

FLORA
OF INDIA
SERIES - 3

FLORA
OF
TONK DISTRICT

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BOTANICAL SURVEY OF INDIA

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Rajasthan

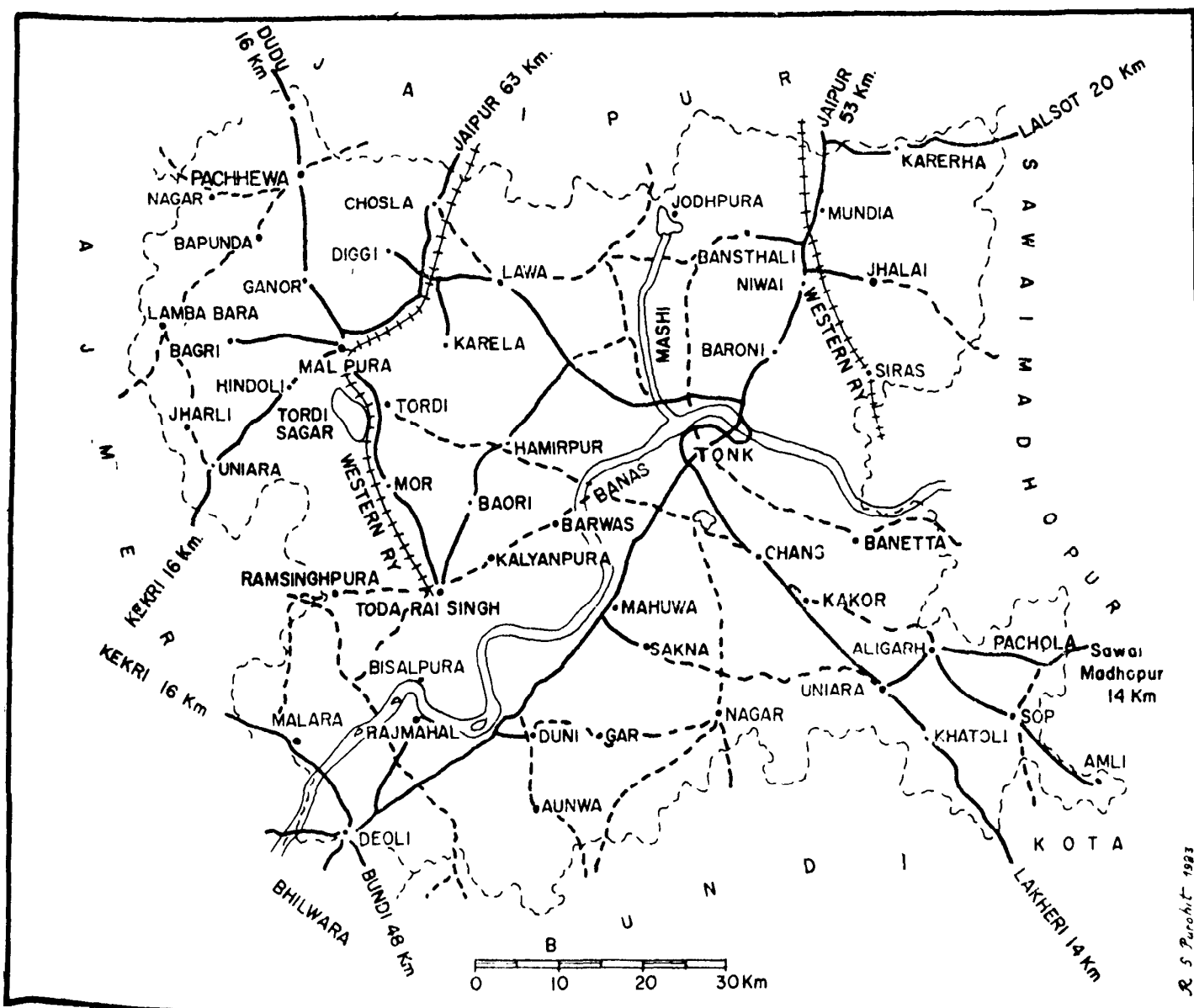
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BOTANICAL SURVEY OF INDIA
Department of Environment



TONK DISTRICT



INTRODUCTION

Tonk district is one of the 26 districts of Rajasthan state. It has a number of places of interest to attract the tourist. The forest, lakes and the historical buildings can enchant any tourist. A scheme has also been formulated by the Rajasthan State Government to bring Toda Rai Singh, a picturesque place surrounded by hills and historically an important town named after the great grandson of Rana Amar Singh of Marwar, Raja Rai Singh Sisodia, on the tourist map of Rajasthan.

HISTORY

The Malavas were perhaps the earliest people to inhabit the area. The movement of the Malava tribe or a section of it to Rajputana from their homeland north of the confluence of the Ravi and Chenab is believed to have begun perhaps after the Indo-Greek occupation of Punjab. During the time of the powerful Samudra Gupta, Malavas, whose rule probably extended over Mewar, Tonk and the adjoining regions of south-east Rajasthan, submitted to him and entered into friendly relations with him by paying taxes. They appear to have retained their semi-independent status during the reigns of Chandra Gupta II and Kumar Gupta I also. It is believed that they have been engulfed in the Huna avalanche by the middle of the fifth century A.D. Later, Tonk region came under the Guhilot dynasty of Mewar and during the 7th century A.D. a part of the Tonk region apparently came under Chahamanas dynasty. It appears to have come under one or all of the following during the eleventh and twelfth centuries : Chahamanas (Chauhans), Chalukyas (Solanki) and Paramars (Pawars).

It is said that during the reign of Akbar the great, Tordi and Tonkara districts were conquered by Maharaja Man Singh of Jaipur and that in 1643 A.D. twelve deserted villages in tonkara were given as grant to a Brahman named Bhola who named his cluster Tonk. The founder of the princely state of Tonk was Nawab Amir Khan (1768-1834 A.D.), the hero and villain of many battles and intrigues. The era of modernisation dawned on the state with the reign of Nawab Hafiz Mohammad Ibrahim Ali Khan, the great grandson of Amir Khan. During his long reign which lasted from 1867 to 1930, the longest in the history of the

state, it witnessed several changes in the fields of administration, revenue, justice and social reforms. Following India's independence in 1947, Tonk state was merged with the former Rajasthan on March 25, 1948 (Maya Ram, 1970).

LOCATION

The present district of Tonk has, however, no semblance with the old Tonk state. The tahsils of Tonk and Aligarh of the former state, together with some adjacent territories from the states of Bundi, Jaipur and Ajmer were made into a separate district of Tonk. It is located between longitudes 75°07' and 76°19' E and latitudes 25°41' and 26°34' N. It is bounded in the north by Jaipur district, in the east by Sawai Madhopur district, in the south by Kota, Bundi and Bhilwara districts and in the west by Ajmer district. In area it is about 7,163 sq km.

PAST AND PRESENT WORK

A review of literature on the floristic studies in Rajasthan (Jain, 1970; Sharma, 1981) has revealed that Tonk district has received very little attention. The two recent floras on Rajasthan viz. by Bhandari (1978) and Sharma and Tiagi (1979) deal with W. Rajasthan (Jaisalmer, Jodhpur and Barmer districts) and N.E. Rajasthan (Jaipur, Sawai Madhopur and Alwar districts) respectively.

A preliminary ecological survey of plant communities in and around Tonk was undertaken by Mulay and Mathur (1961). A short account of the Vegetation of Tonk district is given in the Tonk District Gazetteer (Maya Ram *l.c.*). Apart from these, there is no other published account on the flora or vegetation of Tonk district. Thus, there is not even a check list of plants found in Tonk district.

The present work which was undertaken to fill up this lacuna and bring out a flora of the district is the result of four botanical explorations conducted during different seasons of the year. Almost the entire district was covered during each trip, taking care to visit the different vegetation zones for the collection of plant specimens. Detailed, on the spot field notes were made on habit, habitat, colour of flower, association, vegetation type, local name, uses etc. Collections were mainly confined to native or naturalised plants of the district. Cultivated plants were not collected, although a brief account of it is given elsewhere. Efforts were made to identify the plants based on fresh or pickled materials. The determinations were

finally checked and confirmed by the study of literature and by comparison with herbarium specimens deposited in the herbaria of Arid Zone Circle, Botanical Survey of India, Jodhpur (BSJO), Central Arid Zone Research Institute, Jodhpur and in some cases the Central National Herbarium, Calcutta (CAL), Specimens collected have been deposited in the BSJO and CAL.

Bentham and Hooker's system of classification has been followed, with present day delimitation of certain families. Keys to families, genera and species are so constructed as to assist in the easy identification of the plants reported in this work. The genera within families and the species within genera are arranged in an alphabetical sequence.

An attempt has been made to give the correct nomenclature of the taxa dealt with, based on the study of recent monographs, floras and other taxonomic literature. For each species the valid name with citation is followed by the basionym, wherever applicable. Reference is also made to the Flora of British India (Hooker, 1872-1897), Flora of the Upper Gangetic Plain (Duthie, 1903-1929), published illustrations, particularly those devoted almost exclusively to Indian plants and recent monographs, wherever available. Local names in Hindi, as far as could be ascertained, are given after the citation of literature.

A brief description of each species and intraspecific category is given, stressing primarily on characters not reflected in the key. This is followed by flowering and fruiting periods, frequency, general habitat and distribution, nomenclatural notes in a few cases and economic importance, wherever known.

PHYSIOGRAPHY

The Aravalli ranges tending in north-easterly direction divide the semi-desert and desert regions of western Rajasthan from the comparatively more damp and fertile region on the east and south-east. The district lies, at a not very far off distance, east of the Aravalli range and has the shape of a kite or a rhombus. The general slope is from north-west to the south and east. There are many ridges of rocky hills scattered in the district. One chain of hills starts from Bhilwara district and running along the boundaries of Bhilwara and Bundi districts enters the Tonk district in the south near Rajkot. It runs in a north-easterly direction and extends up to Banetha. It continues in the same direction through Sawai Madhopur district. A second chain extends from Toda Rai Singh to Rajmahal. The other important hill is near Malpura.

The main river in this district is the Banas with its tributaries. It rises from the eastern flank of the Aravalli at Paras Ram Mahadev in Udaipur district and enters Tonk district at Negdia in Deoli Tahsil. Forcing its way through the hill Rajmahal it takes a serpentine course dividing the district roughly into two parts—two thirds to its west and north and one third to its east and south. It leaves the district at Sureli near Barwana. It is more or less perennial and is fordable during winter and summer but in the rains becomes a swift and angry torrent, more than half a kilometre in breadth and sometimes 9 metres deep. Its bed is sandy-alluvial and at certain places it is cultivated. The total length of Banas is about 400 km of which about 135 km is in Tonk district. Mashi and Sohadra, both of which rise from Ajmer district are the principal tributaries of Banas. The other small rivers which join the Banas or its tributaries are Khari, Dai, Badi and Galwa.

There is no natural lake in the district. However, several tanks formed by harnessing the feeders of the Mashi and the Banas are found; the biggest of such tanks is Tordi Sagar which is said to be one of the biggest irrigation tanks in Rajasthan. It is fed by Sohadra. In addition, there are a number of small tanks scattered in different parts of the district, like Malpura, Toda Rai Singh, Deoli, Tonk etc.

GEOLOGY AND SOIL

The two main geological formations in this region are the Aravalli system and the Delhi system. The Aravalli system consists of three parallel belts running from north east to south west. The first is the Baonli-Anwa belt, the second is a short distance to the north-west of Baonli-Anwa belt and is extensively intruded by pegmatites, the third is further north-west and runs through Tonk city. Here it consists of alteration of mica schists and thin rusty quartzites. Other exposures of this belt are at Niwai and Rajmahal, and at the latter place the formations consist of garnetiferous mica schists and pegmatites. Granites are important intrusive rocks of igneous origin in the Aravalli system of this area.

The scattered outliers of the Delhi system found (as detached hills) at places like Niwai consist of Alwar quartzites. At Rajmahal and Chandsen also there are exposures of quartzite, resembling the Alwar series. The minerals found in this district are beryl, garnet, mica, soapstone and building stone.

The soil for the greater part is loam. At places like Niwai and Tonk it varies from sandy loam to loam and in most of the remaining area it

varies from clay loam to loam. In the river beds of Banas, Mashi etc. the soil is alluvial. In some areas it is sandy.

The soils from ponds, puddles and ditches have fairly rich amount of silt and clay and are usually black in colour.

CLIMATE

Except in the short south west monsoon season, which commences from about the third week of June and lasts till the middle of September, the climate is dry. The hot weather (summer) begins in March and extends till June. The winter season is between December and February.

The average annual rainfall in the whole district is 613.6 mm but it generally decreases from the south-east to the north-west. The bulk of the annual rainfall (about 93%) is received during the south-west monsoon viz. June to September and the months in which highest rainfall occurs over the region are July and August.

May is usually the hottest month when the mean daily maximum temperature is about 40°C and the mean daily minimum temperature is about 26°C. On individual days the day temperature may be as high as 46°C. In summer months humidity is relatively very low. After about the middle of November both day and night temperatures begin to drop steadily till January which is generally the coldest part of the year. The mean daily maximum temperature in that month is about 22°C while the mean daily minimum temperature is about 8°C. During cold waves in the wake of cold western disturbances the minimum temperature may sometimes come down to a degree or two below the freezing point of water, especially in January and February. Occasionally frosts may occur.

Winds are generally light to moderate with a slight strengthening in summer and in early monsoon.

VEGETATION

The vegetation in Tonk district may conveniently be treated under the following heads :

1. Forests on hills and base of hills
2. Vegetation on low sand dunes
3. Plantations
4. Vegetation on plains

5. Aquatic habitat
6. Marshy habitat
7. Weeds of cultivated fields

Forests on hills and base of hills : About 14% of the total area of the district is forest mostly located at Toda Rai Singh, Bisalpura, Rajmahal, Tonk, Niwai, Siras, Banetha, Kakor, Nagar and Amlı. The forests mainly fall under Northern tropical dry deciduous forest coming under the following types as per Champion and Seth's (1968) classification :

- i. *Anogeissus pendula* forest (5/E1)
- ii. *Anogeissus pendula* scrub (5/E1/DS1)

Anogeissus pendula Forest

The forests on the hills, particularly at Toda Rai Singh, Bisalpura, Rajmahal, Bhotunda, Tordı, Ghati, Niwai, Sohela, Banetha, Kakor and Amlı are of the *Anogeissus pendula* type with *Anogeissus pendula* as the dominant tree species. The usual trees and shrubs associated with it are *Acacia senegal*, *Bauhinia racemosa*, *Boswellia serrata*, *Butea monosperma*, *Capparis sepiaria*, *Cassia auriculata*, *C. fistula*, *Crataeva adansonii* subsp. *odora*, *Dichrostachys cinerea*, *Diospyros melanoxylon*, *Dyerophytum indicum*, *Ehretia aspera*, *Flacourtia indica*, *Grewia flavescens*, *G. tenax*, *Holoptelea integrifolia*, *Lannea coromandelica*, *Moringa concanensis*, *Sterculia urens*, *Wrightia tinctoria*, *W. tomentosa* etc. In rocky areas *Euphorbia caducifolia* is dominant.

At the summit of the hills, however, *Boswellia serrata* becomes dominant. The other tree species commonly found being *Acacia catechu*, *Anogeissus pendula*, *Bauhinia racemosa*, *Dalbergia sissoo*, *Wrightia tinctoria* etc.

In the valleys between the hills the vegetation is comparatively denser with trees and shrubs like *Anogeissus pendula*, *Aegle marmelos*, *Butea monosperma*, *Capparis sepiaria*, *Cassia fistula*, *Cordia gharaf*, *Crataeva adansonii* subsp. *odora*, *Ehretia aspera*, *Flacourtia indica*, *Grewia subinaequalis*, *Mitragyna parvifolia*, *Syzygium cumini*, *Wrightia tinctoria*, *W. tomentosa* etc. At Toda Rai Singh *Dendrocalamus strictus* is also sometimes encountered.

At the base of the hills the common trees and shrubs found are *Acacia leucophloea*, *A. nilotica* subsp. *indica*, *A. senegal*, *Anogeissus*

pendula, *Balanites aegyptiaca*, *Bauhinia racemosa*, *Butea monosperma*, *Capparis decidua*, *C. sepiaria*, *Cassia auriculata*, *Cordia gharaf*, *Euphorbia caducifolia*, *Maytenus emarginata*, *Prosopis cineraria*, *Salvadora oleoides*, *Ziziphus nummularia* etc. At the base of the hills at *Tordi*, *Ghati* and *Pucha Bundha* *Phoenix sylvestris* and *Cryptostegia grandiflora* with its showy flowers are abundant. *Vitex negundo* and *Opuntia dillenii* are common at the base of the hills at *Bisalpora*. A patch of *Pongamia pinnata* forest is also found on the banks of the river *Banas* at *Bisalpora*.

Of the climbers found particularly on the hills, mention may be made of *Abrus precatorius*, *Atylosia scarabaeoides*, *Canavalia virosa*, *Cocculus hirsutus*, *Maerua arenaria* var. *scabra*, *Rhynchosia minima* etc.

The ground flora in these forests is represented by herbs and undershrubs like *Achyranthes aspera*, *Anisomeles indica*, *Barleria prionitis*, *Bidens biternata*, *Blepharis maderaspatensis*, *Boerhavia diffusa*, *Borreria articularis*, *Cassia tora*, *Cleome viscosa*, *Commelina forskalaei*, *Desmodium neomexicana*, *Dipteracanthus patulus* var. *alba*, *Elytraria acaulis*, *Indigofera cordifolia*, *Ipomoea pes-tigridis*, *Kickxia ramosissima*, *Lantana indica*, *Lepidagathis cristata*, *Lindenbergia indica*, *Melhantha futteyporensis*, *Ocimum americanum*, *Peristrophe bicalyculata*, *Pupalia lappacea*, *Rostellularia vahlii*, *Sida cordifolia*, *S. cordata*, *Tephrosia purpurea*, *Trichodesma indicum*, *Tridax procumbens*, *Triumfetta pentandra*, *Urginea indica*, *Vernonia cinerea* etc. The common grasses found are *Apluda mutica*, *Chloris dolichostachya*, *Schoenefeldia gracilis* and *Sehima nervosum*, the last two species being common at the foot of the hills. The parasite *Dendrophthoe falcata* is common on *Boswellia serrata* and the fern *Adiantum incisum* is encountered at *Toda Rai Singh* growing from rock-crevices.

Anogeissus pendula scrub

There are some low rocky hills with very little top soil in places like *Anwa*, *Gar*, *Indoda*, *Banetha*, *Kacha Bundha* and *Siras* which are more or less barren. The vegetation here is very sparse with the trees assuming stunted, bushy habit. The forests on these hills come under *Anogeissus pendula* scrub type. In addition to the dominant species, *Anogeissus pendula* the other species encountered are *Acacia leucophloea*, *Butea monosperma*, *Capparis decidua*, *C. sepiaria*, *Dichrostachys cinerea*, *Grewia tenax* and *Maytenus emarginata* with climbers like *Cocculus hirsutus* and *Maerua arenaria* var. *scabra* and herbs like *Apluda mutica*, *Boerhavia diffusa*, *Borreria articularis*, *Glossocardia bosvallea*, *Indigofera cordifolia*, *Lepidagathis cristata*, *Polygala erioptera*, *Urginea indica* etc.

At the base of these hills *Ziziphus nummularia* and *Cassia tora* along with *Acacia leucophloea*, *Capparis decidua*, *Maytenus emarginata*, *Prosopis cineraria*, *Salvadora oleoides* etc. are found.

It is said that there were beautiful dense forests with many species of fauna in these places when it was a princely state. The ruthless destruction of the forests, coupled with excessive grazing has resulted in the continuous retrogradation of the vegetation to its present state.

Vegetation on low sand dunes

At certain places like Toda Rai Singh, Tordi, Ghati, Kakor, Banetha, Sohela, Niwai and Siras there are deposition of sand, generally at the base of hills, forming small sand dunes. The vegetation here comes under Northern tropical thorn forest falling broadly under the type Desert thorn forest (6B/C1), as per the classification of Champion and Seth (*l. c.*). *Maytenus emarginatus* is the dominant species here with *Holoptelea integrifolia* as the co-dominant. The other species of trees and shrubs found are *Acacia leucophloea*, *A. nilotica* subsp. *indica*, *A. senegal*, *Capparis decidua*, *C. sepiaria*, *Flacourtia indica*, *Prosopis cineraria*, *Salvadora oleoides*, *Tecomella undulata* and *Ziziphus nummularia*. Herbs and undershrubs are represented by *Aerva javanica*, *Alhagi pseudalhagi*, *Arnebia hispidissima*, *Boerhavia diffusa*, *Convolvulus prostratus*, *Crotalaria burhia*, *Farsetia hamiltonii*, *Helitropium strigosum*, *Indigofera linifolia*, *Leptadenia pyrotechnica*, *Sericostoma pauciflorum*, *Tephrosia purpurea*, *Tribulus terrestris* etc. along with grasses like *Eleusine compressa*, *Perotis hordeiformis* etc. Occasionally, *Striga gesnerioides* is met with as a parasite on *Lepidagathis trinervis*.

Plantations

In the plantations and closures of forest department found in places like Tordi, Rajmahal, Tonk, Kacha Bundha, Sohela, Amli, etc. the common trees and shrubs found are *Acacia catechu*, *A. leucophloea*, *A. nilotica* subsp. *indica*, *A. senegal*, *Ailanthus excelsa*, *Albizia lebbeck*, *Anogeissus pendula*, *Azadirachta indica*, *Balanites aegyptiaca*, *Bauhinia racemosa*, *Butea monosperma*, *Capparis decidua*, *C. sepiaria*, *Cordia gharaf*, *Dalbergia sissoo*, *Dichrostachys cinerea*, *Euphorbia caducifolia*, *Grewia flavescens*, *Maytenus emarginata*, *Prosopis cineraria*, *P. juliflora*, *Salvadora oleoides*, *Tecomella undulata*, *Ziziphus nummularia* etc. Climbers like *Abrus precatorius*, *Asparagus racemosus*, *Cardiospermum helicacabum*, *Maerua arenaria* var. *scabra*, *Mukia maderaspatana*, *Pergularia daemia*, *Rhynchosia minima* and *Rivea hypocrateriformis* are also met with. In the ground flora the common plants found are

Achyranthes aspera, *Boerhavia diffusa*, *Ipomoea pes-tigridis*, *Ocimum americanum*, *Pavonia zeylanica*, *Rostellularia vahlii*, *Tephrosia purpurea*, *Triumfetta pentandra* and *Vernonia cinerea*, along with grasses like *Cenchrus ciliaris*, *Tetrapogon tenellus* etc. *Vetiveria zizanioides* is grown on a large scale in Sohela R. F.

Vegetation on plains

Much of the plains in Tonk district, leaving the areas under reserve forests, are utilised for growing agricultural crops. Hence the vegetation here is sparse, and is generally confined to waste lands and fallow fields. *Ziziphus nummularia* is abundant almost throughout the district on plains, the other notable species being *Leptadenia pyrotechnica*. Of the trees and other shrubs found, mention may be made of *Acacia leucophloea*, *A. nilotica* subsp. *indica*, *Azadirachta indica*, *Calotropis procera*, *Capparis decidua*, *Mimosa hamata*, *Phoenix sylvestris*, *Prosopis cineraria* and *Salvadora oleoides*. The common herbaceous plants are *Alhagi pseudalhagi*, *Argemone mexicana*, *Boerhavia diffusa*, *Chrozophora prostrata*, *Convolvulus prostratus*, *Corchorus depressus*, *Crotalaria medicagenia*, *Datura innoxia*, *Echinops echinatus*, *Euphorbia clarkeana*, *Evolvulus alsinoides*, *Fagonia schweinfurthii*, *Heliotropium stigosum*, *Hibiscus ovalifolius*, *Indigofera cordifolia*, *I. linnaei*, *Lamnaea procumbens*, *Pavonia zeylanica*, *Rhynchosia capitata*, *Sida cordifolia*, *Solanum surattense*, *Tephrosia purpurea*, *Tribulus terrestris*, *Urginea indica*, *Vernonia cinerea* etc. The common grasses found are *Cenchrus ciliaris*, *C. setigerus*, *Chloris virgata*, *Cynodon dactylon*, *Desmostachya bipinnata*, *Eragrostis tremula* etc.

on the Banas river bed, wherever it is rather dry, plants like *Alhagi pseudalhagi*, *Argemone mexicana*, *Chrozophora prostrata*, *Echinops echinatus*, *Vetiveria zizanioides* etc. are met with.

Aquatic habitat

The Banas river is rich in aquatic plants like *Hydrilla verticillata*, *Potamogeton pectinatus*, *Vallisneria spiralis* and *Zanichellia palustris* subsp. *pedicellata*. Occasionally, *Nymphoides indicum* is also met with. In streams, as in Niwai, *Azolla pinnata*, *Lemna perpusilla*, *Pistia stratiotes* and *Spirodela polyrhiza* are common. In ponds, puddles, tanks etc. *Ceratophyllum demersum*, *Hydrilla verticillata*, *Ipomoea aquatica*, *Nechamandra alternifolia*, *Nymphaea nauchali*, *N. pubescens*, *Nelumbo nucifera*, *Potamogeton nodosus*, *P. petinatus*, *Trapa bispinosa*, *Vallisneria spiralis*, *Chara* sp. etc. are generally met with.

Marshy habitat

The common plants found in marshy habitats around tanks, lakes, ponds, water courses, streams, dam sites and the marshy places in the

Banas river bed are *Alternanthera sessilis*, *Ammanniabaccifera*, *A. multiflora*, *Bacopa monnieri*, *Bergia ammanioides*, *Caesulia axillaris*, *Eclipta alba*, *Ludwigia perennis*, *Potentilla supina*, *Vahlia digyna*, *Veronica anagallis-aquatica* etc. *Polygonum glabrum* is generally found on Banas river bed in marshy situations. At certain places in the marshy places around tanks as in Rampura near Kakor and Bhotunda near Rajmahal *Glossostigma spathulatum* is abundant. The species commonly associated with it is *Dopatrium junceum*. Some of the other plants encountered in marshy areas around tanks and ponds are *Dentella repens*, *Merremia emarginata*, *Peplidium maritimum*, *Sagittaria guayanensis* and *Typha angustata*. It is also of interest to note the occurrence of the orchid *Zeuxine strateumatica* growing in marshy place at Niwai under the shade of *Pandanus* sp. Sedges abound in marshy habitats, of which mention may be made of *Cyperus alopecuroides*, *C. difformis*, *C. iria*, *C. laevigatus*, *C. pangorei*, *C. pygmaeus*, *Fimbristylis bisumbellata*, *F. quinquangularis*, *Picreus flavidus*, *P. pumilus*, *Scirpus affinis*, *S. littoralis*, *S. roylei*, *S. tuberosus* etc. Grasses commonly found in such habitats are *Echinochloa colonum*, *E. crusgalli*, *Eragrostis minor*, *E. tenella*, *Dichanthium annulatum*, *Hemarthria compressa*, *Imperata cylindrica*, *Paspalidium geminatum*, *Phragmites karka* and *Polypogon monspeliensis*. At Tordi Sagar *Equisetum ramosissimum* is common in swampy areas by the side of irrigation channels.

Slightly away from the margins of tanks lake etc. and in drying up ponds the following plants are encountered: *Blumea obliqua*, *Coldenia procumbens*, *Glinus lotoides*, *Gnephalium polycaulon*, *G. pulvinatum*, *Grangea maderaspatana*, *Heliotropium ovalifolium*, *H. supinum*, *Phyla nodiflora*, *Polygonum plebeium*, *Portulaca pilosa*, *Pulicaria crispa*, *Verbascum chinense* etc.

Phoenix sylvestris is common throughout the district and are generally encountered in marshy places like margins of tanks etc.

Weeds of cultivated fields

The common weeds founds in the cultivated fields on the Banas river bed are : *Amaranthus spinosus*, *Asphodelus tenuifolius*, *Chenopodium album*, *Melilotus alba*, *M. indica*, *Pluchea lanceolata* and *Polygonum plebeium* along with sedges and grasses like *Cyperus compressus*, *C. laevigatus*, *Fimbristylis bisumbellata*, *Crypsis schoenoides*, *Echinochloa colonum*, *Eragrostis minor*, *E. pilosa*, *E. tenella*, *Polypogon monspeliensis* etc.

When the water level is low, the margins of tanks are converted into cultivated fields as in Tordi Sagar and the weeds found here are *Eclipta alba*, *Gnephalium polycaulon*, *Polygonum plebeium*, *Potentilla supina* and the sedge *Cyperus pygmaeus*.

The common weeds found in and around the other cultivated fields in Tonk district are : *Abutilon indicum*, *Anagallis arvensis*, *Asphodelus tenuifolius*, *Catharanthus pusillus*, *Celosia argentea*, *Chenopodium album*, *C. murale*, *Convolvulus arvensis*, *Euphorbia dracunculoides*, *Gynandropsis gynandra*, *Ipomoea pes-tigrides*, *Malva parvifolia*, *Melilotus indica*, *Solanum nigrum*, *Spergula fallax*, *Striga angustifolia* and grasses like *Cenchrus setigerus*, *Cynodon dactylon* etc.

Cultivated plants

Tonk is famous for its water melons, locally known as Turbooz (*Citrullus vulgaris* Schrad. ex Eckl. & Zeyh.) and musk melons, locally known as Kharbuza (*Cucumis melo* L.) which are cultivated extensively on the Banas river beds and sent to different parts of India.

On the Banas river bed and elsewhere the following vegetables are also grown : *Abelmoschus esculentus* (L.) Moench. (Lady's finger ; *Bhendi*), *Allium cepa* L. (Onion ; *Pyaz*, *Kanda*), *A. sativum* L. (Garlic ; *Lashan*), *Benincasa hispida* (Thunb.) Cogn. (White gourd ; *Petha*), *Brassica oleracea* L. var. *botrytis* L. (Cauliflower ; *Phoolgobi*), *B. oleracea* var. *capitata* L. (Cabbage ; *Bandgobhi*), *Capsicum annuum* L. (Chilli ; *Mirch*), *Citrullus vulgaris* Schard. var. *fistulosus* Duthie & Fuller (Squash melon ; *Tinda*), *Coriandrum sativum* L. (Coriander ; *Dhana*), *Cucumis melo* L. var. *culta* Royle (Cucumber ; *Kachra*, *Kakaria*), *Cucurbita moschata* Duch. ex Poir. (Cushaw and winter crookneck squash ; *Sitaphal*, *Mitha kaddu*), *Daucus carota* L. (Carrot ; *Gajar*), *Ipomoea batatas* (L.) Lam. (Sweet-potato ; *Shakar-Kandi*), *Lagenaria vulgaris* Ser. (Bottle-gourd ; *Lauki*, *Ghiya*), *Luffa acutangula* (L.) Roxb. (Dish-cloth gourd ; Rag-gourd ; *Tori*), *Lycopersicon lycopersicum* (L.) Karst. (Tomato ; *Tamatar*), *Momordica charantia* L. (Bitter-gourd ; *Karala*), *Pisum sativum* L. (Pea ; *Mattar*), *Raphanus sativus* L. (Radish ; *Mulli*), *Solanum melongena* L. (Bringal ; *Baigan*) and *S. tuberosum* L. (Potato ; *Alu*).

Cereals, pulses, cash crops and other crop plants grown are ; *Arachis hypogaea* L. (Ground nut ; *Mungphali*, *Mumphali*), *Brassica campestris* L. var. *sarson* Prain (Mustard ; *Sarso*), *B. nigra* Koch (Black mustard ; *Birai*), *Cicer arietinum* L. (Chic-pea ; *Chana*), *Coriandrum sativum* L. (Coriander ; *Dhana*), *Cuminum cyminum* L. (Cumin ; *Zera*), *Foeniculum vulgare* Mill. (Fennel ; *Sonf*), *Gossypium* spp. (Cotton ; *Rui*), *Hordeum vulgare* L. (Barley ; *Jow*), *Linum usitatissimum* L. (Linseed ; *Alsi*), *Pennisetum typhoides* (Burm. f.) Stapf & C. E. Hubb. (Pearl-millet ; *Bajra*), *Phaseolus aureus* Roxb. (Green or golden gram ; *Moong*), *Saccharum officinarum* L. (Sugar cane ; *Ikh*, *Gana*), *Sesamum indicum* L. (Sesame ; *Till*), *Sorghum vulgare* Pers.

(Sorghum ; *Jawar*), *Trigonella foenum-graecum* L. (Fenugreek; *Methi*), *Triticum aestivum* L. (Wheat ; *Kanak, Gehu*), *Vigna aconitifolius* (Jacq.) Marechal (Moth bean ; *Moth*), *V. mungo* (L.) Hepper (Black gram ; *Urd*) and *Zea mays* L. (Maize ; *Makki*).

The common fruit trees grown in the Tonk district are : *Carica papaya* L. (Papaya ; *Pappita*), *Citrus aurantium*. L. (Orange ; *Santara, Malta*), *C. limon* (L.) Burm. f. (Lemon ; *Nimbu*), *Mangifera indica* L. (Mango ; *Am*), *Manilkara hexandra* (Roxb.) Dub. (*Khirni*), *Psidium guajava* L. (Guava ; *Amrood*), *Punica granatum* L. (Pomegranate ; *Anar*) and *Syzygium cumini* (L.) Skeels (Black plum ; *Jammun*).

SYNOPSIS OF THE FLORA

The total Angiosperm Flora of Tonk district, including both indigenous and naturalised plants, comprises of about 370 species belonging to 258 genera under 88 families. The following table (Table 1) gives the number of families, genera and species under Dicotyledons and Monocotyledons.

TABLE 1. STATISTICAL SYNOPSIS OF THE FLORA

Angiosperms	Families		Genera		Species	
	No.	%	No.	%	No.	%
Dicotyledons	72	81.8	197	76.4	274	74.1
Monocotyledons	16	18.2	61	23.6	96	25.9
Total	88	100	258	100	370	100

The families with 10 or more species are as follows :

1. Poaceae 50 spp. (36 genera)
2. Fabaceae 30 spp. (18 genera)
3. Asteraceae 26 spp. (23 genera)
4. Cyperaceae 22 spp. (4 genera)
5. Euphorbiaceae 14 spp. (5 genera)
6. Convolvulaceae 13 spp. (5 genera)
7. Acaithaceae 12 spp. (9 genera)

8. Boraginaceae	12 spp. (7 genera)
9. Mimosaceae	11 spp. (7 genera)
10. Scrophulariaceae	11 spp. (10 genera)
11. Amaranthaceae	10 spp. (8 genera)

The following families have 5 or more genera :

1. Poaceae	36 genera (50 spp.)
2. Asteraceae	23 genera (26 spp.)
3. Fabaceae	18 genera (30 spp.)
4. Scrophulariaceae	10 genera (11 spp.)
5. Acanthaceae	9 genera (12 spp.)
6. Amaranthaceae	8 genera (10 spp.)
7. Boraginaceae	7 genera (12 spp.)
8. Mimosaceae	7 genera (11 spp.)
9. Lamiaceae	6 genera (9 spp.)
10. Euphorbiaceae	5 genera (14 spp.)
11. Convolvulaceae	5 genera (13 spp.)
12. Malvaceae	5 genera (7 spp.)
13. Rubiaceae	5 genera (5 spp.)

If the Fabaceae *s. l.* are taken as one family they comprise 27 genera and 49 species. Even then poaceae occupy the first place, the second and third position being occupied by Fabaceae *s. l.* and Asteraceae respectively.

Except for Poaceae (50 spp.) and Cyperaceae (22 spp.), the Monocotyledons are poorly represented. The remaining 24 species belong to 14 different families. The ratio of species belonging to Monocotyledons to Dicotyledons is 1 : 2. 9, of genera 1 : 3. 2 and of families 1 : 4. 5.

The proportion of genera to species is 1: 1. 4 which is rather low in comparison to the corresponding ratio for the whole of India which is estimated to be about 1 : 7, but it is more or less comparable to the ratio for North Gujarat 1 : 1. 83 (Saxton, 1922) and Delhi State 1 : 1. 63 (Maheshwari, 1963).

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KEY TO FAMILIES

- 1 a. Tap root usually present; vascular bundles of the stem usually in a circle; leaves usually with reticulate venation; pollen grains usually not monocolpate; cotyledons 2 :
 - 2 a. Perianth of 2 or more whorls, usually differentiated in to an outer calyx and inner corolla :
 - 3 a. At least some of the petals free at the base :
 - 4 a. Ovary inferior or half inferior :
 - 5 a. Stamens numerous, more than 10 :
 - 6 a. Aquatic herbs; leaves cordate; seeds arillate ... NYPHAEACEAE 2
 - 6 b. Terrestrial plants; leaves not cordate, rarely much reduced; seeds not arillate :
 - 7 a. Plants succulent, very spiny; leaves much reduced; petals numerous ... CACTACEAE 37
 - 7 b. Plants woody, unarmed; leaves well-developed with pellucid glands; petals 4-5 ... MYRTACEAE 33
 - 5b. Stamens definite, not more than 10 :
 - 8a. Tendrillar vines; flowers unisexual; anther loculi usually flexuous or conduplicate ...CUCURBITACEAE 36
 - 8b. Plants not tendrillar; flowers bisexual; anther loculi straight :
 - 9a. Flowers 4-merous; style 1; ovary 4-locular ... ONAGRACEAE 35
 - 9b. Flowers 5-merous; styles 2; ovary 1-locular ... VAHLIACEAE 31
 - 4b. Ovary superior :
 - 10a. Stamens numerous, more than 10 :
 - 11a. Aquatic herbs; leaves peltate; connective clavate ... NELUMBONACEAE 3
 - 11b. Terrestrial plants; leaves not peltate; connective not clavate :
 - 12a. Gynoecium of many, free carpels ...
 - 12b. Gynoecium of 1 carpel or syncarpous :

- 13a. Plants with yellow sap; laves lacerate; petals biseriate ... PAPAVERACEAE 4
- 13b. Plants without yellow sap; leaves not lacerate; petals uniseriate :
- 14a. Petals 4 :
- 15a. Plants woody; fruit indehiscent ... CAPPARACEAE 7
- 15b. Herbs; fruit dehiscent ... CLEOMACEAE 6
- 14b. Petals 5 :
- 16a. Leaves bipinnate; ovary 1-locular; placentation marginal ... MIMOSACEAE 29
- 16b. Leaves simple, sometimes lobed, never bipinnate; ovary 2-or more locular; placentation axile :
- 17a. Flowers unisexual ... EUPHORBIACEAE 69
- 17b. Flowers bisexual :
- 18a. Stamens monadelphous; anthers 1-locular ... MALVACEAE 12
- 18b. Stamens free or very shortly connate at the base; anthers 2-locular.. TILIACEAE 14
- 10b. Stamens definite, not more than 10 :
- 19a. Sepals 3+3; petals 3+3; carpels free ... MENISPERMACEAE 1
- 19b. Sepals 4-5; petals 4-5; gynoecium of 1 carpel or syncarpous :
- 20 a. Stamens tetradynamous ... BRASSICACEAE 5
- 20 b. Stamens not tetradynamous :
- 21a. Ovary 1-locular :
- 22a. Flowers unisexual; ovule 1 ... ANACARDIACEAE 25
- 22b. Flowers bisexual; ovules 2-numerous :
- 23a. Petals 4 ... CLEOMACEAE 6
- 23b. Petals 5 :

- 24a. Branches and inflorescence dichotomously branched with one branch tending to outgrow the other; placentation free-central ... CARYOPHYLLACEAE 10
- 24b. Branches in the vegetative region and the inflorescence not dichotomous; placentation parietal or marginal :
- 25a. Fruit a capsule :
- 26a. Indumentum stellate; flowers actinomorphic; filaments connate below; anthers 2-locular ... STERCULIACEAE 13
- 26b. Indumentum not stellate; flowers zygomorphic; filaments free; anthers 1-locular MORINGACEAE 26
- 25b. Fruit a legume, sometimes indehiscent or lomentoid :
- 27a. Leaves bipinnate; corolla actinomorphic; petals valvate ... MIMOSACEAE 29
- 27b. Leaves simple, unifoliate, trifoliate or simply pinnate; corolla zygomorphic (sometimes weakly so); petals imbricate :
- 28a. Adaxial petal interior (ascending imbrication)... CAESALPINIACEAE 28
- 28b. Adaxial petal exterior (descending imbrication)... FABACEAE 27

- 21b. Ovary 2 or more locular :
- 29a. Sepals unequal, the two inner larger; petals 3, the median anterior keel-like and crested ... POLYGALACEAE 9
- 29b. Sepals or calyx lobes equal or nearly so; petals 4-5, not keeled or crested :
- 30a. Inflorescence leaf-opposed ... VITACEAE 23
- 30b. Flower or inflorescence axillary :
- 31a. Petals 4 :
- 32a. Leaves biternate; seeds arillate ... SAPINDACEAE 24
- 32b. Leaves simple; seeds not arillate ... LYTHRACEAE 34
- 31b. Petals 5 :
- 33a. Leaves simple :
- 34a. Flowers unisexual ... EUPHORBIACEAE 69
- 34b. Flowers bisexual :
- 35a. Plants stellately hairy ... STERCULIACEAE 13
- 35b. Plants not stellately hairy :
- 36a. Trees or shrubs with stipular spines; style simple or 2-4-fid :
- 37a. Stamens alternate with petals; fruit a capsule; seeds arillate... CELASTRACEAE 21
- 37b. Stamens antipetalous; fruit a drupe; seed not arillate ... RHAMNACEAE 22
- 36b. Unarmed herbs; style 5-fid ... LINACEAE 15
- 33b. Leaves pinnate or (1-) 2-3-foliate :
- 38a. Herbs ... ZYGOPHYLLACEAE 16

- 38b. Plants woody :
 - 39a. Plants armed with simple or forked spines ... **BALANITACEAE 18**
 - 39b. Plants unarmed:
 - 40a. Stamens connate into a tube ... **MELIACEAE 20**
 - 40b. Stamens free :
 - 41a. Resinous trees; flowers bisexual; fruit a drupe ... **BURSERACEAE 19**
 - 41b. Trees not resinous; flowers unisexual or polygamous; fruit a samara... **SIMAROUBACEAE 17**
- 3b. Petals all united, at least at the base :
 - 42a. Ovary inferior or half inferior :
 - 43a. Tendril-bearing vines; anther loculi usually flexuous or conduplicate ... **CUCUBITACEAE 36**
 - 43b. Plants not tendrillar ; anther loculi straight :
 - 44a. Stamens antipetalous or more numerous than the petals; ovary half inferior ... **PORTULACACEAE 11**
 - 44b. Stamens alternating with the petals; ovary inferior :
 - 45a. Leaves exstipulate; inflorescence an involucrate capitulum ; anthers usually syngenesious; fruit an achene ... **ASTERACEAE 41**
 - 45b. Leaves with inter-or intrapetiolar stipules; inflorescence not an involucrate capitulum; anthers free; fruit a capsule, berry or drupe ... **RUBIACEAE 40**
 - 42b. Ovary superior :
 - 46a. Flowers unisexual ... **EBENACEAE 45**
 - 46b. Flowers bisexual :
 - 47a. Corolla regular :
 - 48a. Stamens antipetalous :
 - 49a. Plants with milky Juice; ovary many-locular ... **SAPOTACEAE 44**

- 49b. Plants without milky juice; ovary
1-locular :
- 50a. Styles or style branches 5;
placentation basal; ovule 1 ... **PLUMBAGINACEAE 42**
- 50b. Style simple; placentation free-
central; ovules numerous ... **PRIMULACEAE 43**
- 48b. Stamens alternating with or more numer-
ous than the corolla lobes :
- 51a. Stem parasites without chlorophyll;
stem thread-like ... **CUSCUTACEAE 54**
- 51b. Free-living plantas with chlorophyll;
Stem not thread-like :
- 52a. Leaves bipinnate ... **MIMOSACEAE 29**
- 52b. Leaves simple :
- 53a. Placentation parietal :
- 54a. Aquatic herbs; leaves
orbicular, deeply
cordate ... **MENYANTHACEAE 51**
- 54b. Terrestrial herbs;
leaves not orbicular
or cordate ... **GENTIANACEAE 50**
- 53b. Placentation axile, basal
or marginal :
- 55a. Flowers 4-merous; ov-
ary 1-locular ... **SALVADORACEAE 46**
- 55b. Flowers 5-merous;
ovary 2-4-locular or
carpels 2 and free or
connate at base :
- 56a. Ovules 1-2 in
each loculus :
- 57a. Plants usually
climbing; fruit
capsular ... **CONVOLVULACEAE 53**
- 57b. Plants not
climbing; fruit
of 4 nutlets
or pyrenes
or drupace-
ous ... **BORAGINACEAE 52**
- 56b. Ovules 4 - many
in each loculus :

- 58a. Plants with milky latex; leaves opposite; seeds usually with silky appendages :
 - 59a. Pollen granular :
 - 60a. Stamens with coronal appendage ... PERIPLOCACEAE 49
 - 60b. Stamens without coronal appendage ... APOCYNACEAE 47
 - 59b. Pollen in pollinia ... ASCLEPIADACEAE 48
- 58b. Plants without milky juice; leaves alternate; seeds without silky appendages ... SOLANACEAE 55
- 47b. Corolla irregular :
 - 61a. Fruit a long-horned capsule ... MARTYNIACEAE 58
 - 61b. Fruit not long-horned :
 - 62a. Leaves usually prominently marked with cystoliths; capsule dehiscent elastically ... ACANTHACEAE 59
 - 62b. Leaves without cystoliths; fruit not elastically dehiscent :
 - 63a. Ovules 1-2 in each loculus :
 - 64a. Style gynobasic; fruit of 4 nutlets ... LAMIACEAE 61
 - 64b. Style terminal; fruit a drupe or pyrene ... VERBENACEAE 60
 - 63b. Ovules many in each loculus :
 - 65a. Trees; seeds winged ... BIGNONIACEAE 57
 - 65b. Herbs; seeds not winged ... SCROPHULARIACEAE 56
- 2b. Perianth of 1 whorl, mostly sepaloid, sometime petaloid or 0:
 - 66a Ovary inferior :
 - 67a. Trees ... COMBRETACEAE 32
 - 67b. Shrubs, sometimes climbing :
 - 68a. Branch-parasitic shrubs ; flowers actinomorphic ; style simple ... LORANTHACEAE 68
 - 68b. Non-parasitic climbers; flowers zygomorphic; style divided ... ARISTOLOCHIACEAE 67
 - 66b. Ovary superior :
 - 69a. Submerged aquatic herbs ... CERATOPHYLLACEAE 72
 - 69b. Terrestrial plants :

- 70a. Gynoecium of usually 5, distinct or nearly distinct carpels :
- 71a. Trees, stellately hairy ... STERCULIACEAE 13
- 71b. Herbs, not stellately hairy ... MOLLUGINACEAE 39
- 70b. Gynoecium of 1 carpel or syncarpous :
- 72a. Ovary 1-locular :
- 73a. Herbs, undershrubs or shrubs :
- 74a. Leaves with an ochrea ... POLYGONACEAE 66
- 74b. Leaves without an ochrea :
- 75a. Perianth petaloid :
- 76a. Twining plants; leaves alternate; fruits not glandular ... BASELLACEAE 65
- 76b. Plants not twining; leaves opposite; fruits glandular ... NYCTAGINACEAE 62
- 75b. Perianth not petaloid :
- 77a. Bracts and bracteoles present; perianth scarious ... AMARANTHACEAE 63
- 77b. Bracts and bracteoles absent; perianth green... CHENOPODIACEAE 64
- 73b. Trees :
- 78a. Plants with milky sap; fruit multiple, composed of a number of drupes or achenes inside a common, fleshy, flask-shaped receptacle ... MORACEAE 71
- 78b. Plants without milky sap; fruit a samara ... ULMACEAE 70
- 72b. Ovary 2-or more locular :
- 79a. Flowers unisexual :
- 80a. Trees; stamens numerous; fruit a berry ... FLACOURTIACEAE 8
- 80b. Herbs, under shrubs or shrubs; stamens up to 8; fruit a capsule. EUPHORBIACEAE 69
- 79b. Flowers bisexual :
- 81a. Stamens 4 ... LYTHRACEAE 34
- 81b. Stamens 5 or more :

- 82a. Stamens hypogynous ... MOLLUGINACEAE 39
- 82b. Stamens perigynous ... AIZOACEAE 38
- 1b. Tap root usually absent; vascular bundles of the stem scattered; leaves usually with parallel venation; pollen grains usually monocolpate; cotyledon 1:
 - 83a. Ovary superior :
 - 84a. Perianth absent (when flowers are unisexual then absent at least in male flowers) or rudimentary, or of scales or bristles or lodicules :
 - 85a. Plants minute, thalloid: ... LEMNACEAE 82
 - 85b. Plants well—developed, differentiated into stem and leaves :
 - 86a. Flowers in spikelets and in the axils of membranous bract :
 - 87a. Stem usually with solid internodes; leaf sheath usually closed; each flower subtended by a single bract (glume); perianth of bristles, hairs, scales or 0; style 1 ... CYPERACEAE 87
 - 87b. Stem usually with hollow internodes; leaf sheath usually with free margins; each flower subtended by a bract (lemma) and a bracteole (palea); perianth reduced to lodicules; styles usually 2 ... POACEAE 88
 - 86b. Flowers not in spikelets; bracts when present not membranous :
 - 88a. Aquatic plants, submerged or floating; inflorescence glabrous :
 - 89a. Plants floating, inflorescence subtended by a spathaceous bract; fruits sessile ... ARACEAE 81
 - 89b. Plants submerged ; bract absent; fruits stipitate ... ZANNICEHELLIACEAE 85
 - 88b. Marsh plants; inflorescence densely pappose ... TYPHACEAE 80
 - 84b. Perianth present :
 - 90a. Aquatic plants; carpels free :
 - 91a. Flowers in spikes, ebracteate; perianth 4, in one series; carpels 4 ... POTAMOGETONACEAE 84
 - 91b. Flowers in racemes, bracteate; perianth 6, in two series, inner petaloid; carpels many ... ALISMATACEAE 83

- 90b. Terrestrial plants; carpels united :
- 92a. Trees; leaves plicate, palmately or pinnately divided ... ARECACEAE 79
- 92b. Herbs or shrubs; leaves simple or reduced, not plicate :
- 93a. Inflorescence an involucrate capitula; flowers unisexual ... ERIOCAULACEAE 86
- 93b. Inflorescence not a capitula; flowers bisexual :
- 94a. Outer whorl of perianth herbaceous and different from the petaloid inner whorl ... COMMELINACEAE 77
- 94b. Outer and inner whorl of perianth similar :
- 95a. Perianth scarious; pollen in tetrads ... JUNCACEAE 78
- 95b. Perianth petaloid; pollen free ... LILIACEAE 76
- 83b. Ovary inferior :
- 96a. Flowers actinomorphic; pollen free :
- 97a. Terrestrial shrubs; ovary 3-locular with axile placentation; style simple ... AGAVACEAE 75
- 97b. Aquatic herbs; ovary 1-locular with diffuse parietal placentation; style divided ... HYDROCHARITACEAE 73
- 96b. Flowers zygomorphic; pollen in pollinia ... ORCHIDACEAE 74

DICOTYLEDONS

1. MENISPERMACEAE

COCCULUS DC. *nom. cons.*

Cocculus hirsutus (L.) Diels in Engl. Pflanzenr. 46 : 236. 1910 ; Forman in Kew Bull. 29 : 478. pl. 14 D. 1974. *Menispermum hirsutum* L. Sp. Pl. 341. 1753. *Cocculus villosus* DC. Syst. Nat. 1 : 525 1817 ; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 101. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 28. 1903 (Repr. ed. 1 : 29. 1960). 'Bajar Bel' (Hindi).

Pubescent climbing shrubs. Leaves up to 8.0×6.5 cm, ovate or ovate oblong, subcordate or cuneate, obtuse or mucronate. Staminate flowers in short, many - flowered cymules in clusters of 2 - 3, greenish - yellow. Pistillate flowers 1 - 3, axillary. Drupes c. 4.5 mm in diam., red or dark purple ; endocarp laterally ribbed and with a prominent dorsal ridge, condyle perforate, pericarp of dried fruit easily rubbed off.

Fl. & Fr. : Almost throughout the year.

Common in forests ; Tonk R.F. and Rajmahal R.F.

2. NYMPHAEACEAE

NYMPHAEA L. *nom. cons.*

- | | | |
|---|-----|-----------------------|
| 1a. Leaves entire or wavy, glabrous ; connective produced beyond anther tip | ... | <i>N. nouchali</i> 1 |
| 1b. Leaves sharply toothed, densely hairy beneath ; connective of anthers hardly produced | ... | <i>N. pubescens</i> 2 |

1. *Nymphaea nouchali* Burm. f. Fl. Ind. 120. 1768. *N. stellata* Willd. Sp. Pl. 2 : 1153. 1799 ; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 114. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 34. 1903 (Repr. ed. 1 : 34. 1960) ; Subram. Aquat. Angiosp. 6. f. 1. 1962. 'Kamal-kakri' (Hindi).

Perennial aquatic herbs. Leaves up to 20 × 16 cm, orbicular, peltate, floating, green above, purple beneath. Flowers *c.* 9 cm in diam. Petals white, the tip often bluish. Stamens 22–30; anthers yellow with bluish appendages. Stigmas yellow.

Fl. & Fr. : August–October.

Common; Mor village near Malpura.

2. *Nymphaea pubescens* Willd. Sp. Pl. 2 : 1154. 1799. *N. lotus* auct. non L. 1753; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 114. 1872; Duthie, Fl. Upper Gang. Pl. 1 : 33. 1903 (Repr. ed. 1 : 34. 1960). *N. nouchali* auct. non Burm. f. 1768; Subram. Aquat. Angiosp. 6. Pl. I. f. 2. 1962; Mahesh. Illus. Fl. Delhi f. 3. 1966. 'Kamal' (Hindi).

