; Haines, *Bot. Bihar & Orissa* 3: 1124. 1924.

Diffuse herbs. Leaves linear–lanceolate, 8–15 × 0.3–0.6 cm. Spathes 1–2, ovate-lanceolate, acute or acuminate, rounded at base. Sepals free, ovate, obtuse, inner 2 basally connate. Petals blue, ovate, clawed. Imperfect stamens 3. Posticous lobe 1-ovuled or obsolete. Seeds black with white bloom smooth.

Common in wet places Indomalaysia. August–November. JALPIPARI. Sarkar & Bhatta., 830.

Used as cattle feed. Also used in dysentery.

4. *Commelina suffruticosa* Bl., *Enum Pl. Java* ed. 1: 3 .1827 ; Hook . f. , *Fl. Brit. India* 6:374.1892; Haines, *Bot. Bihar & Orissa* 3. 1126.1924.

Usually stout herbs. Leaves lanceolate, 7–15 × 2–5 cm, glabrous or pubescent beneath, finely acuminate, margins scabrid, base unequal. Spathes solitary or several clustered together, 1–1.5 cm long. Flowers in clusters of 6–12. Petals white. Seeds ellipsoid, 0.3 cm long.

Occasional. Tropics. August–September Sarkar & Bhatta., 1232.

## 2. CYANOTIS D. Don, *nom. cons.*

*Cyanotis cristata* (L.) D. Don, *Prodr. Fl. Nepal* 46.1825; Hook. f., *Fl. Brit. India* 6:385.1892; Haines, *Bot. Bihar & Orissa* 3:1130.1924; *Commelina cristata* L., *Sp. Pl.* 42. 1753.

Slender creeping herbs ; branches erect or ascending, upto 60 cm long. Leaves oblong –lanceolate, 5–10 × 1–2 cm, margin ciliate. Cymes recurved not clustered. Petals bluish violet, corolla tube 0.5–0.7 cm long, lobes 0.3–0.4 cm long. Seeds trigonous, brown, pitted.

Common. Palaeotropics. August–September. Sarkar & Bhatta., 1100, 1196.

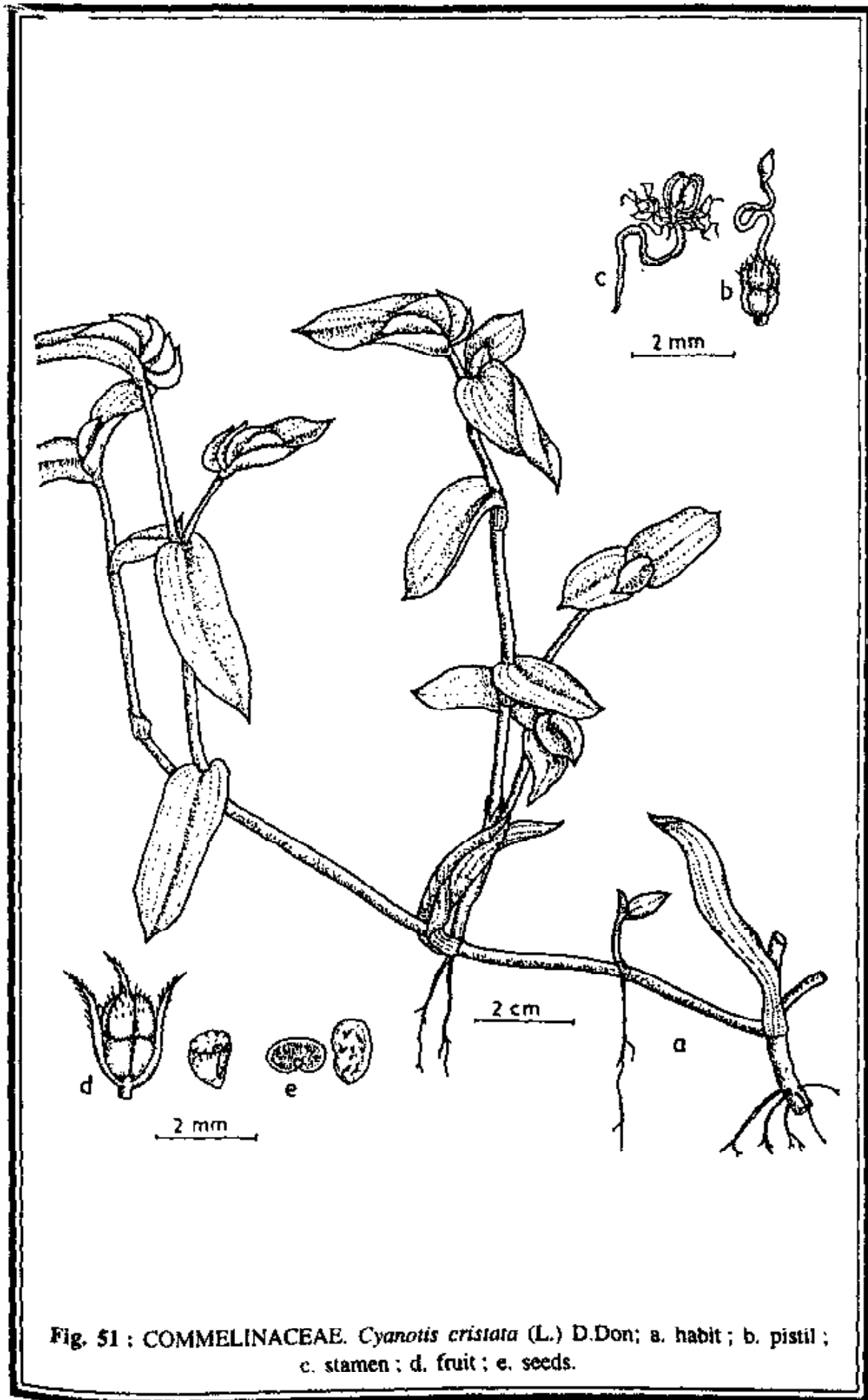


Fig. 51 : COMMELINACEAE. *Cyanotis cristata* (L.) D. Don; a. habit ; b. pistil ; c. stamen ; d. fruit ; e. seeds.

## 3. FLOSCOPA Lour.

**Floscopa scandens** Lour., Fl. Cochin, 1: 193.1790; Hook. f., Fl. Brit. India 6:390.1892; Haines, Bot. Bihar & Orissa 3: 1131.1924; *Dithyrocarpus rothii* Wt., Ic. t. 208.1839. *D. petiolatus* Wt., Ic. t. 2079.1853. *D. undulatus* Wt., Ic. t. 2380.1853.

Creeping or suberect herbs. Leaves elliptic-lanceolate, acuminate, 4–6 × 1–3 cm, sheath short, mouth fringed with long white hairs. Flowers purplish. Capsules ellipsoid. Seeds rugose.

Occasionally on wet places. Indomalayasia. September–December. Sarkar & Bhatta., 188, 611.

Used in applications for fractured bones. Juice of stem used for sore eyes.

4. MURDANNIA Royle, *nom. cons.*

- |   |     |                        |
|---|-----|------------------------|
| 1a. Ovary 3–many ovulate in each locule .     | ... | 2                      |
| 1b. Ovary 2–ovulate in each locule            | ... | 2. <i>M. nudiflora</i> |
| 2a. Panicles leafless. Seeds reticulate       | ... | 1. <i>M. edulis</i>    |
| 2b. Panicles leafy. Seeds minutely scaberulus | ... | 3. <i>M. spirata</i>   |

1. **Murdannia edulis** (Stokes) Faden in Taxon, 29: 77.1980. *Commelina edulis* Stokes, Bot. Materia Med. 1: 184. 1812. *C. tuberosa* Lour., Fl. Cochinch. 1: 40.1790, non L. 1753. *C. scapiflora* Roxb., Fl. Indica 1: 175.1820. *Aneilema scapiflorum* Wt. Ic. t. 2073.1853; Hook. f., Fl. Brit. India 6:375.1892; Haines, Bot. Bihar & Orissa 3: 1127. 1924.

Slender annual herbs. Roots fusiform. Leaves lanceolate to 25 cm long, 0.3–1.5 cm broad. Panicles 5–15 cm long. Petals blue–mauve. 0.8–1.2 cm long. Seeds uniseriate, reticulate.

Standstone plant. Indomalaysia. June–July. Sarkar & Bhatta., 1471.

2. **Murdannia nudiflora** (L.) Brenan in Kew Bull. 7:189.1952. *Commelina nudiflora* L. Sp. Pl. 41.1753, p.p. *Aneilema nudiflorum* (L.) R. Br., Prodr. 271.1810; Hook. f., Fl. Brit. India 6:378.1892; Haines, Bot. Bihar & Orissa 3:1128.1924; *Murdannia malabarica* (L.) Brueckn. in E. & P. Pflanzenfam. ed. 2, 15a:173.1930. *Tradescantia malabarica* L., Sp. Pl. ed. 2, 412.1762.

Diffuse or ascending herbs. Leaves lanceolate or linear-lanceolate, 3-10 cm long, glabrous. Panicles terminal and in upper leaf-axils. Flowers 2-12 in each cincinnus. Petals dark or pale blue or white, clawed. Seeds broadly oblong, acuminate, rugose-reticulate.

Very common in wet places and on sandy soils. Pantropical. August-November. Sarkar & Bhatta., 919.

3. *Murdannia spirata* (L.) Brueckn. in E. & P., Pflanzenfam. ed. 2, 15a: 173. 1930. *Commelina spirata* L., Mant. 2: 176. 1771. *Aneilema spiratum* (L.) R. Br. Prodr. 271. 1810; Hook. f., Fl. Brit. India 6: 377. 1892. Haines, Bot. Bihar & Orissa 3: 1128. 1924.

Diffuse or ascending herbs; branches 5-30 cm long. Leaves oblong-lanceolate or ovate, 1.0-4.0 x 0.4-1.0 cm, wavy auricled, amplexicauled. Panicles 1.5-4.0 cm long, usually divaricately branched. Petals pink, blue or purple. Capsules trigonous, shortly beaked. Seeds rugose.

Occasional in wet places. Fl. & Fr. September-January. Shetty 593 (CAL !).

#### 5. RHOEO Hance

*Rhoeo spathacea* (Swartz) W.T. Stearn, Baileya 5: 195-198. 1957; Kumar & Subra. Chrom. Atlas Fl. Pl. Indian Subcont. 2: 497. 1989. *R. discolor* (L'Her.) Hance in Walp. Ann. 3: 659. 1853. *Tradescantia spathacea* Swartz, Prod. Veg. Ind. Occ. 57. 1808; *T. discolor* L'Her. Sert. Angl. 8. t. 12. 1788.

Erect stout herbs. Leaves narrowly lanceolate, sheathing at base, imbricate, abaxial surface purple. Flowers white.

Grown as garden ornamentals. A Mexican plant. Bhatta., & Sarkar 993.

#### 6. TONNINGIA Neck. ex A.H.L. Juss.

*Tonningia axillaris* (L.) O. Kuntze, Rev. Gen. Pl. 2: 721. 1801. *Amischophacelus axillaris* (L.) Rolla Rao & Kammathy, J. Linn. Soc. (Bot.) 59: 306. 1966. *Commelina axillaris* L. Sp. Pl. 42. 1753; *Cyanotis axillaris* (L.) Schult. f. Syst. 7: 1154, 1830; Hook. f., Fl. Brit. India 6: 388. 1892; Haines, Bot. Bihar & Orissa 3: 1130. 1924.

Slender, perennial creeping herbs, 10-75 cm long; branches ascending. Leaves linear or ensiform 4.0-5.0 x 0.3-1.2 cm, sheaths 0.5-1.0 cm long, swollen and almost fully enclosing the flowers. Petals blue or pink, corolla tube 1 cm long, lobes ovate. Filaments blue bearded. Seeds pitted.

Common in wet fields. Indomalaysia. Fl. & Fr. : August–January. Bhatta. & Sarkar 1582.

Acrid leaves used in ringworm and other parasitic skin diseases. The plant is reported to possess antityphoid and anti-tubercular properties.

### CXXIX. ERIOCAULACEAE

#### ERIOCAULON L.

- 1a. Submersed herbs ; anthers black ... 2. *E. setaceum*  
 1b. Herbs growing in wet grounds ; anthers white ... 1. *E. quinquangulare*

1. *Eriocaulon quinquangulare* L., Sp. Pl. 87.1753 ; Hook.f., Fl. Brit.India 6 : 582.1893 ; Haines, Bot. Bihar & Orissa 3 : 1116.1924.

Tufted herbs. Leaves 2–10 × 0.2–0.5 cm. Peduncles twisted, ribbed ; 5–27 cm long. Heads subglobose, 0.3–0.5 cm broad. Floral bracts ciliate at the tip. Male flowers : sepals linear–lanceolate ; one petal larger than the others.

Along the margins of water bodies. India, Burma, Sri Lanka. September–January. Sarkar & Bhatta., 1775.

2. *Eriocaulon setaceum* L., Sp. Pl. 87.1753 ; Hook.f., Fl. Brit.India 6 : 572.1893 ; Haines, Bot. Bihar & Orissa 3 : 1115.1924 ; Gandhi in Sald. & Nicol. Fl. Hassan Dist. 654.1976.

Stems elongate, 10–35 (–160) cm long, spongy. Leaves slender, filiform. Peduncles to 6 cm long ; heads to 0.2 cm across ; floral bracts glabrous.

In shallow water bodies. India, Sri Lanka. August–September. Sarkar & Bhatta., 1750.

### CXXX. JUNCACEAE

#### JUNCUS L.

*Juncus prismatocarpus* R. Br., Prodr. 259.1810 ; Hook.f., Fl. Brit.India 6 : 395.1892 ; Haines, Bot. Bihar & Orissa 3 : 1132.1924 ; Ramchandran & Nair, Fl. Cannanore 489.1988.

Tufted. Stems terete or flattened. Leaves to 10 cm long, transversely septate. Stamens included. Ovary 1–locular. Capsule 3–valved.

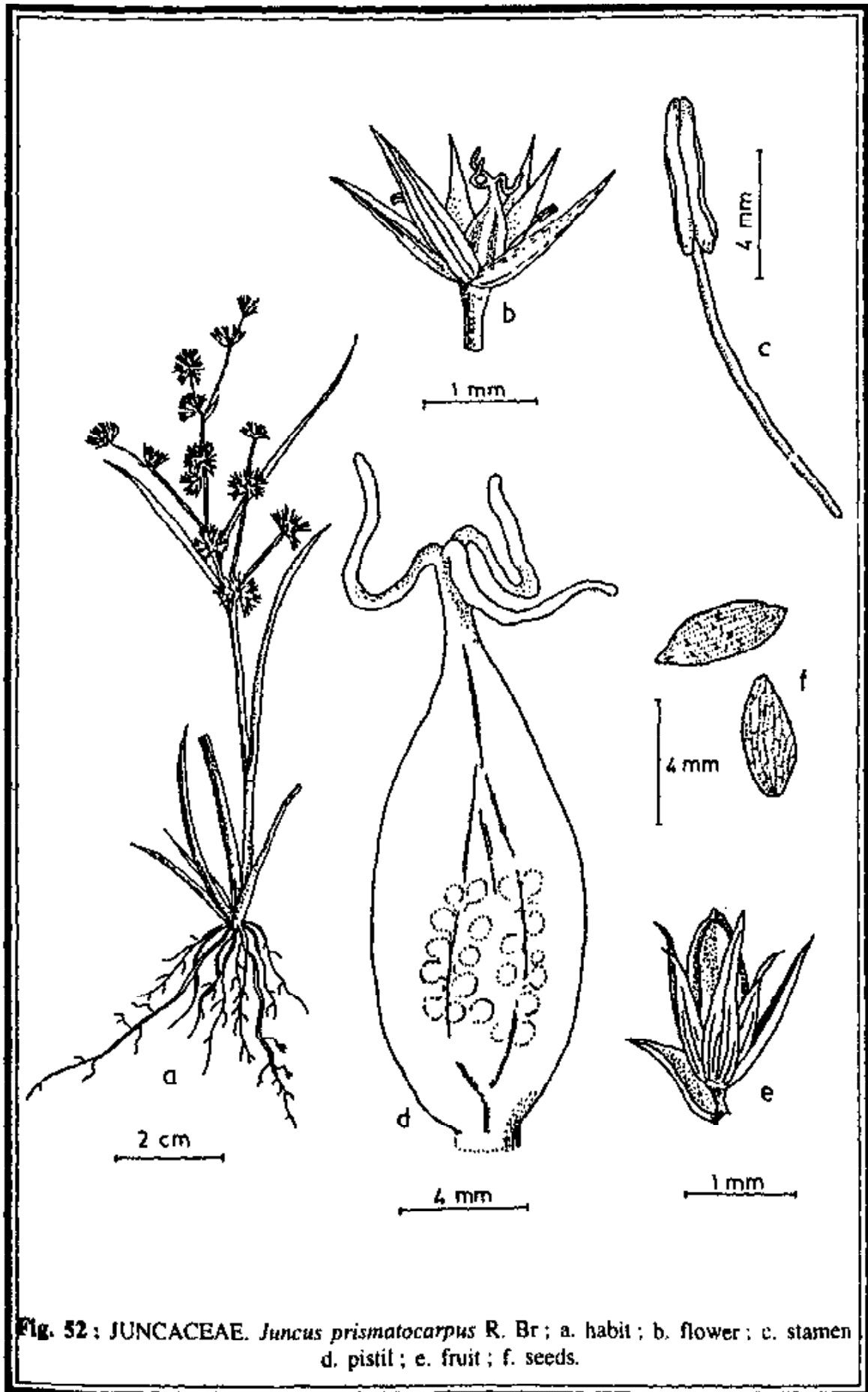


Fig. 52 : JUNCACEAE. *Juncus prismatocarpus* R. Br ; a. habit ; b. flower ; c. stamen ; d. pistil ; e. fruit ; f. seeds.

Along the margins of road-side ditches. Indomalesia. September–November. Sarkar & Bhatta., 1706, 1804.

## CXXXI. CYPERACEAE

1a. Flowers unisexual ; nuts enclosed within an utricle ...	2. CAREX
1b. Flowers unisexual or bisexual ; nuts naked. ...	2
2a. Perianth present. ...	3
2b. Perianth absent. ...	5
3a. Perianth of scales and bristles. ...	4
3b. Perianth of bristles only ...	7. SCIRPUS
4a. Bristles 2-seriate ...	6. FURENA
4b. Bristles 6 ...	4. ERIOPHORUM
5a. Nuts crowned by the persistent stylebase ...	1. BULBOSTYLIS
5b. Nuts not crowned by the persistent stylebase. ...	6
6a. Style articulated with the ovary, usually swollen at the base, usually fimbriate ...	5. FIMBRISTYLIS
6b. Style continuous with the ovary, neither swollen nor fimbriate ...	3. CYPERUS

1. BULBOSTYLIS Kunth, *nom. cons.*

**Bulbostylis densa** (Wall.) Hand. –Mazz. in Karsten & Schenk, *Vegetationsb.* 20.7 : 16. 1930. *Scirpus densus* Wall. in Roxb., *Fl. Indica* 1 : 231, 1820. *Bulbostylis capillaris* var. *trifida* Cl. in Hook. f., *Fl. Brit. India* 6 : 652. 1893 ; Haines, *Bot. Bihar & Orissa* 3 : 967. 1924.

Small tufted annuals, to 20 cm long. Spikelets oblong–ovate or oblong ; glumes ovate, mucicous, keeled. Nut obovate.

Along borders of rice fields. Palaeotropics. August–October. Sarkar & Bhatta., 954.

2. CAREX L.

*Carex wallichiana* Presc. ex Nees in Wt., Contrib. 129.1834 ; Cl. in Hook.f., Fl. Brit.India 6 : 747.1893 ; Haines, Bot.Bihar & Orissa 3 : 980.1924.

Stoloniferous herbs, stems to 40 cm high. Leaves slender, flat. Utricle densely hairy. Nut stipitate.

Wet grounds along forest margins. Afghanistan to Japan. February–April. Sarkar & Bhatta., 472.

3. CYPERUS L.

1a. Style 2-fid ; nut lenticular.	...	2
1b. Style 3-fid ; nut trigonal.	...	7
2a. Inflorescence capitate of sessile glomerules, each spikelet maturing solitary nut.	...	3
2b. Inflorescence anthellate or capitate, each spikelet maturing several nuts.	...	5
3a. Keel of the glume distinctly winged	...	9. <i>C. kyllingia</i>
3b. Keel of the glume not winged.	...	4
4a. Rhizome short ; heads usually 3	...	15. <i>C. triceps</i>
4b. Rhizome horizontally creeping ; heads solitary	...	3. <i>C. brevifolius</i>
5a. Glumes mucronate ; robust perennials	...	1. <i>C. alopecuroides</i>
5b. Glumes muticous ; tufted perennials.	...	6
6a. Glumes usually with a depression on each side ; keel arcuate	...	14. <i>C. sanguinolentus</i>
6b. Glumes without depression ; keel straight	...	6. <i>C. tenuispica</i>
7a. Rhachilla of the spikelets caducous	...	4. <i>C. cyperoides</i>
7b. Rhachilla of the spikelets persistent.	...	8
8a. Inflorescence capitate.	...	9
8b. Inflorescence anthellate with distinct rays.	...	10

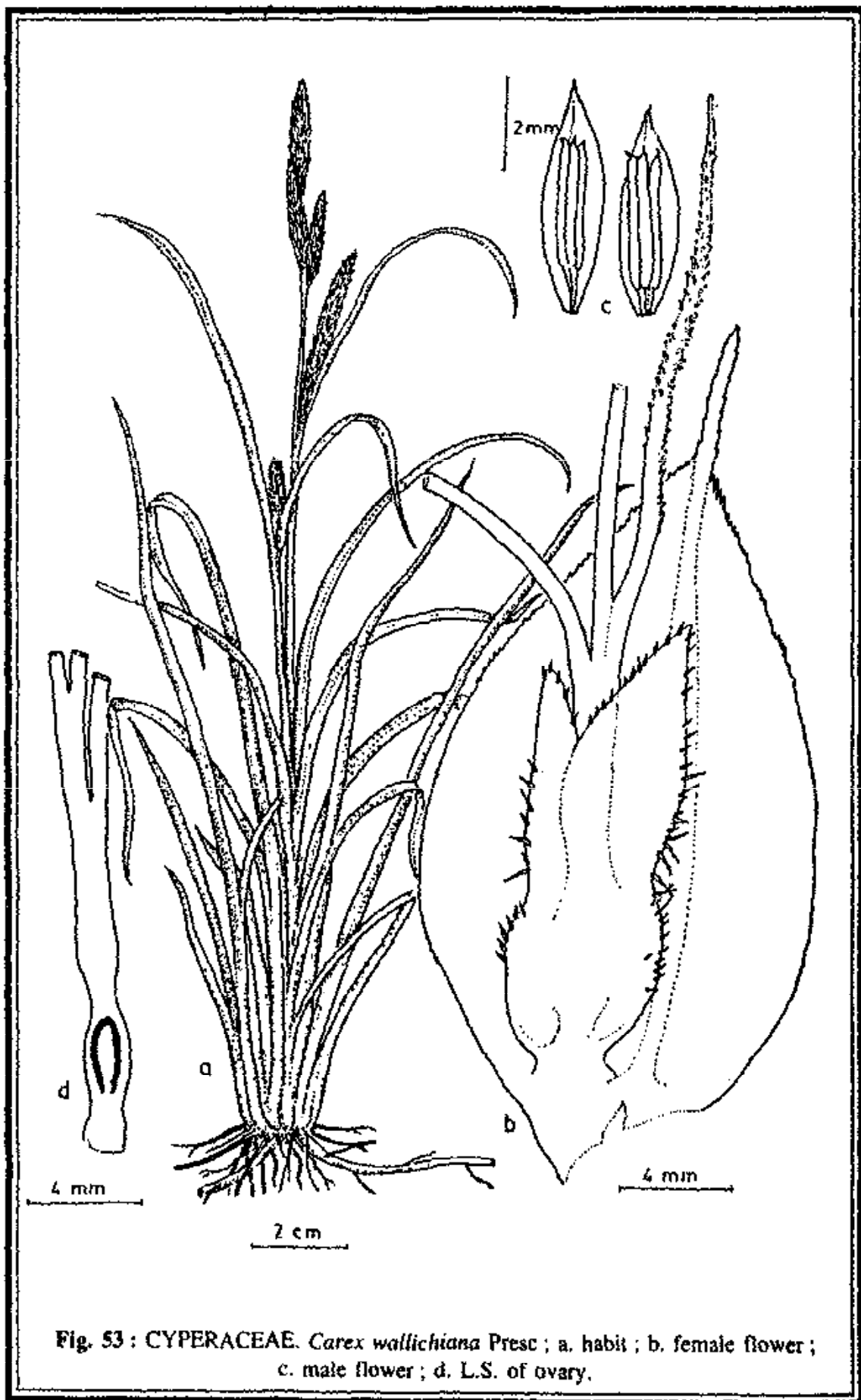


Fig. 53 : CYPERACEAE. *Carex wallichiana* Presc ; a. habit ; b. female flower ;  
c. male flower ; d. L.S. of ovary.

9a. Spikes globose ; glumes 0.08 cm long	...	5. <i>C. difformis</i>
9b. Spikes broadly ovoid ; glumes 0.3–0.5 cm long	...	10. <i>C. niveus</i>
10a. Spikelets spicate ; rhachis several times longer than the spikelets.	...	11
10b. Spikelets digitate or very shortly spicate, rhachis obscure, or much shorter.	...	13
11a. Glumes as broad as long	...	8. <i>C. iria</i>
11b. Glumes about half or less as broad as long.	...	12
12a. Stems articulated	...	2. <i>C. articulatus</i>
12b. Stems not articulated	...	11. <i>C. nutans</i>
13a. Spikelets digitate or compound umbel.	...	14
13b. Spikelets shortly spicate	...	13. <i>C. rotundus</i>
14a. Stamens 1	...	7. <i>C. halpan</i>
14b. Stamens 3	...	12. <i>C. radiatus</i>

1. *Cyperus alopecuroides* Rottb., Progr. 20.1772 ; Kern in Reinwardtia 2 : 101.1952. *Jancellus alopecuroides* Cl. in Hook.f., Fl. Brit. India 6 : 595.1893.

Stout perennials, to 1 m high ; stems trigonous. Spikes digitate ; spikelets densely crowded, ovate or oblong–lanceolate ; glumes ovate, apiculate. Nut obovoid, apiculate, to 0.5 cm long.

Along margins of water bodies. Tropics & subtropics. October–March. Sarkar & Bhatt., 950.

2. *Cyperus articulatus* L., Sp. Pl. 44.1753 ; Cl. in Hook.f., Fl. Brit. India 6 : 611.1893 ; Haines, Bot. Bihar & Orissa 3 : 943. 1924.

Perennial herbs ; stems to 1.5 m high, cylindrical, septate. Leaves reduced to papery sheaths. Nut oblong, blackish.

Near water. Pantropics & subtropics. September–February. Sarkar & Bhatta., 1303.

3. **Cyperus brevifolius** (Rottb.) Hassk., Cat.Hort.Bog. 24.1844; Kern in Fl. Mal.7 (3) : 656.1974. *Kyllinga brevifolia* Rottb., Descr. & Ic. 13.t.4.f.3.1773 ; Cl.in Hook.f.,Fl.Brit. India 6:588.1893; Haines Bot. Bihar & Orissa 3 ; 950. 1924.

Perennials ; rhizomes creeping. Leaves to 0.3 cm broad. Spikelets compressed, to 0.25 cm long. Nut obovate, apiculate, to 0.1 cm long.

Moist places. Tropics & subtropics. July–December. Sarkar & Bhatta., 662.

4. **Cyperus cyperoides** (L.) Kuntze, Rev. Gen. Pl. 3, 2 : 333.1898; Kern in Fl.Mal.7(3) : 641.1974. *Scirpus cyperoides* L., Mant. 2 : 181.1771. *Mariscus sieberianus* Nees ex Cl. in Hook.f.,Fl. Brit. India 6 : 622.1893 ; Haines, Bot. Bihar & Orissa 3 : 952.1924.

Perennials. Leaves to 0.5 cm broad. Spikes sessile or subsessile ; spikelets linear or linear–lanceolate, to 0.5 cm long ; glumes oblong–ovate. Stamens 3. Nut linear, apiculate.

Common along wet forest areas. Tropics. August–March. Sarkar & Bhatta., 757.

5. **Cyperus difformis** L., Cent. Pl. 2 : 6.1756 ; Cl. in Hook. f., Fl. Brit.India 6 : 599.1893 ; Haines, Bot. Bihar & Orissa 3 : 935.1924.

Tufted annuals. Leaves 0.2–0.5 cm broad, suddenly acuminate. Spikelets in globose inflorescences. Nut obovoid, pale brown.

Near ponds and other aquatic bodies. Tropics & subtropics. September–March. Sarkar & Bhatta., 645.

6. **Cyperus tenuispica** Steud., Syn.Pl. Glum. 2 :11.1855 ; Kotha. & Moor. Fl. Raigad Dt. 436.1993. *Cyperus flavidus* auct.pl., Cl. in Hook.f., Fl. Brit. India 6: 600.1893 ; Haines, Bot. Bihar & Orissa 3 : 936.1924; non Retzius, 1789.

Annuals or perennial herbs. Leaves to 0.1 cm long. Spikelets to 2 cm long ; glumes oblong–ovate, keeled, to 0.2 cm long. Stamens 2. Nut oblong–obovate.

Weed of rice fields. Old world tropics. September–April. Sarkar & Bhatta., 941.

7. **Cyperus halpan** L., Sp.Pl.45.1753 ; 'haspan', Cl. in Hook.f., Fl. Brit., India 6 : 600 .1893; Haines, Bot.Bihar & Orissa 3 : 936. Rama. & Nair, Fl. Cannanore 506.1988.

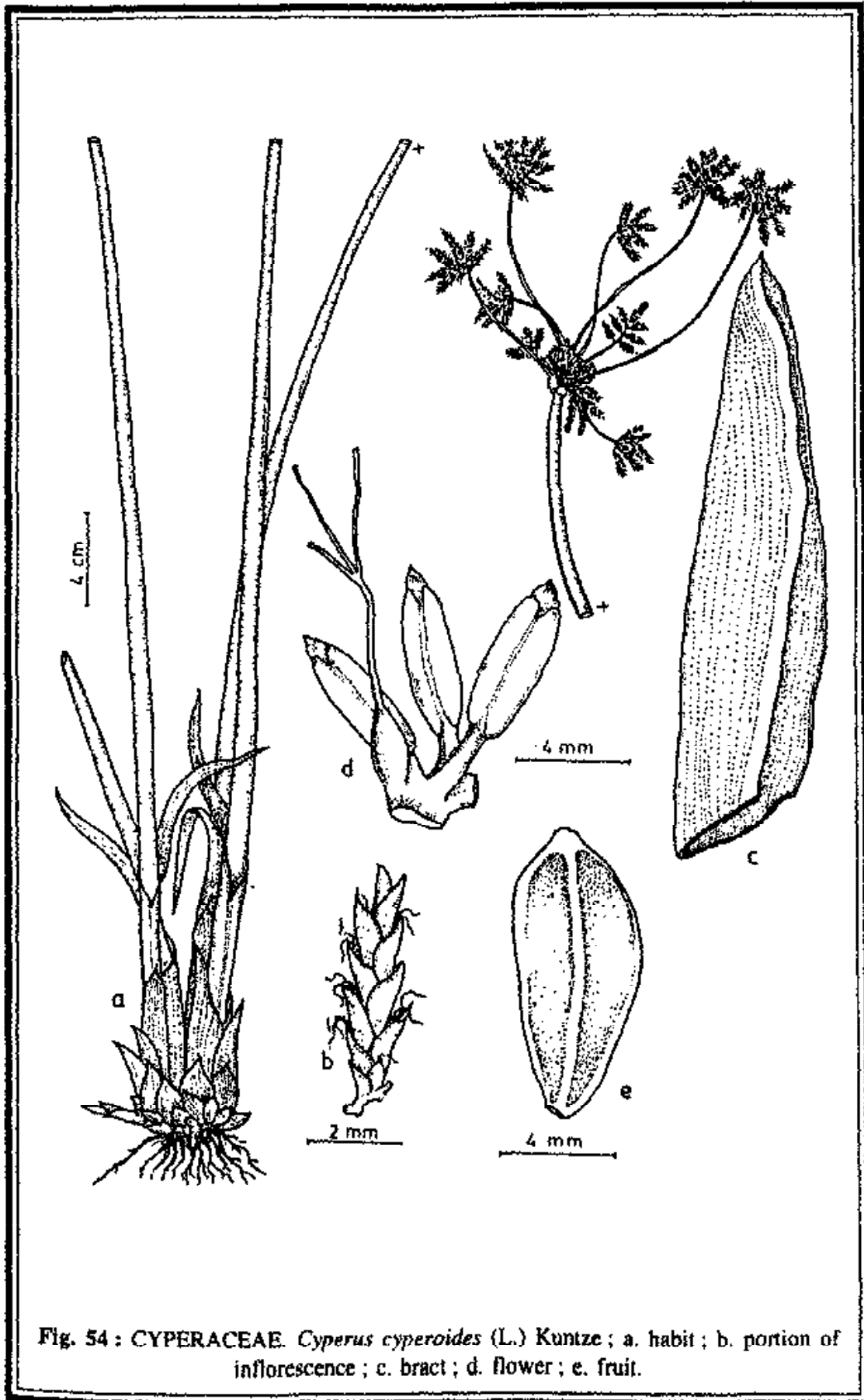


Fig. 54 : CYPERACEAE. *Cyperus cyperoides* (L.) Kuntze ; a. habit ; b. portion of inflorescence ; c. bract ; d. flower ; e. fruit.

Perennials, usually tufted. Leaves to 0.4 cm broad. Spikelets stellately spreading ; glumes ovate-oblong, keeled. Stamen 1. Nut broadly obovoid.

Along moist places. Tropics. September–February. Sarkar & Bhatta., 620.

8. *Cyperus iria* L., Sp. Pl. 45.1753 ; Cl. in Hook.f., Fl. Brit. India 6 : 606.1893 ; Prain, Bengal Pl. 2 : 860 ; Duthie, Fl. U.G.P. 2 : 385 ; Haines, Bot. Bihar & Orissa 3 : 938. 1924.

Annual or perennial herbs ; stems to 50 cm high. Leaves to 0.5 cm broad. Spikelets oblong, to 0.8 cm long ; glumes broadly ovate. Nut obovoid-ellipsoid.

Very common along moist grounds. Paleotropics & subtropics. August–April. Sarkar & Bhatta., 644.

9. *Cyperus kyllingia* Endl., Cat. Hort. Ac. Vindob. 1 : 94.1842 ; Kern in Fl. Mal. 7(3):659.1974. *Kyllingia monocephala* Rottb., Descr. Ic. 13.t.4.f.4.1773 ; Cl. in Hook.f., Fl. Brit. India 6:588.1893 ; Prain, Bengal Pl. 2: 855 ; Duthie, Fl. U.G.P. 2 : 397 ; Haines, Bot. Bihar & Orissa 3 : 950. 1924.

Perennials. Leaves to 0.4 cm broad. Inflorescence capitate ; spikelets ovate-elliptic ; glumes keeled. Stamens 3. Nut lenticular, oblong.

In wet, shady places. Cosmopolitan. July–August. Sarkar & Bhatta., 942.

Note : *Cyperus nemoralis* Cherm. Bull. Mus. Hist. Nat. Paris 27:553.1921, is a quite different species of Madagascar—Bhatta.

10. *Cyperus niveus* Retz., Obs. 5 : 12.1788 ; Cl. in Hook.f., Fl. Brit. India 6 : 601.1893 ; Prain, Bengal Pl. 2 : 860 ; Duthie, Fl. U.G.P. 2 : 383 ; Haines, Bot. Bihar & Orissa 3 : 939. 1924.

Perennials. Leaves to 0.25 cm broad. Inflorescence capitate ; spikelets oblong-elliptic, to 2.5 cm long ; glumes ovate-lanceolate. Stamens 3. Nut obovoid, brown.

Along forest areas. India to China. May–June. Sarkar & Bhatta., 940.

11. *Cyperus nutans* Vahl, Enum. Pl. 2 : 363.1805 var. *eleusinoides* (Kunth) Haines, Bot. Bihar & Orissa 3 : 898.1924 ; *Cyperus eleusinoides* Kunth, Enum. Pl. 2 : 39.1837.

Perennials ; stems trigonous, leafy below. Spikes numerous ; spikelets linear-oblong ; glumes elliptic-oblong, mucronate. Stamens 3. Nuts obovoid.

Along river beds. Tropics. August–February. Sarkar & Bhatta., 253.

12. *Cyperus radiatus* Vahl, Enum. 2 : 369. 1805 ; Cl. in Hook.f., Fl. Brit. India 6 : 617. 1893 ; Haines, Bot. Bihar & Orissa 3 : 945. 1924.

Stout perennials. Inflorescence a compound umbel ; spikelets cylindrical. Stamens 3. Nuts ellipsoid.

Occasional along moist places. Palaeotropics. May–June. Sarkar & Bhatta., 1549, 1577.

13. *Cyperus rotundus* L., Sp. Pl. 45. 1753 ; Cl. in Hook.f., Fl. Brit. India 6 : 614. 1893 ; Haines, Bot. Bihar & Orissa 3 : 946. 1924.

Rhizomatous perennials, stems compressed, trigonous ; spikelets to 3.5 cm long, reddish–brown ; glumes ovate. Stamens 3. Nut blackish, to 0.17 cm long.

Common along waste lands. Pantropics. August–May. Sarkar & Bhatta., 943.

14. *Cyperus sanguinolentus* Vahl, Enum. 2. 351. 1806 ; Kern in Fl. Mal. 7(3) : 646. 1974. *Pycneus sanguinolentus* (Vahl) Nees in Linnaea 9 : 283. 1834 ; Cl. in Hook.f., Fl. Brit. India 6 : 590. 1893 ; Haines, Bot. Bihar & Orissa 3 : 947. 1924.

Annuals or perennials. Inflorescence somewhat capitate ; spikelets to 0.25 cm long, ovate or oblong–lanceolate ; glumes ovate. Stamens 2. Nuts obovate, blackish.

Wet grounds. Tropics. September–November. Sarkar & Bhatta., 465.

15. *Cyperus triceps* (Rottb.) Endl., Cat. Hort. Ae. Vindob. 1 : 94. 1842 ; Kern in Fl. Mal. 1, 7(3) : 659. 1974. *Kyllinga triceps* Rottb., Descr. Ic. 14. t. 4. f. 6. 1773 ; Cl. in Hook.f., Fl. Brit. India 6 : 587. 1893 ; Haines, Bot. Bihar & Orissa 3 : 950. 1924.

Perennials ; stems thickened at the base. Leaves to 0.3 cm wide. Inflorescence of 3–lobed dense heads. Stamens 2. Nuts oblong.

Common. Tropics. July–September. Sarkar & Bhatta., 953.

Note : Rottboell (1773) cited *Scripus glomeratus* L. in synonymy of *Kyllinga triceps* but he cited a definite type (“dominus Koenigius legit”) [Tokyo Code 1994. Art. 9.1, 33 Note 2, 33.3, 52.2) —Bhatta.

#### 4. ERIOPHORUM L.

*Eriophorum comosum* (Wall.) Wall. ex. Nees in Wt. Contrib. 110. 1834 ; Cl. in Hook. f., Fl. Brit. India 6 : 664. 1893 ; Chow. & Wadhwa, Fl. Himach. Pra. Ana. 3. 749. 1984 ; Lakshmi, & Sharma, Fl. Nasik Dt. 504, Fig. 43. 1991 ; Haines, Bot.

Bihar & Orissa 3 : 971. 1924; *Scirpus comosus* Wall. in Roxb. Fl. Indica. Carey ed., 1 : 234. 1820.

Tufted perennials. Leaves to 1m long. Glumes ovate-lanceolate. Nut brownish.

Common along the sandstone areas. Afghanistan to China. September-December. Sarkar & Bhatta., 1364, 1409.

Leaves are used in rope making.

#### 5. FIMBRISTYLIS Vahl, *nom. cons.*

1a. Stigmas 2 ... 1. *F. dichotoma*

1b. Stigmas 3 ... 2. *F. littoralis*

1. *Fimbristylis dichotoma* (L.) Vahl, Enum. Pl. 2 : 287. 1806 ; Kern in Fl. Mal. 7(3) : 575. 1974. *Scirpus dichotomus* L., Sp. Pl. 50. 1753. *Fimbristylis diphylla* Vahl, Enum. Pl. 2 : 289. 1806 ; Cl. in Hook. f., Fl. Brit. India 6 : 636. 1893 ; Haines, Bot. Bihar & Orissa 3 : 964. 1924.

Tufted sedges. Leaves flat, to 0.5 cm broad. Spikelets ovoid, globose ; glumes broadly ovate. Stamens 1-3. Nut obovate, longitudinally ribbed.

Weed of rice fields. Tropics. July-October. Sarkar & Bhatta., 882.

2. *Fimbristylis littoralis* Gaud. in Freyc., Voy. Bot. 413. 1826. Lakshmi, & Sharma, Fl. Nasik Dt. 508. 1991. *F. miliacea* Vahl, Enum. Pl. 2 : 287. 1806, excl. basion. *Scirpus miliaceus* L. 1759 ; Cl. in Hook. f., Fl. Brit. India 6 : 644. 1893 ; Haines, Bot. Bihar & Orissa 3 : 958. 1924.

Stems to 35 cm high, striate. Leaves to 0.2 cm broad. Spikelets subglobose in decomposed umbels. Nut minutely tuberculate.

Along borders of rice fields. Tropics. July-October. Sarkar & Bhatta., 878.

#### 6. FUIRENA Rottb.

*Fuirena ciliaris* (L.) Roxb., Fl. Indica 1 : 184. 1820 ; Kern in Fl. Mal. 7(3) : 519. 1974. *Scirpus ciliaris* L., Mant. Pl. 2 : 182. 1771. *Fuirena glomerata* Lamk., Ill. 1 : 150. 1791 ; Cl. in Hook. f., Fl. Brit. India 6 : 666. 1893 ; Haines, Bot. Bihar & Orissa 3 : 972. 1924.

Annuals, to 40 cm high. Leaves to 11 cm long. Glumes obovate-oblong, to 0.16 cm long. Nut elliptic or obovate, beaked.