Perennial aquatic herbs. Leaves up to 25 × 20 cm. orbicular, peltate, floating, green above, brownish beneath. Flowers large, showy, *c.* 12 cm in diam. Petals white with a tinge of pink. Stamens *c.* 40, yellow.

Fl. : August–October.

Rare; found in the tank at Chandalai village near Tonk.

3. NELUMBONACEAE

NELUMBO Adans.

Nelumbo nucifera Gaertn. Fruct. Sem. Pl. 1. 73. t. 19. f. 2. 1788; Subram. Aquat. Angiosp. 8. frontispiece & f. 4. 1962. *Nelumbium speciosum* Willd. Sp. Pl. 2 : 1258. 1799; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 116. 1872; Duthie, Fl. Upper Gang. Pl. 1 : 35. 1903 (Repr. ed. 1 : 35. 1960). 'Kamal' (Hindi).

Perennial, stoloniferous, aquatic herbs. Leaves *c.* 25 × 21 cm, orbicular, margins upturned, exactly peltate, when mature raised high above the water; petiole with small, distinct prickles. Flowers large, showy, *c.* 19 cm in diam., pink or rosy; peduncle with black prickles. Stamens *c.* 230. Carpels several, embedded separately on the top of the turbinate spongy receptacle. Fruit an aggregate of indehiscent, single seeded nutlets.

Fl. & Fr. : March May.

Common ; Bomb Talab in Malpura.

This is the sacred lotus of India. The rhizomes, young leaves and peduncles are used as vegetable. The carpels are eaten raw. The plant is also of medicinal value.

4. PAPAVERACEAE

ARGEMONE L.

Argemone mexicana L. Sp. Pl. 508. 1753 ; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 117. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 36. 1903, *pro parte* (Reqr. ed. 1 : 37. 1960) ; Basu, Ind. Med. Pl. t. 54. 1918. 'Satyanashi' (Hindi).

Glaucous, prickly herbs or undershrubs, 0.5 1.0 m, with yellow sap. Leaves up to 15.0×8.5 cm, prickly, sinuate pinnatifid, variegated with white. Flowers 4 5 cm in diam., yellow. Stamens indefinite ; anthers yellow or orange. Stigma red. Capsules 2.5 4.0×1.0 1.5 cm, prickly, dehiscent by valves. Seeds brownish black.

Fl. & Fr. : October March.

Very common on Banas river bed ; Benthali village.

It is a native of tropical America and has run wild in India.

5. BRASSICACEAE

FARSETIA Turra

Farsetia hamiltonii Royle, Ill. Bot. Himal. Mount. 71. 1834 ; Hook f. & Anders. in Hook. f. Fl. Brit. Ind. 1 : 140. 1872 ; Duthie, Fl. upper Gang. pl. 1 : 41. 1903. (Repr. ed. 1 : 40. 1960) ; Mahesh. Illus. Fl. Delhi f. 7. 1966. 'Bui, Kagpilang' (Hindi).

Erect herbs up to 60 cm densely covered with closely appressed medifixed hairs. Leaves up to 7.5×0.15 (-0.3) cm linear. Flowers in lax, ebracteate racemes, white or pinkish. Sepals appressed hairy. Silique 1.0×0.4 - 5.0×0.4 cm, linear - oblong with wavy margins, flattened, beaked with persistent style, appressed hairy with medifixed hairs, brown. Seeds 1-seriate, suborbicular with a broad membranous wing, dark brown.

Fl. & Fr. : September - March.

Very Common on sandy river bed ; Mavasi.

6. CLEOMACEAE

CLEOME L.

- 1a. Plants usually glandular - hairy ; leaves digitately 3 - 5 (-7) - foliate ; seeds with distinct cross - ribs :
- 2a. Flowers in dense, bracteate racemes, white or purplish ; androgynophore conspicuous ... *C. gynandra* 1
- 2b. Flowers in lax, leafy racemes, yellow ; androgynophore absent ... *C. viscosa* 3
- 1b. Plants spinescent - hairy ; leaves simple ; seeds without distinct cross - ribs ... *C. simplicifolia* 2

1. *Cleome gynandra* L. Sp. Pl. 671. 1753 ; Iltis in Brittonia 12 : 283. 1960 ; Jacobs in Fl. Males. 1.6 : 101. 1960 ; Mahesh. Illus. Fl. Delhi f. 10. 1966. *C. pentaphylla* L. Sp. Pl. ed. 2. 938. 1763, *nom. illegit.* based on *C. gynandra* L. *Gynandropsis pentaphylla* (L.) DC. prodr. 1 : 238. 1824 ; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 171. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 51. 1903. (Repr. ed. 1 : 49. 1960). 'Hulhul' (Hindi).

Erect, glandular hairy herbs, 30 - 100 cm. Leaflets up to 6.5×3.5 cm, obovate to oblanceolate, denticulate to subentire. Stamens 6. Capsules $2.5 - 8.0 \times 0.3 - 0.4$ cm, glandular pubescent, obliquely striated, many seeded. Seeds c. 1.4 mm in diam., reniform, with superficial concentric ribs and irregular cross ribs, black brown.

Fl. & Fr. : June November.

Common weed in wastelands ; Niwai.

2. *Cleome simplicifolia* (Camb.) Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1. 169. 1872 ; Duthie, Fl. upper Gang. Pl. 1 : 49. 1903 (Repr. ed. 1 : 48. 1960). *Polanisia simplicifolia* Camb. in Jacquem. Voy. Inde 4 : 20. t. 20. 1844. *P. burtporensis* Munro in Wight, Ic. 3 (4) : 5. t 1072. 1846.

Strigose herbs, 10 75 cm. Leaves up to 7.0×2.5 cm, obovate to oblong - elliptic. Flowers in elongated leafy racemes, purple ; pedicels up to 3.5 cm long, filiform. Stamens 10 12. Capsules 1.5 3.0 cm long, striate, torulose. Seeds c. 2 mm in diam., reniform, yellowish with brown spots.

Fl. & Fr. : July November.

Rare ; Gaunri village near Rajmahal.

3. *Cleome viscosa* L. Sp. Pl. 672. 1753 ; Wight, Ic. 1 : t. 2. 1838 ; Jacobs in Fl. Males. 1. 6 : 103. f. 32 c d, 1960 ; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1: 170. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 50. 1903 (Repr. ed. 1 : 48. 1960) ; Mahesh. Illus. Fl. Delhi f. 9. 1966. 'Gandhia' (Hindi).

Erect, glandular hairy herbs, 15 100 cm. Leaflets up to 5.5×3.0 cm, obovate to elliptic oblong. Stamens 10 20. Capsules 2.5 9.0×0.25 0.45 cm, glandular hairy, obliquely striated, many seeded. Seeds c. 1.25 mm in diam., reniform, with faint concentric ribs and strong cross ribs, dark brown.

Fl. & Fr. : July November.

Common at the foot of the hills ; Kakor R. F.

7. CAPPARACEAE

1a. Sepals free ; fruits globose or ovoid :

2a. Leaves simple with 2 stipular spines ... *Capparis* 1

2b. Leaves trifoliate, without stipular spines ... *Crataeva* 2

1b. Sepals united at base ; fruits moniliform ... *Maerua* 3

1. CAPPARIS L.

- 1a. Plants leafless except on young shoots ; flowers in corymbose racemes or fascicles, red or orange-red ... *C. decidua* 1
- 1b. Plants leafy ; flowers subumbellate, creamish white ... *C. sepiaria* 2

1. **Capparis decidua** (Forssk.) Edgew. in Journ. Linn. Soc. Bot. 6 : 184. 1862 ; Jacobs in Blumea 12: 424. 1965 ; Mahesh. Illus. Fl. Delhi f. 12. 1966. *Sodada decidua* Forssk. Fl. Aegypt. Arab. 81. 1775. *Capparis aphylla* Roth, Nov. Sp. Pl. Ind. Or. 238. 1821 ; Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 174. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 53. 1903 (Repr. ed. 1 : 51. 1960). 'Kair' (Hindi).

Densely branched shrubs or small trees, 2-6 m, with leafless (except the young shoots), green, spiny branches. Leaves when present small, linear, soon caducous. Stipular spines straight. Flowers 1-2 cm across. Fruits 1.0-1.5 cm across, globose or ovoid, bright red when ripe. Seeds 4-5 mm in diam.

Fl. & Fr. : February - November.

Common ; Frazer Bridge near Tonk and Aamli R. F.

2. **Capparis sepiaria** L. Syst. Nat. ed. 10. 2 : 1071. 1759 ; Hook. f. & Thoms in Hook. f. Fl. Brit. Ind. 1 : 177. 1872, incl. vars ; Duthie, Fl. Upper Gang. Pl. 1 : 53. 1903 (Repr. ed. 1 : 52. 1960) ; Jacobs in Fl. Males. 1. 6 : 79. 1960 & in Blumea 12. 489. 1965 ; Mahesh. Illus. Fl. Delhi f. 13. 1966. *C. glauca* wall. ex Hook. f. & Thoms. l. c. 1: 180. 1872.

Much branched, subscaudent or scaudent, more or less pubescent shrubs. Leaves c. 4 × 2 cm, elliptic, oblong-elliptic or obovate. Stipular spines recurved. Flowers at the ends of branches, 5-10 mm across, slightly fragrant. Berries c. 1 cm across, globose.

Fl. & Fr. : April - July.

Common at Paccha Bundha (Tonk) and fairly common at Mohamandpura R. F. near Aamli.

2. CRATAEVA L.

Crataeva adansonii DC. Prodr. 1. 243. 1824 subsp. *odora* (Buch.-Ham.) Jacobs in Blumea 12: 198. 1964 ; Mahesh. Illus. Fl. Delhi f. 14.

1966. *C. odora* Buch.-Ham. in Trans. Linn. Soc. 15 : 118. 1827. *C. roxburghii* R. Br. in Denh. & Clapp. Narr. Trav. Disc. Afr. App. 224. 1826. as interpreted by Wight & Arn. Prodr. 23. 1834. *C. religiosa* non Forst. f. var. *roxburghii* (R. Br.) Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1 : 172. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 52. 1903 (Repr. ed. 1 : 51. 1960).

Moderate sized, deciduous trees, 4-10 m ; bark dark grey. Petiole up to 10 cm long ; leaflets up to 11×5 cm, elliptic to elliptic lanceolate, cuneate, acuminate. Flowers greenish yellow. Berries c. 3.5 cm in diam., globose, red. Seeds reniform, brown.

Fl. & Fr. : April-September.

Common on the hills ; Tordi R. F. and Toda Rai Singh R. F.

3. MAERUA Forssk.

Maerua arenaria (DC.) Hook. f. & Thoms. in Hook. f. Fl. Brit. Ind. 1: 171. 1872 var. *scabra* Hook. f. & Thoms. l. c. 1: 171. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 51. 1903 (Repr. ed. 1 : 50. 1960) ; Mahesh. Illus. Fl. Delhi f. 11. 1966.

Scandent shrubs. Leaves up to 7×3 cm, oblong-ovate. Flowers usually in dense corymbose racemes, greenish-cream with white filaments. Fruits 1-6 cm long, cylindrical, somewhat twisted, moniliform, deeply constricted between the seeds.

Fl. & Fr. : October-March.

Found on Aunwa hills and in Tonk R. F.

8. FLACOURTIACEAE

FLACOURTIA Commers. ex L, Herit.'

Flacourtia indica (Burm. f.) Merrill, Interpret. Rumph. Herb. Amboina 377. 1917 ; Sleumer in Fl. Males. 1. 5 : 76. 1954. *Gmelina indica* Burm. f. Fl. Ind. 132. t. 39. f. 5. 1768 ; *Flacourtia ramontchi* L' Herit. Strip. Nov. 3. 59. t. 30 & 30 B. 1785 ; Wight, Ic. 1 : t. 85. 1838 ; Hook. f. & Thoms.

in Hook. f. Fl. Brit. Ind. 1 : 193. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 59 1903 (Repr. ed. 1 : 57. 1960). *F. sepiaria* Roxb. Pl. Cor. 1 : 48. t. 68. 1796 ; Hook. f. & Thoms. *l. c.* 1 : 194. 1872. 'Kondari, Kanju' (Hindi).

Deciduous trees, 5 - 8 m ; younger branches pubescent. Leaves up to 8 × 5 cm, ovate, elliptic, obovate or suborbicular, crenate - serrate. Flowers unisexual, greenish or yellowish. Male flowers in short, clustered racemes. Calyx pubescent. Stamens numerous. Female flowers solitary or in pairs. Calyx pubescent. Styles, 4 - 5. Berries globose with persistent styles, reddish when ripe.

Fl. & Fr. : February - May.

Common in forests ; Niwai, Aamli R. F. and Sohela R. F.
The fruits are edible.

9. POLYGALACEAE

POLYGALA L.

Polygala erioptera DC. Prodr. 1 : 326. 1824 ; Bennett in Hook. f. Fl. Brit. Ind. 1 : 203. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 62. 1903 (Repr. ed. 1 : 60. 1960) ; Mukherjee in Bull. Bot. Soc. Bengal 12 : 47. 1960.

Pubescent herbs, 5.0 - 6.5 cm. Leaves up to 4.5 × 1.0 cm, linear, linear-oblong or rarely elliptic or obovate-lanceolate. Flowers in short, few-flowered, axillary or extra-axillary racemes throughout the stem, pink with dark pink crest. Capsules 3 - 5 × 2 - 3 mm, elliptic-oblong, emarginate, pubescent. Seeds pilose ; strophiole 3-lobed.

Fl. & Fr. : August - November.

Common ; Kacha Bundha R. F. near Tonk.

10. CARYOPHYLLACEAE

1a. Leaves ending in a prickly point ; flowers in compact, terminal cymes ; style 1, with capitate or 3-lobed stigma ...

Polycarpaea 1

- 1b. Leaves not ending in a prickly point ; flowers in loose,
terminal dichasia ; styles 3 or 5, free ...

Spergula 2

1. POLYCARPAEA Lam. *nom. cons.*

Polycarpaea corymbosa (L.) Lam. Tabl. Encycl. 2. 129. 1797 ; Wight, Ic. 2 (4) : 6. t. 712. 1843 ; Edgew. & Hook. f. in Hook f. Fl. Brit. Ind. 1 : 245. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 68. 1903 (Repr. ed. 1 : 65. 1960). *Achyranthes corymbosa* L. Sp. Pl. 205. 1753. 'Dholphuli, Machechi' (Hindi).

Erect, generally much branched herbs, 10 - 30 cm. Leaves up to 2.5 × 0.12 cm, spuriously whorled, linear. Stipules scarious. Flowers small, silvery white to reddish. Sepals entirely scarious. Stamens 5. Capsules c. 0.15 mm long, 3 valved, brown.

Fl. & Fr. : August - November.

Common weed in fallow fields ; Rajmahal R. F.

2. SPERGULA L.

Spergula fallax (Lowe) Krause in Sturm, Deutschl. Fl. ed. 2. 5 : 19. 1901 ; Milne-Redhead in Kew Bull. 1950 : 338. 1950 ; Burrt & Lewish in Kew Bull. 1952. 349. 1952 ; Zohary, Fl. Palastina 1: 122. 1 : f. 170. 1966. *Spergularia fallax* Lowe in Hook. f. Kew Journ. Bot. 8 : 289. 1856. *Spergula pentandra* sensu Edgew. & Hook. f. in Hook. f. Fl. Brit. Ind. 1 : 243. 1874. *pro parte* (non L. 1753) ; Duthie, Fl. Upper Gang. Pl. 1 : 67. 1903 (Repr. ed. 1: 64. 1960). 'Khandidal' (Hindi).

Annual herbs, 10 - 30 cm, often branched from the base. Leaves up to 4.0 × 0.1 cm, spuriously whorled, linear. Flowers white. Sepals white-margined. Stamens 8 - 10. Styles 3. Capsules 4 - 5 mm long, ovoid or subglobose, 3 valved. Seeds black with hyaline wing.

Fl. & Fr. : December - March.

Common weed found in moist localities ; Haji - Ki Kothi (Niwai).

Closely allied to *Spergula arvensis* L. and *S. pentandra* L. which, however, are characterised by 5 valved capsules and 5 styles, while in *S. fallax* the capsules are 3-valved, the styles being 3. *S. pentandra* does not occur in India. In *S. arvensis* which in India is found in southern and eastern Parts the leaves are channelled beneath and the seeds are narrowly margined. In *S. fallax* the leaves are not channelled beneath and the seeds are winged.

11 PORTULACACEAE

PORTULACA L.

1a. Leaves spatulate or obovate - oblong ; stipular hairs inconspicuous ; sepals carinate ... *P. oleracea* 1

1b. Leaves linear - lanceolate to elliptic ; stipular hairs conspicuous ; sepals not carinate ... *P. pilosa* 2

1. **Portulaca oleracea** L. Sp. Pl. 445. 1753 ; Dyer in Hook. f. Fl. Brit. Ind. 1 : 246. 1874 ; Duthie, Fl. Upper Gang. Pl. 1. 69. 1903 (Repr. ed. 1: 66. 1960) ; Basu, Ind. Med. Pl. t. 95. 1918 ; Geesink in Blumea 17 : 292. 1969. '*Luna, Kulfa, Lunak*' (Hindi).

Prostrate or ascending, succulent herbs, 4-35 cm, with reddish-pink stem. Leaves up to 2.5 × 1.0 cm, fleshy, subsessile, rounded or truncate at apex. Flowers in capituli of usually 3-6 flowers, yellow. Capsules ovate, many seeded. Seeds reniform, tuberculate, black.

Fl. & Fr. : Almost throughout the year.

Common on Banas river bed ; Tonk.

2. **Portulacea pilosa** L. Sp. Pl. 445. 1753 ; Geesink in Blumea 17 : 294. 1969 ; Ghaffoor in Nasir & Ali, Fl. W. Pak. No. 51. 7. f. 1 H. 1973 ; Raizada, Suppl. Fl. Upper Gang. Pl. 22. 1976. *P. tuberosa* Roxb. Fl. Ind. ed Carey. 2 : 464. 1832 ; Dyer in Hook. f. Fl. Brit. Ind. 1 : 247. 1874.

Prostrate or ascending herbs, up to 20 cm. Leaves up to 1.8 × 0.2 cm, fleshy. Flowers in terminal capituli of 2-6 flowers surrounded by ring of pale hairs pink. Capsules ovoid, many - seeded. Seeds reniform, tuberculate, shining black.

Fl. & Fr. : May September

Common in wet places ; Niwai temple.

Geesink (*l. c.*) states that "I have come to the conclusion that this is a very complex species in which I have here combined 60 names." He treats *P. tuberosa* as a synonym of *P. pilosa* subsp. *pilosa*. Ghafoor (*l. c.*) and Rechinger, *Fl. Iranica* 117 : 3 - 4. 1976, however, treat *P. tuberosa* and *P. pilosa* as distinct species.

12. MALVACEAE

1a. Epicalyx present :

2a. Epicalyx segments 5 or more :

3a Style branches 5, as many as carpels ; fruit a Capsule ... *Hibiscus* 2

3b. Style branches 10, twice as many as carpels ; fruit a schizocarp, at maturity breaking up into mericarps ... *Pavonia* 4

2b. Epicalyx segments 3 ... *Malva* 3

1b. Epicalyx absent :

4a. Ovules 2 or more per locule ; seeds 2 or more per mericarp ... *Abutilon* 1

4b. Ovule 1 per locule ; seed 1 per mericarp ... *Sida* 5

1. ABUTILON Mill.

Abutilon indicum (L.) Sweet, Hort. Brit. ed. 1. 54. 1826 ; Wight Ic. 1 : t. 12. 1838 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 326. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 83. 1903 (Repr. ed. 1 : 78. 1960) ; Borss. in Blumea 14 : 170. 1966. *Sida indica* L. in Torner, Cent. Pl. 2. 26. 1756. 'Kanghi' (Hindi).

Erect, tomentose undershrubs, up to 1.5 m. Leaves up to 7×7 cm, broadly ovate or suborbicular, cordate, acute, dentate. Flowers axillary, solitary, yellow or orange ; pedicels jointed near the apex, geniculate. Mericarps 15 - 20, much longer than the calyx, flattened, reniform, shortly acuminate at apex, dorsally densely hairy. Seeds reniform, punctate by minute warts, hairy at the hilum, brown grey.

Fl. & Fr. : July March.

Common by the side of the fields ; Ghati village neas Tordi.

2. HIBISCUS L. *nom. cons.*

Hibiscus micranthus L. f. Suppl. 308. 1781 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 335. 1874 ; Duthie, Fl. Upqer Gang. Pl. 1 : 89. 1903 ; Mahesh. Illus. Fl. Delhi f. 29. 1966. *H. ovalifolius* auct. pl., non (Forssk.) Vahl 1790. 'Okda, okdha' (Hindi).

Erect, suffruticose, stellately hairy perennials, 0.5 - 2.5 m. Leaves up to 3.5 × 3.0 cm ovate. Flowers solitary, axillary, white fading to pink. Capsules 7 - 9 mm long, globose. Seeds reniform, cottony.

Fl. & Fr. : May November.

Common on hills ; Tordi R. F., Sohela, Toda Rai Singh and Banetha.

3. MALVA L.

Malva parviflora L. in Hojer, Demonstr. Pl. Hort. Ups. 18. 1753 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 321. 1874 ; Duthie, Fl. Upper Gang. Pl. 1. 79. 1903 (Repr ed. 1 : 74. 1960) ; Borss. in Blumea 14 : 149. 1966 ; Mahesh. Illus. Fl. Delhi f. 25. 1966. 'Panirak' (Hindi).

Prostrate or ascending herbs. Leaves with long petiole, lamina up to 5.0 × 7.5 cm, suborbicular or reniform. Epicalyx segments linear. Flowers in axillary clusters, white. Calyx accrescent. Petals notched, hardly exceeding the sepals. Stigma linear. Schizocarp c. 7 mm across, discoid. Mericarps c. 10, prominently veined, 1 seeded. Seeds glabrous, dark brown.

Fl. & Fr. : February March.

Common on field bunds ; Tordi.

4. PAVONIA Cav. *nom. cons.*

Pavonia zeylanica (L.) Cav. Diss. 3. 134. t. 48. f. 2. 1787 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 331. 1874 ; Mahesh. Illus. Fl. Delhi f. 28. 1966 ; Raizada, Suppl. Fl. Upper Gang. Pl. 32. 1976. *Hibiscus zeylanicus* L. Sp. Pl. 697. 1753. 'Sugandh-buti' (Hindi).

Erect, suffruticose, glandular - hairy perennials, 0.5 - 1.5 m. Leaves up to 3 × 3 cm, undivided or 3 - lobed, dentate. Epicalyx segments setaceous, hairy. Flowers pink or rarely white. Mericarps, slightly winged at edges, pale brown. Seeds minutely longitudinally papillately striate, puberulous, dark brown.

Fl. & Fr. : May - December.

Common ; Rajmahal R. F., Sohela R. F. and Niwai.

5. SIDA L.

- | | | |
|--|-----|------------------------|
| 1a. Style branches and mericarps 5 ; mericarps smooth,
muticous | ... | <i>S. cordata</i> 1 |
| 1b. Style branches and mericarps more than 5 ; mericarps
prominently reticulated, 2-awned : | | |
| 2a. Awns long, exceeding the calyx, retroseely
ciliate | ... | <i>S. cordifolia</i> 2 |
| 2b. Awns short, not exceeding the calyx, stellate
hairy | ... | <i>S. ovata</i> 3 |

1. **Sida cordata** (Burm. f.) Borss. in Blumea 14 : 182. 1966. *Melochia cordata* Burm. f. Fl. Ind. 143. 1768. *Sida veronicifolia* Lam. Encycl. 1 : 5. 1783 ; Duthie, Fl. Upper Gang. Pl. 1: 80. 1903 (Repr. ed. 1 : 75. 1960). *S. humilis* Cav. var. *veronicifolia* (Lam.) Mast. in Hook. f. Fl. Brit. Ind. 1 : 322. 1874. *S. humilis* Cav., Diss. 5 : 277. t. 134. f. 2. 1788 ; Mast. l. c. 1 : 322. 1874 incl. vars. 'Bhiunli' (Hindi).

Ascending or erect, slender, hairy, herbs, up to 65 cm. Leaves up to 6×5 cm, broadly ovate to suborbicular, cordate, acute to acuminate, crenate to serrate. Flowers on long pedicels, axillary. yellow or orange. Mericarps thin walled. seeds glabrous, brown black.

Fl. & Fr. : Almost throughout the year.

Common ; Mayola forest (Bisalपुरa) and by the side of Niwai tank.

2. **Sida cordifolia** L. Sp. Pl. 684. 1753 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 324. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 82. 1903 (Repr. ed 1 : 77. 1960) ; Borss. in Blumea 14 : 199. 1966. 'Sahadui' (Hindi).

Erect, much branched, tomentose undershrubs up to 1 m. Leaves up to 5×3 cm, broadly ovate or orbicular, shallowly cordate, obtuse or acute, serrate to crenate. Flowers axillary, cream or pale yellow. Mericarps 10, tough walled, stellately - hairy. Seeds glabrous except at the hilum, brown black.

Fl. & Fr. : Almost throught the year.

Common in waste lands, cultivated fields and river beds ; Haji- Ki- Kothi (Niwai) ; Ghati village and on dry river bed of Mavasi.

3. *Sida ovata* Forssk. Fl. Aegypt. Arab. 124. 1775. *S. grewioides* Guill. & Perr. in Guill. Perr. & A. Rich. Fl. Seneg. Tent. 1 : 71. 1830 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 323. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 81. 1903 (Repr. ed. 1 : 77. 1960). 'Kharenti' (Hindi).

Erect, tomentose undershrubs, up to 1 m. Leaves up to 5×5 cm, ovate elliptic, oblong elliptic, oblong ovate or suborbicular, rounded or shallowly cordate, crenate. Flowers axillary, yellow, orange - yellow or white. Mericarps 7 - 8, tough walled ; awns very short, connivent. Seeds glabrous except at the hilum, dark brown.

Fl. & Fr. : Almost throughout the year.

Common at the base of the hills ; Ghati village.

13. STERCULIACEAE

- | | |
|---|--------------------|
| 1a. Trees ; flowers unisexual or polygamous ; petals 0 ... | <i>Sterculia</i> 2 |
| 1b. Shrubs or herbs ; flowers hermaphrodite ; petals present : | |
| 2a. Flowers in sessile or subsessile dense heads in leaf axils ; petals clawed ; staminodes 0 ; style 1, not branched ; ovary 1 - celled ... | <i>Waltheria</i> 3 |
| 2b. Flowers solitary or on forked peduncles from leaf axils ; petals not clawed ; staminodes 5 ; style divided into 5 spreading branches ; ovary 5 - celled ... | <i>Melhanian</i> 1 |

1. MELHANIA Forssk.

Melhanian futteyporensis Munro ex Mast. in Hook. f. Fl. Brit. Ind. 1 : 373. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 106. 1903 (Repr. ed. 1 : 100. 1960).

Hoary tomentose undershrubs, *c.* 1 m. Leaves up to 9.5 × 5.5 cm, ovate to ovate lanceolate, cordate, crenate serrate. Flowers in 2-4 flowered terminal cymes, pale orange. Bracts 3, ovate, cordate at base, tomentose. Capsules ovoid, 1.0-1.5 × 0.8-1.0 cm, villous. Seeds angular muricate.

Fl. & Fr. : May - September.

Common on hills ; Tordi R.F. and Toda Rai Singh R.F.

2. STERCULIA L.

Sterculia urens Roxb. Pl. Cor. 25. t. 24. 1795 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 355. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 100. 1903 (Repr. ed. 1 : 94. 1960) ; Basu, Ind. Med. Pl. t. 146. 1918. '*Kor, Lakh*' (Hindi).

Moderate sized trees, 6-10 m ; bark red, peeling. Leaves large, up to 18 × 26 cm, crowded at the ends of branches, shallowly palmately 3-5-lobed, cordate. Flowers numerous in terminal, glandular pubescent panicles. Stamens 10, united into a column. Follicles 5, each 2.0-5.5 × 1-2 cm, woody, covered with stinging bristles, red. Seeds oblong, dark brown or black.

Fl. & Fr. : November - May.

Common on Hills ; Toda Rai Singh R.F. and Ghati R. F.

3. WALTHERIA L.

Waltheria indica L. Sp. Pl. 673. 1753 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 374. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 107. 1903 (Repr. ed. 1 : 101. 1960) ; Wealth of India 10 : 563. f. 165. 1976. '*Mundi*' (Hindi).

Perennial, suffruticose, pubescent herbs or undershrubs, 50-120 cm. Leaves up to 7.0 × 5.5 cm, ovate to ovate-oblong, crenate-serrate. Flowers yellow. Capsules *c.* 3 mm long, obovoid ; villous above, enclosed in the calyx. Seeds solitary, obovoid, black or brown-black.

Fl. & Fr. : September - February.

Rare ; Bisalpara R.F., Malpura and Sohela R.F.

14. TILIACEAE

- 1a. Basal serrations of lamina mostly glandular ; fruits echinate or bristly ... *Triumfetta* 3
- 1b. Basal serrations of lamina eglandular ; fruits neither echinate nor bristly :
- 2a. Trees or shrubs ; petals clawed, glandular at base ; fruits drupaceous, often 2 - 4 - lobed, rarely not lobed ... *Grewia* 2
- 2b. Herbs or undershrubs ; petals not clawed, eglandular at base ; fruits elongate or subglobose capsules *Corchorus* 1

1. CORCHORUS L.

- 1a. Plants prostrate ; capsules 4 - loculed *C. depressus* 2
- 1b. Plants erect or suberect ; capsules 3 - or 5 - loculed :
- 2a. Capsules ending in 3 radiating points, 3 winged ... *C. aestuans* 1
- 2b. Capsules ending in a single beak lobed at the tip, not winged :
- 3a. Leaf blade usually with filiform appendages at base ; capsules more than 2.5 cm long, with a long beak, 5 - loculed ... *C. olitorius* 4
- 3b. Leaf blade without filiform appendages at base ; capsules up to 1.5 cm long, shortly beaked, 3 loculed ... *C. fascicularis* 3

1. *Corchorus aestuans* L. Syst. Nat. ed. 10. 1 : 1079. 1759 ; Mahesh. Illus. Fl. Delhi f. 35. 1966. *C. acutangulus* auct. non Forssk. 1775 ; Lam. Encycl. 2 : 104. 1786 ; Wight, Ic. 3 (1) : 1. t. 739. 1844 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 398. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 121. 1903 (Repr. ed. 1 : 114. 1960). 'Chonch' (Hindi).

Ascending, suberect or erect, Much branched, hairy annuals, 6 60 cm. Leaves up to 10×5 cm, ovate to ovate - lanceolate, serrate, basal serratures sometimes produced into filiform appendages. Flowers 1 3 (-4) together, yellow. Capsules 1.5 4.0×0.3 0.6 cm, 3 loculed ; beaks bifid. Seeds angular, obliquely truncate at both ends, rough, brown.

Fl. & Fr. : August November.

Common ; Benthali (Deoli).

2. **Corchorus depressus** (L.) Stocks in proc. Linn. Soc. 1 : 367. 1848 ; Mahesh. Illus. Fl. Delhi f. 32. 1966. *Antichorus depressus* L. Mant. 1 : 64. 1767. *Corchorus antichorus* Raeusch. Nom. Bot. ed. 3. 158. 1797 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 398. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 121. 1903 (Repr. ed. 1 : 114. 1960). '*Chamkesh, Baphuli*' (Hindi).

Prostrate, much, branched, woody perennials. Leaves up to 25 × 12 mm, elliptic, broadly elliptic, obovate elliptic or roundish, crenate serrate, plicate in bud. Flowers yellow. Capsules 7 17 × 1.5 2.0 mm, oblong cylindrical; beak short, entire, straight or curved. Seeds angular, obliquely truncate, smooth, greyish brown.

Fl. & Fr. : August March.

Common ; Sohela R.F.

3. **Corchorus fascicularis** Lam. Encycl. 2 : 104. 1786 ; Mast. in Hook f. Fl. Brit. Ind. 1 : 398. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 121. 1903 (Repr. ed. 1 : 114. 1960) ; Basu, Ind. Med. Pl. t. 161 B. 1918 '*Chonchi*' (Hindi).

Woody herbs, c. 0.5 m. Leaves up to 5.0 × 1.5 cm, elliptic oblong or lanceolate, serrate. Flowers in fascicles of usually 2 5 flowers, yellow. Capsules 0.8 - 1.5 × 0.2 cm, pubescent. Seeds wedge - shaped, smooth, dark brown.

Fl. & Fr. : September November.

Common ; Siras forest.

4. **Corchorus olitorius** L. Sp. Pl. 529. 1753 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 397. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 120. 1903 (Repr. ed. 1 : 113. 1960) ; Mahesh. Illus. Fl. Delhi f. 33. 1966. '*Jute*' (Hindi).

Erect herbs, 15 100 cm, woody at base, glabrous except the petiole. Leaves up to 12.0 × 5.5 cm. lanceolate or ovate - lanceolate, serrate. Flowers 1 3 together, yellow; Capsules up to 7 cm, 10 ribbed; locules with distinct partitions between seeds. Seeds trigonous, rough, black.

Fl. & Fr. : July November.

Common by the sides of cultivated fields ; Nayagaon (Deoli).

2. GREWIA L.

- 1a. Leaves up to 5 cm long ; flowers usually solitary, white or cream-coloured ; drupes glabrous, rarely with a few stellate hairs ... *G. tenax* 3
- 1b. Leaves up to 10 cm long ; flowers in axillary cymes, yellow or orange - yellow ; drupes hairy or pilose :
- 2a. Leaves 3 - nerved, rounded or subtruncate at base ; drupes stellately hairy ... *G. flavescens* 1
- 2b. Leaves 5 - 6 nerved, cordate at base ; drupes pilose ... *G. subinaequalis* 2

1. *Grewia flavescens* A. Juss. in Ann. Mus. Nation. Hist. Nat. Paris 4 : 91. 1804 ; Narayanaswamy & Rao in Journ. Indian Bot. Soc. 29 : 187. 1950. *G. pilosa* Wight & Arn. Prodr. 78. 1834, non Lam. 1789 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 388. 1874, *pro parte* ; Duthie, Fl. Upper Gang. Pl. 1 : 112. 1903 (Repr. ed. 1 : 105. 1960).

Straggling shrubs or small trees 3 - 4 m ; bark grey. Leaves up to 11.0 × 4.5 cm, ovate oblong to oblong lanceolate, irregularly serrate, stellately hairy. Flower buds densely bristly tomentose, oblong, dialated at base, constricted in the middle. Flowers yellow. Anthers hairy on the back. Drupes 7 - 10 × 6 - 15 mm, entire or slightly 2 - 4 lobed, with a crustaceous rind ; mesocarp fibrous. Stone muricate.

Fl. & Fr. : August - November.

Common ; Kachha Bundha R.F. near Tonk.

2. *Grewia subinaequalis* DC. Prodr. 1 : 511. 1824 ; Narayanaswamy & Rao in Journ. Indian Bot. Soc. 29 : 187. 1950. *G. asiatica* auct. non L. 1767 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 386. 1874, *pro parte* ; Duthie, Fl. Upper Gang. Pl. 1 : 113. 1903 (Repr. ed. 1 : 107. 1960) ; Wealth of India 4 : 262. f. 127, 128. 1956. 'Phalsa' (Hindi).

Shrubs or trees, up to 10 m ; bark grey. Leaves up to 16 × 15 cm, broadly ovate to almost orbicular, obliquely cordate at base, irregularly crenate ; petiole clavate. Flowers orange - yellow ; pedicels clavate. Drupes 4 - 8 × 4 - 11 mm, entire or slightly lobed ; mesocarp fibrous. Stone rugose.

Fl. & Fr. : November - May.

Common in the valley of hills ; Toda Rai Singh R.F.

There is considerable confusion on the nomenclature of this species and a number of authors assign it to *G. asiatica* L. Narayanaswami and l. c. 183 185 have dealt with the nomenclature of this plant.

3. *Grewia tenax* (Forssk.) Fiori in Bos. Piant. Legn. Eritr. 246. 1909 ; Mahesh. Illus. Fl. Delhi f. 31. 1966. *Chadara tenax* Forssk. Fl. Aegypt.-Arab. 105. 1775. *Grewia populifolia* Vahl, Symb. 1 : 33. 1790 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 385. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 111. 1903 (Repr. ed. 1 : 104. 1960). 'Khata Chabeni' (Hindi).

Shrubs, up to 3 m ; bark dark grey. Leaves up to 5 × 4 cm, ovate, ovate - elliptic, obovate or almost orbicular, serrate, 5 nerved at base. Flowers with mild fragrance. Petals usually notched. Drupes 5 9 × 5 14 mm, usually 2 4 lobed, orange or orange red. Stone muricate.

Fl. & Fr. : May February.

Common on hills ; Ghati, Tordi R.F. and Sohela R.F.

3. TRIUMFETTA L.

Triumfetta pentandra A. Rich. in Guill. Perr. & A. Rich. Fl. Seneg. Tent. 1 : 93. 19. 1831 ; Ghafoor in Nasir & Ali, Fl. W. Pak. No. 75 : 19. f. 4 C & D. 1974. *T. neglecta* Wight & Arn. Prodr. 75. 1834 ; Mast. in Hook. f. Fl. Brit. Ind. 1 : 396. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 119. 1903 (Repr. ed. 1 : 112. 1960).

Erect, hairy herbs, 25 - 60 cm. Leaves up to 9.0 × 8.5 cm, rhomboid-orbicular or ovate lanceolate, coarsely serrate, undivided, or 3 lobed. Flowers yellow or orange - yellow. Stamens 5 - 7. Capsules 5.0 - 7.0 × 4.5 mm including the uncinatate spines, densely tomentose ; spines ciliate on their upper edges. Seeds somewhat trigonous, brown.

Fl. & Fr. : August - October.

Rare ; near the river at Vijayapura (Deoli).

15. LINACEAE

LINUM L.

Linum usitatissimum L. Sp. Pl. 277. 1753 ; Hook. f. Fl. Brit. Ind. 1 : 410. 1874 ; Duthie, Fl. Upper Gang. Pl. 1 : 122. 1903 (Repr. ed. 1 : 115. 1960) ; Basu, Ind. Med. Pl. t. 164 A. 1918. 'Alsi' (Hindi).

Erect, annual herbs, 10-1100 cm. Leaves sessile, up to 3.5×0.5 cm, linear or linear-lanceolate. Flowers in terminal panicles, blue. Capsules 9-11 mm, globose, beaked, 10-valved. Seeds flattened, ellipsoid, smooth, shining, dark brown.

Fl. & Fr. : February-March.

The plant is cultivated for its oil and is found as an escape in cultivated fields; Deoli.

16. ZYGOPHYLLACEAE

- | | | |
|--|-----|-------------------|
| 1a. Leaves 1-3-foliate; stipules spiny; fruits not spinous; seeds albuminous | ... | <i>Fagonia</i> 1 |
| 1b. Leaves pinnate; stipules not spiny; fruits spinous; seeds exalbuminous | ... | <i>Tribulus</i> 2 |

1. FAGONIA L.

Fagonia schweinfurthii Hadidi, osterr. Bot. Zeitsch. 121: 273. 1975 & in Webbia 33: 87. 1978. *F. indica* Burm. f. Fl. Ind. 102. t. 34. f. 1. 1768 var. *schweinfurthii* Hadidi in Rech. f. Fl. Iran. 98: 6. t. 6. 1972. *F. arabica* auct. non L. 1753; Edgew. & Hook. f. in Hook. f. Fl. Brit. Ind. 1: 425. 1874, pro parte *F. cretica* auct. non L. 1753; Duthie, Fl. Upper Gang. Pl. 1: 127. 1903. (Repr. ed. 1: 120. 1960); Mahesh. Illus. Fl. Delhi f. 39. 1966. 'Jowasa' (Hindi).

Diffuse, branched, suffrutescent herbs, 15-40 cm with terete, striate branches. Leaves trifoliate, terminal ones unifoliate; leaflets up to 2.8×0.3 cm, linear-oblong, mucronate. Spines shorter or longer than leaves. Flowers pink or purple. Petals clawed. Stamens 10. Capsules 4-6 \times 2.5-5.0 mm including the aristate tip, deeply 5-angled, pyramidal, pubescent. Seeds c. 3.0×2.5 mm, compressed, ovate-orbicular, punctate.

Fl. & Fr. : Almost throughout the year.

Common in wastelands; Kotri village (Aligarh).

2. TRIBULUS L.

Tribulus terrestris L. Sp. Pl. 387. 1753; Edgew. & Hook. f. in Hook. f. Fl. Brit. Ind. 1: 423. 1874; Duthie, Fl. Upper Gang. Pl. 1: 127. 1903

(Repr. ed. 1 : 119. 1960) ; Mahesh. Illus. Fl. Delhi f. 38. 1966. 'Gokhru' (Hindi).

Procumbent or ascending, pilose herbs. Leaves paripinnate ; leaflets usually 5 - 6 pairs, up to 1.5×0.7 cm, ovate to elliptic - oblong. Flowers yellow. Stamens 10. Fruits 0.8 - 1.5 cm wide ; mericarps 3 - 5, tuberculate on dorsal side, hairy, with two long patent and 2 short downwardly directed spines.

Fl. & Fr. : March - November.

Common by the side of tanks and rivers ; Niwai.

17. SIMAROUBACEAE

Ailanthus Desf. *nom. cons.*

Ailanthus excelsa Roxb. Pl. Cor. 1 : 24. t. 23. 1795 ; Wight, Ill. Indian Bot. 1 : 170. t. 67. 1840 ; Bennett in Hook. f. Fl. Brit. Ind. 1 : 518. 1875 ; Duthie, Fl. Upper Gang. Pl. 1 : 144. 1903 (Repr. ed. 1 : 136. 1960) ; Basu, Ind. Med. Pl. t. 202. 1918 ; Nootboom in Fl. Males. 1 - 6 : 219. 1962. 'Arua, Urrulo' (Hindi).

Trees, 4 - 10 m or more tall ; bark whitish. Leaves up to 40 cm ; leaflets 8 - 14 pairs, alternate or subopposite, up to 11×5 cm, obliquely ovate or ovate - lanceolate, very unequal at the base, acuminate or acute, irregularly toothed, densely tomentose particularly beneath. Flowers in large, lax, tomentose panicles, greenish yellow. Samara $4 - 6 \times 0.8 - 1.3$ cm, oblanceolate, twisted, copper red, many nerved, the nerves reticulate above the seeds, otherwise nearly parallel. Seed solitary in the centre of the samara.

Fl. & Fr. : December - April.

Common in Tonk R. F ; planted.

18. BALANITACEAE

Balanites Delile *nom. cons.*

Balanites aegyptiaca (L.) Delile, Fl. Egypte 77 & 221. t. 28. f. 1. 1813 ; Wight, Ic. 1 : t. 274. 1840 ; Basak, Fl. India Fasc. 4 : 20. 1980. *Ximenia*

aegyptiaca L. Sp. Pl. 1194. 1753. *Balanites roxburghii* Planch. in Ann. Sc. Nat. ser. 4. 2 : 258. 1854 ; Bennett in Hook. f. Fl. Brit. Ind. 1 : 522. 1875. *B. aegyptiaca* var. *roxburghii* (Planch.) Duthie, Fl. Upper Gang. Pl. 1 : 145. 1903 (Repr. ed. 1 : 136 : 1960). 'Hingota' (Hindi).

Small thorny trees, 3 - 5 m ; bark whitsh. Leaves 2 - foliate ; leaflets up to 5.0×2.5 cm, elliptic to obovate. Flowers in few flowered fascicles, greenish, fragrant ; peduncle and pedicel pubescent. Sepals 5, elliptic - ovate densely pubescent outside, with long silky hairs inside. Petals 5, elliptic-oblong, glabrous outside, with long silky hairs inside. Disc prominent, 10-lobed. Drupes $4.4 - 6.5 \times 1.4 - 5.0$ cm, ellipsoid, ovoid or subspherical, grooved, puberulus, 1 seeded. Seed testa fibrous.

Fl. & Fr. : April - February,

Common ; Tonk R. F.

19. BURSERACEAE

BOSWELLIA Roxb. ex Colebr.

Boswellia serrata Roxb. ex Colebr. in Asiat. Res. 9 : 379. t. 5. 1807 ; Bennett in Hook. f. Fl. Brit. Ind. 1 : 528. 1875 ; Duthie, Fl. Upper Gang. Pl. 1 : 147. 1903 (Repr. ed. 1 : 138. 1960). 'Salar' (Hindi).

Deciduous trees, c. 6 m ; bark pelling off in thin flakes. Leaves up to 30 cm long, pinnate, crowded near the ends of branches ; leaflets opposite or subopposite, up to 5×2 cm, ovate to oblong ovate, oblique at base, rounded, retuse or acute, crenate serrate. Flowers in axillary, pupescent racemes, shorter than the leaves, white with a tinge of pink, slightly fragrant. Drupes $1.25 - 2.75 \times 0.75 - 1.75$ cm, trigonous, dehiscent. Seeds heart-shaped, acuminate at apex, pale yellow.

Fl. & Fr. : February - March.

Common on hills in rocky places ; Toda Rai Singh. R. F.

20. MELIACEAE

AZADIRACHTA A. Juss.

Azadirachta indica A. Juss. in Mem Mus. Hist. Nat. Par. 19 : 221, t. 13. f. 5. 1830 ; Wight, Ic. 1 : t. 17. 1838. *Melia azadirachta* L. Sp. Pl. 385.

1753 ; Hiern in Hook. f. Fl. Brit. Ind. 1 : 544. 1875 ; Duthie, Fl. Upper Gang. Pl. 1 : 150. 1903 (Repr. ed. 1 : 141. 1960) ; Basu, Ind. Med. Pl. t. 218. 1918. 'Neem' (Hindi).

Trees, 8 - 15 m. Leaves up to 25 cm long, pinnate, crowded near the ends of branches ; leaflets alternate to opposite, up to 8×2 cm, ovate-lanceolate, falcate from a very oblique, unilaterally resected, acute base, acuminate, serrate. Flowers in panicles in the topmost leaf axils, white, sweet - scented. Sepals 5. petals 5. Petals 5, puberulus. Anthers 10;staminal tube a little shorter than petals. Stigma 3 - dentate. Drupes 1.4 - 1.8 \times 1.1 - 1.7 cm, oblong, glabrous, yellow when ripe, 1 - seeded. Seeds c. 1 cm long, oblong - ovoid, brown.

Fl. & Fr. : March - July.

Commonly planted along road sides and near villages ; Uniyara along Tonk - Aligarh road.

Seeds yield oil which is used in soap industry.

21. CELASTRACEAE

MAYTENUS Molina

Maytenus emarginatus (Willd.) Ding Hou in Fl. Males. 1. 6 : 241. 1962. *Celastrus emarginatus* Willd. Sp. Pl. 1. 1128. 1798. *Gymnosporia montana*(Roth) Benth. Fl. Austr. 1 : 400 : 1863, *pro comb* ; Lawson in Hook. f. Fl. Brit. Ind. 1 : 621. 1875. *Celastrus montana* Roth in Roem. & Schult. Syst. Veg. 5. 427. 1819. *C. senegalensis* Duthie, Fl. Upper Gang. Pl. 1 : 159. 1903, non Lam. 1785 (Repr. ed. 1 : 149. 1960). *Maytenus senegalensis* auct. non Exell 1952 ; Mahesh. Illus. Fl. Delhi f. 43. 1966. 'Kankara' (Hindi).

Armed or unarmed shrubs or small trees, 2 - 6 m. Leaves up to 5.5×1.8 cm, variable in shape, obovate, oblanceolate or linear - spatulate, cuneate at base, obtuse, emarginate or acute at apex, entire or crenulate. Cymes dichotomous or fasciculate, axillary or borne on spines. Flowers pentamerous, white. Sepals ovate, ciliate. Petals oblong. Stigmas 2. Disc lobed. Ovary 2 - celled. Capsules 2.5 - 60 mm across, subglobose 2 - 1- celled, purple when ripe. Seeds c. 3.5 mm long, ellipsoid, red or chestnut brown; aril fleshy, attached at the base.

Fl. & Fr. : October - May

Common on sandy loam and rocky soil ; Raj mahal, Kachha Bundha (near Tonk) and Tonk R. F.

22. RHAMNACEAE

ZIZIPHUS Miller

- | | | | |
|---|-----|----------------------|---|
| 1a. Bushes ; leaves up to 2.5 cm long ; fruits less than 1 cm long | ... | <i>Z. nummularia</i> | 2 |
| 1b. Trees ; leaves more than 3 cm (up to 8 cm) long ; fruits over 1.2 cm long | ... | <i>Z. mauritiana</i> | 1 |

1. *Ziziphus mauritiana* Lam. Encycl. 3 : 319. 1789 ; Mahesh. Illus. Fl. Delhi f. 44. 1966. *Z. jujuba* Lam. l. c. 3 : 318. 1789, non Mill. 1768 ; Wight, Ic. 1 : t. 99. 1838 ; Lawson in Hook. f. Fl. Brit. Ind. 1 : 632. 1875 ; Duthie, Fl. Upper Gang. Pl. 1 : 163. 1903 (Repr. ed. 1 : 152. 1960). 'Bara Bor, Premji Bor' (Hindi).

Much branched trees, 3-7 m ; prickles solitary or generally paired. Leaves up to 8.0 × 4.5 cm, oblong elliptic, ovate or nearly orbicular, faintly and irregularly dentate, strongly 3-nerved at the base, densely tomentose beneath. Flowers in cymes, greenish pale yellow. Drupes 1.5-3.2 × 1.3-1.5 cm, globose, ellipsoid or oblong, yellow, orange or red when ripe ; stone 1-2 seeded. Seeds plano-convex, orbicular to lanceolate, brown.

Fl. & Fr. : August-March.

Common ; Janakpura Village (Tordi Sagar).

The fruits are edible.

2. *Ziziphus nummularia* (Burm. f.) Wight & Arn. Prodr. 162. 1834 ; Lawson in Hook. f. Fl. Brit. Ind. 1 : 633. 1875 ; Mahesh. Illus. Fl. Delhi f. 45. 1966. *Rhamnus nummularia* Burm. f. Fl. Ind. 61. 1768. *Ziziphus rotundifolia* Lam. Encycl. 3 : 319. 1789 ; Duthie, Fl. Upper Gang. Pl. 1 : 164. 1903 (Repr. ed. 1 : 153. 1960). 'Berī, Jar Berī' (Hindi).

Thorny shrubs or small bushes, 1-3 m ; stipular spines in pairs, slender, one of them much shorter and curved. Leaves up to 2.5 × 2.0 cm, broadly ovate to orbicular, entire or crenulate, 3-nerved at the base, densely tomentose beneath. Flowers in axillary cymes greenish pale yellow. Drupes 7-9 mm across, globose, red when ripe ; stone 1-2 seeded. Seeds c. 4 mm across, subhemispherical, brown.

Fl. & Fr. : July-December.

Abundant ; Kakor forest.

The fruits are edible.

23. VITACEAE

CAYRATIA Juss. *nom. cons.*

Cayratia trifolia (L.) Domin in Biblioth. Bot. 89 : 371. 1927. *Vitis*

trifolia L. Sp. Pl. 203. 1753 ; Duthie, Fl. Upper Gang. Pl. 1 : 174. 1903. (Repr. ed. 1 : 163. 1960). *V. carnososa* Wight & Arn. Prodr. 127. 1834 ; Wight, Ic. 1 : t. 171. 1839 ; Lawson in Hook. f. Fl. Brit. Ind. 1 : 654. 1875. *Cissus carnososa* Lam. Encycl. 1: 31. 1783. *Cayratia carnososa* (Lam.) Gagnep. in Not. Syst. 1 : 347. 1911 ; Mahesh. Illus. Fl. Delhi 46. 1966. 'Amar-Bel' (Hindi).

Fairly large, herbaceous climbers, woody at base only. Leaves digitately trifoliate, rather fleshy ; leaflets 8×6 cm, variable, broadly elliptic to ovate or suborbicular, oblique at the base, crenate serrate. Tendrils branched. Flowers in long - peduncled, divaricate cymes, greenish with conspicuous, white, lobed disc. Berries c. 7×7 mm, obovoid globose, shining black or dark purple, 2 - 4 seeded. Seeds trigonous, the ventral side with two cavities.

Fl. & Fr. : August - November.

Occasionally found on gravelly soil ; Rajmahal R. F.

24. SAPINDACEAE

CARDIOSPERMUM L.

Cardiospermum halicacabum L. Sp. Pl. 366. 1753 ; Wight, Ic. 2 (2) : 8. t. 508. 1841 ; Hiern in Hook. f. Fl. Brit. Ind. 1 : 670. 1875 ; Duthie, Fl. Upper Gang. Pl. 1 : 178. 1903 (Repr. ed. 1 : 166. 1960) ; Mahesh. Illus. Fl. Delhi f. 47. 1966. 'Kapal-Phor' (Hindi).

Slender herbs climbing by means of peduncular, circinate tendrils. Leaves biternate ; leaflets up to 5. 5×2.2 cm, lanceolate, ovate - lanceolate, ovate or elliptic, coarsely toothed. Flowers in axillary cymes, white. Capsules trigonous, inflated, winged at the three angles, veined. Seeds 3, globose, smooth, black with a small, white, cordate aril.

Fl. & Fr. : August - November.

Common ; Sohela R. F.

25. ANACARDIACEAE

LANNEA A. Rich. *nom. cons.*

Lannea coromandelica (Houtt.) Merrill in Journ. Arnold Arb. 19 :

353. 1939. *Dialium coromandelicum* Houtt. Nat. Hist. ser. 2. 2 : 39. t. 5. f. 2. 1774. *Odina wodier* Roxb. Fl. Ind. ed. Carey 2 : 293. 1832 ; Wight, Ic. 1 (3) : t. 60. 1838 ; Hook. f. Fl. Brit Ind. 2. 29. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 188. 1903 (Repr. ed. 1 : 175. 1960). 'Gurjan, Garjan' (Hindi).

Deciduous trees, 5 - 10 m ; bark whitish - grey ; younger leaves and branches stellately pubescent. Leaves oddpinnate ; leaflets 5 - 11, 0.2 - 6.5 × 1.75-3.0 cm, ovate, base rounded or truncate, caudate - acuminate, entire. Flowers crowded in fascicled racemes born at the ends of leafless branches, unisexual, tetramerous. Male racemes compound ; female simple. Drupes c. 1.25 × 0.75 cm, fleshy, pale pink to red. Seeds c. 1.0 × 0.7 cm, compressed, reniform, grey.

Fl. : February - April ; *Fr.* : April - June.

Common on rocky hills ; Ghati R. F. and Sohela R. F.

26. MORINGACEAE

MORINGA Adans.

Moringa concanensis Nimmo ex Dalzell & Gibs. Bomb. Fl. 311. 1861 ; Hook. f. Fl. Brit. Ind. 2 : 45. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 193. 1903 (Repr. ed. 1 : 180. 1960) ; Basu, Ind. Med. Pl. t. 284. 1918. 'Sain - jana' (Hindi).

Trees, 4 - 8 m, Leaves usually bipinnate ; leaflets up to 3.5 × 3.0 cm, broadly elliptic, obovate or suborbicular, obtuse or emarginate. Flowers in lax, thinly pubescent panicles, white with pink streaks, fragrant. Pods 30-45 cm long, linear, acutely 3 - angled, slightly constricted between the seeds. Seeds 3 - angled, with a very thin, hyaline wing at each angle.

Fl. & Fr. : December - March.

Common ; Mayola forest (Bisalpura) on rocky/gravelly soil.

27. FABACEAE

1a. Herbs or shrubs, sometimes climbing :

2a. Leaves even pinnate :

- 3a. Herbs ; leaflets in 1 pair ; stipules peltate ; pods echinate ... *Zornia* 18
- 3b. Climbers ; leaflets in many pairs ; stipules basifixed ; pods not echinate ... *Abrus* 1
- 2b. Leaves odd pinnate, digitately 3 - foliate, unifoliate or simple :
- 4a. Undershubs with axillary spines ... *Alhagi* 2
- 4b. Unarmed :
- 5a. Hairs centrally attached ; anthers apiculate ... *Indigofera* 11
- 5b. Hairs basifixed or none ; anthers muticous :
- 6a. Leaflets dentate :
- 7a. Pods spirally twisted, spinous ... *Medicago* 12
- 7b. Pods globose or ovoid, not spinous ... *Melilotus* 13
- 6b. Leaves and leaflets not dentate :
- 8a. Venation striate ... *Tephrosia* 16
- 8b. Venation reticulate :
- 9a. Leaves simple, unifoliate or digitately or subdigitately 3 - foliate :
- 10a. Seeds strophiolate ... *Atylosia* 4
- 10b. Seeds estrophiolate :
- 11a. Stamens diadelphous ; anthers uniform ; pods jointed ... *Alysicarpus* 3
- 11b. Stamens diadelphous ; anthers dimorphous ; pods not jointed :
- 12a. prostrate herbs ; flowers solitary ; pods flat ... *Goniogyna* 10
- 12b. Erect herbs or under-shrubs ; flowers in racemes ; pods turgid or inflated ... *Crotalaria* 7

- 9b. Leaves pinnately 3 - foliate:
- 13a. Stamens monadelphous ; pods more than 10 x 2 cm, dorsal suture 3 - keeled ... *Canavalia* 6
- 13b. Stamens diadelphous ; pods less than 10 x 2 cm, dorsal suture not 3 - keeled :
- 14a. Pods distinctly jointed ... *Desmodium* 9
- 14b. Pods not jointed :
- 15a. Leaflets gland - dotted beneath ; style not bearded ; ovules and seeds 1 - 2 ... *Rhynchosia* 15
- 15b. Leaflets not gland-dotted beneath ; style bearded along the inner face ; ovules and seeds 3 - many ... *Vigna* 17
- 1b. Trees :
- 16a. Leaves pinnately 3 foliate ; leaflets stipellate ; flowers more than 3 cm long ; fruits silky tomentose ... *Butea* 5
- 16b. Leaves pinnately 3 - 7 foliate ; leaflets exstipellate ; flowers less than 1.5 cm long ; fruits glabrous :
- 17a. Leaflets alternate ; calyx teeth distinct ; pods ligulate ... *Dalbergia* 8
- 17b. Leaflets opposite ; calyx nearly truncate, teeth obsolete ; pods woody ... *Pongamia* 14

1. ABRUS Adans.

Abrus precatorius L. Syst. Nat. ed. 12 : 472. 1767 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 175. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 262. 1903 (Repr. ed. 1 : 241. 1960) ; Mahesh. Illus. Fl. Delhi f. 71, 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 258. 1977 'Ratti, Chirmi' (Hindi).

Perennial climbers. Leaves up to 12 cm long ; rachis bristle - tipped ;

leaflets up to 22×0.8 cm, oblong, obtuse, mucronate. Flowers in dense racemes pink. Pods $2.5 - 5.5 \times 1.0 - 1.5$ cm, oblong, beaked, pubescent, 3 - 5 - seeded. Seeds up to 8×6 mm, ovoid, shining, scarlet with a black spot at the hilum.

Fl. & Fr. : August - September.

Common on gravelly soil ; Toda Rai Singh R. F.

2. ALHAGI Gangnebin

Alhagi maurorum Medic. in Vorles, Chrupf. Phys. Oek. Ges. 2 : 397. 1787 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 145. 1876 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 319. 1977. *Hedysarum alhagi* L. Sp. Pl. 745. 1753. *H. pseudalhagi* M. Bieb. Fl. Taur. - Cauc. 2 : 174. 1808. *Alhagi pseudalhagi* (M. Bieb.) Desv. in Journ. Bot. 120. 1813 ; Mahesh. Illus Fl. Delhi f. 66. 1966. *A. camelorum* Fisch. ex DC. Prodr. 2 : 352. 1825 ; Duthie, Fl. Upper Gang. Pl. 1 : 279. 1903 (Repr. ed. 1 : 257. 1960).

Spiry undershrubs, up to 1 m. Leaves up to $1.1 - 0.8$ cm, obovate or obovate - oblong, entire. Spines axillary, flower - bearing. Flowers red. Pods c. 3 mm long, pinkish red, usually falcate, 1 - 9 - seeded, strongly constricted between the seeds. Seeds c. 2×1 mm, subreniform, smooth, blackish brown.

Fl. & Fr. : February - May.

Very common on river beds and also in fallow fields ; Uniyara village.

3. ALYSICARPUS Desv. *nom. cons.*

- | | | |
|---|-----|---------------------------|
| 1a. Calyx longer than the 2 lowermost joints of the pod;
pods glabrous | ... | <i>A. roxburghianus</i> 2 |
| 1b. Calyx shorter than the 2 lowermost joints of the pod;
pods hairy with hooked hairs : | | |
| 2a. Racemes dense ; pods moniliform, densely
hairy | ... | <i>A. monilifer</i> 1 |
| 2b. Racemes lax ; pods not moniliform, faintly
hairy | ... | <i>A. vaginalis</i> 3 |

1. **Alysicarpus monilifer** (L.) DC. Prodr. 2 : 353. 1825 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 157. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 276. 1903 (Repr. ed. 1 : 254. 1960) ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 345. 1977. *Hedysarum moniliferum* L. Mant. 102. 1767. 'Jhunighas' Hindi).

Prostrate, much branched, perennial herbs ; branches with spreading hairs. Leaves unifoliate ; leaflets up to 2.5×1.8 cm, base rounded, often cordate, apex rounded or retuse, mucronate. Flowers in close, axillary racemes, red. Pods c. 0.5 - 2.3 cm long, distinctly moniliform, turgid, faintly reticulate, 2 - 7 seeded. Seeds smooth, rather shining, brown.

Fl. & Fr. : August - March.

Rare ; Bentheli village (Deoli) on loamy soil.

2. **Alysicarpus roxburghianus** Thoth. & Pramanik in Bull. Bot. Surv. India 21 : 189. 1981. *Hedysarum bupleurifolium* Roxb. Pl. Cor. t. 194. 1805, non L. 1763, nec Roxb. 1832.

Diffuse or ascending herbs, c. 30 cm. Leaves unifoliate; leaflets up to 4.5×0.5 cm ; linear to linear - lanceolate, the lower leaflets sometimes elliptic. Flowers in spike - like lax racemes, arranged in distant pairs, purple. Pods c. 1 cm long, slightly moniliform, 3 - 5 seeded. Seeds smooth, rather shining, yellow.

Fl. & Fr. : August - September.

Rare ; Tordi Sagar in moist places.

3. **Alysicarpus vaginalis** (L.) DC. Prodr. 2 : 353. 1825 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 158. 1876 (excl. vars. *heterophyllus* and *stocksii*) ; Duthie, Fl. Upper Gang. Pl. 1 : 277. 1903 (Repr. ed. 1 : 255. 1960) ; Mahesh Illus. Fl. Delhi f. 69. 1966. *Hedysarum vaginale* L. sp. Pl. 746. 1753. *Alysicarpus vaginalis* var *nummularifolius* Miq. Fl. Ind. Bat. 1 : 232. 1855 ; Baker, *l. c.* Duthie, *l. c.*

Prostrate or erect herbs, 30 - 60 cm, Leaves unifoliate ; leaflets up to 8.0×2.8 cm, very variable, ovate - orbicular to oblong or the upper ones ovate - lanceolate, sub cordate at base, apex obtuse, retuse minutely mucronate. Flowers in axillary or terminal racemes, red. Pods up to 2.5 cm long, joints 4 - 8, longer than broad. seeds smooth, rather shining, pale brown.

Fl. & Fr. : August - November.

Tonk (*Maheshwari* 52868, LWG).

4. ATYLOSIA Wight & Arn.

Atylosia scarabaeoides (L.) Baker in Hook. f. Fl. Brit. Ind. 2 : 215. 1876. Duthie, Fl. Upper Gang. Pl. 1 : 212. 1903 (Repr. ed. 1 : 196. 1960) ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 219. 1977. *Dolichos scarabaeoides* L. Sp. Pl. 726. 1753.

Pubescent, herbaceous climbers or trailing plants. Leaflets up to 3.5 × 2.3 cm ; elliptic or elliptic - obovate. Flowers in axillary, few - flowered racemes, yellow. pods. c. 2.3 cm long, oblong, compressed, apiculate, 3 - 6 seeded, conspicuously grooved between the seeds, densely pubescent. Seeds c. 4.0 × 2.5 mm, oblong, rounded at both ends, blackish brown, with a conspicuous divided strophiole.

Fl. & Fr. : April - June.

Common by the side of streams in rocky habitats on hills ; Gaonri R.F. near Deoli.

5. BUTEA Roxb. ex Willd. *nom. cons.*

Butea monosperma (Lam.) Taub. in Engl. & Prantl, Nat. Pflanzenfam. 3 (3) : 366. 1894 ; Mahesh. Illus. Fl. Delhi f. 74. 1966 ; Ali in Nasir & Ali Fl. W. Pak. No. 100 : 237. 1977. *Erythrina monosperma* Lam. Encycl. 1 : 391. 1785. *Butea frondosa* Koenig ex Roxb. in Asiat. Res. 3 : 369. 1792 ; Bedd. Fl. Sylv. t. 176. 1872 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 194. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 240. 1903 (Repr. ed. 1 : 221. 1960). 'Palas, Dhak' (Hindi).

Small or moderate sized, deciduous trees ; bark pale grey. Terminal leaflets up to 20.0 × 17.5 cm, broadly obovate - rhomboid, obtuse or retuse, margins undulate ; lateral leaflets slightly smaller than the terminal, obliquely ovate. Flowers in racemes fascicled on tubercles of rachis, showy, red or orange red. Calyx brown - velvety outside, grey - silky within. Petals silky hairy outside. Pods c. 12.0 × 4.5 cm, pendulous, stalked within the calyx, dehiscent at apex, 1 seeded. Seeds c. 3.0 × 2.5 cm, subreniform, flat pale brown.

Fl. & Fr. : February - April.

Fairly common ; Rajmahal hills and Sohela R. F.

6. CANAVALIA DC. *nom. cons.*

Canavalia virosa (Roxb.) Wight & Arn. Prodr. 1 : 253. 1834 ; Duthie, Fl. Upper Gang. Pl. 1 : 235. 1903 (Repr. ed. 1 : 217. 1960) ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 233. 1977. *Dolichos virosus* Roxb. Fl. Ind. ed. Carey 3 : 301. 1832, excl. syn. *C. ensiformis* var. *virosa* (Roxb.) Baker in Hook. f. Fl. Brit. Ind. 2 : 196. 1876. 'Bara Sem, Sem' (Hindi).

Large, perennial climbers. Leaflets up to 13×10 cm, ovate, cuneate, acuminate. Flowers in many - flowered, lax, axillary racemes on long peduncles, mauve or dark pink. Pods c. 13×3 cm, linear - oblong, flat shortly pointed at apex, dorsal suture 3 keeled, densely ferruginous pubescent at first, later more obscurely so. Seeds c. 1.9×1.1 cm, oblong - ellipsoid, yellowish - brown, marbled with black.

Fl. & Fr. : August - March.

Common ; Toda Rai Singh R. F.

7. CROTALARIA L.

- | | | |
|---|-----|-------------------------|
| 1a. Leaves trifoliate | ... | <i>C. medicaginea</i> 2 |
| 1b. Leaves simple : | | |
| 2a. Leaves small, inconspicuous, deciduous, exstipulate ;
pods scarcely longer than calyx, pubescent, 1 - 2
(-4) - seeded | ... | <i>C. burhia</i> 1 |
| 2b. Leaves large and distinct, persistent, stipulate ; pods
longer than calyx, glabrous, many seeded | ... | <i>C. mysorensis</i> 3 |

1. **Crotalaria burhia** Buch. Ham. ex Benth. in Hook. Lond. Journ. Bot. 2 : 474. 1843 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 66. 1876 ; Duthie, Fl. Upper Gang Pl. 1 : 202. 1903 (Repr. ed. 1 : 186. 1960) ; Mahesh. Illus. Fl. Delhi f. 50. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 45. 1977. 'Khim, Sineo' (Hindi).

Low, rigid, copiously stiffly branched, xerophytic undershrubs, up to 1 m, with appressed pubescence. Leaves up to 2.4×0.5 cm, oblong or lanceolate. Flowers in elongate, terminal racemes, yellow ; standard with reddish veins. Pods c. 5×4 mm, oblong, villous. Seeds obliquely semi-lunar, notched at the hilum, shining.

Fl. & Fr. : August - April.

Abundant in wastelands on sandy soil ; Niwai.

2. *Crotalaria medicaginea* Lam. Encycl. 2 : 201. 1786 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 81. 1876, incl. vars. ; Duthie, Fl. Upper Gang. Pl. 1 : 207. 1903, incl. vars. (Repr. ed. 1 : 190. 1960) ; Munk in Reinwardtia 6 : 208. 1962 ; Mahesh. Illus. Fl. Delhi f. 49. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 41. f. 3. A E. 1977. incl. var. '*Jhejhru*' (Hindi).

Perennial, appressed pubescent herbs, branching from a woody root-stalk. Leaflets up to 3.2×1.0 cm, obovate or oblanceolate, rounded, truncate or emarginate at the apex. Flowers in terminal or leaf - opposed racemes, yellow. Pods 4 - 5 mm across, obliquely subglobose, acutely beaked, pubescent, 2 seeded. Seeds suborbicular, notched at the hilum, shining.

Fl. & Fr. : August - December.

Common on gravelly sandy loam soil ; Kacha Bundha near Tonk.

3. *Corotalaria mysorensis* Roth, Nov. Pl. Sp. 338. 1821 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 70. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 204. 1903 (Repr. ed. 1 : 188. 1960) ; Munk in Reinwardtia 6 : 210. 1962 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 47. 1977. '*Jute*' (Hindi).

Suffruticose herbs, c. 50 cm, clothed with long, spreading, silky hairs. Stipules linear - lanceolate. Leaves up to 8×2 cm, linear - oblong, obtuse. Flowers in lax racemes, light yellow ; bracts foliaceous, linear - lanceolate ; bracteoles beneath the calyx, linear - lanceolate ; standard with brown or red veins. Pods c. 2.0×1.2 cm, oblong, inflated, reticulately veined. Seeds 20 - 30, obliquely semi - lunar, notched at the hilum.

Fl. & Fr. : August - September.

Common ; Sohela R. F.

8. DALBERGIA L. f. *nom. cons.*

Dalbergia sissoo Roxb. Fl. Ind. ed. Carey 3 : 223. 1832 ; Bedd. Fl. Sylv. t. 25. 1869 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 231. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 264. 1903 (Repr. ed 1 : 243. 1960) ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 56. 1977. '*Talli, Shisham*' (Hindi).

Trees, 5 - 15 m. Leaf rachis zigzag ; leaflets 3 - 5, up to 7.0×5.5 cm, broadly oval or obovate, abruptly acuminate. Flowers in axillary panicles, yellowish - white. Pods $3.5 - 8.0 \times 0.7 - 1.2$ cm, 1 - 3 seeded. Seeds reniform, flattened.

Fl. & Fr. : March - November.

Common ; Kachha Bundha R. F. near Tonk.

9. DESMODIUM Desv. *nom. cons.*

Desmodium neomexicanum A. Gray, Pl. Wright, 1 : 53. 1852 ; Chavan

et al. in Kew Bull. 17 : 265. 1963 ; Mahesh. & Sharma in Bull. Bot. Surv. Ind. 11 : 455. 1972 ; Raizada, Suppl. Fl. Upper Gang. Pl. 51. 1976.

Erect or straggling, hairy herbs, 30 - 40 cm. Leaves stipulate, pedice - late, the terminal largest, up to 6.0×2.75 cm, ovate to ovate - lanceolate, mucronate, margins ciliate. Racemes terminal and axillary, lax. Flowers bracteate, pink. Pods 2.0 - 2.5 cm long, 2 - 4 - jointed with sutures deeply indented, reticulately veined, hairy, margins ciliate, 2 - 4-seeded.

Fl. & Fr. : August - November.

Common on hills ; Rajmahal R. F. (Deoli).

10. GONIOGYNA DC.

Goniogyna hirta (Willd.) Ali in Taxon 16 : 463. 1967 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 39. 1977. *Hallia hirta* Willd. Sp. Pl. 3 (2) : 1169. 1803. *Heylandia latebrosa* auct. non (L.) DC. 1825 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 65. 1876; Duthie, Fl. Upper Gang. Pl. 1 : 200. 1903 (Repr. ed. 1 : 185. 1960). 'Gorkh Buti' (Hindi).

Prostrate, much branched, pilose herbs. Leaves simple, sessile, up to 2.2×1.0 cm, cordate - ovate, unequal at base, entire. Flowers in the axils of most of the leaves, solitary, yellow ; standard with purple veins. Pods c. 0.5 cm long, oblong ovoid, pilose, 1 - 2 - seeded. Seeds suborbicular reniform, brown.

Fl. & Fr. : September - November.

Common on road sides ; Sakrampur. Also found by the side of tank near Gar village on sandy clayey soil.

11. INDIGOFERA L.

1a. Leaves simple :

2a. Leaves ovate, base cordate ; pods terete, oblong,
generally 2 - , rarely 1 - seeded ... *I. cordifolia* 1

2b. Leaves linear ; pods subglobose, 1 - seeded ... *I. linifolia* 3

Ib. Leaves 3 to many - foliate :

- | | | |
|--|-----|-----------------------|
| 3a. Leaves trifoliate ; pods tetragonal | ... | <i>I. trita</i> 6 |
| 3b. Leaflets more than 3 per leaf ; pods oblong, cylindric
or obscurely 4 - angled : | | |
| 4a. Racemes subcapitate ; pods usually 2, rarely
1 - seeded | ... | <i>I. linnaei</i> 4 |
| 4b. Racemes elongate ; pods many - seeded : | | |
| 5a. Leaflets 7 - 13 ; racemes many - flowered ; pods
deflexed, slightly curved, hairy | ... | <i>I. tinctoria</i> 5 |
| 5b. Leaflets 5 - 7 ; racemes up to 4 - flowered ; pods
patent, straight, glabrous | ... | <i>I. glabra</i> 2 |

1. **Indigofera cordifolia** Heyne ex Roth, Nov. Pl. Sp. 357. 1821; Baker in Hook. f. Fl. Brit. Ind. 2 : 93. 1876; Duthie, Fl. Upper Gang. Pl. 1 : 250. 1903 (Repr. ed. 1 : 230. 1960) ; Ali in Bot. Not. III : 545. 1958 & in Nasir & Ali, Fl. W. Pak. No. 100 : 69. f. 12 A G. 1977. 'Bekario' (Hindi).

Decumbent, obliquely erect or erect, usually much branched, white hairy herbs. Leaves subsessile, up to 2.5×1.5 cm, obtuse, mucronate. Flowers in small, nearly sessile heads, red. Pods c. 4.5 mm long, beaked, densely appressed hairy, inner side of the pericarp with yellow spots. Seeds granular, pitted, yellow.

Fl. & Fr. : August - November.

Common weed found almost throughout the district.

2. **Indigofera glabra** L. Sp. Pl. 751. 1753 ; Ali in Bot. Not. III: 572. 1958 ; Duthie, Fl. Upper Gang. Pl. 1 : 251. 1903 (Repr. ed. 1 : 231. 1960). *I. pentaphylla* Murr. Syst. Veg. ed. 13. 564. 1774 ; Wight, Ic. 2 (1) : 7. t. 385. 1840 ; Baker in Hook. f. Fl. Brit. India 2 : 95. 1976.

Suffruticose, decumbent, sparsely appressed hairy herbs, 30 - 100 cm ; branches pigmented red. Stipules lanceolate. Leaflets up to 1.8×1.4 cm, obovate to elliptic, obtuse or retuse, mucronate. Flowers distant in axillary,

distinctly peduncled racemes, red. Pods 1.2 - 2.7 cm long, obscurely 4-angled, beaked, brown, 10 - 12 - seeded. Seeds cubical, brown.

Fl & Fr. : August - October.

Rare ; found on sandy loam soil near Banetha village (Tonk).

3. *Indigofera linifolia* (L. f.) Retz. Obs. 4 : 29. 1786 ; Wight, Ic. 1 : t. 313. 1840 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 92. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 249. 1903 (Repr. ed. 1 : 229. 1960) ; Ali in Bot. Not. III: 546. 1958 & in Nasir & Ali, Fl. W. Pak. No. 100 : 69. f. 9 H M, O. 1977 ; Mahesh. Illus. Fl. Delhi f. 54. 1966. *Hedysarum linifolium* L. f. Suppl. 331. 1781. 'Sankh - Buti' Hindi).

Decumbent, obliquely erect or erect, appressed white hairy herbs, usually much branched from the base. Leaves up to 4.5 × 0.3 cm, acuminate. Flowers in dense, shortly peduncled, up to 12 - flowered, short, axillary racemes, red. Pods c. 2 mm long, apiculate, densely appressed hairy. Seeds subglobose, uniformly minutely granular, grey.

Fl & Fr. : August - November.

Rare ; found on low sand dunes in Tordi R. F.

4. *Indigofera linnaei* Ali in Bot. Not. 111 : 549. 1958 & in Nasir & Ali, Fl. W. Pak. No. 100 : 75. 1977 ; Mahesh. Illus. Fl. Delhi f. 56. 1966. *I. enneaphylla* L. Mant. 2 : 272. 571. 1771, *nom. superfl* ; Wight, Ic. 2 (1) : 8. t. 403. 1840 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 94. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 250. 1903 (Repr. ed. 1 : 230. 1960). 'Leel, Bekario' (Hindi).

Prostrate, appressed white hairy herbs. Leaflets usually 7 - 9, alternate, up to 1.3 × 0.5 cm, obovate, obtuse to retuse. Flowers bright red. Pods c. 5 mm long, terete, oblong, beaked, appressed hairy. Seeds ovoid globose, truncate at one end, shining, brown.

Fl. & Fr. : Almost throughout the year.

Common on sandy to sandy - loam soil ; Haji Ki - Kothi (Niwai) and Amla R. F.

5. *Indigofera tinctoria* L. Sp. Pl. 751. 1753 ; Wight, Ic. 2 (1) : 5. t. 365.

1840 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 99. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 254. 1903 (Repr. ed. 1: 235. 1960) ; Ali in Bot. Not. 111 : 567. 1958 & in Nasir & Ali : Fl. W. Pak. No. 100 : 82. f. 10 A F. 1977. 'Neel' (Hindi).

Appressed white hairy undershrubs, 1.0 - 1.5 m. Leaflets opposite, up to 2.3×1.0 cm, ovate, oblong or obovate, obtuse or retuse, mucronate. Flowers greenish pale red. Pods 2.5 - 3.5 cm long, linear pointed, thickened at the sutures, 8 - 12 seeded. Seeds subcylindric, truncate at both ends, pale green to brown.

Fl. & Fr. : August - March.

Common on river bed ; Vijayapura, Deoli.

6. *Indigofera trita* L. f. Suppl. 335. 1781 ; Wight, Ic. 1 : t. 315. 1840 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 96. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 252. 1903 (Repr. ed. 1 : 232. 1960) ; Ali in Bot. Not. 111 : 553. 1958 & in Nasir & Ali, Fl. W. Pak. No. 100 : 78. 1977 ; Mahesh. Illus. Fl. Delhi f. 58. 1966.

Undershrubs, c. 1 m, with fine appressed hairs. Leaflets up to 4×3 cm, obovate-oblong, obtuse or retuse, mucronate. Flowers in spicate racemes, red. Pods c. 2.5 cm long, patent, sometimes deflexed, appressed pubescent, shortly beaked, 6- 10 seeded. Seeds oblong, brown.

Fl. & Fr. : September - February.

Common in wastelands ; tank at Suntheli village.

12. *MEDICAGO* L.

Medicago polymorpha L. Sp. Pl. 779. 1753 *emend.* Shin. in Rhodora 58 : 5. 1956 ; Mahesh. Illus. Fl. Delhi f. 51. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 302. 1977. *M. denticulata* Willd. Sp. Pl. 3 : 1414. 1802 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 90. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 211. 1903 (Repr. ed. 1 : 194. 1960). 'Chandausi' (Hindi).

Procumbent or ascending herbs branching from the base. Stipules lacinate. Leaves trifoliate ; leaflets up to 2.0×1.5 cm. obovate cuneate, obtuse, truncate or retuse at the apex, dentate at the upper third. Flowers in few-

flowered, dense racemes, yellow. Pods *c.* 6 mm across, discoid, or subglobose, of 2-4 spirals, face reticulately veined, margined with a double row of hooked spines. Seeds reniform, smooth, yellow or brown.

Fl. & Fr. : January - March.

Common winter season weed in cultivated fields ; Barni village.

13. MELILOTUS Mill.

- | | | |
|---|-----|-------------------|
| 1a. Flowers white ; seeds smooth | ... | <i>M alba</i> 1 |
| 1b. Flowers yellow ; seeds finely verrucose | ... | <i>M indica</i> 2 |

1. *Melilotus alba* Medik. Desr. in Lam. Encycl. 4 : 63. 1797 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 89. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 208. 1903 (Repr. ed. 1 : 192. 1960) ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 308. 1977. 'Khandai' (Hindi).

Erect, annual herbs, 15-100 cm. Stipules linear-subulate. Leaves 3-foliolate ; leaflets up to 3.0 × 1.5 cm, those of lower leaves obovate, leaflets of upper leaves often narrowly elliptic. Flowers 3.5-4.5 mm long, in many flowered, slender racemes, white. Pods *c.* 4 mm long, somewhat compressed, ovoid or ellipsoid, with a short, sharp, curved beak at the apex, reticulately veined. Seeds 1-2, ovoid.

Fl. & Fr. : December-March.

Not common ; winter season weed in fields Banas river bed near Benthali village.

2. *Melilotus indica* (L.) All. Fl. Pedem. 1 : 308. 1785 ; Duthie, Fl. Upper Gang. Pl. 1 : 208. 1903 (Repr. ed. 1 : 191. 1960) ; Mahesh. IISUL. Fl. Delhi f. 53. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 308. 1977. *Trifolium (M.) indica* L. Sp. Pl. 765. 1753. *M. Parviflorus* Desf. Fl. Atlant. 2: 192. 1799 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 89. 1876 ("parviflora"). 'Methi' (Hindi).

Erect, annual herbs, 5-75 cm. Stipules lanceolate, broadened at base. Leaves 3-foliolate ; leaflets 3 × 2 cm, obovate or oblong-obovate, obtuse or retuse. Flowers *c.* 2.5 mm long, in many-flowered, slender

racemes, yellow. Pods *c.* 3 mm long, minutely apiculate, reticulately veined. Seed 1, ovoid.

Fl. & Fr. : December-March.

Common winter season weed in fields ; Banas river bed near Bentheli village.

14. PONGAMIA Vent. *nom. cons.*

Pongamia pinnata (L.) Pierre, Fl. For. Cochinch. Sub. t. 385. 1899; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 55. 1977. *Cytisus pinnatus* L. Sp. Pl. 741. 1753. *Galedupa indica* Lam. Encycl. 2 : 594. 1788. *Pongamia glabra* Vent. Jard. Malm. 1 : 28. t. 28. 1803 ; Wight, Ic. 1: t. 59. 1838 ; Bedd. Fl. Sylv. t. 177. 1872 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 240. 1876; Duthie, Fl. Upper Gang. Pl. 1 : 267. 1903 (Repr. ed. 1 : 246. 1960). *Derris indica* (Lam.) Bennet in Journ. Bombay Nat. Hist. Soc. 68 : 303. 1971. 'Papari' (Hindi).

Trees, about 10 m ; bark grey or whitish grey. Leaves imparipinnate ; leaflets 3 - 7, up to 13.0×10.5 cm, ovate, elliptic or elliptic oblong, shortly acuminate. Flowers in axillary racemes, pinkish white. Pods 3.2 - 5.5×1.1 - 2.0 cm, obliquely oblong, compressed, narrowed at the base, beaked, indehiscent, 1-seeded. Seeds 1.9 - 2.4×1.1 - 1.4 cm, oblong, reddish - brown.

Fl. : April - May ; *Fr.* : Throughout the year.

Very common on the banks of Banas river ; Bisalpur.

15. RHYNCHOSIA Lour. *nom. cons.*

1a. Glabrescent herbs ; racemes lax ; flowers *c.* 6 mm ; pods oblong - falcate ; seeds estrophiolate

R. minima var.
laxiflora 2

1b. Pilose herbs ; racemes subcapitate ; flowers *c.* 12 mm ; pods suborbicular ; seeds strophiolate

R. capitata 1

1. **Rhynchosia capitata** (Heyne ex Roth) DC. Prodr. 2 : 386. 1825 ;

Duthie, Fl. Upper Gang. Pl. 1 : 222. 1903 (Repr. ed. 1 : 204. 1960) ; Mahesh. Illus. Fl. Delhi f. 77. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 227, f. 31 A C, E I. 1977. *Glycine capitata* Heyne ex Roth, Nov. Sp. 346. 1821. *Rhynchosia aurea* sensu Baker in Hook. f. Fl. Brit. Ind. 2 : 221. 1876, *pro parte, non DC.* 1825. *Nomisia capitata* (Heyne ex Roth) Wight & Arn. Prodr. 237. 1834 ; Wight, Ic. 1: t. 295. 1840. 'Papro' (Hindi).

Trailing, pilose herbs. Leaflets up to 4.7×4.7 cm, rhomboid - ovate or rhomboid - obovate. minutely pale yellow gland - dotted beneath. Flowers in axillary racemes, yellow, turning brown when old. Calyx teeth linear-subulate, 3 4 times as long as the tube. Pods 10 12 mm long, slightly compressed, mucronate, with close transverse wrinkles on the faces, clothed with long spreading hairs, 2 seeded. Seeds c. 6.0×3.5 mm, oblong, compressed, rounded at the ends, blackish.

Fl. & Fr. : August October.

Common weed in fallow fields ; Rajmahal.

2. *Rhynchosia minima* (L.) DC. Prodr. 2 : 385. 1825. var. *laxiflora* (Camb.) Baker in Hook. f. Fl. Brit. Ind. 2 : 223. 1876 ; Raizada, Suppl. Fl. Upper Gang. Pl. 58. 1976. *R. laxiflora* Camb. in Jacquem. Voy. Inde 44, t. 54. 1841.

Climbing or trailing herbs. Leaflets up to 5.5×5.5 cm, the upper and lower halves subdeltoid, acute, minutely yellow gland - dotted beneath. Flowers in axillary racemes, usually longer than leaves, yellow ; standard with red streaks. Calyx teeth about twice as long as the tube. Pods c. 1.8×0.5 cm, usually 2 rarely 1 seeded. Seeds c. 4.5×3.5 mm, oblong-reniform, brown or blackish, mottled.

Fl. & Fr. : July November.

Common on gravelly soil ; Rajmahal R.F. (Deoli).

16. TEPHROSIA Pers. *nom. cons.*

1a. Leaves simple ; flowers axillary, solitary or two together ;
seeds discoid ...

T. strigosa 2

- 1b. Leaves pinnately compound ; flowers in leaf - opposed, lax racemes ; seeds subcylindric ... *T. purpurea* 1

1. *Tephrosia purpurea* (L.) Pers. Syn. Pl. 2 : 329. 1807 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 112. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 245. 1903 (Repr. ed 1 : 225. 1960) ; Mahesh. Illus. Fl. Delhi f. 63 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 63. 1977. *Cracca purpurea* L. Sp. Pl. 752. 1753. 'Sarphanki' (Hindi).

Appressed - hairy undershrubs, 20 - 60 cm. Leaves imparipinnate ; leaflets 5 - 15, up to 3.5 × 1.5 cm, elliptic - oblong, oblanceolate or obovate, obtuse or retuse, mucronate. Flowers in leaf - opposed, lax racemes, bright pink or purplish - red. Pods 3 - 6 cm long, linear, slightly upcurved, mucronate, appressed - pubescent, 9 - 6 - seeded. Seeds subcylindric, smooth, dark brown.

Fl. & Fr. : July - February.

Common by the side of tanks ; Tordi Sagar.

2. *Tephrosia strigosa* (Dalzell) Santapau & Mahesh. in Journ. Bombay Nat. Hist. Soc. 54 : 805. 1957 ; Mahesh. Illus. Fl. Delhi f. 61. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 100 : 59. 1977. *Macronyx strigosus* Dalzell in Hook. Journ. Bot. 2. 35 : 1850. *Tephrosia tenuis* Wall. ex Dalzell & Gibs. Bombay Fl. 61, 1861 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 111. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 244. 1903 (Repr. ed. 1 : 225. 1960). 'Jhino-Biyonio' (Hindi).

Erect, much branched, appressed - hairy annuals, 20 - 40 cm ; stem and branches filiform. Leaves alternate, petiolate or sessile, up to 7.5 × 0.8 cm, linear to linear - oblong, tapering at both the ends, apiculate, entire. Flowers on long, filiform pedicels, pale pink or violet. Pods c. 3.0 × 0.3 cm, linear - oblong, often slightly falcate upwardly, beaked, clothed with appressed hairs, 5 - 9 (-10) - seeded. Seeds c. 2. mm across, discoid, glabrous, brown, mottled with black.

Fl. & Fr. : August - November.

Common in wastelands ; Tonk (*Maheshwari*, 53221, LWG).

17. VIGNA Savi

Vigna trilobata (L.) Verdc. in Taxon 17 : 172. 1968 ; Ali in Nasir &

Ali, Fl. W. Pak. No. 100 : 244. f. 32 A E, M. 1977. *Dolichos trilobata* L. Mant. 1 : 101. 1767. *Phaseolus trilobus* non (L.) Ait. ; Wight, Ic. 1 : t. 94. 1838 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 201. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 224. 1903 (Repr. ed. 1 : 207. 1960) ; Mahesh. Illus. Fl. Delhi f. 75. 1966. 'Chawla' (Hindi).

Diffuse or trailing, more or less hairy herbs. Stipules ovate to ovate-lanceolate, peltate. Leaflets up to 5×5 cm, usually 3 lobed, the middle lobe spathulate. Flowers in few flowered, subcapitate racemes born on long peduncles, yellow. Pods 2.2 4.0 cm long, subcylindric, septate between the seeds. Seeds c. 3 mm long, subcylindric, truncate at ends, papillose, brown, mottled.

Fl. & Fr. : July November.

Common on sandy loam soil ; Sohela R.F.

81 ZORNIA Gmel.

Zornia gibbosa Span. in Linnaea 15 : 192. 1841 ; Mohlenbrock in Webbia 16 : 112. f. 44 & 76. 1961 ; Mahesh. Illus. Fl. Delhi f. 64. 1966 ; Ali in Nasir and Ali, Fl. W. Pak. No. 100 : 356. f. 7. C - J. 1977. *Z. diphylla* auct. non Pers. 1807 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 147. 1876 ; Duthie, Fl. Upper Gang. Pl. 1 : 268. 1903 (Repr. ed. 1 : 247. 1960).

Prostrate, decumbent or suberect annuals. Stipules produced below their insertion, lanceolate, punctate. Leaflets up to 4.0×1.2 cm, lanceolate to ovate lanceolate, acute, punctate beneath. Flowers in lax racemes, yellow. Bracts foliaceous, produced below their insertion, elliptic ovate, punctate, margins ciliate. Pods 0.5 1.8 cm long, 1 6 joined, with retrorsely hairy bristles. Seeds c. 2.0×1.2 mm, rather shining, pale yellow or brown.

Fl. & Fr. : August September.

Tonk (*Maheshwari* 52948, LWG).

28. CAESALPINIACEAE

- 1a. Laveses simple, 2 - lobed at the apex ; calyx spathaceous, splitting to the base down one side only ..

Bauhinia 1

1b. Leaves pinnate ; calyx deeply divided

Cassia 2

1. BAUHINIA L.

Bauhinia racemosa Lam. Encycl. 1 : 390. 1785 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 276. 1878 ; Bedd. Fl. Sylv. t. 182. 1872 ; Duthie, Fl. Upper Gang. Pl. 1 : 298. 1903 (Repr. ed. 1 : 274. 1960) ; Basu, Ind. Med. Pl. t. 363. 1918 ; de Wit in Reinwardtia 3 : 537. 1956 ; Ali in Nasir & Ali, Fl. W. Pak. No. 54 : 4. 1973. '*Jhinjha*' (Hindi).

Deciduous trees, 3 - 5 m ; bark dark grey, rough. Leaves up to 5.5 × 7.5 cm, broader than long, usually cordate at base, grey pubescent beneath. Flowers in terminal, leaf - opposed racemes, creamish - white, buds asymetrically fusiform, pointed. Stamens 10, all perfect. Pods 7 - 20 × 1.5 - 2.5 cm, turgid, torulose, falcate, indehiscent, c. 15 seeded. Seeds c. 6 × 4 mm, oval, black.

Fl. & Fr. : April - September.

Fairly common on gravelly soil ; Amlia R.F. (Aligarh) and Ghati R.F.

2. CASSIA L.

1a. Herbs, undershrubs or shrubs, foliar glands present:

2a. Plants viscid ; leaflets in 2 pairs ... *C. absus* 1

2b. Plants not viscid ; leaflets in 3 or more pairs :

3a. Leaflets in 3 pairs ; pods subtetragonal when ripe :

4a. Glands present between each of the two lowest pairs of leaflets ; all the 7 anthers rounded at the apex ; areoles on both sides of the seed broad, 1.5 - 2.0 mm wide, extending up to the hilum ... *C. tora* 7

4b. Gland present between the lowest pair of leaflets ; the 3 large anthers narrowed into a neck ; areoles on both sides of the seed narrow, linear, up to 0.5 mm wide, never extending up to the hilum ... *C. obtusifolia* 4

- 3b. Leaflets in more than 3 pairs ; pods flat when ripe :
- 5a. Herbs ; stipules small ; lanceolate ; calyx segments acuminate ; stamens 5 fertile... *C. pumila* 5
- 5b. Shrubs ; stipules foliaceous ; broadly reniform ; calyx segments obtuse ; stamens 10, the 3 upper reduced to staminodes ... *C. auriculata* 2
- 1b. Trees ; foliar glands on petiole or rachis absent :
- 6a. Flowers in long, pendulous racemes ; stamens 10, all fertile ; pods cylindrical ... *C. fistula* 3
- 6b. Flowers in stiff panicle of corymbs ; fertile stamens 7, 3 upper stamens much reduced ; pods flat with thickened sutures ... *C. siamea* 6

1. **Cassia absus** L. Sp. Pl. 376. 1753 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 265. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 294. 1903 (Repr. ed. 1 : 271, 1960) ; Basu, Ind. Med. Pl. t. 357. 1918 ; de Wit in Webbia 11 : 279, 1955 ; Ali in Nasir and Ali, Fl. W. Pak. No. 54 : 20 t. 2 A, B. 1973 ; Singh in Bull. Bot. Surv. India 18 : 91. 1979. 'Chaksu' (Hindi).

Viscous glandular - hairy herbs or undershrubs, up to 60 cm, widely branching. Leaves 5-10 cm long ; leaflets up to 5.0×2.5 cm, obliquely elliptic to obovate, obtuse, mucronate. Flowers in terminal or leaf-opposed racemes, red. Stamens 5, fertile. Pods 3.5-4.5×0.6-0.7 cm, short beaked, with oblique depressions between the seeds, hairy. Seeds up to 8, each c. 4.0×2.5 mm, obovate, glossy, brown.

Fl. & Fr. : August - September.

Tonk (*Maheshwari* 52914, LWG).

2. **Cassia auriculata** L. Sp. Pl. 379. 1753 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 263. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 294. 1903 (Repr. ed. 1 : 270. 1960) ; de Wit in Webbia 11 : 234. 1955 ; Ali in Nasir and Ali, Fl. W. Pak. No. 54 : 27, 1973 ; Singh in Bull. Bot. Surv. India 18 : 92. 1979. 'Awal, Tarwar' (Hindi).

Finely pubescent shrubs, 1-2 m. Leaves 2.5-10.0 cm long ; rachis with a linear gland between each pair of leaflets ; leaflets 5-12 pairs, up to

3.0×1.3 cm, oval or oblong obovate, obtuse or emarginate, apiculate. Flowers in corymbose racemes, large, showy, yellow. Petals long - clawed. Pods 7.0 - 12.5×1.4 - 1.8 cm, flat, oblong, mucronate, deeply impressed and septate between the seeds. Seeds 10 - 20, each c. 7×5 mm, oblong-ovate, blackish brown ; areole c. 3×1 mm.

Fl. & Fr. : August - November.

Abundant on sandy loam soil ; Toda Rai Singh R.F.

3. *Cassia fistula* L. Sp. Pl. 377. 1753 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 261. 1878 ; Duthie, Fl. Upper Gang. Pl 1 : 291. 1903 (Repr. ed. 1 : 268. 1960) ; de Wit in Webbia 11 : 207. 1955 ; Ali in Nasir & Ali, Fl. W. Pak. No. 54 : 12. 1973 ; Singh in Bull. Bot. Surv. India 18 : 97. 1979. *C. rhombifolia* Roxb. Fl. Ind. ed. Carey 2 : 335. 1832 ; Wight, Ic. 1 : t. 269. 1840. 'Amaltas, Kirala' (Hindi).

Deciduous trees, 5 - 8 m. Leaves 15 - 40 cm long ; leaflets 4 - 8 pairs, up to 16.0×7.5 cm, ovate to oblong ovate. Flowers showy, bright yellow. Pods 20 60×1.5 2.5 cm, transversely septate, dark brown. Seeds numerous, embedded in the sweetish pulp, c. 10×8 mm, obovate, shining, brown.

Fl. & Fr. : May February.

Common in forests in rocky habitats ; Toda Rai Singh.

4. *Casia obtusifolia* L. Sp. Pl. 377. 1753 ; Duthie, Fl. Upper Gang. Pl. 1 : 293. 1903 (Repr. ed. 1 : 270. 1960) ; de Wit in Webbia 11 : 254 1955 ; Brenan in Kew Bull. 13 : 248. 1958 ; Ali in Nasir & Ali, Fl. W. Pak. No. 54 : 17. t. 4 A - C. 1973 ; Singh in Bull. Bot. Surv. India 18 : 95. 1979. *C. tora* sensu Baker in Hook. f. Fl. Brit. Ind. 2 : 263. 1878, *pro parte* (non L. 1753).

Tall herbs or undershrubs, c. 1 m. Leaves 5 8 cm long ; leaflets up to 3.5×2.1 cm, obovate, rounded or abruptly narrowed above to a usually mucronate apex. Flowers 1 2, yellow. Sepals ciliate. Pods 8 - 15×0.4 - 0.5 cm, obliquely septate within. Seeds many, each 5×3 mm, rhomboidal, slightly muricate, shining, dark brown with greenish areoles.

Fl. & Fr. : August November.

Common on gravelly soil ; Mayola forest (Bisalpura R.F.).

C. obtusifolia has been very generally confused with *C. tora* L. Bentham in Trans. Linn. Soc. Lond. 27 : 335. 1871 reduced the former to the synonymy of *C. tora* and this has been followed by many subsequent workers, including Baker (*l.c.*). Prain in J. Asiat. Soc. Bengal 66 (2) : 347 - 518. 1897 considered *C. obtusifolia* and *C. tora* as distinct species, the former being characterised in having a gland between the lowest pair of leaflets and the latter in having glands between each of the two lowest pair of leaflets. This character, however, has been observed not to hold good in all cases since *C. obtusifolia* also sometimes has glands between each of the two lowest pair of leaflets.

C. obtusifolia, however, differs from *C. tora* in the 3 large anthers being narrowed shortly below their apex like the neck of a bottle, and in the seeds having narrow, linear areoles, which do not extend up to the hilum.

5. *Cassia pumila* Lam. Encycl. 1 : 651. 1785 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 266. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 295. 1903 (Repr. ed. 1 : 271. 1960) ; de Wit in Webbia 11 : 288. 1955 ; Ali in Nasir & Ali, Fl. W. Pak. No. 54 : 20. 1973 ; Singh in Bull. Bot. Surv. India 18 : 87. 1979.

Prostrate or sometimes erect, hairy herbs, up to 50 cm, Leaves 2.5 - 8.0 cm long with a peltate, stipitate gland on the petiole below the leaflets, glands between the leaflets early deciduous ; leaflets 6 - 30 pairs, subsessile, up to 18.0 × 3.5 mm, linear - oblong with the midrib close to the upper margin, apex rounded with a long mucro. Flowers usually solitary, sometimes 2 - 3 together, yellow. Pods 2.0 - 4.5 × 0.35 - 0.5 cm, flattened, torulose, with oblique partitions between the seeds, pubescent. Seeds up to 12, each c. 3.5 × 2.0 mm, subrhomboidal or obliquely ovate, brown or blackish-brown.

Fl. & Fr. : August - September,

Common on gravelly soil ; Rajmahal R.F. (Deoli).

6. *Cassia siamea* Lam. Encycl. 1 : 648. 1785 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 264. 1878 ; de Wit in Webbia 11 : 263. 1955 ; Ali in Nasir & Ali, Fl. W. Pak. No. 54 : 25. t. 7 A G. 1973 ; Raizada, Suppl. Fl. Upper Gang. Pl. 63. 1976 ; Singh in Bull. Bot. Surv. India 18 : 98. 1979.

Trees, 4 - 8 m. Leaves 10 - 30 cm long ; leaflets 5 - 12 pairs, up to - 5.5 × 2.2 cm, oval oblong, mostly emarginate and mucronate. Flowers yellow. Sepals downy, obtuse. Pods 15 30 × 1.2 - 1.6 cm, strap shaped, indented between the seeds. Seeds c. 6 mm across, suborbicular or oblong, flat, shining, blackish dark brown.

Fl. & Fr. : August May.

Rare ; Lava village, along Malpura Tonk road.

7. *Cassia tora* L. Sp. Pl. 376. 1753 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 263. 1878, *pro parte* ; de Wit in Webbia 11 : 276. 1955 ; Brenan in Kew Bull. 13. 248. 1958 ; Ali in Nasir & Ali, Fl. W. Pak. No. 54 : 19. 1973 ; Singh in Bull. Bot. Surv. India 18 : 94. 1979. '*Pawad*' (Hindi).

Tall, foetid herbs or undershrubs, c. 1 m. Leaves 5 17 cm long; leaflets up to 6.5 × 3.5 cm, obovate, rounded or abruptly narrowed above to a usually mucronate apex. Flowers 5 - 6, yellow. Pods 5 - 25 × 0.4 - 0.5 cm, obliquely septate within. Seeds many, each c. 5 × 3 mm, rhomboidal, shining, dark brown with greenish areoles.

Fl. & Fr. : August November.

Rare ; Mayola forest (Bisalpura R.F.) on gravelly soil.

29. MIMOSACEAE

1a. Stamens definite, as many as or twice as many as petals :

2a. Flowers in heads :

3a. Plants without prickles ; flowers 5 - merous ; fruits not prickly, straight, dehiscing at the sutures :

4a. Herbs, leaflets sensitive ; heads, c. 5 mm in diam.; anthers gland-crested ...

Neptunia 6

4b. Shrubs or trees, leaflets not sensitive ; heads 1.5 - 2.2 cm in diam. ; anthers not gland crested ...

Leucaena 4

3b. Plants prickly ; flowers 4 - merous (in our specimens) ; fruits prickly, curved, with

segmented valves and indehiscent sutures ...	<i>Mimosa</i> 5
2b. Flowers in spikes or spike - like racems :	
5a. All flowers of spike - like racemes bisexual ; fruit straight or curved but not twisted ...	<i>Prosopis</i> 7
5b. Upper flowers of spikes bisexual, the lower neuter ; fruits twisted - tortuous ...	<i>Dichrostachys</i> 3
1b. Stamens indefinite, more than 10 :	
6a. Plants armed with spines or prickles ; leaflets less than 1 cm long ; stamens free ...	<i>Acacia</i> 1
6b. Plants unarmed ; leaflets more than 2.5 cm long ; stamens monadelphous ...	<i>Albizia</i> 2

1. ACACIA Mill.

1a. Spines long, straight ; flowers in globose heads :	
2a. Heads axillary, in fascicles of 2 - 8 ; pods distinctly stalked, moniliform with regular narrow constrictions between the seeds ...	<i>A. nilotica ssp. indica</i> 3
2b. Heads in terminal panicles, numerous ; pods sessile, sutures not indented ...	<i>A. leucophloea</i> 2
1b. Prickles short, hooked like rose thorns ; flowers in elongate, cylindric spikes :	
3a. Prickles 3 at each node ; pinnae 3 - 7 pairs ; leaflets up to 20 pairs ...	<i>A. senegal</i> 4
3b. Prickles in pairs at each node ; pinnae 10 pairs or more ; leaflets usually more than 20 pairs ...	<i>A. catechu</i> 1

1. *Acacia catechu* (L. f.) Willd. Sp. Pl. 4 : 1079. 1806 ; Bedd. Fl. Sylv. t. 49. 1870 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 295. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 316. 1903 (Repr. ed. 1 : 290. 1960) ; Mahesh. Illus. Fl. Delhi f. 83. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 36 : 5. 1973. *Mimosa catechu* L. f. Suppl. 439. 1781. 'Khair, Katha' (Hindi).

Trees, 3 - 6 m ; bark dark grey ; young branchlets pubescent. Prickles brown or grey. Leaves up to 17 cm long, 2 - pinnate with a large gland

above the middle of the petiole and several glands between the pinnae ; pinnae 10 - 30 pairs ; leaflets 20 - 50 pairs, subsessile, linear - oblong, subacute. Flowers pale yellow, mildly fragrant. Pods 5.0 - 8.5 × 1.2 - 1.5 cm, flat with a triangular beak at the apex, shining, brown.

Fl. & Fr. : May - September.

Very common ; on hills in rocky habitats ; Toda Rai Singh, also found at Kachha Bundha (Tonk) and Aamli R.F.

Differs from the closely allied *A. chundra* (Roxb.) Willd. (= *A. catechu* Willd. var. *sundra* Prain) by its pubescent leaf, calyx and corolla.

2. *Acacia leucophloea* (Roxb.) Willd. Sp. Pl. 4 : 1083. 1806 ; Bedd. Fl. Sylv. t. 48. 1870 ; Brandis, Illus. Forest Fl. N.W. India t. 27. 1874 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 294. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 315. 1903 (Repr. ed. 1 : 290. 1960) ; Mahesh. Illus. Fl. Delhi f. 80. 1966 ; Ali in Nasir and Ali, Fl. W. Pak. No. 36 : 9. t. 2. 1973. *Mimosa leucophloea* Roxb. Pl. Cor. 2. 27. t. 150. 1800. '*Safed Kikar, Karir*, (Hindi).

Trees, 3 - 7 m ; bark whitish - grey ; young branchlets pubescent. Stipular spines in pairs, 1.0 - 3.5 cm long, black or brown, less often whitish, pubescent at least when young. Leaves up to 8 cm long, 2 pinnate, glands on the rachis cup - shaped ; pinnae 5 - 12 pairs ; leaflets 10 - 30 pairs, subsessile, up to 8.0 × 1.5 mm, linear - oblong, obtuse. Flowers creamy - yellow, mildly fragrant. Pods 6 - 15 × 0.6 - 0.8 cm, narrowly ligulate, usually falcate, brown tomentose. Seeds 6 - 12, each c. 6 × 4 mm, ovate or rhomboid ovate, blackish brown.

Fl. & Fr. : September - March.