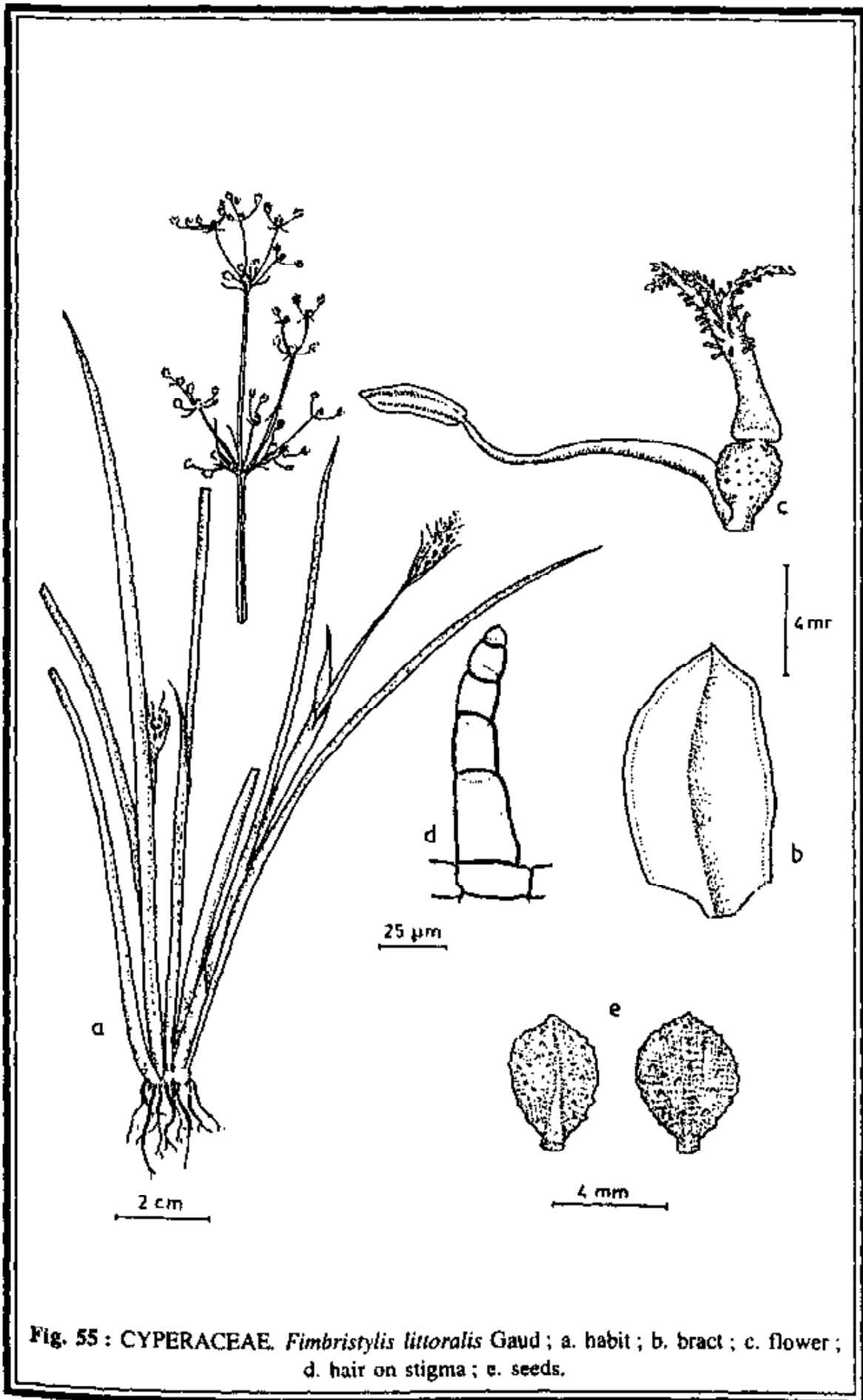


Fig. 55 : CYPERACEAE. *Fimbristylis littoralis* Gaud ; a. habit ; b. bract ; c. flower ; d. hair on stigma ; e. seeds.

Along moist places. Palaeotropics & subtropics. September–May. Sarkar & Bhatta., 1330.

### 7. SCIRPUS L.

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Stems and bracts transversely septate,<br>flowering nearer to the base | ... | 1. <i>S. articulatus</i> |
| 1b. Stems, bracts not septate, flowering nearer to the top.                |     | 2                        |
| 2a. Perianth-bristles present  | ... | 2. <i>S. juncooides</i>  |
| 2b. Perianth-bristles absent   | ... | 3. <i>S. supinus</i>     |

1. *Scirpus articulatus* L., Sp. Pl. 47.1753 ; Cl. in Hook.f., Fl.Brit.India 6 : 656.1893 ; Haines, Bot.Bihar & Orissa 3 : 969.1924; *Schoenoplectus articulatus* (L.) Palla, Bot. Jahrb. Syst. 10 : 299.1889 ; Lakshmi. & Sharma, Fl. Nasik Dist. 520.1991; Karthi. & Kumar, Fl. Yavatmal Dt. 269.1993.

Stems spongy, to 30 cm high. Leaves absent. Inflorescence capitate ; spikelets brownish, ovoid-oblong. Glumes suborbicular. Nuts obovoid, transversely wavy-wrinkled.

In marshy places. Old world tropics. September–April. Sarkar & Bhatta., 1314.

2. *Scirpus juncooides* Roxb., Fl. Indica 1 : 218.1820 ; Kern in Fl. Mal.7(3): 512.1974. *S. erectus* auct. pl., Cl. in Hook.f.,Fl.Brit.India 6 : 656.1893 ; non Poir, 1805. *Schoenoplectus juncooides* (Roxb.) Palla, Bot. Jahrb.Syst. 10 : 299.1888 ; Hooper in Sald. & Nicol. Fl. Hassan Dist. 697.1976.

Leaves absent. Inflorescence capitate ; spikelets ovoid-oblong to 1.8 cm long. Perianth bristles 5–6, unequal, scabrid. Styles 2–fid. Nut broadly obovoid.

Margins of shallow water. Tropics. March–May. Sarkar & Bhatta., 1269.

3. *Scirpus supinus* L., Sp. Pl. 49.1753 ; Cl. in Hook.f., Fl.Brit.India 6 : 655.1893 ; Haines, Bot.Bihar & Orissa 3 : 969. *Schoenoplectus supinus* (L.) Palla, Bot. Jahrb. 10:299.1889. Lakshmi. & Sharma, Fl. Nasik, Dist. 520.1991.

Tufted herbs ; stems terete. Spikelets in clusters. Glumes elliptic-oblong, keeled. Bristles 0. Styles 3–fid. Nut transversely-wrinkled.

Weed of rice fields. Cosmopolitan. September–February. Sarkar & Bhatta.,1242,1632.

CXXXII. POACEAE ( GRAMINEAE *nom. alt.* )**Synoptical key to the subfamilies**

1 (a). Tall stout arborescent perennial grasses ( Bamboos ), culms hollow very rarely subsolid between the nodes, woody upto 8 m or more, always with culm – sheaths ( reduced leaves ) : blade base disarticulating from the sheath ; leaves usually 'petiolate'. Empty glumes 2 – more scarcely differentiated from the basal bracts of spikelets and usually increasing in size to the flowering. Flowering glumes 1 – several. Palea usually large. Stamens 6 (in our species)...

**Subfamily I : BAMBUSOIDEAE**

1 (b). Herbaceous, rarely suffruticose with hollow or solid culms upto 5 m high, if perennial usually not woody, without culm-sheath ; blade base not disarticulating from the sheath ; leaves sessile. Empty glumes 2–1 (rarely 0), not passing into basal bracts. Stamens 3–1 ( excluding Oryzae 3–6 ). Lodicules 2 or 0 ...2.

2 (a). Spikelets with one perfect floret, when two flowered reduced florets always below the perfect, may be unisexual and paired or in different parts of the same plant ... Subfamily II : PANICOIDEAE

2 (b). Spikelets 1–to many –flowered, always with at least a single hermaphrodite floret; if two flowered with one of the florets barren – then lemmas as firm as the glumes, reduced florets, if any above the perfect floret ( except Oryzae ) ... subfamily III : POOIDEAE

**Subfamily I : BAMBUSOIDEAE**

Arboreal ; culms woody ; leaves with a pseudopetiole ; spikelets all of one kind ; lower 2 or more glumes empty ; lodicules 3–0.

- |   |     |                   |
|---|-----|-------------------|
| 1a. Spikelets falling off as a whole ;<br>rachilla disarticulating              | ... | 16. DENDROCALAMUS |
| 1b. Spikelets not falling off as a whole ;<br>rachilla promptly disarticulating | ... | 6. BAMBUSA        |

**Subfamily II : PANICOIDEAE**

Spikelets 2 – flowered, falling entire at maturity, usually with the upper floret hermaphrodite and the lower male or barren. caryopsis dorsally compressed.

### Synoptical key to the tribes

- 1a. Staminate and pistillate spikelets in separate inflorescences or in different parts of the same inflorescence and of appearance ... **TRIBE II : MAYDEAE**
- 1b. Spikelets all hermaphrodite, or with male or barren and hermaphrodite spikelets mixed in the same inflorescence. ... **2**
- 2a. Spikelets often paired, with one sessile and the other pedicelled ; glumes more or less rigid; upper lemma usually awned ... **TRIBE I : ANDROPOGONEAE**
- 2b. Spikelets solitary or paired, more or less similar ; glumes membranous ; upper lemma usually awnless ... **TRIBE III : PANICEAE**

#### Tribe I : ANDROPOGONEAE

- 1a. Spikelets similar; joints of the panicle thin, linear or somewhat expanded at the top. ... **2**
- 1b. Spikelets in each pair dissimilar, or if more or less similar then the joints of the raceme and the pedicel thick and swollen. ... **8**
- 2a. Spikelets arranged in more or less ample panicles or compound racemes arranged along a central axis. ... **3**
- 2b. Spikelets arranged in a single or in several racemes, the latter being digitate or arranged along a very short main axis. ... **6**
- 3a. Rhachis of racemes tough or tardily breaking up ; spikelets deciduous from their pedicels. ... **4**
- 3b. Rhachis of the racemes breaking up. ... **5**
- 4a. Panicles narrow ; contracted, silvery, glumes very delicate ... **34. IMPERATA**
- 4b. Panicles broader or widely spreading ; glumes indurated, brown or reddish brown ... **41. NARENGA**

5a. Spikelets unawned	...	55. SACCHARUM
5b. Spikelets awned	...	25. ERIANTHUS
6a. Upper lemma 2-toothed, awned ; stamens 3	...	28. EULALIOPSIS
6b. Upper lemma deeply cleft, awned in the cleft.	...	7
7a. Lower glume 2-keeled, depressed between the keels		27. EULALIA
7b. Lower glume convex on the back, at least at maturity. Recemes solitary ; upper glume awned	...	52. POGONATHERUM
8a. Joints of the rhachis and pedicel of the pedicelled spikelet swollen, 3 -angled, rounded or flattened.	...	9
8b. Joints of the rhachis and the pedicel narrow, seldom thickened upwards, occasionally with a translucent longitudinal groove.	...	12
9a. Sessile spikelet with a male and a hermaphrodite floret ; upper lemma awned.	...	10
9b. Sessile spikelet with a hermaphrodite floret only or occasionally with a staminate floret below ; upper lemma unawned.	...	11
10a. Racemes many-noded, not confined in a spathe - like sheath	...	36. ISCHAEMUM
10b. Recemes 1 - noded, reduced to 3 heteromorphous spikelets, enclosed in a boat-shaped spathe	...	2. APLUDA
11a. Sessile spikelet spherical ; lower glume pitted all over		29. HACKELOCHLOA
11b. Sessile spikelet not spherical in shape	...	54. ROTTBOELLIA
12a. Spikelets in racemes which are not interrupted by spathes or solitary at the ends of the branches ; the racemes collected into whorled panicles ; joints and pedicels not furrowed.	...	13
12b. Panicles of racemes which are interrupted by spathes, or the espatheate racemes digitate or in pairs or solitary and terminal ; median furrow present in joints and or pedicels	...	15

13a. Spikelets dorsally compressed	...	59. SORGHUM
13b. Spikelets compressed from the sides.	...	14
14a. Lower glume smooth	...	11. CHRYSOPOGON
14b. Lower glume tuberculate	...	66. VETIVERIA
15a. Margins of lower glume of the sessile spikelets sharply infolded, 2-keeled; awn glabrous.	...	16
15b. Margins of the lower glumes intumed and rounded at the sides. at the most keeled upwards ; awn usually hairy.	...	20
16a. Upper lemma of the sessile spikelet not cleft, often stipitate and passing into the awn.	...	17
16b. Upper lemma of the sessile spikelet 2-lobed or 2-cleft, awned in the sinus.	...	19
17a. Spikelets arranged in false racemes terminating the branches and branchlets of a true panicle	...	9. CAPILLIPEDIUM
17b. Spikelets arranged in false racemes which are either solitary and terminal or subsessile, arranged along a central axis, but not at the tips of capillary branches	...	18
18a. Joints and pedicels with a translucent longitudinal furrow	...	7. BOTHRIOCHLOA
18b. Joints and pedicels not as above	...	18. DICHANTHILUM
19a. Aromatic ; racemes supported by spathes	...	13. CYMBOPOGON
19b. Not aromatic ; racemes not supported by spathes	...	57. SCHIZACHYRIUM
20a. Racemes solitary at the ends of the branches, surrounded at the base by an involucre of homogamous spikelets.	...	21
20b. Racemes without an involucre	...	30. HETEROPOGON

- 21a. Involucral spikelets pedicellate ; deciduous ;  
callus of fertile spikelets very short,  
truncate or obtuse ... 37. ISEILEMA
- 21b. Involucral spikelets sessile, not deciduous ;  
callus of the fertile spikelets pointed ... 61. THEMEDA

Tribe II : MAYDEAE

- 1a. Female spikelets completely enclosed in a metamorphosed  
leaf sheath ... 12. COIX
- 1b. Female spikelets not enclosed in a false involucre as above.
- 2a. Female spikelets in crowded longitudinal rows on a very  
thick axis ... 67. ZEA
- 2b. Female spikelets not as above ... 65. TRIPSACUM

Tribe III : PANICEAE

- 1a. Spikelets falling singly, not subtended by bristles,  
or if so, then the bristles persisting after the  
spikelets have fallen ( *Setaria* ). ... 2
- 1b. Spikelets with an involucre of bristles ;  
florets not deciduous ... 47. PENNISETUM
- 2a. Spikelets arranged in more or less open panicles,  
or with the panicles contracted and spike-like. ... 3
- 2b. Spikelets arranged in one-sided spikes or  
spike-like racemes ; spikes or racemes digitate or  
scattered, rarely solitary. ... 6
- 3a. Spikelets not subtended by bristle-like branches. ... 4
- 3b. Spikelets subtended-or replaced by one to many  
bristle-like branchlets which remain after the  
spikelets have fallen. ... 58. SETARIA
- 4a. Spikelets arranged in open or contracted panicles ... 44. PANICUM
- 4b. Spikelets usually arranged in cylindrical spike-like panicles. ... 5

- 5a. Upper lemma and palea indurated and closed at apex;  
upper glume inflated; spikelets gibbous ... 56. SACCIOLEPIS
- 5b. Upper lemma and palea membranous, gaping at  
apex; spikelets lanceolate ... 33. HYMENACHNE
- 6a. Lemma of the upper floret more or less crustaceous  
or coriaceous, usually with narrow inrolled margins,  
exposing much of the palea. ... 7
- 6b. Lemma of the upper floret thinly cartilaginous,  
usually with flat hyaline margins. ... 12
- 7a. Lower glume and lowest internode of the rachilla not  
forming a swollen callus at the base of the spikelet... 8
- 7b. Lower glume and lowest internode of the rachilla  
forming a swollen callus at the base of the spikelet ;  
upper lemma mucronate or short awned ... 6. ERIOCHLOA
- 8a. Lower glume (when present) turned away from the  
rachis of the racemes or spike ; spikelet abaxial. ... 9
- 8b. Lower glume turned towards the rachis ;  
spikelets adaxial ... 8. BRACHIARIA
- 9a. Lower glume developed although sometimes small... 10
- 9b. Lower glume usually absent; spikelet planoconvex ... 46. PASPALUM
- 10a. Glumes acuminate or awned ; upper lemma not mucronate. 11
- 10b. Glumes awnless; upper lemma acute ... 45. PASPALIDIUM
- 11a. Leaf-blades linear ; racemes dense ;  
culms erect or suberect ... 20. ECHINOCHLOA
- 11b. Leaf-blades lanceolate to ovate ; racemes more or  
less loose ; culms creeping and ascending ... 42. OPLISMENUS
- 12a. Spikelets awnless ... 19. DIGITARIA
- 12b. Spikelets awned ... 1. ALLOTEROPSE

**Subfamily III : POOIDEAE**

Spikelets one to many flowered, reduced florets if any above the perfect floret [*Oryza plena* (Prain) Chow. 1949]. Caryopsis terete or laterally compressed.

1a.	Spikelets borne in open or contracted or spike-like panicles less often in racemes or spikes. ...	2
1b.	Spikes digitate or spikelets on opposite sides of the rachis of solitary spikes or spike-like racemes. ...	23
2a.	Spikelets usually with 2 or more fertile florets, or if with one fertile floret then with sterile reduced florets above it. ...	3
2b.	Spikelets with one fertile floret, with or without 1-2 much reduced florets ...	12
3a.	Lemma and rachilla glabrous or hairy, but with the hairs not enveloping the lemma, or if so, then the lemma with a geniculate awn. ...	4
3b.	Lemmas or rachilla-joints bearing long, silky hairs which envelope the lemma (Tribe-Arundineae). ...	11
4a.	Lemmas usually 5-to many-nerved, awnless, membranous, exserted from the glume (Tribe-Festuceae) ...	51. POA
4b.	Lemmas 1-3-nerved ; inflorescence of panicles, if racemes or spikes the spikelets not secund (Tribe - Eragrosteae). ...	5
5a.	Lemmas entire at the apex. ...	6
5b.	Lemmas lobed or toothed ...	39. LEPTOCHLOA
6a.	Spikelets in open, contracted or spike-like panicles, rarely in solitary secund spikes ( <i>Eragrostiella</i> ). ...	7
6b.	Spikelets in digitate or racemosely arranged spikes or spike - like racemes. ...	9
7a.	Spikelets unawned. ...	8
7b.	Spikelets awned, in dense globose clusters ...	22. ELYTROPHORUS

8a. Inflorescence a panicle	...	24. ERAGROSTIS
8b. Inflorescence a solitary secund spike	...	23. ERAGROSTIELLA
9a. Axis and branches of the inflorescence ending in a spikelet.		10
9b. Axis of spikes terminating in a sharp point	...	15. DACTYLOCTENIUM
10a. Spikes numerous, not digitate	...	17. DESMOSTACHYA
10b. Spikes few, digitate	...	21. ELBUSINE
11a. Lemmas glabrous ; rachilla long-villous	...	50. PHRAGMITES
11b. Lemmas hairy ; rachilla glabrous	...	5. ARUNDO
12a. Glumes minute or suppressed ; fertile lemma and palea very similar in shape and texture (Tribe—Oryzeae).		13
12b. Glumes well developed ; fertile lemma and palea not similar.		15
13a. Leaf—blades ovate—oblong; a floating grass	...	32. HYORORYZA
13b. Leaf—blades linear; aquatic or forest grasses	...	14
14a. Tip of pedicel with 2 lips	...	43. ORYZA
14b. Tip of pedicel without lips	...	38. LEERSIA
15a. Spikelets with 3 florets (Tribe—Phalarideae)	...	49. PHALARIS
15b. Spikelets with 1 or 2 florets.	...	16
16a. Spikelets 2—flowered ; lower male or barren ; upper hermaphrodite.	...	17
16b. Spikelets with 1 fertile floret.	...	19
17a. Lower floret empty and without a palea (Tribe — Thysanolaeneae)	...	62. THYSANOLAENA
17b. Lower floret male or barren, usually with a palea.	...	18
18a. Glumes equal ; upper lemma unawned (Tribe — Isachneae)	...	35. ISACHNE
18b. Glumes unequal ; upper lemma awned (Tribe — Arundinelleae)	...	4. ARUNDINELLA

19a. Spikelets very rarely falling entire and then with firmly membranous or coreaceous lemmas. ...	20
19b. Spikelets falling entire at maturity. ...	22
20a. Lemmas hyaline or membranous at maturity. ...	21
20b. Lemmas rigid at maturity ; spikelets awned ; awn bifid (Tribe-Aristideae) ...	3. ARISTIDA
21a. Lemmas usually 3 -5-nerved,awned (Tribe - Agrostideae) ...	53. POLYPOGON
21b. Lemmas 1-3-nerved, awnless (Tribe - Sporoboleae) ...	60. SPOROBOLUS
22a. Spikelets fascicled or solitary ; glumes not awned (Tribe - Zoysieae) ...	63. TRAGUS
22b. Spikelets solitary ; glumes awned (Tribe - Perotideae) ...	48. PEROTIS
23a. Spikelets on opposite sides of the rachis of solitary spikes or spike-like racemes. Grains longitudinally grooved (Tribe - Triticeae). ...	24
23b. Spikelets secund on a tough rhachis or on digitate spikes (Tribe - Chlorideae) ...	25
24a. Spikelets 1-flowered ...	31. HORDEUM
24b. Spikelets more than 2-flowered ...	65. TRITICUM
25a. Spikes secund ; spikelets 1 - flowered. unawned ...	40. MICROCHLOA
25b. Spikes digitate. ...	26
26a. Florets awned ...	10. CHLORIS
26b. Florets unawned ...	14. CYNODON

1. ALLOTEROPSIS J. S. Presl ex C.B. Presl

*Alloteropsis cimicina* (L.) Stapf in Prain, Fl. Trop. Afr. 9 : 487. 1919 ;  
Haines, Bot. Bihar & Orissa 3 : 1055. 1924; Bor, Grass. Burma, Ceylon, India & Pak.

276.1960. *Milium cimicinum* L., Mant. 2 : 184. 1771. *Axonopus cimicinus* (L.) P. Beauv., 'Ess. Agrost. 12.1812 ; Hook.f., Fl. Brit. India 7 : 63. 1896 ; *Milium cimicinum* L., Mant. Alt. 184.1771.

Erect or ascending herbs, 20–80 cm high. Leaves ovate–lanceolate, 3–15 × 0.5–1.5 cm, base amplexicaule. Racemes several, usually whorled ; spikelets 0.4–0.5 cm long ; upper glume ciliate–margined ; palea papillose.

Common. India, Burma, Sri Lanka, Tropical Africa, Australia. August–September. Sarkar & Bhatta., 812.

## 2. APLUDA L.

*Apluda mutica* L., Sp. Pl. 82.1753 ; Bor, op.cit 93. *A. varia* Hack. in DC., Monogr. Phan. 6 : 197.1889 ; Hook.f., Fl. Brit. India 7 : 150.1896 ; Haines, Bot. Bihar & Orissa 3 : 1104.1924.

Branches 40–130 cm high, rooting at lower nodes. Each raceme enclosed within a spatheole, and many such racemes together forming a 5–30 cm long interrupted pseudopanicule.

Common in the forest margins. India, N. E. Asia, Australia. September–June. Sarkar & Bhatta., 807.

Culms used for making hats.

## 3. ARISTIDA L.

*Aristida adscensionis* L., Sp. Pl. 82.1753 ; Hook.f., Fl. Brit. India 7 : 224.1896 ; Haines, Bot. Bihar & Orissa 3 : 1022 ; Bor, Grass, Burma, Ceylon, India & Pak. 407.1960.

Tufted herbs, to 50 cm high. Leaves narrow, convolute, to 0.2 cm broad. Panicles 4–25 cm long. Spikelets purplish ; lower glume 0.1–0.3 cm long, upper 0.5–1 cm long, central awn 0.7–2.5 cm long.

On exposed grounds. Cosmopolitan. October–May. Sarkar & Bhatta, 1752.

Grazed by cattle when tender.

## 4. ARUNDINELLA Raddi

- |   |     |                         |
|---|-----|-------------------------|
| 1a. Spikelets less than 0.5 cm long ; pedicels shorter than the spikelets | ... | 1. <i>A. nepalensis</i> |
| 1b. Spikelets more than 0.5 cm long ; pedicels to 1 cm long               | ... | 2. <i>A. setosa</i>     |

1. *Arundinella nepalensis* Trin. , Gram. Panic. 62.1826 ; Hook . f., Fl. Brit. India 7:70.1896 ; Prain, Bengal Pl. 2:916.1903.

Perennials, to 60 cm high. Panicle 10–45 cm long. Upper lemma bearing a geniculate awn

On sandstone hills . S.E. Asia, China, Japan . September–December . Sarkar & Bhatta., 1418.

2. *Arundinella setosa* Trin. Gram. Panic. 63. 1826 ; Bor, op. cit. 424. *A.capillaris* Hook f. Fl. Brit. India 7:74.1896. *Milium cimicinoides* Roxb. ex Hook. f. , Fl. Brit. India 7:70.1896.

Perennials, to 80 cm high. Leaves linear hairy at the base. Panicle effuse. Lower glumes to 0.4 cm long, upper to 0.5 cm long ; upper lemma coriaceous ; awn 0.8–1 cm long.

Occasional. S.E. Asia. September–October. Sarkar & Bhatta., 1174.

Used for making brooms.

#### 5. ARUNDO L.

*Arundo donax* L. , Sp. Pl. 81. 1753 ; Hook . f., Fl. Brit. India 7 :302 1896; Haines , Bot . Bihar & Orissa 3 : 998.1924; Bor, Grass. Burma, Ceylon, India & Pak. 413. 1960.

Stout, reed –like grass, to 3 m high. Laves distributed along the culms, 30–60 × 2.5–5 cm. Panicle to 40 cm long.

Common along ditches and streams . Tropical Asia and Mediterranean region. October–December. Sarkar & Bhatta., 1170.

Dried, crushed culms are woven into rough mats for walls and roofs of mud houses.

#### 6. BAMBUSA Schreb., *nom. cons.*

- |  |     |                       |
|--|-----|-----------------------|
| 1a. Ligules narrow, obscure ; blade of stem–sheaths triangular |     |                       |
| or reniform, with cordate base                                 | ... | 2. <i>B. tulda</i>    |
| 1b. Ligules distinct.  | ... | 2                     |
| 2a. Nodes with a white ring below, swollen                     | ... | 1. <i>B. balcooa</i>  |
| 2b. Nodes not as above   | ... | 3. <i>B. vulgaris</i> |

1. *Bambusa balcooa* Roxb. Fl. Indica 2:196.1824 ; Hook .f. Fl. Brit. India 7:387.1896 ; Haines , Bot. Bihar & Orissa 3 : 994. 1924.

Stems 7–15 cm across. Ligule of stem–sheaths broad, toothed ; ligule of

leaves broadly triangular, membranous ; blade of stem-sheaths 2-morphic, lower short, wide, ciliate with rounded top, upper short triangular.

Collected near Gobardhana. BALKU BANS. Sarkar & Bhatta., 542.

Culms used as a building material. Yields good quality paper pulp. Young leaves and twigs used as fodder.

2. **Bambusa tulda** Roxb. , Fl. Indica 2: 193.1824 ; Hook . f. , Fl. Brit. India 7 :387. 1896 ; Haines , Bot . Bihar & Orissa 3: 993.1924.

Stems 5-10 cm across. Stems sheaths 15-23 cm long, 15-19 cm broad; gradually narrowed upwards; blade with coarsely fringed auricles and hairy within, triangular or broadly lanceolate cuspidate.

Planted in villages . Throughout India , BANS. Sarkar & Bhatta., 485.

3. **Bambusa vulgaris** Schrad. in Wendl. Coll.Pl. ii.26, t. 47. 1810 ; Hook . f. , Fl. Brit. India 7: 391.1896 ; Haines , Bot. Bihar & Orissa 3: 995. 1924.

Stems to 9 cm across, yellowish green Stem sheaths densely hairy above, yellowish, 12-15 × 17 - 23 cm, top rounded retuse, blade 5 - 15 × 10 cm, appressed hairy, base decurrent with rounded falcate, fimbriate auricles, ligule broad, toothed or fimbriate.

Very commonly cultivated. BANS. Sarkar & Bhatta., 221.

#### 7. **BOTHRIOCHLOA** O.Kuntze

**Bothriochloa bladhii** (Retz.) Blake in Proc. Roy. Soc. Queensland 80: 62.1969 ; Cope, in Nasir & Ali, Fl. Pak. 143 : 248.1982. *Andropogon bladhii* Retz., Obs. 2 : 27.1781. *A. intermedius* R. Br. , Prodr. 202.1810 ; Hook . f. , Fl. Brit. India 7 : 175.1897 ; *Bothriochloa intermedia* (R. Br.) A. Camus in Ann. Soc. Linn. Lyon 1930, n.s. 76 : 164.1931 ; Bor, op. cit. 108. *B. glabra* (Roxb.) A. Camus in Ann. Soc. Linn. Lyon n.s.76. 164.1931 ; Bor. op. . cit 107. *Amphilopsis glabra* (Roxb.) Stapf in Prain , Fl. Trop. Afr. 9 : 172.1917 ; Haines , Bot . Bihar & Orissa 3 : 1075. *Bothriochloa intermedia* var. *punctata* Keng, Clav. Gram. Prim. Sin. 244. 1957.

Stems to 1.5 m high. Leaves narrowly or broadly linear, 10-55 × 0.2-1.2 cm. Inflorescence to 20 cm long . Sessile spikelets 0.2-0.4 cm long, lower glume with or without a pit.

Common along forest margins. Indomalaysia Australia, Tropical Africa. October-January. Sarkar & Bhatta., 883.

A good fodder.

8. BRACHIARIA Griseb.

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Rachis more or less flat ; spikelets 0.25–0.3 cm long,<br>densely crowded in more than two rows<br>on the rachis | ... | 3. <i>B. mutica</i>      |
| 1b. Rachis triquetrus.   | ... | 2                        |
| 2a. Spikelets to 0.2 cm long, paired   | ... | 5. <i>B. reptans</i>     |
| 2b. Spikelets more than 0.2 cm long  | ... | 3                        |
| 3a. Spikelets turgid   | ... | 4. <i>B. ramosa</i>      |
| 3b. Spikelets not turgid   | ... | 4                        |
| 4a. Spikelets 0.25–0.3 cm long   | ... | 1. <i>B. distachya</i>   |
| 4b. Spikelets 0.3 cm long  | ... | 2. <i>B. miliiformis</i> |

1. *Brachiaria distachya* (L.) Stapf in Prain, Fl. Trop. Afr. 9 :565.1919 ; Haines, Bot. Bihar & Orissa 3 :1050.1924; Bor, op.cit. 281. *Panicum distachyum* L. Mant Alt. 183. 1771 ; Hook. f. Fl. Brit. India. 7 : 37. 1896.

Slender, ascending annuals. Leaves lanceolate or linear–lanceolate, 5–15 cm long. Spikelets secund on the rachis, 0.25 –0.3 cm long , apiculate.

Common in waste places. Indomalesia, Australia. July–August. Sarkar & Bhatta., 1919.

A fodder grass, good for cattle.

2. *Brachiaria miliiformis* (Presl) A. Chase in Contrib. U.S Nat. Herb. 22: 35.1920 ; Bor, Grass. Burma, Ceylon , India & Pak . 283.1960. *Panicum miliiforme* J. Presl ex C. Presl, Rel. Hacnk 1. 300. 1830.

Annuls or perennials. Leaf blade to 6 cm long . Racemes horizontal ; spikelets to 0.37 cm long, oblong–obovate, apiculate.

Occasional in some places. Indomalesia . June–September . Sarkar 952.

3. *Brachiaria mutica* (Forssk. ) Stapf in Prain, Fl. Trop. Afr., 9 : 526.1919; Bor. op. cit. 284. *Panicum muticum* Forssk., Fl. Aegypt. –Arab. 20. 1775 ; Hook. f., Fl. Brit. India 7:34.1896.

Annuals or perennials. Rachis more or less flat; spikelets solitary, to 0.3 cm long, arranged in 2 or more rows on the rachis.

In moist places. Tropics. August, Sarkar & Bhatta., 855.

4. **Brachiaria ramosa** (L.) Stapf in Prain, Fl. Trop. Afr. 9 : 542. 1919; Haines, Bot. Bihar & Orissa 3: 1051.1924; Bor, op. cit. 284. *Panicum ramosum* L. Mant. Pl. 29. 1767; Hook. f., Fl. Brit. India 7: 36.1896.

Culms ascending, 20–60 cm long. Leaves linear lanceolate, to 10 cm long. Racemes 3–8 scattered along 1–10 cm long common axis each 2–9 cm long; spikelets 0.25–0.3 cm long, elliptic, white ciliate at the base.

In waste lands. Tropics. August Sarkar & Bhatta., 721.

Straw relished by cattle.

5. **Brachiaria reptans** (L.) Gard. et. C. E. Hubb. in Hook. Icones Pl. 3363.1938; Bor, op. cit. 285. *Panicum reptans* L., Syst. Nat. ed 10.870.1754; *P. prostratum* Lamk., Encycl. Meth. Bot. 1 :171.1791; Hook f. Fl. Brit. India 7: 33.1896; *Urochloa reptans* (L.) Stapf in Prain, Fl. Trop. Africa 9: 601 1920; Haines, Bot. Bihar & Orissa 3: 1049.1924.

Ascending culms to 70 cm long. Leaves lanceolate, 2–5 cm long. Racemes 4–10, scattered along 1–6 cm long axis; spikelets to 0.2 cm long, paired; lower glume truncate.

In wet places Tropics, Australia July –August. Sarkar & Bhatta., 866.

Used as fodder

#### 9. CAPILLIPEDIUM Stapf

- |   |     |                          |
|---|-----|--------------------------|
| 1a. Panicle pyramidal; lower glume of the sessile spikelet flat on the back | ... | 1. <i>C. assimile</i>    |
| 1b. Panicle oblong; lower glume of the sessile spikelet channelled          | ... | 2. <i>C. parviflorum</i> |

1. **Capillipedium assimile** (Steud.) A. Camus in Lecomte, Fl. Gen. de l'Indo-Chine 7: 314.1922; Haines, Bot. Bihar & Orissa 3: 1074.1924; Bor, op. cit. 140. *Andropogon assimilis* Steud. in Zool., Syst. Verz. 58. 1854; Hook. f., Fl. Brit. India 7: 179.1896.

Culms woody, slender, to 1 m high. Leaves lanceolate to linear, 6–12 cm long. Panicles to 10 cm long.

Common in the sandstone hills and forests. Indomalaysia China, Japan. October–December. Sarkar & Bhatta., 1092, 1419.

2. **Capillipedium parviflorum** (R. Br.) Stapf in Prain, Fl. Trop Afr. 9 : 169. 1917 ; Haines Bot Bihar & Orissa 3 ; 1074.1924; Bor, op. cit. 112. *Holcus parviflorus* R. Br., Prodr. 199.1810. *Andropogon micranthus* Kunth , Rev. Gram 1: 165.1829.

Culms to 1.3 m high . Leaves slightly narrowed or rounded at the base . Panicle large, diffuse of small spikelets.

Haines (*l. c.*) reported the plant from Ramnagar Hills . Tropics . Haines 3946 (CAL !).

10 CHLORIS Sw.

**Chloris barbata** Sw., Fl. Indi. Occ. 1 : 200.1797, Hook .f., Fl. Brit. India 7: 292.1896 ; Haines, Bot Bihar & Orissa 3: 1014.1924; Bor, op. cit. 465. *Andropogon barbatus* L., Mant. Pl. Alt. 302.1771, non L. 1759.

Annual herbs ; culms sometimes to 50 cm high. Leaves linear, to 15 cm long. Spikes 6–20 to 8 cm long ; spikelets 0.25 cm long ; awns 3.

In waste lands. Tropics. October–December. Sarkar & Bhatta., 859.

A fodder.

11. CHRYSOPOGON Trin., *nom.cons.*

- |   |                             |
|---|-----------------------------|
| 1a. Pedicels half the length of the sessile spikelets or longer.  | 2                           |
| 1b. Pedicels shorter than half the length of the sessile spikelet | ... 2. <i>C. fulvus</i>     |
| 2a. Pedicels glabrous or nearly so ; culms short                  | ... 1. <i>C. aciculatus</i> |
| 2b. Pedicels villous ; culms long                                 | ... 3. <i>C. lancearius</i> |

1. **Chrysopogon aciculatus** (Retz.) Trin., Fund. Agrost. 188.1820 ; Haines, Bot. Bihar & Orissa 3 : 1083.1924 ; Bor, op.cit. 115. *Andropogon aciculatus* Retz., Obs. Bot, 5 : 22. 1789 ; Hook f. , Fl. Brit . India 7 : 188. 1896.

Stems creeping, to 30 cm high. Leaves linear–lanceolate, to 12 cm long. Panicle purple ; callus pungent ; spikelets to 0.4 cm long.

Common. Tropical Asia. July–December. Sarkar & Bhatta., 903.

Good fodder.

2. *Chrysopogon fulvus* (Spreng.) Chiov., Fl. Somalia 1 : 327.1929 ; Bor, op. cit. 116. *Pollinia fulva* Spreng., Pugill. 2 : 10. 1815. *Andropogon montanus* Trin. ex Spreng. Neue Entdeck 2 : 93. 1821 ; Haines Bot Bihar & Orissa 3:1084.1924; *A. monticola* Roem. et Schult., Syst. Veg. 2 : 665.1827 ; Hook. f., Fl. Brit. India 7 :193.1896.

Erect tufted grass. Leaves to 2 × 0.2 cm, ciliate at the base . Panicles 7.5–10 cm long ; callus with hairs.

Common in the northern hilly region. Tropical Asia & Africa. September–December. Sarkar & Bhatta., 698.

3. *Chrysopogon lancearius* ( Hook.f) Haines Bot Bihar & Orissa 1036.1924 ; Bor, op. cit. 118. *Andropogon lancearius* Hook. f. Fl. Brit. India 7:190.1896.

Culms to 1.6 m high. Leaves 46–60 cm long Panicles 15–30 cm long ; capillary branches to 7 cm long with brown hairs at the tip.

Common . Foot of Himalayas from Bihar to the Duars. September–November. Sarkar & Bhatta., 1361,1566.

## 12. *Coix* L.

*Coix lacryma-jobi* L. Sp. Pl. 972.1753 ; Hook. f. Fl. Brit. India 7: 100.1896 ; Haines , Bot. Bihar & Orissa 3: 111.1924; Bor. op. cit. 264.

Culms to 25 cm long, 0.3 cm across. Leaves 13.5–18 × 0.9–1.4 cm. Lower glume of the staminate spikelets narrowly winged. Involucres ovoi, hard, polished, white, sometimes bluish, 0.5–0.75 × 0.35–0.5 cm.

Common in the villages. Tropics. September–February. Sarkar & Bhatta. 1291.

Pearly involucres used in ornaments. Leaves and stems provide a good fodder.

13. CYMBOPOGON Spreng.

- 1a. Joints of spikes and pedicels of upper spikelets copiously villous on the sides and the back ; hairs more or less concealing the sessile spikelets ... 2. *C. jwarancusa*
- 1b. Joint of spikes and pedicels of upper spikelets not copiously villous ; hairs not concealing the sessile spikelets ... 2
- 2a. G. I dorsally flat or nearly so ... 3. *C. nardus*
- 2b. G. I dorsally deeply concave ... 1. *C. gidarba*

1 **Cymbopogon gidarba** (Ham. ex Hook .f.) Haines, Bot. Bihar & Orissa 1048.1924 ; Bor, op. cit. 128. *Andropogon gidarba* Ham. ex Hook. f. Fl. Brit India 7 :208.1896.

A slender perennial. Leaves narrow, to 0.5 cm across Panicle erect. Lower glume of sessile spikelets with a deep slot-like depression occupying most of its length.

Rare. India. October–November . Shetty 348 (CAL !).

A good fodder grass.

2. **Cymbopogon jwarancusa** (Jones) Schult. , Syst. Veg. 2, Mant. 458.1824; Haines, Bot. Bihar & Orissa 3 :1093; Bor, op.cit 128. *Andropogon jwarancusa* Jones in Asiat . Res. 4 : 109.1795 ; Hook. f. , Fl. Brit. India 7 : 203. 1896.

A tall perennial. Leaf-baldes flat ; basal sheths when old slipping from the culm and becoming curled in a characteristic spiral. Panicles long , narrow ; sessile spikelets awned.

Occasional. India. April–August. Sarkar & Bhatta., 1474.

Used in cough, chronic rheumatism etc. Yields an essential oil.

3. **Cymbopogon nardus** (L.) Rendle in Cat. Welw. Afr. Pl. 2 :155.1899 ; Haines, Bot. Bihar & Orissa 3 :1094.1924. Bor, op. cit 130. *Andropogon nardus* L. , Sp. Pl. 1046,1753 ; Hook. f. Fl. Brit. India 7 :206.1896.

A tall perennial, to 2 m high. Leaf lanceolate, acuminate, glaucous beneath. Panicle drooping.

In the northern part of the district . South-east Asia. September–December. Sarkar & Bhatta., 1089.

Source of the East Indian 'Lemongrass Oil', used in perfumery, soaps and cosmetics and as mosquito repellent.

#### 14. CYNODON Rich., *nom. cons.*

**Cyanodon dactylon** (L.) Pers. Syn. Pl. 1 : 85.1805 ; Hook. f. , Fl. Brit. India 7 : 288.1896 ; Haines , Bot. Bihar & Orissa 3 : 1012.1924 ; Bor, op. cit. 469. *Panicum dactylon* L Sp. Pl. 58.1753.

Culms creeping, 10–40 cm long. Leaves linear, 4–7 × 0.2–0.4 cm ; ligule a ring of white hairs. Spikes 4–6, slender, 2–6 cm long.

Common. Cosmopolitan. Throughout the year. Sarkar & Bhatta., 1511.

A good soil binder. Important as a lawn grass.

#### 15. DACTYLOCTENIUM Willd

**Dactyloctenium aegyptium** (L.) Willd. , Enum . Hort . Berol. 1029. 1809 ; P. Beauv, Ess. Agrost. Expl . Pl . 15.1812 ; Bor, op. cit 489. *Cynosurus aegyptius* L. , Sp. Pl. 72.1753. *Eleusine aegyptia* (L.) Desf. , Fl. Atlant. 1 : 85.1798 ; Hook. f. Fl Brit India 7 : 344. 1896 ; Haines , Bot. Bihar & Orissa 3:1016.1924.

Culms 30–70 cm long. Leaves papillose–hispid. Spikes 1–9, whorled, 2–5 cm long ; upper glume with 0.1–0.3 cm long awn Grains ovoid.

In open places. Tropics. August–June. Sarkar & Bhatta., 1526.

Grains used as food in times of scarcity.