Common on sandy loam soil ; Siras forest, Kachha Bundha R.F. (Tonk) and Aunwa forest.

3. *Acacia nilotica* (L.) Willd ex Delile Fl. Aegypt. Ill. 79. 1813 subsp. *indica* (Benth.) Brenan in Kew Bull. 12 : 84. 1957 ; Ali in Nasir & Ali, Fl. W. Pak. No. 36 : 11. 1973. *A. arabica* (Lam.) Willd. var. *indica* Benth. in Hook Lond. Journ. Bot. 1 : 500. 1842. *A. arabica* auct. non (Lam.) Willd. 1808 ; Bedd. Fl. Sylv. t. 47 1870 ; Baker in Hook. f. Fl. Brit.

Ind. 2 : 293. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 314. 1903 (Repr. ed. 1 : 288. 1960) ; Basu, Ind. Med. Pl. t. 375. 1918. '*Babul, Kikar*' (Hindi).

Trees, 3 - 15 m ; bark dark grey ; young branchlets pubescent. Stipular spines in pairs, 1 - 5 cm long, white. Leaves up to 10 cm long, 2 pinnate with glands on the petiole and between the pinnae, especially the upper ones ; pinnae 2 - 7 pairs ; leaflets 10 - 25 pairs, subsessile, up to 6.5 × 1.5 mm, linear oblong, obtuse. Flowers bright yellow. Pods 10 - 20 × 1.2 - 1.5 cm, necklace - like, whitish or grey - pubescent. Seeds up to 16, each c. 8 × 7 mm, oval or subcircular, compressed, blackish - brown.

Fl. & Fr. : September - March.

Common on sandy loam soil ; Tonk R.F. and Kachha Bundha R.F. (Tonk).

4. *Acacia senegal* (L.) Willd. Sp. Pl. 4 : 1077. 1806 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 295. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 317. 1903 (Repr. ed. 1 : 291. 1960) ; Basu, Ind. Med. Pl. t. 379. 1918 ; Ali in Nasir & Ali, Fl. W. Pak. No. 36 : 6. t. 1 D - F. 1973. '*Kumatiya, Kumbat*' (Hindi).

Trees, 3 - 6 m ; bark whitish, whitish grey or pale brown ; young branchlets pubescent, soon glabrescent. Prickles dark brown, the central hooked downwards. Leaves up to 7 cm long, 2 pinnate, rachis with one gland at the base and one between the uppermost pair of pinnae ; leaflets 6 - 20 pairs, subsessile, up to 6.0 × 2.5 mm, linear to elliptic - oblong, obtuse. Flowers white or cream, fragrant. Pods 4 - 10 × 1.6 - 2.4 cm, oblong, flat, venose, rounded or with a small beak at the apex, sparsely pubescent, pale brown. Seeds 4 - 6, each c. 7 mm across, subcircular, disc like, dark brown.

Fl. & Fr. : July - January.

Common in plantation at Tordi R.F. (Malpura).

2. ALBIZIA Durazz.

Albizia lebbek (L.) Benth. in Hook. Lond. Journ. Bot. 3 : 87. 1844 ; Bedd. Fl. Sylv. t. 53. 1870 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 298. 1878 ;

Duthie, Fl. Upper Gang. Pl. 1 : 320. 1903 (Repr. ed. 1 : 295. 1960); Basu, Ind. Med. Pl. t. 383. 1918; Ali in Nasir & Ali, Fl. W. Pak. No. 53 : 23. f. 5 D - E. 1973. *Mimosa lebbeck* L. Sp. Pl. 516. 1753. 'Saras, Siras' (Hindi).

Deciduous trees, 5 - 15 m ; bark greyish pale brown. Leaves up to 40 cm long, 2 - pinnate, with a large gland on the petiole ; pinnae 1 - 4 pairs, usually with glands between the upper pair of pinnae ; leaflets 4 - 10 pairs, up to 5.2×2.5 cm, the lateral leaflets elliptic oblong, the terminal obovate-oblong, unequal sided, obtuse. Flowers in peduncled, umbellate heads, greenish pale yellow, very fragrant. Stamens c. 4 cm long ; anthers greenish. Pods 12 - 30×3 - 5 cm, straw coloured. Seeds up to 12, each c. 10.0×7.5 mm, ellipsoid - oblong to subcircular, flattened, pale brown.

Fl. : March - August ; *Fr.* : August - February.

Common in forests and also planted as avenue tree ; Tordi R.F., and on road sides along Niwai - Tonk road near Pahari village.

3. *DICHRSTACHYS* (DC.) Wight & Arn. *nom. cons.*

Dichrostachys cinerea (L.) Wight & Arn. Prodr. 271. 1834 ; Wight, Ic. 2 (1) : 4. t. 357. 1840 ; Bedd. Fl. Sylv. t. 185. 1872 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 288. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 310. 1903 (Repr. ed. 1 : 285. 1960) ; Ali in Nasir & Ali, Fl. W. Pak. No. 36 : 37. 1973. *Mimosa cinerea* L. Sp. Pl. 520. 1753. 'Kunlai' (Hindi).

Shrubs or small trees, 2 - 4 m ; bark grey ; branchlets usually ending in spines, pubescent. Leaves up to 6 cm long, 2 - pinnate with stipiform glands at the insertion of pinnae ; pinnae ; 4 - 12 pairs ; leaflets 12 - 24 pairs, up to 3×1 mm, linear from an oblique base, subacute, ciliate on the margins. Flowers numerous, sessile, in downwardly directed, stalked spikes, fragrant, the upper half with fertile flowers yellow, the lower half with neuter flowers pink or sometimes white. Pods 5 - 7×0.6 - 0.9 cm, compressed, pubescent, dark brown. Seeds c. 4.5×3.5 mm, ovoid or suborbicular, compressed, shining, pale brown.

Fl. & Fr. : May - February.

Common in forests on rocky and sandy - loam soil ; Tonk R.F., Toda Rai Singh Forest and Banetha.

4. LEUCAENA Benth.

Leucaena latisiliqua (L.) Gillis in Taxon 23 : 190. 1974. *Mimosa latisiliqua* L. Sp. Pl. 1 : 519. 1763. *M. glauca* L. Sp. Pl. ed. 2. 2 : 1504. 1763, non *M. glauca* L. Sp. Pl. 1 : 520. 1753. *M. leucocephala* Lam. Encycl. 1 : 12. 1783. *Leucaena glauca* (L.) Benth. in Hook. Journ. Bot. 4 : 416. 1842 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 290. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 310. 1903 (Repr. ed. 1 : 286. 1903) ; Wealth of India 6 : 77 f. 34. 1962. *L. leucocephala* (Lam.) de Wit in Taxon 10 : 54. 1961 ; Ali in Nasir and Ali, Fl. W. Pak. No. 36 : f. 8 G. H. 1973. '*Lamba Bavalia*' (Hindi).

Large shrubs or small evergreen trees, 2 - 6 m ; young branches densely greyish pubescent. Leaves up to 25 cm long, 2 - pinnate, main rachis ending in a soft bristle ; pinnae 3 - 8 pairs ; leaflets 7 - 20 pairs, sessile, up to 14 × 3 mm, linear lanceolate, asymmetrical, acute and mucronate. Flowers cream. Stamens 10, anthers with scattered long hairs. Pods 10 - 16 × 1.3 - 1.8 cm, brown, flat, minutely pilose. Seeds 15 - 25 each c. 7.5 × 4.5 mm, oval-ovovate, shining, dark brown.

Fl. & Fr. : September - February.

Rare ; near Niwai Temple in marshy areas.

Native of tropical America.

5. MIMOSA L.

Mimosa hamata Willd. Sp. Pl. 4 : 1033. 1806 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 291. 1878 ; Duthie. Fl. Upper Gang. Pl. 1 : 312. 1903 (Repr. ed. 1 : 287. 1960) ; Mahesh. Illus. Fl. Delhi f. 79. 1966 ; Ali in Nasir & Ali, Fl. W. Pak. No. 36 : 27. f. 8 C - F. 1973. '*Mundi*' (Hindi)

Much branched, prickly, pubescent shrubs, 0.5 - 2.0 m. Leaves up to 4 cm long, 2 - pinnate ; pinnae 3 - 6 pairs ; leaflets 6 - 10 pairs, up to 6 × 2 mm, ovate oblong, mucronate. Flowers in solitary or rarely paired, axillary, globose heads, pink. Stamens 8. Pods 2.5 - 9.0 × 0.7 × 1.3 cm, flat, falcate, pubescent, up to 8 - jointed ; sutures wavy, prickly. Seeds c. 6 × 5 mm, broadly ovoid to suborbicular, flattened, muricate, dark brown.

Fl. & Fr. : July October.

Very common ; Gaunri village near Rajmahal R.F. (Deoli).

6. NEPTUNIA LOUR.

Neptunia triquetra (Vahl) Benth. in Hook. Journ. Bot 4 : 355. 1842 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 286. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 307. 1903 (Repr. ed. 1 : 282. 1960). *Mimosa triquetra* Vahl, Symb. Bot. 3 : 102. 1797. *Desmanthus triquetrus* Willd. Sp. Pl. 4 : 1045. 1806 ; Wight, Ic. 3 (1) : 3. t. 756. 1844.

Low, diffuse, perennial herbs. Leaves up to 5 cm long, 2 pinnate ; pinnae 1-3 pairs ; leaflets 10-15 pairs, sessile, up to 7.5×2.0 mm, linear-oblong, obtuse, ciliate on the margins. Flowers yellow ; peduncle with 1 or 2, large bracts. Pods 1.0-2.5×0.6-0.8 cm, oblong, rounded with a small beak at the apex, venulose. Seed 2-8, each c. 4.0×3.5 mm, oval to subcircular, compressed, polished, blackish-brown.

Fl. & Fr. : September October.

Found in marshy places ; Kakor village near Tonk.

7. PROSOPIS L.

- | | |
|--|-----------------------|
| 1a. Internodes with prickles ; ovary and petals
glabrous ; pods subcylindric ... | <i>P. cineraria</i> 1 |
| 1b. Internodes without prickles ; ovary and petals
within villous ; pods compressed ... | <i>P- juliflora</i> 2 |

1. **Prosopis cineraria** (L.) Druce in Rep. Bot. Soc. Exch. Club Brit. Isles 3 : 422. 1914 ; Ali in Nasir & Ali, Fl. W. Pak. No. 53 : 29. f. 7. 1973 ; Burkart in Journ. Arn. Arb. 57 : 450. 1976. *Mimosa cineraria* L. Sp. Pl. ed. 2. 1500. 1763. *Prosopis spicigera* L. Mant. 68. 1767 ; Bedd. Fl. Sylv. t. 56. 1870 ; Brandis, Illus. Fl. N. W. India t. 25. 1874 ; Baker in Hook. f. Fl. Brit. Ind. 2 : 288. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 309. 1903 (Repr. ed. 1 : 284. 1960). 'Khejri' (Hindi).

Trees, 3-12 m; bark grey, rough with deep fissures or cracks. Leaves up to 12 cm long, 2-pinnate; pinnae usually 2 pairs; leaflets 7-12 pairs, up to 15 × 5 mm, obliquely oblong, usually obtuse and mucronate. Flowers yellow. Stamens 10; anthers tipped with deciduous glands. Pods 8-20 × 0.5-0.7 cm, pendulous, slender, torulose, pointed at the apex, pale yellow. Seeds 10-15, each c. 6 × 5 mm, oblong to subcircular dull brown.

Fl. & Fr. : March - June.

Common throughout the district on sandy loam soil.

2. *Prosopis juliflora* (Swartz.) DC. Prodr. 2 : 447. 1825; Duthie, Fl. Upper Gang. Pl. 1 : 309. 1903 (Repr. ed. 1 : 285. 1960); Mahesh. Illus. Fl. Delhi f. 78. 1966; Ali in Nasir & Ali, Fl. W. Pak. No. 36 : 31. 1973; Burkart in Journ. Arn. Arb. 57 : 499. 1976. *Mimosa juliflora* Swartz. Prodr. 85. 1788. '*Bilayati-Babul, Kikar*' (Hindi).

Large shrubs or a small trees, 2-5 m, generally armed with divergent, paired or solitary, axillary spines 0.5-4.0 cm long. Leaves up to 15 cm long, 2-pinnate; pinnae 1-2 (-3) pairs; main rachis ending in a soft bristle; leaflets 15-25 pairs, up to 17 × 4 mm, obliquely oblong, obtuse, sometimes mucronate. Flowers greenish yellow. Stamens 10; anthers tipped with deciduous glands. Pods 12-25 × 7-13 cm, pendulous, subfalcate, yellow. Seeds 10-25 each c. 6 × 4 mm, ovoid to ellipsoid, glossy, brown.

Fl. & Fr. : Almost throughout the year.

Common; Tonk R.F.

It is a native of tropical and subtropical America.

30. ROSACEAE

POTENTILLA L.

***Potentilla supina* L.** Sp. Pl. 497. 1753; Hook. f. Fl. Brit. Ind. 2 : 359. 1878; Duthie, Fl. Upper Gang. Pl. 1 : 327. 1903 (Repr. ed. 1 : 301. 1960); Basu, Ind. Med. Pl. t. 395 A. 1918. '*Dudi*' (Hindi).

Ascending or prostrate, densely hairy annuals. Leaves pinnate; leaflets 3-9, up to 2.5 × 1.3 cm, obovate, oblong or cuneate, incise-dentate.

Flowers solitary, axillary. Epicalyx segments oblong elliptic. Sepals triangular ovate. Petals yellow, shorter than the calyx. Achenes many, minute, subreniform, brown.

Fl. & Fr. : November - March.

Common in moist places by the side of tanks ; Banetha and Gar village.

31. VAHLIACEAE

VAHLIA Thunb. *nom. cons.*

Vahlia digyna (Retz.) Kuntze, Revis. Gen. Pl. 227. 1891. *Oldenlandia digyna* Retz. Obs. 4 : 23. 1786. *Vahlia viscosa* Roxb. Fl. Ind. ed. Carey 2 : 89 : 1832 ; Wight, Ic. 2 (3) : 5. t. 563. 1842 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 399. 1878 ; Duthie ; Fl. Upper Gang. Pl. 1 : 331. 1903 (Repr. ed. 1 : 305. 1960). *Bistella digyna* (Retz.) Bullock in Acta Bot. Neerl. 15 : 85. 1966 ; Siddiqui in Nasir & Ali, Fl. W. Pak. No. 10 : 1. f. 1. 1971.

Erect or diffuse, glandular - pubescent annuals, up to 35 cm. Leaves subsessile, up to 3.5 × 0.8 cm, oblong lanceolate to ovate. Flowers 1 - 2 in most of the upper axils of leaves, yellow or pale yellow. Calyx glandular-pubescent, tube hemispheric, entirely adherent to the ovary ; lobes 5, triangular - ovate. Petals 5, shorter than the calyx lobes. Stamens 5. Ovary inferior ; styles 2. Capsules c. 3 mm in diam., subglobose, dehiscent at the apex. Seeds many, minute, ovoid cylindrical, straw coloured.

Fl. & Fr. : October - February.

Common in marshy places ; forest near Banas river in Sopari village.

32. COMBRETACEAE

- | | | |
|---|-----|---------------------|
| 1a. Flowers in globose heads ; fruits less than 1 cm long,
subquadrate, beaked | ... | <i>Anogeissus</i> 1 |
| 1b. Flowers in spikes ; fruits more than 2 cm long, subglobose,
not beaked | ... | <i>Terminalia</i> 2 |

1. ANOGEISSUS (DC.) Guillem., Perr. & Rich.

Anogeissus pendula Edgew. in Journ. Asiat. Soc. Bengal 21 : 171. 1853 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 451. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 339. 1903 (Repr. ed. 1 : 312. 1960) ; Mahesh. Illus. Fl. Delhi f. 84. 1966. '*Dhak, Dhaklo*' (Hindi).

Trees, 4 - 10 m, with pendulous branches ; bark grey. Leaves up to 3.5×2.0 cm, elliptic or obovate, base narrowed, apex obtuse or acute, usually mucronate. Flowers greenish yellow. Petals 0. Stamens 10, biseriate. Fruits packed in dense heads, c. 5 mm long and broad excluding the beak which is about half as long as the nucleus, 2 winged, brown, upper portion of nucleus and beak hairy. Seed ovoid or ellipsoid.

Fl. & Fr. : July - November.

Common ; Kachha Bundha near Tonk.

2. TERMINALIA L. *nom. cons.*

Terminalia bellirica (Gaertn.) Roxb. Pl. Cor. 2. 54. t. 198. 1805 ('*bellerica*') ; Bedd. Fl. Sylv. t. 19. 1869 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 445. 1878 ; Duthie, Fl. Upper Gang. Pl. 1 : 335. 1903 (Repr. ed. 1 : 308. 1960) ; Basu, Ind. Med. Pl. t. 412 B. 1918. *Myrobalanus bellirica* Gaertn. Fruct. Sem. Pl. 2 : 90. t. 97, f. a d. 1790 ('*bellirina*'). '*Bahera*' (Hindi).

Deciduous trees, 10 - 20 m ; bark ashy - grey. Leaves up to 18.5 - 15.0 cm crowded at the ends of branchlets, broadly elliptic or obovate - elliptic, base narrowed, often unequal ; petioles 3 - 9 cm long. Spikes axillary with male flowers towards the apex and female towards the base. Flowers sessile, greenish - yellow, foetid. Petals 0. Stamens 10, biseriate. Fruits 2.5-3.5×2.2-2.5 cm, subglobose, very finely pubescent. Seed *l. c.* 2.4×1.8 cm, oblong-ovoid, hard, ribbed, pale yellow.

Fl. & Fr. : May - November.

Rare ; near Mataji temple at Rajmahal R.F. by the side of Banas river ; planted.

33. MYRTACEAE

SYZYGIUM Gaertn. *nom. cons.*

Syzygium cumini (L.) Skeels in U.S.D.A. Bur. Pl. Industr. Bull. 248 : 2. 1912. *Myrtus cumini* L. Sp. Pl. 471. 1753. *Eugenia jambolana* Lam. Encycl. 3 : 198. 1789 ; Wight, Ic. 2 (3) : 2. t. 535. 1842 ; Bedd. Fl. Sylv. t. 197. 1872 ; Duthie, in Hook. f. Fl. Brit. Ind. 2 : 499. 1879 & Fl. Upper Gang. Pl. 1 : 342. 1903 (Repr. ed. 1 : 314. 1960). 'Jamun' (Hindi).

Trees, 8 - 10 m ; bark light grey. Leaves up to 11×5 cm, broadly ovate elliptic, elliptic oblong or lanceolate, tapering at base, pellucid dotted, main lateral nerves numerous. Flowers many, small, in cymes arranged in panicles which arise from the scars of fallen leaves, greenish-white. Calyx truncate or obscurely lobed, broader than long, turbinate. Petals 4, orbicular, calyptrate. Stamens numerous. Berries ovoid or oblong, dark purple, 1 seeded.

Fl. & Fr. : May - July.

Common ; by the side of the dam, Chand Sen Bundha (Diggi) and near Niwai temple.

Fruits are edible.

34. LYTHRACEAE

- | | | |
|--|-----|-------------------|
| 1a. Paludose herbs ; inflorescence of short cymes ; petals when present not wrinkled, caducous | ... | <i>Ammannia</i> 1 |
| 1b. Shrubs, not paludose ; inflorescence of large, paniced cymes ; petals wrinkled, not caducous | ... | <i>Lawsonia</i> 2 |

I. AMMANNIA L.

- | | | |
|--|-----|------------------------|
| 1a. Leaves attenuate or rounded at base ; cymes <u>+</u> sessile, dense ; hypanthium not ribbed ; style 0 - 0.5 mm long... | | <i>A. baccifera</i> 1 |
| 1b. Leaves subauriculate at base ; cymes pedunculate, lax ; hypanthium 8 - ribbed ; style c. 1 mm long | ... | <i>A. multiflora</i> 2 |

1. *Ammannia baccifera* L. Sp. Pl. 120. 1753 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 569. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 350. 1903 (Repr. ed. 1 : 321. 1960) ; Basu, Ind. Med. Pl. t. 430. 1918 ; Dar in Nasir & Ali, Fl. W. Pak. No. 78 : 9. f. 2 E, F. 1975 'Jar-Bangro' (Hindi).

Erect or suberect, glabrous herbs, 5 - 50 cm ; branches angular. Leaves up to 5×1 cm, linear - oblong, oblong lanceolate or obovate, obtuse or acute. Flowers sessile or subsessile in condensed, axillary clusters. Petals 0. Stamens 4. Capsules *c.* 1.5 mm in diam., depressed globose, red. Seeds numerous, minute, sub hemispheric, excavated on the plane face, brown.

Fl. & Fr. : October February.

Common in marshy places ; near Niwai temple and elsewhere.

2. *Ammannia multiflora* Roxb. Fl. Ind. ed. Carey & Wall. 1 : 447. 1820 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 570. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 351 1903 (Repr. ed. 1 : 322. 1960) ; Dar in Nasir & Ali, Fl. W. Pak. No. 78 : 9 f. 2 C, D. 1975.

Erect, glabrous herbs ; stem 4 gonous or almost 4 - winged. Leaves upto 1.5×0.3 cm, linear oblong or elliptic - oblong. Flowers pedicelled, in axillary, pedunculate, 3 - many - flowered, often compound cymes. Petals 4, obovate, violet, caducous. Stamens 4. Capsules *c.* 1.5 mm in diam., globose, red. Seeds numerous, minute, 1/2 obovoid, excavated on the plane face, brown to reddish brown.

Fl. & Fr. : September - October.

Common in marshy places ; Kakor.

2. LAWSONIA L.

Lawsonia inermis L. Sp. Pl. 349. 1753 ; Dar in Nasir & Ali, Fl. W. Pak. No. 78 : 5. f. 1 A - C. 1975. *L. alba* Lam. Encycl. 3 : 106. 1789 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 573. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 352. 1903 (Repr. ed. 1 : 323. 1960) ; Basu, Ind. Med. Pl. t. 432 A. 1918. 'Mehndi' (Hindi).

Glabrous, much branched shrubs, *c.* 2 m. Leaves up to 4.0×1.6 cm, usually elliptic, narrowed into a short petiole. Flowers creamish, fragrant. Petals 4, very shortly clawed, suborbicular or subreniform. Stamens 8. Capsules *c.* 6 mm in diam., globose or depressed globose, veined, dark brown. Seeds many, pyramidal, brown.

Fl. & Fr. : May November.

Commonly planted along hedges ; Aligarh.

35. ONAGRACEAE

LUDWIGIA L.

Ludwigia perennis L. Sp. Pl. 1 : 119. 1753 ; Raven in Reinwardtia 6 : 367. 1963 ; Mahesh. Illus. Fl. Delhi f. 85. 1966. *L. parviflora* Roxb. Fl. Ind. ed. Carry & Wall. 1 : 440. 1820 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 588. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 356. 1903 (Repr. ed. 1 : 327. 1960).

Paludose, subglabrous annuals, 15 - 30 cm. Leaves up to 7.5 × 1.2 cm, narrowly elliptic or linear lanceolate, narrowly cuneate at base. Flowers small, solitary, axillary, 4 - merous, yellow. Pollen shed in tetrads. Capsules c. 1 cm long, thin - walled, narrowed below, pale brown. Seeds pluriseriate in each locule of the capsule, more or less ellipsoid, brown with fine brown lines.

Fl. & Fr. : August September.

Common in marshy places ; Kakor village.

36. CUCURBITACEAE

- | | |
|--|----------------------------|
| 1a. Petiole base with a conspicuous, stipuliform bract fringed on the margin with long, filiform cilia : | |
| 2a. Anther thecae straight ; seeds 2, one side concave and the other convex | ... <i>Blastania</i> 1 |
| 2b. Anther - thecae inverted U - shaped ; seeds 6 - 14, faces flat | ... <i>Dactyliandra</i> 2 |
| 1b. Petiole base without a stipuliform bract : | |
| 3a. Petals fimbriate on the margins | ... <i>Trichosanthes</i> 5 |
| 3b. Petals not fimbriate : | |
| 4a. Peduncle of male flower with spathaceous bract ; anther - cells flexuose ; fruits with soft, blunt spines or protuberances | ... <i>Momordica</i> 4 |

- 4b. Peduncle of male flower without spatheaceous bract ; anther - cells straight ; fruits without spines or protuberances ...

Melothria 3

1. BLASTANIA Kotschy & Peyr.

Blastania garcinii (Burm. f.) Cogn. in DC. Monog. Phan. 3 : 629. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 379. 1903 (Repr. ed. 1 : 348. 1960); Mahesh. Illus. Fl. Delhi f. 87. 1966 ; Chakravarty, Fl. India Fasc. 11 : 13. 1982. *Sicyos garcinii* Burm. f. Fl. Ind. 211. 1768. *Ctenolepis garcinii* (Burm. f.) Naud. in Ann. Sc. Nat. ser. 5. 6 : 13. 1867 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 629. 1879.

Monoecious, slender climbers. Tendrils simple. Leaves up to 5×5 cm, scabrid punctate with white tuberculate dots, palmately 5 lobed almost to the base, lobes constricted at the base, margins denticulate. Stipuliform bracts suborbicular. Flowers pale yellowish white. Fruits 4 - 6×7 - 10 mm, hammer - shaped. Seeds c. 9.0×4.5 mm, oblong - obovate, base slightly attenuate, dark brown.

Fl. & Fr. : October - November.

Rare ; Kachha Bundha R.F. near Tonk on sandy loam soil.

2. DACTYLIANDRA (Hook. f.) Hook. f.

Dactyliandra welwitschii Hook. f. in Oliver, Fl. Trop. Afr. 2 : 557. 1871 ; Bhandari & Dalbir Singh in Kew Bull. 19 : 133. f. 1 & 2, 1 - 4. 1964 ; Mahesh. & Sharma in Bull. Bot. Surv. India 11 : 455. 1972. Chakravarty, Fl. India Fasc. 11 : 46. 1982. '*Ankh Phootani Ki-Bel*' (Hindi).

Monoecious climbers. Tendrils simple. Leaves up to 8×8 cm, scabrid punctate with white tuberculate dots, palmately (3-) 5 lobed, margins denticulate. Stipuliform bracts nearly orbicular. Flowers white, greenish - white or greenish cream. Fruits 1.0 - 1.3 cm in diam., subglobose. Seeds c. 7×3 mm, compressed, basal end notched, narrowly winged or margined near the base, rugose, light brown.

Fl. & Fr. : August - October.

Tonk (*Maheshwari* 52926, LWG).

3. MELOTHRIA L.

Melothria maderaspatana (L.) Cogn. in DC. Mong. Phan. 3 : 623. 1881; Duthie, Fl. Upper Gang. Pl. 1 : 379. 1903 (Repr. ed. 1 : 347. 1960); Mahesh. Illus. Fl. Delhi f. 86. 1966; Chakravarty, Fl. India Fasc. 11 : 83. 1982. *Cucumis maderaspatana* L. Sp. Pl. 1012. 1753. *Bryonia scabrella* L. f. Suppl. 424. 1781; Wight, Ic. 2 (2) : 7. t. 501. 1841. *Mukia scabrella* (L. f.) Arn. in Hook. Journ. Bot. 3 : 276. 1841; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 623. 1879 excl. syn. '*Ankh Phod Ki Bel*' (Hindi).

Monoecious, roughly bristly hairy climbers or trailing plants. Tendrils simple. Leaves up to 8×8 cm, ovate or subdeltoid, unlobed or 3 5 lobed, cordate at the base with a wide sinus, acute or acuminate, denticulate. Flowers yellow; male flowers fascicled on short peduncles; female flowers solitary or in clusters, subsessile. Fruits c. 6 mm across, globose, at first green and variegated with white, red when ripe. Seeds c. 4.5×3.0 mm, ovate, bordered, scrobiculate.

Fl. & Fr. : August November.

Common; Shoela R.F. on sandy loam soil and Banthali (Deoli).

4. MOMORDICA L.

Momordica dioica Roxb. ex Willd. Sp. Pl. 4 : 605. 1805; Wight, Ic. 2 (2) : 7. t. 505, 506. 1841; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 617. 1879, excl. syn; Duthie, Fl. Upper Gang. Pl. 1 : 370. 1903 (Repr. ed. 1 : 339. 1960); Basu, Ind. Med. Pl. t, 453. 1918; Chakravarty, Fl. India Fasc. 11 : 94. 1982. '*Kankera, Jangli Karela*' (Hindi).

Climbers with tuberous roots. Tendrils simple. Leaves up to 8.5×7.5 cm, ovate. 3 5 lobed or unlobed, base cordate. Flowers solitary, yellow. Fruits c. 3×2 cm, ovoid, rostrate at apex, orange - coloured. Seeds many, c. 7×5 mm, broadly ovoid, pale brown.

Fl. & Fr. : August September.

Common on sandy soil; on the way to Banthali (Deoli) at Vijayapura.

5. TRICHOSANTHES L.

Trichosanthes bracteata (Lam.) Voigt. Hort. Suburb. Calc. 58. 1845; Chakravarty, Fl. India Fase. 11 : 109. 1982. *Modecca bracteata* Lam. Encycl. 4 : 210. 1797. *Trichosanthes palmata* Roxb. Fl. Ind. ed. Carey 3: 704. 1832 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 606. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 363. 1903 (Repr. ed. 1 : 332. 1960) ; Basu, Ind. Med. Pl. t. 442 B. 1918, '*Lal Indrayan*' (Hindi).

Large climbers. Tendrils 2 - 3 - cleft. Leaves up to 13×12 cm, broadly ovate, unlobed or 3 - 5 - lobed, cordate at base, denticulate, scabrid. Flowers white ; racemed flowers with obovate, laciniate bracts ; solitary flowers ebracteate or minutely bracteate. Fruits c. 5 cm in diam., ovoid, red when ripe. Seeds many, each c. 1.2×0.6 cm, oblong obovate.

Fl. & Fr. : August September.

Rare ; Toda Rai Singh R.F. in rocky habitats.

37. CACTACEAE

OPUNTIA Mill.

Opuntia dillenii (Ker-Gawler) Haw. Suppl. Pl. Succ. 79. 1819 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 657. 1879 ; Burkill in Rec. Bot. Surv. India 4 (6) : 314. 1911 ; Duthie, Fl. Upper Gang. Pl. 1 : 384. 1903 (Repr. ed. 1 : 352. 1960) ; Wight, Illus. Ind. Bot. 2 : 48. pl. 114. 1850. *Cactus dillenii* Ker-Gawler, Edwards' Bot. Reg. 3 : t. 255. 1818 '*Thor, Nagphani*' (Hindi).

Straggling, branched, thorny, succulent bush up to 2.5 m ; segments flat, thick, obovate or oblanceolate, with many areoles bearing yellowish spines and numerous small bristles. Flowers pink, red or yellowish red. Berries globose, fleshy, areolar and glochidiate.

Fl. & Fr. : August May.

Common in wastelands and on rocky hills ; Kachha Bundha (Tonk).

Native of S. America.

38. AIZOACEAE

ZALEYA Burm. f.

Zaleya govindia (Buch. Ham. ex G. Don) N.C. Nair in Bull. Bot. Surv. India 8 : 86. 1966. *Trianthema govindia* Buch. Ham. ex G. Don, Gen. Syst. 3 : 72. 1834 ; Melville in Kew Bull. 1952 : 264. 1952. *T. pentandra* auct. plur., non. L. 1767 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 660. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 386. 1903 (Repr. ed. 1 : 354. 1960) ; Basu, Ind. Med. Pl. t. 471. 1918. 'Santhi' (Hindi).

Prostrate, much branched, subsucculent, papillose or glabrous herbs. Leaves opposite, up to 4.0×2.5 cm, elliptic oblong to slightly obovate, narrowed at the base, rounded at the apex ; petiole distinct, c. 1 cm long with a sheathing base. Flowers axillary, subsessile, glomerulate, greenish, tinged with pink or crimson. Sepals 5, margins white. Stamens 5. Styles 2. Capsules c. 4 mm long, brown, often tinged with crimson, operculate. Seeds 4, each c. 1.5 mm in diam., suborbicular, rugose, black.

Fl. & Fr. : August March.

Common ; Haji-Ki-Kothi (Niwai) and Banas river bed near Banetha.

39. MOLLUGINACEAE

- | | | |
|--|-----|------------------|
| 1a. Plants without raphides ; carpels united ; fruit a loculicided capsule ; seed with a distinct, filiform appendage | ... | <i>Glinus</i> 2 |
| 1b. Plants, especially the leaves with numerous raphides ; carpels ; free fruit of 5, one - seeded, indehiscent parts ; seed without appendage | ... | <i>Gisekia</i> 1 |

1. GISEKIA L.

Gisekia pharnaceoides L. Mant. Alt. 562. 1771 ; Wight, Ic. 4 (1) : 1. t. 1167. 1848 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 664. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 388. 1903 (Repr. ed 1 : 356. 1960) ; Basu, Ind. Med.

Pl. t. 475. 1918 ; Y. Nasir in Nasir & Ali, Fl. W. Pak. No. 41 : 10. f. 2
J M. 1973. 'Sareli - Morang' (Hindi).

Prostrate or suberect, semi-succulent, glabrous herbs. Leaves mostly opposite, up to 4.5×0.8 cm, linear - lanceolate or oblanceolate - spatulate, obtuse or subacute ; with raphides on the under surface. Flowers small in axillary umbellate cymes, greenish or greenish - white, often with pink or yellowish tinge, 5 - merous. Sepals with membranous margins. Petals O. Filaments dialated at the base. Achenes 1.2×1.0 mm. Seeds c. 1 mm long, subreniform, minutely punctate, shiny, black.

Fl. & Fr. : May November.

Very common by the side of tanks ; Niwai.

2. GLINUS L.

Glinus lotoides L. Sp Pl. 463. 1753 ; Backer in Fl. Males. I. 4 : 269. 1951 ; Mahesh. Illus. Fl. Delhi f. 90. 1966 ; Y. Nasir in Nasir & Ali, Fl. W. Pak. No. 40 : 1. f. 1. A - D. 1973. *Mollugo hirta* Thunb. Prodr. Fl. Cap. 24. 1794 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 2 : 662. 1879 ; Duthie, Fl. Upper Gang. Pl. 1 : 386. 1903 (Repr. ed. 1 : 354. 1960) ; Basu, Ind. Med. Pl. t. 473 A. 1918. 'Bakada' (Hindi).

Prostrate, much branched, densely stellately pubescent herbs. Leaves subverticillate, up to 2.5×1.8 cm, broadly obovate or suborbicular, cuneate. Flowers in axillary clusters, greenish - white. Calyx enlarged in fruit. Capsules c. 6×4 mm, ovoid. Seeds many, minute, subreniform, granulate, shiny, reddish black, strophiolate, with a curved, linear appendage which curves round the seed.

Fl. & Fr. : October May.

Common ; near Niwai temple on sandy soil and Banas river bed.

40. RUBIACEAE

1a. Plants woody, trees or shrubs ; flowers in heads :

2a. Style with 2 linear branches (partly stigmatic) ;
ovule solitary in each cell ; fruit a fleshy syncarp

Morinda 3

- 2b. Stigma mitre - shaped ; fruit a capsule splitting into 2 dehiscent cocci ... *Mitragyna* 2
- 1b. Plants herbaceous ; flowers not in heads :
- 3a. Flowers in nodal whorls ; ovule solitary in each cell ; seeds grooved ventrally : ... *Spermacoce* 5
- 3b. Flowers solitary or in pedunculate inflorescence ; ovules numerous in each cell ; seed not grooved ventrally :
- 4a. Stipules bristly ; corolla lobes entire ; fruits nearly glabrous or with few short hairs ... *Oldenlandia* 4
- 4b. Stipules entire ; corolla lobes with a tooth on each side ; fruits with long, hollow, glassy hairs *Dentella* 1

1. DENTELLA J. R. & G. Forster

Dentella repens (L.) J. R. & G. Forster, Char. Gen. Pl. 26. t. 13. 1776 ; Hook. f. Fl. Brit. Ind. 3 : 42. 1880 ; Duthie, Fl. Upper Gang. Pl. 1 : 410. 1905 (Repr. ed. 1 : 378. 1960). *Oldenlandia repens* L. Mant. 40. 1767.

Slender, prostrate herbs, rooting at nodes. Leaves up to 10×3 mm, elliptic or subspathulate, gradually tapering into the petiole, subacute or obtuse. Stipules scarious. Flowers solitary in one axil only of a pair of leaves and in the forks of branches, white. Calyx with glassy hairs. Corolla narrowly infundibuliform. Fruits c. 2.5 mm in diam., globose, indehiscent, crowned by persistent calyx limbs. Seeds numerous, minute, angular, reticulate, dark brown.

Fl. & Fr. : May October.

Very common by the side of dam ; Chand Sen Bundha near Diggi.

2. MITRAGYNA Korth. *nom. cons.*

Mitragyna parvifolia (Roxb.) Korth. Observ. Naocl. Indic. 19. 1839 ; Duthie, Fl. Upper Gang. Pl. 1 : 408. 1905 (Repr. ed. 1 : 376. 1960) ; Mahesh. Illus. Fl. Delhi f. 97. 1966. *Nauclea parvifolia* Roxb. Pl. Cor. 1 :

40. t. 52. 1796 ; Bedd. Fl. Sylv. t. 34. 1869. *Stephegyne parvifolia* Korth. in Verh. Nat. Ges. 161. 1840 ; Hook. f. Fl. Brit. Ind. 3 : 25. 1880. 'Kaem-Kadam' (Hindi).

Deciduous trees, 4 - 8 m ; bark pale grey. Leaves up to 11 × 8 cm, variable in size and shape, suborbicular, oval or obovate. Stipules large, oblong spatulate. Flowers in usually solitary, 2.5 - 3.0 cm across (c. 1.5 cm. in diam. in fruit) heads, light yellow or reddish, fragrant. Corolla funnel shaped. Stigma much exserted. Seeds many, each c. 2.0 × 0.5 mm, flattened, winged all round, pale brown.

Fl. & Fr. : May - March.

Common ; in the valleys of hills at Toda Rai Singh and at the foot of hills at Bisalpara.

3. MORINDA L.

Morinda tomentosa Heyne ex Roth, Nov. Pl. Sp. 147. 1821 ; Santapau & Merchant in Bull. Bot. Surv. India 3 : 108. 1962 ; Backer & Bakh. f. Fl. Java 2 : 351. 1965. *M. tinctoria* Roxb. Fl. Ind. ed. Carey & Wall. 2 : 197. 1824, non Noronha, 1790 ; Hook. f. Fl. Brit. Ind. 3 : 156. 1880 ; Basu, Ind. Med. Pl. t. 507 B, 1918. *M. tinctoria* var. *tomentosa* (Roth) Hook. f. l.c. 3 : 156. 1880 ; Duthie, Fl. Upper Gang. Pl. 1 : 427. 1905 (Repr. ed. 1 : 392. 1960. 'Achi' (Hindi).

Trees, 2 - 6 m ; branchlets 4 - angled, finely pubescent. Leaves up to 25 × 15 cm, elliptic or ovate, abruptly acutely attenuate in to and decurrent along the petiole, acute or shortly acuminate, tomentose, turning black when dry. Stipules bifid. Flowers in heads, usually opposite a leaf, white, fragrant. Syncarpium c. 2 cm in diam., bullate.

Fl. & Fr. : May - October.

Common in rocky habitats ; Toda Rai Singh.

4. OLDENLANDIA L.

Oldenlandia corymbosa L. Sp. Pl. 119. 1753 ; Brem. in Verh. Akad. Wet. afd. Natuurh. II. 48 (2) : 254. 1952 ; Hook. f. Fl. Brit. Ind. 3 : 64.

1880 *pro parte*; Duthie, Fl. Upper Gang. Pl. 1 : 413. 1905, excl. syn. *Hedyotis burmanniana* Wight & Arn. (Repr. ed. 1 : 380. 1960); Mahesh. Illus. Fl. Delhi f. 96. 1966. '*Daman Papar*' (Hindi).

Shortly bristly annuals, up to 20 cm or more high, but often diminutive. Leaves sessile, up to 3.0×0.4 cm, linear or linear lanceolate. Flowers solitary or 2-5 flowered on elongate peduncles, pinkish white; peduncle and pedicel filiform. Capsules *c.* 2.5 mm in diam., subglobose, loculicidal, crowned by the calyx limbs. Seeds numerous, minute, angular, testa reticulate, pale brown.

Fl. & Fr. : September - January.

Common on field bunds and wastelands; Tordi Sagar and Bisalपुरa R.F.

5. SPERMACOCE L.

Spermacoce hispida L. Sp. Pl. 102. 1753; Hook. f. Fl. Brit. Ind. 3 : 200. 1881; Duthie, Fl. Upper Gang. Pl. 1 : 429. 1905 (Repr. ed. 1 : 395. 1960); Basu, Ind. Med. Pl. t. 509. 1918; Verdcourt in Kew Bull. 30 : 307. 1975. *S. articularis* L. f. Suppl. 119. 1781. *Borreria hispida* (L.) K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4 (4) : 144. 1891, non Spruce ex K. Schum. 1888. *B. articularis* (L. f.) F. N. Williams in Bull. Herb. Bois. II. 5 : 956. 1905. '*Satganthiya*' (Hindi).

Semi-erect, hispid herbs; Stem quadrangular. Leaves up to 4.0×1.25 cm, elliptic to elliptic-lanceolate. Stipules 3-5-bristled. Flowers sessile, pale violet. Capsules *c.* 4×2 mm excluding the calyx teeth, ellipsoid, densely hispid. Seeds *c.* 2.5×1.5 mm, oblong-ellipsoid, plano-convex, ventrally with a longitudinal groove, testa minutely reticulate, brown.

Fl. & Fr. : July - November.

Common on low sand dunes; Benthali village (Deoli).

41. ASTERACEAE

1a. Male and female capitula separate, monoecious;
female florets apetalous; anthers not syngenesious;
achenes only two per capitulum ...

Xanthium 23

- 1b. Male and female capitula not separate ; outer female florets always petalous ; anthers syngenesious ; achenes either one or many per capitulum but never only two :
- 2a. Plants lactiferous ; capitula ligulate wth all the florets ligulate :
- 3a. Fistular, flexous, hispid herbs ; involucral bracts 2 - seriate ; corolla pale blue ; achenes obovate, angular ; pappus of scales, persistent... *Cichorium* 6
- 3b. Solid, erect, glabrous herbs ; involucral bracts multiseriate ; corolla yellow ; achenes polymorphic, ribbed ; pappus of hairs, deciduous ... *Launaea* 15
- 2b. Plants not lactiferous ; capitula discoid or disciform with all the florets tubular, or radiate with only the ray florets ligulate :
- 4a. Capitula aggregated into a compound head :
- 5a. Armed, cottony - woolly, herbs ; capitula 1 - flowered ; involucral bracts multiseriate, pungent ... *Echinops* 8
- 5b. Unarmed herbs, not woolly ; capitula few to many - flowered ; involucral bracts 1-seriate, not pungent :
- 6a. Stem winged ; involucral bract more than two per capitulum ; corolla reddish - violet or purple ... *Sphaeranthus* 20
- 6b. Stem not winged ; involucral bracts two per capitulum ; corolla white or yellow :
- 7a. Marshy plants ; leaves alternate ; capitula homogamous, white ; achenes winged, notched at the apex, not enclosed in the involucre of bracts ; pappus of two obovate scales ... *Caesulia* 5
- 7b. Dryland plants ; leaves opposite or pseudovercillate ; capitula heterogamous, yellow ; achenes compressed, enclosed in involucre of bracts ; pappus absent ... *Flaveria* 11
- 4b. Capitula simple, not aggregated into compound heads :
- 8a. Capitula homogamous, discoid :
- 9a. Involucral bracts 1 - seriate, margins coherent ; ribs of achenes scabrid ; pappus multiseriate, uniform ... *Emilia* 10

- 9b. Involucral bracts multiseriate, margins free
 achenes hairy throughout; pappus two
 seriate, the outer short ... *Vernonia* 22
- 8b. Capitula heterogamous :
- 10a. Pappus of 2 - 5 awns :
- 11a. Leaves opposite, 3 - 5 - foliate ; leaflets
 ovate - lanceolate ; outer achenes late-
 rally compressed, inner 3 - 4 - angled,
 ribbed ; pappus of 3 - 5 awns ... *Bidens* 2
- 11b. Leaves alternate, bipinnatisect ; pinnules
 linear ; all achenes laterally compressed ;
 pappus of 2 divaricate awns ... *Glossocardia* 12
- 10b. Pappus of scales, hairs or absent :
- 12a. Achenes enclosed in two horned,
 hooked, spinous involucral bracts ... *Acanthospermum* 1
- 12b. Achenes not enclosed in involucral
 bracts :
- 13a. Achenes gibbous, enclosed in
 rugose, pubescent, beaked paleae... *Sclerocarpus* 19
- 13b. Achenes not gibbous, not enclosed
 in paleae :
- 14a. Corolla white or yellow :
- 15a. Involucral bracts 2 - seri-
 ate ; corolla white :
- 16a. Anthers obtuse at
 base ; achenes trans-
 versely rugose, hairy,
 those of female florets
 trigonous, those of bi-
 sexual florets obovoid ;
 pappus setae 2 - 5,
 plumose ... *Blainvillea* 3
- 16b. Anthers sagittate ; all
 achenes similar, dorsi-
 ventrally compressed,
 narrowly winged, tran-
 versely rugose and
 tuberculate ; pappus a
 ring of thick scales,
 forming a cone on top
 of the achenes ... *Eclipta* 9
- 15b. Involucral bracts more
 than two seriate ; corolla
 yellow :

- 17a. Leaves pinnately lobed but not lyrate ; achenes glandular ; pappus cupular with fimbriate mouth ... *Grangea* 14
- 17b. Leaves not lobed, if rarely lobed, then lyrate ; achenes not glandular ; pappus of hairs or absent :
- 18a. White - woolly herbs :
- 19a. Leaves cordate amplexicaul ; capitula solitary or paired ; achenes glabrous or hairy ; pappus 2 - seriate *Pulicaria* 18
- 19b. Leaves not cordate - amplexicaul ; capitula in clusters or in spike - like racemes ; achenes papillose ; pappus 1 seriate ... *Gnaphalium* 13
- 18b. Glabrous or pubescent herbs undershrubs :
- 20a. Capitula solitary on a long peduncle ; outer florets ligulate, 2 - 4- toothed or partite :
- 21a. Leaves opposite, base cuneate ; anthers acute below ; achenes oblong or turbinate ; pappus bristles plumose ... *Tridax* 21
- 21b. Leaves alternate, sessile, base cordate-hastate ; anthers tailed ; achenes terete ; pappus hairs not plumose ... *Pentanema* 16
- 20b. Capitula arranged in branched panicles or in corymbs ; outer florets tubular :
- 22a. Anthers tailed ; achenes ribbed or angled ... *Blumea* 4
- 22b. Anthers obtuse below ; achenes much compressed ... *Conyza* 7

- 14b. Corolla purplish - pink or violet :
- 23a. Corolla of outer florets ligulate,
glabrous ; pappus connate at
the base in sterile achenes ... *Pluchea* 17
- 23b. Corolla of outer florets tubular,
pubescent ; pappus free at base *Blumea* 4

1. ACANTHOSPERMUM Schrank

Acanthospermum hispidum DC. Prodr. 5 : 522. 1836 ; Raizada, Suppl. Fl. Upper Gang. Pl. 99. 1976. '*Kanti*' (Hindi).

Erect, hispidly hairy herbs, 30 - 70 cm. Leaves opposite, sessile or short - petiolate, up to 5.0×2.5 cm, obovate - spatulate or elliptic, crenate or crenulate. Capitula born in the forks of the branches, yellow. Outer involucre bracts 2.5 - 4.0 mm long, densely hairy. Ray florets uniseriate, female, enclosed in the 2 - horned inner involucre bracts, covered with many hooked spines. Disc florets tubular, enclosed in the palea. Achenes 5 - 10, each c. 5 mm long (excluding the terminal spines), triangular, compressed, glabrous. Pappus absent.

Fl. & Fr. : August - November.

Rare ; a weed in fields and wastelands ; Ghati village near Tordi.

An introduced weed from S. America.

2. BIDENS L.

Bidens biternata (Lour.) Merr. & Sherff ex Sherff in Bot. Gaz. 88. 293. 1929 & in Field Mus. Nat. Hist. Bot. Ser. 16 : 38. pl. 99. f. a, c m. 1937. *Coreopsis biternata* Lour. Fl. Cochinch. ed. 1. 508. 1790. *Bidens pilosa* auct. non L. 1753 ; Hook. f. Fl. Brit. Ind. 3 : 309. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 472. 1905 (Repr. ed. 1 : 430. 1960). '*Chirchitta*' (Hindi).

Erect herbs, 10 - 50 cm ; stem grooved, angular. Leaves petiolate ; leaflets up to 5.0×2.2 cm ; base narrowed, acute to acuminate, dentate. Capitula on a long peduncle, yellow. Involucre bracts pilose, the outer

short. Ray florets ligulate, often only one, sterile. Achenes *c.* 2 cm long, linear, obscurely 4 angled, ribbed, glabrous or hispid, black. Pappus awns retrorsely hispid, yellowish brown.

Fl. & Fr. : August September.

Common in the forests on hills ; Rajmahal R.F. (Deoli.)

3. BLAINVILLEA Cass.

Blainvillea acmella (L.) Philipson in *Blumea* 6 : 350. 1950. *Verbesina acmella* L. Sp. Pl. 901. 1753. *Eclipta latifolia* L. f. Suppl. 378. 1781. *Blainvillea rhomboidea* Cass. Dict. Sci. Nat. 29 : 494. 1823 ; Duthie, Fl. Upper Gang. Pl. 1 : 469. 1905 (Repr. ed. 1 : 428. 1960). *B. latifolia* (L. f.) DC. in Wight, Contrib. Bot. Ind. 17. 1834 ; Hook. f. Fl. Brit. Ind. 3 : 305. 1881.

Erect, scabrid hairy herbs, 40 60 cm. Leaves opposite (upper ones alternate), petiolate, up to 10.5 × 6.0 cm, ovate, ovate - elliptic, rhomboid-ovate or ovate - lanceolate, cuneate or rounded, acute to acuminate, serrate. Capitula on long peduncle, 6 7 mm across. Involucral bracts hairy outside, the outer herbaceous ; inner paleaceous, shorter. Ray florets ligulate, female. Achenes 3.5 - 4.0 mm long, cuneate, of bisexual florets laterally compressed.

Fl. & Fr.: August October.

Common ; Banas river bed near Bentheli (Deoli).

4. BLUMEA DC. *nom. cons.*

- | | | |
|---|-----|-------------------------|
| 1a. Stem and younger parts with stalked glands ; leaves narrowed at the base ; capitula in panicles ; hairs on corolla lobes of bisexual florets unicellular ; achenes ribbed | ... | <i>B. membranacea</i> 1 |
| 1b. Plant eglandular ; leaves semi - amplexicaul ; capitula solitary or in pairs ; hairs on corolla lobes of bisexual florets multicellular ; achenes not ribbed | ... | <i>B. obliqua</i> 2 |

1. **Blumea membranacea** DC. Prodr. 5 : 440. 1836 ; Hook. f. Fl. Brit. Ind. 3 : 265. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 455. 1905. (Repr. ed. 1 : 415. 1960) ; Randeria in *Blumea* 10 : 270. 1960.

Erect, pilose herbs, 25 - 40 cm. Leaves alternate, petiolate, up to 10.5 × 5.5 cm, elliptic - lanceolate or ovate lanceolate, usually lyrate lobed with the terminal lobe elliptic - ovate and the lateral ones more or less triangular, acute or acuminate, serrate dentate. Capitula 5 - 7 mm across, yellow. Involucral bracts multi seriate, pubescent outside, longer than the florets. Corolla of female florets tubular, obscurely 2 - 3 lobed. Achenes c. 1 mm long, oblong - ellipsoid, pubescent. Pappus 1 - seriate, c. 2.5 mm long, white.

Fl. & Fr. : September - November.

Common on hills in rocky or gravelly habitats ; Toda Rai Singh forest.

2. *Blumea obliqua* (L.) Druce, Rep. Bot. Exch. Club Brit. Isles 4 : 609. 1917 ; *Randeria* in *Blumea* 10 : 286. 1960. *Erigeron obliquum* L. Mant. Alt. 573. 1771. *Blumea amplexans* DC. in Wight, Contrib. Bot. Ind. 13. 1834 ; Hook. f. Fl. Brit. Ind. 3 : 260. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 451. 1905 (Repr. ed. 1 : 412. 1960).

Erect or diffuse, suffruticose, villous, herbs, 30 - 50 cm. Leaves alternate, sessile, up to 5 × 1 cm, elliptic - oblong, oblong - lanceolate or spatulate apiculate or acute, serrate-dentate. Capitula terminal or axillary, pedunculate, c. 1 cm across, purple. Involucral bracts multiseriate, longer than the florets, prolonged acuminate, margins scarious, pubescent outside. Female florets filiform, 2 - 3 - lobed, glabrous. Achenes c. 0.5 mm long, oblong to obovate, pubescent. Pappus 1 - seriate, c. 3.5 mm long.

Fl. & Fr. : October - February.

Found in marshy places ; Tordi Sagar.

5. CAESULIA Roxb.

Caesulia axillaris Roxb. Pl. Cor. 1 : 64. 93. 1798 ; Wight, Ic. 3 (4) : 8 t. 1102. 1846 ; Hook. f. Fl. Brit. Ind. 3 : 291. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 462. 1905 (Repr. ed. 1 : 422. 1960).

Prostrate or suberect, succulent, glabrous herbs, 15 - 75 cm ; stem often red. Leaves sessile, up to 14.0 × 1.7 cm, linear - lanceolate, auricled at the base, acut serrulate. Capitula axillary, sessile. Involucral bracts 2, large, membranous, c. 9 × 7 mm, broadly ovate. Anthers dark purple or red, segittate. Achenes c. 3 mm long, obovoid, flat with a rib on each face, sparsely hairy with stout hairs.