Note : Under Art. 32.6 & 33.3, Willdenow may be regarded as the author of this new combination—Bhatta.

#### 16. DENDROCALAMUS Nees

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Spikelets not spinescent ; heads congested | ... | 1. <i>D. hamiltonii</i> |
| 1b. Spikelets spinescent ; heads distinct      | ... | 2. <i>D. strictus</i>   |

1. **Dendrocalamus hamiltonii** Nees & Arn. ex Munro in Trans. Linn. soc., 26:151.1868 ; Haines , Bot. Bihar & Orissa 3 : 992. 1924.

A tall bamboo. Leaves large, broadly lanceolate, cuspidate.

Haines (*l.c.*) reported the plant from the Someswar Hills. Haines 1894 (Cal!).

Culms used as building materials.

2. *Dendrocalamus strictus* (Roxb.) Nees in *Linnaea* 9 : 476.1834 ; Hook.f., *Fl. Brit. India* 7 : 404.1896, Haines *Bot. Bihar & Orissa* 3 : 992.1924; *Bambos stricta* Roxb. *Pl. Cor.* 1 : 58, t.80.1795.

Culms 4–15 m high and 3–7 cm across. Culm-sheaths 8–30 cm long, golden-brown hairy on the back, ciliate-margined. Leaves linear lanceolate, 3–25 cm long, pubescent beneath. Lemma spinescent.

Gobardhana, planted. January–June. BANS. Sarkar & Bhatta., 1436.

Uses as the previous

#### 17. DESMOSTACHYA (Stapf) Stapf

*Desmostachya bipinnata* (L.) Stapf in *Thiselt.-Dyer, Fl. Cap.* 7 : 632.1900; Bor, op. cit. 491. *Briza bipinnata* L., *Syst. Nat.* ed. 10, 2 : 875.1759. *Poa cynosuroides* Retz., *Obs.* 4 : 20. 1786. *Eragrostis cynosuroides* (Retz.) P.Beauv., *Ess. Agrost.* 162.1855 ; Hook.f., *Fl. Brit. India* 7 : 324.1896 ; *Desmostachya cynosuroides* (Retz.) Stapf ex Haines, *Bot. Bihar & Orissa* 3 : 1007.1924.

Rhizomatous herbs, to 70 cm high. Leaves rolled, 0.4–0.8 cm broad ; lower leaf-sheaths densely imbricating. Inflorescence 15–40 cm long, purplish-green. Spikelets clustered or distant, 0.3–1 cm long ; 3–17-flowered.

Common along roadsides. Tropics. May–November. Sarkar & Bhatta., 808.

Used for ropes and for thatching.

#### 18. DICHANTHIUM Willemet

*Dichanthium annulatum* (Forssk.) Stapf in *Prain, Fl. Trop. Africa* 9:178.1917 ; Haines, *Bot. Bihar & Orissa* 3 : 1087.1924; Bor, op. cit. 133. *Andropogon annulatus* Forssk., *Fl. Aegypt.-Arab.* 173.1775 ; Hook.f., *Fl. Brit. India* 7 : 196.1896.

Culms 20–80 cm long. Racemes shortly peduncled, 3–7 cm long ; spikelets 0.2–0.6 cm long ; lower glumes villous ; upper lemma with 0.8–2 cm long awn.

Common on exposed grounds. India, Burma, Tropical N. Africa. August–November. Sarkar & Bhatta., 889,958.

19. *DIGITARIA* HALLER, *nom. cons.*

- |  |     |                         |
|--|-----|-------------------------|
| 1a. Spikelets binate in the centre of the racemes,<br>0.2–0.35 cm long | ... | 1. <i>D. ciliaris</i>   |
| 1b. Spikelets ternate in the centre of the raceme, 0.1–0.18 cm long.   |     | 2                       |
| 2a. Hairs on the spikelets verrucose                                   | ... | 2. <i>D. longiflora</i> |
| 2b. Hairs on the spikelets clavate at the tip                          | ... | 3. <i>D. stricta</i>    |

1. *Digitaria ciliaris* (Retz.) Koel., Descr. Gram. 27.1802; Cope in Nasir & Ali Fl. Pakistan no. 143.228.1982. *Panicum ciliare* Retz., Obs. Bot. 4:16.1786. *Paspalum sanguinale* var. *ciliare* Hook. f., Fl. Brit. India 7:15.1896. *Digitaria sanguinalis* (Link) Scop var. *ciliaris* Prain, Bengal Pl. 2:888; Haines, Bot. Bihar & Orissa 3:1054.1924; *D. adscendens* (H. B. & K.) Henr. in Blumea 1:92.1934; Bor, Grass. Burma, Ceylon, India & Pak. 298.1960.

Slender ascending annuals. Racemes 2–12, digitate, 2–15 cm long; rachis broadly winged, triquetrous; spikelets 0.25–0.35 cm long.

In moist places. Tropics. August–November. Sarkar & Bhatta., 837.

A fodder grass.

2. *Digitaria longiflora* (Retz.) Pers., Syn. Pl. 1:85.1805; Haines, Bot. Bihar & Orissa 3:1054.1924; Bor, op. cit.302. *D. tenuiflora* P. Beauv. Ess. Agrost. Expl. Pl. 1812; Prain, Bengal Pl. 2:889. *Paspalum longiflorum* Retz., Obs. Bot. 4:15.1786; Hook. f., Fl. Brit. India 7:17.1896.

Annuals or perennials, to 30 cm long. Racemes usually 2, rarely 4, digitate, 4–6 cm long; rachis ribbon-like; spikelets 0.1–0.18 cm long.

Common in wasteland Tropics. July–October. Sarkar & Bhatta., 1166.

Used as a fodder.

3. *Digitaria stricta* Roth ex R. & S. Syst. Veg 2:474.1817; Bor, Grass. Burma, Ceylon, India & Pak. 305.1960. *Paspalum ryleanum* Nees ex Hook. f., Fl. Brit. India 7:18.1896. *Digitaria ryleana* Prain, Bengal Pl. 1182.1903; rep. 2:890; Haines, Bot. Bihar & Orissa 3:1055.1924.

Tufted erect annuals, 25–30 cm high. Leaves linear. Racemes 3–10,

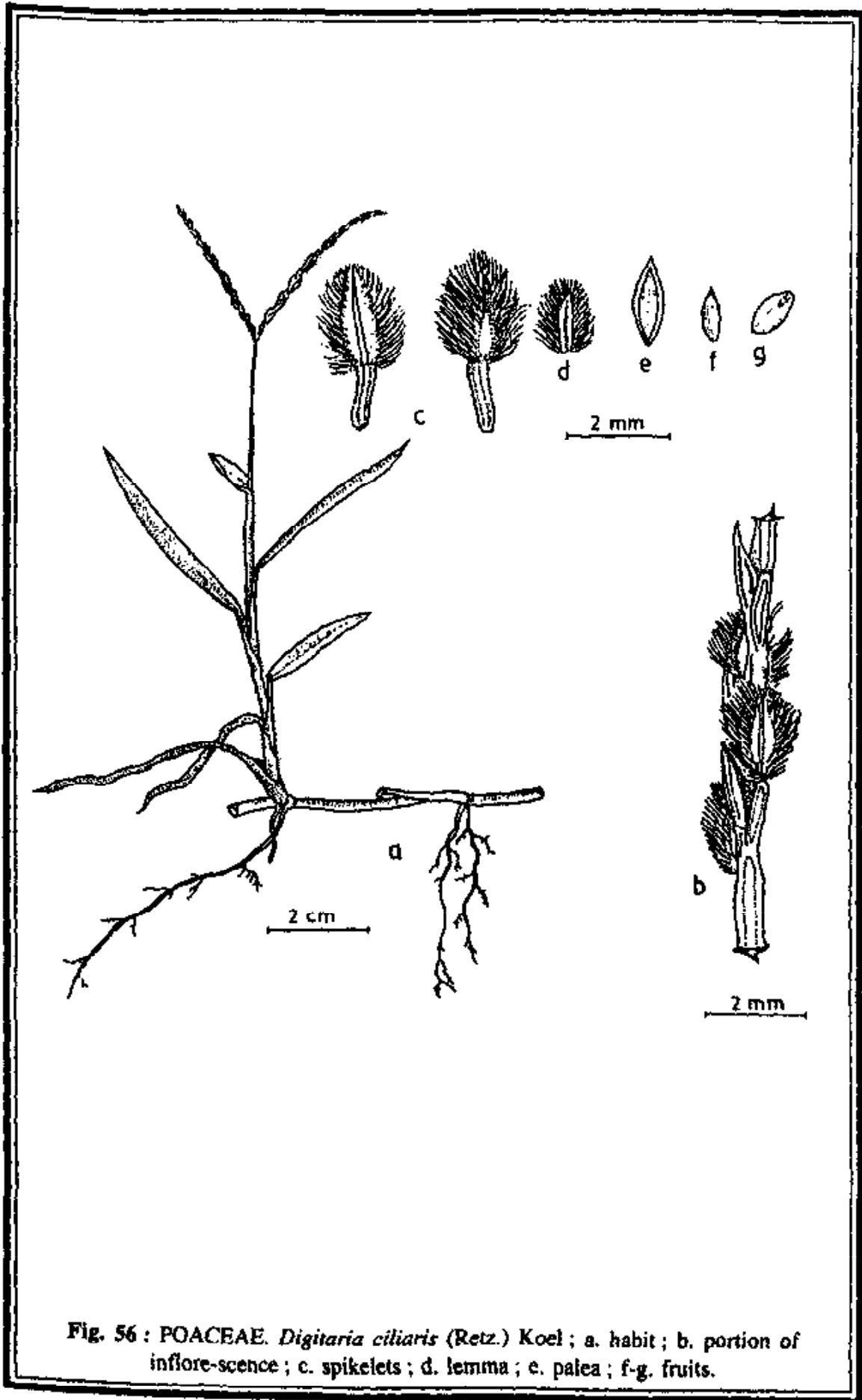


Fig. 56 : POACEAE. *Digitaria ciliaris* (Retz.) Koel ; a. habit ; b. portion of inflorescence ; c. spikelets ; d. lemma ; e. palea ; f-g. fruits.

sub-digitate, 4–10 cm long; rachis and pedicels narrowly winged, spikelets elliptic-obovate 0.1–0.15 cm long; lower glume absent.

Tropical Asia. October–November. Sarkar & Bhatta., 666.

20. *Echinochloa* P. Beauv., *nom. cons.*

- |  |     |                       |
|--|-----|-----------------------|
| 1a. Ligule absent .  | ... | 1. <i>E. colona</i>   |
| 1b. Ligule a fringe of hairs, atleast in<br>the lower leaves | ... | 2. <i>E. stagnina</i> |

1. *Echinochloa colona* (L.) Link, Hort. Berol. 2: 209.1833; Haines, Bot. Bihar & Orissa 3: 1043.1924; Bor, op. cit. 308. *Panicum colonum* L., Syst. Nat. ed 10, 2: 870.1759; Hook. f., Fl. Brit. India 7: 32. 1896.

Annuals, erect or ascending, 10–80 cm high. Inflorescence linear, to 15 cm long; racemes 1–3 cm long; lower lemma acute or cuspidate.

Common throughout the district. Tropical Asia & Africa. July–November. Sarkar & Bhatta., 863.

Quick-growing fodder grass.

2. *Echinochloa stagnina* (Retz.) P. Beauv., Ess. Agrost. 53, 161, 171.1812; Bor, op. cit. 311. *Panicum stagninum* Retz., Obs. Bot. 5: 17.1789.

Annuals or perennials; culms ascending, spongy, to 20 cm long. Racemes 1–3 cm long; spikelets ovate, to 0.4 cm long; lower lemma with upto 1 cm long awn.

Partly submerged in shallow water bodies. Tropical Asia & Africa. August–November. Sarkar & Bhatta., 647.

Fodder.

21. *Eleusine* Gaertn.

- |  |     |                       |
|--|-----|-----------------------|
| 1a. Spikes 0.9–1.5 cm across; spikelets ovate    | ... | 1. <i>E. coracana</i> |
| 1b. Spikes 0.3–0.7 cm across; spikelets elliptic | ... | 2. <i>E. indica</i>   |

1. *Eleusine coracana* (L.) Gaertn., Fruct. 1: 8. t. l. f. 11. 1780; Haines, Bot. Bihar & Orissa 3: 1015.1924; Bor, op. cit. 492. *Cynosurus coracanus* L., Syst. Nat. ed. 10, 2: 875.1759.

Robust tufted annuals, 40–100 cm high. Spikes 3–7, digitate, suberect with incurved tips, to 4 cm long ; spikelets congested, awnles, to 0.4 cm long ; grains to 0.2 cm across.

Cultivated. October. MARUA, RAGI, Sarkar & Bhatta., 833.

Used as food grain.

2. *Eleusine indica* ( L. ) Gaertn., Fruct. 1 : 8.1788 ; Hook.f., Fl. Brit. India 7 : 293.1896 ; Prain, Bengal Pl. 2 : 927 ; Haines, Bot. Bihar & Orissa 3 : 1015.1924 ; Bor, op. cit. 493 *Cynosurus indicus* L., Sp. Pl. 1 : 72.1753.

Tufted annual with erect or ascending 15–60 cm long culms. Leaves usually folded. Spikes usually several, digitate or subdigitate, sometimes solitary, slender, erect, 4–10 cm long. Spikelets 0.5–0.7 cm long, 3–7-flowered.

Common in moist places. Tropics & subtropics. June–November. Sarkar & Bhatta., 401. Grains eaten in times of scarcity.

## 22. ELYTROPHORUS P. Beauv.

*Elytrophorus spicatus* ( Willd. ) A. Camus in Lecomte, Fl. Gen. de Indo – Chine 7 : 547.1923 ; Bor, op. cit. 493 : *Dactylis spicata* Willd. in Ges. Natur f. Freunde Berlin, Neue Schrift 3 : 416.1801. *Elytrophorus articulatus* P. Beauv., Ess. Agrost. 67. t. 14. f. 2. 1812 ; Hook.f., Fl. Brit. India 7 : 306.1896 ; Haines, Bot. Bihar & Orissa 3 : 1008. 1924.

Annuals, 10–35 cm high. Leaves linear, to 18 cm long. Panicle to 20 cm long and 0.7 cm across.

Occasional in moist waste lands. Tropics. October–December. Sarkar & Bhatta., 1169.

## 23. ERAGROSTIELLA BOR

*Eragrostiella bifaria* ( Vahl ) Bor in Ind. For. 66 : 276.1940 ; Bor, op. cit. 494. *Poa bifaria* Vahl, Symb. Bot. 2 : 19.1791. *Eragrostis coromandeliana* ( Koen. ex Rott. ) Trin. in Mem. Acad. Sci. Peterst. ser. 6, 1 : 415.1830 ; Hook.f., Fl. Brit. India 7 : 326.1896 ; Haines, Bot. Bihar & Orissa 3 : 1006. 1924.

Tufted annuals, 20–50 cm high. Leaves convolute, filiform, all basal, 3–8 cm long. Spikelets elliptic, 0.4–0.7 cm long ; long glume lanceolate ; upper glume broader ; lemmas to 0.25 cm long ; wings of the palea keel ciliate.

On exposed sandstones. India, Burma, Ceylon. September–December. Sarkar & Bhatta., 635.

## 24 ERAGROSTIS Wolf

1a.	Spikelets breaking up from above downwards ; rachis fragile.	2
1b.	Spikelets breaking up from below upwards ; rachis tough.	6
2a.	Keels of the palea ciliate. ...	3
2b.	Keels of the palea scabrid or smooth, never ciliate....	5
3a.	Panicles spiciform, or compact and dense. ...	4
3b.	Panicles effuse ...	8. <i>E. tenella</i>
4a.	Lemmas cuspidate ...	1. <i>E. ciliata</i>
4b.	Lemmas obtuse ...	2. <i>E. coarctata</i>
5a.	Panicle branches mostly solitary ; spikelets densely clustered, 6-14-flowered ; lemma to 0.1 cm long ...	3. <i>E. diarrhena</i>
5b.	Panicle branches more or less whorled ; spikelets loose, scattered, few-flowered ; lemma less than 0.1 cm long ...	5. <i>E. japonica</i>
6a.	Annuals. ...	7
6b.	Perennials ...	7. <i>E. nutans</i>
7a.	Lemmas up to 0.15 cm long ...	4. <i>E. gangetica</i>
7b.	Lemmas more than 0.15 cm long. ...	8
8a.	Spikelets 0.2 cm or more broad ...	10. <i>E. unioloides</i>
8b.	Spikelets 0.15-0.2 cm broad. ...	9
9a.	Plants with glands ...	6. <i>E. minor</i>
9b.	Plants without glands ...	9. <i>E. tremula</i>

1. *Eragrostis ciliata* ( Roxb. ) Nees, Agrost. Bras. 512.1829 ; Hook.f., Fl. Brit. India 7 : 313.1896 ; Haines, Bot. Bihar & Orissa 3 : 1001-1924 ; Bor., op.cit. 506. *Poa ciliata* Roxb., Fl. Indica 1 : 336.1820.

Perennials, 30–80 cm high with horizontal root stock. Panicles dense, spiciform, 4–10 cm long. Spikelets 0.2–0.4 cm long ; glumes, lemmas and paleas all ciliate ; lower lemma mucronate.

In waste lands. India, Burma, China. July–November. Sarkar & Bhatta., 1539.

2. *Eragrostis coarctata* Stapf in Hook.f., Fl. Brit. India 7 : 313.1896 ; Haines, Bot. Bihar & Orissa 3 : 1001.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 507.1960.

Perennials with a short, creeping root-stock ; culms tufted, erect or ascending, 20–80 cm long. Panicles dense, sub-spiciform, 7–12 cm long ; rhachis bearded at the nodes ; spikelets to 0.3 cm long ; glumes, lemmas and paleas all ciliate.

Occasional. India, Burma. Rastier (?), s.n., (Cal !).

3. *Eragrostis diarrhena* ( Schult. ) Steud., Syn. Pl. Glum. 1 : 266.1854 ; Bor, op.cit. 507. *E. interrupta* P. Beauv. var. *koenigii* Stapf ex Hook.f., Fl. Brit. India 7 : 316.1896 ; Haines, Bot. Bihar & Orissa 3 : 1003.1924 ; *Poa diarrhena* Schult., Syst. Veg. 2, Mant. 616.1827. *Poa diandra* Roxb., Fl. Indica 337.1820 non R. Br. 1810.

Slender, tufted, erect or ascending, 10–50 cm high. Panicles linear oblong, 12–35 cm long, with mostly solitary branches : spikelets clustered, to 0.2 cm long. 6–14-flowered ; lemma to 0.1 cm long.

In wastelands. South–East Asia. October–March. Sarkar & Bhatta., 1363.

4. *Eragrostis gangetica* (Roxb.) Steud., Syn. Pl. Glum. 1 : 266.1854 ; Haines, Bot. Bihar & Orissa 3 : 1004.1924 ; Bor, op. cit. 508. *Poa gangetica* Roxb., Fl. Indica 1 ; 341. 1820. *E. stenophylla* Stapf in Hook.f., Fl. Brit. India 7 : 318.1896 p. p., non Hochst. ex Miq. 1851. *E. stenophylla* Hochst. ex Miq. in Verh. Konink-Nederl. Inst. 3 : 4, 39.1851 p. p. ; Haines, Bot. Bihar & Orissa 3 : 1004. 1924.

Tufted erect annuals, 5–12 cm high. Panicles narrowly oblong, 10–25 cm long, fairly dense with capillary branches and spikelets, mostly pointing upwards ; spikelets 0.4–0.7 cm long, several -flowered, greyish, lemmas to 0.13 cm long.

Common. Tropical Asia & Africa. July–November. Sarkar & Bhatta., 893, 1280.

5. *Eragrostis japonica* (Thunb.) Trin. in Mem. Acad. Sci. Petersb. ser. 6, 1 : 405.1830 ; Bor, op.cit. 509. *Poa japonica* Thunb., Fl. Jap. 51.1784. *Eragrostis interrupta* var. *tenuissima* Stapf ex Hook. f., Fl. Brit. India 7.316.1896 ; Haines, Bot. Bihar & Orissa 3 : 1003. 1924.

Erect tufted annuals or perennials, 10–90 cm high. Leaves flat, 0.3–0.5 cm broad. Panicles 4–30 cm long, branches mostly in dense remote pseudo-whorles, towards the base ; spikelets to 0.2 cm long, rachilla fragile.

In most places. Tropical Asia. August–October. Rastier (?), s.n. (Cal!).

6. *Eragrostis minor* Host, Gram. Austr. 4 : 15.1809 ; Hook.f., Fl. Brit. India 7 : 321 ; Haines, Bot. Bihar & Orissa 3 : 1005.1924 ; T. A. Cope in Nasir & Ali, Fl. Pakistan No. 143 : 95.1982. *E. poaeoides* P. Beauv., Ess. Agrost. 162.1812 ; Bor, Grass. Burma, Ceylon, India & Pak. 512.1960.

Tufted annuals, 10–40 cm high. Leaves usually with row of warty glands on the margins. Panicle ovate, 5–15 cm long, usually glandular on branchlets and pedicels ; spikelets purplish ; glumes to 0.15 cm long.

Common. India and extending to the Mediterranean Region. June–October. Sarkar & Bhatta., 891.

7. *Eragrostis nutans* ( Retz. ) Nees ex Steud., Nom. Bot. ed. 2, 563.1840 ; Bor, op.cit. 511. *Poa nutans* Retz., Obs. Bot. 4 : 19.1786. *Eragrostis stenophylla* auct., Hook.f., Fl. Brit. India 7 : 318.1896. *p. p.*, non Hochst. 1851.

Perennials, 30–100 cm high. Panicles contracted, upto 12 cm long, 3 cm wide ; spikelets crowded, ascending, to 0.1 cm wide, greyish ; lemmas oblong, to 0.13 cm long with straight lateral.

8. *Eragrostis tenella* ( L. ) P. Beauv. ex R. & S., Syst. 2 : 576.1817 ; Hook.f., Fl. Brit. India 7 : 315.1896, Haines, Bot. Bihar & Orissa 3 : 1001.1924 ; Bor, op.cit. 513. *Poa tenella* L., Sp. Pl. 69.1753.

Slender, erect or ascending tufted annuals ; culms 5–30 cm long. Panicles open, elliptic or pyramidal, 2–12 cm long ; branches with yellowish glands ; spikelets 0.15–0.25 cm long, 4–8-flowered ; palea-keels ciliate.

Common in waste lands. Tropics. June–October. Sarkar & Bhatta. 854, 1045.

9. *Eragrostis tremula* (Lamk.) Hochst. ex Steud., Syn. Pl. Glum. 1 : 269.1854 ; Hook.f., Fl. Brit. India 7 : 320.1896 ; Haines, Bot. Bihar & Orissa 3 : 1005.1924 ; op.cit. 514. *Poa tremula* Lamk., Encycl. Meth. Bot. 1. 185.1791.

Slender, tufted annuals, 30–60 cm high. Panicle effuse ; branches long ciliate ; spikelets narrow, 0.6–2 cm long.

Sandy river beds. India and Burma to Tropical Africa. August–November. Sarkar & Bhatta., 1064.

10. *Eragrostis unioloides* (Retz.) Nees ex Steud., Syn. Pl. Glum. 1 : 264.1854 ; Bor, op.cit. 515. *Poa unioloides* Retz., Obs. Bot. 5 : 19.1789. *E. amabilis* auct. pl.; Hook. f., Fl. Brit. India 7 : 317.1896 ; Haines, Bot. Bihar & Orissa 3 : 1003.1924.

Tufted, erect annuals or perennials, 10–60 cm high. Panicles 5–20 cm long, fairly dense and oblong, or open and ovate ; spikelets ovate, 0.3–1 × 0.2–0.4 cm, usually purple tinged ; lemmas broadly ovate–suborbicular.

In west places. India, South East Asia. July–November. Sarkar & Bhatta., 1334.

## 25. *ERIANTHUS* Michx.

- |                        |     |                        |
|------------------------|-----|------------------------|
| 1a. Panicle decomposed | ... | 1. <i>E. ravennae</i>  |
| 1b. Panicle simple     | ... | 2. <i>E. rufipilus</i> |

1. *Erianthus ravennae* (L.) P. Beauv., Ess. Agrost. 14. 1812 ; Bor, Grass. Burma, Ceylon, India & Pak. 151.1960. *Andropogon ravennae* L., Sp. Pl. ed. 2. 1481.1763. *Saccharum ravennae* (L.) Murray, Syst. Veg. ed. 13, 88.1774 ; Haines, Bot. Bihar & Orissa 3 : 1060.1924; *Erianthus elephantinus* Hook.f., Fl. Brit. India 7 : 122.1896.

Large tufted perennials, to 1.8 m high. Leaves large, to 1.5m long ; ligule of dense white hairs. Panicle to 40 cm long, silvery silky ; spikelets about 0.4 cm long ; glumes of sessile spikelets glabrous, of the pedicelled spikelet with few or sparse hairs.

Common in the northern part. Northern India, Mediterranean Region. October–December. Sarkar & Bhatta., 991.

Culms used for screens.

2. *Erianthus rufipilus* ( Steud. ) Griseb. in Nachr. Ges. Wiss. Gottingen 93.1868 ; Bor, op.cit 152. *Saccharum rufipilum* Steud., Syn. Pl. Glum. 1 : 409.1855.

Erect, tufted annuals, to 1.5 m high. Panicle–branches short, sparingly divided ; spikelets 0.3–0.35 cm long, surrounded by mauve–coloured long hairs ; awns not more than 2 cm long.

In the sandstone hills, occasional. Hills of north and north–east India. September–December. Sarkar & Bhatta., 1384.

26. *ERIOCHLOA* Kunth

*Eriochloa procera* (Retz.) Hubb. in Bull. Misc. Inf. Kew 1930 : 256.1930 ; Bor, op. cit. 312. *Agrostis procera* Retz., Obs. 4 : 19.1786. *Eriochloa polystachya* auct. pl. Hook.f., Fl. Brit. India 7 : 20.1896. *E. ramosa* O. Kuntze, Rev. Gen. Pl. 2 : 775.1891; Haines, Bot. Bihar & Orissa 3 : 1052.; non H.B. & K. 1816.

Annuals, 20–60 cm high. Racemes 2–7 cm long ; axis to 15 cm long ; spikelets lanceolate, to 0.3 cm long, acute or acuminate ; lower glume absent ; upper lemma with a very short mucro.

In wet places. Tropics. March–April. Sarkar & Bhatta., 543.

Yields a good fodder.

27. *EULALIA* Kunth

*Eulalia trispicata* (Schult.) Henr. in Blumea 3 : 453. 1940 ; Bor, op. cit. 157. *Andropogon trispicata* Schult., Mant. 2 : 452.1824. *Eulalia argentea* Brongn. in Duperr., Voy. Coquille Bot. 2 : 2, 92.1830 ; Haines, Bot. Bihar & Orissa 3 : 1064.1924; *Pollinia argentea* Trin. in Bull. Acad. Sci. Petersb. 1 : 71.1836 ; Hook.f., Fl. Brit. India 7 : 111.1896.

Culms 30–100 cm high. Racemes 2–12, to 11 cm long, brownish, with white hairs on the joints ; spikelets 0.25–0.35 cm long.

Open forests. Indomalesia, Australia. October–January. Sarkar & Bhatta., 1534.

28. *EULALIOPSIS* Honda

*Eulaliopsis binata* (Retz.) Hubb. in Hook., Icon. Pl. t. 3262.1935 ; Chow. & Wadhwa, Fl. Himal. Pra. Anal 769.1984. *Andropogon binatus* Retz., Obs. Bot. 5 : 21. 1789. *Ischaemum angustifolium* (Trin.) Hack. in DC. Monogr. Phan. 6: 241.1889 ; Hook. f., Fl. Brit. India 7 : 129.1896 ; *Pollinidium angustifolium* (Trin.) Haines, Bot. Bihar & Orissa. 1020. (1066). 1924.

Perennials, 40–80 cm high. Leaves long convolute. Racemes 2–4, to 2–4 cm long, brown hairy ; spikelets 0.35–0.45 cm long ; upper lemma with 0.6–0.9 cm long awn.

Occasional. Indomalesia. February–July. Sarkar & Bhatta., 366. "Sabai" or "Baib" grass.

Used for ropes, mats, strings. Yields paper pulp.

## 29. HACKELOCHLOA O. Kuntze

**Hackelochloa granularis** ( L. ) O. Kuntze, Rev. Gen. Pl. 776.1891 ; Bor, op.cit.159. *Cenchrus granularis* L., Mant. 2 : 575.1771. *Manisuris granularis* L. f., Nov. Gram. Gen. 40.1779 ; Hook.f., Fl. Brit. India 7 : 159.1896 ; Haines, Bot. Bihar & Orissa 3 : 1105.1924.

Erect herbs to 8 cm high. Leaves linear, linear-lanceolate,  $1.5 \times 2.5 \times 0.3-0.5$  cm, hispid. Racemes short ; sessile spikelets 0.15 cm long ; upper glume deeply pitted.

Common in the sandstone hills. Tropics. October-December. Sarkar & Bhatta., 1016.

Fodder. Used in case of enlarged spleen and liver.

## 30. HETEROPOGON Pers.

**Heteropogon contortus** ( L. ) P. Beauv. ex R. & S. in Syst. Veg. 2 : 836.1817. Haines, Bot. Bihar & Orissa 3 : 1088.1924; *Andropogon contortus* L., Sp. Pl. 1045.1753 ; Hook.f., Fl. Brit. India 7 : 253.1896.

Perennials, 30-100 cm high. Racemes 3-8 cm long ; awns long, chestnut brown, spirally twisted ; sessile spikelets 0.6-0.8 cm long with a pungent rufusly beared callus.

Open forest areas. Tropics. September-January, KHER. Sarkar & Bhatta., 1261.

## 31. HORDEUM L.

**Hordeum vulgare** L., Sp. Pl. 84.1753 ; Bor, Grass. Burma, Ceylon, India & Pak. 677.1960.

Annuals. Spikelets 3 at each node of the spike—axis ; Central fertile, the lateral pair barren.

Cultivated. JOB. Sarkar & Bhatta., 406.

## 32. HYGRORYZA Nees

**Hygroryza aristata** ( Retz. ) Nees ex Wt. & Arn. in Edinb. New Phil. J. 15 : 380. 1833 ; Hook.f., Fl. Brit. India 7 : 95.1896 ; Haines, Bot. Bihar & Orissa 3 : 1027.1924; *Pharus aristatus* Retz., Obs. 5 : 23.1789.

Floating herbs. Leaves ovate-oblong,  $2-7 \times 1-2$  cm. Panicles obovate. 3-6 cm long ; spikelets sessile.

Common along shallow ponds and ditches. India, Sri Lanka, Burma. October–December. Sarkar & Bhatta., 1279.

Fodder. Grains are sweet.

### 33. HYMENACHNE P. Beauv.

**Hymenachne acutigluma** (Steudel) Gilliland, Gard. Bull. Singapore 20:314.1963. *Panicum acutiglumum* Stendel, Syn. pl. Gram. 66:1855. *Panicum myuros* auct. pl. Hook.f., Fl. Brit. India 7: 39.1896; non. Lamk.1791. *Hymenachne myurus* P. Beauv., Ess. Agrost. 1812; Haines, Bot. Bihar & Orissa 3: 1037. 1924.

Leaves lanceolate, cordate, 20–40 × 1–1.5 cm. Panicle to 14 cm long; spikelets to 0.5 cm long.

Common in waste water bodies. Indomalaysia. October–November. Sarkar & Bhatta., 861.

### 34. IMPERATA Cirillo

**Imperata cylindrica** (L.) Raeuschel., Nom. Bot. ed. 3, 10.1797; Bor, Grass. Burma, Ceylon, India & Pak. 169.1960. *Lagurus cylindricus* L., Syst. Nat. ed. 10, 878.1759. *Imperata arundinacea* Cir., Pl. Rar. Neap. 2: 26.1792; Hook.f., Fl. Brit. India 7: 106.1896; Haines, Bot. Bihar & Orissa 3:1061.1924.

Leaves 10–40 × 0.3–0.8 cm. Panicles 7–13 cm long; spikelets to 0.5 cm long; glumes as long as the spikelets.

Along open grounds. Tropics. August–June. ULU. Sarkar & Bhatta., 898.

A good fodder. Leaves used for thatching.

### 35. ISACHNE R. Br.

**Isachne dispar** Trin., Sp. Gram. 1: t. 86.1828; Hook.f., Fl. Brit. India 7: 26.1886. Bor, op. cit. *Panicum dispar* (Trin.) Steud., Syn. Pl. Glum. 1: 96.1854.

Small herbs, to 10 cm high. Leaves ovate–lanceolate. Panicle dense; spikelets subglobose, to 0.2 cm across.

In waste lands. Tropics. October. Sarkar & Bhatta., 992.1267.

Note: Allied species *Isachne globosa* (Thunb.) O. Kuntze [= *Isachne australis* R. Br.] grows gregariously in the adjacent districts.

## 36. ISCHAEMUM L.

**Ischaemum rugosum** Salisb., Icon. Strip. Rar. 1. t. 1. 1791 ; Hook.f., Fl. Brit. India 7 : 127.1896 ; Haines, Bot. Bihar & Orissa 3 : 1068.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 184.1960.

Slender annuals ; culms 10–50 cm long. Racemes paired, 3–8 cm long ; internodes and pedicels clavate, ciliate ; sessile spikelets 0.4–0.6 cm long ; lower glume coriaceous and transversely ridged ; upper lemma with 1.5–2 cm long awn.

In moist places. Indomalesia. January–May. Sarkar & Bhatta., 895.

## 37. ISEILEMA Anders.

**Iseilema laxum** Hack. in DC., Monogr. Bhan. 6 : 682.1889 ; Hook.f., Fl. Brit. India 7 : 218.1896 ; Haines, Bot. Bihar & Orissa 3 : 1102.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 188.1960.

Culms to 50 cm high ; lower nodes glabrous. Leaves upto 18 cm long. Spatheoles 0.8–1 cm long ; sessile spikelets contracted at the base.

In paddy fields. India, Sri Lanka. August–April. Sarkar & Bhatta., 858.

38. LEERSIA Swartz, *nom. cons.*

**Leersia hexandra** Swartz, Prodr. Veg. Ind. Occ. 21.1788 ; Hook.f., Fl. Brit. India 7 : 94.1896 ; Prain, Bengal Pl. 892 ; Haines, Bot. Bihar & Orissa 3 : 1026.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 599.1960.

Culms 20–50 cm long. Panicles 5–10 cm long ; spikelets 0.25–0.35 cm long, laterally compressed ; glumes absent ; lemmas spinulosely ciliate.

Along the margins of water bodies. Tropics. October–December. Sarkar & Bhatta., 888.

## 39. LEPTOCHLOA P. Beauv.

- |                            |     |                        |
|----------------------------|-----|------------------------|
| 1a. Spikelets 3–6–flowered | ... | 1. <i>L. chinensis</i> |
| 1b. Spikelets 2–3–flowered | ... | 2. <i>L. panicea</i>   |

1. **Leptochloa chinensis** (L.) Nees in Syll. Ratisb. 1 : 4.1824 ; Hook.f., Fl. Brit. India 7 : 299.1896 ; Haines, Bot. Bihar & Orissa 3 : 1017.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 516.1960. *Poa chinensis* L., Sp. Pl. ed.1, 69.1753.

Culms to 60 cm high. Leaves 15–40 cm long, flat or convolute. Spikes to 10 cm long, thick ; glumes unequal ; the lower 0.12–0.2 cm long ; the upper 0.1–0.25 cm long.

In moist places. South–East Asia. July–October. Sarkar & Bhatta., 904.

2. *Leptochloa panicea* (Retz.) Ohwi in Bot. Mag. Tokyo 55 : 311.1941 ; Bor, op.cit. 517. *Poa panicea* Retz., Obs. Bot. 3 : 11. 1783. *Leptochloa filiformis* R. & S. Hook.f., Fl. Brit. India 7 : 298.1896 ; Haines, Bot. Bihar & Orissa 3 : 1017. 1924.

Ascending annuals, to 50 cm high. Leaves upto 25 cm long. Racemes slender, several, 4–11 cm long ; spikelets to 0.2 cm long.

In moist places. Tropical Asia and Africa. September–November. Sarkar & Bhatta., 1825.

#### 40. MICROCHLOA R. Br.

*Microchloa kunthii* Desv., Opusc. 75.1831 ; Bor, Grass. Burma, Ceylon, India & Pak. 474.1960. Karthi. *et al.*, Fl. Indicae Enum. : Monocot. 237. 1989.

Slender herbs. Spikes secund, curved, long ; glumes herbaceous, pale, translucent.

In waste lands. Tropics. September–October. Sarkar & Bhatta., 1283.

#### 41. NARENGA BOR

*Narenga porphyrocoma* (Hance) Bor in Indian Forest. 66 : 267.1940 ; Bor, op. cit. 198. *Saccharum narenga* Buch.–Ham. ex Hook.f., Fl. Brit. India 7 : 120.1896 ; Haines, Bot. Bihar & Orissa 3 : 1060.1924. *Eriochrysis porphyrocoma* Hance, J. Bot. 14 : 294.1876.

Culms to 3 m high. Panicle purplish or greyish purple in colour.

Haines (*l. c.*) reported this plant from the sal forests of Champaran. Tropics of N. E. Asia. Haines 494. (CAL !).

#### 42. OPLISMENUS P. Beauv., *nom. cons.*

1a. Awns reddish, smooth, viscid, filiform, stiff ... 2. *O. compositus*

1b. Awns pale, barbellate, capillary, often flexuous ... 1. *O. burmannii*

1. *Oplismenus burmannii* ( Retz. ) P. Beauv., Ess. Agrost. 54, 168,

169.1812 ; Hook.f., Fl. Brit. India 7 : 68.1896 ; Prain, Bengal Pl.2 : 883 ; Haines, Bot. Bihar & Orissa 3 : 1045.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 317.1960. *Panicum burmannii* Retz., Obs. Bot. 10.1783.

Culms 15–25 cm long. Leaves to 5 cm long. Spikelets to 0.25 cm long ; awns 0.25–0.5 cm long.

Common along forest clearings. Tropics. June–October. Sarkar & Bhatta., 867.

A good fodder.

2. *Oplismenus compositus* (L.) P. Beauv., Ess. Agrost. 54, 168, 169.1812 ; Hook.f., Fl. Brit. India 7 : 66.1896 ; Prain, Bengal Pl.2 : 883 ; Haines, Bot. Bihar & Orissa 3 : 1045.1924 ; Bor, op. cit 317. *Panicum compositus* L., Sp. Pl. 57.1753.

Culms to 50 cm long. Leaves 5.0–11.0 × 1.5–2.5 cm. Racemes 3–12 cm long ; spikelets 0.3–0.4 cm long ; awns 0.3–1 cm long.

Common. Tropics. October–December. Sarkar & Bhatta., 901.

#### 43. ORYZA L.

1a. Spikelets caducous ... 1. *O. rufipogon*

1b. Spikelets persistent ... 2. *O. sativa*

1. *Oryza rufipogon* Griff., Notul.3 : 5.1851 ; Bor, op. cit 605. *O. sativa* var. *fatua* (Koen. ex Trin.) ex Prain in Bengal Pl. 2 : 1184.1903. *O. nivara* Sharma et Shastry, Indian J. Genetics & Pl. Br. 25(2) : 161.1965.

Erect. Annuals. Panicles 8–12 cm long ; glumes to 0.25 cm long, finely pointed ; lemma to 0.7 cm long ; awn to 5.6 cm long ; grains reddish in colour.

Common in the marshy places. Eastern India, Madras. September–October. Sarkar & Bhatta., 873.

Grains edible.

2. *Oryza sativa* L., Sp. Pl. 333.1753 ; Bor, Grass. Burma, Ceylon, India & Pak. 605.1960.

Cultivated throughout the district. DHAN. Sarkar & Bhatta., 874.

## 44. PANICUM L.

- |  |     |                        |
|--|-----|------------------------|
| 1a. Spikelets acute.                     | ... | 2                      |
| 1b. Spikelets obtuse ; leaf-blades broad | ... | 1. <i>P. notatum</i>   |
| 2a. Leaf blades narrow, flat             | ... | 3. <i>P. repens</i>    |
| 2b. Leaf blades broad, involute          | ... | 2. <i>P. paludosum</i> |

1. *Panicum notatum* Retz., Obs. Bot. 4 : 18.1786. *P. montanum* Roxb., Fl. Indica 1 : 315.1820 ; Hook.f., Fl. Brit. India 7 : 53. 1896 ; Haines, Bot. Bihar & Orissa 3 : 1042.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 329.1960.

Erect perennials ; culms 30–80 cm long. Leaves 7–15 × 1.2–2.5 cm. Panicle effuse, to 30 cm long ; spikelets to 0.25 cm long ; lower glume to 0.2 cm long ; 3–5-nerved.

Along forest margins. South–East Asia. November–January. Sarkar & Bhatta., 1281.

2. *Panicum paludosum* Roxb., Fl. Indica 1 : 310.1820 ; Bor, Grass. Burma, Ceylon, India & Pak. 329. *P. proliferum* auct. pl. ; Hook.f., Fl. Brit. India 7 : 50.1896 ; Haines, Bot. Bihar & Orissa 3 : 1041.1924 ; non Lamk., 1797.

Aquatic perennials ; culms creeping, spongy. Leaves narrowly linear-lanceolate. Panicles 10–25 cm long ; spikelets 0.3–0.4 × 0.1 cm ; lower glume orbicular, hyaline.

In shallow water bodies. Tropical Asia, Australia. October–December. Sarkar & Bhatta., 1311.

3. *Panicum repens* L., Sp. Pl. ed. 2, 87.1762 ; Hook.f., Fl. Brit. India 7 : 49.1896 ; Prain, Bengal Pl. 2 : 888 ; Haines, Bot. Bihar & Orissa 3 : 1040.1924 ; Bor, Grass. Barma, Ceylon, India & Pak. 330.1960.

Aquatic perennials ; culms creeping, slender, to 70 cm long. Leaves linear-lanceolate. Panicles to 10 cm long ; spikelets lanceolate to lanceolate-oblong ; lower glume orbicular.

In rice fields as weed. Tropics and sub-tropics. October–November. Sarkar & Bhatta., 946.

## 45. PASPALIDIUM Stapf

**Paspalidium flavidum** (Retz.). A Camus in Lecomte, Fl. Gen. de Indo-Chine 7: 419.1922; Haines, Bot. Bihar & Orissa 3: 1045.1924; Bor, op. cit. 333. *Panicum flavidum* Retz., Obs. Bot. 4: 15.1786; Hook.f., Fl. Brit. India 7: 28.1886.