Fl. & Fr. : October - November.

Common in marshy habitats ; Siras.

6. CICHORIUM L.

Cichorium endivia L. Sp. Pl. 813. 1753.

Decumbent herbs, *c.* 1 m. Cauline leaves sessile, *c.* 7 × 2 cm, lanceolate, semiamplexicaul, acute or obtuse with a short mucro, runcinate and often pinnatifid. Capitula axillary or terminal, clustered, homogamous, pale blue. Involucral bracts hairy outside, the outer shorter. Flowers ligulate. Corolla 5 lobed. Achenes 2.5 - 3.0 mm long. Pappus 0.5 - 1.0 mm long.

Fl. & Fr. : February - May.

Common weed in cultivated fields ; Ghass village near Tonk.

7. CONYZA Less. *nom. cons.*

Conyza bonariensis (L.) Cronquist in Bull. Torrey Bot. Club 70 : 632. 1943. *Erigeron bonariensis* L. Sp. Pl. 863. 1753 ; Raizada, Suppl. Fl. Upper Gang. Pl. 112. 1976. 'Phulni' (Hindi).

Erect herbs, 30 - 60 cm ; stem ribbed, bearing mixed indumentum of stiff spreading setulose hairs and softer adpressed hairs. Leaves alternate, up to 7.5 × 1.5 cm ; lower ones larger, oblanceolate spathulate, mucronate, serrate - incised ; the upper ones linear - lanceolate, subentire or serrate. Capitula *c.* 8 mm across, pale yellow. Involucral bracts 3 - 4 mm long, pilose outside. Achenes *c.* 1.3 mm long, linear - oblong, sparsely pubescent. Pappus 1 - seriate, *c.* 3.5 mm long, strigulose, dirty white.

Fl. & Fr. : November - July.

Common weed in cultivated fields ; Ghass village near Tonk.

8. ECHINOPS L.

Echinops echinatus Roxb. Fl. Ind. ed. Carey 3 : 447. 1832 ; Hook. f. Fl. Brit. Ind. 3 : 358. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 480. 1905 (Repr. ed. 1 : 437. 1960) ; Basu, Ind. Med. Pl. t. 548. 1918. 'Oontkatela' (Hindi).

Erect, much branched herbs, 50 - 100 cm. Leaves up to 30 × 10 cm, deeply pinnatifid ; lobes sinuate and spinescent. Capitula homogamous, up to 4 cm in diam. (excluding the spines), globose, pale blue. Involucre with white bristles ; outer bracts with sharp spines exceeding the compound heads, inner connate for more than half their length in to a tube which surrounds the achene. Anthers pale violet, tailed. Achenes *c.* 7 mm long, obconic,

densely villous. Pappus short, antrorsely hispid, yellowish, forming a cylindrical brush on the achenes.

Fl. & Fr. : October March.

Common on river bed and fallow fields ; Banas river bed near Rajmahal and Panchewar.

9. ECLIPTA L. *nom. cons.*

Eclipta alba (L.) Hassk. Pl. Jav. Rar. 528. 1848 ; Hook. f. Fl. Brit. Ind. 3 : 304. 1881 ; Basu, Ind. Med. Pl. t. 530. 1918. *Verbesina alba* L. Sp. Pl. 902. 1753. *V. prostrata* L. Sp. Pl. 902. 1753. *Eclipta erecta* L. Mant. Alt. 286. 1771 ; Duthie, Fl. Upper Gang. Pl. 1 : 468. 1905 (Repr. ed. 1 : 427. 1960). *E. prostrata* (L.) L. Mant. Alt. 286. 1771. 'Jal-Bhangro' (Hindi).

Prostrate, decumbent or erect, appressed hairy herbs, 5 - 30 cm. Leaves opposite, subsessile, up to 8.0×2.3 cm, elliptic to lanceolate, cuneate, subentire or distantly serrate. Capitula axillary and terminal, pedunculate, c. 6 mm across. Involucral bracts c. 5.0×2.5 mm, ovate, herbaceous. Ray florets ligulate, fertile, 2 dentate. Anthers blackish. Achenes c. 3 mm long, cuneate, brown.

Fl. & Fr. : Almost throughout the year.

A common weed in marshy habitats ; Tordi Sagar.

Linnaeus (*l. c.* 1753) simultaneously published the names *Verbesina alba* and *V. prostrata*. Later he published (*l. c.* 1771) *Eclipta erecta*, a superfluous name based on *V. alba* and *E. prostrata*, based on *E. prostrata*. The first author to unite these taxa was Hasskar (*l. c.*) who did so under the name *Eclipta alba* (L.) Hassk.

10. EMILIA Cass.

Emilia sonchifolia (L.) DC. in Wight, Contrib. Bot. Ind. 24. 1834 & Prodr. 6 : 302. 1838 ; Hook. f. Fl. Brit. Ind. 3 : 336. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 478. 1905 (Repr. ed. 1 : 436. 1960). *Cacalia sonchifolia* L. Sp. Pl. 835. 1753.

Erect, delicate, glabrescent herbs, 20 - 60 cm. Leaves alternate, up to 9×5 cm ; the lower ones petioled, obovate, suborbicular or lyrate, obtuse, subentire or toothed ; the upper and middle ones sessile, ovate - triangular, often lyrate, sagittate and auricled, acute, dentate or subentire. Capitula in lax, pedunculate, corymbose inflorescence, c. 1 cm long, dark pink. Invol-

ucral bracts c. 9 mm long, glabrous. Achenes c. 3 mm long, narrowly oblong, ribbed. Pappus c. 9 mm long, white.

Fl. & Fr. : August September.

Common in wastelands ; Tonk (*Maheshwari* 52987, LWG)

11. FLAVERIA A. Juss.

Flaveria trinervia (Spreng.) C. Mohr. in Contrib. U. S. Nat. Herb. 6 : 810. 1901 ; Raizada, Suppl. Fl. Upper Gang. Pl. 117. 1976. *Oedera trinervia* Spreng. Bot. Gart. Halle 63. 1800.

Erect, dichotomously branched herbs or undershrubs, 10-40 cm. Leaves up to 6×3 cm, elliptic, broadly elliptic or oblanceolate, 3-nerved, acute, coarsely serrate ; petiole dilated at base. Capitula compound, heads fasciculate. Involucral bracts 2 per head, connivent, c. 3.5 mm long, oblong. Corolla of ligulate florets 2-lobed. Achenes c. 2.5 mm long, obovoid, c. 10-ribbed, black.

Fl. & Fr. : November February.

Common weed in fallow fields and wastelands ; near Aligarh.

12. GLOSSOCARDIA Cass.

Glossocardia bosvallea (L. f.) DC. in Wight, Contrib. Bot. Ind. 19. 1834 ; Wight, Ic. 3 (4) : 9. t. 1110. 1846 ; Mahesh. Illus. Fl. Delhi. f. 109. 1966. *Verbesina bosvallea* L. f. Suppl. 379. 1781 ; *Glossocardia linearifolia* Cass. in Dict. Sci. Nat. 19 : 62. 1821 ; Hook. f. Fl. Brit. Ind. 3 : 308. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 471. 1905 (Repr. ed. 1 : 430. 1960).

Diffuse herbs. Leaves up to 2.5 cm long. Capitula pendunculate, c. 10×5 mm, yellow. Involucral bracts with scarious margins, the inner longer. Achenes c. 8 mm long (excluding the awn), narrowly oblong densely hairy, dark brown. Pappus awns c. 4 mm long.

Fl. & Fr. : July October.

Common on low hills in rocky habitats ; Anwa R. F. (Deoli).

13. GNEPHALIUM L.

- 1a. Leaves usually more than 15 mm long ; heads in leafy,
terminal, spikes ... *G. polycaulon* 1
- 1b. Leaves usually less than 15 mm long ; heads in rounded,
leafy, axillary or terminal clusters ... *G. pulvinatum* 2

1. **Gnephaliium polycaulon** Pers. Syn. 2 : 421. 1807 ; Grierson in Notes Roy. Bot. Gard. Edinb. 31 : 137. 1971. *G. indicum* auct. non L. 1753 ; Hook. f. Fl. Brit. Ind. 3 : 289. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 461. 1905 (Repr. ed. 1 : 421. 1960). 'Buch bucha' (Hindi).

Spreading, annual herbs, 5 15 (-25) cm, with numerous, lateral, ascending branches from near the base. Leaves up to 30 (-45) × 0.8 cm, linear-ovate or spatulate, apiculate. Involucral bracts 2 3 seriate. c. 2.5 mm long, pale brown. Florets yellow. Achenes c. 0.5 mm long, oblong. Pappus hairs c. 1.5 mm long, white.

Fl. & Fr. : November - March.

common by the side of tanks on sandy clayey soil ; Gar village.

2. **Gnephaliium pulvinatum** Delile, Fl Aegypt. 266. t. 44. 1812 ; Hook. f. Fl. Brit. Ind. 3 : 289. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 462. 1905 (Repr. ed. 1 : 422. 1960).

Small, prostrate, annual herbs with numerous branches from the base. Leaves up to 15.0 × 0.3 cm, spatulate, mucronate. Involucral bracts c. 3 mm long, acute. Florets yellow. Achenes c. 0.5 mm long, oblong-ovate. Pappus hairs c. 2 mm long, white.

Fl. & Fr. : December - March.

Found in marshy places ; by the side of Tordi Sagar.

14. GRANGEA Adans.

Grangea maderaspatana (L.) Poir. in Lam. Encycl. Suppl. 2 : 825. 1812 ; Wight, Ic. 3 (4) : 8. t. 1097. 1846 ; Hook. f. Fl. Brit. ind. 3 : 247. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 446. 1905 (Repr. ed. 1 : 407. 1960). *Artemisia maderaspatana* L. Sp. Pl. 849. 1753.

Prostrate, tufted, hairy herbs. Leaves alternate, sessile, up to 6 cm long, segments oblong, serrate dentate. Capitula solitary, leaf opposed or

terminal, c. 7 mm across, depressed subglobose. Involucral bracts c. 5 mm long, oblong, hairy. Achenes c. 2 mm long.

Fl. & Fr. : Almost throughout the year.

Common in moist habitats ; Tordi Sagar and Banas river bed.

15. LAUNAEA Cass.

Launaea procumbens (Roxb.) Ramayya & Rajagopal in Kew Bull. 23 : 465. 1969. *Prenanthes procumbens* Roxb. Fl. Ind. ed. Carey 3 : 404. 1832. *Launaea nudicaulis* auct. pl. non Hook. f. *sensu stricto*, Fl. Brit. Ind. 3 : 416. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 494. 1905 (Repr. ed. 1 : 450. 1960) ; Basu, Ind. Med. Pl. t. 564. 1918 ; Mahesh. Illus. Fl. Delhi f. 99. 1966. '*Jangli - gobi*' (Hindi).

Glabrous herbs. Leaves mostly radical, up to 20.0×4.5 cm, oblong or oblong ovate, pinnately lobed ; lobes rounded or acute, spinulose with cartilaginous teeth. Capitula in subracemose inflorescence, homogamous, c. 1.5 cm long. Involucral bracts unequal, glabrous. Corolla 5 toothed. Anthers sagittate. Achenes 3 4 mm long, rugulose. Pappus hairs c. 8.5 mm long, homomorphic, white.

Fl. & Fr. : September March.

Common in wastelands and on low sand dunes ; Bentheli village.

16. PENTANEMA Cass.

Pentanema indicum (L.) Ling, Acta Phytotax. Sinica 10 : 179. 1965 ; K. H. Rech. in Fl. Iranica 145 : 97. 1980. *Inula indica* L. Sp. Pl. ed. 2. 1236. 1763 ; Duthie, Fl. Upper Gang. Pl. 1 : 464. 1905 (Repr. ed. 1 : 423. 1960). *Vicoa indica* (L.) DC. in Wight, Contrib. Bot. Ind. 10. 1834 ; Wight, Ic. 3 (4) : 13. t. 1148. 1846. *V. auriculata* Cass. in Ann. Sci. Nat. Paris 17 : 418. 1829 ; Hook. f. Fl. Brit. Ind. 3 : 297. 1881.

Erect, suffrutescent, glabrescent herbs, 30 - 45 cm. leaves up to 7.0×1.5 cm, oblong lanceolate or linear lanceolate acute or acuminate, subentire or crenate. Capitula solitary, terminal or leaf - opposed on a long peduncle, 1.1 1.4 cm across, yellow. Involucral bracts multiseriate, c. 3 mm long, hairy outside, 1 nerved with scarious margins. Ray florets female. Corolla 3 - toothed, revolute. Achenes c. 1.5 mm long, thinly hairy. Pappus 1 seriate in disc florets, c. 3 mm long, none in ray florets.

Fl. & Fr. : September November.

Common on hills in gravelly or rocky habitats ; Kakor forest and hills at Sopari Village.

17. PLUCHEA Cass.

Pluchea lanceolata (DC.) C. B. Clarke, Comp. Ind. 94. 1876 ; Hook. f. Fl. Brit. Ind. 3 : 272. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 458. 1905. (Repr. ed. 1 : 418. 1960) ; Mahesh. Illus. Fl. Delhi f. 108. 1966. *Berthelotia lanceolata* DC. Prodr. 5 : 376. 1836. 'Rukr' (Hindi).

Erect, hoary undershrubs, 30 - 75 cm. Leaves alternate sessile, up to 6.0×1.5 cm, coriaceous, oblong or oblanceolate, tapering at the base, apiculate, acute or obtuse, subentire or obscurely subdentate at the apex. Capitula in compound corymbs, c. 8 mm across. Involucral bracts multi-seriate, 2.5 - 4.0 mm long, densely pubescent outside. Achenes c. 1 mm long. Pappus c. 5 mm long, dirty white.

Fl. & Fr. : December - May.

Common weed in fallow and cultivated fields ; Banetha (Kakor) and Balunda (border of Tonk-Bundi districts).

18. PULICARIA Gaertn.

- | | |
|--|-----------------------|
| 1a. Plants white - woolly ; ray florets ligulate ; achenes glabrous ; inner pappus hairs plumose at the apex ... | <i>P. crispa</i> 1 |
| 1b. Plants villous ; ray florets tubular ; achenes sparsely appressed hairy ; inner pappus hairs not plumose at the apex ... | <i>P. foliolosa</i> 2 |

1. **Pulicaria crispa** (Forssk.) Benth. & Hook. f. Gen. Pl. 2 : 336. 1867 ; Hook. f. Fl. Brit. Ind. 3 : 299. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 466. 1905 (Repr. ed. 1 : 425. 1960) ; Basu, Ind. Med. Pl. t. 526 A. 1918 ; Mahesh. Illus. Fl. Delhi f. 103. 1966. *Aster crispus* Forssk. Fl. Aegypt. - Arb. 150. 1775. 'Haldwa' (Hindi).

Erect or diffuse-herbs or undershrubs. Leaves alternate, sessile, up to 7.0×1.5 cm, diminishing in size towards the apex, linear or linear - oblong, obovate - oblong or subspathulate, subacute or obtuse, undulate - crisped or denticulate. Capitula solitary at the end of paniculate branches, pedunculate, c. 7 mm across, yellow. Involucral bracts 2 - 3 mm long, linear - lan-

ceolate, recurved, margins scarious, pubescent outside. Achenes *c.* 0.9 mm long, oblong ellipsoid. Outer pappus cupular, fimbriate, the inner *c.* 2.5 mm long, antrorsely scabrid.

Fl. & Fr. : Almost throughout the year.

Found in moist places by the side of tanks and on river beds ; Tordi Sagar and Banas river bed.

2. ***Pulicaria foliolosa*** DC. Prodr. 5 : 480. 1836 ; Hook f. Fl. Brit. Ind. 3 : 298. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 465. 1905 (Repr. ed. 1 : 424. 1960).

Much branched herbs, *c.* 10 cm, with woody rootstalk. Leaves alternate, sessile, up to 3 (-7) × 0.8 (-1.0) cm, oblong, linear - oblong, spatulate, or oblanceolate, base half amplexicaul, obtuse. Capitula deciform, *c.* 0.8 cm across, yellow ; peduncle villous, glandular. Involucral bracts subequal, acute, hairy, Ray florets, 3 toothed. Achenes *c.* 0.7 mm long, oblong, terete, brown. The outer pappus a minute cup with fimbriate edges, the inner *c.* 2.0 mm long.

Fl. & Fr. : May August.

Common on river bed ; Banas river bed near Fraser bridge (Tonk).

19. SCLEROCARPUS Jacq.

Sclerocarpus africanus Jacq. ex Murr. Syst. Veg. ed. 14. 783. 1784 ; Hook. f. Fl. Brit. Ind. 3 : 305. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 469. 1905 (Repr. ed. 1 : 427. 1960).

Erect, hispid, annual herbs, 25 - 40 cm. Upper leaves alternate, lower opposite, petiolate, up to 9.5 × 5.5 cm, ovate or ovate lanceolate, cuneate, acute or acuminate, crenate serrate. Capitula terminal, solitary, sessile or peduncled, *c.* 1 cm across, yellow. Involucral bracts 2 seriate, hairy. Ray florets 3, ligulate ; corolla 2 lobed, pubescent. Anthers sagittate. Achenes *c.* 5 mm long, black. Pappus absent.

Fl. & Fr. : August November.

Fairly common on hills in gravelly habitats ; Toda Rai Singh R. F.

20. SPHAERANTHUS L.

Sphaeranthus indicus L. Sp. Pl. 927. 1753 ; Hook. f. Fl. Brit. Ind. 3 : 275. 1881, pro parte ; Duthie, Fl. Upper Gang. Pl. 1 : 459. 1905. (Repr. ed. 1 : 419. 1960). *S. hirtus* Willd. Sp. Pl. 3 : 2395. 1803 ; Wight, Ic. 3 (4) : 8. t. 1094. 1846. 'Mundi' (Hindi).

Much - branched, prostrate or ascending, aromatic, glandular - hairy herbs. Leaves alternate, sessile, up to 5.5×1.3 cm, obovate, spatulate, obovate - oblong or oblong - elliptic, decurrent, apex acute with a short mucro or rounded, margins coarsely double spinous dentate. Heads terminal, solitary, heterogamous, ovoid or globose, 7 - 10 mm across ; peduncle winged, Involucral bracts c. 2.5 mm long, linear obovate, ciliate. Disc. florets 2 - 3 ; anthers sagittate ; stigma undivided. Corolla of ray florets 2 - lobed ; stigma divided. Achenes stalked. Pappus absent.

Fl. & Fr. : December - March.

Common weed near dams ; Kachha bundha near Tonk.

21. TRIDAX L.

Tridax procumbens L. Sp. Pl. 900. 1753 ; Hook f. Fl. Brit. Ind. 3 : 311. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 475. 1905 (Repr. ed. 1 : 433. 1960).

Procumbent or erect, hairy herbs, 30 - 60 cm. Leaves up to 6.0×3.5 cm, ovate, ovate - lanceolate, elliptic or elliptic - lanceolate, coarsely serrate, often incised. Capitula solitary, yellow or pale yellow. Outer involucral bracts herbaceous, very hairy, Achenes c. 2.5 mm long, silky pilose. Pappus c. 6.5 mm long.

Fl. & Fr. : Almost throughout the year.

Common in wastelands and on hills throughout the district.

22. VERNONIA Schreb. *nom. cons.*

Vernonia cinerea (L.) Less. in Linnaea 4 : 291. 1829 ; Hook. f. Fl. Brit. Ind. 3 : 233. 1881 ; Duthie, Fl. Upper Gang. Pl. 1 : 441. 1905 (Repr. ed. 1 : 404. 1960) ; Mahesh. Illus. Fl. Delhi f. 101. 1966. *Conyza cinerea* L. Sp. Pl. 862. 1753.

Erect or rarely decumbent, pubescent herbs, 20-75 cm; stem striate. Leaves alternate, petiolate, up to 5.5 × 3.5 cm, ovate, ovate-lanceolate, rhomboid-ovate, obovate or ovate-elliptic, cuneate, acute or obtuse, subentire to crenate. Capitula in lax, terminal, compound corymbs, c. 6 mm across, purple or violet. Involucral bracts pubescent outside, gland-dotted, the longest c. 4.5 mm long. Achenes c. 1.5 mm long, oblong, narrowed at base, obscurely ribbed. Pappus white, the outer short; inner c. 4 mm long, antrorsely barbellate.

Fl. & Fr. : Almost throughout the year.

Common weed in wastelands and in fallow fields; Tordi Sagar and Kotri village Aligarh road.

A highly polymorphic plant.

23. XANTHIUM L

Xanthium strumarium L. Sp. Pl. 987. 1753; Hook. f. Fl. Brit. Ind. 3: 303. 1881; Duthie, Fl. Upper Gang. Pl. 1: 467. 1905 (Repr. ed. 1: 426. 1960). *X. indicum* Koenig ex Roxb. Fl. Ind. ed. Carey 3: 601. 1832; Wight, Ic. 3 (4): 8. t. 1104. 1846. '*Bichhu Buti, Bhangra*' (Hindi).

Erect or diffuse, often gregarious, shortly hairy herbs or undershrubs, 25-200 cm. Leaves alternate, long petiolate, up to 8.5 × 10.0 cm, 3-5-lobed, broadly cordate, ovate or deltoid ovate, acute or acuminate, irregularly coarsely dentate. Functionally male capitula in the upper axil and the female towards the base. Male capitula many-flowered. Female capitula with 2 florets; involucral bracts connate, hard, tipped by two stout, curved beaks and covered by many hooked spines. Achenes 2, each c. 1.5 cm long, oblong-ellipsoid, compressed, pointed, glabrous, enclosed within hardened, tomentose involucre. Pappus absent.

Fl. & Fr. : October-February.

Common weed in wastelands; Haji Ki-Kothi near Niwai.

42. PLUMBAGINACEAE

DYEROPHYTUM Kuntze

Dyerophytum indicum (Gibs. ex Wight) Kuntze, Revis. Gen. Pl. 3: 394. 1898. *Vogelia indica* Gibs. ex Wight in Cal. Journ. Nat. Hist. 7: 17.

1847 ; Wight, Ic. 3 (4) : 5. t. 1075. 1846 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 3 : 481. 1882 ; Duthie, Fl. Upper Gang. Pl. 2 : 2. 1911 (Repr. ed. 1 : 458. 1960).

Subscandent, glaucous undershrubs or shrubs, 1 to 3 m ; stem and branches terete, finely striate, scurfy. Leaves perfoliate, 2.0 5.5 × 2 5 cm, ovate, elliptic, oblong, orbicular or obovate, obtuse or retuse with a mucro, undulate, coriaceous, glaucous - green, more or less covered with scurfy scales. Flowers in dense paniculate spikes, bright yellow. Bracts lanceolate. Calyx persistent, c. 8 cm long, tubular, strongly 5 ribbed, tube winged between the ribs ; the wings transversely undulate, membranous. Corolla c. 1.5 cm long ; lobes 5, obovate oblong, emarginate. Style densely hairy at the base. Seed pear shaped, smooth.

Fl. & Fr. : Almost throughout the year.

Common on rocky hills ; Toda Rai Singh.

43. PRIMULACEAE

ANAGALLIS L.

Anagallis arvensis L. Sp. Pl. 148. 1753 ; Hook. f. Fl. Brit. Ind. 3 : 506. 1882 ; Duthie, Fl. Upper Gang. Pl. 2 : 6. 1911 (Repr. ed. 1 : 461. 1960) ; Mahesh. Illus. Fl. Delhi f. 117. 1966. '*Dharti - Dhak*' (Hindi).

Erect or decumbent, glabrous annuals, 10 30 cm, much branched from the base ; stem quadrangular. Leaves opposite, sessile, up to 3.0 × 1.5 cm, ovate, cordate amlexicaule subacute or obtuse. Flowers axillary, solitary, pedicillate, dark blue, red at the centre. Sepals free, lanceolate, acuminate, keeled. Corolla lobes glandular hairy along the margins. Stamens 5 ; filaments bearded. Capsules with decurved pedicel, c. 4 × 4 mm, globose, circumscissile, with persistent style base and sepals. Seeds minute, trigonous, rugose, dark brown.

Fl. & Fr. : January March.

Common winter season weed in cultivated fields in moist places ; Barni village.

44. SAPOTACEAE

MIMUSOPS L.

Mimusops elengi L. Sp. Pl. 349. 1753 ; Bedd. Fl. Sylv. t. 40. 1870 ; Wight, Ic. 4 (4) : 13. t. 1586. 1850 ; C. B. Clarke in Hook. f. Fl. Brit.

Ind. 3 : 548. 1882 ; Duthie, Fl. Upper Gang. Pl. 2 : 13. 1911 (Repr. ed. 1 : 467 1960). '*Morsali*' (*Marwari*), '*Mulsari*' (Hindi).

Evergreen, glabrous trees, 10 - 20 m ; bark dark grey. Leaves alternate, up to 10×6 cm, elliptic, ovate lanceolate, or ovate elliptic, acuminate, margins undulate. Flowers axillary, solitary or clustered, pedicillate, star-shaped, white or creamish - white, sweet scented. Sepals 8, free, ovate-lanceolate, fulvous pubescent. Petals many in two whorls. Stamens 8 ; staminodes ovate, acute, hairy on the back. Ovary appressedly silky - pubescent. Berries c. 3 cm long, ovoid, bright yellow when ripe. Seeds solitary, ovoid, slightly compressed.

Fl. & Fr. : May September

Common on hills in rocky habitats ; Rajmahal R. F., Tordī R. F. and mataji temple.

The small, fragrant flowers are made into garlands. The ripe fruits are edible. The wood is valuable, and an oil is extracted from the seeds.

45. EBENACEAE

DIOSPYROS L.

Diospyros melanoxyton Roxb. Pl. Cor. 1 : 36. t. 46. 1795 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 3 : 564. 1882. *D. tupru* Buch. Ham. in Trans. Linn. Soc. 15 : 111. 1826 ; C. B. Clarke *l. c.* 3 : 563. 1882. *D. dubia* Wall. ex A. DC. in DC. Prodr. 8 : 223. 1848 ; Wight, Ic. 4 (1) : 9. t. 1223. 1848. *D. wightiana* Wall. ex DC. *l. c.* 223. 1848 ; Bedd. Fl. Sylv. t. 67. 1870, '*Tandu pata*, *Biri pata*' (Hindi).

Deciduous trees, 4 - 6 m ; bark dark grey ; young parts tomentose. Leaves sub - opposite or alternate, petiolate, up to 16.5×11.5 cm, ovate - elliptic or oblong - ovate, obtuse or retuse, margins subentire, pubescent beneath. Male flowers in short, drooping cymes, tomentose. Female ones solitary, rather longer than the males. Fruits c. 3.5×3.0 cm, ovoid or globose, glabrous, pubescent when immature, yellow when ripe ; fruiting calyx thickly coriaceous, lobes often reflexed with undulate margins. Seeds many, each c. 1.5×0.8 cm, oblong, often obliquely truncate at the apex, somewhat compressed, testa shining, rugose.

Fr. : August - February.

Commonly found in dry deciduous forest ; Toda Rai Singh.

The leaves are used for making bidis and the fruits are edible and sold in the market.

46. SALVADORACEAE

SALVADORA L.

Salvadora oleoides Decne. in Jacquem. Voy. Inde. 140. t. 144. 1844 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 3 : 620. 1882 ; Brand. For. Fl. N. W. India 316. t. 39. 1874 ; Duthie, Fl. Upper Gang. Pl. 2 : 29. 1911 (Repr. ed. 1 : 481. 1960) ; Mahesh. Illus. Fl. Delhi f. 119. 1966 ; Qureshi in Nasir & Ali, Fl. W. Pak. No. 29 : 3. f. 1 A D. 1972. '*Pilu, Jal*' (Hindi).

Trees or shrubs, 3 - 6 m, with short and twisted, whitish trunk. Leaves opposite, petiolate, up to 7.5 × 2.0 cm, linear - lanceolate, ovate - lanceolate or elliptic - lanceolate, acute or subobtuse, often mucronate, margins subentire. Flowers in erect, compact, axillary, paniculate spikes, white or cream, slightly fragrant. Calyx cup shaped with rounded lobes. Corolla lobes obovate or oblong, reflexed. Stamens exserted. Stigma peltate. Drupes c. 4.5 mm in diam., ovoid globose with persistent calyx, red when ripe, 1-seeded. Seeds c. 4 mm in diam., globose.

Fl. & Fr. : February - May.

Very common on sandy plains ; Ghati R. F.

The fruits are edible. Wood is used as fuel and the tender branches and leaves are used as fodder. Seeds yield an oil of medicinal value.

47. APOCYNACEAE

1a. Small trees ; calyx with glands or scales inside ; throat of corolla with 1 - 2 series of coronary scales ; base of seeds with deciduous coma ...

1b. Herbs or small shrubs ; calyx without glands or scales inside ; throat of corolla without coronary scales ; seeds not comose :

- 2a. Shrubs armed with spines ; nectary absent ; fruit a
fleshy berry ; seeds minutely pitted ... *Carissa* 1
- 2b. Unarmed herbs ; nectary of 2 erect glands ; fruit
of paired follicles ; seeds with muriccate ribs ... *Catharanthus* 2

1. *CARISSA* L. *nom. cons.*

Carissa congesta Wight, Ic. 4 (2) : 1. t. 1289. 1848. *C. carandus* auct. non L. 1767 ; Hook. f. Fl. Brit. Ind. 3 : 630. 1882, *pro parte* ; Duthie, Fl. Upper Gang. Pl. 2 : 31. 1911 (Repr. ed 1 : 483. 1960) '*Karuna*' (Hindi).

Evergreen shrubs, 2.0 - 2.5 m ; stem and branches with paired, straight, sharp spines up to 2 cm long. Leaves up to 6.5×4.5 cm, very variable in shape, elliptic, obovate or orbicular, obtuse or retuse, often mucronate, margins entire. Flowers in terminal, pedunculate, pubertulous, corymbose cymes, white or pinkish, Corolla tube 1.0 - 1.5 cm long, dilated at the top. Stamens 5, included. Stigma slightly penicillate at the apex. Berries c. 1.5×1.0 cm, ellipsoid, smooth, green, pigmented red, 4 or more seeded. Seeds peltately attached to the septum.

Fl. & Fr. : April August.

Rare ; found in rocky habitat ; Mataji temple at Tordi R. F., probably planted.

The fruits are sold in the market and are used as vegetable and for making pickle.

2. *CATHARANTHUS* G. Don

Catharanthus pusillus (Murr.) G. Don, Gen. Syst. 4 : 95. 1837 ; Mahesh. Illus. Fl. Delhi f. 120. 1966. *Vinca pusilla* Murr. Novi Comment. Soc. Regiae Sci. Gott. 3 : 66. t. 2. f. 1. 1773 ; Hook. f. Fl. Brit. Ind. 3 : 640. 1882. *Lochnera pusilla* K. Schum. in Engl. & Prantl, Nat. Pflanzenfam. 4 (2) : 145. 1895 ; Duthie, Fl. Upper Gang. Pl. 2 : 34. 1911 (Repr. ed. 1 : 485. 1960). '*Teanklo*' (Hindi).

Erect, glabrous herbs, 15 - 35 cm ; stem quadrangular. Leaves opposite, petiolate, up to 6.5×1.5 cm, lanceolate, base attenuate, apex acute or acuminate, margins subentire ; axillary glands numerous. Flowers axillary, solitary or in pairs, white. Calyx segments lanceolate subulate. Corolla tube 7 - 8 mm long, slightly dilated at the top ; mouth pilose within. Follicles c.

5.5×0.2 cm, linear, subtortulose, glabrous. Seeds c. 3×1 mm, cylindric, black.

Fl. & Fr. : July September.

Common weed in fallow fields ; Haji Ki - Kothi (Niwai).

3. WRIGHTIA R. Br.

- | | | |
|--|-----|-----------------------|
| 1a. Follicles laterally compressed, connate throughout, grooved at the junction ; corona 5 10, orange, broadly ovate, suborbicular or oblong | .. | <i>W. tomentosa</i> 2 |
| 1b. Follicles cylindric, distinct, connate at the apex only ; corona numerous, white, linear, laciniate | ... | <i>W. tinctoria</i> 1 |

1. *Wrightia tinctoria* R. Br. in Mem. Wern. Soc. 1 : 73. 1811 ; Wight, Ic. 2 (2) : 2. t. 444. 1841 ; Hook. f. Fl. Brit. Ind. 3 : 653. 1882 ; Duthie, Fl. Upper Gang. Pl. 2 : 38. 1911 (Repr. ed. 1 : 489. 1960). 'Khirni' (Hindi).

Deciduous trees, 3 7 m ; bark whitish grey ; latex milky. Leaves opposite, shortly petiolate, up to 15.0×6.5 cm, elliptic, elliptic - oblong, elliptic - lanceolate or obovate - oblong, base rounded, apex acuminate, rarely rounded or retuse, subentire, pubescent on both the sides. Flowers in lax, terminal, dichotomous cymes, white, sweet scented. Calyx pubescent outside. Corolla tube short ; lobes oblong, obtuse. Follicles up to 45 cm long, pendulous, paired, deep green with white tubercles. Seeds c. 2.0×0.3 cm, linear, glabrous, brown. Coma c. 7 cm long.

Fl. : April May ; *Fr.* : Greater part of the year.

Common in deciduous forests in rocky habitats ; Toda Rai Singh R. F. ; Bisalpura R. F. and Banetha forest.

Leaves yield a blue dye used by the local people. Seeds are often eaten.

It resembles the valuable medicinal plant *Holarrhena antidysenterica* (Roth) A. DC. in which the anthers are included in the corolla tube which are without a corona and the seeds have the coma at the apex. In *Wrightia tinctoria* R. Br. the anthers are exerted, coronary scales are present and the seeds bear the coma at the base.

2. **Wrightia tomentosa** Roem. & Schult. Syst. Veg. 4 : 414. 1819 ; Wight, Ic. 2 (2) : 2. t. 443. 1841 ; Hook. f. Fl. Brit. Ind. 3 : 653. 1882 ; Duthie, Fl. Upper Gang. Pl. 2 : 39. 1911 (Repr. ed. 1 : 490. 1960). *W. wallichii* A. DC. Prodr. 8 : 405 1844 ; Wight, Ic. 4 (2) : t. 1296. 1848. 'Dudhi, Indarjau' (Hindi).

Deciduous trees, 5 - 7 m ; bark whitish - grey ; latex milky ; younger parts densely tomentose. Leaves opposite, shortly petiolate, up to 12.0×6.5 cm, elliptic - oblong, ovate or ovate - oblong, base acute or rounded, acuminate, subentire. Flowers in terminal, corymbose cymes, creamish - yellow, slightly fragrant. Calyx pubescent outside. Corolla tube twice as long as calyx lobes ; lobes oblong, rounded. Follicles up to 20.0×1.8 cm. Seeds c. 1.5 cm long, linear, brown. Coma at the lower end c. 2.5 cm long, white.

Fl. & Fr. : May February.

Common on hills ; Toda Rai Singh R. F.

The bark of the stem and the roots are used as an antidote to snake-bite and the sting of scorpions. The wood is used for carving and turnery. The tender fruits are edible. The floss is used for stuffing.

Nerium indicum Mill. (*N. odorum* Soland.) 'Kaner' (Hindi).

Evergreen garden shrubs. Flowers showy, in terminal cymes, white, rosy red or pink, fragrant.

Plumeria rubra L. (*P. acutifolia* Poir.) 'Champa' (Hindi).

Small trees. Flowers white or creamish with a yellow centre, sweet-scented.

Native of America ; planted for ornamental purposes.

48. ASCLEPIADACEAE

1a. Plants climbing or twining ; seeds crenate or crenulate at the lower end :

2a. Inflorescence of corymbose cymes ; calyx glandular inside ; corona double, the inner spurred at the base, produced into the subulate horn incurved over the style apex ; follicles reflexed, echinate ...

Pergularia 4

- 2b. Inflorescence of umbellate cymes ; calyx eglandular inside ; corona single, neither spurred nor horned ; follicles erect, glabrous ... *Pentatropis* 3
- 1b. Plants erect ; seeds not crenate at the lower end :
- 3a. Latex milky ; calyx glandular inside ; corona single ; anthers with membranous appendages ; follicles ellipsoid or ovoid, obtuse ; seeds minutely tomentose ... *Calotropis* 1
- 3b. Latex yellowish ; calyx eglandular inside ; corona double ; anthers without membranous appendages ; follicles terete, lanceolate, tapering to a long beak ; seeds glabrous ... *Leptadenia* 2

1. CALOTROPIS R. Br.

Calotropis procera (Aiton) R. Br. in Aiton f. Hort. Kew. ed. 2. 2 : 78. 1811 ; Wight, Ic. 4 (1) : 17. t. 1278. 1848 ; Hook. f. Fl. Brit. Ind. 4 : 18. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 48. 1911 (Repr. ed. 1 : 498. 1960) ; Santapau & Irani in Univ. Bombay Bot. Mem. No. 4 : 19. 1962 ; Mahesh. Illus. Fl. Delhi f. 124. 1966. *Asclepias procera* Aiton, Hort. Kew. ed. 1. 1 : 305. 1789. 'Aak, Aakra, Madar' (Hindi).

Evergreen, glaucous shrubs or small trees, 2 - 4 m ; latex milky. Leaves opposite, up to 18 × 12 cm, decussate, subamplexicaul, acute or acuminate, entire. Flowers in terminal and axillary, corymbose cymes, violet, pale pink or purple, pale shining silvery outside. Corona lobes compressed, exceeding the staminal column, obscurely bifid at the apex and with an upcurved spur at the base. Follicles in pairs, c. 7.5 × 3.0 cm. Seeds c. 8 × 5 mm, broadly ovate, flattened, thin - margined, pale brown. Coma up to 4 cm long, silky - white.

Fl. & Fr. : Almost throughout the year.

Common in wastelands and fallow fields near villages throughout the district.

Floss is used for stuffing purposes and the latex is highly medicinal.

2. LEPTADENIA R. Br.

Leptadenia pyrotechnica (Forssk.) Decne. in Ann. Sci. Nat. ser. 2. 9 : 269. 1838 ; Santapau & Irani in Univ. Bombay Bot. Mem. No. 4 : 59. 1962 ; Mahesh. Illus. Fl. Delhi f. 128. 1966. *Cynanchum pyrotechnicum* Forssk. Fl. Aegypt. Arab. 53. 1775. *Leptadenia spartium* Wight, Contrib. 48. 1834 ; Hook. f. Fl. Brit. Ind. 4 : 64. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 63. 1911 (Repr. ed. 1 : 511. 1960). 'Khip, Khimp' (Hindi).

Glaucous, much branched, nearly leafless, bushy undershrubs or shrubs, 1-2 m. Leaves sessile, present only on young shoots. Flowers in lateral, umbellate cymes. Calyx cupular, pubescent, ciliolate on the margins. Corolla deeply divided, rotate, pubescent. Follicles up to 15 cm long. Seeds c. 6 mm long, ovate-lanceolate, flattened, margined. Coma c. 3.5 cm long, silky-white.

Fl. : October - January ; *Fr.* : March - May.

Common on low sand dunes ; Tordi R. F.

Plants are used for making huts ; stem fibres are used for making ropes.

3. PENTATROPIS Wight & Arn.

Pentatropis spiralis (Forssk.) Decne. in Ann. Sci. Nat. ser. 2. 9 : 327. t. 11. 1838 ; Hook. f. Fl. Brit. Ind. 4 : 19. 1883 ; Santapau & Irani in Univ. Bombay Bot. Mem. No. 4 : 70. 1962 ; Basu, Ind. Med. Pl. t. 622 A. 1918. *Asclepias spiralis* Forssk. Fl. Aegypt. Arab. 49. 1775. *Pentatropis cynanchoides* R. Br. in Salt. Voy. Abyss. Append. 64. 1814 ; Duthie, Fl. Upper Gang. Pl. 2 : 52. 1911 (Repr. ed. 1 : 501. 1960).

Perennial twiners with watery sap. Leaves opposite, petiolate, up to 4.5 × 3.2 cm, ovate or ovate-lanceolate, cordate or narrowed at the base, acute, acuminate or rounded at the apex, entire. Flowers greenish-yellow with purple patches at the base within. Calyx deeply divided, sparsely pubescent. Corolla divided almost to the base; the lobes narrowly linear from a triangular base, pubescent within, the apex often curled. Corona

lobes shorter than column, deltoid ovate, acute. Follicles *c.* 8.0 × 1.5 cm, lanceolate, tapering to a beak. Seeds ovate, flattened. Coma *c.* 2.5 cm long.

Fl. & Fr. : August - November.

Not common ; found on loamy soil ; Tordi Sagar dam.

4. PERGULARIA L.

Pergularia daemia (Forssk.) Chiov. Result. Sc. Miss. Stefan. - Paoli Somal. Ital. 1 : 115. 1916 ; Blatt. & McC. in Journ. Bombay Nat. Hist. Soc. 36 : 528. 1933 ; Santapau & Irani in Univ. Bombay Bot. Mem. No. 4 : 74. 1962. *Asclepias daemia* Forssk. Fl. Aegypt. - Arab. 51. 1775. *Daemia extensa* (Jacq.) R. Br. in Mem. Wern. Soc. 1 : 50. 1811 ; Wight, Ic. 2 (3) : 7. t. 596. 1842 ; Hook. f. Fl. Brit. Ind. 4 : 20. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 52. 1911 (Repr. ed. 1 : 501. 1960). 'Aakasan' (Hindi).

Perennial, hispid climbers ; latex milky. Leaves opposite, long - petioled up to 6 × 7 cm, broadly ovate, deeply cordate, acuminate, subentire, almost pubescent on both the surfaces. Flowers pale green or greenish - white. Calyx lobes ovate lanceolate, pubescent. Corolla campanulate. Follicles paired, *c.* 6.0 × 1.2 cm, lanceolate, attenuated into a long beak, softly echinate. Seed *c.* 7.0 × 3.5 mm, ovate, truncate at the apex, densely velvety pubescent all over. Coma up to 3 cm long, silky white.

Fl. & Fr. : Almost throughout the year.

Common ; Aamli R. F. (Aligarh).

49. PERIPLOCACEAE

CRYPTOSTEGIA R. Br.

Cryptostegia grandiflora R. Br. in Edwards, Bot. Reg. 5. t. 435. 1820 ; Wight, Ic. 3 (2) : 3. t. 832. 1844 45 ; Hook. f. Fl. Brit. Ind. 4 :

6. 1883 ; Santapau & Irani in Univ. Bombay Bot. Mem. No. 4 : 93. 1962 ; Raizada, Suppl. Fl. Upper Gang. Pl. 152. 1976. '*Chabuk - Chari, Rubberki Bel*' (Hindi).

Large, evergreen, straggling, scandent or climbing, woody shrubs with milky latex. Leaves opposite, petiolate, up to 10×6 cm, elliptic or oblong, acuminate, obtuse or retuse at the apex, margins undulate. Flowers in terminal, di - or trichotomous cymes, pale purple or pink, showy. Calyx 5 lobed. Corolla funnel shaped, with 5 corolline appendages. Follicles paired, *c.* 13.0 × 2.8 cm, divaricate, boat shaped, woody, angled or winged. Seeds *c.* 0.8 cm long, oblong ovate, compressed, rugose. Coma *c.* 2.5 cm long, silky white.

Fl. & Fr. : Almost throughout the year.

Common in moist, shaded habitats ; Banas river bed at Sopari village (Tonk).

50. GENTIANACEAE

ENICOSTEMA Blume *nom. cons.*

Enicostema hyssopifolium (Willd.) Verdoorn in *Bothalia* 7 : 462. 1961 ; Mahesh. *Illus. Fl. Delhi* f. 129. 1966. *Exacum hyssopifolium* Willd. *Sp. Pl.* 1 : 640. 1798. *Enicostema littorale* Blume, *Bijdr.* 848. 1826 ; C.B. Clarke in *Hook. f. Fl. Brit. Ind.* 4 : 101. 1883 ; Duthie, *Fl. Upper Gang. Pl.* 2 : 73. 1911 (Repr. ed. 1 : 519. 1960). *Adenema hyssopifolium* G. Don, *Gen. Syst.* 4 : 201. 1837 ; Wight, *Ic.* 2 (3) : 8. t. 600. 1842. '*Chota - Chirietta*' (Hindi).

Erect, perennial, glabrous herbs, 20 - 40 cm, branched from the base ; stem subquadrangular, ridges often denticulate. Leaves opposite, variable, up to 7×2 cm, ovate, ovate lanceolate, linear or elliptic - oblong, 3 - nerved from the base, denticulate or subentire. Flowers in axillary clusters, white. Corolla tubular, lobes lanceolate. Stamens inserted at the middle ; filaments filiform with a small, double - hooded, scaly gland at the base. Stigma 2 - lobed. Capsules *c.* 4.0 × 2.5 mm, apiculate, with persistent calyx lobes. Seeds many, *c.* 0.5 mm across, subglobose, foveolate, brown.

Fl. & Fr. : July November.

Common near marshy habitats ; Siras R. F. and Gauri village near Rajmahal R.F.

51. MENYANTHACEAE

NYMPHOIDES J. Hill

Nymphoides indica (L.) Kuntze, Revis. Gen. Pl. 429. 1891 ; Subram. Aquat. Angiosp. 24. pl. 2. f. 17. 1962. *Menyanthes indica* L. Sp. Pl. 145. 1753. *Limnanthemum indicum* (L.) Griseb. emend. Thwaites, Enum. 205. 1860 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 131. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 79. 1911 (Repr. ed. 1 : 525. 1960).

Rhizomatous, floating aquatic herbs. Leaves up to 6.0 × 7.5 cm, suborbicular, deeply cordate, subentire ; petiole up to 15 cm long. Flowers in clusters at the base of petiole, pedicellate, white with yellow centre. Sepals free, ovate - lanceolate, acute. Corolla lobes oblong, obtuse, fimbriate. Stamens 5. Stigma 2 - lobed.

Fl. : February March.

Rare ; Banas river near Bisalpura.

52. BORAGINACEAE (Including EHRETIACEAE)

1a. Trees or shrubs :

2a. Calyx tubular, teeth usually 5 ; filaments hairy at the base ; style 4 - fid or twice forked ; endocarp unlobed ... *Cordia* 3

2b. Calyx 4 - 5 partite ; filaments glabrous ; style 2 - fid or once forked ; endocarp 2 - 4 - lobed ... *Ehretia* 4

1b. Herbs or undershrubs :

- 3a. Calyx 8.0 - 12.0 × 3.5 - 5.5 mm ; anthers tomentose, apices subulate and contorted ... *Trichodesma* 7
- 3b. Calyx less than 6 × 2 mm ; anthers glabrous, apices obtuse, apiculate or with a small disc, not subulate or contorted :
- 4a. Style arising from between the carpels :
- 5a. Plant clothed with short, stiff, pointed, appressed hairs with tuberculate bases; flowers white ; corolla throat densely hairy ; style undivided ; stigma one ... *Sericostoma* 6
- 5b. Plant clothed with stout, pungent, spreading hairs with tuberculate bases and with soft, non - pungent, non-tuberculate hairs ; flowers yellow ; corolla throat glabrous; style 2 - partite; stigmas two *Arnebia* 1
- 4b. Style when present terminal on the entire ovary, not inserted between the carpels :
- 6a. Flowers spicate ; style one, originating in a fleshy, annular ring; stigma conical ... *Heliotropium* 5
- 6b. Flowers solitary ; styles two, without fleshy, annular ring ; stigma capitate... *Coldenia* 2

1. ARNEBIA FORSSK.

Arnebia hispidissima (Lehm.) A. DC. in DC. Prodr. 10 : 94. 1846 ; Wight, Ic. 4 (2) : 17. t. 1393. 1848 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 176. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 97. 1911 (Repr. ed. 1 : 541. 1960) ; Mahesh. Illus. Fl. Delhi f. 135. 1966 ; Kazmi in Journ. Arnold Arb. 52 : 489. 1971. *Lithospermum hispidissimum* Lehm. Icon. Descr. Nov. Strip. t. 39. 1823. 'Ratanjot, Ram - Bui' (Hindi).

Deep rooted, decumbent or erect herbs. Leaves sessile, up to 8.0 × 0.8 cm, linear - lanceolate to lanceolate, acute or subacute. Flowers in secund, many flowered spikes. Calyx segments divided up to the base, unequal. Corolla tubular, densely villulose outside ; lobes oblong, obtuse. Nutlets 4, ovoid - conic, acute, tuberculate.

Fl. & Fr. : Almost throughout the year.

A xerophytic herb found on low sand dunes and sandy plains ; Bentheli village.

The roots yield a purple dye.

2. COLDENIA L.

Coldenia procumbens L. Sp. Pl. 125. 1753 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 144. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 88. 1911 (Repr. ed. 1 : 532. 1960) ; Mahesh. Illus. Fl. Delhi f. 131. 1966 ; Kazmi in Journ. Arnold Arb. 51 : 148. 1970. '*Tripankhi*' (Hindi).

Hairy herbs ; rootstalk woody. Leaves alternate, petiolate, up to 2.5 × 1.5 cm, obovate oblong. Flowers yellowish - white or white. Corolla lobes 4, oblong, rounded. Stigma capitate. Fruits c. 2 mm long, 4 lobed pyramid, separating into 4, 1 seeded, beaked, muriculate pyrenes.

Fl. : February May ; *Fr.* : June November.

Common near dam sites ; Tordi Sagar.

3. CORDIA L.

- | | |
|---|-----------------------|
| 1a. Leaves alternate, broadly elliptic, ovate, obovate or sub-
orbicular ; seeds lenticular. ... | <i>C. dichotoma</i> 1 |
| 1b. Leaves opposite or subopposite, oblong or oblanceolate ;
seeds ovoid ... | <i>C. gharaf</i> 2 |

1. **Cordia dichotoma** Forst. f. Prodr. 18. 1786 ; Kazmi in Journ. Arnold Arb. 51 : 141. 1970. *C. obliqua* Willd. Phytogr. 4. t. 4. 1794 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 137. 1883. excl. var. '*Lasoorā, Lasua, Bara Gunda*' (Hindi).

Deciduous trees, c. 8 m ; bark grey. Leaves up to 10 × 7 cm, undulate or subentire, scabrous when old, softly pubescent beneath when young. Flowers in lax, terminal or axillary, pedunculate, cymose inflorescence, white. Corolla lobes 5, recurved. Filaments hairy below. Drupes c. 1.5 cm long, ovoid, apiculate, yellow or pink when ripe, surrounded by accrescent, irregularly toothed calyx. Seeds c. 1 cm across, stony, rugose.

Fl. : February April ; *Fr.* : May - July.

Commonly planted along road sides ; Tonk.

Fruits are edible and are used as vegetable and also for preparing pickle.

2. *Cordia gharaf* (Forssk.) Ehrenb. ex Aschers. in Sitz. ber. Ges. Naturf. Freunde Berlin 1879 : 46. 1879 ; Johnston in Journ. Arnold Arb. 37 : 292. 1956 ; Kazmi in Journ. Arnold Arb. 51 : 140. 1970. *Cornus gharaf* Forssk. Fl. Aegypt. Arab. 99. 1775. *Cordia rothii* Roem. & Schult. Syst. Veg. 4 : 798. 1819 ; Wight, Ic. 4 (2) : 15. t. 1379. 1848 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 138. 1883 ; Duthie, Fl. Upper Gang.. Pl. 2 : 85. 1911 (Repr. ed. 1 : 530. 1960). 'Gundi, Gundia' (Hindi).

Erect trees, 3 - 8 m ; bark grey. Leaves up to 11.0 × 3.5 cm, rounded, retuse or mucronate at the apex, subentire, scabrous on both sides. Flowers in lax, terminal or axillary, short, paniculate corymbs, cream. Corolla lobes 5, reflexed. Filaments glabrous. Drupes c. 1.2 cm long, ovoid, apiculate, longitudinally striate, shining, orange, orange yellow or reddish-brown when ripe, surrounded by the persistent, saucer shaped, accrescent calyx. Seeds c. 8 mm long, stony, pale brown.

Fl. & Fr. : Almost throughout the year.

Rare ; found in rocky habitats ; Ghati R. F.

Fruits are edible ; bark is used for cleaning the teeth.

4. EHRETIA P. Br.

Ehretia aspera Roxb. Pl. Cor. 1 : 41. t. 55. 1796 ; Duthie, Fl. Upper Gang. Pl. 2 : 87. 1911 (Repr. ed. 1 : 532. 1960). *E. laevis* Roxb. var. *aspera* C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 142. 1883.

Shrubs or small trees, 3 - 5 m ; bark ashy grey ; younger branches downy. Leaves alternate, petiolate, variable, up to 7.5 × 4.0 cm, elliptic-obovate, elliptic or obovate, acuminate, acute, retuse or rounded at the apex, persistently hairy beneath and shortly hairy above. Flowers white, fragrant. Calyx lobes hairy outside, ciliate along the margins. Corolla lobes oblong, obtuse. Stigma capitate. Drupes c. 5 mm across, depressed globose, orange when mature, blackish and wrinkled when dry.

Fl. & Fr. : March - May.

Common tree of deciduous forests ; Aamli R.F. and Sohela R.F.