Culms erect or ascending from a prostrate base, to 70 cm long. Leaves 0.2–0.8 cm broad, acute or obtuse. Spikes 1–several, 0.3–2.5 cm long; spikelets 0.2–0.3 cm long.

In waste places. Tropical Asia. June–October. Sarkar & Bhatta., 1190.

## 46. PASPALUM L.

- 1a. Spikelets broadly lanceolate, acute ... 2. *P. vaginatum*  
 1b. Spikelets broadly ovate–elliptic to almost orbicular, obtuse ... 1. *P. scrobiculatum*

1. **Paspalum scrobiculatum** L., Mant. 1: 29.1767; Hook.f., Fl. Brit. India 7: 10.1896; Prain. Bengal Pl. 2: 890; Haines, Bot. Bihar & Orissa 3: 1046.1924; Bor, Grass. Burma, Ceylon, India & Pak. 340.1960. Cope in Nasir & Ali, Fl. Pakistan no. 143: 213.1982. *P. orbiculare* Forst., Fl. Insul. Austr. Prodr. 7.1786; Bor, op. cit. 340. *P. commersonii* Lamk., Illus 1: 175. t. 43/1. 1791; Bor, op. cit. 335.; *P. cartilagineum* Presl, Rel. Haenk. 1: 216.1830; Bor, Grass. Burma, Ceylon, India & Pak. 335.1960.

Perennials, 10–100 cm high, usually erect, sometimes with a procumbent base. Leaves 0.3–0.7 cm broad. Racemes subdigitate; spikelets 0.15–0.3 cm long; lower glume absent.

Cultivated and self-sown. Indomalesia. July–December. Sarkar & Bhatta., 763,916.

A highly polymorphic species.

2. **Paspalum vaginatum** Swartz, Prodr. Veg. Ind. Occ. 21.1788; Bor, Grass. Burma, Ceylon, India & Pak. 341.1960.

Perennials; rhizomes and stolons creeping. Racemes short to 4 cm long; spikelets broadly lanceolate; upper glume glabrous; lower glume absent; lower lemma faint.

In wet places. Tropics and subtropics. July–November. Sarkar & Bhatta., 783.

## 47. PENNISETUM L. C. Rich. ex Pers.

**Pennisetum americanum** (L.) K. Schum., Engl. Pflanzenw. Oest. Afr. B. 51, c. t. 4. f. A. & B. 1895; Bor, Rech. f., Fl. Iran 70 : 503. 1970. *Panicum americanum* L., Sp. Pl. 56. 1753. *Pennisetum typhoides* (Burm.f.) Stapf et C. E. Hubb., Bull. Misc. Inf. Kew 1933. 271. 1933 : Bor, Grass. Burma, Ceylon, India & Pak. 350. 1960 : *P. typhoideum* L. C. Rich in Pers., Syn. Pl. 1 : 72. 1805; Hook.f., Fl. Brit. India 7 : 82. 1896.

Simple or branched, stout annuals, 1–2 m : leaves linear lanceolate, glabrous or hairy, 8.5 – 52 × 0.7 – 1.8 cm ; spikes cylindrical, terminal, pale brown; spikelets 3–4 mm.

Cultivated for its grains. BAJRA Fl. & Fr. : August–February. Bhatta. & Sarkar 710.

## 48. PEROTIS Ait.

**Perotis indica** (L.) O. Kuntze., Rev. Gen. Pl. 2 : 787. 1891 ; Bor, Grass. Burma, Ceylon, India & Pak. 611. 1960. *Anthoxanthum indicum* L., Sp. Pl. 28. 1753; Hook.f., Fl. Brit. India 7 : 98. 1896 ; Haines, Bot. Bihar & Orissa 3 : 1024.

Culms spreading, 20–70 cm long. Leaves ovate–lanceolate, 2–7 cm long. Spikes solitary, 3–25 cm long ; spikelets linear, to 0.25 cm long.

On exposed grounds. Indomalaysia. August–December. Sarkar & Bhatta., 1043, 1333.

## 49. PHALARIS L.

**Phalaris minor** Retz , Obs Bot. 3: 8. 1783 ; Bor, Grass Burma, Ceylon India & Pak. 616. 1960.

Culms to 1.2 m high . Spikelets all alike ; wing of glums minutely serrate and undulate ; sterile lemmas dissimilar.

An exotic, harmful weed of wheat cultivation. February–March Sarkar & Bhatta., 433.

## 50. PHRAGMITES Trin.

**Phragmites vallisneria** (Pluk. ex L.) Veldkamp, Blumea 37(1): 232-233, 1992. *Arundo vallisneria* Pluk. ex L., Herb. Amb. 15, 1754; *Phragmites karka* (Retz. ) Trin. ex Steud., Nom. Bot. ed. 2, 2 : 324. 1841 ; Hook. f. , Fl. Brit. India 7: 304. 1896; Haines, Bot. Bihar & Orissa 3:997 ;

Tall perennial reeds with creeping rhizome culms 2–5 m high. Leaves 30–50 cm long ; 1–3 cm broad. Panicles 20–40 × 10–20 cm, profusely branched and silky hairy ; spikelets to 1 cm long.

Along streams, bogs. Indomalesia . July–November. Sarkar & Bhatta., 1516.

Culms used as walls of mud houses.

### 51. POA L.

**Poa annua** L. Sp. Pl. 68.1753 ; Bor, Grass. Burma, Ceylon, India & Pak 555.1960.

Culms to 10 cm high. Leaves linear–lanceolate. Upper floret similar to others; keel of the palea ciliate; anthers to 0.08 cm long.

Bhikhna Thori, 200 m. Cosmopolitan. October . Sarkar & Bhatta., 1517.

### 52. POGONATHERUM P. Beauv.

**Pogonatherum paniceum** (Lamk. ) Hack. in Allg. Bot.2. 12 :178.1906 ; Bor, Grass. Burma, Ceylon , India & Pak. 202.1960. *Saccharum paniceum* Lamk., Encycl. Meth. Bot. 1:595.1785. *Pogonatherum saccharoideum* P. Beauv Ess. Agrost. 176., 177. 1812 ; Hook. f. , Fl. Brit . India 7:141.1896 ; Haines, Bot. Bihar & Orissa 3:1063. 1924.

Culms to 60 cm long, 0.15 cm across. Leaves 3.5–6 × 1–2 cm. Racemes to 3.5 cm long ; spikelets to 0.3 cm long ; awns to 1.8 cm long.

Common in the sandstone hills in tufts. India, Burma, Sri Lanka, December–January Sarkar & Bhatta., 434.

### 53. POLYPOGON Desf.

**Polypogon monspeliensis** (L. ) Desf., Fl. Atlant . 1 :67.1798 ; Hook. f. , Fl. Brit. India 7 :245.1896 ; Haines, Bot. Bihar & Orissa 3 :1021.1924 ; Bor, Grass. Burma, Ceylon, India & Pak . 403. 1960.

Culms 10–60 cm high. Leaves linear–lanceolate. Panicle 2.5–10 cm long, spikelets minutely pubescent.

Common along of sandy river banks. Cosmopolitan . February–April. Sarkar & Bhatta., 229,260.

54. *ROTTBOELLIA* L.f., *nom. cons.*

***Rottboellia cochinchinensis*** (Lour.) W.D. Clayton in Kew Bull. 35 : 817. 1981. *Setagosa cochinchinensis* Lour. Fl. Cochinch. 51. 1790. *Rottboellia exaltata* L.f., Suppl. 114.1781. non (L.) L.f. 1779 ; Hook.f., Fl. Brit. India 7 : 156. 1896 ; Haines, Bot. Bihar & Orissa 3 : 1107. 1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 206. 1960.

Erect annual herbs to 3 m high, standing on stiff adventitious stilt roots. Leaves about 25 × 3 cm, linear-lanceolate, hispid above, margins spinulosely scabrid. Spikes terete 8–14 cm long. Sessile spikelets sunk in internode, lanceolate. Anthers 3. Grains ellipsoid.

In waste lands. Indomalesia, Australia, Africa. Fl. & Fr. : October–November. Bhatta., & Sarkar 842.

55. *SACCHARUM* L.

- |  |     |                           |
|--|-----|---------------------------|
| 1a. Peduncle hairy below the panicle ; rhachis very fragile ; hairs very white-silvery | ... | 5. <i>S. spontaneum</i>   |
| 1b. Peduncle not hairy ; rhachis less fragile  | ... | 2                         |
| 2a. Lower glume of sessile spikelet glabrous ; upper glume also glabrous               | ... | 3. <i>S. officinarum</i>  |
| 2b. Lower glume of sessile spikelet with long hairs                                    |     | 3                         |
| 3a. Spikelets 0.4–0.6 cm long, longer than the joints of the rhachis ; leaves glaucous | ... | 2. <i>S. bengalense</i>   |
| 3b. Spikelets 0.25–0.4 cm long, shorter than the joints of the rhachis ; leaves green. | ... | 4                         |
| 4a. Sessile spikelets 0.25–0.4 cm long ; joints 0.35–0.4 cm long                       | ... | 1. <i>S. arundinaceum</i> |
| 4b. Sessile spikelets 0.3–0.4 cm long ; joints 0.6–0.7 cm long                         | ... | 4. <i>S. procerum</i>     |

1. ***Saccharum arundinaceum*** Retz., Obs. Bot. 4 : 14.1786 ; Hook. f., Fl. Brit. India 7 : 119; Haines, Bot. Bihar & Orissa 3 : 1059.1924; Bor, Grass. Burma, Ceylon, India & Pak. 211.1960.

Culms to 3.5 m high. Leaves 1.5 m × 5 cm. Panicle pale-white.

Occasional in the wet grass land. India, Burma, Sri Lanka. October. KAGRA. Sarkar & Bhatta., 1297.

Culms used for making walls of mud houses.

2. *Saccharum bengalense* Retz., Obs. Bot. 5 : 16.1789 ; Bor, Grass, Burma, Ceylon, India & Pak. 211.1960. *S. munja* Roxb., Fl. Indica 1 : 250.1820 ; Haines, Bot. Bihar & Orissa 3 : 1059.1924; *S. arundinaceum* auct. pl ; Hook. f., Fl. Brit. India 7 : 119.1896, p.p, non Retz ; *S. arundinaceum* var. *ciliaris* Prain, Bengal Pl. 2 : 895.1903.

Culms to 2.5 m high and to 1.5 cm across. Leaves long, to 2 cm broad. Panicles pale-silvery.

Common. North and N. W. India. October-December. MUNJA. Sarkar & Bhatta., 1199.

Fibres of the upper leaf-sheaths of the flowering culms is used for making baskets, mats, ropes etc.

3. *Saccharum officinarum* L., Sp. Pl. 54.1753 ; Bor, Grass. Burma, Ceylon, India & Pak. 212.1960 ; Haines, Bot. Bihar & Orissa 3 : 1058.1924.

Extensively cultivated throughout the district. UKH. Sarkar & Bhatta., 604.

4. *Saccharum procerum* Roxb., Fl. Indica 1 : 248.1820 ; Bor, Grass. Burma, Ceylon, India & Pak. 213.1960. *S. arundinaceum* auct. pl. ; Hook.f., Fl. Brit. India 7 : 119.1896, p.p ; Haines, Bot. Bihar & Orissa 3 : 1059.1924; non Retz.1786.

Culms to 1.5 m high. Leaves to 1 cm across. Panicles pale-white.

In the exposed grounds near Goberdhana. N.E. India, Burma. October - November. Sarkar & Bhatta., 1277.

5. *Saccharum spontaneum* L., Mant. Alt. 183.1771 ; Hook. f., Fl. Brit. India 7 : 118.1896 ; Haines, Bot. Bihar & Orissa 3 : 1057.1924; Bor, Grass, Burma, Ceylon, India & Pak. 214.1960.

Culms to 2 m high. Leaves to 1.5 m long to 0.6 cm broad. Panicles to 40 cm long, silvery white.

Common along streams and swampy places. Tropics. September-October. KAANS. Sarkar & Bhatta., 1165.

Leaves used for rope making in the villages.

## 56. SACCIOLEPIS Nash

*Sacciolepis myosuroides* (R. Br.) A. Camus in Lecomte, Fl. Gen de Indo-Chine 7 : 460.1922 ; Haines, Bot. Bihar & Orissa 3 : 1036 ; Bor, Grass. Burma, Ceylon, India & Pak. 358.1960. *Panicum myosuroides* R. Br., Prodr. 189.1810. ; Hook f., Fl. Brit.India 7 : 42.1896.

Culms to 1 m high from a creeping rhizome. Panicle dense ; pedicels shorter than the spikelets ; spikelets subglobose, blunt.

In marshes. Tropical Asia & Australia. September – November. Shetty 399. (CAL !).

## 57. SCHIZACHYRIUM Nees

*Schizachyrium brevifolium* (Sw.) Nees ex Buse in Miquel, Plant. Junghn. 359.1854 ; Haines, Bot. Bihar & Orissa 3 : 1090.1924; Bor, Grass. Burma, Ceylon, India & Pak. 215.1960. *Andropogon brevifolius* Sw., Prodr. Veg. Ind. Occ. 26.1788 ; Hook. f., Fl. Brit. India 7 : 165.1896.

Culms 20–40 cm long. Leaves linear-lanceolate, 1.5–3 cm long, obtuse. Racemes 1–2 cm long ; joints of raceme 0.2–0.3 cm long ; spikelets 0.3–0.35 cm long.

In dry exposed sandstone hills. Tropics. October–December. Sarkar & Bhatta., 1260

58. SETARIA P. Beauv., *nom. cons.*

- |   |                           |
|---|---------------------------|
| 1a. Inflorescence a cylindric and dense spikiform panicles.                           | 2                         |
| 1b. Inflorescence a dense or rather loose,<br>narrow or widely spreading panicle. ... | 3                         |
| 2a. Upper glume as long as the upper lemma ...  | 2. <i>S. italica</i>      |
| 2b. Upper glume shorter than the upper lemma ...                                      | 4. <i>S. pumila</i>       |
| 3a. Annuals ; panicle with short racemes ;<br>spikelets crowded ...                   | 1. <i>S. barbata</i>      |
| 3b. Perennials ; panicle with long branches ;<br>spikelets lax ...                    | 3. <i>S. paniculifera</i> |

1. *Setaria barbata* (Lamk.) Kunth, Rev. Gram. 1 : 47.1829 ; Bor, Grass. Burma, Ceylon, India & Pak. 360.1960. *Panicum flavescens* auct. pl. ; Hook. f., Fl. Brit. India 7 : 56.1896 ; non Sw.1788.

Annuals. Culms to 30 cm high. Panicle with short racemes ; spikelets elliptic-acute, crowded ; lower floret male or barren ; upper glume half to three-quarters the length of the upper lemma.

In waste places. Tropics. August-October. Sarkar & Bhatta., 1518.

2. *Setaria italica* (L.) P. Beauv., Ess. Agrost 51, 170, 178. 1812 ; Bor, Grass. Burma, Ceylon, India & Pak. 362.1960. *Panicum italicum* L., Sp. Pl. 56. 1753.

Annuals, to 1 m high. Leaves 15-40 × 1-2.5 cm. Panicle 5-18 cm long. Cultivated for its grains. India. July - October KAGNI DANA. Sarkar & Bhatta., 1520.

3. *Setaria paniculifera* (Steud.) Fourn. ex Hemsl., Biol. Centr. Amer. Bot. 3 : 505. 1885 ; Bor, Grass. Burma, Ceylon, India & Pak 363. 1960.

Perennials ; culms to 50 cm high. Spikelets elliptic ; lower floret barren. Sometimes in cultivation. Tropical America. Sarkar & Bhatta., 887.

4. *Setaria pumila* (Poir.) Roem. & Schult., Syst. vdg. 2:891. 1817 ; *Panicum pumilum* Poir. in Lam., Encycl. 4:273.1816 ; *Setaria glauca* sensu ; Hook. f., Fl. Brit. India 7 : 78. 1896 p.p ; Haines, Bot. Bihar & Orissa 3 : 1034.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 360. 1960.non (L.) P. Beauv.

Annuals to 40 cm high. Inflorescence a cylindric false spike, to 7.5 cm long ; peduncle long ; spikelets 0.3 cm long ; upper lemma coarsely rugose, boat-shaped, slightly keeled upwards.

In waste places. Tropics. July - November Sarkar & Bhatta., 816.

Note : A good fodder. *Setaria glauca* [(L.) P. Beauv. (1812) may be treated as *Pennisetum glaucum* (L.) R. Br. (1810)].

#### 59. SORGHUM Moench. *nom. cons.*

*Sorghum bicolor* (L.) Moench, Meth. Bot. 207.1794 ; *Holcus bicolor* L. Mant. pl. 2:301.1771. *Sorghum vulgare* Pers., Syn. 1 : 101. 1805. *Andropogon sorghum* Brot., Fl. Lusit. 1 : 88. 1805.

Cultivated for its grains. JUAR.

60. *SPOROBOLUS* R. Br.

*Sporobolus diander* (Retz.) P. Beauv., Ess. Agrost., 26, 147, 178. 1812 ; Hook. f., Fl. Brit. India 7 : 247. 1896 ; Haines, Bot. Bihar & Orissa 3 : 1019.1924; Bor, Grass. Burma, Ceylon, India & Pak. 629. 1960 ; *Agrostis diandra* Retz., Obs. Bot. 5 : 19. 1789. *Sporobolus indicus* (L.) R. Br. var. *diander* (Retz.) Jovet & Guedes in Bull. Centre & Rech. Sc. Biarritz. 7 : 65. 1968 & Taxon 22 : 163. 1973. Karthi. et al., Fl. Indicae Enum. 264. 1989.

Culms 15–20cm high. Leaves to 25 cm long. Panicles 4–20 cm long. Spikelets 0.12–0.15 cm long, longer glumes to 0.05 cm long, upper to 0.07 cm long.

Common along open grasslands. Indomalesia. June–October. Sarkar & Bhatta., 912.

61. *THEMEDA* Forssk.

- |   |                              |
|---|------------------------------|
| 1a. Pairs of involucrel spikelets inserted at different levels. | 2                            |
| 1b. Pairs of involucrel spikelets inserted at the same level    | ... 3. <i>T. laxa</i>        |
| 2a. Involucrel spikelets without tubercle-based hairs           | ... 2. <i>T. caudata</i>     |
| 2b. Involucrel spikelets with tubercle-based hairs              | ... 1. <i>T. arundinacea</i> |

1. *Themeda arundinacea* (Roxb.) Ridley in Trans. Linn. Soc. ser. 2, 3 : 401. 1893 ; Haines, Bot. Bihar & Orissa 3 : 1100.1924; Bor, Grass. Burma, Ceylon, India & Pak. 250. 1960 ; *Anthistiria gigantea* Hack. ssp. *arundinacea* (Roxb.) Hack. in DC., Monogr. Phan. 6 : 674. 1889 ; Hook. f., Fl. Brit. India 7 : 217. 1896. *A. arundinacea* Roxb., Fl. Indica 1 : 256. 1820.

Tall perennials, tufted, to 3 m high. Panicles erect ; branches inclined ; involucrel spikelets 1.2–2.0 cm long ; hairs golden-yellow ; awns 4–7 cm long, deep brown, somewhat twisted.

In forest clearings. India, Burma. October–December. Sarkar & Bhatta., 1386. 1514.

Yields paper pulp.

2. ***Themeda caudata*** (Nees) A. Camus in Lecomte, Fl. Gen de Indo-Chine 7 : 364. 1922 ; Haines, Bot. Bihar & Orissa 3 : 1110.1924 ; Bor. Grass. Burma, Ceylon, India & Pak. 250. 1960 ; *Anthistiria caudata* Nees in Hook. et Arn., Bot. Beechey Voy. 245. 1838. *A. gigantea* Cav. ssp. *caudata* (Nees) Hack. in DC., Monogr. Phan. 6 : 676. 1889. Hook. f., Fl. Brit. India 7 : 217. 1896. p.p.

Tall perennials, to 4 m high. Panicles drooping, to 80 cm long ; involucrel spikelets 1.0–1.5 cm long.

Common near Gobardhana. N.E. India, Burma. October–December. Sarkar & Bhatta., 1502.

Yields paper pulp.

3. ***Themeda laxa*** (Anderss.) A. Camus in Bull. Mus. Hist. Nat. Paris 26 : 423. 1920 ; Haines, Bot. Bihar & Orissa 3 : 1099.1924 ; Bor, Grass. Burma, Ceylon, India & Pak. 251. 1960 ; *Anthistiria laxa* Anderss. in Nov. Act. Sci. Upsal. ser. 3, 2 : 453. 1856 ; Hook. f., Fl. Brit. India 7 : 213. 1896.

Tufted perennials, to 1.25 m high. Panicles loose, leafy ; involucrel spikelets less than 0.6 cm long, glumes strigose ; awns to 3.5 cm long.

Along forest margins. Eastern Himalaya, M. P. October–December. Sarkar & Bhatta., 1278.

## 62. THYSANOLAENA Nees

***Thysanolaena latifolia*** (Roxb. ex Hornem.) Honda, J. Fac. Sci. Imp. Univ. Tokyo III Bot., 3:312; Veldkamp & Winia, Blumea 35(2):451.1991; *T. maxima* (Roxb.) O. Kuntze, Rev. Pl. 2 : 794. 1891 ; Bor, Grass. Burma, Ceylon, India & Pak. 650. 1960 ; *T. agrostis* Nees in Edinb. New Phil. J. 18 : 180. 1835 ; Hook. f., Fl. Brit. India 7 : 61. 1896 ; Haines, Bot. Bihar & Orissa 3 : 1027.1924.

Culms 1.5–3.5 m high. Leaves lanceolate, subamplexicaul, 30–50 × 3–6 cm. Panicles 30–60 cm long Spikelets 0.1–0.18 cm long ; glumes hyaline ; upper lemma ciliate–margined.

Common in the northern part, abundant in the sandstone hills. Throughout India. January – May. PHOOL JHARU. Sarkar & Bhatta., 999, 1455.

Inflorescences used as brooms.

Note : Under Art. 33.3. Honda may be regarded as the author of this new combination. —Bhatta.

63. *TRAGUS* Halleer, *nom. cons.*

*Tragus roxburghii* Panigrahi in Kew. Bull. 29 : 495. 1974. *Lappago biflora* sensu Roxb., Fl. Indica 1 : 284. 1820, quoad descript. excl. typo. *Tragus biflorus* auct. pl. non Schult., Syst. Veg. Mant. 2 : 205. 1824, quoted descript., excl. typo. ; Bor, Grass. Burma Ceylon India & Pak. 683. 1960. *T. racemosus* auct. pl. Hook. f., Fl. Brit. India 7 : 97. 1896. Haines, Bot. Bihar & Orissa 3 : 893. 1924; non. (L.) All., 1785.

Culms to 15 cm long. Leaves linear – lanceolate, to 10 cm long. Spikelets in pairs ; lower glumes armed with hooked spines ; upper glumes smooth.

In exposed grounds. S. E. Asia and E. Africa. July – September. Sarkar & Bhatta., 782.

Notes : Unfortunately, Roxburgh cited *Phalaris muricata* Forssk. (1775) as a synonym ; consequently, *Lappaga biflora* became a superfluous name.

64. *TRIPSACUM* L.

*Tripsacum laxum* Nash in N. Am. Fl. 17 : 81. 1909 ; Bor, Grass. Burma, Ceylon, India & Pak. 268. 1960.

Tall monoecious shrubs. Pistillate spikelets enclosed in a structure partly derived from the hardened lower glume and chiefly from the broad, thickened internode ; staminate and pistillate spikelets in the same spike.

Culms to 4.5 m long. Leaves 5–9 cm broad. Inflorescence very lax ; male racemes slender, flexuous ; male spikelets to 0.4 cm long.

Cultivated as fodder. Mexico, S. America. GAMMA, GOMA. Sarkar & Bhatta., 1579.

65. *TRITICUM* L.

*Triticum aestivum* L., Sp. Pl. 85. 1753 ; Bor, Grass. Burma, Ceylon, India & Pak. 679. 1960.

Annual herbs. Spikelets more than 2-flowered ; glumes and lemmas keeled on the back ; grain free between lemma and palea.

Spikes long, more or less loose, somewhat dorsally compressed, to 10 cm long ; penduncle slender ; grains 0.6 × 0.3 cm.

Widely cultivated. GEHUN. Sarkar & Bhatta., 450, 764.

Note : Tokyo code 329.1994. Typus : Herb. Clifford : 24, *Triticum* No. 3. (BM). *nom. specifica cons.* —Bhatta.

## 66. VETIVERIA Lem.-Lisanc.

*Vetiveria zizanioides* (L.) Nash in Small, Fl. South-East U.S. 67.1903; Stapf in Prain, Fl. Trop. Africa 9 : 1-768. 1917 ; Haines, Bot. Bihar & Orissa 3 : 1079. 1924. Bor, Grass. Barma, Ceylon, India & Pak. 258. 1960. *Phalaris zizanioides* L., Mant. Pl. 2 : 183. 1771. *Andropogon squarrosus* auct. pl.; Hook. f., Fl. Brit. India 7 : 186. 1896 ; Prain, Bengal Pl. 2 : 907 ; non. L.f., 1781.

Culms to 2 m high. Leaves up to 1 m long, 0.4-1 cm broad. Panicle purplish green, 20-25 cm or more long ; racemes to 3 cm long with 10 sessile spikelets ; lower glume spinulose.

Along the banks of rivers, forest margins. Tropics. July-December. KHASKHAS. Sarkar & Bhatta., 803.

Fragrant roots yield an essential oil, also used for basketry and mat making.

## 67. ZEA L.

*Zea mays* L., Sp. Pl. 971. 1753; Bor, Grass. Burma, Ceylon, India & Pak. 270. 1960 ; Haines, Bot. Bihar & Orissa 3: 1113.1924.

Cultivated for its grains. A native of America. MAKAI. Sarkar & Bhatta., 998.

Leaves and culms used as a fodder

## CXXXIII. TYPHACEAE

## TYPHA L.

- |  |     |                          |
|--|-----|--------------------------|
| 1a. Leaves semicylindric above the sheath ;<br>pollen simple | ... | 1. <i>T. angustata</i>   |
| 1b. Leaves 3-gonous above the sheath ;<br>pollen 4-globate   | ... | 2. <i>T. elephantina</i> |

1. *Typha angustata* Chaub. & Bory et al., Exp. Sc. Moree Bot. 2, 1 : 338. 1832; Hook. f., Fl. Brit. India 6 : 489. 1893 ; Haines, Bot. Bihar & Orissa 3 : 918.1924; Gandhi in Sald. & Nicol., Fl. Hassan Dt. 760. 1976. *T. angustifolia* auct. non L., 1753. Karthi. & Kumar, Fl. Yavatmal Dt. 251. 1993.

Stems to 2.5 m. Leaves flattened at apex, 1.4–1.7 cm × 0.5–1.1 cm. Interval between male and female spikes variable. Pistillodes clavate-tipped.

Common in the marshes. India. May–June. PATER. Sarkar & Bhatta., 429.

Leaves used as fodder, as thatching materials, or for making mats and screens. Silky florets used for stuffing.

2. *Typha elephantina* Roxb., Fl. Indica 3 : 566. 1820 ; Hook. f., Fl. Brit. India 6 : 489. 1893 ; Haines, Bot. Bihar & Orissa 3 : 917. 1924.

Stems to 2–4 m. Leaves 1.5 – 2.5 m × 1.5 – 2.5 cm. Female spikes shorter than the male spike.

Common in marshes, road-side ditches, nalas etc. India, Burma, N. America. July–September. HOGLA. Sarkar & Bhatta., 430.

Uses same as the previous.

#### CXXXIV. BROMELIACEAE

##### ANANAS Mill.

*Ananas comosus* (L.) Merrill, Interpr. Herb. Amb. 133. 1917; Rao, Fl. Goa, Diu, Daman 2: 429. 1986. *Bromelia comosa* L. in Stickman, Herb. Amb. 21. 1754. *Ananas sativus* Schult. f., Syst. 7.1283.1830. Haines, Bot. Bihar & Orissa 1164.1924.

Leaves long, spinous-serrate. Flowers in terminal dense spike. Sepals 3. Petal 3. Stamens 6. Carpels 3. Ovary 3-celled, inferior. Fruit fleshy, multiple.

Cultivated for its edible fruits. Native of Tropical America. ANANNAS/ANARAS. Sarkar 849.

#### CXXXV. MUSACEAE

##### MUSA L.

*Musa balbisiana* Colla, Mem. Gen. Musa 56. 1820 ; Hara et al. Enum. Fl. Pl. Nepal 1 : 63. 1978. *M. sapientum* auct. non L. ; Hook. f., Fl. Brit. India 6 : 262. 1892 p.p. ; Haines op. cit. 1177.

Pseudostem 3m or more long. Fruit sub-cylindric, 3-angled, fleshy.

Wild in the ravines at the Someswar Hills. Commonly cultivated ~~banana~~.

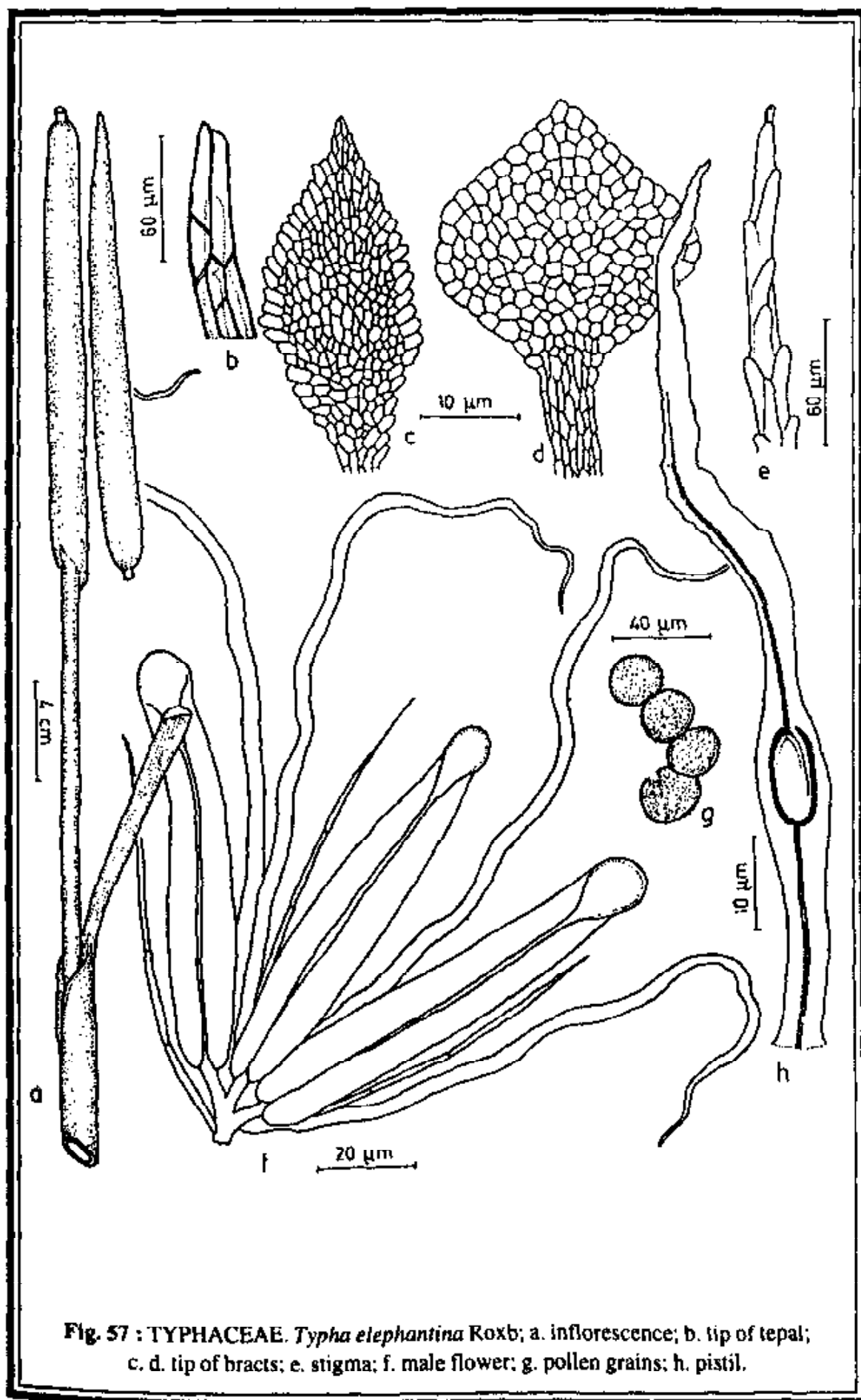


Fig. 57 : TYPHACEAE. *Typha elephantina* Roxb; a. inflorescence; b. tip of tepal; c. d. tip of bracts; e. stigma; f. male flower; g. pollen grains; h. pistil.

*Musa x paradisiaca* L., is a sterile triploid that produces no seeds. Sarkar & Bhatta., 1441.

### CXXXVI. ZINGIBERACEAE

- |   |              |
|---|--------------|
| 1a. Inflorescence on separate leafless shoot. ...                           | 2            |
| 1b. Inflorescence terminal on the leafy shoot. ...                          | 3            |
| 2a. Anther connective prolonged into a beak ;<br>corolla tube cylindric ... | 4. ZINGIBER  |
| 2b. Anther connective truncate, crested ;<br>corolla tube funnel-shaped ... | 1. CURCUMA   |
| 3a. Aerial stem less than 1 m tall ; ovary 1-locular ...                    | 2. GLOBBIA   |
| 3b. Aerial stem above 1 m tall ; ovary 3 - locular ...                      | 3. HEDYCHIUM |

#### 1. CURCUMA L.

- |   |                       |
|---|-----------------------|
| 1a. Rhizome deep orange-yellow ...            | 2. <i>C. longa</i>    |
| 1b. Rhizome pale-yellow or straw coloured ... | 2                     |
| 2a. Coma bracts whitish green ...             | 1. <i>C. amada</i>    |
| 2b. Coma bracts scarlet red ...               | 3. <i>C. zedoaria</i> |

1. *Curcuma amada* Roxb., in *Asiat. Res.* 11 : 341. 1810 ; Vajravelu, *Fl. Palghat Dt.* 499. 1990; Haines, *Bot. Bihar & Orissa*, 1185, 1186, 1187. 1924.

Rhizome aromatic. Leaves oblong - elliptic. Coma bracts whitish green.

Aromatic rhizomes are used in the preparation of "chutney" AMADA, AMAHALDI. Sarkar & Bhatta., 293.

2. *Curcuma longa* L. *Sp. Pl.* 2. 1753. *sensu lato*; Baker in *Hook. f., Fl. Brit. India* 6 : 214. 1890 ; Haines, *Bot. Bihar & Orissa*, 3: 1186. 1924 ; Burt in *Notes, Royal Bot. Gar. Edin.* 35 : 212. 1976. *Curcuma domestica* (Medik) Val. in *Bull. Jard. Bot. Butzg. "Ser. 2"*. 27 : 31. 1918; Singh et al. *Dic. Econ. Pl. India*, J CAR 62.1983.

Rhizome aromatic. Bracts white.

Cultivated. Rhizomes used as a spice. HALDI. Sarkar & Bhatta., 1547.

3. *Curcuma zedoaria* (Christm.) Rosc. in Trans. Linn. Soc. 8 : 354. 1807 et Monandr. Pl. t. 109. 1825; Baker in Hook. f., Fl. Brit. India 6 : 210. 1890 ; Prain, Bengal Pl. 2 : 783 ; Haines, Bot. Bihar & Orissa 3 : 1185.1924. *Amomum zedoaria* Christm. in Christm. & Panzer, Linn., Pflanzensyst. 5 : 12. 1779.

Rhizome faintly yellow in colour, stem to 50 cm, glabrous. Peduncles 8–20 cm long. Spikes 8–18 cm long ; lower flowering bracts green. Coma bracts scarlet red.

Occasional in the forest floor. Fl. September – October ; Fr. : January – February. SHUTEE/KAKHURA. Sarkar & Bhatta., 981.

## 2. GLOBBA L.

- 1a. Bracts persistent ; anthers with a bifid wing  
on either side ... 1. *G. bulbifera*
- 1b. Bracts deciduous ; anthers not winged ... 2. *G. racemosa*

1. *Globba bulbifera* Roxb. in Asiat. Res. 11. 358. 1810 ; Baker in Hook. f., Fl. Brit. India 6 : 206. 1890 ; Haines, Bot. Bihar & Orissa 3 : 1180.1924. Kulkarni, Fl. Sindhudurg 444. 1988.

Rhizomatous herbs, to 50 cm high. Leaves elliptic – lanceolate or oblong, 7–25 × 3–8 cm. Panicles 6–18 cm long; bracts foliaceous ; lower bracts enclosing globose–ellipsoid bulbil Flowers orange yellow, to 3 cm long.

Common in the Sal forests. Indomalesia. September – October. Sarkar & Bhatta., 1573.

Note : Many authors treated it under *Globba marantina* L. (1771).

2. *Globba racemosa* Smith, Exot. Bot. 2 : 115.t. 117. 1804 ; Baker in Hook. f., Fl. Brit. India 6 : 201. 1890 ; Haines, Bot. Bihar & Orissa 3 : 1179.1924.

Herbs, to 80 cm high. Leaves oblong – lanceolate, 8–30 × 3–9 cm pubescent beneath. Panicles 5–20 cm long ; bracts 10–15 cm long. Flower to 3 cm long.

Occasional in the Sal forests. India. August – September. Sarkar & Bhatta., 1488.

## 3. HEDYCHIUM Koenig

- 1a. Bracts broad ; stamen not much  
exceeding the lip ... 1. *H. coronarium*
- 1b. Bracts narrow ; stamen far exceeding the lip ... 2. *H. thyrsiforme*

1. *Hedychium coronarium* Koenig in Retz. Obs. 3 : 73. 1783 ; Baker in Hook.f., Fl. Brit. India 6 : 225. 1892 ; Haines, Bot. Bihar & Orissa 3 : 1189.1924.

Aerial branches to 1 m long. Leaves lanceolate, to 30–45 cm long. Flowers white, fragrant, to 8 cm across. Capsule to 2 cm long.

Common in shady places near ravines. India. July – November. DOOLAL-CHAMPA, Sarkar & Bhatta. 1574.

2. *Hedychium thyrsiforme* Buch-Ham.ex Sm. in Rees, Cyclop, 17 (4), 1819; Baker in Hook. f., Fl. Brit. India 6 : 230. 1890 ; Haines, Bot. Bihar & Orissa 3 : 1189.1924.

Stems inclined, 1–2 m high. Leaves oblong or broadly lanceolate, 30–45 cm × 6.5–11 cm. Flowers white. Capsule orange–red.

Common in gregarious patches near streams. Tropics. Fr. : December. Sarkar & Bhatta., 1405.

#### 4. ZINGIBER Mill., *nom. cons.*

- |   |     |                         |
|---|-----|-------------------------|
| 1a. Spike terminating the leafy stem                  | ... | 1. <i>Z. capitatum</i>  |
| 1b. Spikes radical or from the base of the leafy stem | ... | 2. <i>Z. officinale</i> |

1. *Zingiber capitatum* Roxb., in Asiat. Res. 11 : 348. 1810 ; Baker in Hook. f., Fl. Brit. India 6 : 248. 1892 ; Haines, Bot. Bihar & Orissa 3 : 1195.1924.

Rhizomes faintly aromatic. Leaves linear–lanceolate, 10–35 cm long, pubescent beneath. Spikes 8–13 cm long ; bracts green with red margins. Flower pale yellow ; lip obovate, to 2 cm long, yellow. Anther with a long incurved beak.

Moist forest floor. Tropics. August–October. JUNGLEE-ADA. Sarkar 1753.

2. *Zingiber officinale* Rosc. in Trans. Linn. Soc. 8 : 348. 1807; Haines, Bot. Bihar & Orissa 3 : 1193.1924.

Rhizomes horizontal, aromatic. Leaves linear–lanceolate. Flowers greenish.

Cultivated throughout the district. Rhizomes used as spice. ADRAK, ADA. Sarkar & Bhatta., 1834.

## CXXXVII. COSTACEAE

## COSTUS L.

*Costus speciosus* (Koen.) J.E. Smith in Trans. Linn. Soc. 1 : 249. 1791; Baker in Hook. f., Fl. Brit. India 6 : 249. 1892; Haines, Bot. Bihar & Orissa 3 : 1196.1924; *Banksia speciosa* Koen. in Retz., Obs. Bot. 3 : 75. 1784.

Aerial stem to 1.5 m high. Leaves oblanceolate- obovate, 12-20 × 6-11 cm. Spike to 8 cm long, ovoid ; coma bracts bright red. Corolla pinkish-white ; lip obovate, crumple - margined ; connective petaloid. Capsule blackish red, to 1.2 cm across. Seeds angular, black, shining.

Occasional in the exposed forest floors and near human habitations in the villages. Indomalesia. August - February. KOOST/KEOO. Sarkar & Bhatta., 932.

## CXXXVIII. CANNACEAE

## CANNA L.

*Canna indica* L., Sp. Pl. 1. 1753 ; Hook. f., Fl. Brit. India 6 : 260. 1892 ; Haines, Bot. Bihar & Orissa. 3 : 1199.1924. *C. orientalis* Roscoe, Monandr. Pl. t. 12. 1824.

Erect stems to 2 m tall. Leaves shining, 35-60 cm × 17-31 cm. Sepals reddish. Petals and staminodes bright red. Seeds to 0.5 cm in diam.

Cultivated and escape. Pantropical. All seasons. KALABATI/SURBO-JUYA Sarkar & Bhatta., 591.

Different cultivated varieties show wide range in colours.

Note : I have introduced ~~Canna~~ *Canna coccinea* Mill. from the Jardin Botanico Nacional de Cuba at the ~~Burdwan~~ Burdwan University Botanic garden. -Bhatta.