5. HELIOTROPIUM L.

- 1a. Plants glabrous ; corolla glabrous ... *H. curassavicum* 1
- 1b. Plants hairy ; corolla hairy :
- 2a. Calyx divided up to 1/4 of their length ; fruits completely enclosed by the calyx ... *H. supinum* 5
- 2b. Calyx divided nearly to the base ; fruits not completely enclosed by the calyx :
- 3a. Leaves obovate, oblanceolate, elliptic, oblong-elliptic or ovate, 3 - 6 × 2 - 4 cm ; flowers ebracteate ; anthers free ; style absent or inconspicuous :
- 4a. Calyx lobes very unequal ; corolla lobes acute with intermediate teeth, tube hairy on both sides ; nutlets appressed hairy on the back ... *H. ovalifolium* 3.
- 4b. Calyx lobes almost equal ; corolla lobes rounded, without intermediate teeth, tube glabrous inside, hairy outside ; nutlets minutely verrucose, finely puberulus ... *H. ellipticum* 2.
- 3b. Leaves lanceolate or linear - lanceolate, less than 2.0 × 0.2 cm ; flowers distinctly bracteate ; anthers connate by their produced connectives ; style distinct ... *H. strigosum* 4.

1. **Heliotropium curassavicum** L. Sp. Pl. 130. 1753 ; Mahesh. & Sharma in Bull. Bot. Surv. India 11 : 455. 1972 ; Kazmi in Journ. Arnold Arb. 51 : 178. 1970 ; Raizada, Suppl. Fl. Upper Gang. Pl. 158. 1976.

Prostrate or decumbent, halophytic herbs. Leaves fleshy, subopposite, sessile, up to 4 × 1 cm, elliptic, elliptic - lanceolate, oblanceolate or linear-lanceolate, cuneate, margins irregular. Flowers in pedunculate, scropioid spikes, white. Calyx lobes subequal. Corolla lobes obtuse, crisped at the margins. Style very short. Nutlets 4, each c. 2 mm long, rounded on the back, rugulose, glabrous, pale brown.

Fl. & Fr. : Almost throughout the year.

Commonly found in saline, marshy habitats ; Mavasi river bed along Tonk Malpura road near Natra village.

Native of West Indies and Tropical America now spread throughout the tropical and subtropical regions of both hemispheres.

2. **Heliotropium ellipticum** Ledeb. in Eichw. Pl. Nov. 10. t. 4. 1831 33 ; Kazmi in Journ. Arnold Arb. 51 : 177. 1970. *H. eichwaldii* Steud., Nomencl. Bot. ed. 2. 1 : 744. 1840 - 41 ; DC. Prodr. 9 : 535. 1845 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 149 1883 ; Duthie, Fl. Upper

Gang. Pl. 2 : 92. 1911 (Repr. ed. 1 : 536. 1960) ; Basu, Ind. Med. Pl. t. 652 A. 1918. 'Kameda' (Hindi).

Erect herbs, 25 - 80 cm, clothed with bulbous - based hairs ; rootstalk woody. Leaves up to 6×4 cm, elliptic - oblong, ovate or obovate, sub-entire. Flowers in binate or trinate, scorpioid spikes, white. Stigma conical, hairy. Nutlets 4, each c. 1.5 mm long, ellipsoid.

Fl. & Fr. : September - May.

Common weed in wastelands, fallow fields and in dried up tanks ; Haji-Ki-Kothi and Niwai.

3. *Heliotropium ovalifolium* Forssk. Fl. Aegypt. - Arab. 38. 1775; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 150. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 92. 1911 (Repr. ed. 1 : 536. 1960) ; Kazmi in Journ. Arnold Arb. 51 : 178. 1970. *H. coromandelianum* Retz. Obs. Bot. 2 : 9. 1781 ; Wight, Ic. 4 (2) : 17. t. 1388. 1848.

Erect, decumbent or prostrate, perennial herbs ; rootstalk woody. Leaves alternate to subopposite, petiolate, up to 3.5×3.0 cm, margins subentire. Flowers in forked, scorpioid spikes, white. Stigma conical. Nutlets usually 4, each c. 1 mm long.

Fl. & Fr. : Almost throughout the year.

Common on moist sandy - clayey soil ; Tordi Sagar, Chand Sen bundha and Siras forest.

4. *Heliotropium strigosum* Willd. Sp. Pl. 1 : 743. 1798 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 151. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 93. 1911 (Repr. ed. 1 : 537. 1960) ; Kazmi in Journ. Arnold Arb. 51 : 152. 1970. 'Panachuni, Jhunkri' (Hindi).

Decumbent or prostrate, appressedly hairy, perennial herbs ; rootstalk woody. Leaves shortly petiolate, margins slightly revolute, entire. Flowers pedicellate or sessile, in axillary or terminal spikes, white. Calyx lobes subequal. Corolla hairy outside, throat yellow ; lobes broadly ovate, acute. Stigmatic ring conspicuous. Nutlets 4, each c. 2 mm. long with rounded back, appressedly hairy, surrounded by the enlarged calyx.

Fl. & Fr. : Almost throughout the year.

Common weed in cultivated and fallow fields and in dried up tanks ; Niwai tank.

5. *Heliotropium supinum* L. Sp. Pl. 130. 1753 ; Wight, Ic. 4 (2) : 17. t. 1387. 1848 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 149. 1883 ; Duthie,

Fl. Upper Gang. Pl. 2 : 91. 1911 (Repr. ed. 1 : 535. 1960) ; Mahesh. Illus. Fl. Delhi f. 132. 1966 ; Kazmi in Journ. Arnold Arb. 51 : 179. 1970. *H. malabaricum* Retz. Obs. Bot. 4 : 24. 1786. *H. supinum* L. var. *malabaricum* (Retz.) C.B. Clarke, l. c. 4 : 149. 1883. 'Talab Buti' (Hindi).

Prostrate, spreading, much branched, villous herbs. Leaves up to 2.5 × 1.5 cm, elliptic obovate, ovate or suborbicular, entire or crenate. Flowers in simple or forked, villous, scorpioid spikes, white. Corolla hairy outside ; lobes rounded. Style distinct ; stigma conical, apex hirsute. Nutlets 1 - 4, each c. 3 mm long, rounded on the back, margined, obscurely tuberculate, brown.

Fl. & Fr. : Almost throughout the year.

Common in dried up tanks ; Niwai.

6. SERICOSTOMA Stocks ex Wight

Sericostoma pauciflorum Stocks in Wight, Ic. 4 (2) : 15. t 1377. 1848; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 175. 1883 ; Kazmi in Journ. Arnold Arb. 51 : 181. 1970 ; Raizada, Suppl. Fl. Upper Gang. Pl. 159. 1976.

Deep rooted, erect or straggling, strigose undershrubs, 20 - 35 cm. Leaves sessile, up to 2.0 × 0.3 cm, linear - lanceolate or oblong lanceolate, subobtusate. Flowers bracteate, in 2 - 4 (-5) flowered racemes. Calyx segments subequal. Corolla lobes equal to the tube, strongly veined. Stamens inserted at the sinuses of the corolla lobes. Nutlets usually 2, ovoid, keeled on the ventral face, rounded on the back, tuberculate, surrounded by the enlarged, persistent calyx.

Fl. & Fr. : Almost throughout the year.

Common on low sand dunes and in sandy wastelands ; Bentheli and Siras village.

7. TRICHODESMA R. Br. *nom. cons.*

Trichodesma indicum (L.) Lehm. Pl. Asperif. Nucif. 193. 1818 (*indica*) ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 153. 1883 ; Duthie, Fl. Upper

Gang. Pl. 2 : 94 1911, *pro parte* (Repr. ed. 1 : 538. 1960) ; Basu, Ind. Med. Pl. t. 653 A. 1918 ; Kazmi in Journ. Arnold Arb. 52 : 516. 1971; Banerjee & Pramanik in Bull. Bot. Surv. India 17 : 110. 1978. *Borago indica* L. Sp. Pl. 137. 1753.

Erect or diffuse, much branched herbs or undershrubs with tubercle based hairs. Leaves opposite, crowded, sessile, up to 6.5×3.5 cm, ovate-oblong, lanceolate or linear lanceolate, base semiamplexicaul, margins revolute. Flowers solitary, leaf - opposed or in terminal, few flowered cymes, pale blue or sky - blue. Calyx lobes sagittate auriculate at the base. Corolla hairy inside ; lobes ovate with filiform apices and brownish glandular swellings at the base. Nutlets 4, each *c.* 5.5×3 mm, ovoid with rounded, smooth back and scabrous or rugose inner face, white, surrounded by the accrescent calyx.

Fl. & Fr. : August March.

Common in rocky habitats ; Tordi R. F.

The binominal *T. indicum* is often attributed to R. Br. (Prodr. 496. 1810) but he only stated that *Borago indica* L. belonged to *Trichodesma* and did not actually make the combination.

53. CONVULVULACEAE

- | | | |
|--|-----|----------------------|
| 1a. Styles 2 ; stigmas 4. ... | ... | <i>Evolvulus</i> 2 |
| 1b. Style 1 ; stigma 1 or 2 : | | |
| 2a. Pollen smooth : | | |
| 3a. Stigmas 2, linear or filiform ; corolla white or pink | ... | <i>Convolvulus</i> 1 |
| 3b. Stigmas biglobular, corolla bright yellow or white | ... | <i>Merremia</i> 4 |
| 2b. Pollen spinulose : | | |
| 4a. Corolla salver - shaped ; stigmas 2, linear-oblong, fruits woody, apiculate, indehiscent or irregularly dehiscent | ... | <i>Rivea</i> 5 |
| 4b. Corolla campanulate or funnel - shaped ; stigma capitate or biglobular ; fruits neither woody nor apiculate, dehiscing by valves | ... | <i>Ipomoea</i> 3 |

1. CONVULVULUS L.

- 1a. Leaves petiolate, broadly oblong, obtuse or retuse, base hastate or sagittate ; sepals glabrous ; seeds glabrous ... *C. arvensis* 1
- 1b. Leaves sessile, ovate lanceolate or lanceolate, acuminate, narrowed to the base ; sepals densely hairy ; seeds pubescent ... *C. prostratus* 2

1. **Convolvulus arvensis** L. Sp. Pl. 153. 1753 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 219. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 106. 1911 (Repr. ed. 1 : 548. 1960) ; Ooststr. in Blumea 3 : 283. 1939 & in Fl. Males. I. 4 : 437. 1953 ; Mahesh. Illus. Fl. Delhi f. 146. 1966 ; Ghazanfar in Nasir & Ali, Fl. W. Pak. No. 126 : 28. f. 4 H. 1979. '*Hirankhur*' (Hindi).

Creeping or twining, perennial herbs. Leaves up to 5.5 × 2.0 cm. Flowers bracteate, axillary, solitary or 2-3 on a long peduncle, pale pink. Sepals unequal. Corolla campanulate. Capsules c. 5 × 4 mm, ovoid-globose, glabrous, with persistent calyx and style base, 4 seeded. Seeds subtrigonal, dark brown, black or reddish brown.

Fl. & Fr. : November - March.

Common weed in cultivated fields ; Deoli.

2. **Convolvulus prostratus** Forssk. Fl. Aegypt. - Arab. 203. 1775 ; Ghazanfar in Nasir & Ali, Fl. W. Pak. No. 126 : 23. f. 3 D-G. 1979. *C. microphyllus* Sieb. ex Spreng. Syst. Veg. 1 : 611. 1825 ; Wight, Ic. 4 (2) : 13. t. 1367. 1848 ; Mahesh. Illus. Fl. Delhi f. 147. 1966. *C. pluricaulis* Choisy, Convolv. Orient. in Mem. Soc. Phys. Hist. Nat. Geneve. 6 : 477. 1834 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 218. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 105. 1911 (Repr. ed. 1 : 547. 1960). *C. pluricaulis* Choisy var. *macra* C.B. Clarke, l. c. 4 : 218. 1883. '*Santari*' (Hindi).

Prostrate or suberect, fulvous villous, perennial herbs. Leaves up to 5.0 × 0.5 cm. Flowers bracteate, axillary, solitary or 2-3 together, sessile or on a short pedicel, pale pink or white. Sepals unequal. Corolla campanulate. Capsules c. 3.5 mm long, ellipsoid or subglobose, smooth, with persistent calyx, 4 seeded. Seeds ellipsoid, smooth, black.

Fl. & Fr. : Almost throughout the year.

Common in fallow fields and wastelands ; Bentheli village and Tordi R.F.

2. EVOLVULUS L.

Evolvulus alsinoides (L.) L. Sp. Pl. ed. 2 : 392. 1762 ; C.B. Clarke Hook. f. Fl. Brit. Ind. 4 : 220. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 10. 1911 (Repr. ed. 1 : 546. 1960) ; Ooststr. in Blumea 3 : 74. 1938 & in 1 Males. I : 4. 395. 1953 ; Mahesh. Illus. Fl. Delhi f. 136. 1966 ; Austin Nasir & Ali, Fl. W. Pak. No. 126 : 32. f. 5 A, B. 1979. *Convolvulus alsinoides* L. Sp. Pl. 157. 1753. 'Phooli' (Hindi).

Decumbent, much branched, pilose, perennial herbs. Leaves up 3.5×1.3 cm, ovate, elliptic - oblong or lanceolate, narrowed to rounded the base, acute, acuminate or obtuse and mucronate at the apex, entire. Flowers bracteate, axillary, solitary or 2-3 on a c. 4 cm long, filiform peduncle, blue. Sepals lanceolate, acuminate, pilose. Corolla rotate. Capsule c. 4 mm across, globular, 4 seeded. Seeds trigonously ovoid, glabrous dark brown.

Fl. & Fr. : August - November.

Common ; Kakor R. F.

A polymorphic species.

3. IPOMOEA L.

- 1a. Erect shrubs with milky latex ; midrib below with two small glands at the base of the leaf blade ; seeds comose atleast on margins ... *I. carnea* ssp. *fistulosa* 3
- 1b. Twining, trailing or prostrate herbs without milky latex ; leaf blade devoid of glands ; seeds glabrous or densely pubescent :
- 2a. Glabrous , aquatic or marshy plants ; stem fistular, spongy, rooting at the nodes ... *I. aquatica* 1
- 2b. Hairy, dry-land plants ; stem solid, not rooting at the nodes :
- 3a. Leaves white tomentose beneath, capsules hairy ... *I. arachnosperma* 2
- 3b. Leaves glabrous or hispid but not white - tomentose beneath ; capsules glabrous :

- 4a. Stem muricate; flowers ebracteate; sepals glabrous, awned; filaments hairy at the base; capsules more than 1.5 cm long ... *I. turbinata* 6
- 4b. Stem hispid, not muricate; flowers bracteate; sepals hispid, not awned; filaments glabrous; capsules less than 1 cm long :
- 5a. Peduncle very short, inconspicuous; bracts linear ... *I. sindica* 5
- 5b. Peduncle long and distinct; bracts foliaceous :
- 6a. Leaves palmately 5 - 9 - lobed ... *I. pes - tigridis* 4a
- 6b. Leaves entire or shallowly lobed ... *I. pes - tigridis* var. *capitellata* 4b

1. *Ipomoea aquatica* Forssk. Fl. Aegypt. - Arab. 44. 1775; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 210. 1883; Ooststr. in Blumea 3 : 528. 1940 & in Fl. Males. I. 4 : 473. f. 47, 48. 1953; Subram. Aquat. Angiosp. 27. f. 19. 1962; Mahesh. Illus. Fl. Delhi. f. 139. 1966; Austin in Nasir & Ali, Fl. W. Pak. No. 126 : 38. f. 5 C, D. 1979. *Ipomoea reptans* Poir. in Lam. Encycl. Suppl. 3 : 460. 1814, non *Convolvulus reptans* L. 1753; Duthie, Fl. Upper Gang. Pl. 2 : 114. 1911 (Repr. ed. 1 : 555. 1960). 'Jal - Bel' (Hindi).

Leaves variable, up to 9.0 × 4.5 cm, ovate - triangular or oblong-lanceolate, hastate or cordate at the base, acute or obtuse, subentire. Flowers bracteate, axillary, solitary or in few - flowered cymes, pale pink or purple; peduncle 3 - 7 cm long. Sepals subequal. Corolla funnel-shaped. Capsules ovoid to globose. Seeds densely soft pilose.

Fl. & Fr. : Almost throughout the year.

Common in tanks and marshy places; Banetha village.

The tender young shoots and leaves are used as vegetable by the local people.

2. *Ipomoea arachnosperma* Welw. Apont. Phyto Geogr. 588. 1858; Austin in Nasir & Ali, Fl. W. Pak. No. 126 : 39. f. 5 E, F. 1979. *I. pilosa* (Roxb.) Sweet, Hort. Brit. ed. 2. 289. 1827, non Houtt. 1777; Wight, Ic. 3 (2) : 3. t. 837. 1843 45; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 213. 1883; Duthie, Fl. Upper Gang. Pl. 2 : 114. 1911 (Repr. ed. 1 : 555. 1960).

Densely patently hairy herbs. Leaves up to 10.0×11.5 cm, obovate or cordate, acuminate or acute, entire or slightly lobed. Flowers in few-flowered, axillary cymes, dark pink or red. Calyx lobes lanceolate acuminate, setose. Corolla lobes acutely lobed, with hairy mid-petals. Capsules c. 8 mm long, ovoid or subglobose. Seeds c. 4 long, valvate pubescent, black.

Fl. & Fr. : August - November.

Common ; Tonk (*Maheshwari* 52955, LWG.)

3. *Ipomoea carnea* Jacq. Enum. Syst. Pl. 13. 1760. subsp. *fistulosa* (Mart. ex Choisy) D. Austin in Taxon 26 : 237. f. 2. 1977. *I. losa* Mart. ex Choisy in DC. Prodr. 9 : 349. 1845 ; Mahesh. Illus. Delhi f. 138. 1966 ; Raizada, Suppl. Fl. Upper Gang. Pl. 163. 1977. *I. Bhattacharyya* in Journ. Bombay Nat. Hist. Soc. 73 : 318. 1977. *I. ssicaulis* (Benth.) B. L. Robinson in Proc. Amer. Acad. Sci. 51 : 1916 ; Ooststr. in Blumea 3 : 569. 1940 & in Fl. Males I. 4 : 485. '*Basaram Buti*' (Hindi).

Shrubs, up to 2.5 m ; stem fistular. Leaves up to 22×12 cm, bilobely ovate or ovate-lanceolate, cordate or truncate at the base, acuminate subentire. Flowers bracteate, in axillary and terminal, many-flowered cymes showy, pale pink, lilac or purple. Sepals subequal, suborbicular or rounded with 5 nectaries between their bases. Stigma globular-capitate. Capsule c. 1.5 cm long, ovoid to subglobose, glabrous, with persistent calyx.

Fl. & Fr. : Throughout the year.

Common near streams, often cultivated as a hedge plant ; near temples.

A native of America now naturalised in many parts India.

4. a. *Ipomoea pes-tigridis* L. Sp. Pl. 162. 1753 ; Wight, Ic. 3 (t. 836. 1844 - 1845 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 204. 1847. Duthie, Fl. Upper Gang. Pl. 2 : 116. 1911 (Repr. ed. 1 : 557. 1960) ; Ooststr. in Blumea 3 : 504. 1940 & in Fl. Males. I. 4 : 467. f. 40. 1953 ; Mahesh. Illus. Fl. Delhi f. 143. 1966 ; Austin in Nasir & Ali, Fl. W. Pak. No.

46. 1979. *I. hepaticaefolia* L. l. c. 161. 1753. *I. pes-tigridis* L. var. *hepaticaefolia* (L.) C. B. Clarke, l. c. 4 : 204. 1883. 'Ghiabati' (Hindi).

Patently hairy herbs. Leaves compound, lobes up to 7×3 cm, oval to elliptic oblong or obovate, narrowed or attenuate at the base, acute or acuminate. Flowers in axillary heads on a long peduncle, pale pink or white ; bracts foliaceous. Sepals unequal, lanceolate, hairy. Capsules c. 1 cm long, ovoid, brown, 4 - seeded. Seeds c. 4 mm long, trigonous with distinct hilum, tomentose, whitish grey.

Fl. & Fr. : August October.

Common in wastelands ; Haji Ki Kothi (Niwai).

4b. *Ipomoea pes tigridis* L. var. *capitellata* C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 204. 1883.

It differs from the type only in having undivided, ovate - cordate, acute leaves.

Fl. & Fr. : August October.

Haji-Ki-Kothi (Niwai).

Forms intermediate between the type and var. *capitellata*, having slightly lobed leaves are quite common.

5. *Ipomoea sindica* Stapf in Kew Bull. 1894 : 346. 1894 ; Duthie, Fl. Upper Gang. Pl. 2 : 113. 1911 (Repr. ed. 1 : 554. 1960) ; Mahesh. Illus. Fl. Delhi f. 140. 1966. 'Rota balari' (Hindi).

Annual herbs. Leaves up to 6.5×4.0 cm, triangular - hastate or broadly ovate, base deeply cordate with rounded and often diverging lobes, acute or acuminate, subentire. Flowers in axillary, few flowered cymes, often solitary, shortly pedicellate, white. Capsules c. 8×8 cm, globose or ovoid, pale brown. Seeds c. 4 mm long, trigonous, minutely grey - velvety, black.

Fl. & Fr. : August November.

Common in gravelly/rocky habitats ; Kacha Bundha near Tonk.

It closely resembles *I. eriocarpa* R. Br. but the latter can be distinguished by the hispid capsules and glabrous seeds.

6. *Ipomoea turbinata* Lag. Gen. Sp. Pl. 10. 1816; Gunn in Brittonia 24 : 163. 1972; Austin in Nasir & Ali, Fl. W. Pak. No. 126 : 50. f. 6. H, I. 1979; *Convolvulus muricatus* L. Mant. 44. 1767. *Ipomoea muricata* (L.) Jacq. Pl. Hort. Schoenbr. 3 : 40. t. 323. 1798, non Cav. 1799; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 197. 1883; Ooststr. in Blumea 3 : 551. 1940 & in Fl. Males. I. 4 : 481. 1953. *Calonyction muricatum* (L.) G. Don, Gen. Syst. 4 : 264. 1838; Duthie, Fl. Upper Gang. Pl. 2 : 118. 1911 (Repr. ed. 1 : 559. 1960).

Perennial shrubs. Leaves up to 8 × 10 cm, ovate - cordate to suborbicular, acuminate or acute, subentire. Flowers axillary, solitary or in few-flowered cymes, pale purple. Sepale subequal. Capsules c. 1.8 × 1.5 cm, ovoid, apiculate, pale brown, 4 seeded. Seeds c. 1.0 × 0.5 cm, glabrous, blackish.

Fl. & Fr. : August - October.

Common on slopes of hills; Tonk (*Maheshwari* 52979, LWG).

4. MERREMIA Dennst. ex Endl. *nom. cons.*

- | | | |
|--|-----|------------------------|
| 1a. Twining or climbing, hirsute herbs; leaves palmately 5-lobed; flowers on a long peduncle, white; sepals densely hirsute; anthers spirally twisted; seeds trigonous. | ... | <i>M. aegyptia</i> 1 |
| 1b. Prostrate, glabrescent herbs; leaves simple; flowers subsessile or sessile, yellow; sepals fimbriate along the margins and more or less hairy on the back; anthers straight; seeds plano-orbicular | ... | <i>M. emarginata</i> 2 |

1. *Merremia aegyptia* (L.) Urban, Symb. Antill. 4 : 505. 1910; Ooststr. in Blumea 3 : 327. 1939 & in Fl. Males. I. 4 : 448. 1953; Mahesh. Illus. Fl. Delhi f. 144. 1966; Raizada, Suppl. Fl. Upper Gang. Pl. 164. 1976; Austin in Nasir & Ali, Fl. W. Pak. No. 126 : 54. f. 7 B, C. 1979. *Ipomoea aegyptia* L. Sp. Pl. 162. 1753. *Convolvulus pentaphylla* L. Sp. Pl. ed. 2. 223. 1762. *Ipomoea pentaphylla* (L.) Jacq. Collectanea 2 : 297. 1788; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 202. 1883. *Merremia pentaphylla* (L.) Hallier f. in Bot. Jahrb. 16 : 552. 1893; Duthie, Fl. Upper Gang. Pl. 2 : 110. 1911 (Repr. ed. 1 : 551. 1960). '*Ghiabel*' (Hindi).

Annuals. Lobes of leaves up to 8.5×4.5 cm, elliptic, subentire. Flowers bracteate, axillary, solitary, or 2 - 3 or more. Sepals unequal, ovate-lanceolate, acute. Corolla funnel shaped. Capsules 1.5 - 2.0 cm long, subglobose or ovoid, glabrous, papery, 4 - seeded. Seeds c. 5 mm long, shining, brown or black with white hilum.

Fl. & Fr. : September - November.

Common ; Kacha Bundha (Tonk).

Very variable in respect of hairyness and size of leaflets. It resembles *M. dissecta* (Jacq.) Hall. in which the sepals are glabrous, while in *M. aegyptia* (L.) Urban the sepals are hirsute.

2. *Merremia emarginata* (Burm. f.) Hallier f. Bot. Jahrb. 16 : 552. 1893 ; Duthie, Fl. Upper Gang. Pl. 2 : 109. 1911 (Repr. ed. 1 : 551. 1960). *Evolvulus emarginatus* Burm. f. Fl. Ind. 77. t. 30. f. 1. 1768. *Ipomoea reniformis* (Roxb.) Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6 : 446. 1834 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 206. 1883.

Perennials, rooting at nodes. Leaves up to 3×3 cm, reniform to broadly ovate, cordate at the base, obtuse, emarginate or rarely acute, roughly crenate or subentire. Flowers in bracteate, axillary, cymose clusters. Outer 2 sepals apiculate, inner 3 emarginate. Corolla tubular - campanulate. Capsules c. 4 mm across, subglobular, glabrous, 2 - 4 seeded. Seeds c. 2.5 mm across, glabrous, brown.

Fl. & Fr. : August - November.

Common in moist places ; Siras R.F.

5. RIVEA Choisy

Rivea hypocrateriformis (Desr.) Choisy in Mem. Soc. Phys. Hist. Nat. Geneve 6 : 408. 1834 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 184. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 119. 1911 (Repr. ed. 1 : 560. 1960) ; Mahesh. Illus. Fl. Delhi f. 137. 1966 ; Austin in Nasir & Ali, Fl. W. Pak. No. 126 : 60. f. 8 \bar{D} - F. 1979. *Convolvulus hypocrateriformis* Desr. in Lam. Encycl. 3 : 561 1792. 'Thor-ki-bel' (Hindi).

Large, woody, whitish grey - tomentose climbers. Leaves up to 6.5×9.0 cm, reniform - ovate or suborbicular, cordate at the base, shortly

acuminate, obtuse or retuse, entire, with a pair of glands at the base of lamina beneath. Flowers bracteate, axillary, 1 - 3 on a long peduncle, white or creamish - white. Sepals oblong ovate, obtuse, silky hairy. Corolla 7 - 9 cm long, caducous. Fruits *c.* 1.5 × 1.0 cm, subglobose or ovoid. Seeds *c.* 7.5 × 5.0 mm, trigonous with a distinct hilum, glabrous, brown.

Fl. & Fr. : August - November.

Common climber in forests ; Sohela R.F.

54. CUSCUTACEAE

CUSCUTA L.

Cuscuta reflexa Roxb. Pl. Cor. 2 : 3. t. 104. 1799 & Fl. Ind. ed. Carey 1. 446. 1832 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 225. 1883; Ooststr. in Fl. Males. I. 4 : 393. 1953 ; Santapau & Patel in Journ. Bombay Nat. Hist. Soc. 54 : 712. f. A 1 - 7. 1957 ; Duthie, Fl. Upper Gang. Pl. 2 : 100. 1911 (Repr. ed. 1 : 543. 1960). '*Amar - bel*' (Hindi).

Fleshy, leafless, glabrous, twining, stem parasites ; branches yellowish-green or pale green, forming dense masses on host trees and shrubs. Flowers bracteate, solitary, clustered or in racemes, white or creamish. Calyx cupulate, 5 partite, subequal. Corolla campanulate tubular, 2 - 3 times longer than the calyx lobes ; lobes reflexed ; base of corolla tube with fimbriate scales. Stamens 5. Stigmas 2, divergent. Capsules 5.5 - 8.0 mm in diam., depressed globose, conical at the apex, glabrous. Seeds 2 - 4, each *c.* 3.5 mm across, suborbicular, glabrous, minutely pitted, brownish - black.

Fl. & Fr. : November - March.

Common on *Ziziphus nummularia* (Burm. f.) Wight & Arn. ; Pachewar near Malpura.

55. SOLANACEAE

1a. Corolla rotate or broadly campanulate ; anthers connivent in a short cone, dehiscing by apical pores or short silt ...

Solanum 4

- 1b. Corolla tubular ; anthers free, dehiscent longitudinally :
- 2a. Spinous, glabrous shrubs ; flowers less than 1.5 cm long ; fruit a berry *Lycium* 2
- 2b. Unarmed, viscid - pubescent or tomentose herbs or undershrubs ; flowers more than 3 cm long ; fruit a capsule :
- 3a. Flowers in terminal racemes ; fruiting calyx completely enveloping the fruit, lobes straight; capsules smooth ... *Nicotiana* 3
- 3b. Flowers solitary ; fruiting calyx not enveloping the fruit, lobes recurved ; capsules spiny ... *Datura* 1

1. DATURA L.

Datura innoxia Mill. Gard. Dict. ed. 8. n. 5. 1768 ; Santapau in Journ. Bombay Nat. Hist. Soc. 47 : 659. 1948. *D. metel* L. Syst. Nat. ed. 10, 2 : 932. 1759, non 1753 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 243. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 131. 1911 (Repr. ed. 2 : 9. 1960). 'Daturu' (Hindi).

Erect, stout undershrubs, 1.0 - 1.5 m ; stem fistular, terete. Leaves alternate or subopposite, up to 20 × 12 cm, ovate lanceolate to broadly ovate, unequal at the base, acute or acuminate, entire or repand - dentate. Flowers axillary, pedicellate, white or dirty white. Calyx tubular, up to 11 cm long ; lobes acute. Corolla twice as long as the calyx ; limb 10-toothed. Stigma bilobed. Capsules c. 4 × 4 cm, ovoid to globose, deflexed. Seeds closely packed, c. 4 × 3 mm, subreniform, compressed, foveolate, yellowish brown.

Fl. & Fr. : Almost throughout the year.

Common weed of fallow fields and wastelands ; Ghati village.

This is a S. American plant, introduced into India and now almost naturalized. It is regarded as the most poisonous of all the species of *Datura*.

2. LYCIUM L.

Lycium barbarum L. Sp. Pl. 192. 1753 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 241. 1883 ; Mahesh. Illus. Fl. Delhi f. 152. 1966 ; Bhandari,

Fl. Indian Desert 270. f. 99. 1978. *L. europaeum* auct. non L. 1753 ; C.B. Clarke, *l. c.* 4 : 240. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 129. 1911 (Repr. ed. 2 : 7. 1960). *L. indicum* Wight, Ic. 4 (2) : 19. t. 1403. 1848. 'Morali, Arak Mehandi' (Hindi).

Suberect or erect, glaucous shrubs, 1-3 m ; branches whitish, armed with sharp spines which sometimes elongate and bear leaves and flowers. Leaves subsessile, variable, up to 4.5 × 1.3 cm, oblong - lanceolate, lanceolate, oblong - spatulate or elliptic, attenuate, entire. Flowers pedicellate, solitary or in fascicles of up to 5, funnel - shaped, white. Filaments hairy at the base. Ovary seated on cup shaped disc. Stigma mushroom head like. Fruits *c.* 4 mm in diam., subglobose, bright red when ripe, with persistent calyx. Seeds many, discoid or subreniform, minutely pitted, yellowish - brown.

Fl. & Fr. : August - March.

Common in sandy habitats ; Padara village.

Berries are eaten by the local people. The leaves and tender branches are used as fodder for camels and goats.

3. NICOTIANA L.

Nicotiana plumbaginifolia Viv. Elench. Pl. Hort. Dinagro 26. t. 5. 1802 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 246. 1883 ; Raizada, Suppl. Fl. Upper Gang. Pl. 170. 1976. 'Jangli Tambakoo' (Hindi).

Erect herbs, 15-40 cm. Leaves sessile or subsessile, basal rosette, up to 12.5 × 9.0 cm, spatulate, cuneate, acute to obtuse, margins wavy to subentire ; cauline leaves alternate, subamplexicaule, lanceolate, elliptic, ovate - lanceolate or ovate - elliptic, acuminate, scabridly hairy particularly on midvein. Flowers bracteate, purplish pink or pale pink. Corolla tube *c.* 3.5 cm long, ventricose. Stigma capitate, bilobed. Fruits *c.* 1.0 × 0.6 cm, ovoid - conical, pale brown. Seeds numerous, minute, subglobose, rugose, pale brown.

Fl. : April - May ; *Fr.* : October.

Common ; Banas river bed near Frazer bridge (Tonk).

An introduced weed from Mexico and West Indies.

4. SOLANUM L.

- 1a. Plant prickly ; berries yellow, c. 2 cm in diameter ... *S. surattense* 2
 1b. Plant not prickly ; berries black, blackish purple or red,
 c. 0.8 cm in diameter ... *S. nigrum* 1

1. *Solanum nigrum* L. Sp. Pl. 186. 1753 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 229. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 124. 1911 (Repr. ed. 2 : 2. 1960) ; Santapau in Journ. Bombay Nat. Hist. Soc. 47 : 652. 1948. *S. rubrum* Mill. Gard. Dict. ed. 8. n. 1768, non L. 1767 ; Wight, Ic. 2 (1) : 3. t. 344. 1840. 'Mokoi' (Hindi).

Erect or rambling, glabrous herbs, 50-75 cm. Leaves up to 10.5 × 6.0 cm, ovate or ovate-oblong, sinuate-toothed, lobed or entire, base cuneate, often decurrent. Flowers nodding, in extra-axillary umbellate cymes, white. Calyx 5-lobed, sparsely puberulus. Filaments hairy at the base. Berries glabrous. Seeds discoid, minutely pitted, yellow.

Fl. & Fr. : Almost throughout the year.

Common weed in cultivated fields ; Ghati village.

A highly polymorphic plant. It comprises diploid, tetraploid and hexaploid races.

2. *Solanum surattense* Burm. f. Fl. Ind. 57. 1768 ; Mahesh. Illus. Fl. Delhi f. 150. 1966. *S. xanthocarpum* Schrad. & Wendl. in Schrad. Sert. Hanov. 1 : 8. t. 2. 1795 ; C. B. Clarke, in Hook. f. Fl. Brit. Ind. 4 : 236. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 125. 1911 (Repr. ed. 2 : 3. 1960) ; Santapau in Journ. Bombay Nat. Hist. Soc. 47 : 653. 1948. *S. jacquini* Willd. Sp. Pl. 1 : 1041. 1797 ; Wight, Ic. 4 (2) : 18. t. 1401. 1848. 'Ringani, 'Oonth Kateli' (Hindi).

Prostrate, decumbent ascending or diffuse perennials ; stem with many, compressed, straight, yellow, shining prickles up to 1.8 cm long. Leaves up to 10.0 × 7.5 cm, ovate-elliptic to oblong, pinnately lobed or sinuate, the midrib and often the main lateral nerves armed with long prickles. Flowers 1-5, in extra-axillary cymes, deep violet or purple, rarely white. Calyx prickly and stellately hairy outside. Berries globose. Seeds discoid, minutely pitted, pale brown.

Fl. & Fr. : Almost throughout the year.

Very common weed in wastelands and in fallow fields throughout the district.

56. SCROPHULARIACEAE

- 1a. Perfect stamens 2 :
- 2a. Flowers in lax, axillary racemes ; corolla 4 - lobed, rotate ... *Veronica* 10
- 2b. Flowers solitary, in pairs or 1 - 3 - nate ; corolla subequally 5 lobed or 2 - lipped with 5 unequal lobes :
- 3a. Erect herbs; flowers in distant pairs, bracteate ; 2 lipped ... *Dopatrium* 2
- 3b. Prostrate herbs ; flowers solitary or 1 - 3 - nate, ebracteate ; corolla subequally 5 - lobed :
- 4a. Calyx 3 - lobed ; anthers 2 - celled ; seeds ovoid, smooth ... *Glossostigma* 3
- 4b. Calyx 5 - toothed ; anthers 1 - celled ; seeds angular, oblong, truncate at both ends, obscurely striate ... *Peplidium* 6
- 1b. Perfect stamens 4, didynamous :
- 5a. Herbaceous root - parasites ; calyx distinctly ribbed ; corolla tube abruptly incurved at or above the middle ... *Striga* 8
- 5b. Non parasitic herbs ; calyx not ribbed ; corolla tube straight :
- 6a. Leaves alternate, lower usually lobed or pinnatifid ; filaments pubescent or bearded :
- 7a. Twining, procumbent or diffuse, villous herbs ; flowers solitary ; corolla 2 - lipped, spurred ; anthers 2 celled ; seeds echinulate ... *Kickxia* 4
- 7b. Erect, glandular pubescent herbs ; flowers in lax racemes ; corolla rotate, not spurred ; anthers 1 - celled ; seeds warted. *Verbascum* 9
- 6b. Leaves opposite, not lobed ; filaments glabrous :
- 8a. Erect, glandular - pubescent, dry land herbs ; corolla 2 - lipped ; anther cells stipitate ; seeds alveolate or reticulate :
- 9a. Aromatic herbs ; flowers dark blue or violet ; stamens included ; capsules glabrous ... *Stemodia* 7
- 9b. Non aromatic herbs ; flowers yellow ; stamens exerted ; capsules pubescent ... *Lindenbergia* 5
- 8b. Prostrate, succulent, glabrous, marsh - land herbs ; corolla not 2 - lipped ; anther cells not stipitate ; seeds longitudinally striate ... *Bacopa* 1

1. BACOPA Aubl. *nom. cons.*

Bacopa monnieri Wettstein in Engl. & Prantl, Nat. Pflanzenfam. 4 (3b) : 77. 1891 ('*monniera*'); Pennell in Proc. Acad. Nat. Sci. Philad. 98 : 94. 1946 ; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 133. 1956 ; Philcox in Kew Bull. 33 : 679. 1979. *Lysimachia monnieri* L. in Torner Cent. 2 : 9. 1756. *Moniera cuneifolia* Michx. Fl. Bor. - Amer. 2 : 22. 1803 ('*Monniera*'); Duthie, Fl. Upper Gang. Pl. 2 : 142. 1911 (Repr. ed. 2 : 17. 1960). *Herpestis monniera* (L.) Kunth, Nov. Gen. & Sp. 2 : 366. 1818, *nom. illegit.* ; Hook. f. Fl. Brit. Ind. 4 : 272. 1884. '*Jallep*' (Hindi).

Herbs, rooting at nodes. Leaves sessile, up to 2.2 × 0.7 cm, obovate-oblong or spatulate, subentire. Flowers bracteate, axillary, solitary, on a long pedicel, pale purplish blue, purple violet, purplish pale pink, purplish white or white. Calyx lobes 5, free, unequal. Corolla campanulate ; lobes 5, subequal. Capsules c. 0.6 mm long, ovoid, acute, pale brown. Seeds many, each c. 0.5 mm long, oblong or globose, pale brown.

Fl. & Fr. : Almost throughout the year.

Common in marshy/aquatic habitats ; Niwai, Uniyara river bed and Banas river bed near Banetha.

For the nomenclature of this species reference may be made to Philcox (*l. c.*).

2. DOPATRIUM Buch. Ham. ex Benth.

Dopatrium junceum (Roxb.) Buch. Ham. ex Benth. Scroph. Ind. 31. 1835 ; Hook. f. Fl. Brit. Ind. 4 : 274. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 147. 1911 (Repr. ed. 2 : 22. 1960) ; Pennell in Acad. Nat. Sci. Philad. Monogr. 5 : 24. 1943 ; Chatterjee & Bharadwaja in Bull. Bot. Soc. Beng. 9 : 135. 1956. *Gratiola juncea* Roxb. Pl. Cor. 2 : 16. t. 129. 1800.

Fleshy, glabrous annuals, 10 - 30 cm ; stem red. Leaves opposite, sessile, up to 2.0 × 0.5 cm, obovate or oblong, acute or obtuse, entire. Flowers axillary, dark pink ; lower flowers sessile, upper ones on long, filiform pedicel. Calyx 5 partite. Stigma 2 lamellate. Capsules c. 2 mm across, globose. Seeds many, each c. 0.5 mm long, oblong or ellipsoid, tuberculate, pale blackish brown.

Fl. & Fr. : August November.

An ephemeral plant found in marshy places ; tank near Rampura village.

3. GLOSSOSTIGMA Wight & Arn. ex Arn. *nom. cons.*

Glossostigma diandrum (L.) Kuntze, Revis. Gen. Pl. 461. 1891. *Limosella diandra* L. Mant. Alt. 252. 1771. *Microcarpaea spathulata* W. Hook. Bot. Misc. 2 : 101. Suppl. t. 4. 1831. *Glossostigma spathulatum* (W. Hook.) Wight & Arn. ex Arn. in Nov. Act. Acad. Caes. Leop. - Carol. Nat. Cur. 18 : 355. 1836 ; Hook. f. Fl. Brit. Ind. 4 : 288. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 152. 1911 (Repr. ed. 2 : 27. 1960) ; Pennell in Acad. Nat. Sci. Philad. Monogr. 5 : 36. 1943 ; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 133. 1956.

Tufted, glabrous, delicate herbs, rooting at nodes. Leaves membranous, opposite, subsessile or petiolate, up to 7.0×1.5 mm, linear - spathulate, entire. Flowers minute, axillary, solitary, pale pink or bluish - white. Calyx campanulate. Stigma spathulate. Capsules 2.0×2.5 mm, globose, enclosed in the enlarged calyx. Seeds many, pale brown.

Fl. & Fr. : October- February.

Very common in moist, marshy and aquatic situations ; Rampura village.

It is the tiniest plant of the family.

4. KICKXIA Dum.

Kickxia ramosissima (Wall.) Janch. in Oest. Bot. Zeist. 82 : 152. 1933 ; Pennell in Acad. Nat. Sci. Philad. Monogr. 5 : 59. 1943 ; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 131. 1956 ; Mahesh. Illus. Fl. Delhi f. 153. 1966. *Linaria ramosissima* Wall. Pl. Asiat. Rar. 2 : 43. t. 153. 1831 ; Hook. f. Fl. Brit. Ind. 4 : 251. 1883 ; Duthie, Fl. Upper Gang. Pl. 2 : 140. 1911 (Repr. ed. 2 : 15. 1960).

Perennial herbs. Leaves petiolate, variable in shape and size, up to 3.0×3.5 cm ; lower leaves 5 - 7 lobed or triangular - hastate ; uppermost usually sagittate, acute. Flowers ebracteate, axillary, pedicellate, yellow.

Calyx 5, free. Stigma capitate. Capsules *c.* 3.5 mm long, ovoid, pale brown. Seeds *c.* 0.25 mm long, oblongish, black.

Fl. : August - January ; *Fr.* : February May.

Common in rock - crevices ; Toda Rai Singh R.F. and Kacha Bundha R.F., Tonk.

5. LINDENBERGIA Lehm.

Lindenbergia indica (L.) Vatke, Osterr, Bot. Zeitschr. 25 : 10. 1875 ; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 139. 1956 ; Mahesh. Illus. Fl. Delhi f. 154. 1966. *Dodartia indica* L. Sp. Pl. 633. 1753. *Lindenbergia urticaefolia* Lehm. in Link. & Otto, Ind. Sem. Hort. Hamburg. 1829 : 5. 1830 ; Hook. f. Fl. Brit. Ind. 4 : 262. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 160. 1911 (Repr. ed. 2 : 33. 1960). *L. polyantha* Royle ex Benth. Scroph. Ind. 22. 1835 ; Hook. f. *l. c.* 4 : 262. 1884 ; Duthie, *l. c.* 2 : 160. 1911 (Repr. ed. 2 : 33. 1960). 'Pili - Buti' (Hindi).

Erect or straggling, polymorphic herbs. Leaves petiolate, up to 10.5 × 6.5 cm, broadly ovate, ovate or elliptic, acute or subacute, crenate-serrate; upper leaves smaller and passing into bracts. Flowers axillary, sessile or pedicellate, solitary or in pairs. Calyx campanulate ; lobes 5. Stigma capitate. Capsules *c.* 6 mm long, slightly laterally compressed, beaked. Seeds many, each *c.* 0.5 mm long, oblong or ellipsoid, reticulate, brownish.

Fl. & Fr. : August - May.

Commonly found in rock crevices ; Tordi R. F., Kakor R. F. and Anwa R.F.

6. PEPLIDIUM Delile

Peplidium maritimum (L. f.) Wettst. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3b) : 78. 1891 ; Raizada & Sharma in Indian For. 88. 365. 1966 ; Raizada, Suppl. Fl. Upper Gang. Pl. 190. 1976. *Hedyotis maritima* L. f. Suppl. 119. 1781. *Peplidium humifusum* Delile, Fl. Egypte 148. t. 4. 1812 ; Hook. f. Fl. Brit. Ind. 4 : 287. 1884.

Succulent, glabrous herbs, rooting at nodes. Basal leaves rosulate, spatulate; upper opposite, up to 1.5×1.0 cm, obovate, spatulate or oval, entire; petiole scarious. Flowers solitary or 3 in axils. Stigma spatulate, recurved. Capsules 2.0 - 2.5 mm in diam., ovoid to globose, 2-grooved along the septa, surrounded by the persistent, enlarged, membranous calyx. Seeds many, minute, shining pale brown.

Fl. & Fr. : September - January.

Common in marshy habitats; Tordi Sagar.

7. *STEMODIA* L. *nom. cons.*

Stemodia viscosa Roxb. Pl. Cor. 2 : 33. t. 163. 1802; Wight, Ic. 4 (3) : 1. t. 1408. 1849; Hook. f. Fl. Brit. Ind. 4 : 265. 1884; Duthie, Fl. Upper Gang. Pl. 2 : 144. 1911 (Repr. ed. 2 : 20. 1960); Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 139. 1956.

Perennial herbs, up to 20 cm. Leaves sessile, up to 12.0×0.5 cm, oblong or obovate, auricled or amplexicaul at the base, acute, margins serrate or serrulate at the apex or subentire. Flowers bracteate, axillary, solitary or very rarely in few-flowered racemes. Calyx 5-partite, glandular-hairy and ciliate. Capsules c. 6 mm long, ovoid-oblong, acuminate, pale brown, enveloped by the persistent calyx. Seeds many, minute, ovoid or oblong-ellipsoid, alveolate, black.

Fl. & Fr. : January - May.

Rare; found in dried up tanks; Niwai tank.

8. *STRIGA* LOUR.

- 1a. Plants pink or reddish-pink, turning black when dry; leaves reduced to scales; calyx tube 4-ribbed, teeth 4 ... *S. gesnerioides* 2
 b1. Plants green, not turning black when dry; leaves not reduced to scales; calyx tube 15-ribbed, teeth 5 ... *S. angustifolia* 1

1. *Striga angustifolia* (D. Don) Saldanha in Bull. Bot. Surv. India 5 : 70. 1963. *Buchnera angustifolia* D. Don, Prodr. Fl. Nepal. 91. 1825.

B. euphrasioides auct. non Vahl, 1794 ; Benth. Scroph. Ind. 41. 1835. *Striga euphrasioides* sensu Benth. in Hook. Comp. Bot. Mag. 1: 364. 1836, excl. basionym ; Wight, Ic. 3 (2) : 5. t. 855. 1844 45 ; Hook. f. Fl. Brit. Ind. 4 : 299. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 157. 1911 (Repr. ed. 2 : 31. 1960) ; Pennell in Acad. Nat. Sci. Philad. Monogr. 5 : 96. 1943 ; Chatterjee & Bharadwaja in Bull. Bot. Soc. Bengal 9 : 152. 1956. 'Aggia' (Hindi).

Erect, scabrous herbs, 15 - 30 cm ; stem ribbed. Leaves usually alternate, sessile, up to 4.5×0.4 cm, linear to linear lanceolate, acute, entire or sub-entire. Flowers axillary, subsessile, solitary, forming lax, leafy, terminal spikes, white. Corolla 2 lipped ; throat hairy. Stamens included. Stigma capitate. Capsules c. 0.7 cm long, ovoid or ellipsoid, apiculate, glabrous. Seeds many, each 0.4 - 0.6 mm long, oblong, minutely reticulate, blackish.

Fl. & Fr. : August - October.

Common in fallow fields ; Rajmahal R. F.

It is a root parasite on grass species.

2. *Striga gesnerioides* (Willd.) Vatke, Oesterr. Bot Zeits. 25 : 11. 1875 ; Pennell in Acad. Nat. Sci. Philad. Monogr. 5 : 97. 1943 ; Chatterjee & Bharadwaja in Bull. Bot Soc. Bengal 9 : 151. 1956 ; Saldanha in Bull. Bot. Surv. India 5 : 68. 1963. *Buchnera gesnerioides* Willd. Sp. Pl. 3. 338. 1800. *Striga orobanchoides* (R. Br. ex Endl.) Benth. in Hook. Comp. Bot. Mag. 1 : 361. t. 19. 1836 ; Wight, Ic. 4 (3) : 2. t. 1414. 1849 ; Hook. f. Fl. Brit. Ind. 4 : 299. 1884 ; Duthié, Fl. Upper Gang. Pl. 2 : 156. 1911 (Repr. ed. 2 : 30. 1960).

Erect, glabrous or puberulous herbs, c. 40 cm. Leaves up to 1.5×0.3 cm. ovate oblong or ovate lanceolate, acute. Flowers bracteate, sessile, in terminal spikes, pale pink to pale white. Corolla 2 lipped, throat hairy. Stamens included. Stigma capitate. Capsules c. 4.5 mm long, ovoid oblong, glabrous, with persistent style base. Seeds many, each c. 0.4 mm long, oblong, minutely reticulate, pale brown.

Fl. & Fr. : July - November.

A common root parasite on *Lepidagathis trinervis* Nees ; Tordi Sagar.

9. VERBASCUM L.

Verbascum chinense (L.) Santapau, Fl. Purandhar 90. 1958. *Scrophularia chinensis* L. Mant. Alt. 250. 1771. *Celsis coromandeliana*

Vahl, *Symb. Bot.* 3 : 79. 1794 ; Wight, *Ic.* 4 (3) : 1. t. 1406. 1849 ; Hook. f. *Fl. Brit. Ind.* 4 : 251. 1883 ; Duthie, *Fl. Upper Gang.* Pl. 2 : 139. 1911 (Repr. ed. 2 : 15. 1960). *Verbascum coromandelianum* (Vahl) Kuntze, *Revis. Gen. Pl.* 1 : 468. 1891 ; Pennell in *Acad. Nat. Sci. Philad. Monogr.* 5 : 39. 1943 ; Chatterjee & Bharadwaja in *Bull. Bot. Soc. Bengal* 9 : 129. 1956.

Annuals, 50 - 75 cm. Basal leaves rosette, long petioled, up to 15×5 cm, oblong - ovate, ovate or elliptic, lyrate pinnatifid, upper ones usually sessile, passing into bracts, subcordate to amplexicaul, crenate-dentate. Calyx 5, free. Corolla 5 - lobed. Stigma capitate. Capsules c. 4 mm across, subglobose or ovoid, punctate. Seeds many, each c. 0.5 mm long, oblong, truncate, black.

Fl. & Fr. : November - March.

Common on sandy and sandy - loam soil and also in dried up tanks ; Niwai, Tordi Sagar and Banas river bed, Tonk.

10. VERONICA L.

Veronica anagallis aquatica L. *Sp. Pl.* 12. 1753 ; Hook. f. *Fl. Brit. Ind.* 4 : 293. 1884 ('*anagallis*') ; Duthie, *Fl. Upper Gang.* Pl. 2 : 154. 1911. (*anagallis*) (Repr. ed. 2 : 28. 1960) ; Pennell in *Acad. Nat. Sci. Philad. Monogr.* 5 : 89. 1943 ; Chatterjee & Bharadwaja in *Bull. Bot. Soc. Bengal* 9 : 148. 1956 (*anagallis*).

Erect, decumbent or creeping, glabrous or glandular - pubescent annuals, 10 - 25 cm high. Leaves opposite, lower petiolate, upper sessile, up to 6.0×1.5 cm, oblong, ovate - lanceolate or oblong - lanceolate, remotely serrate or subentire. Flowers bracteate, pedicellate, white or pinkish-white. Calyx 4, free, acute. Stamens exerted. Stigma subcapitate. Capsules c. 3 mm in diam., compressed, orbicular, notched, glabrous, surrounded by the calyx. Seeds many, minute, ovoid, more or less biconvex, rugulose, polished, pale brown.

Fl. & Fr. : Almost throughout the year.

Rare ; found in moist situations ; Banas river bed (Tonk).

57. BIGNONIACEAE

TECOMELLA Seem.

Tecomella undulata (Sm.) Seem. in Ann. & Mag. Nat.Hist. ser. 3.10 : 30. 1862 & in Journ. Bot. 1 : 18. 1863 ; Duthie, Fl. Upper Gang. Pl. 2 : 171. 1911 (Repr. ed. 2 : 43. 1960) ; Mahesh. Illus. Fl. Delhi f. 159. 1966 ; Y. J. Nasir in Nasir & Ali, Fl. W. Pak. No. 131 : 5. t. 2 A - G. 1979. *Bignonia undulata* Sm. Exot. Bot. 1 : 35. 1805. *Tecoma undulata* G. Don, Gen. Syst. 4 : 223. 1837 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 378. 1884. 'Rohira, Rohiro' (Hindi).

Trees, 3 - 8 m ; bark grey to whitish - grey ; branches drooping. Leaves up to 13.0×3.5 cm, narrowly oblong, obtuse or retuse, margins undulate or subentire. Flowers in corymbose racemes from short, lateral branches, showy, reddish yellow to orange - yellow. Calyx campanulate ; teeth 5. Corolla tubular, subequally 5 lobed. Stamens 4, exserted ; anther cells divergent. Stigma bi lamellate, spatulate - oblong. Capsules c. 26.0×1.3 cm, linear - oblong, slightly curved, glabrous. Seeds c. 0.9 mm across (excluding the wing), compressed, discoid, brown, winged ; wing c. 2 cm long, membranous.