## CXXXIX. PONTEDERIACEAE

- |   |     |                      |
|---|-----|----------------------|
| 1a. Leafblade sub-orbicular ; tepals almost free ; stamens at the base of the tepals        | ... | 1. <i>Eichhornia</i> |
| 1b. Leafblade sagittate or lanceolate ; tepals forming a distinct tube. Stamens epipetalous | ... | 2. <i>Monochoria</i> |

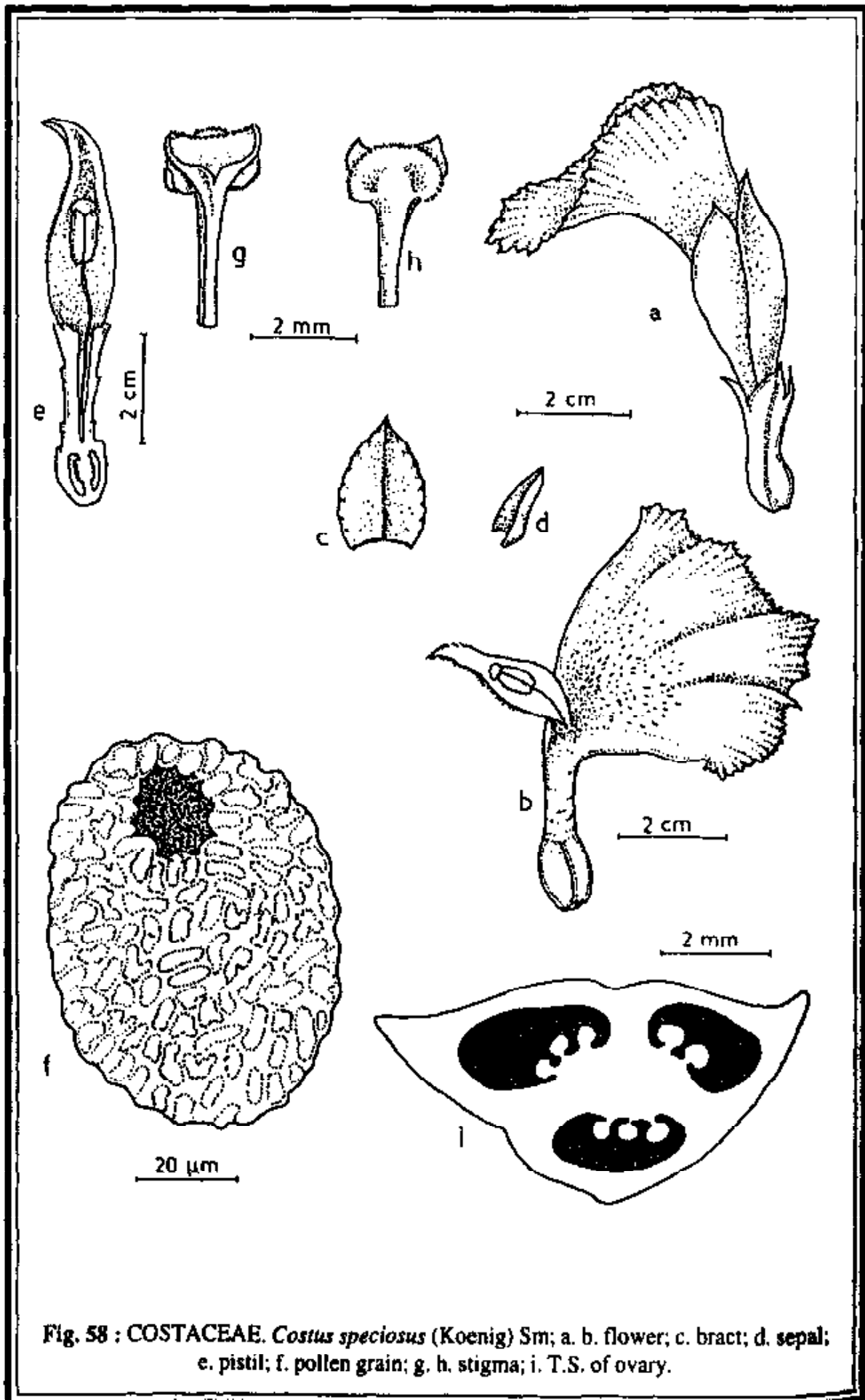


Fig. 58 : COSTACEAE. *Costus speciosus* (Koenig) Sm; a. b. flower; c. bract; d. sepal; e. pistil; f. pollen grain; g. h. stigma; i. T.S. of ovary.

1. *Eichhornia* Kunth, *nom. cons.*

*Eichhornia crassipes* (Mart.) Solms. in DC., Mon.Phan. 4 : 527. 1883 ; Haines, Bot. Bihar & Orissa 3 : 1151.1924. *Pontederia crassipes* Mart., Nov. Gen.Pl. 9. t. 4. 1823.

Leaves in rosette ; petiole elongated and inflated somewhere in the middle ; lamina broadly ovate– rhomboid. Flowers bluish or pinkish, showy, to 4 cm across.

Very common in the marshes. Neotropical. May–September. KACHURIPANA. Sarkar & Bhatta., 869.

Note : This pantropical aquatic weed multiplies vegetatively and very rapidly and poses a threat in aquaculture.

2. *Monochoria* Presl.

1a. Root–stock creeping ; leaves hastate or sagittate ... 1. *M. hastata*

1b. Root–stock suberect ; leaves ovate–lanceolate ... 2. *M. vaginalis*

1. *Monochoria hastata* (L.) Solms in A.DC., Mon. Phan. 4 : 523. 1883 ; Haines, Bot. Bihar & Orissa 2 : 1150.1922; *Pontederia hastata* L., Sp.Pl. 288.1753. *Monochoria hastaeifolia* Presl, Rel. Haenk. 2 : 128.1835 ; Hook.f., Fl. Brit. India 6 : 362.1892.

Lamina 15–20 × 3–5 cm. Flowers long–peduncled. Tepals blue, persistent, becoming twisted and enclose the capsule. Capsule sub–globose or oblong.

Common in the marshes. Palaeotropics. July– October. Sarkar & Bhatta., 994.

2. *Monochoria vaginalis* (Burm.f.) C. Presl, Rel. Haenk. 2. 128.1827 ; Hook .f., Fl. Brit. India 6 : 363.1892 ; Haines, Bot. Bihar & Orissa. 3 : 1151.1924; *Pontederia vaginalis* Burm. f., Fl. Indica 80.1768. *P.vaginalis* var. *plantaginea* (Roxb.) Solms in DC., Mon. Phan.4. : 524.1883 ; Hook.f., Fl. Brit. Ind. 6 : 363.1892. *P. plantaginea* Roxb., Fl. Indica 2 : 123.1832.

Leafblade 4–6 × 2.5–3.5 cm, petiole to 15 cm long. Tepals blue. Ovary ellipsoid, glandular. Seeds rounded at each end, ribbed, brownish.

Common in the marshes and also in cultivated paddy fields. Palaeotropics. July – November. NOUKA. Sarkar & Bhatta. 857.

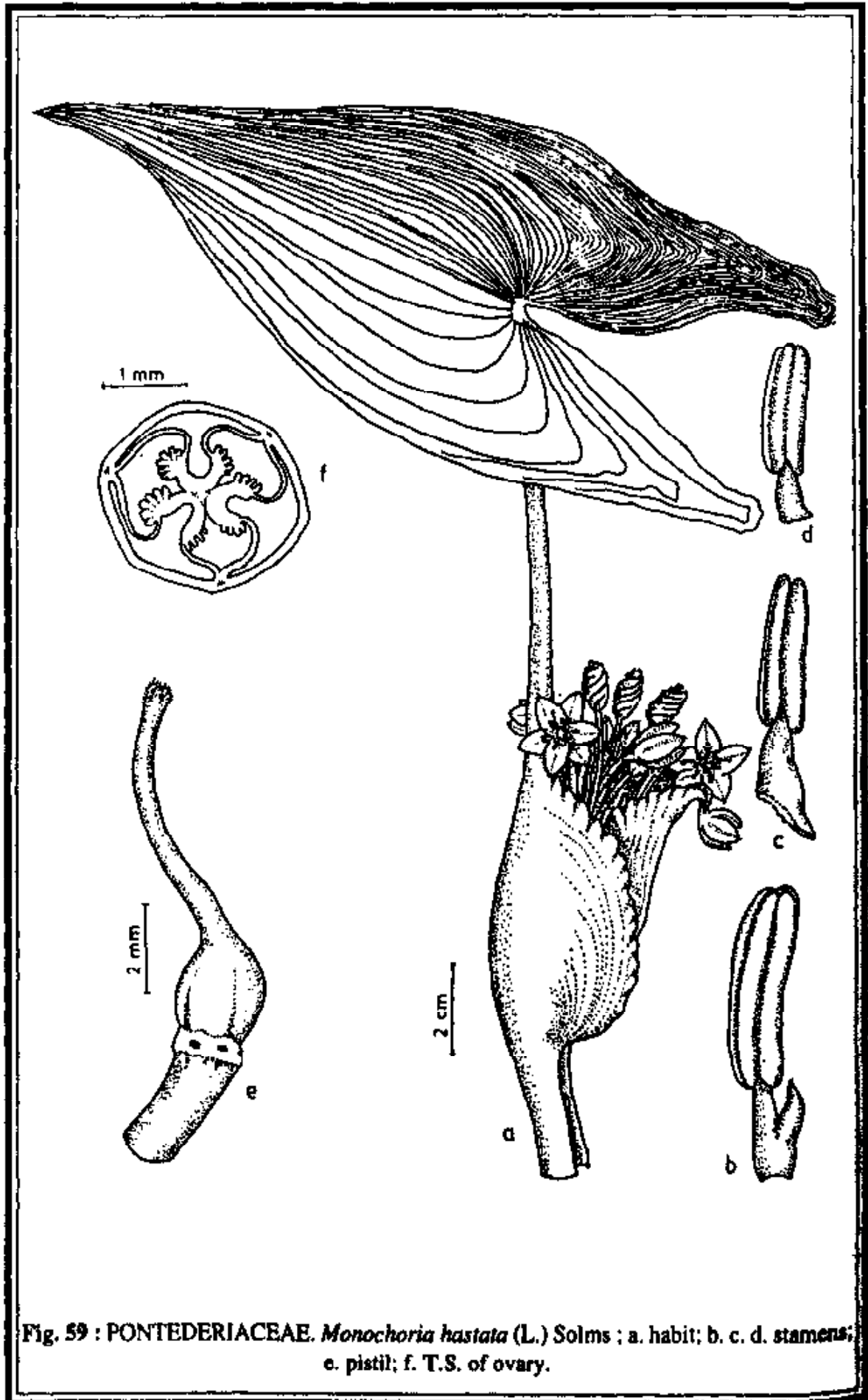


Fig. 59 : PONTEDERIACEAE. *Monochoria hastata* (L.) Solms ; a. habit; b. c. d. stamens; e. pistil; f. T.S. of ovary.

CXL. LILIACEAE

- |  |     |                 |
|--|-----|-----------------|
| 1a. Scandent shrubs ; leaves reduced to needle like cladodes | ... | 1. ASPARAGUS    |
| 1b. Herbs ; leaves not reduced                               | ... | 2               |
| 2a. Leaves ending in tendrils                                | ... | 3. GLORIOSA     |
| 2b. Leaves not as above                                      | ... | 2. CHLOROPHYTUM |

1. ASPARAGUS L.

**Asparagus racemosus** Willd., Sp.Pl. 2 : 152.1799 ; Hook.f., Fl. Brit. India 6 : 316.1892 ; Haines,Bot. Bihar & Orissa 3 : 1137.1924.

Cladodes to 2.5 cm long Flowers white, to 0.45 cm across. Berry to 0.5 cm across.

Very common in the district. Palaeotropics. September – December. SHATAMULI. Sarkar & Bhatta., 1081.

Tuberous roots are used in the preparation of "morobba".

2. CHLOROPHYTUM Ker Gawl.

**Chlorophytum arundinaceum** Baker. J. Linn. Soc. Bot. 15 : 323. 1876 ; Hook. f., Fl. Brit. India 6 : 333. 1892 ; Prain, Bengal Pl. 2 : 810 Year; Haines, Bot. Bihar & Orissa 3 : 1147. 1924.

Leaves oblong – lanceolate, to 70 cm long. Scape to 50 cm high. Flowers white, to 1.8 cm across.

Common along the forest areas, also on the sandstone hills. Tropical India, Buma. March–December. Sarkar & Bhatta., 997,1211,1545.

Roots used as a tonic.

3. GLORIOSA L.

**Gloriosa superba** L., Sp.Pl. 305.1753 ; Hook.f., Fl. Brit. India 6 : 358.1892 ; Haines, Bot. Bihar & Orissa 3 : 1143. 1924.

Upto 3 m long. Leaves ovate– lanceolate, 8–15 cm long, sessile. Flowers showy, to 10 cm across. Tepals show a transition of colour from greenish–yellow to red ; margins crisped.

In open forests. Palaeotropics. July–October. ULATCHANDAL. Sarkar & Bhatta., 848.

Tubers contain colchicine.

### CXLI. AMARYLLIDACEAE

- 1a. Scape many-flowered ; flowers white ... 1. CRINUM  
 1b. Scape 1-flowered ; flowers rose-coloured ... 2. ZEPHYRANTHES

#### 1. CRINUM L.

**Crinum asiaticum** L., Sp. Pl. 292.1753 ; Hook. f., Fl. Brit. India 6 : 280.1892 ; Haines, Bot. Bihar & Orissa 3 : 1157. 1924.

Robust bulbous herbs with an upright caudex. Leaves linear-lanceolate. Perianth tube to 10 cm long ; lobes to 6 cm long.

Cultivated and escape. Tropical India, Sri Lanka, Java. February – June. BURO-KANUR. Sarkar & Bhatta., 845.

#### 2. ZEPHYRANTHES Herb., *nom. cons.*

**Zephyranthes rosea** Lindl. in Bot. Reg. t. 821.1836 ; Haines, Bot. Bihar & Orissa 3 : 1156. 1924.

Leaves linear, to 30 cm long, obtuse at apex. Scape to 25 cm long.

Cultivated and escape. April – August. Sarkar & Bhatta., 846.

### CXLII. HYPOXIDACEAE

#### CURCULIGO Gaertn.

**Curculigo orchioides** Gaertn., Fruct. 1 : 63. t. 16.1788 ; Hook. f., Fl. Brit. India 6 : 278.1892 ; Haines, Bot. Bihar & Orissa 3 : 1162. 1924.

Tubers subcylindric ; roots fleshy. Leaves linear-lanceolate, 10–30 × 1–3 cm. Flowering scape very short. Flowers yellow.

Sal forests. India, Java, August – September. TAL-LOORA, Sarkar & Bhatta. 174.

Apex of leaves give rise to plantlets and provides an effective method of vegetative multiplication.

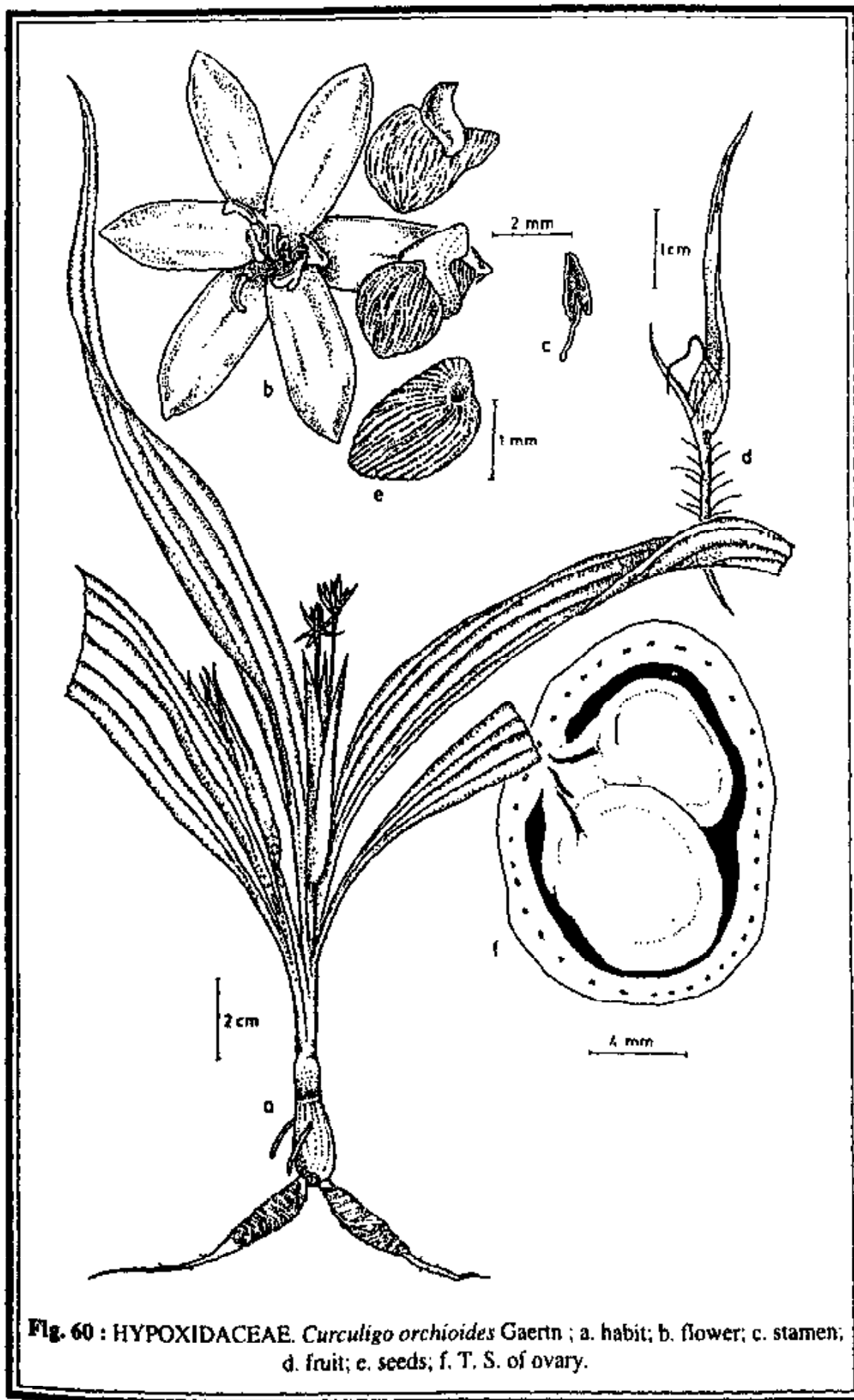


Fig. 60 : HYPOXIDACEAE. *Curculigo orchioides* Gaertn ; a. habit; b. flower; c. stamen; d. fruit; e. seeds; f. T. S. of ovary.

## CXLIII. AGAVACEAE

- |   |     |                |
|---|-----|----------------|
| 1a. Stems underground, rhizomatous  | ... | 3. SANSEVIERIA |
| 1b. Stems conspicuous, upright, branched or unbranched.                   |     | 2              |
| 2a. Stems stout ; leaves thick, fleshy, spine-tipped. ...                 |     | 3              |
| 2b. Stems slender ; leaves thin, midvein prominent ; not spine-tipped     | ... | 2. CORDYLINE   |
| 3a. Leaf-margins spiny ; flowers, small ; stamens exerted                 | ... | 1. AGAVE       |
| 3b. Leaf-margins entire ; flowers large ; stamens included within corolla | ... | 4. YUCCA       |

Note : This family is distinguishable from Liliaceae and Amaryllidaceae by the presence of the following features : root-stock never bulbous ; habit mostly arborescent ; inflorescence never umbelliform (Cronquist, 1981).

## 1. AGAVE L.

**Agave sisalana** Perrine in U.S. Senate Docu. 300 : 36.1838; Engelmann in Trans. Acad. Sc. St. Louis. 3 : 316. 1873 ; Haines, Bot. Bihar & Orissa 3 : 1155. 1924.

Leaves lanceolate, spine-tipped, margins with reflexed spines.

Grown in gardens as an ornamental also used as a boundary plant in cultivated fields. Native of Mexico. Sarkar & Bhatta., 559.

2. CORDYLINE Comm. ex R. Br., *nom. cons.*

**Cordyline terminalis** Kunth, Enum. 5 : 25. 1850 ; Haines, op. cit. 1140; Bailey, Manual Cult. Pl. 242.1948; Karthi. et al., Fl. Indicae Enum., B.S.I., 92. 1989.

Leaves oblong-lanceolate, variously coloured. Flowers pinkish white in drooping panicle of racemes.

Commonly grown in gardens for its coloured leaves. E. Himalayas to China. Sarkar & Bhatta., 532.

3. SANSEVIERIA Thunb., *nom. cons.*

- 1a. Leaves narrowly linear-ensiform, semi-terete,  
channelled above; flowers 1.2 cm long ... 1. *S. roxburghiana*
- 1b. Leaves rather wide-ensiform, flat, not channelled  
above; flowers 2.5 cm long ... 2. *S. trifasciata*

1. *Sansevieria roxburghiana* Schult. & Schult. f., in R & S., Syst. Veg. 7 : 357.1829 ; Haines, Bot. Bihar & Orissa 3 : 1140. 1924.

Leaves pale green with transverse dark green bands. Racemes to 30 cm long. Flowers white or greenish white.

Grown in gardens for its foliages also somewhat naturalized. Native of Sri Lanka. Sarkar 1742.

2. *Sansevieria trifasciata* Hort. ex Prain, Bengal Pl. 2 : 1054. 1903 (792.1963., Repr. ed.) ; Bailey, Manual Cult Pl. 240.1948; Karthi, et al., Fl. Indicae Enum. Monocot., B.S.I., 101.1989.

Leaves linear – lanceolate or narrow long – lanceolate, longitudinally striped golden– yellow, to 50 cm long. Flowers white.

Grown as a garden ornamental. Native of Belgian Congo. Sarkar & Bhatta., 751.

4. YUCCA L.

*Yucca gloriosa* L., Sp. Pl. 319.1753 ; Haines, Bot. Bihar & Orissa 3 : 1141.1924 ; Singh et al., Dict. Econ. Pl. India., ICAR. 247.1983.

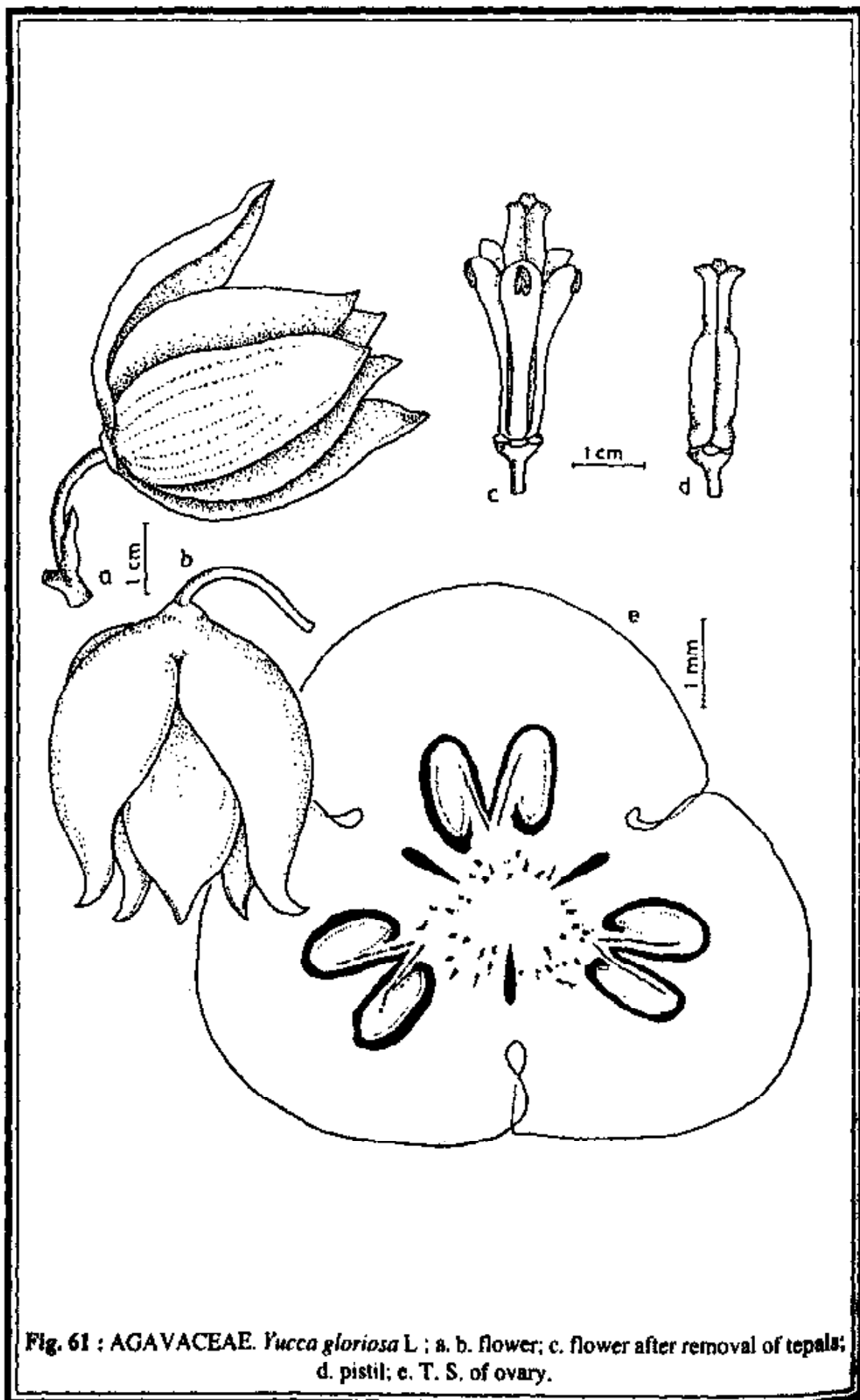
Stems stout. Leaves dark green, 30–50 × 4–5 cm. Flowers white, showy in terminal panicle of racemes. Capsule drooping.

Grown as a garden ornamental. Native of N. America. Sarkar & Bhatta., 590.

CXLIV. SMILACACEAE

SMILAX L.

- 1a. Unarmed climbers ; umbels solitary ... 1. *S. lanceaefolia*
- 1b. Armed climbers ; umbels panicled. ... 2



- 2a. Umbels alternate on a common peduncle ;  
leaf sheath not auricled ... 2. *S. ovalifolia*
- 2b. Umbels whorled ; leaf sheath auricled ... 3. *S. perfoliata*

1. ***Smilax lanceaefolia*** Roxb., Fl. Indica 3 : 792.1832 ; Hook. f., Fl. Brit. India 6 : 312.1892 ; Haines, Bot. Bihar & Orissa 3 : 1135.1924.

Perennial dioecious climbers arising from large tuberous-Thickened, starchy rhizomes. Roots mycorrhizal, without root-hairs. Branches round, polished. Leaves alternate, elliptic-oblong, to 7.6 × 3.5 cm, three costate. Umbels peduncled. Flowers unisexual, trimerous (staminodes in female flower 3). Fruit a berry, to 0.75 cm in diameter.

Sandstone hills. India June – November. GOOTEA-SHOOK-CHINA. Sarkar & Bhatta., 1414.

Juice of tuberous roots given in rheumatic pains.

2. ***Smilax ovalifolia*** Roxb., Fl. Indica. 3 : 794.1832 ; Koyama, Fl. East. Himalaya 417.1966. *S. macrophylla* Roxb., Fl. Indica 3 : 793.1832 ; Hook. f., Fl. Brit. India 6 : 310.1892 ; Haines, Bot. Bihar & Orissa 3 : 1135. 1924. non Willd., 1805.

Stems striate, armed with prickles. Leaves broadly – ovate or suborbicular, to 20 cm long five to nine costate. Umbels 2–5. Flower small, greenish yellow.

Common. India, Burma. April–January. KUMARIKA. Sarkar & Bhatta., 214.

Roots used as a substitute for Sarsaparilla in the treatment of venereal disease, gonorrhoea, rheumatism and pains.

3. ***Smilax perfoliata*** Lour., Fl. Cochinch. 622.1790 ; Koyama, Fl. East. Himalaya 417.1966 ; *S. prolifera* Wall. ex Roxb., Fl. Indica 3 : 795.1832 ; Hook. f., Fl. Brit. India 6 : 312.1892 ; Haines, Bot. Bihar & Orissa 3 : 1136.1924.

Stout climbers. Stems terete, armed with prickles. Leaves oblong–ovate or orbicular, to 18 × 10 cm, five costate. Umbels 10 or many.

Rare in the Ramnagar hills. India, Sri Lanka, Burma.

Uses as the previous and grown as an ornamental plant.

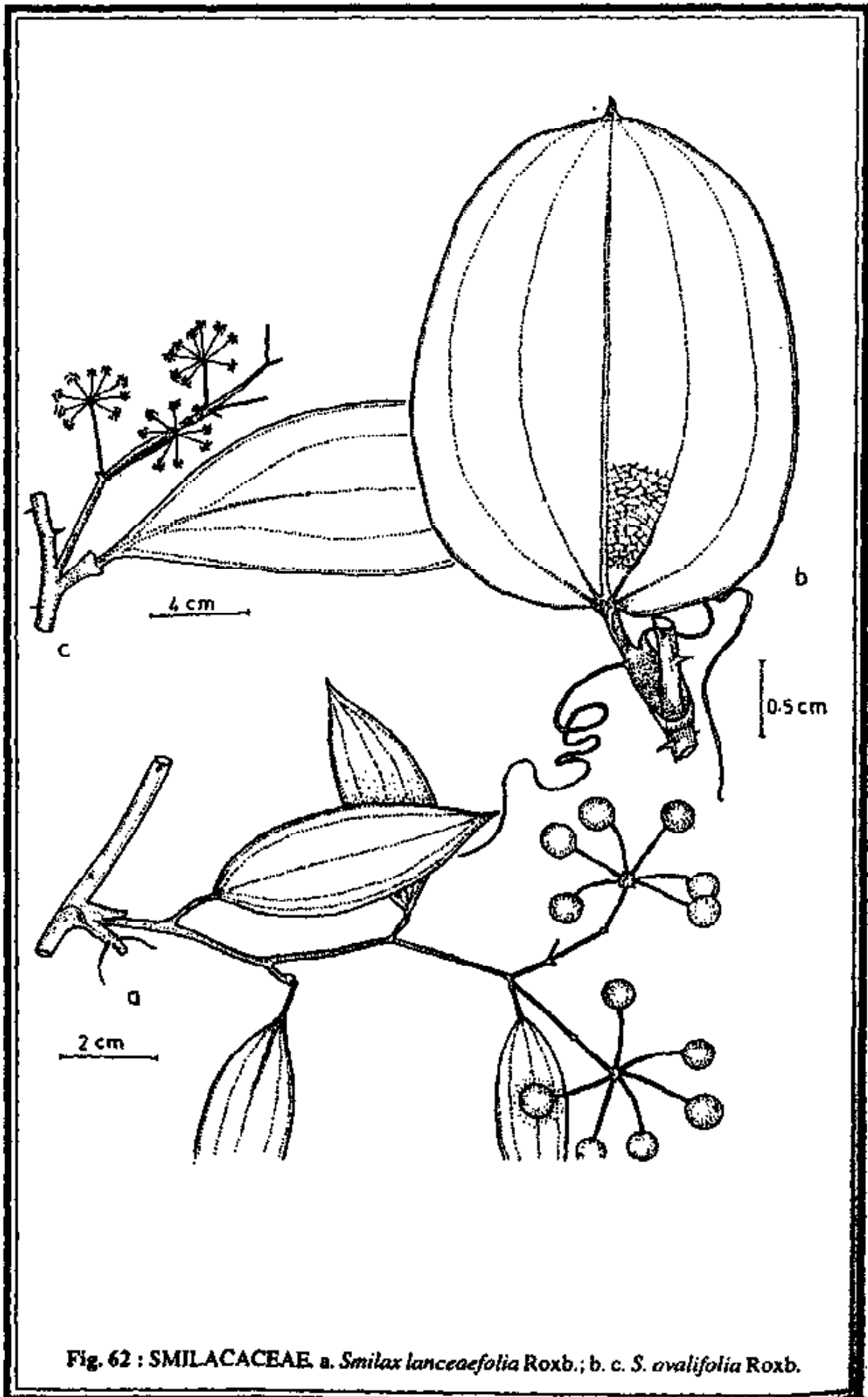


Fig. 62 : SMILACACEAE. a. *Smilax lanceaeifolia* Roxb.; b. c. *S. ovalifolia* Roxb.

## CXLV. DIOSCOREACEAE

## DIOSCOREA L.

1a. Leaves simple.	...	2
1b. Leaves palmately compound.	...	6
2a. Stems twining to the left	...	2. <i>D. bulbifera</i>
2b. Stems twining to the right	...	3
3a. Plants hairy	...	6. <i>D. pubera</i>
3b. Plants glabrous throughout	...	4
4a. Stems strongly 4-angled, somewhat winged	...	1. <i>D. alata</i>
4b. Stems not as above.	...	5
5a. Male inflorescence shorter than the leaf ; flowers distant	...	7. <i>D. wallichii</i>
5b. Male inflorescence longer than the leaf ; flowers dense	...	3. <i>D. glabra</i>
6a. Middle leaflet 3-costate ; stamens all fertile	...	4. <i>D. hispida</i>
6b. Middle leaflet 1-costate ; fertile stamens 3	...	5. <i>D. pentaphylla</i>

1. *Dioscorea alata* L., Sp. Pl. 1033.1753 ; Hook.; f., Fl. Brit. India 6 : 296.1892 ; Burkill in Steenis, Fl. Males. I, 4 : 330.1951 ; Haines, Bot. Bihar & Orissa 3 : 1171.1924.

Stout climber ; stems sometimes with scattered prickles. Leaves usually opposite, very broadly cordata, 12.5 × 8.5 cm, glabrous, 9 – costate, upper leaves smaller & narrower. Large, globose bulbils present.

Cultivated for its edible tubers. Tubers contain 21% starch and can be ground into a meal ; also used as a vegetable. Considered anthelmintic ; also used in leprosy and piles.

Flowers rare. KHAM ALU. Sarkar & Bhatta., 469. White Yam.

2. *Dioscorea bulbifera* L., Sp. Pl. 1033.1753 ; Hook. f. op. cit. 296. Haines, Bot. Bihar & Orissa 3 : 1172.1924; *D. sativa* auct. non L. 1753 ; Hook. f., Fl. Brit. India 6 : 295.1892 p.p.

Stout climber, tuber solitary, subsessile, globose – pyriform. Leaves alternate, broadly ovate, cordate, 9–14.4 × 7.3–11.8 cm. Male flowers in slender, axillary and paniced spikes. Tepals yellowish green. Female flowering axes to 30 cm long. Capsule broadly oblong. 2–2.2 × 1 cm. Seeds winged, brownish.

Common. India, Sri Lanka. August – December. Sarkar & Bhatta., 1504, 1550. Potato yam.

Tubers acrid, eaten as a vegetable in times of scarcity.

3. *Dioscorea glabra* Roxb., Fl. Indica 3 : 804.1832 ; Hook. f., Fl. Brit. India 6 : 294.1892 ; Haines, Bot. Bihar & Orissa 3 : 1168.1924.

Tubers cylindrical. Leaves elliptic–ovate, 7.7–10 × 3.4–4.6 cm, base rounded or cordate. Male flowering axes slender, to 70 cm long ; male flowers to 0.15 cm across ; tepals ovate–oblong. Female flowering axes short. Capsule retuse at both ends, 1.5–1.8 × 1.4–2 cm. Seeds winged.

Common in the forest areas. Indomalesia. September – March. PITALU. Sarkar & Bhatta., 1445.

Tubers edible, but not much relished as they become gluey on cooking.

4. *Dioscorea hispida* Dennst., Schleuss. Hort.Malab., 15.1818 ; Burkill in Fl. Males 4 : 318.1951. *D. daemonia* Roxb, Fl. Indica 3 : 805.1832 ; Hook. f., Fl. Brit. India 6 : 289.1892 ; Haines, Bot. Bihar & Orissa 3:1173.1924; *D. triphylla* L. var. *daemonia* Prain & Burkill in J. As. Soc. Beng. (N.S.) 10 : 26.1914.

Stems deciduously golden hairy, prickly ; tubers subglobose. Leaves 3–foliolate ; middle leaflet elliptic–oblong or obovate, 10–20 × 8–12 cm ; lateral leaflets smaller. Male flowers in dense spikes, to 20 cm long. Female spikes to 30 cm long. Capsule oblong.

Common in the wet forest areas and lower part of the sandstone hills. South and South East Asia. June–September. Sarkar & Bhatta., 1084.1506.

Tubers acrid and poisonous

5. *Dioscorea pentaphylla* L., Sp. Pl. 1032.1753. ; Hook.f., Fl. Brit. India 6 : 289.1892 ; Haines, Bot. Bihar & Orissa 3 : 1173.1924; *D. triphylla* L., Sp. Pl. 1032.1753.



Fig. 63 : DIOSCOREACEAE. *Dioscorea bulbifera* L. ; a. male plant; b. male flowers; c. top view of the same; d. female plant; e. female flower; f. the same after removal of tepals; g. T.S. of ovary; h. L.S. of ovary.

Bulbils abundant, globose. Leaves 3–5-foliolate, leaflets elliptic-oblongate, 3–8 × 0.8–3.4 cm ; middle leaflet larger than the laterals. Male spikes to 4 cm long. Female spikes 15–25 cm long. Capsule ascending, pubescent when young, 2 × 0.6 cm.

Common in the villages. Tropical Africa to Malasia. September – December. KANTA ALU. Sarkar & Bhatta., 1473.

Tubers edible. Flowers consumed as a vegetable.

6. *Dioscorea pubera* Bl., Enum. Pl. Java 1 : 21.1827. *D. anguina* Roxb., Fl. Indica 3 : 803.1832 ; Hook.f., Fl. Brit. India 6 : 293.1892 ; Haines, Bot. Bihar & Orissa 3 : 1167.1924.

Stems pubescent when young ; tubers clavate, long-stalked. Leaves ovate-cordate, 11.5–15.6 × 10.9–13.6 cm, pulvinus lilac. Male spikes dense-flowered. Capsule oblong, to 1.5 cm long.

Common in the moist forest areas. Assam, Sri Lanka, Burma, Malasia. September–January. KOOKOOR ALU. Sarkar & Bhatta., 1472.

Tubers edible.

7. *Dioscorea wallichii* Hook.f., Fl. Brit. India 6 : 295, 1892 ; Haines, Bot. Bihar & Orissa 3 : 1170.1924. *D. aculeata* L., Sp. Pl. 1033.1753 *p.p.*, Vajravelu, Fl. Palghat Dt. 509.1990.

Tubers cylindrical. Leaves sub-coriaceous, ovate-orbicular, cordate, 7–9.5 × 3.3–5 cm, 7–9-costate. Male spike to 2.5 cm long. Female spikes usually to 6.5 cm long. Capsule stramineous, to 2 cm long.

Occasional. India to Burma, October–February. MOU ALU. Sarkar & Bhatta., 1282.

Tubers edible.

#### CXLVI. ORCHIDACEAE

1a. Plants epiphytic.	...	2
1b. Plants not epiphytic.	...	3
2a. Leaves with deep apical notch ; flowers in dense racemes	...	6. RHYNCHOSTYLIS
2b. Leaves not as above ; flowers in lax racemes	...	7. VANDA

3a. Leaf solitary	...	4. NERVILIA
3b. Leaves more than one.	...	4
4a. Spur to 10 cm long	...	5. PECTELIS
4b. Spur when present, small.	...	5
5a. Scape leaf-less ; tuberous herbs.	...	6
5b. Scape with leaves ; tubers absent.	...	7
6a. Labellum obscurely 3-lobed, cymbiform	...	3. GEODORUM
6b. Labellum distinctly 3-lobed, saccate or spurred at base	...	2. EULOPHIA
7a. Stigma 1 ; leaves plicate	...	1. EPIPACTIS
7b. Stigma 2 ; leaves not plicate	...	8. ZEUXINE

1. EPIPACTIS Zinn, *nom. cons.*

*Epipactis veratrifolia* Boiss. et Hohen. in Diagn. Ser. 1, 131 : 11.1853; Hunt in Kew Bull. 24 : 76. 1970. *E. consimilis* Wall. ex Hook. f., Fl. Brit. India 6 : 126 .1890 ; non D.Don, 1825.

Stems to 70 cm high. Leaves lanceolate, 20 × 4 cm, acuminate, sessile. Bracts foliaceous. Flowers to 2.5 cm across, deep lavender-coloured or greenish with brown bands.

Sandstone hills, rare. W. Himalaya to Sikkim, China, Burma, Afghanistan, Nilgiri hills. February-March. Sarkar & Bhatta., 1805.

2. EULOPHIA R.Br., *nom. cons.*

*Eulophia graminea* Lindl., Gen. & Sp. Orch.182.1833 ; Hook. f., Fl. Brit. India 6 : 2.1890.

Leaves to 10-20 cm long. Panicle to 60 cm long. Flowers brownish green. Grasslands. India. October. Sarkar & Bhatta., 2122.

3. GEODORUM Jacks.

*Geodorum densiflorum* (Lamk.) Schltr. in Fedde, Repert. Beih. 4 : 259.1929 ; Sant & Kapadia, Orch. Bombay 203.1966. *Limqorum densiflorum*

Lamk., Ency. 3 : 516.1791-92. *Geodorum purpureum* R.Br. in Ait. Hort. Kew. ed. 2, 5 : 207.1813 ; Hook. f., Fl. Brit. India 6 : 16.1890. *G. dilatatum* sensu Hook.f., Fl. Brit. India 6 : 17.1890 ; Haines, Bot. Bihar & Orissa 3 : 1222. 1924. non R. Br., 1813.

Tubers globose, to 3 cm across. Leaves elliptic, 15 - 40 × 4 - 7 cm, base tapering to a long sheath. Racemes to 30 cm long. Flowers pale purple or rose-coloured. Capsule 3-1.5 cm.

In Sal forests. Indomalesia. Fl. : June -July ; Fr. : October. Sarkar & Bhatta., 1563.

#### 4. NERVILIA Comm. ex Gaud., *nom. cons.*

- 1a. Labellum 3-lobed ; scapes many-flowered ... 1. *N. aragoana*  
 1b. Labellum not lobed ; scapes 1-3-flowered ... 2. *N. plicata*

1. *Nervilia aragoana* Gaud. in Fery., Voy. Bot. 422. t. 35.1829 ; Saldanha, Fl. Hassan 837.1976. *Pogonia flabelliformis* Lindley, Gen. Sp. Orch. Pl. : 415.1840 ; Hook. f., Fl. Brit. India 6 : 121.1890 ; Haines, Bot. Bihar & Orissa 3 : 1215. 1924. (Repr. ed. 1961).

Tuber to 2 cm across. Leaves long-petioled, sub-orbicular, to 12 cm long. Flowers to 2.5 cm long.

Shady, moist forest floor. Indomalesia. May - June. Sarkar & Bhatta., 458.