Fl. & Fr. : October - April.

Common on plains on sandy - loam and sandy soil ; Sohela R. F.

The colour of the flower is very variable.

The wood is of high timber value. The leaves are used as fodder.

Kigelia africana (Lam.) Benth. in Hook. Niger Fl. 463. 1849 (- *K. pinnata* (Jacq.) DC.). 'Kadu' (Hindi).

Medium sized trees. Leaves imparipinnate. Flowers in lax, hanging racemes. Fruits woody, large, hanging by a long stalk.

Commonly planted along road sides and also in gardens.

Native of Tropical Africa.

58. MARTYNIACEAE

MARTYNIA L.

Martynia annua L. Sp. Pl. 618. 1753 ; Mahesh. Illus. Fl. Delhi f. 162. 1966. *M. diandra* Glox. Obs. Bot. 14. pl. 1. 1785 ; C.B. Clarke in

Hook. f. Fl. Brit. Ind. 4 : 386. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 176. 1911 (Repr. ed. 2 : 48. 1960) ; Nasir in Nasir & Ali, Fl. W. Pak. No. 13 : 1. f. A - H. 1972. '*Bichu buti*' (Hindi).

Erect, glandular - tomentose herbs or undershrubs, c. 1.5 m ; stem fistular. Leaves up to 16×15 cm, broadly ovate, deeply cordate at the base, acute, distinctly dentate. Flowers in lax, terminal racemes, drooping, showy, pink with red patches on the corolla. Bracts and bracteoles petaloid, pink. Sepals 5, free, unequal. Corolla 5 lobed, the posterior lobe the largest. Stamens 2. Stigmas 2, flat. Capsules c. 3 cm long, ovoid, hard with 2 prominent curved hooks, glandular, 2 valved, black.

Fl. & Fr. : August November.

Native of Mexico, now quite naturalized and found as a common weed ; Kacha Bundha near Tonk.

59. ACANTHACEAE

- 1a. Scapigerous, stemless herbs ; leaves redical, rosette. ... *Elytraria* 4
- 1b. Plant with stem and cauline leaves :
 - 2a. Fertile stamens 2 :
 - 3a. Calyx 4 - partite :
 - 4a. Armed undershrubs ; flowers yellow ; bracts and calyx spine - tipped ; calyx segments unequal ; capsules 2 - seeded... *Barleria* 1
 - 4b. Unarmed herbs ; flowers white, pale pink or pale purple ; bracts and calyx not spine - tipped ; calyx segments equal ; capsules 4 - seeded ... *Rostellularia* 9
 - 3b. Calyx 5 - partite :
 - 5a. Flowers in axillary or terminal, linear spikes or in clusters ; filaments pubescent at the base only ; lower anther cell spurred ... *Justicia* 6
 - 5b. Flowers in trichotomously branched, lax panicles or axillary, simple or branched unilateral racemes ; filaments sparsely hairy throughout ; anther - cells not spurred :
 - 6a. Flowers in trichotomously branched, lax panicle ; corolla 4 lobed ; anther - cells not bearded ; capsules 4 seeded ; seeds discoid or

- orbicular, slightly rugose, glandular-papillose, with a white aril ... *Peristrophe* 8
- 6b. Flowers in axillary, simple or branched, unilateral racemes ; corolla 5 - lobed ; anther - cells bearded at the base ; capsules many - seeded ; seeds oblong, rugosely pitted, not arillate ... *Indoneestiella* 5
- 2b. Fertile stamens 4, didynamous :
- 7a. Leaves in whorls of 4 ; bracteoles 8(- 10) in opposite pairs, accrescent, upper margins with stiff, retrorsely scabrid bristles ; calyx 4 - partite ; seeds echinate ... *Blepharis* 2
- 7b. Leaves opposite ; bracteoles less than 8, margins without bristles ; calyx 5 - partite ; seeds clothed with white, silky, hygroscopic hairs :
- 8a. Flowers solitary, axillary ; capsules elliptic-clavate, more than 2 - seeded ; seeds discoid or suborbicular ... *Dipteracanthus* 3
- 8b. Flowers in spikes or heads, often aggregated into radical or subradical heads ; capsules compressed, ovoid or obovoid - lanceolate ; 2 - seeded ; seeds ovoid - oblong or oblong ... *Lepidagathis* 7

1. BARLERIA L.

Barleria prionitis L. Sp. Pl. 636. 1753 ; Wight, Ic. 2 (2) : 3. t. 452. 1841 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 482. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 200. 1911 (Repr. ed. 2 : 69. 1960) ; Santapau in Univ. Bombay Bot. Mem. 2 : 57. 1952 ; Mahesh. Illus. Fl. Delhi f. 170. 1966. '*Kala bans*' (Hindi).

Glabrous, bushy undershrubs, 50 - 75 cm. Leaves petiolate, up to 11.0 × 5.2 cm, elliptic or ovate - elliptic, tapering at the base, acuminate, bristle - tipped, entire ; interpetiolar spines up to 4.5 cm long, whitish, acicular. Flowers in terminal spikes. Bracts foliaceous. Bracteoles 2, linear - subulate, keeled. Corolla infundibuliform, obscurely 2 - lipped,

pubescent outside. Stigma entire. Capsules *c.* 1.5 cm long, ovoid, beaked, glabrous, brown. Seeds *c.* 6 mm across, ovoid, compressed, shining brown, clothed with silky, appressed hairs.

Fl. & Fr. : Almost throughout the year.

Common in rocky habitats ; Tordi R.F. and Rajmahal R.F.

2. BLEPHARIS JUSS.

Blepharis maderaspatensis (L.) Heyne ex Roth, Nov. Pl. Sp. 320. 1821 ; Santapau in Univ. Bombay Bot. Mem. 2 : 15. 1952. *Acanthus maderaspatensis* L. Sp. Pl. 639. 1753. *Blepharis boerhaviaefolia* Pers. Syn. Pl. 2. 180. 1806 ; Wight, Ic. 2 (2) : 3. t. 458. 1841 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 478. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 183. 1911 (Repr. ed. 2 : 53. 1960).

Semierect or prostrate, pubescent herbs or undershrubs. Leaves subsessile or petiolate, up to 8.5 × 3.5 cm. elliptic, ovate lanceolate or ovate - elliptic, cuneate, acute and finely apiculate, entire or serrulate. Flowers axillary, 2 3 together, sessile, whitish with purplish - pink veins and yellow patch on the lower lip. Lower lip of corolla 3 lobed ; upper lip obsolete. Connective of lower pair of stamens produced ; the larger cell of anthers densely bearded on the margins. Stigma shortly 2 - fid. Capsules *c.* 8 mm long, ellipsoid, shining brown, 2 seeded. Seeds *c.* 3.5 mm across, suborbicular, compressed.

Fl. & Fr. : September - January.

Common in rock crevices ; Toda Rai Singh R. F.

3. DIPTERACANTHUS Nees *emend.* Bremek.

Dipteracanthus patulus (Jacq.) Nees in Wall. Pl. Asiat. Rar. 3 : 82. 1832. var. ***alba*** (Saxton) Bhandari in Bull. Bot. Surv. India 6 : 327. 1965. *Ruellia patula* Jacq. Misc. Bot. 2 : 358. 1781. var. ***alba*** Saxton in Rec. Bot. Surv. India 6 : 288. 1918.

Straggling, hoary pubescent undershrubs, up to 0.5 m ; stem quadrangular. Leaves petiolate, up to 5 × 3 cm, ovate or ovate-elliptic, base rounded, apex obtuse or apiculate. Flowers white. Bract absent. Bracteoles 2, foliaceous. Corolla infundibuliform, caducous ; lobes 5, rounded. Stigma 2 lamellate, unequal. Capsules c. 1.5 - 2.0 cm long, pointed, glabrous, brown. Seeds c. 3.5 - 4.0 mm across, one surface glabrous, the other pubescent, margins with hygroscopic white hairs, pale brown.

Fl. & Fr. : Almost throughout the year.

Common on hills in rocky habitats ; Sopari and Toda Rai Singh R. F.

4. ELYTRARIA A. Michx. *nom. cons.*

Elytraria acaulis (L. f.) Lindau in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 1 : 304. 1897 ; Santapau in Univ. Bombay Bot. Mem. 2 : 11 1951 ; Mahesh. Illus. Fl. Delhi f. 163. 1966. *Justicia acaulis* L. f. Suppl. 84. 1781. *Elytraria crenata* Vahl, Enum. 1 : 106. 1804 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 394. 1884. *Tubiflora acaulis* (L. f.) Kuntze, Revis. Gen. Pl. 1 : 500. 1891 ; Duthie, Fl. Upper Gang. Pl. 2 : 180. 1911 (Repr. ed. 2 : 51. 1960). 'Pathar - Chatta' (Hindi).

Small herbs. Leaves petiolate, up to 20 × 8 cm, obovate or oblanceolate, base tapering, obtuse at the apex, crenate. Scapes many, up to 21 cm long ; spike simple or branched. Flowers white. Bract 1. Bracteoles 2, smaller than the bract. Calyx segments 4, unequal, with scarious and ciliate margins. Corolla 2 lipped, 5 - lobed. Stamens 2. Stigma slightly 2 - lobed. Capsules c. 5 mm long, ovoid, acute, glabrous. Seeds many, minute, somewhat ovoid, minutely papillose, pale brown.

Fl. & Fr. : May - October.

Rare ; found under the shade of trees on loamy soil ; Banetha village near Tonk.

5. INDONEESIELLA Sreem.

Indoneesiella echioides (L.) Sreem. in Phytologia 16 : 466. 1968. *Justicia echioides* L. Sp. Pl. 16. 1753. *Andrographis echioides* (L.) Nees in Wall. Pl. Asiat. Rar. 3 : 117. 1832 ; Wight, Ic. 2 (2) : 4. t. 467. 1841 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 505. 1884 ; Duthie, Fl. Upper Gang. Pl. 2 : 197. 1911 (Repr. ed. 2 : 66. 1960) ; Santapau in Univ. Bombay Bot. Mem. 2 : 51. 1952 ; Mahesh. Illus. Fl. Delhi f. 165. 1966.

Erect annuals, 15 - 50 cm ; stem quadrangular, grooved, clothed with long, white, spreading hairs. Leaves opposite, decussate, sessile, up to 8.2 × 3.5 cm, oblong or elliptic - oblong, base cuneate or rounded, margins entire or subentire, ciliate. Flowers pinkish white, pale purple or white with red or purple spots on the lower lip ; rachis glandular - hairy. Bracts linear lanceolate. Bracteoles very small, subulate. Calyx enlarging in fruits. Stigma shortly 2 - lobed. Capsules 1.0 - 1.2 cm long, elliptic - oblong, compressed, acute, hairy. Seeds *c.* 2.5 × 2.0 mm.

Fl. & Fr. : August - November.

Common in rock crevices and on walls ; Tonk (*Maheshwari* 52930, LWG).

6. JUSTICIA L.

Justicia heterocarpa T. Anders. in Journ. Linn. Soc. 7 : 41. 1863 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 531. 1885 ; Raizada, Suppl. Fl. Upper Gang. Pl. 206. 1976 ; Bhandari, Fl. Indian Desert 303. f. 115. 1978.

Erect or straggling annuals, 10 - 50 cm. Leaves membranous, up to 4.5 × 2.8 cm, ovate - lanceolate or ovate, base rounded or cuneate, acute, entire, ciliate. Flowers sessile, few in axillary clusters, white with pinkish or purple throat. Bracts and bracteoles present or absent. Calyx linear-lanceolate, densely glandular - pubescent outside, ciliate on the margins. Stigma shortly bifid. Capsules dimorphic. Normal capsules *c.* 4 mm long, ellipsoidal, acutely beaked, pubescent, 4 seeded. Seeds tuberculate, glabrous. Abnormal capsules *c.* 3 mm long, with deeply dissected, *c.* 6 vertical wings ; teeth densely retrorsely barbellate ; 1 - seeded. Seeds angled, glabrous, minutely punctate, bigger than those of the normal capsules.

Fl. & Fr. : August - November.

Common at Toda Rai Singh (*Maheshwari* 52906, LWG).

7. LEPIDAGATHIS Willd.

1a. Leaves less than 5 mm broad, distinctly 3 - nerved ; flowers in one - sided spikes ; bracts with a long, recurved spine equal to

- the size of the lamina ; calyx 5 - partite ; anther - cells
bearded ... *L. trinervis* 2
- 1b. Leaves more than 8 mm broad with only 1 midnerve ;
flowers in globose heads ; bracts with a straight spine shorter
than the lamina ; calyx 4 - partite with one segment 2 - fid at
the apex ; anther - cells glabrous ,.. *L. cristata* 1

1. *Lepidagathis cristata* Willd. Sp. Pl. 3 : 400. 1800 ; Wight, Ic. 2 (2) : 3. t. 455. 1841 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 516. 1885 ; Santapau in Univ. Bombay Bot. Mem. 2 : 71. 1952. 'Kangia' (Hindi).

Suffruticose, perennial herbs ; branches procumbent, spreading, quadrangular, pubescent. Leaves sessile, up to 8.5 × 2.0 cm, linear - oblong or oblong - lanceolate, lineolate, acute. Flowers white or pale pink with brown or purple spots and streaks. Stigma slightly bifid. Capsules c. 5 mm long, ovoid, acute, glabrous, 2 seeded. Seeds c. 2.5 mm long, ovoid oblong, densely clothed with white, hygroscopic hairs.

Fl. & Fr. : September - November.

Common in gravelly places on sandy loam soil ; Kakor forest.

2. *Lepidagathis trinervis* Wall. ex Nees in Wall. Pl. Asiat. Rar. 3 : 96. 1832 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 517. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 204. 1911 (Repr. ed. 2 : 72. 1960) ; Santapau in Univ. Bombay Bot. Mem. 2 : 72. 1952. 'Patthar - phor - buti' (Hindi).

Diffuse, suffruticose, perennial herbs ; stem quadrangular. Leaves sessile, up to 5.5 × 0.3 cm, linear, base tapering, apex acute, margins scabrous. Flowers in axillary, sessile spikes ; spikes solitary or many, packed together and forming a single head near the base ; flowers pink, pale violet or pale purple, sometime white ; throat with transverse streaks and yellow, brown and purple spots. Stigma entire. Capsules c. 6.5 mm long, ovoid-lanceolate, compressed, beaked, glabrous, pale yellowish - brown, 2 seeded. Seeds c. 4 mm long, oblong, rounded at the apex, grey, covered with long silky white, hygroscopic hairs.

Fl. & Fr. : November - January.

Common in rocky habitats ; Kachha Bundha (Tonk), Gar R.F. and Banetha forest.

8. PERISTROPHE Nees

Peristrophe bicalyculata (Retz.) Nees in Wall. Pl. Asiat. Rar. 3 : 113. 1832 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 554. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 210. 1911 (Repr. ed. 2 : 79. 1960) ; Santapau in Univ. Bombay Bot. Mem. No. 2 : 93. 1952 ; Mahesh. Illus. Fl. Delhi f. 166. 1966. *Dianthera bicalyculata* Retz. in Ver. Acad. Handl. 297. t. 9. 1775. 'Kagner' (Hindi).

Erect, much branched, pilose herbs or undershrubs, 0.5 - 2.0 m ; stem sulcate or angular. Leaves up to 8.5 × 5.5 cm, ovate, ovate lanceolate or ovate elliptic, strongly lineolate. Flowers pink, violet or purple, throat with dark pink spots. Bracts 2, unequal. Bracteoles 4, almost equal, longer than the bracts. Corolla hairy outside ; upper lip entire ; lower lip longer with 3 lobes ; throat hairy. Stigma shortly bifid. Capsules c. 7 mm long, ellipsoid, beaked, narrowed into a cylindric stalk, pubescent. Seeds c. 2 mm across, brown.

Fl. & Fr. : October January.

Common on loamy soil ; Janakpura village near Tordi Sagar.

9. ROSTELLULARIA Reichb.

- 1a. Plants pubescent or hairy ; bracts and bracteoles shorter than the calyx, acute or acuminate, margins ciliate ; capsules pubescent on the upper part ; seeds compressed, papillose or minutely tuberculate :
- 2a. Stem and branches patently hairy ; leaves ovate, suborbicular or broadly elliptic ; seeds minutely tuberculate ... *R. prostrata* 1
- 2b. Stem and branches pubescent ; leaves ovate - lanceolate, elliptic - lanceolate or linear - lanceolate ; seeds papillose ... *R. vahlit* 3
- 1b. Plants glabrous ; bracts and bracteoles longer or equal to the calyx, obtuse, glabrous ; capsules glabrous ; seeds not compressed, reticulately rugose *R. quinqueangularis*
... var. *peploides* 2

1. **Rostellularia prostrata** (C.B. Clarke) Majumdar in Bull. Bot. Soc. Bengal 25 : 75. 1971. *Justicia diffusa* Willd. var. *prostrata* C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 538. 1885. *J. prostrata* (C.B. Clarke) Gamble in Fl. Pres. Madras 2 (6) : 1081. 1924 ; Santapau in Univ. Bombay Bot. Mem. 2 : 88. 1952 ; Raizada, Suppl. Fl. Upper Gang. Pl. 207. 1976.

Prostrate or decumbent, much branched herbs ; branches subquadran- gular. Leaves petiolate, up to 2.2×1.1 cm, base rounded, margins entire. Flowers in axillary and terminal, narrowly linear spikes up to 7.5 cm, white or pink. Stigma entire. Capsules c. 4 mm long, ellipsoid or oblong - ellipsoid, beaked, grooved. Seeds c. 1 mm across, ovoid - orbicular, reddish brown.

Fl. & Fr. : September February.

Common in moist places, fallow fields and in rocky habitats ; Tordi Sagar, Haji Ki Kothi and Siras.

2. **Rostellularia quinqueangularis** (Koen. ex Roxb.) Nees in DC. Prodr. 11 : 375. 1847. var. **peploides** (Nees) Raizada, Suppl. Fl. Upper Gang. Pl. 209. 1976. *Rostellularia peploides* Nees in Wall. Pl. Asiat. Rar. 3 : 101. 1832. *Rostellularia peploides* (Nees) Nees in DC. Prodr. 11 : 375. 1847. *Justicia quinqueangularis* Koen. ex Roxb. var. *peploides* (Nees) C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 537. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 209. 1911 (Repr. ed. 2 : 77. 1960) ; Santapau in Univ. Bombay Bot. Mem. 2 : 89. 1952.

Erect or procumbent ascending annuals ; branches subquadran- gular. Leaves petiolate, up to 4×2 cm, oblong elliptic or ovate oblong, lineo- late, base attenuate, apex obtuse, margins subentire. Flowers in axillary and terminal, linear spikes up to 4.5 cm long, pink or white with purple streaks. Stigma entire. Capsules c. 6 mm long, ellipsoid, beaked, glabrous. Seeds c. 1.5 mm across, suborbicular, brownish.

Fl. & Fr. : July October.

Common in marshy habitats ; Kakor R.F.

3. **Rostellularia vahlii** (Roth) Nees in Wall. Pl. Asiat. Rar. 3 : 102. 1832 & in DC. Prodr. 11 : 376. 1847. *Justicia vahlii* Roth, Nov. Pl. Sp. 14. 1821 ; Santapau in Univ. Bombay Bot. Mem. 2 : 88. 1952 ; Raizada, Suppl. Fl. Upper Gang. Pl. 207. 1976. *J. diffusa* Willd. var. *vahlii* C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 538. 1885. 'Makhan - ghass' (Hindi).

Straggling or suberect, much branched herbs, c. 0.5 m ; branches quadrangular. Leaves sessile or shortly petiolate, up to 5.5×1.5 cm, cuneate, acute, entire. Flowers in axillary and terminal, narrowly linear spikes up to 12 cm long, pink or pale purple ; lower lip with red streaks. Stigma entire. Capsules 4 - 5 mm long, oblong - ellipsoid, beaked, grooved, 4 - seeded. Seeds c. 1 mm across, ovoid orbicular.

Fl. & Fr. : August November.

Common weed ; Sohela R.F.

60. VERBENACEAE

- 1a. Flowers in capitate, ovoid or cylindric spikes ; stamens included ; stigma oblique, subcapitate :
- 2a. Prostrate or creeping herbs ; leaves obovate - spatulate or oblanceolate ; calyx deeply 2 - cleft ; corolla 2 - lipped, falling off as a calyptra ... *Phyla* 3
- 2b. Shrubs ; leaves ovate ; calyx truncate ; corolla tubular, not falling off as a calyptra ... *Lantana* 2
- 1b. Flowers in paniculate cymes ; stamens exserted ; stigma shortly 2 - fid :
- 3a. Leaves simple ; corolla tubular ; filaments glabrous ; drupes broadly obovoid, 4 - lobed, glabrous ... *Clerodendrum* 1
- 3b. Leaves digitately 3 - 5 - foliolate ; corolla 2 - lipped ; filaments hairy at the base ; drupes globose ; pubescent... *Vitex* 4

1. CLERODENDRUM L.

Clerodendrum phlomidis L. f. Suppl. 292. 1781 ; Wight, Ic. 4 (3) : 13. t. 1473. 1849 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 590. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 225. 1911 (Repr. ed. 2 : 92. 1960) ; Mahesh. Illus. Fl. Delhi f. 173. 1966 ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak. No. 774 31. 1974 'Urui, Arni' (Hindi).

Shrubs or small trees 1 - 4 m ; bark grey ; young parts pubescent. Leaves opposite, petiolate, up to 6.0×5.5 cm, broadly ovate to rhomboid ovate, base subcordate or truncate, apex obtuse or acute, margins entire, undulate, or crenate - dentate. Flowers white. Bracts foliaceous. Calyx campanulate, 5 - lobed. Corolla 5 - lobed. Stamens 4, didynamous. Drupes c. 10 mm long, separating into 4, 1 seeded pyrenes, shining black, enclosed by the persistent, enlarged calyx. Seeds c. 7 mm long, oblong, pointed at the base, whitish.

Fl. & Fr. : Almost throughout the year.

Common in wastelands, fallow fields and along hedges of cultivated fields ; Ghati and Sohela R.F.

2 LANTANA L.

Lantana indica Roxb. Fl. Ind. ed. Carey 3 : 89. 1832 ; Wight, Ic. 4 (3) : 11. t. 1464. 1849 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 562. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 216. 1911 (Repr. ed. 2 : 83. 1960) ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak No. 77 : 7. 1974. '*Papar-dani, Mevaka - Pad*' (Hindi).

Erect, sparsely pubescent shrubs ; stem 4 angular. Leaves opposite, petiolate, up to 9.0×4.5 cm, base narrowed, cordate or truncate, crenate-serrate. Flowers bracteate, axillary, white, fragrant. Corolla 4 - lobed; throat yellowish. Stamens 4, didynamous. Drupes c. 3 mm across, globose, violet or purple when ripe, with 2, 1 seeded pyrenes, enclosed in the thin, transparent calyx.

Fl. & Fr. : Almost throughout the year.

Common on low rocky hills ; Kacha Bundha (Tonk).

3. PHYLA Lour.

Phyla nodiflora (L.) Greene in Pittonia 4 : 46. 1899 ; Moldenke in Ann. Missouri Bot. Gard. 60 : 63. 1793 ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak. No. 77 : 11. 1974. *Verbena nodiflora* L. Sp. Pl. 20. 1753. *Lippia*

nodiflora (L.) Michx. Fl. Bor. - Amer. 2 : 15. 1803 ; Wight, Ic. 4 (3) : 11. t. 1463. 1849 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 563. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 217. 1911 (Repr. ed. 2 : 84. 1960). 'Jal buti, Mundi' (Hindi).

Appressed puberulent or glabrescent, perennial herbs, rooting at nodes. Leaves fleshy, opposite, petiolate, up to 1.5×1.4 cm, margins serrate dentate at upper half. Spikes globose cylindric at first, elongated later, up to 4.5×0.5 cm ; peduncle up to 3 cm long. Flowers bracteate, pale pink, purple or white. Stamens 4, didynamous. Pyrenes 2, each c. 1.2 mm long, globose oblong, plano convex, pale brown, 1 seeded.

Fl. & Fr. : Almost throughout the year.

Common near moist places ; Tordi Sagar and Banas river bed near Tonk.

4. VITEX L.

Vitex negundo L. Sp. Pl. 638. 1753 ; Wight, Ic. 2 (3) : 1. t. 519. 1842 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 4 : 583. 1885 (excl. var. *incisa*) ; Duthie, Fl. Upper Gang. Pl. 2 : 224. 1911 (Repr. ed. 2 : 90. 1960) ; Jafri & Ghafoor in Nasir & Ali, Fl. W. Pak. No. 77 : 27. 1974. 'Nirgundi' (Hindi).

Shrubs, 1.5 2.0 m ; branches sub quadrangular, densely white-tomentose. Leaves opposite, up to 14.0 × 3.5 cm, lanceolate, acuminate or acute. Inflorescence tomentose. Flowers bracteate, lavender, dull white, bluish purple or purplish - pink. Calyx teeth 5. Stamens 4, didynamous. Drupes c. 3 mm across, globose, slightly pubescent, black when ripe, surrounded by the enlarged, persistent calyx.

Fl. & Fr. : Almost throughuot the year.

Common in wastelands ; Mayola forest (Bisalपुरa).

61. LAMIACEAE

1a. Perfect stamens 2, ascending or erect ; connective linear, long, transverse to and articulate with the filament ...

Salvia 6

- 1b. Perfect stamens 4, declinate ; connective not transverse ; anthers confluent :
- 2a. Calyx tubular, 5 - 12 - toothed ; upper lip of corolla pubescent or woolly :
- 3a. Flowers in whorls, forming a spikate inflorescence, crimson - red, pinkish - purple or purple ; calyx gland - dotted, mouth straight, teeth 5 ; upper lip of corolla oblong ; stamens exerted ; filaments bearded... *Anisomeles* 2
- 3b. Flowers in verticillasters, forming globular heads, white ; calyx not gland - dotted, mouth oblique, teeth 6 - 12 ; upper lip of corolla saccate, hooded or concave ; stamens included ; filaments not bearded ... *Leucas* 3
- 2b. Calyx 2 - lipped, 5 - toothed, upper lip deflexed ; upper lip of corolla glabrous :
- 4a. Flowers in interrupted whorls ; fruiting calyx deflexed, upper lip suborbicular, not closing the mouth of calyx tube, lower lip strongly awned ; nutlets punctate :
- 5a. Aromatic herbs ; stigma 2 - fid ; nutlets ellipsoid ... *Ocimum* 4
- 5b. Inodorous herbs ; stigma clavate or capitate ; nutlets globose or subglobose, compressed ... *Orthosiphon* 5
- 4b. Flowers in compact, cylindric spikes ; fruiting calyx not deflexed, upper lip ovate - lanceolate, deflexed over and closing the mouth of calyx tube, lower lip truncate, not awned ; nutlets smooth ... *Anisochilus* 1

1. ANISOCHILUS Wall. ex Benth.

Anisochilus carnosus (L. f.) Wall. Pl. Asiat. Rar. 2 : 18. 1830 - 1831 ; Hook. f. Fl. Brit. Ind. 4 : 627. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 240. 1911 (Repr. ed. 2 : 104. 1960) ; Basu, Ind. Med. Pl. t. 753 A. 1918 ; Mukerjee in Rec. Bot Surv. India 14 (1) : 58. 1940. *Lavandula carnosus* L. f. Suppl. 273. 1781. 'Panjiri' (Hindi).

Erect annuals, 40 - 60 cm ; stem fistular, quadrangular, finely pubescent. Leaves opposite, petiolate, up to 8×8 cm, broadly ovate, crenate. Flowers bracteate, purple or violet. Calyx glandular - pubescent. Corolla

pubescent outside. Style 2 fid. Nutlets *c.* 1 mm long, ovoid, 3 - angled with one face convex, shining, brown.

Fl. & Fr. : september - October.

Fairly common in rocky habitats ; Toda Rai Singh R. F.

2. ANISOMELES R. Br.

Anisomeles indica (L.) Kuntze, Revis. Gen. Pl. 2 : 512. 1891 ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 152. 1940 ; Keng in Fl. Males. I. 8 : 329. f. 8. 1978. *Nepeta indica* L. Sp. Pl. 571. 1753. *Anisomeles ovata* R. Br. in W. T. Aiton, Hortus Kew. ed. 2. 3 : 364. 1811 ; Wight, Ic. 3 (2) : 5. t. 865. 1844 - 1845 ; Hook. f. Fl. Brit. Ind. 4 : 672. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 245. 1911 (Repr. ed. 2 : 109. 1960). 'Kala Bhangra' (Hindi).

Erect, pubescent, aromatic herbs or undershrubs, *c.* 1 m ; stem 4-angular. Leaves opposite, petiolate, up to 13.5 × 11.0 cm, broadly ovate or ovate, cordate or truncate at the base, acuminate, crenate serrate. Bracts foliaceous. Nutlets *c.* 1.75 mm long, ovoid, apiculate, 3 angled with one face convex, smooth, shining, nearly black.

Fl. & Fr. : May - October.

Common in rocky gravelly habitats ; Toda Rai Singh R.F.

3. LEUCAS R. Br.

- 1a. Mouth of calyx much produced on the lower side ; corolla tube not annulate within, middle lobe of the lower lip 2-fid; nutlets distinctly glandular at the apex ... *L. urticaefolia* 4
- 1b. Mouth of calyx produced on the upper side ; corolla tube annulate within ; middle lobe of the lower lip rounded or truncate ; nutlets not glandular at the apex :
- 2a. Bracts 1 - 2 cm long ; mouth of the calyx densely villous with the villi as long as the teeth ; nutlets 3 mm or more long ... *L. cephalotes* 2

2b. Bracts less than 1 cm long ; mouth of the calyx not villous or the villi shorter than the teeth ; nutlets 2.5 mm or less long :

- | | | |
|--|-----|--------------------|
| 3a. Bracts ovate - lanceolate or lanceolate ; calyx teeth 10, c. 2.5 mm long, lanceolate | ... | <i>L. nutans</i> 3 |
| 3b. Bracts linear ; calyx teeth c. 12, c. 0.5 mm long, triangular | ... | <i>L. aspera</i> 1 |

1. *Leucas aspera* (Willd.) Link, Enum. Hort. Berol. 2 : 113. 1822 ; Hook. f. Fl. Brit. Ind. 4 : 690. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 250. 1911 (Repr. ed. 2 : 113. 1960) ; Basu, Ind. Med. Pl. t. 775. 1918 ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 166. 1940 ; Keng in Fl. Males. I. 8 : 337. 1978. *Phlomis aspera* Willd. Enum. Hort. Berol. 2 : 621. 1809. 'Gupha' (Hindi).

Erect or diffuse, hispid annuals, 20 - 50 cm. Leaves opposite, subsessile, up to 6.0 × 1.8 cm, elliptic, linear - lanceolate or linear - oblong, crenate or entire. Heads terminal and axillary, up to 2.5 cm across. Calyx strongly ribbed. Lower lip of corolla 3 lobed, twice as long as the upper lip. Style 2 fid. Nutlets oblong, subtruncate at the apex, triquetrous, outer face rounded, smooth, brownish.

Fl. & Fr. : September - May.

Common weed in fallow and cultivated fields ; Haji Ki Kothi, Siras R.F. and Ghati R.F.

2. *Leucas cephalotes* (Roth) Spreng. Syst. 2 : 743. 1825 ; Wight, Ic. 2 (1) : 2. t. 337. 1840 ; Hook. f. Fl. Brit. Ind 4 : 689. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 251. 1911 (Repr. ed. 2 : 114. 1960) ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 168. 1940. *Phlomis cephalotes* Roth, Nov. Pl. Sp. 262. 1821. 'Nidralu' (Hindi).

Erect, hispid annuals, 5 - 50 cm. Leaves opposite, petiolate, up to 7.5 × 2.5 cm, ovate, ovate lanceolate or elliptic, crenate - serrate, glandular-punctate. Heads usually terminal, up to 4.5 cm across. Bracts foliaceous, ovate lanceolate. Calyx teeth c. 10, triangular - subulate. Middle lobe of the lower lip of corolla truncate. Style 2 fid. Nutlets obovoid - oblong, subtruncate at the apex, triquetrous with the outer face rounded, smooth, shining, spotted brown.

Fl. & Fr. : August - March.

Common in fallow fields ; Sakarampura.

3. *Leucas nutans* (Roth) Spreng. Syst. 2 : 743. 1825 ; Hook. f. Fl. Brit. Ind. 4 : 688. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 251. 1911 (Repr. ed. 2 : 114. 1960) ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 169. 1940. *Phlomis nutans* Roth, Nov. Pl. Sp. 263. 1821.

Small, diffusely branched, hispid annuals. Leaves opposite, sessile, up to 4.5×1.2 cm, oblong lanceolate or ovate lanceolate, serrate, glandular punctate. Heads terminal and axillary, up to 1.5 cm across. Calyx strongly ribbed. Middle lobe of lower lip of corolla obovate, rounded. Style 2 - fid. Nutlets oblong - ellipsoid, subtruncate at the apex, triquetrous, outer face rounded, smooth, brown.

Fl. & Fr. : October - November.

Common in forests on gravelly sandy soil ; Kakor forest.

4. *Leucas urticaefolia* (Vahl) R. Br. Prodr. 504. 1810 ; Wight, Ic. 4 (3) : 9. t. 1451. 1849 ; Hook. f. Fl. Brit. Ind. 4 : 680. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 249. 1911 (Repr. ed. 2 : 112. 1960) ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 166. 1940. *Phlomis urticaefolia* Vahl, Symb. 3 : 76. 1790. 'Gubbha' (Hindi).

Erect, hairy annuals, 60 - 150 cm. Leaves opposite, petiolate, up to 9.5×5.5 cm, ovate, rounded or tapering at the base, coarsely crenate-serrate. Heads terminal and axillary, up to 2 cm across. Bracts linear-lanceolate. Style 2 - fid. Nutlets c. 2 mm long, obovoid oblong, obliquely truncate, trigonous with the outer face rounded, polished, smooth, brown.

Fl. & Fr. : July - February.

Common at the foot of hills on gravelly soil ; Tordi R.F. near Malpura.

4. OCIMUM L.

Ocimum americanum L. Cent. Pl. 1 : 15. 1755 ; Mahesh. Illus. Fl. Delhi f. 174. 1966 ; Keng in Fl. Males. I. 8 : 376. 1978. *O. canum* Sims in Bot. Mag. 51. t. 2452. 1823 ; Hook. f. Fl. Brit. Ind. 4 : 607. 1885 ; Duthie,

Fl. Upper Gang. Pl. 2 : 234. 1911 (Repr. ed. 2 : 99. 1960) ; Mukerjee in Rec. Bot. Surv. India 4 (1) : 17. 1940. '*Bantulsi, Jangli Tulsi*' (Hindi).

Erect, suffruticose, pubescent herbs, 30 - 60 cm. Leaves opposite, petiolate, up to 4.5×2.5 cm, elliptic or elliptic - lanceolate, subentire. Flowers bracteate, white, pale purplish - white or pale purple ; pedicel recurved. Calyx villous. Filaments hairy at the knee. Nutlets c. 2 mm long, black, mucilaginous.

Fl. & Fr. : August - March.

Common at the foot of hills on sandy - loam to gravelly - sandy - loam soil ; Ghati and Kakor R.F.

5. ORTHOSIPHON Benth.

Orthosiphon pallidus Royle ex Benth. Lab. Gen. et Sp. 708. 1832 ; Hook. f. Fl. Brit. Ind. 4 : 613. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 236. 1911 (Repr. ed. 2 : 100. 1960) ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 23 1940 ; Mahesh. Illus. Fl. Delhi f. 175. 1966.

Erect or diffuse herbs, up to 20 cm or more high ; stem quadrangular, glabrescent or finely pubescent. Leaves opposite, petiolate, up to 3.5×2.5 cm, ovate, cuneate, crenate or serrate, gland dotted. Flowers bracteate, creamish - white ; lower lip suborbicular, concave. Stamens included ; filaments glabrous. Nutlets c. 1 mm across, pale brown.

Fl. & Fr. : May - August.

Common in wastelands ; Kotri village.

6. SALVIA L.

Salvia aegyptiaca L. Sp. Pl. 23. 1753 ; Hook. f. Fl. Brit. Ind. 4 : 656. 1885 ; Duthie, Fl. Upper Gang. Pl. 2 : 256. 1911 (Repr. ed. 2 : 119. 1960) ; Basu, Ind. Med. Pl. t. 764 B. 1918 ; Mukerjee in Rec. Bot. Surv. India 14 (1) : 107. 1940.

Small, much branched, spreading, hispid, aromatic, perennial herbs. Leaves opposite, subsessile, up to 2.2×0.5 cm, linear - lanceolate or elliptic-lanceolate, crenate - serrate. Flowers in long racemes, bracteate, white or blue with purplish dots. Calyx campanulate, 2 lipped with transparent gland tipped hairs. Corolla throat annulate within; lower lip 3 lobed; upper lip slightly notched. Nutlets *c.* 1.75 cm long, oblong - ellipsoid, minutely rugose, black.

Fl. & Fr. : March - November.

Common on low rocky hills; Banetha forest.

In fruiting calyx, gland - tipped hairs are few.

62. NYCTAGINACEAE

BOERHAVIA L.

Boerhavia diffusa L. Sp. Pl. 3. 1753; Duthie, Fl. Upper Gang. Pl. 3 : 2. 1915 (Repr. ed. 2 : 127. 1960); Stemmerik in Fl. Males. I. 6 : 454. 1964. *B. repens* L. Sp. Pl. 3. 1753; Hook. f. Fl. Brit. Ind. 4 : 709. 1885. *B. repens* L. var. *diffusa* Hook. f. & var. *procumbens* (Roxb.) Hook. f. 1. c. 4 : 709. 1885. *B. procumbens* Roxb. Fl. Ind. ed Carey & Wall. 1 : 148. 1820; Wight, Ic. 3 (2) : 6. t. 874. 1844 - 1845. 'Satha, Sathi' (Hindi).

Diffuse or decumbent - ascending, glabrescent or pubescent and stalked glandular - hairy, perennial herbs. Leaves in unequal, opposite pairs. 1 - 4 \times 0.8 - 3.5 cm, ovate, broadly ovate, ovate lanceolate, ovate oblong or suborbicular, usually cordate or rounded at the base, acute or obtuse, subentire undulate, often white beneath. Inflorescence a panicle of subcapitate umbels. Flowers pink to rose. Perianth *c.* 3 cm long, infundibuliform, constricted below the middle, glandular hairy; lobes 5. Stamens 2 - 4. Anthocarp *c.* 4 mm long, clavate, 5 ribbed, with stalked glandular hairs throughout.

Fl. & Fr. : Almost throughout the year.

A very common weed in wastelands in rocky and gravelly habitats; Toda Rai Singh R. F.

It is a highly polymorphic species in respect of habit, degree of hairiness, size and shape of leaves and colour of flowers.

63. AMARANTHACEAE

- 1a. Fertile flowers (at least the lower ones) subtended by modified sterile flowers :
- 2a. Plants glabrous ; leaves alternate ; sterile flowers represented by antler - like scales ; tepals glabrous ; filaments free ; stigmas 2 ; fruit a crustaceous nut, muricate ... *Digera* 6
- 2b. Plants pubescent ; leaves opposite ; sterile flowers represented by stellately spreading hooked spines ; tepals woolly on the back ; filaments connate to form a cup ; stigma capitate ; fruit a membranous utricle ... *Pupalia* 2
- 1b. Fertile flowers not subtended by any sterile flowers :
- 3a. Leaves alternate :
- 4a. Flowers silvery - white to pinkish, hermaphrodite ; fruits 2 - many - seeded ... *Celosia* 5
- 4b. Flowers green or lanate, unisexual or polygamous ; fruits 1 seeded :
- 5a. Plants tomentose ; flowers lanate, polygamous ; filaments alternating with pseudostaminodes and connate to form a cup ... *Aerva* 2
- 5b. Plants glabrous, papillate or slightly pubescent ; flowers glabrous, unisexual ; filaments free ; pseudo - staminodes absent... *Amaranthus* 4
- 3b. Leaves opposite :
- 6a. Stigma capitate ; utricle falling off with the perianth :
- 7a. Spikes dense, sessile ; bracteoles acuminate or aristate ; anthers 1 - celled, 2 - locellate ; utricle orbicular or obcordate ; seeds suborbicular ... *Alternanthera* 3
- 7b. Spikes lax, pedunculate ; bracteoles spinous, the spine winged at the base ; anthers 2 - celled, 4 - locellate ; utricle oblong or ovoid ; seeds cylindrical ... *Achyranthes* 1
- 6b. Stigmas 2 ; utricle not falling off with the perianth :

- 8a. Flower hermaphrodite ; bracteole with a dorsal crest ; anthers 1 - celled, 2 - locellate ; filaments entirely connate, the tube toothed at the apex ... *Gomphrena* 7
- 8b. Flowers polygamous ; bracteole not dorsally crested ; anthers 2 celled, 4 locellate ; filaments connate at the base ; the tube not toothed *Aerva* 2

1. ACHYRANTHES L.

Achyranthes aspera L. Sp. Pl. 204. 1753 ; Wight, Ic. 5 (2) : 3. t. 1777. 1852 ; Hook. f. Fl. Brit. Ind. 4 : 730. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 18. 1915 (Repr. ed. 2 : 140. 1960) ; Backer in Fl. Males. I. 4 : 88. 1949 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 33. f. 6 E. 1974. 'Kantio-Bhurat' (Hindi).

Erect or straggling, stiff - hairy herbs or undershrubs, 0.25 - 1.0 m ; stem sulcate. Leaves petiolate, up to 8.5 × 7.0 cm, obovate rounded or oval obovate, cuneate, obtuse, acute or acuminate, margins entire or wavy. Spikes 20 - 40 cm long. Tepals 5, subequal, ovate lanceolate. Stamens 5 ; scales of pseudo staminodes fringed. Utricle rounded at the base and truncate at the apex. Seeds reddish brown.

Fl. & Fr. : Almost throughout the year.

A common weed in cultivated fields ; Niwai.

Very variable in habit, size and shape of leaves and the length of the spikes.

2. AERVA FORSSK. *nom. cons.*

- 1a. Leaves linear or linear - oblong ; spikes arranged in panicle ; outer tepals with the midrib ceasing well below the apex ... *A. javanica* var. *bovei* 1

- 1b. Leaves elliptic - obovate or ovate - elliptic - obovate ;
spikes 1 - 4 in the axils of leaves ; outer tepals with the
midribs excurrent into a distinct mucro ...

A. lanata 2

1. *Aerva javanica* (Burm. f.) Juss. ex J. A. Schult. Syst. Veg. ed. 15. 5 : 565. 1819 var. *bovei* Webb in Hook. Niger Fl. 173 : 1849 ; Townsend in Kew Bull. 29: 463. 1974 & in Nasir & Ali, Fl. W. Pak. No. 71 : 27. f. 4 C. 1974. *A. bovei* (Webb) Edgew. in Journ. Linn. Soc. 6 : 206. 1862. *A. pseudo - tomentosa* Blatt. & Hallb. in Journ. Bomb. Nat. Hist. Soc. 26 : 817. 1919. *A. persica* (Burm. f.) Merrill var. *bovei* (Webb) Chiov. Fl. Somala. 286. 1929. 'Bui' (Hindi).

Erect herbs or undershrubs, 30 - 150 cm. Leaves sessile or shortly petiolate, up to 7.0 × 0.6 cm, attenuate, acute, margins plain or involute. Spikes 4 - 20 mm long, cylindrical or globose. Bracts and bracteoles broadly ovate. Tepals 5, elliptic lanceolate. Stamens 5. Seeds round, slightly compressed, smooth, shining, brown to black.

Fl. & Fr. : Almost throughout the year.

Common on low sand dunes ; Tordi R.F.

2. *Aerva lanata* (L.) Juss. ex J. A. Schult. Syst. Veg. ed. 15. 5 : 546. 1819 ; Wight, Ic. 2 (4) : 7. t. 723. 1843 ; Hook. f. Fl. Brit. Ind. 4 : 728. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 16. 1915 (Repr. ed. 2 : 139. 1960) ; Backer in Fl. Males. I. 4 : 84. f. 5. 1949 ; Mahesh. Illus. Fl. Delhi f. 176. 1966 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 31. 1974. *Achyranthes lanata* L. Sp. Pl. 204. 1753.

Prostrate or straggling, perennial herbs, c. 30 cm. Leaves shortly petiolate, up to 2.0 × 0.8 cm, cuneate, rounded and apiculate at the apex, entire. Spikes 0.5 - 1.5 cm long. Bract and bracteole persistent, ovate, concave. Tepals 5, oval oblong. Stamens 5. Utricle ovoid, acute. Seeds c. 0.75 mm across, round, compressed, shining, black - brown.

Fl. & Fr. : May - September.

Found in rocky habitats ; Toda Rai Singh R.F.

3. ALTERNANTHERA Forssk.

Alternanthera sessilis (L.) DC. Cat. Pl. Horti Monsp. 77. 1813 ; Hook. f. Fl. Brit. Ind. 4 : 731. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 20.

1915 (Repr. ed. 2 : 142. 1960) ; Backer in Fl. Males. I. 4 : 92. 1949 ; Mahesh. Illus. Fl. Delhi f. 181. 1966 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 41. 1974. *Gomphrena sessilis* L. Sp. Pl. 225. 1753.

Prostrate or decumbent herbs, rooting at nodes ; stem and branches angular, with a line of hairs down each side ; nodes and leaf axils with tufts of white hairs. Leaves up to 6.0 × 1.5 cm, elliptic - obovate, oblanceolate, linear - oblong or linear - oblanceolate, obtuse or rounded, entire or obscurely dentate, glabrous. Spikes 1 - 4 in the axils of leaves, 0.5 - 1.5 cm long, globose - cylindrical. Tepals 5, free, ovate, acute. Fertile stamens 3 ; pseudo-staminodes 2. Utricle brown. Seeds c. 1 mm across, shining, yellowish or reddish - brown.

Fl. & Fr. : Almost throughout the year.

A common weed in moist places ; Banas river bed near Sopari village.

4. AMARANTHUS L.

- | | | |
|---|-----|-------------------------|
| 1a. Leaf axils with paired, sharp spines ; tepals 5 ; anthers 5 ; capsules ovoid - urceolate, without any ribs | ... | <i>A. spinosus</i> 1 |
| 1b. Leaf axils without spines ; tepals 2 ; anthers 2 ; capsules ellipsoid with 4 - 5, prominent, raised, green, longitudinal ribs | ... | <i>A. tenuifolius</i> 2 |

1. *Amaranthus spinosus* L. Sp. Pl. 991. 1753 ; Wight, Ic. 2 (2) : 8. t. 513. 1841 ; Hook. f. Fl. Brit. Ind. 4 : 718. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 10. 1915 (Repr. ed. 2 : 133. 1960) ; Backer in Fl. Males. I. 4 : 78. 1949 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 9. f. 2. C, D. 1974. '*Kantio - chandlio*' (Hindi).

Erect, armed annuals, 0.5 - 0.75 m ; stem angular. Leaves long petiole, up to 7 × 5 cm, ovate - lanceolate, ovate or oblong - elliptic, cuneate, retuse, finely mucronate or obtuse. Spines c. 1.5 cm long. Flowers in axillary or terminal, globose to cylindrical, dense spikes, green ; lower flowers of the spikes entirely female, upper ones male. Bracts and bract-woles deltoid - ovate, awned by the excurrent midrib. Seeds c. 1 mm in diam., suborbicular, lenticular, shining, black to brownish - black.

Fl. & Fr. : Almost throughout the year.

A common weed in cultivated fields ; Banas river bed at Bentheli village.

2. *Amaranthus tenuifolius* Willd. Sp. Pl. 4 : 381. 1805 ; Wight, Ic. 2 (4) : 7. t. 718. 1843 ; Hook. f. Fl. Brit. Ind. 4 : 722. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 14. 1915 (Repr. ed. 2 : 137. 1960) ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71: 20. 1974.

Erect, diffuse or prostrate annuals, 5 - 45 cm ; stem sulcate. Leaves petiolate, up to 2.5 × 0.6 cm, linear - oblanceolate to linear oblong, attenuate, rounded to emarginate, mucronulate, entire or slightly undulate. Flowers in axillary cymose clusters, green ; male and female flowers intermixed or male mostly towards the top. Bracts and bracteoles oblong - elliptic, concave with median green vitta and hyaline margins. Seeds visible through the capsule, suborbicular, lenticular, smooth, shining, reddish - brown.

Fl. & Fr. : Almost throughout the year.

Common weed in moist places ; Tordi Sagar and Kacha Bundha.

5. CELOSIA L.

Celosia argentea L. Sp. Pl. 205. 1753 ; Wight, Ic. 5 (2) : 1. t. 1767. 1852 ; Hook. f. Fl. Brit. Ind. 4 : 714. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 7. 1915 (Repr. ed. 2 : 131. 1960) ; Backer in Fl. Males. I. 4 : 73. 1949 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 5. f. 1 C, D. 1974. *C. cristata* L. Sp. Pl. 205. 1753 ; Hook f. l. c. 4 : 715. 1885. 'Imarti' (Hindi).

Erect, fistular, glabrous annuals, 0.5 - 1.5 m ; stem sulcate. Leaves up to 8.0 × 3.5 cm, rhomboid, elliptic - obovate, elliptic lanceolate or obovate, acute or obtuse, shortly mucronate, entire or subentire. Flowers in dense, cylindrical, long peduncled spikes 1 - 15 cm long. Bracts and bracteoles subequal, aristate with excurrent midrib. Tepal 5. Stamens 5. Fruits c. 3 mm long, obovoid, with an acute tip. Seeds c. 1.25 mm across, lenticular, very finely reticulate, shining, brownish - black to black.

Fl. & Fr. : August - November.

A common weed in cultivated and fallow fields ; Banetha village.

6. DIGERA Forssk.

Digera muricata (L.) Mart. Beitr. Amar. 2 : 77. 1825 & in Nov. Act. Acad. Caes. Leop. - Carol. Nat. Cur. 13 : 285. 1826 ; Backer in Fl. Males.

I. 4 : 80. f. 3. 1949. *Achyranthes muricata* L. Sp. Pl. ed. 2. 295. 1762. *Digera arvensis* Forssk. Fl. Aegypt. Arab. 65. 1775 ; Hook. f. Fl. Brit. Ind. 4 : 717. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 8. 1915 (Repr. ed. 2 : 132. 1960). *Desmochaeta muricata* Wight, Ic. 2 (4) : 7. t. 732. 1843. 'Lolaru' (Hindi).

Erect or spreading, glabrous herbs, 12 - 50 cm. Leaves up to 6×4 cm, ovate or ovate-lanceolate, cuneate or rounded at the base, acute or obtuse, subentire ; petiole 0.5 - 4.0 cm long. Flowers in loose, axillary, peduncled spikes up to 20 cm long, pink or dark pink. The central flower fertile, surrounded by 2 sterile flowers. Bracts and bracteoles 1-nerved. Tepals 5, unequal. Stamens 5. Nuts *c.* 2 mm across, subglobose. Seeds *c.* 1 mm across, subglobose, pale brown.

Fl. & Fr.: July - December.

Common weed in cultivated and fallow fields and in moist places ; by the side of Tordi Sagar.

7. GOMPHRENA L.

Gomphrena celosioides Mart. Beitr. Amar. 193. 1825 & in Nov. Act. Acad. Caes. Leop. Carol. Nat. Cur. 13 : 301. 1826 ; Backer in Fl. Males. I. 4 : 96. 1949 ; Mahesh. Illus. Fl. Delhi f. 179. 1966 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 44. f. 8 D. 1974 ; Raizada, Suppl. Fl. Upper Gang. Pl. 235. 1976 'Kasia' (Hindi).

Prostrate or decumbent, deep - rooted, appressedly white - pilose herbs. Leaves up to 3.0×1.2 cm, elliptic, oblong - elliptic, obovate or oblanceolate, cuneate, mucronate. Flowers in sessile, ovoid - oblong to elongate spikes 1.0 - 2.5 (-4) cm long, white with a tinge of pink. Tepals 5, lanceolate, acutely mucronate, 1 nerved, clothed with long fine white hairs. Stamens 5. Fruits *c.* 2 mm long, ovoid. Seeds compressed ovoid.

Fl. & Fr. : February - October.

Common weed in fallow fields ; Nayagaon and Haji - Ki Kothi (Niwai).

8. PUPALIA Juss. *nom. cons.*

Pupalia lappacea (L.) Juss. in Ann. Mus. Hist. Nat. Paris 2 : 132. 1803; Hook. f. Fl. Brit. Ind. 4 : 724. 1885 ; Duthie, Fl. Upper Gang. Pl. 3 : 19. 1915 (Repr. ed. 2 : 141. 1960); Backer in Fl. Males. I. 4 : 83. 1949 ;

Mahesh. Illus. Fl. Delhi f. 184. 1966 ; Townsend in Nasir & Ali, Fl. W. Pak. No. 71 : 24. f. 3 D - G. 1974. *Achyranthes lappacea* L. Sp. Pl. 204. 1753. *Pupalia lappacea* (L.) Juss. var. *velutina* Hook. f. l. c. 4 : 724. 1885. *P. atropurpurea* (Lam.) Moq. in DC. Prodr. 13 (2) : 331. 1849 ; Hook. f. l. c. 4 : 723. 1885. 'Chirchitta, Undho Bhurat' (Hindi).

Erect, diffuse or subscandent, pubescent, perennial herbs or undershrubs, 30 - 100 cm. Leaves up to 12.0×4.5 cm, ovate to elliptic, attenuate, apiculate. Spikes 3 - 15 cm long, erect or erecto patent, densely pilose. Flowers in clusters, each cluster with 2 - 3 hermaphrodite flowers and modified flowers consisting of a number of sharply hooked spines with villous base, upper often solitary, without rudimentary flowers. Bracts and bracteoles woolly on the back. Tepals 5, acicular, 3 - nerved, woolly on the back. Stamens 5. Seeds oblong - ovoid, shining, dark brown.