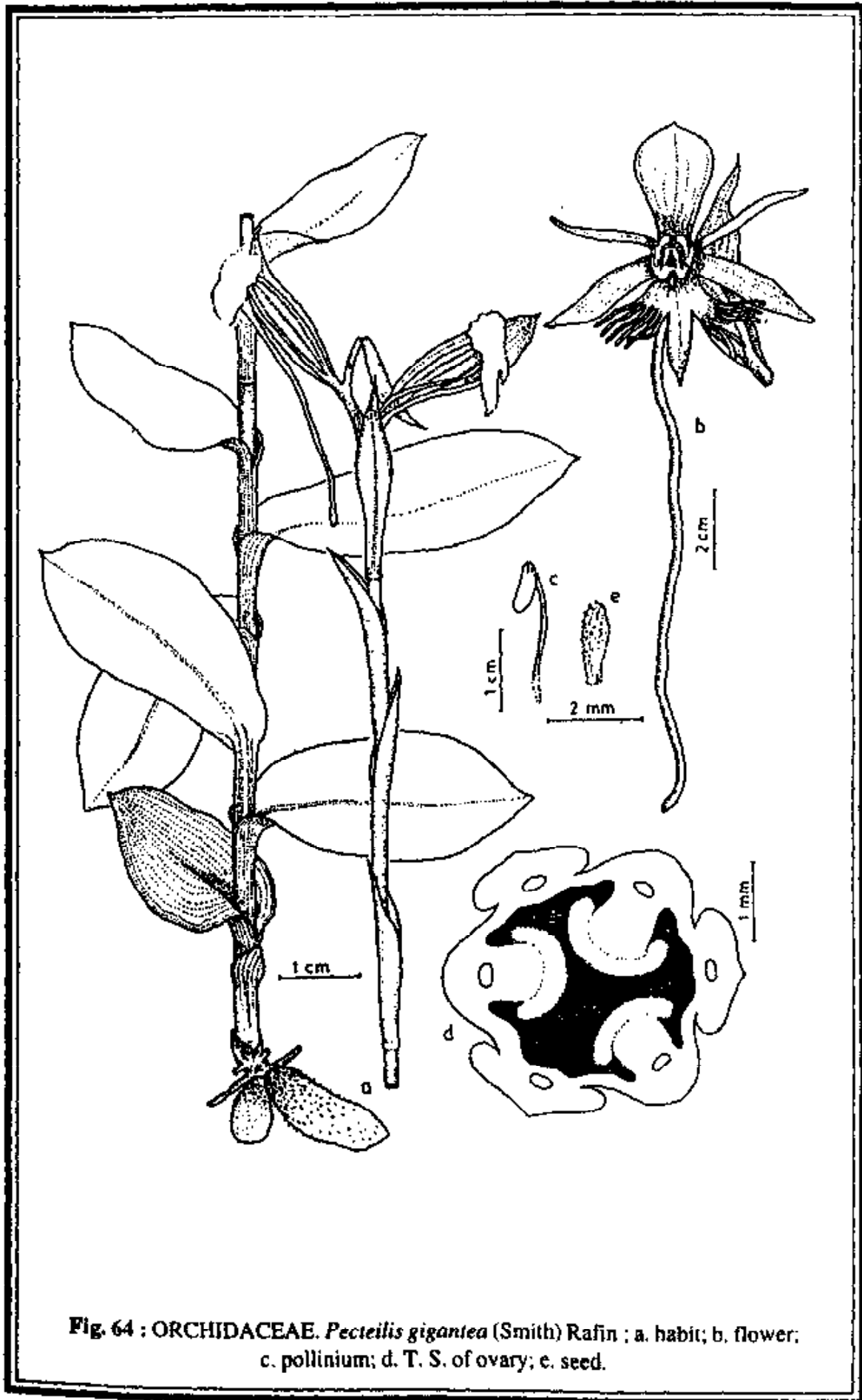
2. *Nervilia plicata* (Andr.) Schltr. in Bot. Jahrb. 45 : 403.1911. *Arethusa plicata* Andr., Bot. Rep. t. 321.1803. *Pogonia plicata* (Andr.) Lindl., Gen. Sp. Orch. 415.1840 ; Hook. f., Fl. Brit. India 6 : 119.1890.

Tuber to 1.5 cm long. Leaves orbicular-ovate, to 10 cm long. Flowers greenish-yellow, to 2.5 cm long.

Shady, moist forest floor. India. May. Sarkar & Bhatta., 1091,1224.

#### 5. PECTEILIS Rafin.

*Pecteilis gigantea* (Smith) Raf. in., Fl. Tell. 2 : 38.1837 ; Seidenf. & Arora in Nord. J. Bot. 2 (1) : 23.1982. *Orchis gigantea* Smith, Exot. Bot. 2 : 79, t. 100. 1805 ; *Habenaria susannae* auct. mult. non(L.) R. Br. 1810 ; Hook. f., Fl. Brit. India 6 : 137,1890 ; Haines, Bot. Bihar & Orissa 3 : 1206. 1924.



**Fig. 64 :** ORCHIDACEAE. *Pecteilis gigantea* (Smith) Rafin ; a. habit; b. flower; c. pollinium; d. T. S. of ovary; e. seed.

Herbs, to 60 cm high. Leaves ovate-oblong, 5-18 × 2-7 cm. Racemes to 20 cm long, 2-6-flowered. Flowers greenish-white. Labellum fimbriate, fan shaped ; spur cylindrical.

Sandstone hills. Indomalesia. September-October. Sarkar & Bhatta., 1237, 1554.

#### 6. RHYNCHOSTYLIS Bl. *emend.* Hassk.

**Rhynchosstylis retusa** (L.) Bl., Bijdr. 286, t. 49.1825 ; Hook. f., Fl. Brit. India 6 : 32.1890 ; Haines, Bot. Bihar & Orissa 3 : 1230.1924. *Epidendrum retusum* L., Sp. Pl. 953.1753.

Leaves to 24 cm long. Racemes to 20 cm long. Flowers showy, pink, to 1 cm across.

Sal forests. Indomalesia. May-July. Sarkar & Bhatta., 208.

#### 7. VANDA W. Jones ex R. Br.

1a. Leaves terete ; flowers larger ... 1. *V. teres*

1b. Leaves flat ; flowers to 4 cm across ... 2. *V. tessellata*

1. **Vanda teres** (Roxb.) Lindl., Gen. Sp. Orchid. Pl. : 217.1833 ; Hook. f., Fl. Brit. India 6 : 49.1890 ; *Dendrobium teres* Roxb. Fl. Indica 3 : 485.1832. *Papilionanthe teres* (Roxb.) Schltr. in Orchis 9 : 78.1915.

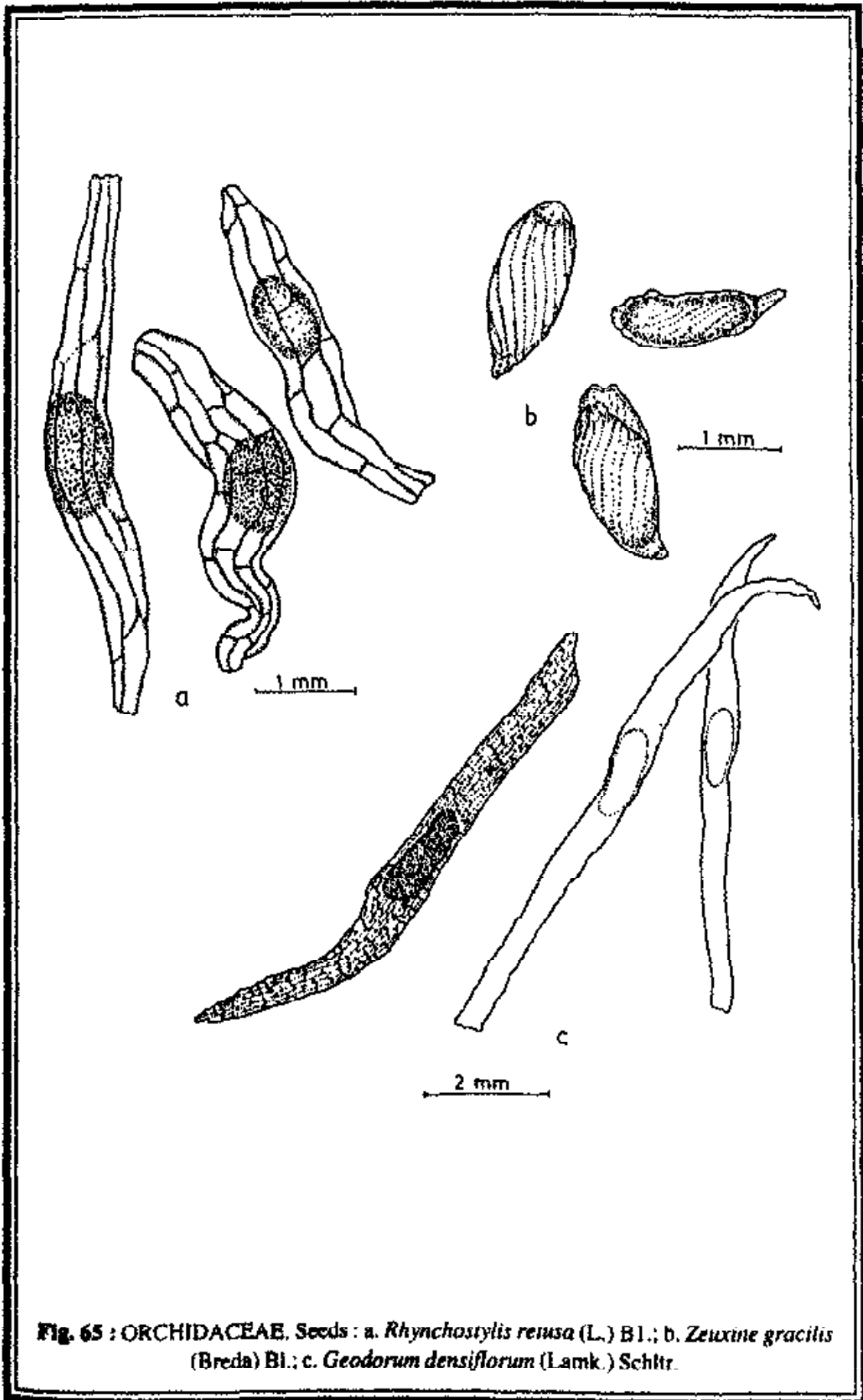
Stems profusely branched. Leaves to 15 cm long, fleshy. Flowers to 10 cm across, fragrant. Labellum hairy towards the base; side lobes broad, incurved ; middle lobe much larger.

Sal forests. West Bengal, Assam, Khasi hills, Andaman & Nicobar Islands, Sikkim, Sarkar & Bhatta., 180.

2. **Vanda tessellata** (Roxb.) Hook. ex G. Don in Loud., Hort. Brit. 372.1830 ; Saldanha, Fl. Hassan Dist. 854.1972. *Epidendrum tessellatum* Roxb., Pl. Corom. 1 : 34.t.42.1795. *Vanda roxburghii* R. Br., Bot. Reg. 6 : t. 506.1820; Hook. f., Fl. Brit. India 6 : 52.1890.

Leaves coriaceous, closely approximate, distichous, 15 - 20 cm long. Racemes to 26 cm long. Flowers rose-coloured, fragrant.

Sal forests. India, Sri Lanka. Throughout the year. Bhatta., & Sarkar. 1537.



**Fig. 65 :** ORCHIDACEAE. Seeds : a. *Rhynchosstylis reusa* (L.) Bl.; b. *Zeuxine gracilis* (Breda) Bl.; c. *Geodorum densiflorum* (Lamk.) Schltr.

8. ZEUXINE Lindl., *nom. cons.*

- 1a. Leaves ovate-oblong, to 3.5 cm broad ... 1. *Z. gracilis*  
 1b. Leaves linear, to 0.5 cm broad ... 2. *Z. strateumatica*

1. *Zeuxine gracilis* (Breda) Bl., Fl. Java 56, t.18.f.2. t.23 D. 1858 ; Sant. & Kapadia, Orch. Bombay 171.1966; *Psychechilus gracile* Breda, Gen. Sp. Orch. t. 9. 1827; *Zeuxine affinis* Benth. ex Hook. f., Fl. Brit. India 6 : 108, 1890 ; Haines, Bot. Bihar & Orissa 3 : 1214.1924.

Herbs, to 20 cm long, leaves to 5 cm long. Flowers lax on a 7 cm long spike.

Shady forest floor. Indomalesia. January – March. Bhatta., & Sarkar, 449.

2. *Zeuxine strateumatica* (L.) Schltr. in Fedde, Repert. 1 : 77.1911. *Orchis strateumatica* L., Sp. Pl. 943.1753. *Zeuxine sulcata* (Roxb.) Lindl., Gen. Sp. Orch. 485.1840 ; Hook. f., Fl. Brit. India 6 : 106.1890 ; Haines, Bot. Bihar & Orissa 3 : 1213. 1924 (Repr. ed. 1961).

Ephemeral herbs, to 17 cm high. Leaves to 5 cm long. Flowers in 2 – 5 cm long dense spikes.

Along open lands. Indomalesia, Afghanistan, Japan, China. January – March. SHWET HOOLEE Bhatta., & Sarkar, 1359.

## SUMMARY

The present study is based on survey of angiospermous plants of the area over a period of ten years. Regular and periodical visits to different habitats were made during these years of intensive survey ; 4509 specimens were collected, which worked out to be 1040 species, grouped into 632 genera, assigned to 146 families according to Cronquist's system of classification. Out of 1040 species Magnoliopsida comprise 804 species and Liliopsida comprise 236 species.

Sixtyone families are monogeneric, of these 45 families are with a single species and the remaining 16 families are with more than one species. The family Gramineae top the list, followed by Leguminosae, Compositae, Euphorbiaceae etc. The ten dominant families comprise 486 species, i.e., 46.73 % of the total species dealt with. Only four species (Fabaceae, Vitaceae, Apiaceae & Lamiaceae) are endemic in this district.

The flora is a mixture of Indo–Malayan and tropical elements. A large number of Himalayan plants also occur in the district. Nevertheless, fifty Tirhut Plants (Prain, 1903) are not available within the district.

One hundred and seventynine species carry medicinal value ; one hundred and seventyfour species are food plants ; sixteen species produce food adjuncts ; eightyseven species produce different types of fibres ; sixtyfive yield timber and fuel wood ; twentyfive produce essential oils and seventeen species yield oil seeds ; fortyone species are poisonous.

## APPENDIX

Classes, subclasses, orders and families of the angiosperms (Magnoliophyta) mentioned in the text (after Cronquist 1981 & 1988, with some modifications).

**Class Magnoliopsida (Dicotyledonae).****Subclass Magnoliidae**

Order Magnoliales (Families Magnoliaceae, Annonaceae).

Order Laurales (Family Lauraceae).

Order Piperales (Family Piperaceae).

Order Aristolochiales (Family Aristolochiaceae).

Order Ceratophyllales (Family Ceratophyllaceae).

Order Nymphaeales (Family Nymphaeaceae).

Order Nelumbonales (Family Nelumbonaceae).

Order Ranunculales (Family Ranunculaceae, Menispermaceae, Sabiaceae, Papaveraceae, Fumariaceae).

**Subclass Hamamelididae**

Order Urticales (Families Ulmaceae, Cannabaceae, Moraceae, Urticaceae).

Order Casuarinales (Family Casuarinaceae).

**Subclass Caryophyllidae**

Order Caryophyllales (Families Phytolaccaceae, Nyctaginaceae, Aizoaceae, Cactaceae, Chenopodiaceae, Amaranthaceae, Portulacaceae, Basellaceae, Molluginaceae, Caryophyllaceae).

Order Polygonales (Family Polygonaceae).

Order Plumbaginales (Family Plumbaginaceae).

**Subclass Dilleniidae**

Order Dilleniales (Family Dilleniaceae).

Order Theales (Families Ochnaceae, Dipterocarpaceae, Elatinaceae, Clusiaceae).

Order Malvales (Families Tiliaceae, Sterculiaceae, Bombacaceae, Malvaceae).

Order Lecythidales (Family Lecythidaceae).

Order Violales (Families Flacourtiaceae, Violaceae, Tamaricaceae, Turneraceae, Passifloraceae, Caricaceae, Cucurbitaceae, Begoniaceae).

Order Salicales (Family Salicaceae).

Order Capparales (Families Capparaceae, Brassicaceae, Moringaceae).

Order Ebenales (Families Sapotaceae, Ebenaceae, Symplocaceae).

Order Primulales (Families Myrsinaceae, Primulaceae).

### **Subclass Rosidae**

Order Rosales (Families Crassulaceae, Rosaceae).

Order Fabales (Families Mimosaceae, Caesalpinaceae, Fabaceae).

Order Haloragales (Family Haloragaceae).

Order Myrtales (Families Lythraceae, Trapaceae, Myrtaceae, Punicaceae, Onagraceae, Melastomataceae, Combretaceae).

Order Cornales (Family Alangiaceae).

Order Santalales (Families Olacaceae, Opiliaceae, Loranthaceae, Viscaceae).

Order Celastrales (Families Celastraceae, Hippocrateaceae, Icacinaceae).

Order Euphorbiales (Family Euphorbiaceae).

Order Rhamnales (Families Rhamnaceae, Leeaceae, Vitaceae).

Order Linales (Family Linaceae).

Order Polygalales (Families Malpighiaceae, Polygalaceae).

Order Sapindales (Families Sapindaceae, Burseraceae, Anacardiaceae, Simaroubaceae, Meliaceae, Rutaceae, Zygophyllaceae).

Order Geraniales (Families Oxalidaceae, Balsaminaceae).

Order Apiales (Families Araliaceae, Apiaceae).

### **Subclass Asteridae**

Order Gentianales (Families Loganiaceae, Gentianaceae, Apocynaceae, Asclepiadaceae).

Order Solanales (Families Solanaceae, Convolvulaceae, Cuscutaceae, Menyanthaceae, Polemoniaceae, Hydrophyllaceae, Boraginaceae).

Order Lamiales (Families Verbenaceae, Lamiaceae).

Order Scrophulariales (Families Buddlejaceae, Oleaceae, Scrophulariaceae,

Orobanchaceae, Acanthaceae, Pedaliaceae, Bignoniaceae, Lentibulariaceae).

Order Campanulales (Families Sphenocleaceae, Campanulaceae).

Order Rubiales (Family Rubiaceae).

Order Asterales (Family Asteraceae).

### **Class Liliopsida (Monocotyledonae).**

#### **Subclass Alismatidae**

Order Alismatales (Families Alismataceae, Hydrocharitaceae).

Order Najadales (Families Aponogetonaceae, Potamogetonaceae, Najadaceae).

#### **Subclass Arecidae**

Order Arecales (Family Arecaceae).

Order Pandanales (Family Pandanaceae).

Order Arales (Families Araceae, Lemnaceae).

#### **Subclass Commelinidae**

Order Commelinales (Families Xyridaceae, Commelinaceae).

Order Eriocaulales (Family Eriocaulaceae).

Order Juncales (Family Juncaceae).

Order Cyperales (Families Cyperaceae, Typhaceae).

Order Poales (Family Poaceae).

#### **Subclass Zingiberidae**

Order Bromeliales (Family Bromeliaceae).

Order Zingiberales (Families Musaceae, Zingiberaceae, Costaceae, Cannaceae).

#### **Subclass Liliidae**

Order Liliales (Families Pontederiaceae, Liliaceae, Amaryllidaceae, Hypoxidaceae, Agavaceae, Smilacaceae, Dioscoreaceae).

Order Orchidales (Family Orchidaceae).

## INDEX TO BOTANICAL NAMES

All synonyms are in italic type. Boldfaced page numbers indicate illustrations.

<i>Abelmoschus</i> Medic.	110	<i>A. tenerum</i> Griff.	130, 131
<i>A. angulosus</i> Wall.		<i>Adenosma</i> R. Br.	319
<i>ex</i> Wt. & Arn.	111	<i>A. indiana</i> (Lour.) Merr.	319
<i>A. crinitus</i> Wall.	111	<i>Adenostemma</i> J.R. & G. Forst	368, 373
<i>A. esculentus</i> (L.) Moench.	111	<i>A. javenia</i> (L.) O. Kuntze	373
<i>Abrus</i> Adans.	158, 161	<i>Adina</i> Salisb.	355
<i>A. precatorius</i> L.	161	<i>A. cordifolia</i> (Roxb.) Hook. f.	355
<i>A. pulchellus</i> Wall. <i>ex</i> Thw.	161, 162	<i>Aeginetia</i> L.	327
<i>Abutilon</i> Mill.	110, 111	<i>A. indica</i> L.	327, 328
<i>A. hirtum</i> (Lamk.) Sweet	112	<i>Aegle</i> Corrêa	11, 15, 16, 17, 245
<i>A. indicum</i> (L.) Sweet	16, 17, 111	<i>A. marmelos</i> (L.) Corrêa	245
<i>A. persicum</i> (Burm. f.) Merr.	112	<i>Aeschynomene</i> L.	13, 161, 162
<i>Acacia</i> Mill.	11, 15, 147	<i>A. aspera</i> L.	13, 162
<i>A. auriculiformis</i> A. Cunn.		<i>A. indica</i> L.	162
<i>ex</i> Benth.	16, 148	<i>Aerva</i> Forssk.	79
<i>A. catechu</i> (L. f.) Willd.	148	<i>A. lanata</i> (L.) Juss.	16, 80
<i>A. chundra</i> (Roxb.) Willd.	148	<i>A. sanguinolenta</i> (L.) Bl.	16, 80
<i>A. farnesiana</i> (L.) Willd.	149	<i>Aganosma</i> G. Don	259
<i>A. nilotica</i> (L.) Willd.	149	<i>A. caryophyllata</i> G. Don	259
<i>A. polyacantha</i> Willd.	149	AGAVACEAE Endl.	39, 482, 484, 499
<i>A. sinuata</i> (Lour.) Merr.	11, 149	<i>Agave</i> L.	482
<i>Acalypha indica</i> L.	16	<i>A. sisalana</i> Perrine	14, 18, 482
ACANTHACEAE Juss.	20, 21, 35	<i>Ageratum</i> L.	373
	329, 332, 343, 499	<i>A. conyzoides</i> L.	373
<i>Achyranthes</i> L.	79	<i>Aglaonema</i> Schott	399, 400
<i>A. aspera</i> L.	16, 79	<i>A. costatum</i> N.E. Br.	400
<i>Acrocephalus</i> Benth.	308	<i>Agrostemma</i> Wall.	352
<i>A. hispidus</i> (L.) Nicol. & Siv.	12, 308	<i>A. sarmentosum</i> Wall.	352, 359, 363
<i>Actinostemma</i> Griff.	130		

<i>Ailanthus</i> Desf.	241	<i>A. philoxeroides</i> (Mart.) Grisebach	13 81, 83
<i>A. excelsa</i> Roxb.	15, 241	<i>A. sessilis</i> (L.) R. Br.	81
<b>AIZOACEAE</b> F.Rudolphi	19, 28, 74, 75, 497	<i>Alysicarpus</i> Desv.	161, 162
<b>ALANGIACEAE</b> DC.	19, 29, 198, 199	<i>A. bupleurifolius</i> (L.) DC.	163, 164
<i>Alangium</i> Lamk.	198	<i>A. monilifer</i> (L.) DC.	162, 163, 164
<i>A. salviifolium</i> (L.f.) Wang.	17 198, 199	<i>A. vaginalis</i> (L.) DC.	163, 164
<i>Albizia</i> Durazz.	150	<b>AMARANTHACEAE</b> Juss.	36, 78, 83, 497
<i>A. chinensis</i> Merr.	15, 150	<i>Amaranthus</i> L.	13, 81
<i>A. lebbeck</i> (L.) Benth.	15, 150	<i>A. caudatus</i> L.	17, 81
<i>A. odoratissima</i> (L.f.) Benth.	151	<i>A. tenuifolius</i> Willd.	82
<i>A. procera</i> (Roxb.) Benth.	15, 151	<i>A. tricolour</i> L.	82
<i>Alcea</i> L.	112	<i>A. spinosus</i> L.	17, 82
<i>A. rosea</i> L.	112	<i>A. viridis</i> L.	17, 82, 83
<b>ALISMATACEAE</b> Vent.	19, 39, 390, 499	<b>AMARYLLIDACEAE</b> J. St.-Hil.	39 480, 499
<b>ALISMATALES</b> Lindl.	499	<i>Amischophacelus</i> Rao & Kamma.	411
<i>Allamanda</i> L.	259	<i>A. axillaris</i> (L.) Rao & Kamma.	411
<i>A. cathartica</i> L.	259	<i>Ammannia</i> L.	187, 188
<i>Allium</i> spp.	17	<i>A. baccifera</i> L.	18, 188
<i>Allophylus</i> L.	235	<i>A. multiflora</i> Roxb.	188
<i>A. serratus</i> (Roxb.) Kurz	16, 235, 236	<i>Amorphophallus</i> Bl. ex Decne.	400
<i>Alloteropsis</i> Presl.	430, 432	<i>A. paeoniifolius</i> (Dennst.) Nicol. var. <i>campanulatus</i> (Decaisne) Siva.	17 18, 400
<i>A. cimicina</i> (L.) Stapf	433	<i>Ampelocissus</i> Planch.	229
<i>Alocasia</i> Schott	17, 399, 400	<i>A. divaricata</i> (Wall. ex Laws.) Planch.	229
<i>A. indica</i> Schott.	400	<i>A. latifolia</i> (Roxb.) Planch.	229
<i>A. macrorhiza</i> G. Don	400	<b>ANACARDIACEAE</b> Lindl.	32, 238 498
<i>Alstonia</i> R. Br.	258, 260	<i>Anacardium</i> L.	239
<i>A. scholaris</i> (L.) R. Br.	260		
<i>Alternanthera</i> Forssk.	80		
<i>A. paronychioides</i> A. St. Hil.	17, 80		

<i>Anacardium occidentale</i> L.	239	APOCYNACEAE Juss.	258, 261, 498
<i>Anagallis</i> L.	145	<i>Aponogeton natans</i> Eng. & Kra.	13
<i>A. arvensis</i> L.	145	APONOGETONACEAE J. Agardh	499
<i>Ananas</i> Mill.	17, 470	ARACEAE Juss.	34, 38, 397, 402, 499
<i>Ananas comosus</i> (L.) Merrill.	470	<i>Arachis</i> L.	15, 17
<i>Andrographis</i> Wall. ex Nees	331	ARALIACEAE Juss.	29, 254, 498
<i>A. paniculata</i> (Burm. f.) Wall.	331	ARALES Lindl.	499
<i>Anisomeles</i> R. Br.	307, 308	<i>Ardisia</i> Swartz	143
<i>A. indica</i> (L.) Kuntze	12, 16	<i>Ardisia solanacea</i> Roxb.	11, 143, 144
<i>Anogeissus</i> (DC.) Wall. ex Guill.	11 15, 195	ARECACEAE Schultz	38, 393 395, 499
<i>A. latifolia</i> (Roxb. ex DC.) Guill.	11, 195	ARECALES Nakai	499
<i>Anthocephalus</i> A. Rich.	11, 361	<i>Areca</i> L.	393
<i>A. cadamba</i> Miq.	11, 361	<i>A. catechu</i> L.	393
ANNONACEAE Juss.	32, 41, 497	<i>Argemone</i> L.	58
<i>Annona</i> L.	17, 41	<i>Argemone mexicana</i> L.	13, 58
<i>A. reticulata</i> L.	42	<i>Argyreia</i> Lour.	16, 282
<i>A. squamosa</i> L.	42	<i>A. bella</i> (Cl.) Raizada	282
<i>Antidesma</i> L.	207	<i>A. involucrata</i> Cl.	282
<i>A. ghaesembilla</i> Gaertn.	11, 12, 17, 207	<i>A. nasirii</i> Austin	284
<i>Antigonon</i> Endl.	93	<i>A. roxburghii</i> Choisy	284
<i>A. leptopus</i> Hook. & Arn.	93	<i>A. setosa</i> (Roxb.) Choisy	284
<i>Antirrhinum</i> L.	319	<i>Arisaema</i> Mart.	400, 401
<i>A. majus</i> L.	319	<i>A. tortuosum</i> (Wall.) Schott	401
<i>A. orontium</i> L.	320	<i>Aristida</i> L.	433, 434
<i>Aphanamixis</i> Bl.	242	<i>A. adscensionis</i> L.	434
<i>A. polystachya</i> (Wall.) Parker	16, 242	<i>Aristolochia</i> L.	48
APIACEAE Lindl.	28, 250, 252, 498	<i>A. indica</i> L.	16, 48
APIALES Nakai	498	ARISTOLOCHIACEAE Juss.	19, 37 48, 497
<i>Apluda</i> L.	427, 434	ARISTOLOCHIALES Lindl.	497
<i>A. mutica</i> L.	434		

<i>Arnebia</i> Forssk.	296	<b>BALSAMINACEAE</b> A. Rich.	19, 31 250, 498
<i>A. hispidissima</i> DC.	296	<i>Bambusa</i> Schreb.	12, 14, 425, 435
<i>Artemisia</i> L.	374	<i>B. balcooa</i> Roxb.	435
<i>A. nilagirica</i> (Cl.) Pamp.	374	<i>B. tulda</i> Roxb.	436
<i>Artabotrys</i> R. Br.	42	<i>B. vulgaris</i> Schrad.	436
<i>A. hexapetalus</i> (L.f.) Bhandari	16, 42	<i>Barleria</i> L.	329, 331
<i>A. odoratissimus</i> R. Br.	42	<i>B. cristata</i> L.	12, 16, 331
<i>Artocarpus</i> J. R. & G. Forst.	62	<i>B. lupulina</i> Lindl.	332, 333
<i>A. lacucha</i> Buch.-Ham.	17, 62	<i>B. prionitis</i> L.	12, 16, 333
<i>A. lakoocha</i> Roxb.	62	<i>B. strigosa</i> Willd.	12, 333
<i>Arundinella</i> Reddi	14, 434	<i>Barringtonia</i> J. R. & G. Forst.	120
<i>A. nepalensis</i> Trin.	435	<i>B. acutangula</i> Gaertn.	15, 16, 18, 120
<i>A. setosa</i> Trin.	435	<b>BASELLACEAE</b> Moq.	19, 29, 88, 497
<i>Arundo</i> L.	14, 432, 435	<i>Basella</i> L.	88
<i>A. donax</i> L.	12, 435	<i>B. alba</i> L.	88
<b>ASCLEPIADACEAE</b> R. Br.	34, 266 270, 498	<i>Bauhinia</i> L.	11, 14, 153
<i>Asclepias</i> L.	267	<i>B. malabarica</i> Roxb.	17, 153
<i>A. curassavica</i> L.	267	<i>B. purpurea</i> L.	11, 17, 154
<i>Asparagus</i> L.	16, 479	<i>B. racemosa</i> Lamk.	154
<i>A. racemosus</i> Willd.	479	<i>B. scandens</i> var. <i>horsfieldii</i> Ohashi	22, 154
<b>ASTERACEAE</b> Dumort	20, 33, 367 384, 499	<i>B. vahlia</i> Wt. & Arn.	11, 16, 154
<b>ASTERALES</b> Lind.	499	<b>BEGONIACEAE</b> C. Agardh	19, 28 135, 136, 498
<i>Atylosia</i> Wt. & Arn.	159, 163	<i>Begonia</i> L.	135
<i>A. scarabacoides</i> (L.) Benth.	163, 165	<i>B. picta</i> Sm.	12, 135, 136
<i>A. volubilis</i> Gamble	163	<i>Benincasa</i> Savi	17
<i>Azadirachta</i> Juss.	243	<i>Bergia ammannioides</i> Roxb. ex Roth	13
<i>A. indica</i> Juss.	15, 16, 243	<i>Beta</i> L.	76
<i>Bacopa</i> Aubl.	318, 320	<i>B. vulgaris</i> L.	17, 76
<i>B. monnieri</i> (L.) Wetts.	13, 16, 320	<i>Bidens</i> L.	372, 374

<i>Bidens biternata</i> (Lour.) Merr. & Sheriff.	374	BORAGINACEAE Juss.	35, 296 297, 498
BIGNONIACEAE Juss.	36, 344, 499	<i>Borassus</i> L.	14, 393
<i>Biophytum</i> DC.	249	<i>B. flabellifer</i> L.	16, 17, 18, 393
<i>B. sensitivum</i> (L.) DC.	16, 249	<i>Bothriospermum</i> Bunge	296, 298
<i>Bischofia</i> Bl.	11, 15, 205, 207	<i>B. tenellum</i> Fisch. & Mey.	297, 298
<i>B. javanica</i> Bl.	11, 12, 207	<i>Bothriochloa</i> Kuntze	428, 436
<i>Blepharis</i> Juss.	329, 333	<i>B. blandii</i> (Rtz.) Blake	436
<i>B. repens</i> (Vahl.) Roth	333	<i>Bougainvillea</i> Comm. ex. Juss.	73, 74
<i>Blumea</i> DC.	20, 370, 374	<i>B. spectabilis</i> Willd.	74
<i>B. bifoliata</i> (L.) DC.	375	<i>Brachiaria</i> Griseb.	430, 437
<i>B. hieracifolia</i> (D. Don) DC.	374, 375	<i>B. distachya</i> (L.) Stapf	437
<i>B. lacera</i> (Brum. f.) DC.	375	<i>B. miliiformis</i> (Pres) A. Chase	437
<i>B. lacera</i> var. <i>glandulosa</i> (DC) Hook. f.	376	<i>B. mutica</i> (Forssk.) Stapf	437
<i>B. laciniata</i> (Roxb.) DC.	375, 376	<i>B. ramosa</i> (L.) Stapf	437, 438
<i>B. mollis</i> (D. Don) Merr.	375, 376	<i>B. reptans</i> (L.) Gard. et. C. E. Hubb.	437, 438
<i>B. obliqua</i> (L.) Druce	375, 376	BRASSICACEAE Burnett	30, 139, 498
<i>B. oxyodonta</i> DC.	375, 377	<i>Brassica</i> spp.	15, 17, 18
<i>Blumiopsis</i> Gagnep.	370, 377	<i>Breynia</i> J. R. & G. Forst.	207, 208
<i>B. flava</i> (DC.) Gagnep.	377	<i>B. restusa</i> (Dennst.) Alston	12, 208
<i>Blyxa</i> Thouars	390, 391	<i>B. vitis-idaea</i> (Burm. f.) Fischer	12, 208
<i>B. octandra</i> (Roxb.) Planch. ex Thw.	13, 391	<i>Bridelia</i> Willd.	11, 14, 205, 208
<i>Boehmeria</i> Jacq.	69	<i>B. retusa</i> Spreng	11, 209
<i>B. macrophylla</i> Hornem, var. <i>scabrella</i> Roxb.	12, 70	<i>B. scandens</i> Willd.	209
<i>B. penduliflora</i> Long	70	<i>B. stipularis</i> Bl.	209
<i>Boerhavia</i> L.	73	<i>B. verrucosa</i> Haines	209
<i>B. diffusa</i> L.	16, 73	BROMELIACEAE Juss.	19, 40, 470, 499
BOMBACACEAE Kunth	33, 108, 497	BROMELIALES Lindl.	499
<i>Bombax</i> L.	11, 14, 108, 109	<i>Buchanania</i> Spreng.	239, 240
<i>B. ceiba</i> L.	11, 12, 15, 119	<i>B. lanzan</i> Spreng.	17, 240
		BUDDLEJACEAE K. Wilh.	19, 35 316, 498

<i>Buddleja</i> L.	316	<i>Callistemon</i> R. Br.	191
<i>B. asiatica</i> Lour.	316	<i>C. linearis</i> DC.	191
<i>Bulbostylis</i> Kunth	414	<i>Calotropis</i> R. Br.	11, 14, 268
<i>B. densa</i> (Wall.) Hand. Mazz.	13, 414	<i>C. acia</i> Buch.-Ham.	268
<b>BURSERACEAE</b> Kunth	19, 33 238, 498	<i>C. gigantea</i> (L.) R. Br.	11, 14, 268
<i>Bursera</i> Jacq. ex L.	238	<i>C. hamiltonii</i> Wt.	11, 14, 16, 268
<i>B. serrata</i> Wall. ex Colebr.	238	<i>C. procera</i> auct. pl.	268
<i>Butea</i> Roxb. ex Willd.	11, 14, 159, 165	<b>CAMPANULACEAE</b> Juss.	346, 499
<i>B. buteiformis</i> (Voigt) Grierson & Long	165	<b>CAMPANULALES</b> Lindl.	33, 499
<i>B. monosperma</i> (Lamk.) Taub.	11, 15 165	<i>Campanula</i> L.	348
<i>B. parviflora</i> Roxb.	11, 15, 165, 166	<i>C. dimorphantha</i> Schweinf.	348
<b>CACTACEAE</b> Juss.	27, 76, 77, 497	<i>Campylotropis</i> Bunge	161, 166
<i>Caesalpinia</i> L.	153, 155	<i>C. stenocarpa</i> (Klotz.) Schindler	166
<i>C. bonduc</i> (L.) Roxb.	16, 155	<b>CANNABACEAE</b> Endl.	19, 37, 61, 497
<i>C. digyna</i> Rottl.	155	<i>Cannabis</i> Tourn. ex L.	14, 61
<i>C. pulcherrima</i> (L.) Swartz	155	<i>C. sativa</i> L.	17, 18, 61
<b>CAESALPINIACEAE</b> R. Br.	27, 153 498	<b>CANNACEAE</b> Juss.	19, 40, 475, 499
<i>Caesulia</i> Roxb.	371, 377	<i>Canna</i> L.	475
<i>C. axillaris</i> Roxb.	377	<i>C. coccinea</i> Mill.	475
<i>Cajanus</i> DC.	159, 166	<i>C. indica</i> L.	475
<i>C. cajan</i> (L.) Millsp.	17, 166	<i>Canscora</i> Lamk.	256
<i>Caladium</i> Vent.	399, 400	<i>C. decussata</i> (Roxb.) R. & S.	256
<i>C. bicolor</i> Vent.	401	<i>C. diffusa</i> (Vahl) R. Br.	256
<i>Calamus</i> L.	14, 393, 394, 395	<i>Cansjera</i> Juss.	198
<i>C. tenuis</i> Roxb.	394, 395	<i>C. rheedei</i> J.F. Gmel.	198
<i>C. viminalis</i> Willd. var. <i>fasciculatus</i> Becc.	394, 395	<i>Canthium</i> Lamk.	352
<i>Callicarpa</i> L.	301, 302	<i>C. dicoccum</i> (Gaertn.) T. & B.	352
<i>C. macrophylla</i> Vahl	302	<i>Capillipedium</i> Stapf	428, 438
		<i>C. assimile</i> (Steud.) A. Camus	438
		<i>C. parviflorum</i> (R. Br.) Stapf	438, 439
		<b>CAPPARACEAE</b> Juss.	135, 498

CAPPARALES Hutch.	498	<i>C. elliptica</i> Willd.	18, 121, 122
<i>Capparis</i> L.	11, 135, 137	<i>C. graveolens</i> Dalz.	18, 121
<i>C. sepiaria</i> L.	11, 16, 137	Cassia L.	153, 156
<i>C. spinosa</i> L.	16, 137	<i>C. fistula</i> L.	15, 16, 156
<i>C. zeylanica</i> L.	16, 137	<i>C. mimosoides</i> L.	156
Capsicum L.	17, 18, 273	<i>C. occidentalis</i> L.	16, 18, 156
<i>C. annuum</i> L.	273, 274	<i>C. sophora</i> L.	16, 156
<i>C. frutescens</i> L.	274	Cassine L.	11, 201
Cardiospermum L.	235, 237	<i>C. glauca</i> (Rottbl.) Kuntze	11, 15, 201
<i>C. helicacabum</i> L.	16, 237	Cassytha L.	44
Carex L.	414, 415	<i>C. filiformis</i> L.	44
<i>C. wallichiana</i> Presc. ex Nees	415, 416	Casuarina Adans.	72
Careya Roxb.	120	<i>C. equisetifolia</i> J.R. & F. Forst.	15, 72
<i>C. arborea</i> Roxb.	11, 15, 120	CASUARINACEAE R. Br.	19, 37 72, 497
<i>C. herbacea</i> Roxb.	120	CASUARINALES Lindl.	497
Carica L.	17, 128	Catharanthus G. Don	258, 260
<i>C. papaya</i> L.	128	<i>C. pusillus</i> (Murr.) G. Don	260, 261
CARICACEAE Dumort.	128, 498	<i>C. roseus</i> (L.) G. Don	16, 262
Carissa L.	19, 29, 258, 260	Catunaregam Adans. ex Wolf	351, 353
<i>C. carandas</i> L.	17, 260	<i>C. spinosa</i> (Thumb.) Triven.	353
Carum L.	253	<i>C. uliginosa</i> (Retz.) Sivarajan	353
<i>C. villosum</i> Haines	252, 253	Cayratia Juss.	229, 230
CARYOPHYLLACEAE Juss.	30, 90 92, 497	<i>C. auriculata</i> (Wall. ex Roxb.) Gamble	292
CARYOPHYLLALES Benth. & Hook. f.	497	<i>C. trifolia</i> (L.) Domin.	230
CARYOPHYLLIDAE Takh.	497	Ceiba pentandra Gaertn.	108, 109
Caryopteris Bunge	11, 301, 302	CELASTRACEAE R. Br.	32, 206, 498
<i>C. bicolor</i> (Hardw.) Mabblerley	11, 302	CELASTRALES Wettst.	498
Caryota L.	14, 393	Celastrus L.	12, 16, 17, 202
<i>C. urens</i> L.	394	<i>C. paniculatus</i> Willd.	202
Casearia Jacq.	121	Celtis L.	11, 59, 60

<i>Celtis tetrandra</i> Roxb.	11, 15, 59, 60	<i>C. album</i> L.	17, 18, 78
<i>Celosia</i> L.	79, 84	<i>C. ambrosioides</i> L.	78
<i>C. argentea</i> L.	84	<i>Chloris</i> Swartz	431, 433, 437
<i>C. argentea</i> f. <i>cristata</i> (L.) Schinz	84	<i>C. barbata</i> Swartz	439
<i>Centaurium</i> Hill	256	<i>Chlorophytum</i> Ker-Gawl.	479
<i>C. centaurioides</i> Rao & Hemadri	256	<i>C. arundinaceum</i> Baker	16, 479
<i>Centella</i> L.	260, 261	<i>Chonemorpha</i> G. Don	259, 262
<i>C. asiatica</i> (L.) Urb.	16, 251	<i>C. fragrans</i> (Moon) Alston	262
<i>Centipeda</i> Lour.	372, 377	<i>Chromolaena</i> DC.	368, 378
<i>C. minima</i> (L.) A. Br. & Aschers.	377	<i>C. odorata</i> (L.) King & Robins.	378
<i>Centranthera</i> R. Br.	319, 320	<i>Chrozophora</i> Juss.	205, 210
<i>C. nepalensis</i> D. Don	320	<i>C. rottleri</i> (Geis.) Juss. ex Spreng.	210
<i>C. indica</i> (L.) Gamble	320	<i>Chrysopogon</i> Trin.	428, 439
<i>Centratherum</i> Cass.	368, 378	<i>C. aciculatus</i> (Retz.) Trin.	439
<i>C. anthelminticum</i> (L.) Kuntze	378	<i>C. fulvus</i> (Spreng.) Chiov.	439, 440
<b>CERATOPHYLLACEAE</b> S. F. Gray	19	<i>C. lancearius</i> (Hook.) Haines	439, 440
	37, 51, 497	<i>Cinnamomum</i> sp.	18
<b>CERATOPHYLLALES</b> Takh.	497	<i>Cirsium</i> Mill.	373, 378
<i>Ceratophyllum</i> L.	13, 51	<i>C. arvense</i> (L.) Scop.	378
<i>C. demersum</i> L.	51	<i>Cissampelos</i> L.	53, 55
<i>Cereus</i> Mill.	76	<i>C. pariera</i> L.	
<i>C. peruvianus</i> (L.) Mill.	76	var. <i>hirsuta</i> (DC.) Forman	16, 55
<i>Ceriscoides</i> Triven.	351, 354	<i>Cissus</i> L.	231, 232
<i>C. turgida</i> (Roxb.) Triven.	354	<i>C. repanda</i> Vahl	230
<i>Cestrum</i> L.	273, 274	<i>Citrullus vulgaris</i> Schrad.	17
<i>C. diurnum</i> L.	274	<i>Citrus</i> L.	17, 245, 246
<i>C. nocturnum</i> L.	274	<i>C. maxima</i> Merr.	246
<i>Ceiba</i> Mill.	14, 15, 108	<i>C. medica</i> L.	246
<i>C. pentandra</i> (L.) Gaertn.	109	<i>Clausena</i> Burm. f.	11, 245, 246
<b>CHENOPODIACEAE</b> Vent.	36, 76, 497	<i>C. kanpurensis</i> Molina	11, 12, 16, 247
<i>Chenopodium</i> L.	76, 78	<i>C. pentaphylla</i> DC.	247

<i>Cleidion</i> Bl.	206, 209	<i>C. esculenta</i> (L.) Schott	17, 401, 402
<i>C. javanicum</i> Bl.	12, 209	COMBRETACEAE R. Br.	28, 195, 498
<i>Clematis</i> L.	51	<i>Combretum</i> Loefl.	195, 196
<i>C. gouriana</i> Roxb.	12, 16, 18, 54	<i>C. roxburghii</i> Spreng.	12, 16, 196
<i>C. roylei</i> Rehder	22, 51, 52	<i>Commelina</i> L.	406, 408
<i>Cleome</i> L.	18, 137	<i>C. benghalensis</i> L.	16, 17, 407
<i>C. chelidonii</i> L.	16, 137, 138	<i>C. hasskarlii</i> Cl.	407
<i>C. gynandra</i> L.	17, 138	<i>C. longifolia</i> Lamk.	13, 407, 408
<i>C. viscosa</i> L.	16, 137, 138	<i>C. suffruticosa</i> Bl.	408
<i>Clerodendrum</i> L.	11, 302	COMMELINACEAE R. Br.	39, 406 409, 499
<i>C. indicum</i> (L.) Kuntze	12, 302	COMMELINALES Lindl.	499
<i>C. inerme</i> (L.) Gaertn.	302, 303	COMMELINIDAE Takh.	499
<i>C. serratum</i> (L.) Moon	11, 303	COMPOSITAE Giseke	21, 367
<i>C. viscosum</i> Vent.	303	CONVOLVULACEAE Juss.	20, 21 35, 281, 283, 498
CLUSIACEAE Lindl.	19, 30, 99, 497	<i>Convolvulus</i> L.	282, 284
<i>Coccinea</i> Wt. & Arn.	128, 130	<i>C. arvensis</i> L.	284
<i>C. grandis</i> (L.) Voigt	16, 17, 130	<i>Conyza</i> Less.	270, 379
<i>Cocculus</i> DC.	16, 53, 55	<i>C. bonariensis</i> (L.) Cronq.	379
<i>C. hirsutus</i> (L.) Diels	55	<i>Corchorus</i> L.	14, 100
<i>Cocos</i> L.	14, 393, 396	<i>C. aestuans</i> L.	100
<i>C. nucifera</i> L.	17, 18, 396	<i>C. capsularis</i> L.	17, 100
<i>Coffea</i> L.	11, 351, 354	<i>C. olitorius</i> L.	17, 100
<i>C. bengalensis</i> Heyne ex R.&S	11, 354	<i>Cordia</i> L.	296, 298
<i>C. khasiana</i> Hook. f.	11, 22, 354	<i>C. dichotoma</i> Forst. f.	298
<i>Coix</i> L.	429, 440	<i>Cordyline</i> Comm. ex R. Br.	482
<i>C. lachryma-jobi</i> L.	440	<i>C. terminalis</i> Kunth.	482
<i>Coldenia</i> L.	296, 298	<i>Coriandrum</i> L.	18
<i>C. procumbens</i> L.	298	CORNALES Lindl.	498
<i>Colebrookea</i> Sm.	307, 308	COSTACEAE Nakai	19, 40, 475 476, 499
<i>C. oppositifolia</i> Sm.	12, 16, 308		
<i>Colocasia</i> Schott	378, 401, 402		

<i>Costus</i> L.	475	<i>C. orchioides</i> Gaertn.	16, 480, 481
<i>C. speciosus</i> (Koen. ex Retz.) J. E. Smith	16, 475, 476	<i>Curcuma</i> L.	472
CRASSULACEAE DC.	498	<i>C. amada</i> Roxb.	472
<i>Crateva</i> L.	135, 138	<i>C. domestica</i> Val.	472
<i>C. nurvala</i> Buch.-Ham.	18, 138	<i>C. longa</i> L.	18, 472
<i>Crinum</i> L.	480	<i>C. zedoaria</i> (Christm.) Rosc.	18, 473
<i>C. asiaticum</i> L.	480	<i>Cuscuta</i> Tourn. ex L.	291
<i>Crotalaria</i> L.	14, 20, 158, 166	<i>C. campestris</i> Yuncker	292, 293
<i>C. albida</i> Heyne ex Roth	16, 167	<i>C. monogyna</i> Vahl	292, 293
<i>C. bialata</i> Schrank	167	<i>C. reflexa</i> Roxb.	16, 291, 293
<i>C. calycina</i> Schrank	167, 168	CUSCUTACEAE Dumort.	19, 35 291, 292, 498
<i>C. hirta</i> Willd.	167, 168	<i>Cyanotis</i> D. Don	408
<i>C. juncea</i> L.	16, 167, 168	<i>C. cristatas</i> (L.) D. Don	408, 409
<i>C. medicaginea</i> Lamk.	167, 168	<i>Cymbopogon</i> Spreng.	12, 441
<i>C. pallida</i> Ait.	167, 169	<i>C. gidarba</i> (Buch.-Ham. ex Hook. f.) Haines	441
<i>C. prostrata</i> Rottl. ex Willd.	167, 169	<i>C. jwarancusa</i> (Jones) Schult.	441
<i>C. spectabilis</i> Roth	16, 167, 169	<i>C. nardus</i> (L.) Rendle	441
<i>C. tetragona</i> Roxb.	167, 169	<i>Cynodon</i> Rich.	16, 442
<i>Croton</i> L.	11, 210	<i>C. dactylon</i> (L.) Pers.	442
<i>C. bonplandianum</i> Baill.	16, 210	<i>Cynoglossum</i> L.	299
<i>C. roxburghii</i> Balak.	11, 12, 210	<i>C. lanceolatum</i> Forssk.	281
CRUCIFERAE Juss.	30, 139, 498	CYPERACEAE Juss.	20, 21, 38, 414 416, 419, 423, 499
<i>Cryptolepis</i> R. Br.	14, 269	CYPERALES G. T. Burn.	499
<i>C. buchananii</i> R. & S.	270	<i>Cyperus</i> L.	14, 20, 415
<i>Cucumis</i> L.	17, 130, 132	<i>C. alopecuroides</i> Rottb.	415, 417
<i>C. callosus</i> (Rottl.) Cogn.	16, 132	<i>C. articulatus</i> L.	13, 417
<i>Cucurbita maxima</i> Duchesne	17	<i>C. brevifolius</i> (Rottb.) Hassk.	415, 418
CUCURBITACEAE Juss.	28, 128 131, 498	<i>C. cyperoides</i> (L.) Kuntze	13, 415, 418, 419
<i>Cuminum</i> L.	18		
<i>Curculigo</i> Gaertn.	480		

<i>Cyperus difformis</i> L.	13, 417, 418	<i>D. repens</i> (L.) J.R. & G. Forst.	355
<i>C. flavidus</i> Retz.	13, 418	<i>Derris</i> Lour.	171
<i>C. halpan</i> L.	13, 417, 418	<i>D. cuneifolia</i> Benth.	12, 18, 171
<i>C. iria</i> L.	13, 417, 418	<i>D. hainesiana</i> Thoth.	12, 171
<i>C. kyllingia</i> Endl.	13, 415, 420	<i>D. scandens</i> (Roxb.) Benth.	12, 18, 171
<i>C. nemoralis</i> Chern.	420	<i>Desmodium</i> DC.	20, 172
<i>C. niveus</i> Retz.	13, 420	<i>D. confertum</i> DC.	172
<i>C. nutans</i> Vahl var. <i>eleusinoides</i> (Kunth) Haines	13, 420	<i>D. gangeticum</i> (L.) DC.	16, 172, 173
<i>C. radiatus</i> Vahl	421	<i>D. gyroides</i> DC.	16, 172, 173
<i>C. rotundus</i> L.	13, 421	<i>D. laxiflorum</i> DC.	172, 173
<i>C. sanguinolentus</i> Vahl	13, 421	<i>D. motorium</i> (Houtt.) Merr.	172, 173
<i>C. tenuispica</i> Steud.	418	<i>D. oojeinense</i> (Roxb.) Ohashi	15 172, 174
<i>C. triceps</i> (Rottb.) Endl.	13, 421	<i>D. pulchellum</i> (L.) Benth.	172, 174
<i>Dactyloctenium</i> Willd.	442	<i>D. triangulare</i> (Retz.) Merr.	172, 174
<i>D. aegyptium</i> (L.) Willd.	17, 442	<i>D. triflorum</i> (L.) DC.	16, 172, 175
<i>Dalbergia</i> L. f.	11, 170	<i>Desmostachya</i> (Stapf) Stapf	14, 443
<i>D. latifolia</i> Roxb.	12, 15, 170	<i>D. bipinnata</i> (L.) Stapf	443
<i>D. sissoo</i> Roxb.	11, 12, 15, 170	<i>Dianthus</i> L.	90
<i>D. volubilis</i> Roxb.	12, 16, 170	<i>D. caryophyllus</i> L.	90
<i>Datura</i> L.	18, 273, 274	<i>Dichanthium</i> Willemet.	443
<i>D. metal</i> L.	16, 274, 275	<i>D. annulatum</i> (Forssk.) Stapf	443
<i>D. stramonium</i> L.	16, 275	<i>Dicliptera</i> Juss.	334
<i>Deeringia</i> R. Br.	17, 79, 84	<i>D. bupleuroides</i> Nees	334
<i>D. amaranthoides</i> Merr.	84	<i>Dieffenbachia</i> Schott	403
<i>Dendrocalamus</i> Nees	11, 14, 425, 442	<i>D. picta</i> Schott	403
<i>D. hamiltonii</i> Nees & Arn. ex Munro	442	<i>D. seguine</i> Schott	403
<i>D. strictus</i> (Roxb.) Nees	17, 443	<i>Digera</i> Forssk.	84
<i>Dendrophthoe</i> Mart.	200	<i>D. muricata</i> (L.) Mart.	16, 84
<i>D. falcata</i> (L.f.) Etting.	200	<i>Digitaria</i> Haller	444
<i>Dentella</i> J.R. & G. Forst.	355	<i>D. ciliaris</i> (Retz.) Koel.	444, 445

<i>Digitaria longiflora</i> (Retz.) Pers.	444	<i>D. roxburghii</i> Hurusawa	211
<i>D. stricta</i> Roth ex R. & S.	444	<i>Duchesnea</i> Sm.	146
<i>Dillenia</i> L.	11, 98	<i>D. indica</i> (Andr.) Focke	12, 146
<i>D. aurea</i> Sm.	11, 17, 98	<i>Duranta</i> L.	303
<i>D. indica</i> L.	17, 98	<i>D. repens</i> L.	303
<i>D. pentagyna</i> Roxb.	17, 98	<i>Dysophylla</i> Bl.	307, 309
DILLENACEAE Salisb.	98, 497	<i>D. cruciata</i> Benth.	309
DILLENIALES Hutch.	497	EBENACEAE Gürke	34, 142, 498
DILLENIIDAE Takh.	497	Ebenales Engler	498
<i>Dioscorea</i>	12, 487	<i>Ecbolium</i> Kurz	334
<i>D. alata</i> L.	17, 487	<i>E. viride</i> var. <i>dentata</i> Raig.	334
<i>D. bulbifera</i> L.	17, 488, 489	<i>Echinacanthus</i> Nees	334
<i>D. glabra</i> Roxb.	17, 488	<i>E. attenuatus</i> Wall. ex Nees	334
<i>D. hispida</i> Dennst.	18, 488	<i>Echinochloa</i> P. Beauv.	446
<i>D. pentaphylla</i> L.	17, 488	<i>E. colona</i> (L.) Link	13, 17, 446
<i>D. pubera</i> Bl.	17, 490	<i>E. stagnina</i> (Retz.) P. Beauv.	446
<i>D. wallichii</i> Hook. f.	17, 490	<i>Eclipta</i> L.	16, 379
DIOSCOREACEAE R. Br.	39, 487 489, 499	<i>E. prostrata</i> (L.) L.	379
<i>Diospyros</i> L.	142	<i>Ehretia</i> L.	11, 296, 299
<i>D. malabarica</i> (Desr.) Kostel.	142	<i>E. acuminata</i> R. Br.	
<i>D. montana</i> Roxb.	143	var. <i>serrata</i> Roxb.	299
<i>Diploknema</i> Pierre	15, 140	<i>E. lacvis</i> Roxb.	11, 299
<i>D. butyracea</i> (Roxb.) Lamk.	140	<i>Eichhornia</i> Kunth	477
DIPTEROCARPACEAE Bl.	19, 31 99, 497	<i>E. crassipes</i> (Mart.) Solms.	13, 477
<i>Dodonaea</i> L.	237	ELATINACEAE Dumort.	497
<i>D. viscosa</i> L.	16, 237	<i>Elatostema</i> J.R. & G. Forst.	70
<i>Dregea</i> E Meyer	272	<i>E. rupestre</i> Wedd.	70
<i>D. volubilis</i> (L.f.) Benth. ex Hook f.	272	<i>Elephantopus</i> L.	379
<i>Drypetes</i> Vahl	211	<i>E. scaber</i> L.	379
<i>D. assamica</i> (Hook. f.) Pax & Hoffm.	12, 211	<i>Eleusine</i> Gaertn.	446
		<i>E. coracana</i> (L.) Gaertn.	17, 446

<i>Eleusine indica</i> (L.) Gaertn.	447	<i>Erigeron</i> L.	380
<i>Elytrophorus</i> P. Beauv.	447	<i>E. sublyratus</i> DC.	380
<i>E. spicatus</i> (Willd.) A. Camus	13, 447	ERIOCAULACEAE Desv.	19, 38 412, 499
<i>Embllica</i> Gaertn.	211	ERIOCAULALES Nakai	499
<i>E. officinalis</i> Gaertn.	15, 16, 17, 211	<i>Eriocaulon</i> L.	412
<i>Emilia</i> Cass.	379	<i>E. quinquangulare</i> L.	13, 412
<i>E. sonchifolia</i> (L.) DC.	379	<i>E. setaceum</i> L.	412
<i>Enydra</i> Lour.	13, 380	<i>Eriochloa</i> Kunth	452
<i>E. fluctuans</i> Lour.	13, 380	<i>E. procera</i> (Retz.) Hubb.	452
<i>Epipactis</i> Zinn	491	<i>Eriolaena</i> DC.	104
<i>E. veratrifolia</i> Boiss.	12, 22, 491	<i>E. wallichii</i> DC.	12, 104, 105
<i>Eragrostiella</i> Bor	12, 447	<i>Eriophorum</i> L.	421
<i>E. bifaria</i> (Vahl) Bor	12, 447	<i>E. comosum</i> Wall. ex Nees	421
<i>Eragrostis</i> Wolf	20, 448	<i>Erycibe</i> Roxb.	285
<i>E. ciliata</i> (Roxb.) Nees	448	<i>E. paniculata</i> Roxb.	17, 285
<i>E. coarctata</i> Stapf	449	<i>Erythrina</i> L.	14, 175
<i>E. diarrhena</i> (Schutt.) Steud.	449	<i>E. variegata</i> L.	16, 175
<i>E. gangeticas</i> (Roxb.) Steud.	449	<i>Eugenia</i> spp.	11
<i>E. japonica</i> (Thumb.) Trin.	449	<i>Eulalia</i> Kunth	452
<i>E. minor</i> Host	450	<i>E. trispicata</i> (Schutt.) Henr.	452
<i>Eragrostis nutans</i> (Retz.) Nees ex Steud.	450	<i>Eulaliopsis</i> Honda	452
<i>E. tenella</i> (L.) P. Beauv. ex R. & S.	450	<i>E. binata</i> (Retz.) Hubb.	14, 452
<i>E. tremula</i> Hochst. ex Steud.	450	<i>Eulophia</i> R. Br.	491
<i>E. unioloides</i> (Retz.) Nees ex Steud.	451	<i>E. graminea</i> Lindl.	491
<i>Eranthemum</i> L.	11, 335	<i>Euphorbia</i> L.	15, 18, 20, 205, 212
<i>E. pulchellum</i> Andr.	335	<i>E. dracunculoides</i> Lamk.	212
<i>E. purpurascens</i> Nees	11, 335	<i>E. fusiformis</i> D. Don	12, 16, 213
<i>Erianthus</i> Mich.	451	<i>E. granulata</i> Forssk.	213
<i>E. rufipilus</i> (Steud.) Griseb.	451	<i>E. hirta</i> L.	16, 213, 214
<i>E. ravennae</i> (L.) P. Beauv.	451	<i>E. hypericifolia</i> auct. pl.	215

<i>Euphorbia orbiculata</i> HBK.	215	<i>F. semicordata</i> Buch.-Ham.	11, 14, 15 66, 67
<i>E. parviflora</i> L.	215	<i>F. virens</i> Ait.	15, 68
<i>E. prostrata</i> Ait.	215	<i>Fimbristylis</i> Vahl	422, 423
<i>E. pulcherrima</i> Willd. ex Klotzsch	215	<i>F. dichotoma</i> (L.) Vahl	13, 422
<i>E. thymifolia</i> L.	215	<i>F. littoralis</i> Gaud.	13, 422
EUPHORBIACEAE Juss.	20, 21, 37 205, 214, 223, 498	<i>Fioria vitifolia</i> Mattei	114
EUPHARBIALES Lindl.	498	<i>Firmiana</i> Marsili	104
<i>Eusteralis cruciata</i> Panig.	309	<i>F. colorata</i> (Roxb.) R. Br.	104
<i>Evolvulus</i> L.	285	<i>F. fulgens</i> (Wall. ex Mast.) Corner	106
<i>E. alsinoides</i> (L.) L.	16, 285	<i>Flacourtia</i> L' Hér.	123
<i>E. numularius</i> (L.) L.	285	<i>F. indica</i> (Burm. f.) Merr.	17, 123, 124
<i>Exacum</i> L.	257	<i>F. ramontchi</i> L' Hér.	17, 123
<i>E. tetragonum</i> Roxb.	257	FLACOURTIACEAE DC.	19, 29, 121 122, 124, 498
FABACEAE Lindl.	27, 158, 164, 498	<i>Flemingia</i> Roxb. ex Ait.	175
FABALES Bromh.	498	<i>F. angustifolia</i> Roxb.	176
<i>Feronia limonia</i> (L.) Swingle	247	<i>F. involucrata</i> Benth.	176
<i>Ficus</i> L.	11, 16, 20, 62	<i>F. macrophylla</i> (Willd.) Kuntze ex Merr.	176
<i>F. arnottiana</i> (Miq.) Miq.	63, 64	<i>F. prostrata</i> Roxb.	176
<i>Ficus benghalensis</i> L.	15, 64	<i>F. strobilifera</i> (L.) R. Br.	16, 176
<i>F. benjamina</i> L.	64	<i>Fleurya</i> Gaud.	70
<i>F. fruticosa</i> Roxb.	64	<i>F. interrupta</i> Gand.	70, 71
<i>F. heterophylla</i> L. f.	11, 64	<i>Floscopa</i> Lour.	16, 410
<i>F. hispida</i> L. f.	17, 65	<i>F. scandens</i> Lour.	410
<i>F. microcarpa</i> L. f.	65	<i>Foeniculum vulgare</i> Mill.	18
<i>F. palmata</i> Forssk.	65	<i>Fuirena</i> Rottb.	18, 422
<i>F. pumila</i> L.	65	<i>F. ciliaris</i> (L.) Roxb.	13, 422
<i>F. racemosa</i> L.	15, 17, 66, 67	FUMARIACEAE DC.	19, 30, 58, 497
<i>F. religiosa</i> L.	15, 66	<i>Fumaria</i> Tourm. ex L.	58
<i>F. rigida</i> Jack.	66	<i>F. indica</i> Pugsley	16, 58
<i>F. rumphii</i> Bl.	66		

<i>Gardenia</i> J. Ellis	11, 351, 355	<i>G. luteo-album</i> L.	380, 381
<i>G. angusta</i> (L.) Merr.	355	<i>G. pensylvanicum</i> Willd.	380, 381
<i>G. turgida</i> Roxb.	11, 18, 354	<i>G. polycaulon</i> Pers.	380, 381
<i>Geniosporum</i> Wall. ex Benth.	306, 309	<i>G. pulvinatum</i> Delile	380, 381
<i>G. coloratum</i> (D. Don) Kuntze	12, 309	<i>Gomphrena</i> L.	79, 85
GENTIANACEAE Juss.	35, 255, 498	<i>G. globosa</i> L.	85
GENTIANALES Lindl.	498	<i>G. serrata</i> L.	85
<i>Gentiana</i> L.	256, 257	<i>Gossypium</i> L.	100, 112
<i>G. aprica</i> Decne.	12, 257	<i>G. hirsutum</i> L.	14, 15, 112
<i>Geodorum</i> Jacks ex Andr.	491	GRAMINEAE Juss.	20, 21, 38, 499
<i>G. densiflorum</i> (Lamk.) Schltr.	12, 22 491, 495	<i>Grangea</i> Adans.	369, 381
GERANIALES Lindl.	498	<i>G. maderaspatana</i> (L.) Poir.	381
<i>Glinus</i> L.	89	<i>Grewia</i> L.	100, 101
<i>G. lotoides</i> L.	17, 89	<i>G. abutilifolia</i> Vent. ex Juss.	18, 101
<i>G. oppositifolius</i> (L.) A. DC.	16, 17, 89	<i>G. disperma</i> Rottbl.	101
<i>Globba</i> L.	472, 473	<i>G. helicterifolia</i> Wall. ex G. Don	12, 102
<i>G. bulbifera</i> Roxb.	473	<i>G. hirsuta</i> Vahl	102
<i>G. marantina</i> L.	473	<i>G. polygama</i> Roxb.	102
<i>G. racemosa</i> Sm.	473	<i>G. sapida</i> Roxb.	18, 102
<i>Glochidion</i> J.R. & G. Forst.	207, 215	<i>G. sclerophylla</i> Roxb. ex G. Don	18, 102
<i>G. assamicum</i> (Muell.) Hook. f.	15, 216	<i>Guizotia</i> Cass.	372, 382
<i>G. lanceolarium</i> Dalz.	216	<i>G. abyssinica</i> (L. f.) Cass.	15, 382
<i>G. multiloculare</i> Muell.-Arg.	216	GUTTIFERAE Juss.	30, 99, 497
<i>G. velutinum</i> Wt.	215, 216	<i>Gymnema</i> R. Br.	267, 270
<i>Gloriosa</i> L.	479	<i>G. sylvestre</i> (Retz.) Schult.	16, 269, 270
<i>G. superba</i> L.	16, 479	<i>Gymnopetalum</i> Arn.	18, 128, 132
<i>Glycosmis</i> Corrêa	247	<i>G. cochinchinense</i> (Lour.) Kurz	132
<i>G. arborea</i> (Roxb.) DC.	247	<i>Hackelochloa</i> Kuntze	427, 453
<i>Gmelina arborea</i> L.	11, 12, 17, 18	<i>H. granularis</i> (L.) Kuntze	12, 16, 453
<i>Gnaphalium</i> L.	371, 380	HALORAGACEAE R. Br.	19, 28 187, 498

HALORAGALES Novák ex Cronq. 498	<i>H. carthamoides</i> (Roxb.) Bhatta. 386
<i>Haldina</i> Ridsd. 350, 355	<i>Heteropanax</i> Seem. 254
<i>H. cordifolia</i> (Roxb.) Ridsd. 355	<i>H. fragrans</i> Seem. 254
HAMAMELIDIDAE Takh. 497	<i>Heteropogon</i> Pers. 428, 453
<i>Hedychium</i> Koenig 472, 473	<i>H. contortus</i> (L.) P. Beauv. ex R. & S. 453
<i>H. coronarium</i> Koenig 473, 474	<i>Hibiscus</i> L. 110, 113
<i>H. thyriforme</i> Buch.-Ham. ex Sm. 474	<i>H. cannabinus</i> L. 14, 113
<i>Hedyotis</i> L. 20, 350, 355	<i>H. mutabilis</i> L. 113
<i>H. affinis</i> R. & S. 362	<i>H. rosa-sinensis</i> L. 113
<i>H. biflora</i> (L.) Lamk. 366	<i>H. sabdariffa</i> L. 14, 18, 113
<i>H. corymbosa</i> (L.) Lamk. 362	<i>H. vitifolius</i> L. 14, 116
<i>H. diffusa</i> Willd. 362	HIPPOCRATEACEAE Juss. 19, 32 203, 498
<i>H. gracilis</i> Wall. 358	<i>Hiptage</i> Gaertn. 232
<i>H. herbacea</i> L. 363	<i>H. benghalensis</i> (L.) Kurz 232
<i>H. ovatifolia</i> Cav. 366	<i>Holarrhena</i> R. Br. 259, 262
<i>H. pinifolia</i> Wall. ex G. Don 355, 356	<i>H. pubescens</i> (Buch.-Ham.) Wall. ex G. Don 11, 16, 262
<i>H. pumila</i> L.f. 363	<i>Holmskioldia</i> Retz. 301, 304
<i>H. verticillata</i> (L.) Lamk. 356	<i>H. sanguinea</i> Retz. 304
<i>Helianthus</i> L. 15	<i>Holoptelea</i> Planch. 11, 59
<i>Helicteres</i> L. 104, 106	<i>H. integrifolia</i> (Roxb.) Planch. 11, 15, 59
<i>H. isora</i> L. 106	<i>Hoppea</i> Willd. 255, 257
<i>Heliotropium</i> L. 296, 299	<i>H. dichotoma</i> Willd. 257
<i>H. indicum</i> L. 299, 300	<i>Hordeum</i> L. 433, 453
<i>H. ovalifolium</i> Forssk. 300	<i>H. vulgare</i> L. 17, 453
<i>H. strigosum</i> Willd. 300	<i>Hybanthus</i> Jacq. 125
<i>Hemidesmus</i> R. Br. 267, 269	<i>H. enneaspermus</i> (L.) F. Muell. 16 125, 126
<i>H. indicus</i> (L.) R. Br. 16, 269, 270	<i>Hydrilla</i> Rich. 390, 391
<i>Hemigraphis</i> Nees 330, 335	
<i>H. hirta</i> (Vahl) Anders. 335	
<i>Hemistepta</i> Bunge 386	

<i>Hydrilla verticillata</i> (L.f.) Royle	13, 391	<i>Imperata</i> Cirillo	426, 454
<b>HYDROCHARITACEAE</b> Juss.	40, 390 499	<i>I. cylindrica</i> (L.) Raeuschel.	14, 454
<i>Hydrocotyle</i> L.	250, 251	<i>Indigofera</i> L.	158, 177
<i>H. sibthorpioides</i> Lamk.	251, 252	<i>I. astragalina</i> DC.	15, 16, 177
<i>Hydrolea</i> L.	295	<i>I. cassioides</i> Rottl. ex DC.	16, 177, 178
<i>H. zeylanica</i> (L.) Vahl	295	<i>I. linifolia</i> (L.f.) Retz.	16, 177, 178
<b>HYDROPHYLLACEAE</b> R. Br.	19, 35 295, 498	<i>I. linnaei</i> Ali	16, 177, 178
<i>Hygrophila</i> R. Br.	330, 336	<i>I. tinctoria</i> L.	15, 177, 178
<i>H. difformis</i> (L.f.) Bl.	336	<i>I. trifoliata</i> L.	16, 177, 178
<i>H. polysperma</i> (Roxb.) Anders.	13, 336, 337	<i>Inula</i> L.	16, 382
<i>H. schulli</i> Almedia	336	<i>I. cappa</i> (D. Don) DC.	12, 382
<i>Hygropyza</i> Nees	13, 432, 453	<i>Ipomoea</i> L.	11, 20, 282, 286
<i>H. aristata</i> (Retz.) Nees ex Wt. & Arn.	453	<i>I. aquatica</i> Forssk.	18, 286
<i>Hymenachne</i> P. Beauv.	430, 454	<i>I. batatas</i> Lamk.	18, 286, 287
<i>H. acutigluma</i> (Steudel) Gilli.	13, 454	<i>I. fistulosa</i> Mart. ex Choisy	286, 287
<i>H. pseudointerrupta</i> C. Muell.	454	<i>I. eriocarpa</i> R. Br.	286, 287
<i>Hymenodictyon</i> Wall.	351, 356	<i>I. nil</i> (L.) Roth	16, 286, 288
<i>H. orikense</i> (Roxb.) Mabb.	356	<i>I. obscura</i> (L.) Ker-Gawl.	16, 286, 288
<i>Hypericum</i> L.	99	<i>I. pes-tigridis</i> L.	286, 288
<i>H. japonicum</i> Thunb. ex Murr.	99	<i>I. quamoclit</i> L.	286, 288
<b>HYPOXIDACEAE</b> R. Br.	19, 40, 480 481, 499	<i>I. turbinata</i> Lag.	286, 289
<i>Hyptis</i> Jacq.	306, 309	<i>Isachne</i> R. Br.	432, 454
<i>H. suaveolens</i> (L.) Poit.	309	<i>I. dispar</i> Trin.	454
<b>ICACINACEAE</b> (Benth.) Miers	19, 32 203, 204, 498	<i>Ischaemum</i> L.	427, 455
<i>Ichnocarpus</i> R. Br.	12, 259	<i>I. rugosum</i> Salisb.	455
<i>I. frutescens</i> (L.) R. Br.	263	<i>Iseilema</i> Anders.	429, 455
<i>Impatiens</i> L.	250	<i>I. laxum</i> Hack.	455
<i>I. balsamina</i> L.	250	<i>Ixora</i> L.	351, 357
		<i>I. arborea</i> Roxb. ex Sm.	357
		<i>I. coccinea</i> L.	357
		<b>Jasminaceae</b> Juss.	318

<i>Jasminum</i> L.	316	<i>Lagenaria</i> sp.	18
<i>J. arborescens</i> Roxb.	316	<i>Lagerstroemia</i> L.	11, 187, 188
<i>J. auriculatum</i> Vahl	316, 317	<i>L. indica</i> L.	188
<i>J. caudatum</i> Wall. ex DC.	316, 317	<i>L. parviflora</i> Roxb.	11, 12, 188, 189
<i>J. multiflorum</i> (Burm.f.) Andrews	15 316, 317	<i>L. speciosa</i> (L.) Pers.	188, 189
<i>J. sambac</i> Ait.	15, 316, 317	<i>Laggera</i> Sch.-Bip. ex Koch.	16, 382
<i>J. scandens</i> Vahl	316, 317	<i>L. aurita</i> (L.F.) Sch.-Bip ex Cl.	382
<i>Jatropha</i> L.	205, 217	LAMIACEAE Lindl.	36, 306, 498
<i>J. curcas</i> L.	15, 217	LAMIALES Bromh.	498
<i>J. gossypifolia</i> L.	15, 16, 217	<i>Lannea</i> A. Rich.	239, 240
<i>J. integerrima</i> Jacq.	217	<i>L. coromandelica</i> (Houtt.) Merrile	240
JUNCACEAE Juss.	19, 38 412, 413, 499	<i>Lantana</i> L.	301, 304
JUNCALES Lindl.	499	<i>L. aculeata</i> L.	304
<i>Juncus</i> L.	412	<i>L. camara</i> L.	304
<i>J. prismatocarpus</i> R. Br.	13, 412, 413	<i>L. indica</i> Roxb.	304
<i>Justicia</i> L.	329, 337	<i>Lapartea interrupta</i> Chew	70
<i>J. adhatoda</i> L.	337	<i>Lasia</i> Lour.	399, 403
<i>J. peploides</i> (Nees) Anders.	337	<i>L. spinosa</i> (L.) Thw.	13, 403
<i>J. simplex</i> D. Don	337, 338	<i>Lathyrus</i> L.	17, 158
<i>Khoautia</i> Cham. & Schlecht	350, 358	<i>L. aphaca</i> L.	179
<i>K. gracilis</i> (Wall.) DC.	358, 359	LAURACEAE Juss.	36, 44, 497
<i>Kirganellia</i> Juss.	207, 217	LAURALES Lindl.	497
<i>K. reticulata</i> (Poir.) Baill.	18, 217	<i>Launaea</i> Cass.	373, 383
<i>Knoxia</i> L.	12, 350, 357	<i>L. procumbens</i> (Roxb.) Ramayya & Rajagopal	383
<i>K. sumatrensis</i> (Retz.) DC.	357	<i>Lawsonia</i> L.	187, 189
<i>K. roxburghii</i> (Spreng.) M.A. Rau	357	<i>L. inermis</i> L.	189
<i>Kydia</i> Roxb.	11, 109, 114	LECYTHIDACEAE Poit	28, 120, 497
<i>K. calycina</i> Roxb.	11, 12, 15, 114	LECYTHIDALES Cronq.	497
LABIATAE Juss.	21, 36, 306, 498	<i>Leea</i> Royen ex L.	12, 227
		<i>L. crispa</i> Royen ex L.	227, 228

<i>Leea macrophylla</i> Roxb. ex Horn.	227	<i>L. plukenetii</i> (Roth) Spreng.	16, 310, 312
LEEACEAE (DC.) Dumort.	19, 32, 227 228, 498	LILIACEAE Juss.	39, 499
<i>Leersia</i> Swartz	432, 455	LILIALES Lindl.	499
<i>L. hexandra</i> Swartz	13, 455	LILIIDAE Takh.	499
LEGUMINOSAE Juss.	20, 21 147, 187, 498	LILIOPSIDA Cronq. et al.	19, 26, 499
<i>Lemna</i> L.	405	<i>Limnophila</i> R. Br.	319, 320
<i>L. aequinoctialis</i> Welw.	11, 13, 405	<i>L. indica</i> (L.) Druce	13, 320, 321
<i>L. paucicostata</i> auct. pl.	405	<i>L. rugosa</i> (Roth) Merr.	320, 321
LEMNACEAE Gray	38, 405, 499	<i>L. sessiliflora</i> (Vahl) Bl.	13, 320, 321
LENTIBULARIACEAE Rich.	19, 34 345, 347, 499	<i>Limonia</i> L.	245, 247
<i>Lens</i> L.	17	<i>Limonia acidissima</i> L.	15, 17, 247
<i>Leonotis</i> (Pers.) R. Br.	308, 310	LINACEAE Gray	31, 233, 498
<i>L. nepetifolia</i> (L.) R. Br.	15, 16, 310	LINALES Cronq.	498
<i>Leonurus</i> L.	306, 310	<i>Lindenbergia</i> Lehm.	319, 321
<i>L. japonicus</i> Houtt.	15, 16, 310	<i>L. muraria</i> (Roxb. ex D. Don) Bruel.	321
<i>Lepidagathis</i> Willd.	329, 338	<i>Lindernia</i> All.	13, 318, 322
<i>L. incurva</i> D. Don	338	<i>L. anagallis</i> (Burm f.) Pennell	322
<i>Leptadenia</i> R. Br.	266, 269	<i>L. antipoda</i> (L.) Alston	322, 323
<i>L. reticulata</i> (Retz.) Wt. & Arn.	16, 270	<i>L. ciliata</i> (Colsm.) Pennell	322, 323
<i>Leptochloa</i> P. Beauv.	431, 455	<i>L. crustacea</i> (L.) F. Muell.	322, 323
<i>L. chinensis</i> (L.) Nees	455, 456	<i>L. multiflora</i> (Roxb.) Muker.	322, 323
<i>L. panicea</i> (Retz.) Ohwi	455	<i>L. oppositifolia</i> Muker.	322, 325
<i>Leucaena</i> Benth.	147, 151	<i>L. parviflora</i> (Roxb.) Haines	322, 325
<i>L. leucocephala</i> (Lamk) de Wit.	15, 51	<i>L. viscosa</i> Boldingh	325
<i>Leucas</i> R. Br.	308, 310	<i>Linum</i> L.	231, 232
<i>L. biflora</i> (Vahl) R. Br.	310, 311	<i>L. usitatissimum</i> L.	14, 15, 232
<i>L. cephalotes</i> (Roth) Spreng.	15, 16, 311	<i>Lippia</i> L.	301, 304
<i>L. helicterifolia</i> Haines	22, 310, 311	<i>L. alba</i> Britt. & Wil.	304
<i>L. indica</i> (L.) R. Br. ex Vatke	308, 309	<i>L. javanica</i> (Brum. f.) Spreng.	12, 304
		Litchi Sonn.	235, 237
		<i>L. chinensis</i> Sonn.	18, 237

Litsea Lamk.	44	MAGNOLIOPSIDA Cronq.	
L. glutinosa (Lour). C.B. Robins.	15	& al.	19, 26, 497
	16, 44	Malachra L.	14, 109, 114
L. monopetala (Roxb.) Pers.	16, 44	M. capitata L.	114
L. sericea (Wall.) Hook.f.	44, 45	Mallotus Lour	12, 15, 206, 218
Lobelia L.	346, 348	M. philippensis (Lamk.) Muel.- Arg.	218
L. alsinoides Lamk.	348	M. repandus Muell.-Arg.	218
L. nicotianifolia Roth ex R. & S.	348	MALPIGHIACEAE Juss.	31, 232, 498
LOGANIACEAE R. Br.	35, 254, 498	MALVACEAE Juss.	20, 21, 33, 109
LORANTHACEAE Juss.	37, 200, 498		116, 497
Loranthus parasiticus (L.) Merr.	200	MALVALES Lind.	497
Ludwigia L.	193	Malvastrum A. Gray	110, 115
L. adscendens (L.) Hara	13, 193	M. coromandelianum (L.) Gracke	115
Ludwigia octovalvis (Jacq.) Raven	193		116
L. perennis L.	193, 194	Malvaviscus Cav.	110, 115
L. prostrata Roxb.	193, 194	M. arboreus Cav.	115
Luffa Mill.	14, 130, 132	Mangifera L.	11, 239, 240
L. cylindrica (L.) Roem.	18, 132	M. indica L.	12, 15, 18, 240
Lycopersicon Mill.	273, 275	Manilkara Adans.	140, 141
L. esculentum Mill.	18, 275	M. achras (Mill.) Fosberg	141
LYTHRACEAE J.St.-Hil.	28, 187, 498	M. zapota (L.) P. Royen	18, 141
Maclura Nutt.	62, 68	M. hexandra (Roxb.) Dub.	18, 141, 142
M. cochinchinensis Corner	68	Marsdenia R. Br.	267, 271
Madhuca J.F. Gmel.	11, 140, 141	M. tenacissima (Roxb.) Moon	271
M. longifolia var. latifolia (Roxb.) Chevalier	15, 141	Martynia L.	342
MAGNOLIACEAE Juss.	19, 29	M. annua L.	342
	41, 497	Maytenus Molina <i>emend.</i> Bosc	201, 202
MAGNOLIALES Bromh.	497	M. rufa (Wall.) Hara	12, 202
MAGNOLIIDAE Takh.	497	M. senegalensis (Lamk.) Exell	16, 202
MAGNOLIOPHYTA Cronq. & al.	26	Mazus Lour.	319, 325
	497	M. pumilus (Burm. f.) Steenis	325
		Mecardonia Ruiz & Pavon.	319, 325

<i>Mecardonia procumbens</i> (Mill.) Small	324, 325	<i>Michelia</i> L.	41
<i>Medicago</i> L.	160, 179	<i>M. champaca</i> L.	1, 15, 41
<i>M. lupulina</i> L.	179	<i>Microchloa</i> R. Br.	433, 456
MELASTOMATACEAE Juss.	19, 28 194, 498	<i>M. kunthii</i> Desv.	456
<i>Melia</i> L.	242, 243	<i>Micrococca</i> Benth.	206, 218
<i>M. azedarach</i> L.	15, 16, 243	<i>M. mercurialis</i> (L.) Benth.	218
MELIACEAE Juss.	32, 242, 498	<i>Micromelum</i> Corrêa	245, 248
<i>Melilotus</i> Juss.	160, 179	<i>M. integerrimum</i> Voigt	245, 248
<i>M. alba</i> Desr.	18, 179	<i>Mikania</i> Willd.	368, 383
<i>M. indica</i> All.	18, 179, 180	<i>M. micrantha</i> Kunth	383
<i>Meliosma</i> Bl.	11, 12, 56	<i>Miliusa</i> Leschen. ex DC.	11, 41, 42
<i>M. simplicifolia</i> (Roxb.) Walp.	11, 56	<i>M. velutina</i> (Dun.) Hook. f. & Thomson	42
<i>Melochia</i> L.	106	<i>Millettia</i> Wt. & Arn.	160, 180
<i>M. corchorifolia</i> L.	13, 105, 106	<i>M. extensa</i> (Benth.) Baker	12, 18, 180
<i>Melothria</i> L.	130, 133	<i>Mimosa</i> L.	147, 152
<i>M. heterophylla</i> (Lour.) Cogn.	18, 133	<i>M. himalayana</i> Gamble	152
MENISPERMACEAE Juss.	30, 53 57, 497	<i>M. pudica</i> L.	16, 152
MENYANTHACEAE Dumort.	19, 35 293, 294, 428	<i>M. rubicaulis</i> auct. pl.	152
<i>Merremia</i> Dennst. ex Endl.	282, 289	MIMOSACEAE R. Br.	27, 147, 498
<i>M. emarginata</i> Hall. f.	289	<i>Mimusops</i> L.	140, 142
<i>M. gangetica</i> (L.) Cufad.	289	<i>M. elengi</i> L.	15, 18, 142
<i>M. vitifolia</i> Hall. f.	289	<i>Mirabilis</i> L.	73, 74
<i>Meyna</i> Roxb. ex Link	352, 358	<i>M. jalapa</i> L.	74
<i>M. laxiflora</i> Robyns	358	<i>Mitragyna</i> Korth.	11, 349, 360
<i>M. pubescens</i> (Kurtz) Robyns	358, 360	<i>M. parviflora</i> (Roxb.) Kunth	11, 360
<i>M. spinosa</i> Roxb. ex Link	358, 360	<i>Mitreola</i> L.	254, 255
<i>Mezoneuron</i> Desf.	153, 157	<i>M. petiolata</i> (Gmel.) Torr. & A. Gray.	255
<i>M. cucullatum</i> (Roxb.) Wt. & Arn.	12 157	MOLLUGINACEAE Hutch.	28, 89, 497
		<i>Mollugo</i> L.	89

Mollugo pentaphylla L.	16, 18, 89	M. balbisiana Colla	470
Momordica L.	130, 133	<i>M. sapientum</i> auct. non L.	18, 470
<i>M. charantia</i> L.	16, 18, 133	MUSACEAE Juss.	19, 470, 499
<i>M. dioica</i> Roxb. ex Willd.	18, 133	Myriophyllum L.	187
Monochoria Presl.	13, 475, 477	<i>M. tetrandrum</i> Roxb.	13, 187
<i>M. hastata</i> (L.) Solms.	477, 478	MYRSINACEAE R. Br.	19, 34, 143 144, 498
<i>M. vaginalis</i> (Burm.f.) Presl.	13, 477	MYRTACEAE Juss.	28, 191, 498
Monstera Adans.	399, 403	MYRTALES Lindl.	498
Monstera deliciosa Liebm.	403	NAJADALES Nakai	499
MORACEAE Link	37, 61, 67, 497	Najas minor All.	13
Morinda L.	349, 360	Naravelia DC.	14, 51, 52
<i>M. pubescens</i> Sm.	360	<i>N. zeylanica</i> (L.) DC.	22, 52
<i>M. tomentosa</i> Heyne ex Roth	360	Narenga Bor	426, 456
Moringa L.	140	<i>N. porphyrocoma</i> Bor	456
<i>M. oleifera</i> Lamk.	15, 18, 140	Natsiatum Arn.	203
MORINGACEAE Dumort.	19, 31, 141	<i>N. herpeticum</i> Arn.	18, 203, 204
Morus L.	62, 68	Nechamandra Planch.	390, 391
<i>M. indica</i> L.	68	<i>N. alternifolia</i> (Roxb.) Thw.	13, 391
Mucuna Adans.	12, 160, 180	Nelsonia R. Br.	329, 338
<i>M. nigricans</i> (Lour.) Steudel	18, 180	<i>N. canescens</i> (Lamk.) Spreng.	338
<i>M. pruriens</i> (L.) DC.	16, 18, 180	Nelumbo Adans.	14, 48
Mukia Arn.	16, 130, 134	<i>N. nucifera</i> Gaertn.	18, 48, 49
<i>M. maderaspatana</i> (L.) Roem.	134	NELUMBONACEAE Dumort.	19, 30 48, 49, 497
Murdannia Royle	406, 410	NELUMBONALES Takh.	497
<i>M. edulis</i> (Stokes) Faden	410	Neolamarckia Bosser	361
<i>M. nudiflora</i> (L.) Brenan	410	<i>N. cadamba</i> (Roxb.) Bosser	361
<i>M. spirata</i> (L.) Bruechn.	410, 411	Neptunia Lour.	147, 152
Murraya L.	11, 245, 248	<i>N. oleracea</i> Lour.	13, 152
<i>M. paniculata</i> (L.) Jack.	16, 248	Nepeta L.	307, 312
<i>M. koenigii</i> (L.) Spreng.	16, 248, 249		
Musa L.	14, 470		

<i>Nepeta hindostana</i> (Roth)		<i>Ocimum</i> L.	306, 312
Haines	15, 16, 312	<i>O. americanum</i> L.	15, 16, 312
<i>Nerium</i> L.	258, 263	<i>O. basilicum</i> L.	15, 16, 18, 312, 313
<i>N. indicum</i> Mill.	263	<i>Oenanthe</i> L.	250, 251
<i>Nervilia</i> Comm. ex Gaud.	491, 492	<i>O. javanica</i> (Bl.) DC.	251
<i>N. aragoana</i> Gaud.	12, 22, 492	OLACACEAE DC.	19, 32, 198, 498
<i>N. plicata</i> (Andr.) Schltr.	12, 22, 492	<i>Olax</i> L.	198
<i>Nicotiana</i> L.	273, 275	<i>O. scandens</i> Roxb.	198
<i>N. plumbaginifolia</i> Viv	275, 277	<i>Oldenlandia</i> L.	351, 361
<i>Nicotiana rustica</i> L.	17, 277	<i>O. affinis</i> (R. & S.) DC.	361, 362
<i>N. tabacum</i> L.	17, 277	<i>O. corymbosa</i> L.	362
<i>Nigella</i> L.	51, 52	<i>O. diffusa</i> (Willd.) Roxb.	362
<i>N. sativa</i> L.	16, 18, 52	<i>O. herbacea</i> Roxb.	362, 363
<i>Nostolachma khasiana</i>		<i>O. pumila</i> DC.	362, 363
Deb & Lahi.	354	OLEACEAE Hoffma. & Link	19, 34 316, 498
NYCTAGINACEAE Juss.	36, 73, 497	ONAGRACEAE Juss.	28, 193, 498
<i>Nyctanthaceae</i> Kundu & De	318	<i>Operculina</i> S. Manso	290, 291
<i>Nyctanthes</i> L.	11, 15, 318	<i>O. turpethum</i> (L.) S. Manso	16, 290
<i>N. arbor-tristis</i> L.	318	OPILIACEAE (Benth.) Valetton.	19, 32 198, 498
<i>Nymphaea</i> L.	50	<i>Oplismenus</i> P. Beauv.	430, 456
<i>N. nouchali</i> Burm.f.	18, 50	<i>O. burmannii</i> (Retz.) P. Beauv.	456
<i>N. pubescens</i> Willd.	18, 50	<i>O. compositus</i> (L.) P. Beauv.	456, 457
<i>N. rubra</i> Roxb. ex Andr.	18, 50	<i>Opuntia</i> L.	76
NYMPHAEACEAE Salisb.	19, 30 50, 497	<i>O. stricta</i> (Haw.) Haw. var.	
NYMPHAEALES J. H. Schaff.	497	<i>dillenii</i> (Ker-Gawl.) Benson	76, 77
<i>Nymphoides</i> Séguier	13, 293	ORCHIDACEAE Juss.	21, 40, 490 493, 495, 499
<i>N. hydrophylla</i> (Lour.) Kuntze	293, 294	ORCHIDALES Bromh.	499
<i>N. indica</i> (L.) Kuntze	13, 293, 295	OROBANCHACEAE Vent.	35, 327 328, 499
<i>Ochna</i> L.	99	<i>Orobanche</i> L.	327
<i>O. obtusata</i> DC.	12, 99		
OCHNACEAE DC.	19, 30, 99, 497		

<i>Orobanche aegyptiaca</i> Pers.	327, 329	<i>Parthenium</i> L.	371, 383
<i>Oroxylum</i> Vent.	11, 344	<i>P. hystereophorus</i> Roxb.	18, 383
<i>O. indicum</i> (L.) Vent.	344	<i>P. h.</i> var. <i>tetramera</i> Bhatta.	383, 384
<i>Oryza</i> L.	432, 457	<i>Paspalidium</i> Stapf	430, 459
<i>O. rufipogon</i> Griff.	13, 17, 457	<i>P. flavidum</i> (Retz.) A. Camus	459
<i>O. sativa</i> L.	13, 17, 194, 457	<b>PAPAVERALES</b> Cornq.	497
<i>O. plena</i> (Prain) Chow.	431	<i>Paspalum</i> L.	430, 459
<i>Osbeckia</i> L.	194	<i>P. scrobiculatum</i> L.	459
<i>O. nepalensis</i> Hook.	194, 195	<i>P. vaginatum</i> Swartz	459
<i>O. nutans</i> Wall. ex Triana	194, 195	<i>Passiflora</i> L.	127
<i>Ottelia</i> Pers.	390, 391	<i>P. foetida</i> L.	18, 127
<i>O. alismoides</i> (L.) Pers.	391	<i>P. suberosa</i> L.	127, 128, 129
<b>OXALIDACEAE</b> R. Br.	31, 249	<b>PASSIFLORACEAE</b> Kunth	19, 29, 127 129, 498
<i>Oxalis</i> L.	249, 250	<i>Pavetta</i> L.	11, 351, 364
<i>Oxalis corniculata</i> L.	16, 250	<i>P. crassicaulis</i> Bremek.	364
<i>Oxystelma</i> R. Br.	267, 271	<i>P. indica</i> L.	11, 364
<i>O. secamone</i> (L.) Karst.	271	<i>Pavonia</i> Cav.	14, 110, 115
<i>Paecleria</i> L.	12, 352, 363	<i>P. repanda</i> Spreng.	115
<i>P. foetida</i> L.	363	<i>Pecteilis</i> Raf.	22, 491, 492
<b>PALMAE</b> Juss.	393	<i>P. gigantea</i> Raf.	12, 492, 493
<b>PANDANACEAE</b> R. Br.	19, 38, 397 398, 499	<b>PEDALIACEAE</b> R.Br.	36, 342, 499
<b>PANDANALES</b> Lindl.	499	<i>Pennisetum</i> L. C. Rich. ex Pers.	429, 460
<i>Pandanus</i> L.f.	397	<i>P. americanum</i> (L.) K. Schum.	460
<i>P. amaryllifolius</i> Roxb.	15, 397	<i>P. glaucum</i> (L.) R. Br.	465
<i>P. fascicularis</i> Lamk.	397, 398	<i>Pentanema</i> Cass.	370, 383
<i>Panicum</i> L.	429, 458	<i>P. indicum</i> (L.) Ling	383, 385
<i>P. notatum</i> Retz.	458	<i>P. vestitum</i> (Wall. ex DC.) Ling	383, 385
<i>P. paludosum</i> Roxb.	458	<i>Pentapetes</i> L.	103, 106
<i>P. repens</i> L.	458	<i>P. phoenicea</i> L.	106
<b>PAPAVERACEAE</b> Juss.	19, 29, 58, 497	<i>Peperomia</i> Ruiz & Pav.	45
<b>PAPILIONACEAE</b> Giseke	158		

<i>Peperomia pellucida</i> (L.) HBK	18, 45, 46	<i>P. nodiflora</i> (L.) Greene	305
<i>Pergularia</i> L.	267, 272	<i>Phyllanthus</i> L. <i>emend.</i> Gaert.	207, 219
<i>P. daemia</i> (Forssk.) Chiv.	16	<i>P. airy-shawii</i> Brunel & Roux	219
<i>Perilla</i> L.	307, 313	<i>P. amarus</i> Schum. & Th.	219, 220
<i>P. frutescens</i> (L.) Brit.	16, 313	<i>P. fraternus</i> Webster	219, 220
<i>Periplocaceae</i> Schl.	266	<i>P. lawi</i> Grah.	219, 220
<i>Peristrophe</i> Nees	330, 339	<i>P. urinaria</i> L.	219, 220
<i>P. paniculate</i> (Forssk.) Brummitt	339	<i>P. virgatus</i> Forst. f.	219, 221
<i>Perotis</i> Ait.	432, 460	<i>Physalis</i> L.	273, 276
<i>P. indica</i> (L.) Kuntze	460	<i>P. minima</i> L.	18, 276, 277
<i>Petalidium</i> Nees	330, 339	<i>P. minima</i> var. <i>indica</i> Cl.	277, 278
<i>P. barlerioides</i> (Roth) Nees	339	<i>P. peruviana</i> L.	277, 278
<i>Peucedanum</i> L.	253	PHYTOLACCACEAE R.Br.	19, 36 73, 497
<i>P. nagpurensis</i> (Cl.) Prain	16, 22, 253	<i>Pilea</i> Lind.	69, 72
<i>Pisum</i> L.	17	<i>P. microphylla</i> (L.) Liebm.	72
<i>Phalaris</i> L.	432, 460	<i>Piper</i> L.	45, 47
<i>P. minor</i> Retz.	460	<i>P. betle</i> L.	17
<i>Phlogacanthus</i> Nees	11, 331, 339	<i>P. longum</i> L.	16
<i>P. thyriformis</i> (Hardw.) Mabb.	11, 339	<i>P. peepuloides</i> Roxb.	16, 47
<i>Phlox</i> L.	295	PIPERACEAE C. Agardh	37, 45 46, 497
<i>P. drummondii</i> Hook.	295	PIPERALES Lindl.	497
<i>Phoebe</i> Nees	44, 45	<i>Pistia</i> L.	397, 404
<i>P. lanceolata</i> (Nees) Nees	16, 45	<i>P. stratiotes</i> L.	13, 16, 404
<i>Phoenix</i> L.	14, 16, 18, 393, 396	<i>Poa</i> L.	431, 461
<i>P. acaulis</i> Buch.-Ham. ex Roxb.	14, 18, 396	<i>P. annua</i> L.	12, 461
<i>P. humilis</i> Royle	18, 396	<i>Pithecellobium</i> Mart.	147, 152
<i>P. sylvestris</i> (L.) Roxb.	18, 396	<i>P. dulce</i> (Roxb.) Benth.	152
<i>Phragmites</i> Trin.	14, 432, 460	<i>Plectranthus</i> L' Hér.	306, 313
<i>P. karka</i> (Retz.) Trin. ex Steud.	460	<i>P. mollis</i> (Ait.) Spreng.	16, 313
<i>P. vallatoria</i> (L.) Veld.	12, 14, 460	PLUMBAGINACEAE Juss.	19, 34 97, 497
<i>Phyla</i> Lour.	301, 305		

PLUMBAGINALES Lind.	97, 497	<i>P. barbatum</i> L.	94, 95
<i>Plumbago</i> L.	16, 97	<i>P. hydropiper</i> L.	13, 18, 94
<i>P. zeylanica</i> L.	97	<i>P. glabrum</i> Willd.	13, 18, 95, 96
<i>Plumeria</i> L.	258, 263	<i>P. lapathifolium</i> L. var.	
<i>P. rubra</i> L.	263	<i>lanatum</i> (Roxb.) Steward	13, 94, 96
POACEAE (R.Br.) Barnhart	38, 425 445, 499	<i>P. plebejum</i> R. Br.	94, 96
POALES Novák	499	<i>P. salicifolium</i> Willd.	94, 96
<i>Pogonatherum</i> P. Beauv.	427, 461	<i>Polypogon</i> Desf.	433, 461
<i>P. paniceum</i> (Lamk.) Hack.	461	<i>P. monspeliensis</i> Desf.	461
<i>Pogostemon</i> Desf.	307, 314	PONTEDERIACEAE Kunth	39, 475 478, 499
<i>P. benghalense</i> (Burm.f.) Kuntze	12 16, 314	<i>Pongamia</i> Vent.	160, 181
POLEMONIACEAE Juss.	19, 35 295, 498	<i>P. pinnata</i> (L.) Pierre	15, 16, 181
<i>Polyalthia</i> Bl.	41, 43	<i>Potentilla</i> L.	146
<i>P. longifolia</i> Benth. & Hook.f.	15, 43	<i>P. supina</i> L.	146
<i>P. suberosa</i> (Roxb.) Benth & Hook. f.	16, 43	<i>Porana</i> Burm. f.	14, 281, 290
<i>Polycarpacea</i> Lamk.	90	<i>P. paniculata</i> Roxb.	290
<i>P. corymbosa</i> (L.) Lamk.	16, 90	<i>Portulaca</i> L.	86
<i>Polycarpon</i> L.	90, 91	<i>P. oleracea</i> L.	18, 86, 87
<i>P. prostratum</i> (Frossk.) Aschers. & Schweinf.	16, 91, 92	<i>P. pilosa</i> L.	18, 86
<i>Polygala</i> L.	233	<i>P. pilosa</i> L. ssp. <i>grandiflora</i> (Hook.) Geesink	86, 88
<i>P. arvensis</i> Willd.	16, 233	<i>P. quadrifida</i> L.	18, 86, 88
<i>P. crotalarioides</i> Buch.- Ham. ex DC.	12, 233, 236	PORTULACACEAE Juss.	29, 86 87, 497
POLYGALACEAE R.Br.	31, 233, 498	POTAMOGETONACEAE Dumort.	19 39, 392, 499
POLYGALALES Benth. & Hook. f.	498	<i>Potamogeton</i> L.	392
POLYGONACEAE Juss. 36, 93, 95, 497		<i>P. nodosus</i> Poir.	13, 392
POLYGONALES Lindl.	497	<i>P. pectinatus</i> L.	13, 392
<i>Polygonum</i> L.	93, 94	<i>Pothos</i> L.	399, 404
		<i>P. scandens</i> L.	404

<i>Pouzolzia</i> Gaud.	69, 72	<i>R. sceleratus</i> L.	13, 17, 52, 53, 54
<i>P. pentandra</i> Benn. & Brown	72	<i>Raphanus sativus</i> L.	139
<i>P. zeylanica</i> (L.) Benn. & Brown	72	<i>Rauvolfia</i> L.	258, 264
<i>Premna</i> L.	301, 305	<i>R. serpentina</i> (L.) Benth. ex Kurz	17, 264
<i>P. mucronata</i> Roxb.	305	<i>R. tetraphylla</i> L.	17, 264
PRIMULACEAE Vent.	34, 145, 498	<i>Reinwardtia</i> Dumort.	231, 232
PRIMULALES Lindl.	498	<i>R. indica</i> Dumort.	232
<i>Primula</i> L.	145	<i>Reissantia</i> Halle	203
<i>P. umbellata</i> (Lour.) Bentvelzen	145	<i>R. arborea</i> (Roxb.) Hara	12, 203
<i>Protium</i> Burm. f.	238	<i>Remusatia</i> Schott	16, 399, 404
<i>P. serratum</i> Engl.	238	<i>R. vivipara</i> (Lodd.) Schoott	404
<i>Pseudelephantopus</i> Rohr	368, 385	RHAMNACEAE Juss.33, 224, 226, 498	
<i>P. spicatus</i> (Aubl.) C.F. Baker	385	RHAMNALES Lindl.	498
<i>Psidium</i> L.	191	<i>Rhaphidophora</i> Hassk.	399, 404
<i>Psidium guajava</i> L.	191	<i>R. aurea</i> (Linden ex Andre) Furtado	404
<i>Pterospermum</i> Schreber.15, 22, 104, 107		<i>Rhinocanthus</i> Nees	330, 340
<i>P. acerifolium</i> Willd.	107	<i>R. nasutus</i> (L.) Kurz	340
<i>Pterygota</i> Schott & Endl.	104, 107	<i>Rhoeo</i> Hance	407, 411
<i>P. alata</i> (Roxb.) R. Br.	107	<i>R. spathacea</i> (Sw.) Stearn	411
<i>Punica</i> L.	193	<i>Rhus</i> L.	12, 239, 241
<i>P. granatum</i> L.	18, 193	<i>R. javanica</i> L.	12, 241
PUNICACEAE Horan. 19, 28, 193, 428		<i>Rhynchosstylis</i> Bl. <i>emend.</i> Hassk.	490, 494
<i>Pupalia</i> Juss.	78, 85	<i>R. retusa</i> (L.) Bl.	22, 494, 495
<i>P. lappacea</i> (L.) Juss.	85	<i>Ricinus</i> L.	205, 221
<i>Quisqualis</i> L.	196	<i>R. communis</i> L.	15, 18, 221
<i>Q. indica</i> L.	196	<i>Rivea</i> Choisy	281, 291
RANUNCULACEAE Juss.30, 51, 54, 497		<i>R. hypocrateriformis</i> (Desr.) Choisy	291
RANANCULALES Lindl.	497	<i>R. ornata</i> (Dear.) Choisy	18, 291
<i>Ranunculus</i> L.	51, 52	<i>Rivina</i> L.	73
<i>R. pensylvanicus</i> L.f.	52, 53, 54		
<i>R. nepalensis</i> DC.	52, 53		

<i>Rivina humilis</i> L.	17, 73	RUTACEAE Juss.	31, 245, 498
<i>Rorippa</i> Scop.	139	<i>Sabia</i> Colebr.	56, 58
<i>R. indica</i> (L.) Hiern	139	<i>S. paniculata</i> Hook. f. & Th.	12, 58
ROSACEAE Juss.	27, 146, 498	SABIACEAE Bl.	32, 56, 497
ROSALES Lindl.	498	<i>Saccharum</i> L.	11, 427, 462
ROSIDAE Takh.	498	<i>S. arundinaceum</i> Retz.	12, 14, 462
<i>Rotala</i> L.	187, 189	<i>S. bengalense</i> Retz.	12, 14, 462, 463
<i>R. indica</i> (Willd.) Koehne	13, 189, 190	<i>S. officinarum</i> L.	16, 462, 463
<i>R. pentandra</i> (Roxb.) Blatt. & Hallb.	190	<i>S. procerum</i> Roxb.	462, 463
<i>R. rosea</i> (Poir.) Cook	13, 189, 190	<i>S. spontaneum</i> L.	12, 462, 463
<i>R. rotundifolia</i> (Roxb.) Koehne	189, 190	<i>Sacciolepis</i> Nash	12, 14, 430, 464
<i>Rottboellia</i> L.f.	427, 462	<i>S. myosuroides</i> (R. Br.) A. Camus	464
<i>R. cochinchinensis</i> (Lour.) W.D. Clayton	462	<i>Sagittaria</i> L.	390
<i>Rubia</i> L.	350, 364	<i>S. guayanensis</i> HBK ssp. <i>lappula</i> (D. Don) Bogin.	13, 390
<i>R. angustissima</i> Wall.	364	SALICACEAE Mirb.	37, 135
RUBIACEAE Juss.	20, 21, 33 349, 359, 499	SALICALES Lindl.	498
RUBIALES Benth. & Hook. f.	499	<i>Salix</i> L.	11, 135
<i>Rubus</i> L.	146	<i>S. tetrasperma</i> Roxb.	11, 15, 135
<i>R. ellipticus</i> Sm.	12, 146	<i>Salomonina</i> Lour.	233, 235
<i>Ruellia</i> L.	330, 340	<i>S. ciliata</i> (L.) DC.	12, 235
<i>R. beddomei</i> Cl.	12, 340	<i>Salvia</i> L.	307, 314
<i>R. prostrata</i> Lamk.	340	<i>S. plebeia</i> R. Br.	17, 314
<i>R. tuberosa</i> L.	340	<i>Sansevieria</i> Thunb.	14, 482, 483
<i>Rumex</i> L.	93, 97	<i>S. roxburghiana</i> Schult.	483
<i>R. dentatus</i> L.	97	<i>S. trifasciata</i> Prain	483
<i>R. vesicarius</i> L.	18, 97	SAPINDACEAE Juss.	31, 235, 498
<i>R. klotzschianus</i> Meisn.	97	SAPINDALES Benth. & Hook. f.	498
<i>Rungia</i> Nees	330, 341	SAPOTACEAE Juss.	36, 140, 498
<i>R. pectinata</i> (L.) Nees	341	<i>Saraca</i> L.	153, 157
<i>R. repens</i> (L.) Nees	341	<i>S. asoca</i> (Roxb.) de Wilde	22

Sauropus Bl.	207, 221	Semecarpus L.f.	239, 241
<i>S. quadrangularis</i> (Willd.) Muell.-Arg.		<i>S. anacardium</i> L.f.	15, 18, 241
var. <i>pubescens</i> Kurz	221	Sesamum L.	15, 344
Saussurea DC.	373, 385	<i>S. orientale</i> L.	344
<i>S. affinis</i> Spreng. ex DC.	385, 386	Sesbania Scop.	160, 181
<i>S. heteromalla</i> (D. Don) Hand.-Mazz.	385, 386	<i>S. bispinosa</i> (Jacq.) W.F. Wight	13, 181
Schleichera Willd.	235, 238	<i>S. grandiflora</i> (L.) Poir.	18, 181, 182
<i>S. oleosa</i> (Lour.) Oken.	11, 15, 238	<i>S. sesban</i> (L.) Merr.	181, 182
Schizachyrium Nees	428, 464	Seseli L.	251, 253
<i>S. brevifolium</i> (Sw.) Buse.	464	<i>S. daucifolium</i> Cl.	253
<i>Schoenoplectus</i> Palla	424	<i>S. diffusum</i> (Roxb. ex Sm.) Sant. & Wagh	253
<i>S. articulatus</i> (L.) Palla	424	Setaria P. Beauv.	429, 464
<i>S. juncoides</i> (Roxb.) Palla	424	<i>S. barbata</i> (Lamk.) Kunth	464, 465
<i>S. supinus</i> (L.) Palla	424	<i>S. glauca</i> (L.) P. Beauv.	464, 465
Scindapsus Schott	399, 405	<i>S. italica</i> (L.) P. Beauv.	17, 464, 465
<i>S. officinalis</i> Schott	17, 405	<i>S. paniculifera</i> Fourn. ex Hemsf.	17, 464, 465
Scoparia L.	319, 326	<i>S. pumila</i> R. & S.	464, 465
<i>S. dulcis</i> L.	329	Shorea Roxb. ex C.F. Gaertn.	99
Scirpus L.	414, 424	<i>S. robusta</i> C.F. Gaertn.	11, 15, 99
<i>S. articulatus</i> L.	13, 424	Sida L.	14, 110, 117
<i>S. juncoides</i> Roxb.	13, 424	<i>S. acuta</i> Burm. f.	117
<i>S. supinus</i> L.	13, 424	<i>S. cordata</i> (Burm. f.) Borssum	17, 117
SCROPHULARIACEAE Juss.	20, 21 36, 318, 324, 498	<i>S. cordifolia</i> L.	17, 117, 118
SCROPHULARIALES Lindl.	498	<i>S. rhombifolia</i> L.	17, 117, 118
Scurrula L.	200	Sigesbeckia L.	372, 386
<i>S. parasitica</i> L.	200	<i>S. orientalis</i> L.	386
Scutellaria L.	307, 314	Silene L.	90, 91
<i>S. repens</i> D. Don	12, 314, 315	<i>S. conoidea</i> L.	16, 90, 91
Securinega Juss.	207, 221	SIMAROUBACEAE DC.	19, 32, 241
<i>S. virosa</i> (Roxb.) Baill.	221		498

SMILACACEAE Vent.	19, 39	<i>S. arvensis</i> L.	17, 91, 92
	483, 486, 499	<i>Spermacoce</i> L.	350, 364
<i>Smilax</i> L.	11, 12, 483	<i>S. articularis</i> L.f.	364
<i>S. lanceaefolia</i> Roxb.	17, 483, 486	<i>S. ramanii</i> Sivarajan et R.V. Nair	365
<i>S. ovalifolia</i> Roxb.	17, 485, 486	<i>Spermadictyon</i> Roxb.	11, 352, 365
<i>S. perfoliata</i> Lour.	485	<i>S. suaveolens</i> Roxb.	11, 365
<i>Smithia</i> Ait.	161, 182	<i>Sphaeranthus</i> L.	370, 387
<i>S. sensitiva</i> Ait.	18, 182	<i>S. indicus</i> L.	387
SOLANACEAE Juss.	35, 273, 277, 498	<i>Sphenoclea</i> Gaertn.	346
SOLANALES Lindl.	498	<i>S. zeylanica</i> Gaertn.	346
<i>Solanum</i> L.	17, 273, 278	SPHENOCLEACEAE DC.	19, 33
<i>S. anguivi</i> Lamk.	278, 279		346, 499
<i>S. erianthum</i> D. Don	278, 279	<i>Spilanthes</i> Jacq.	372, 388
<i>S. melongena</i> L.	18, 278, 279	<i>S. clava</i> DC.	388
<i>S. melongena</i> L.		<i>Spirodela</i> Schleid.	405, 406
var. <i>incanum</i> (L.) Kuntze	18, 279	<i>S. polyrrhiza</i> (L.) Schleid.	13, 406
<i>S. nigrum</i> L.	278, 280	<i>Spondias</i> L.	18, 239, 241
<i>S. sisymbriifolium</i> Lamk.	278, 280	<i>S. pinnata</i> (L.f.) Kurz	241
<i>S. surattense</i> Burm. f.	278, 280	<i>Sporobolus</i> R. Br.	433, 466
<i>S. torvum</i> Sw.	278, 280	<i>S. diander</i> (Retz.) P. Beauv.	466
<i>S. tuberosum</i> L.	18, 278, 281	<i>S. indicus</i> var. <i>diander</i> (Retz.) Jovet & Guedes	466
<i>S. viarum</i> Dunal	278, 281	<i>Staurogyne</i> Wall.	341
<i>Sonchus</i> L.	373, 386	<i>S. glutinosa</i> Kuntze	341
<i>S. asper</i> (L.) Hill	387	<i>Stellaria</i> L.	90, 93
<i>S. oleraceus</i> L.	387	<i>S. media</i> (L.) Villars	18, 93
<i>S. wightianus</i> DC.	386, 387	<i>Stephania</i> Lour.	53, 55
<i>Sorghum</i> Moench.	465	<i>S. japonica</i> (Thumb.) Miers	17, 55
<i>S. bicolor</i> (L.) Moench	17, 465	<i>Sterculia</i> L.	104, 107
<i>S. vulgare</i> Pers.	465	<i>S. foetida</i> L.	15, 107, 108
<i>Soymida</i> Juss.	242, 243	<i>S. urens</i> Roxb	11, 15, 107, 108
<i>S. febrifuga</i> (Roxb.) Juss.	15, 243	<i>S. villosa</i> Roxb. ex DC.	11, 15, 107, 108
<i>Spergula</i> L.	90, 91		

STERCULIACEAE (DC.) Bartling	33	<i>T. divaricata</i> (L.) R. Br.	264
	103, 105, 497	TAMARICACEAE Link	19, 30, 125, 498
<i>Sterospermum</i> Cham.	344, 345	<i>Tamarindus</i> L.	153, 157
<i>S. chelonoides</i> (L.f.) DC.	11, 12, 345	<i>T. indica</i> L.	15, 17, 18, 157
<i>S. colais</i> (Dillw.) Mabberley	11, 345	<i>Tamarix</i> L.	125
<i>Streblus</i> Lour.	11, 14, 62, 69	<i>T. ericoides</i> Rottl.	125
<i>S. asper</i> Lour.	11, 15, 69	<i>T. gallica</i> auct. pl. non L.	127
<i>Striga</i> Lour.	318, 326	<i>T. indica</i> Willd.	125, 127
<i>S. angustifolia</i> (D. Don) Sald.	326	<i>Telosma</i> Coville	267, 272
<i>Striga asiatica</i> (L.) Kuntze	326	<i>T. pallida</i> (Roxb.) Craib	272
<i>Strobilanthes</i> Bl.	312, 342	<i>Tephrosia</i> Pers.	160, 182
<i>S. auriculatus</i> Nees	342	<i>T. candida</i> DC.	18, 182
<i>Strychnos</i> L.	254, 255	<i>T. purpurea</i> (L.) Pers.	17, 182, 183
<i>S. nux-vomica</i> L.	17, 255	<i>Teramnus</i> R. Br.	159, 183
<i>Suregada</i> Roxb. ex Rottl.	206, 222	<i>T. labialis</i> (L.f.) Spreng.	17, 183
<i>S. multiflora</i> (Juss.) Baillon	17, 222	<i>Terminalia</i> L.	11, 195, 196
<i>Swertia</i> L.	255, 257	<i>T. alata</i> Heyne ex Roth	11, 12 15, 196
<i>S. angustifolia</i> Ham. ex D. Don		<i>T. arjuna</i> (Roxb. ex DC.)	
var. <i>pulchella</i> Burkill	12, 257	Wt. & Arn.	15, 17, 196, 197
<i>Swietenia</i> L.	242, 244	<i>T. bellirica</i> (Gaertn.) Roxb.	15, 17 18, 196, 197
<i>S. macrophylla</i> King	13, 244	<i>T. chebula</i> Retz.	11, 15, 17, 196, 197
<i>S. mahagoni</i> L.	15, 244	<i>Tetragium</i> Planch.	229, 231
SYMPLOCACEAE Desf.	36, 143, 498	<i>T. alcicome</i> Haines	12, 22, 231
<i>Symplocos</i> L.	143	<i>T. lanceolarium</i> (Roxb.) Planch.	12, 231
<i>S. racemosa</i> Roxb.	143	<i>T. thomsonianum</i> Planch.	231
<i>Syzygium</i> Gaertn.	191, 192	THEALES Lindl.	497
<i>S. cumini</i> (L.) Skeels	15, 18, 192	<i>Thecagonum</i> Babu	351, 365
<i>S. heyneanum</i> (Duthie)		<i>T. biflora</i> (L.) Babu	365, 366
Wall. ex Gamble	15, 192	<i>T. ovatifolium</i> (Cav.) Babu	359, 365 366
<i>S. samarangense</i> (Bl.)			
Merr. & Perry	18, 192		
<i>Tabernaemontana</i> L.	259, 264		

<i>Themeda</i> Forssk.	14, 429, 466	<i>Trachyspermum</i> Link	252
<i>T. arundinacea</i> (Roxb.) Ridley	12, 466	<i>T. villosum</i> (Haines)	
<i>T. caudata</i> (Nees) A. Camus	12, 466 467	Bhatta, et Sarkar	12, 22, 252, 253
<i>T. laxa</i> (Anders.) A. Camus	12, 466 467	<i>Tragia</i> L.	18, 205, 222
<i>Thespesia</i> Soland. ex Corrêa	11, 110 118	<i>T. hispida</i> Willd.	222, 223
<i>T. lampas</i> (Cav.) Dalz. ex Dalz. & Gibs.	118	<i>T. involucrata</i> L.	222, 223
<i>T. populnea</i> (L.) Soland. ex Corrêa	15, 119	<i>Tragus</i> Haller	433, 468
<i>Thevetia</i> L.	259, 265	<i>T. roxburghii</i> Panigrahi	468
<i>T. neriifolia</i> Juss. ex Steud.	265	<i>Trapa</i> L.	191
<i>Thevetia peruviana</i> K. Schum.	365	<i>T. bispinosa</i> Roxb.	191
<i>Thlaspi</i> L.	139	<i>T. natans</i> L.	13, 18, 191
<i>T. arvense</i> L.	139	TRAPACEAE Dumort.	19, 28, 191
<i>Thunbergia</i> Retz.	329, 342	<i>Trema</i> Lour.	11, 59
<i>T. coccinea</i> Wall. ex D. Don	342, 343	<i>T. orientalis</i> (L.) Bl.	11, 15, 59, 61
<i>T. grandiflora</i> Roxb.	342	<i>T. politoria</i> Planch.	11, 15, 59, 61
<i>Thysanolaena</i> Nees	432, 467	<i>Trevesia</i> Vis.	254
<i>T. maxima</i> (Roxb.) Kuntze	467	<i>T. palmata</i> (Roxb.) Vis.	254
<i>T. latifolia</i> Honda	12, 14, 467	<i>Trewia</i> L.	11, 206, 224
TILIACEAE Juss.	32, 100, 497	<i>T. nudiflora</i> L.	15, 224
<i>Tiliacora</i> Colebr.	53, 56	<i>Trianthema</i> L.	74
<i>T. acuminata</i> (Lamk.) Hook. f. & Thoms.	17, 53, 56, 57	<i>T. portulaccastrum</i> L.	18, 74, 75
<i>Tinospora</i> Miers	53, 56	<i>Tribulus</i> L.	249
<i>T. cordifolia</i> Miers	12, 17, 56	<i>T. terrestris</i> L.	18, 249
<i>Toona</i> (Endl.) Roem.	242, 244	<i>Trichilia</i> P. Br.	242, 244
<i>T. ciliata</i> Roem.	15, 244	<i>T. connaroides</i> (Wt. & Arn.) Benth.	244
<i>Tonningia</i> Neck ex Juss.	406, 411	<i>Trichodesma</i> R. Br.	296, 300
<i>T. axillaris</i> (L.) Kuntze	411	<i>T. indicum</i> (L.) R. Br.	300
		<i>Trichosanthes</i> L.	128, 134
		<i>T. cucumerina</i> L.	18, 134
		<i>T. dioica</i> Roxb.	18
		<i>T. tricuspidata</i> Lour.	18, 134

Trichurus Townsend	79, 86	Urena L.	14, 109, 119
T. monsoniae (L.f.) Townsend	86	U. lobata L.	17, 119
Tridax L.	371, 388	U. sinuata L.	17, 119
T. procumbens L.	17, 388	URTICACEAE Juss.	21, 37, 69, 71, 497
Trigonella L.	18, 160, 183	URTICALES Lindl.	497
T. corniculata L.	17, 183	Utricularia L.	13, 345, 346
Tripsacum L.	429, 468	U. aurea Lour.	345, 346
T. laxum Nash	468	U. exoleta R. Br.	345, 346, 347
Triticum L.	433, 468	Uvaria L.	41, 43
T. aestivum L.	17, 468	U. hamiltonii Hook. f. & Thoms.	43
Triumfetta L.	14, 100, 103	Vaccaria Medik.	90, 93
T. rhomboidea Jacq.	103	V. pyramidata Medik.	93
TURNERACEAE DC.	19, 29, 127, 498	Vallisneria Burm. f.	259, 265
Turnera L.	127	V. solanacea (Roth) Kuntze	265
T. ulmifolia L.	127	Vallisneria L.	390, 392
Tylophora R. Br.	267, 272	V. spiralis L.	13, 392
T. rotundifolia Wt.	17, 272	Vanda W. Jones ex R. Br.	490, 494
Typha L.	14, 469	V. teres (Roxb.) Lindl.	22, 494
T. angustata Chaub. & Bory	13, 469	V. tessellata (Roxb.) G. Don	22, 494
T. elephantina Roxb.	13, 469, 471	Ventilago Gaertn.	224
TYPHACEAE Juss.	19, 38, 469, 471, 499	V. denticulata Willd.	224
TYPHALES Lindl.	499	Verbascum L.	318, 327
Typhonium Schott	400, 405	V. chinense (L.) Sant.	327
T. trilobatum Schott	18, 405	VERBENACEAE J. St.-Hil.	36, 301, 498
ULMACEAE Mirbel	37, 59, 60, 497	Vernonia Schreb.	368, 388
UMBELLIFERAE Juss.	28, 250, 498	V. cinerea (L.) Less.	388
Uraria Desv.	161, 183	V. squarrosa (D. Don) Less.	388
U. lagopodioides Desv.	17, 184	Veronica Tourn. ex L.	318, 327
U. picta (Jacq.) Desv. ex DC.	17, 184	V. anagallis-aquatica L.	327
U. pulchra Haines	12, 22, 184	Vetiveria Lem.-Lisanc.	14, 428, 469
U. rufescens (DC.) Schindl.	17, 184	V. zizanioides (L.) Nash	12, 15

Vicia L.	17, 158, 185	Woodfordia Salisb.	11, 187, 190
V. faba L.	185	W. fruticosa (L.) Kurz	11, 15, 18, 190
V. hirsuta S.F. Gray	185	Wrightia R. Br.	259, 265
V. sativa L.	185	W. arborea (Dennst.) Mabb.	265
Vigna Savi	16, 159, 186	W. tinctoria (Roxb.) R. Br.	265, 266
V. trilobata (L.) Verdc.	17, 186	Xanthium L.	371, 389
V. vexillata (L.) A. Rich.	186	X. strumarium L.	389
Viola L.	125	Xantolis Raf.	140, 142
V. tricolor L.	125	X. tomentosa (Roxb.) Raf.	22
VIOLACEAE Batsch	30, 125, 126, 498	Xeromorphis Raf.	353
VIOLALES Lind.	498	X. spinosa (Thunb.) Keay	11, 18, 393
VISCACEAE Miers	19, 37, 201, 498	X. uliginosa (Retz.) Mahes.	11, 18, 353
Viscum L.	201	Xylosma Forst. f.	121, 123
V. articulatum Burm. f.	201	X. longifolia Clos.	15, 123, 124
V. nepalense Spreng.	201	XYRIDACEAE C. Agardh	19, 39 406, 499
VITACEAE Juss.	32, 229, 428	Xyris L.	406
Vitex L.	301, 305	X. pauciflora Willd.	406
V. negundo L.	17, 305	Youngia Cass.	373, 389
Wahlenbergia Schrad. ex Roth	348, 349	Y. japonica (L.) DC.	389
W. marginata (Thunb.) DC.	349	Yucca L.	482, 483
Waltheria L.	103, 108	Y. gloriosa L.	483, 484
W. indica L.	17, 108	Zea L.	429, 469
Wattakaka Hassk.	17, 267, 272	Z. mays L.	17, 469
W. volubilis (L.f.) Stapf	272	Zephyranthes Herb.	480
Wedelia Jacq.	372, 389	Z. rosea Lindl.	480
W. catenulacea Less.	389	Zeuxine Lindl.	491, 496
W. chinensis Merr.	389	Z. gracilis (Breda) Bl.	22, 495, 496
Wendlandia Bartl. ex DC.	11, 351, 366	Z. strateumtica (L.) Schltr.	22, 496
W. heynei (R. & S.) Sant. & Merchant	366	ZINGIBERACEAE Lindl.	40, 472, 499
W. tinctoria (Roxb.) DC.	11, 366	ZINGIBERALES Nakai	499

ZINGIBERIDAE Cronq.	499	Z. nummularia (Burm. f.) Wt. & Arn.	18, 225
Zingiber Adans.	472, 474	Z. oenoplia (L.) Mill.	18, 224, 225
Z. capitatum Roxb.	474	Z. rugosa Lamk.	224, 227
Z. officinale Rosc.	18, 474	Zornia Gmel.	161, 186
Ziziphus Juss.	11, 224	Z. gibbosa Span.	16, 186
Z. mauritiana Lamk.	18, 225, 226	ZYGOPHYLLACEAE R. Br.	19, 31 249, 498

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