Fl. & Fr. : Almost throughout the year.

Common in gravelly habitats ; Kakor R.F.

64. CHENOPODIACEAE

CHENOPODIUM L.

- | | | |
|--|-----|--------------------|
| 1a. Seeds dull black, papillate, distinctly keeled | ... | <i>C. murale</i> 2 |
| 1b. Seeds shining blackish - brown or black, smooth, not keeled... | | <i>C. album</i> 1 |

1. **Chenopodium album** L. Sp. Pl. 219. 1753 ; Hook. f. Fl. Brit. Ind. 5 : 3. 1886 ; Duthie, Fl. Upper Gang. Pl. 3 : 22. 1915 (Repr. ed. 2 : 143. 1960) ; Backer in Fl. Males. I. 4 : 102. 1949. 'Bathua' (Hindi).

Erect, much branched, annuals, 10 - 50 cm ; younger parts densely covered with white powdery vesicles. Leaves 1.5 - 4.0×0.2 - 1.5 cm, elliptic-oblong to lanceolate or ovate - rhomboid, cuneate, acute or obtuse, entire or dentate serrate. Flowers in terminal or axillary, paniced clusters, 5 - merous. Tepals connate at the base, oval, obtuse, concave with a strong midrib. Stigmas 2. Fruits depressed - globose, finely papillate, enclosed by the persistent tepals. Seeds c. 1.0 - 1.5 mm across, lenticular.

Fl. & Fr. : November - February.

A common winter season weed in cultivated fields and in wastelands ; Bentheli and Haji - Ki Kothi (Niwai).

The leaves and tender twigs are used as vegetable and a preparation in curd, known locally as "Raita" is made. It is also used as fodder.

It is a highly variable plant in respect of habit and size and shape of leaves.

2. **Chenopodium murale** L. Sp. Pl. 219. 1753; Hook. f. Fl. Brit. Ind. 5 : 4. 1886; Duthie, Fl. Upper Gang. Pl. 3 : 23. 1915 (Repr. ed. 2 : 144. 1960); Backer in Fl. Males. I. 4 : 101. 1949. '*Jangli - Bathua*' (Hindi).

Erect or ascending, slightly foetid annuals, 40-60 cm; younger parts clothed with white powdery vesicles. Leaves 1.5-6.0 × 0.7-5.5 cm, ovate-rhomboid, elliptic, oblong or lanceolate from cuneate base, irregularly coarsely dentate-serrate. Flowers in axillary or terminal, paniced clusters, 5-merous. Tepals connate at the base, oval, tip rounded, concave with a distinct midrib. Stigmas 2. Fruits depressed globose, tightly enclosed by incurved, persistent tepals; pericarp not readily separating from the seed. Seeds c. 1.0-1.5 mm across.

Fl. & Fr. : November-March.

A common winter season weed in moist sandy soil; Haji-ki-Kothi (Niwai).

65. BASELLACEAE

BASELLA L.

Basella rubra L. Sp. Pl. 272. 1753; Hook. f. Fl. Brit. Ind. 5 : 20. 1886; Duthie, Fl. Upper Gang. Pl. 3 : 27. 1915 (Repr. ed. 2 : 147. 1960). *B. alba* L. Sp. Pl. 272. 1753; Wight, Ic. 3 (2) : 9. t. 896. 1844-1845. '*Poi*' (Hindi).

Trailing or climbing, succulent, glabrous, perennial herbs. Leaves 3.0-6.5 × 2-6 cm, broadly ovate, cordate at the base, acute or acuminate. Spikes axillary. Flowers bracteate, sessile, pink, sometimes white below. Tepals fleshy, obovate, connate in the lower half. Stamens 5. Styles 3. Utricle c. 4 mm in diam., broadly ovoid, enclosed by the persistent tepals. Seeds subglobose.

Fl. & Fr. : September-February.

Common in marshy places near ponds; Banetha village.

The plant is used as vegetable.

66. POLYGONACEAE

POLYGONUM L.

- 1a. Erect herbs ; leaves more than 5 cm long ; ocreae sheathing the stem, mouth truncate ; flowers more than 5 in paniculate, slender racemes ; styles 2 ; nuts suborbicular, biconvex ... *P. glabrum* 1
- 1b. Diffusely branched, prostrate or decumbent herbs ; leaves less than 3 cm long ; ocreae irregularly lacerately fringed ; flowers 1 - 5 in the axils of leaves ; styles 3 ; nuts acutely trigonous *P. plebeium* 2

1. *Polygonum glabrum* Willd. Sp. Pl. 2 : 447. 1799 ; Wight, Ic. 5 (2) : 6. t. 1799. 1852 ; Hook. f. Fl. Brit. Ind 5 : 34. 1886 ; Duthie, Fl. Upper Gang. Pl. 3 : 35. 1915 (Repr. ed. 2 : 153. 1960) ; Mahesh. Illus. Fl. Delhi f. 188. 1966. 'Nali' (Hindi).

Glabrescent annuals, 0.5 - 1.0 m. Ocreae membranous, 2.5 - 3.5 cm long. Leaves up to 20 × 3 cm, lanceolate or elliptic - lanceolate, attenuate, acuminate, glandular - punctate. Flowers in paniculate, slender racemes, 2.5 - 8.0 cm long, bracteate, pink. Perianth lobes 5, oblong obovate. Stamens 7 - 8. Nuts c. 2 mm long, pointed at the tip, smooth, shining, dark brown or reddish - brown.

Fl. & Fr. : Almost throughout the year.

Very common in marshy places ; Banas river bed at Golian and Tonk.

The leaves and tender branches are used as vegetable.

2. *Polygonum plebeium* R. Br. Prodr. 420. 1810 ('plebejum') ; Hook. f. Fl. Brit. Ind. 5 : 27. 1886 ; Duthie, Fl. Upper Gang. Pl. 3 : 31. 1915 (Repr. ed. 2 : 149. 1960). 'Machechi' (Hindi).

Annual herbs. Leaves up to 1.2 × 0.2 cm, linear, oblong, lanceolate - spatulate or obovate - elliptic, mucronate, margins revolute, glabrous. Ocreae 3.0 - 4.5 mm long, silvery hyaline, membranous. Flowers pink or red. Perianth lobes 5, with a dark median streak. Stamens 7 - 8. Nuts c. 2 mm long, smooth, shining, black.

Fl. & Fr. : November - March.

Common throughout the district in moist, sandy places ; Banas river bed at Bentheli, Banetha tank and Siras forest.

It is a highly polymorphic species in respect of habit, size and shape of leaves, number of flowers in each cluster, length of pedicel and size and shape of perianth lobes.

67. ARISTOLOCHIACEAE

ARISTOLOCHIA L.

Aristolochia indica L. Sp. Pl. 960. 1753 ; Hook. f. Fl. Brit. Ind. 5 : 75. 1886 ; Duthie, Fl. Upper Gang. Pl. 3 : 44. 1915 (Repr. ed. 2 : 161. 1960). *A. lanceolata* Wight, Ic. 5 (2) : 17. t. 1858. 1852.

Twining, glabrous herbs. Leaves 2.5 - 11.5 × 1.5 - 8.5 cm, obovate, oblong or subpandurate, cuneate or subcordate at the base, acute or acuminate, entire, 3 nerved at the base. Flowers in few - flowered, axillary, bracteate racemes ; tube inflated, mouth oblique, trumpet - shaped, greenish ; limb purple or brownish - red. Stamens 6. Styles 6 - lobed. Capsules 2.5 - 3.2 × 1.2 - 2.0 cm, obovoid or oblong, opening from below upwards, 6 - valved ; pedicel splitting into 6 filaments. Seeds many, each c. 5 × 6 mm, deltoid - ovate, flat, winged, pubescent, brown.

Fl. & Fr. : August - October.

Common climber in gravelly habitats ; Toda Rai Singh R.F.

Subterranean rhizomes are used in medicine.

68. LORANTHACEAE

DENDROPHTHOE Mart.

Dendrophthoe falcata (L. f.) Etting. in Denkschr. Akad. Wiss. Math. Naturwiss. 32 : 52 - 53, 58. t. 13, f. 14. 1872 ; Danser in Bull. Jard. Bot. Buitenz. ser. 3. 16 : 30. 1938. *Loranthus falcatus* L. f. Suppl. 211. 1781. *L. longiflorus* Desr. in Lam. Encycl. 3 : 598. 1792 ; Wight, Ic. 1 : t. 302. 1840 ; Hook. f. Fl. Brit. Ind. 5 : 214. 1886 ; Duthie, Fl. Upper Gang. Pl. 3 : 63. 1915 (Repr. ed. 2 : 175. 1960) ; P. Abdulla in Nasir & Ali, Fl. W. Pak. No. 35 : 3. 1973. *L. amplexifolia* DC. Prodr. 4 : 306. 1830. *L. longiflorus* Desr. var. *falcatus* (L. f.) Kurz, For. Fl. 2 : 321. 1877 ; Hook. f. l. c. 5 : 215. 1886. *L. longiflorus* Desr. var. *amplexifolia* (DC.) Thwaites, Enum. 134. 1859 ; Hook. f. l. c. 5 : 215. 1886. 'Banda Patha' (Hindi).

Branched, glabrous, leafy, stem parasites with lenticels. Leaves 4 - 10 × 1.5 - 4.0 cm, elliptic - oblong, elliptic - obovate, obovate - oblong or falcate, cuneate, obtuse, margins undulate or entire, midrib distinct. Flowers in axillary, secund racemes 3.5 - 4.0 cm long, bracteate, pedicellate, red, orange - red or yellowish - red. Calyculus 3 mm long, glabrous, truncate or shallowly 4 - 5 - lobed. Perianth tube 2 - 3 cm long, 5 - lobed ; lobes c. 1 cm long, linear - oblong, reflexed. Stamens 5, epipetalous ; anthers c. 7 mm

long ; filaments red. Style *c.* 3.5 cm long, red ; stigma capitate. Berry *c.* 1.0×0.5 cm, ovoid - oblong, crowned by the persistent calyculus.

Fl. & Fr. : August February.

Rare ; found as a stem parasite on *Boswellia serrata* Roxb. ex Colebr. ; Toda Rai Singh R.F.

69. EUPHORBIACEAE

- | | | |
|--|-----|----------------------|
| 1a. Flowers in cyathia | ... | <i>Euphorbia</i> 4 |
| 1b. Flowers solitary or fascicled or in spikes or racemes : | | |
| 2a. Plants stellately hairy ; leaves 2 - glandular at the base : | | |
| 3a. Inflorescence a spike - like raceme ; pedicels of the female flowers with 2 glands at the base ; seeds oblong, carunculate | ... | <i>Croton</i> 3 |
| 3b. Inflorescence a raceme ; pedicels of [the female flowers without glands ; seeds ovoid or subglobose, scurfy, ecarunculate | ... | <i>Chrozophora</i> 2 |
| 2b. Plants not stellately hairy ; leaves eglandular at the base : | | |
| 4a. Stamens <i>c.</i> 8 ; capsule enclosed by accrescent, leafy bract ; seeds globosely ovoid | ... | <i>Acalypha</i> 1 |
| 4b. Stamens usually 3 ; capsule not enclosed by bract ; seeds trigonous | ... | <i>Phyllanthus</i> 5 |

1. ACALYPHA L.

- | | | |
|--|-----|---------------------|
| 1a. Bract of female flowers fimbriate with 15 - 20 ciliate teeth | ... | <i>A. ciliata</i> 1 |
| 1b. Bract of female flowers dentate with 10 - 15 non - ciliate teeth | ... | <i>A. indica</i> 2 |

1. *Acalypha ciliata* Forssk. Fl. Aegypt. - Arab. 162. 1775 ; Hook. f. Fl. Brit. Ind. 5 : 417. 1887 ; Duthie, Fl. Upper Gang. Pl. 3 : 108. 1915 (Repr. ed. 2 : 209. 1960).

Erect, pubescent annuals, 20-60 cm. Leaves 2-7 × 1-4 cm, ovate to ovate elliptic, base rounded or cuneate, caudate acuminate, finely serrate; petiole 0.5-6.0 cm long. Spikes 0.5-1.5 cm long with the male flowers at the top and the female at the base. Male flowers few, ebracteate, sessile. Tepals 4. Stamens 8; anthers divaricate. Female flowers with 3 tepals. Seeds 1.5 × 1.0 mm, very minutely pitted, brown.

Fl. & Fr. : August-October.

Common on sandy loam soil; Bisalpur R.F.

2. *Acalypha indica* L. Sp. Pl. 1003. 1753; Wight, Ic. 3 (2) : 6. t. 877. 1844-1845; Hook. f. Fl. Brit. Ind. 5 : 416. 1887; Duthie, Fl. Upper Gang. Pl. 3 : 108. 1915 (Repr. ed. 2 : 209. 1960).

Erect, pubescent herbs or undershrubs, 0.5-1.0 m; branches spreading or ascending. Leaves 1-6 × 0.6-5.0 cm, rhomboid-ovate to ovate, cuneate, acute, acuminate or obtuse, crenate-serrate; petiole 1.5-9.0 cm long. Spikes up to 10 cm long with the male flowers clustered towards the top and the female at the base. Capsules hispid. Seeds c. 1 mm long, minutely pitted, pale brown.

Fl. & Fr. : May-October.

Common weed in fallow fields; Kachha Bundha.

2. CHROZOPHORA A. H. L. Juss. *nom. cons.*

- | | | |
|---|-----|-----------------------------|
| 1a. Ovary and capsule covered with silvery lepidote scales and stellate tomentum; stamens 5 | ... | <i>C. hierosolymitana</i> 1 |
| 1b. Ovary and capsule covered with only stellate tomentum; stamens 15 in two whorls: | | |
| 2a. Erect herbs; leaves c. 10 cm long, 2-glandular at the base; stigma red | ... | <i>C. rottleri</i> 3 |
| 2b. Prostrate herbs; Leaves c. 3 cm long, eglandular at the base; stigma orange or yellow | ... | <i>C. prostrata</i> 2 |

1. *Chrozophora hierosolymitana* Spreng. Syst. Veg. 3 : 850. 1826; Balak. in Bull. Bot. Surv. India 15 : 3. 1976. *C. tinctoria* (non A. Juss.) *sensu* Stewart, Punjab Pl. 193. 1869; Hook. f. Fl. Brit. Ind. 5 : 408. 1887, *quoad spec. capsulis lepidotis tantum*. *C. obliqua* (non A. Juss.) Muell. - Arg.

in DC. Prodr. 15 (2) : 749. 1866 *p. p. et quoad* Wall. Cat. 7716 *G tantum*; Hook. f. *l. c.* 5 : 409. 1887, excl. spec. Sind. *C. obliqua* var. *hierosolymitana* (Spreng.) Duthie, Fl. Upper Gang. Pl. 3 : 105. 1915 (Repr. ed. 2 : 206. 1960).

Erect, densely tomentose herbs, 25 - 50 cm. Leaves 2.0 - 5.5 × 1.0 - 3.5 cm, ovate or subrhomboid, subobtuse, wavy, undulate or distinctly toothed ; petiole 1.0 - 5.5 cm long. Flowers in axillary or terminal, bracteate racemes. Male flowers crowded at the top of the raceme, sessile. Sepals 5, linear-elliptic, densely stellate tomentose. Petals 5, ovate - lanceolate, lepidote. Female flowers scattered at the lower part of the raceme, pedicellate. Sepals 5, linear lanceolate, densely stellate - tomentose. Petals 5, linear-lanceolate, densely stellate tomentose. Capsules trilobed. Seeds *c.* 3.5 mm in diam., roughly tuberculate, scurfy, silvery - grey.

Fl. & Fr. March - May.

Very common on dry sandy bed of streams ; Ghati village.

2. ***Chrozophora prostrata*** Dalzell in Dalzell & Gibs., Bombay Fl. 233. 1861; Balak. in Bull. Bot. Surv. India 15 : 6. 1976 ; Duthie, Fl. Upper Gang. Pl. 3 : 106. 1915 (Repr. ed. 2 : 207. 1960). *C. plicata* var. 3. Hook. f. Fl. Brit. Ind. 5 : 410. 1887.

Diffuse, stellate tomentose herbs, 5 - 40 cm. Leaves 0.3 - 3.0 × 0.3 - 1.5 cm, broadly ovate to suborbicular, obtuse at the apex ; petiole 0.5 - 3.0 cm long. Flowers in axillary racemes, bracteate. Male flowers : Sepals 5, ovate. Petals 5, ovate lanceolate. Female flowers : Sepals 5, linear. Petals 5, linear, shorter than the sepals. Capsules trilobed, non - tinctorial. Seeds *c.* 2.5 mm in diam., scurfy, grey.

Fl. & Fr. : Almost throughout the year.

Common in rocky habitats ; Tordi Sagar.

3. ***Chrozophora rottleri*** (Geis.) A. Juss. ex Spreng. Syst. Veg. 3 : 850. 1826 ; Duthie, Fl. Upper Gang. Pl. 3 : 105. 1915 (Repr. ed. 2 : 206. 1960); Balak. in Bull. Bot. Surv. Ind. 15 : 4. 1976. *Croton rottleri* Geis. Croton Monogr. 54. 1807. *Chrozophora tinctoria* (non A. Juss.) Hook. f. Fl. Brit. Ind. 5 : 408. 1887 *pro parte*.

Diffusely branched, densely stellate - tomentose herbs, 25 - 50 cm. Leaves 3 - 10 × 3.3 - 8.5 cm, entire or trilobed, broadly ovate or suborbicular, truncate or cuneate, obtuse, undulate - crenate ; petiole up to 9 cm long. Racemes axillary or terminal, 2 - 6 cm long; bracts linear. Male

flowers sessile. Sepals 5. Petals 5, elliptic - oblong. Filaments connate below into a column. Female flowers pedicellate. Sepals 5, narrowly triangular. Petals 5, setaceous. Capsules trilobed, reddish - purple when mature, tinctorial when wetted ; style persistent. Seeds c. 3 mm in diam., shining, scurfy, grey.

Fl. & Fr. : February May.

Common on sandy loam soil ; Mohamadpura near Aamli and on Banas river bed at Bisalpura.

3. CROTON L.

Croton bonplandianum Baill. in *Adansonia* 4 : 339. 1864 ; Croizat in *Journ. Bombay Nat. Hist. Soc.* 41 : 573. 1940 ; Raizada, *Suppl. Fl. Upper Gang.* Pl. 247. 1976. *C. sparsiflorum* Morong. in *Ann. N.Y. Acad. Sci.* 7 : 221. 1893. '*Kala Bhangra*' (Hindi).

Erect or diffusely branched, annual herbs or undershrubs, 40 - 50 cm ; stem ribbed, clothed with stellate hairs. Leaves 2.0 - 4.5 × 0.3 - 2.0 cm, ovate - lanceolate or ovate, serrate, 3 - nerved at the base. Inflorescence with female flowers at the base and male at the top. Male flowers pale white. Stamens 10 - 15. Female flowers with 2 glands at the base of the pedicel. Capsules trigonous, stellately hairy. Seeds c. 3 mm long, rugose, grey.

Fl. & Fr. : May September.

Common in wastelands and fallow fields; Malpura.

It is a native of S. America, naturalised in many parts of India.

4. EUPHORBIA L.

- 1a. Succulent, dendroid shrubs, armed with two stipular spines ; involucre glands 5 ; seeds globose ... *E. caducifolia* 1
- 1b. Unarmed herbs ; involucre glands 4 ; seeds ovoid or or ellipsoid :
- 2a. Erect herbs ; leaves alternate or opposite ; involucre glands 2 - horned or semilunar ; seeds with a thin crest on one side and a faint furrow on the other ... *E. dracunculoides* 3

- 2b. Prostrate or ascending herbs ; leaves all opposite ; involucre glands not horned ; seeds angular :
- 3a. Plants clothed with long, yellowish, transparent hairs ; leaves 1.2 - 4.5 cm long : ... *E. hirta* 5
- 3b. Plants glabrous or clothed with whitish pubescence ; leaves less than 1.2 cm long :
- 4a. Plants and capsules glabrous or nearly so :
- 5a. Stipules setaceous from a broad toothed base ; seeds rugose ... *E. clarkeana* 2
- 5b. Stipules bipartite, laciniately toothed ; seeds smooth ... *E. heyneana* 4
- 4b. Plants pubescent ; capsules pubescent or hirsute :
- 6a. Branches hispidly pubescent all round ; stipules elongate, fimbriate ; capsules pubescent or hirsute throughout ... *E. thymifolia* 7
- 6b. Branches hispidly pubescent on the upper side only ; stipules deltoid - ovate ; capsules with stiff and spreading hairs only on the keel ... *E. prostrata* 6

1. *Euphorbia caducifolia* Haines in Indian For. 40 : 154. 1914 & Bot. Bihar & Orissa 1 : 143. 1921. *E. neriifolia* auct plur. non L. 1753. 'Thor, Danda Thor' (Hindi).

Glaucous, perennial shrubs, up to 2 m ; latex milky ; branches cylindrical with small, distant, non - confluent tubercles ; each tubercle with a black areole bearing a pair of 4 - 10 mm long, blackish, divergent spines. Leaves fleshy, caducous. Cyathia more than one together, bracteate, pedicellate, red. Involucre c. 6 mm in diam., transversely oblong ; lobes 5, fimbriate ; glands sessile, transversely oblong. Anthers bilobed. Capsules 9 - 11 mm in diam., sharply 3 lobed, glabrous. Seeds c. 3 mm in diam., greyish brown with a distinct marginal line, scurfy.

Fl. & Fr. : February - April.

Very common in rocky habitats throughout the district.

This species closely resembles *E. neriifolia* L. but it can easily be identified by the non - confluent, distant tubercles ; ovate or oblong - ovate, non - apiculate, caducous leaves and oblong, didymous anthers. In *E. neriifolia* L. the tubercles are spirally arranged and confluent ; leaves obovate or obovate - oblong, apiculate ; anthers sagittate, apiculate.

The leaves are used as vegetable and are sold in the market. The milky juice is used as a cure for cough and is applied to the skin for the treatment of blisters.

2. *Euphorbia clarkeana* Hook. f. Fl. Brit. Ind. 5 : 253. 1887 ; Duthie, Fl. Upper Gang. Pl. 3 : 82. 1915 (Repr. ed. 2 : 189. 1960). 'Dudhi' (Hindi).

Prostrate or suberect annuals. Leaves 1.5 - 10.0 × 0.5 - 4.0 mm, obliquely oblong or linear oblong with the base almost auricled on one side, entire or toothed at the tip. Cyathia usually solitary, sometimes two together in each axil. Involucre stalked, c. 0.8 mm in diam., campanulate, glabrous ; lobes 5, lanceolate, toothed, longer than the glands ; glands minute, orbicular, pink. Capsules c. 1.2 mm in diam., trigonous. Seeds c. 1 mm long, ovoid, distinctly 4 angled, scurfy, reddish.

Fl. & Fr. : Almost throughout the year.

Common in sandy habitats ; Niwai to Haji - Ki - Kothi.

3. *Euphorbia dracunculoides* Lam. Dict. Bot. 2 : 428, 1786 & Encycl. 2 : 428. 1788 ; Hook. f. Fl. Brit. Ind. 5 : 262. 1887 ; Duthie, Fl. Upper Gang. Pl. 3 : 78. 1915 (Repr. ed. 2 : 185. 1960) ; Mahesh. Illus. Fl. Delhi f. 192. 1966. 'Ban - bui' (Hindi).

Dichotomously branched, deep rooted, glabrous, glaucous herbs, 20 - 45 cm. Leaves 0.5 - 4.5 (-9) × 0.2 - 0.5 cm, sessile, linear - lanceolate or rarely ovate lanceolate, ovate or oblong, acute, subacute or rarely obtuse, entire. Cyathium solitary in each axil. Involucre shortly stalked, c. 3 mm in diam., campanulate, glabrous outside, hairy inside ; lobes 5, ciliolate. Male flower a stalked stamen. Female flower with ovary on a long stalk. Capsules c. 4.5 mm in diam., glabrous. Seeds c. 3 mm in diam., ellipsoid, rugose, scurfy, strophiolate.

Fl. & Fr. : August - February.

A common winter season weed in cultivated and fallow fields ; Deoli and Siras R.F.

Used as fodder.

4. *Euphorbia heyneana* Spreng. Syst. Veg. 3 : 791. 1826 ; Panigrahi in Kew Bull. 29 : 695 - 696. 1975. *E. microphylla* Heyne ex Roth, Nov. Pl. Sp. 229. 1821, non Lam. 1788 ; Hook. f. Fl. Brit. Ind. 5 : 252. 1887 ; Duthie, Fl. Upper Gang. Pl. 3 : 82. 1915 (Repr. ed. 2 : 188. 1960). *E. orbiculata* Miq. Fl. Ind. Bat. 1 (2) : 421. 1859, non H.B.K. 1817 ; Rajagopal & Panigrahi in Taxon 17 : 547. 1968. 'Dudhi' (Hindi).

Prostrate, spreading, glaucous herbs ; internodes ribbed. Leaves $1.5 \times 6.0 \times 1.4$ mm, obliquely oblong or obovate oblong, apex retuse or subtruncate, serrate, margins entire at the base. Cyathia reddish - green. Involucre stalked, c. 1 mm across, campanulate, glabrous ; lobes 5, triangular. Capsules c. 1.5 mm in diam., obtusely keeled. Seeds c. 1 mm long, ovoid, obtusely tetrangular, apex blunt, pale brown, red when rubbed.

Fl. & Fr. : Almost throughout the year.

Commonly found in rock crevices in marshy places ; Banas river bed at Bisalpura.

5. **Euphorbia hirta** L. Sp. Pl. 454. 1753 ; Duthie, Fl. Upper Gang. Pl. 3 : 80. 1915 (Repr. ed. 2 : 187. 1960) ; Mahesh. Illus. Fl. Delhi f. 193. 1966. *E. pilulifera* auct. non L. 1753 ; Hook. f. Fl. Brit. Ind. 5 : 250. 1887. 'Dudhli' (Hindi).

Procumbent, ascending or erect, hispid annuals. Leaves obliquely oblong - elliptic or ovate elliptic, acute, serrate. Cyathia numerous in each axil. Involucre stalked, c. 1.5 mm in diam., cup shaped ; glands stalked, globose, pink. Ovary on a long stalk, hairy or puberulus. Capsules c. 1 mm in diam., globosely trigonous, appressedly hairy. Seeds c. 1 mm long, ovoid with 3 sharp and one blunt angles, transversely rugose, reddish.

Fl. & Fr. : Almost throughout the year.

A very common weed throughout the district in fallow and cultivated fields ; Kakor R.F. and Aamli R.F.

A very variable plant particularly in respect of habit and in the shape and size of leaves.

6. **Euphorbia prostrata** Aiton, Hort. Kew. ed 1. 2 : 139. 1789 ; Hook. f. Fl. Brit. Ind. 5 : 266. 1887 ; Mahesh. Illus. Fl. Delhi f. 194. 1966. 'Dudi' (Hindi).

Prostrate or decumbent annuals. Leaves $0.2 \times 0.7 \times 0.1$ - 0.4 cm, obliquely oblong, obovate oblong or elliptic oblong, rounded at the apex, minutely serrate especially in the upper half, glabrous above, with scattered hairs beneath. Involucre stalked, c. 0.5 mm in diam., campanulate, pubescent ; lobes 5, deltoid ovate, ciliate. Capsules c. 1.0 - 1.5 mm in diam., usually deflexed, subglobosely trigonous ; cocci prominently keeled. Seeds c. 1 mm long, ovoid, 4 angled, transversely furrowed, scurfy, reddish.

Fl. & Fr. : Almost throughout the year.

Common on moist, sandy clayey soil ; by the side of tank at Gar village.

This species closely resembles *E. thymifolia* L. but it can easily be identified by the capsule being long stalked and hairy only on the keel, while in *E. thymifolia* L. the capsule is shortly stalked and hirsute throughout. *E. heyneana* Spreng. subsp. *heyneana* also resembles *E. prostrata* Aiton but it can be identified by the entirely glabrous capsules.

7. **Euphorbia thymifolia** L. Sp. Pl. 454. 1753 ; Hook. f. Fl. Brit. Ind. 5 : 252. 1887 ; Duthie, Fl. Upper Gang. Pl. 3 : 81. 1915 (Repr. ed. 2 : 188. 1960).

Prostrate, annual herbs. Leaves 1.5 - 8.0 × 1 - 4 mm, obliquely oblong or oblong - elliptic, obtuse, crenulate, glabrous above, usually slightly pubescent beneath. Cyathia more than one in each axil. Involucre shortly stalked, c. 1 mm in diam., campanulate. Capsules c. 1.5 mm in diam. Seeds c. 1 mm long, ovoid, 4 angled, transversely furrowed, scurfy, reddish brown.

Fl. & Fr. : August November.

Comon weed on loamy soil ; Mayola forest near Bisalpora.

5. PHYLLANTHUS L.

Phyllanthus virgatus Forster f. Fl. Ins. Austr. 65. 1786 ; Airy Shaw in Kew Bull. 26 : 325. 1972. *P. simplex* Retz. Obs. Bot. 5 : 29. 1789 ; Hook. f. Fl. Brit. Ind. 5 : 295. 1887 ; Duthie, Fl. Upper Gang. Pl. 3 : 97. 1915 (Repr. ed. 2 : 200. 1960). *Macraea oblongifolia* Wight, Ic. 5 (2) : 27. t. 1902, f. 1. 1852.

Erect or decumbent - ascending, perennial herbs, 15 - 40 cm. Leaves 0.6 - 2.5 × 0.2 - 0.8 cm, linear oblong or elliptic oblong, glabrous ; stipules ovate, sagittate. Male flowers usually solitary. Tepals 5 - 6, oblong - ovate, obtuse, 1 nerved. Filaments free ; anthers didymous. Female flower solitary. Tepals 6, ovate oblong, obtuse. Styles short, 2 fid, recurved. Disc cup - shaped. Capsules c. 3 mm in diam., globose, obscurely 3 lobed, crustaceous. Seeds trigonous, rounded on the back, finely warty, dark brown.

Fl. & Fr. : August September.

Found on loamy soil ; Rampura.

A very variable plant in respect of habit and shape and size of leaves.

70. ULMACEAE

HOLOPTELEA Planch.

Holoptelea integrifolia (Roxb.) Planch. in Ann. Sci. Nat. Bot. ser. 3. 10 : 269. 1848 ; Wight, Ic. 6 : 8. t. 1968. 1853 ; Hook. f. Fl. Brit. Ind. 5 : 481. 1888 ; Duthie, Fl. Upper Gang. Pl. 3 : 120. 1915 (Repr. ed. 2: 217. 1960) ; Brandis, Ind. Trees 595. 1971. *Ulmus integrifolia* Roxb. Pl. Cor. 1 : 56. t. 78. 1798 ; Bedd. Fl. Sylv. t. 310. 1873. 'Kunj, Dhamua, Papri, Kanoj' (Hindi).

Deciduous trees, 6-10 m ; bark whitish - grey ; younger parts pubescent. Leaves 5-15 × 4-10 cm, elliptic or broad ovoid, acuminate ; petiole up to 1.5 cm long. Flowers in numerous fascicles with male and hermaphrodite flowers mixed. Perianth cleft nearly to the base ; segments 5, hairy. Stamens up to 8 ; anthers hairy. Ovary stipitate, compressed, hairy. Samara c. 2.5 cm in diam., obliquely elliptic or suborbicular, notched at the apex and crowned by persistent styles ; wings reticulately veined.

Fl. & Fr. : March - May.

Common on sandy Banas river bed ; Kakor R. F. Also observed elsewhere on sandy river beds.

The wood is chiefly used for fuel and charcoal. The leaves are lopped for cattle fodder.

71. MORACEAE

FICUS L.

- 1a. Plants with many aerial roots ; leaves obtuse or subacute ; basal bracts more than 5 x 10 mm, semilunate ... *F. benghalensis* 2
- 1b. Plants without aerial roots ; leaves caudate - acuminate tailed or acuminate ; basal bracts less than 5 x 10 mm :
- 2a. Leaves broadly ovate to ovate - rotund, caudate - acuminate tailed ; syconia sessile or with a short, glabrous pedicel :

- 3a. Leaf base deeply cordate, tail 1/4 as long as the blade ; syconia depressed at the apex ; basal bracts *c.* 1 × 2 mm, semilunar, glabrous ; perianth lobes of the gall and fertile female flowers united and completely investing the ovary ... *F. arnottiana* 1
- 3b. Leaf base rounded or truncate, tail 1/2 as long as the blade ; syconia with a protuberance at the apex ; basal bracts *c.* 5 × 6 mm, ovate - suborbicular, silvery pubescent ; perianth lobes of the gall and fertile female flowers 5, free ... *F. religiosa* 3
- 2b. Leaves ovate - lanceolate, elliptic - ovate or ovate, shortly acuminate ; syconia with a distinct, pubescent pedicel ... *F. virens* 4

1. *Ficus arnottiana* (Miq.) Miq. Ann. Bot. Lugd. Bat. 3 : 287. 1867 ; King in Ann. Roy. Bot. Gard. Calc. 1 : 56. t. 68, 84 V. 1887 1888 & in Hook. f. Fl. Brit. Ind. 5 : 513. 1888 ; Duchie, Fl. Upper Gang. Pl. 3 : 152. 1915 (Repr. ed. 2 : 242. 1960) ; Corner in Gard. Bull. Straits Settle. 21 : 11. 1965. *Urostigma arnottianum* Miq. in London Journ. Bot. 6 : 564. 1847. 'Pimpli, Palhi' (Hindi).

Glabrous trees, 5 - 8 m ; bark pale brown. Leaves 5 - 18 × 5 - 13 cm, alternate, undulate, tail 1.5 - 5.0 cm ; petiole 5 - 15 cm long ; stipules ovate-lanceolate, caducous. Syconia 0.5 - 1.0 cm across, in pairs or in clusters, smooth, dark purple ; basal bracts 3, membranous. Male flowers few, sessile, situated near the mouth. Gall and fertile female flowers sessile or pedicellate. Style elongate.

Fl. & Fr. : September - March.

Found on rocky hills ; Toda Rai Singh R.F.

This species closely resembles *F. religiosa* L. but it can easily be distinguished by the base of leaf being deeply cordate ; syconia pedicelled to subsessile ; perianth lobes in gall and fertile female flowers united and completely investing the ovary, While in *F. religiosa* L. the base of the leaf is rounded to truncate or slightly cordate ; syconia sessile ; perianth lobes in gall and fertile female flowers 5, free. *F. religiosa* L. also closely resembles *F. rumphii* Bl., but *F. rumphii* can be separated by its leaves being narrowed at the base, with a less suddenly acuminate and shorter tailed apex ; the globular syconia not depressed at the apex and the perianth lobes 3, free.

2. *Ficus benghalensis* L. Sp. Pl. 1059. 1753 ; King in Ann. Roy. Bot. Gard. Calc. 1 : 18. t. 13, 81 C. 1887 - 1888 & in Hook. f. Fl. Brit. Ind. 5 : 499.

1888 ; Duthie, Fl. Upper Gang. Pl. 3 : 147. 1915 (Repr. ed. 2 : 238. 1960) ; Corner in Gard. Bull. Straits Settlem. 21 : 14. 1965. *Urostigma benghalense* (L.) Gasp. Nov. Gen. Fic. 7. 1844 ; Wight, Ic. 6 : 12. t. 1989. 1853. 'Bargad, Barr' (Hindi).

Trees, 7 25 m; latex milky. Leaves 6 22 × 4.5 - 14.0 cm, ovate, ovate-orbicular or elliptic, base rounded or subcordate ; petiole 1.5 3.5 cm long, triangular, acuminate, caducous. Syconia in pairs, sessile, 1.5 - 2.0 cm across, depressed globose, silky - pubescent, bright red when ripe ; basal bracts 3. Male flowers many. Perianth lobes 4, lanceolate. Stamen 1. Gall and fertile female flowers with elongate style.

Fl. & Fr. : Almost throughout the year.

Tordi R.F. ; planted.

3. *Ficus religiosa* L. Sp. Pl. 1059. 1753 ; King in Ann. Roy. Bot. Gard. Calc. 1 : 55. t. 67 A, 84 U. 1887 1888 & in Hook. f. Fl. Brit. Ind. 5 : 513. 1888; Duthie, Fl. Upper Gang. Pl. 3 : 150. 1915 (Repr. ed. 2 : 241. 1960) ; Corner in Gard. Bull. Straits Settlem. 21 : 6. 1965. *Urostigma religiosum* (L.) Gasp. Ric. Caprif. 82. t. 7, f. 1 - 5. 1845 ; Wight, Ic. 6 : 8. t. 1967. 1853. 'Pimpal, Pipal, Pipli' (Hindi).

Glabrous trees, 7 20 m ; bark grey. Leaves 8 - 15 × 6 - 10 cm, undulate, tail 3 - 5 cm long ; petiole 6 10 cm long ; stipules small, ovate, acute, caducous. Syconia in pairs, sessile, c. 1 cm across, depressed - globose with a protuberance at the apex, pinkish ; basal bracts 3. Male flowers very few, sessile, situated near the mouth (absent in many). Gall and fertile female flowers sessile or pedicellate.

Fl. & Fr. : Almost throughout the year.

Commonly planted along road sides and by the side of tanks and dams.

This is the sacred Bo tree, especially sacred to Buddhists and Hindus.

4. *Ficus virens* Aiton, Hort. Kew 3 : 451. 1789 ; Corner in Gard. Bull. Sing. 17 : 376. 1960 & in Gard. Bull. Straits Settlem. 21 : 9. 1965 ; *F. infectoria* Roxb. Fl. Ind. ed. Carey 3 : 551. 1832, non Willd. 1806 ; Wight, Ic. 2 (4) : 3. t. 665. 1843 ; King in Ann. Roy. Bot. Gard. Calc. 1: 60. t. 75, 84 Y2. 1887 1888 & in Hook. f. Fl. Brit. Ind. 5 : 515. 1888 ; Duthie, Fl. Upper Gang. Pl. 3 : 153. 1915 (Repr. ed. 2 : 243. 1960). 'Khabar, Pilkhan' (Hindi).

Trees, c. 10 m ; bark grey. Leaves 5-12 × 2.0-4.5 cm. entire or sub-undulate ; petiole 2.5-3.0 cm long ; stipules broadly ovate, acute. Syconia in pairs on c. 1 cm long pedicel, 0.5-0.8 cm across, globular, pubescent ; basal bracts 3, c. 1.5 × 2.0 mm, ovate rotund. Male flowers sessile with a single stamen. Perianth lobes 4-5, small, linear lanceolate. Gall and fertile female flowers with 3-4, linear lanceolate perianth lobes. Stigma elongate.

Fl. & Fr. : December - September.

Found in rocky habitats on hills ; Toda Rai Singh R. F.

72. CERATOPHYLLACEAE

CERATOPHYLLUM L.

Ceratophyllum demersum L. Sp. Pl. 992. 1753 ; Hook. f. Fl. Brit. Ind. 5: 639. 1888 ; Duthie, Fl. Upper Gang. Pl. 3 : 168. 1915 (Repr. ed. 2 : 255. 1960) ; Steenis, Fl. Males. I. 4 : 41. f. 1. 1949 ; Subram. Aquat. Angiosp. 52. f. 36. 1962. '*Jal-Butti*' (Hindi).

Submerged, much branched, aquatic herbs. Leaves more than 5 in a whorl, up to 1.5 cm long, dichotomously forked, each segment filiform, minutely toothed. Flowers axillary, solitary, sessile or subsessile, unisexual. Perianth - segments linear, ciliate at the apex. Stamens many. Ovary sessile. Fruits laterally compressed, ellipsoid, with persistent subulate style, subtended by two basal spines.

Fl. & Fr. : September - February.

Common in ponds and tanks ; Tordi Sagar.

MONOCOTYLEDONS

73. HYDROCHARITACEAE

1a. Stem stoloniferous ; leaves radical, rosette ; peduncle of the female flower spirally coiled ...

Vallisneria 3

- 1b. Stem leafy, branched ; leaves cauline, whorled or alternate ; peduncle of female flower not spirally coiled :
- 2a. Leaves in whorls ; male flower solitary in the globose spathe provided with subulate appendages ; stamens 3 ; fruit cylindric or narrowly conical ; seeds smooth *Hydrilla* 1
- 2b. Leaves alternate ; male flowers many, densely crowded in an ovoid, 2 - fid spathe ; stamens 2 ; fruit an ovoid utricle ; seeds scrobiculate ... *Nechamandra* 2

1. HYDRILLA L. C. Rich.

Hydrilla verticillata (L. f.) Royle, Ill. Bot. Himal. t. 376. 1839 ; Hartog in Fl. Males. I. 5 : 385. f. 1 3. 1957 ; Hook. f. Fl. Brit. Ind. 5 : 659. 1888 ; Duthie, Fl. Upper Gang. Pl. 3 : 173. 1920 (Reper. ed. 2 : 262. 1960) ; Subram. Aquat. Angiosp. 55. f. 37. 1962. *Serpicula verticillata* L. f. Suppl. 416. 1781.

Slender, submerged, aquatic herbs. Leaves in whorls of 3 8, 2 10 × 1 2 mm, oblong or linear, sharply serrate - dentate. Flowers unisexual. Male flowers shortly pedicellate. Female flower solitary, sessile ; spathe tubular, bifid at the apex. Sepals obovate, whitish with reddish spots. Petals spatulate, apex rounded, whitish. Fruits softly echinate. Seeds 3 6, each c. 2 mm long, fusiform, dark brown.

Fl. & Fr. : September - November.

Abundant in temporary pond near Sandalai village.

2. NECHAMANDRA Planch.

Nechamandra alternifolia (Roxb.) Thwaites, Enum. Pl. Zeyl. 332. 1864 ; Subram. Aquat. Angiosp. 56. f. 38 1962. *Vallisneria alternifolia* Roxb. Fl. Ind. ed. Carey 3 : 750. 1832. *Nechamandra roxburghii* Planch. in Ann. Sci. Nat. Paris ser. 3. 11 : 78. 1849. *Lagarosiphon roxburghii* (Planch.) Benth. in Benth. & Hook. f. Gen. Pl. 3 : 451. 1883 ; Hook. f. Fl. Brit. Ind. 5 : 659. 1888 ; Duthie, Fl. Upper Gang. Pl. 3 : 174. 1920 (Repr. ed. 2 : 262. 1960).

Submerged, perennial, aquatic herbs. Leaves sessile, 1.0 4.5 × 0.3 cm, linear lanceolate, amplexicaul, acute, minutely serrulate, striate. Flowers unisexual. Male flowers minute. Female Fowers solitary,

enclosed in a tubular, 2 fid spathe. Perianth tube filiform, limb 3 - partite, lobes spreading, orbicular. Stigmas 3, finely papillose. Fruits 6 - 8 mm long. Seeds numerous, minute, *c.* 1 mm long ; ascending, oblong - obovate, scrobiculate.

Fl. & Fr. : September - April.

Common in Tordi Sagar.

3. VALLISNERIA L.

Vallisneria spiralis L. Sp. Pl. 1015. 1753 ; Hook. f. Fl. Brit. Ind. 5 : 660. 1888; Duthie, Fl. Upper Gang. Pl. 3 : 174. 1920 (Repr. ed. 2 : 263. 1960); Subram. Aquat. Angiosp. 57. f. 39. 1962. '*Jal - Bel*' (Hindi).

Submerged, tufted, aquatic herbs. Leaves up to 30 × 0.8 cm, linear, ribbon - like, subacute, entire or dentate, 5 nerved. Flowers unisexual. Male flowers many, enclosed in shortly peduncled, 3 lobed spathe. Sepals 3. Petals absent. Stamens 1 - 3, mostly 2. Female flower solitary ; spathe 2 cleft. Sepals 3, oblong - ovate, with reddish spots. Petals 3, scarious. Styles 3. Fruits 4 - 6 (10) cm long, linear, with long, coiled peduncle. Seeds numerous, *c.* 1 mm long, obconic to fusiform.

Fl. & Fr. : February - November.

Common in Banas river near Rajmahal and in Tordi Sagar.

74. ORCHIDACEAE

ZEUXINE Lindl. *nom. cons.*

Zeuxine strateumatica (L.) Schlecht. Fedde Repert. Beih. 1 : 77. 1911 ; Holtum, Fl. Malaya 1 : 133. 1964 (3rd ed.) ; Santapau & Kapadia, Orchid. Bombay 167. t. 38. 1966 ; Blatt. & McC. in Journ. Bombay Nat. Hist. Soc. 35 : 731. 1932. *Orchis strateumatica* L. Sp. Pl. 943. 1753. *Zeuxine sulcata* Lindl. Gen. Sp. Orch. 485. 1840 ; Hook. f. Fl. Brit. Ind. 6 : 106. 1890 ; King & Pantling in Ann. Roy. Bot. Gard. Calc. 8 : 286. t. 381. 1898 ; Duthie, Fl. Upper Gang. Pl. 3 : 219. 1920 (Repr. ed. 2 : 298. 1960).

Slender, erect, terrestrial herbs, 5-20 cm. Leaves 1.5-6.0 cm long, linear-lanceolate, acute to subacuminate, entire. Inflorescence 2-5 cm or more long, dense. Bracts 0.5-5 cm long, ovate-lanceolate, acuminate. Sepals unequal, lateral ones ovate-lanceolate, cymbiform; the dorsal broadly ovate. Petals falcate-lanceolate or oblong, pale pink, united with the dorsal sepal to form a hood over the column. Lip narrowly panduriform, saccate at the base, papillate. Column very short. Anthers very shortly beaked, covered by the wings of the column. Stigmas 2. Capsules c. 0.7 mm long, ovoid. Seeds minute, fusiform, yellowish-brown.

Fl. & Fl. : January-March.

Common in marshy places near Niwai.

75. AGAVACEAE

AGAVE L.

Agave cantala Roxb. Fl. Ind. ed. Carey 2 : 167. 1832; Duthie, Fl. Upper Gang. Pl. 3 : 243. 1920 (Repr. ed. 2 : 316. 1960); Parker, Forest Fl. Punjab 512. 1973 (Repr. ed.). '*Ram bans*' (Hindi).

Scapigerous undershrubs, up to 4 m. Leaves rosette, 80-120 × 5-6 cm, linear-lanceolate, pale green, often glaucous, marginal prickles falcate, ascending, 3 mm long or more, terminal prickle needle-like, reddish, c. 2.0 cm long. Inflorescence a branched panicle; pedicel jointed. Tepals 6, greenish; lobes linear-lanceolate, obtuse. Stamens 6.

Fl. : May.

Planted along the hedges of cultivated fields; Golian village near Tonk.

The plant yields fibres used by the villagers. This species is useful in reclothing bare hills where the soil is poor.

76. LILIACEAE

1a. Thorny climbing or straggling undershrubs; roots tuberous; leaves absent; fruit a berry, red when ripe ...

Asparagus 1

1b. Erect, scapigerous herbs; roots not tuberous; leaves present; fruit a capsule, brownish when ripe :

- 2a. Bulbiferous, perennial herbs ; leaves flat, linear ;
scapes not branched ; pedicels not jointed ; capsules
smooth ; seeds obovate - oblong, winged ... *Urginea* 3
- 2b. Non-bulbiferous, annual herbs ; leaves fistulosus,
terete ; scapes branched ; pedicels jointed near the
middle ; capsules transversely wrinkled ; seeds
acutely trigonous, transversely wrinkled ... *Asphodelus* 2

1. ASPARAGUS L.

Asparagus racemosus Willd. Sp. Pl. 2 : 152. 1799 ; Wight, Ic. 6 : 26. t. 2056. 1853 ; Hook. f. Fl. Brit. Ind. 6 : 316. 1892 ; Duthie, Fl. Upper Gang. Pl. 3 : 259. 1920 (Repr. ed. 2 : 327. 1960). 'Satawar, Safed mussli' (Hindi).

Stem terete. Spines erect or slightly curved, 3-8 mm long. Cladodes slender, whorled, deciduous during flowering and fruiting. Racemes 2.0-5.5 cm long, fascicled, whitish-red or white, fragrant ; pedicels c. 3 mm long, filiform ; bracts 1.5-2.0 mm long, ovate, acute, hyaline. Tepals 6, obovate, obtuse. Anthers 6. Stigmas spreading. Berry 3.0-4.5 mm in diam. Seed solitary, globose, shining black.

Fl. & Fr. : November-February.

Common in rocky habitats ; Rajmahal and on sandy soil at Sohela.

2. ASPHODELUS L.

Asphodelus tenuifolius Cav. in Anal. Cienc. Nat. 3 : 46. t. 27, f. 2. 1801 ; Hook. f. Fl. Brit. Ind. 6 : 332. 1892, excl. syn. *A. fistulosus* L. ; Duthie, Fl. Upper Gang. Pl. 3 : 265. 1920, excl. syn. *A. fistulosus* L. (Repr. ed. 2 : 333. 1960) ; Mahesh. Illus. Fl. Delhi f. 201. 1966. *A. parviflorus* Wight, Ic. 6 : 27. t. 2062. 1853 (*A. pauciflorus* in text). 'Piazi' (Hindi).

Scapigerous herbs. Leaves radical, sessile, 10-20 cm long, acute, scabrid. Scapes many. Flowers bracteate, in lax racemes, white. Pedicels 3-6 mm long, jointed below the middle. Tepals 6, oblong-ovate, obtuse with a distinct, green, brownish-green or reddish-brown mid vein. Anthers 6, orange. Capsules 2-4 mm in diam. Seeds c. 3 mm long, black.

Fl. & Fr. : December-March.

A very common winter season weed in cultivated and fallow fields ; Haji Ki Kothi (Niwai) and Banas river bed near Bentheli village.

The European *A. fistulosus* L. which was hitherto treated as a synonym of *A. tenuifolius* Cav. is now generally considered as a distinct species. *A. fistulosus* is recognisable by the plants being perennial, scape glabrous and leaves scabrid only on the marginal nerves. Backer in Fl. Trop. Africa treats *A. tenuifolius* Cav. as a variety of *A. fistulosus* L.

3. URGINEA Steinh.

Urginea indica (Roxb.) Kunth Enum. Pl. 4 : 333. 1843 ; Wight, Ic. 6 : 27. t. 2063. 1853 ; Hook. f. Fl. Brit. Ind. 6 : 347. 1892 ; Duthie, Fl. Upper Gang. Pl. 3 : 264. 1920 (Repr. ed. 2 : 332. 1960) ; Deb & Dasgupta in Bull. Bot. Surv. India 16: 118. f. 1, 2. 1974 & Fl. India Fasc. 7 : 17. f. 39 46. 1981. *Scilla indica* Roxb. Fl. Ind. ed. Carey 2 : 147. 1832. 'Jangli Kanda' (Rajasthani), 'Pias' (Hindi).

Scapigerous herbs, up to 1 m. Bulbs 3 7×2.5 5.5 cm, fleshy, tunicated, hysteranthous. Leaves subbifarious, whorled at the base, 15 - 40×1 3 cm, linear - lanceolate, acute. Racemes simple, lax. Flowers bracteate, greenish brown ; pedicels 2.0 - 3.5 cm, longer than bracts or become longer in fruits. Perianth lobes 6, biseriate, oblong lanceolate, obtuse. Stamens 6. Stigma trilobed. Capsules c. 2.5×0.8 cm, ellipsoid, trilocular. Seeds many, each c. 1.0×0.5 cm.

Fl. & Fr. : December - May.

Common in rocky loamy habitats ; Kotri village along Aligarh - Aamli road.

77. COMMELINACEAE

- | | | |
|--|-----|-------------------------|
| 1a. Cymes enclosed in spathaceous bracts | ... | <i>Commelina</i> 2 |
| 1b. Cymes not enclosed in spathaceous bracts : | | |
| 2a. Flowers in cymes reduced to axillary fascicles enclosed in inflated sheaths ; stamens 6, all fertile | ... | <i>Amischohacelus</i> 1 |
| 2b. Flowers in lax cymose panicles ; fertile stamens 2 | ... | <i>Murdannia</i> 3 |

1. AMISCHOPHACELUS Rolla Rao & Kammathy

Amischophacelus axillaris (L.) Rolla Rao & Kammathy in Journ. Linn. Soc. Bot. 59 : 306. 1966. *Commelina axillaris* L. Sp. Pl. 42. 1753. *Cyanotis axillaris* (L.) D. Don, Prodr. Fl. Nepal. 46. 1825 ; Hook. f. Fl. Brit. Ind. 6 : 388. 1892 ; Basu, Ind. Med. Pl. t. 985. 1918 ; Duthie, Fl. Upper Gang. Pl. 3 : 280. 1920 (Repr. ed. 2 : 344. 1960) ; Mahesh. Illus. Fl. Delhi f. 205. 1966.

Prostrate or suberect, somewhat fleshy annuals. Leaves sessile, up to 8×1 cm, linear lanceolate or ovate, acute. Sheaths ciliate on the margins. Flowers sessile, blue violet. Filaments bearded. Capsules c. 6.5 mm long (including the beak), oblong - ellipsoid with 3 erect, bilobed, pubescent beaks. Seeds c. 2.0×1.5 mm, subcylindric, truncate at base, rounded at apex, pitted, grey.

Fl. & Fr. : September - December.

Common in marshy places by the side of pond in Kakor village.

2. COMMELINA L.

- | | | |
|--|-----|------------------------|
| 1a. Spathes sessile or nearly so in terminal heads ; all cells of the ovary 1 - ovuled | ... | <i>C. erecta</i> 1 |
| 1b. Spathes pedunculate, solitary, axillary ; the 2 anticous cells of the ovary 2 - ovuled, the posticous 1 - ovuled : | | |
| 2a. Leaf margins usually undulate ; spathes broadly ovate ; posticous cell of the capsule not keeled | ... | <i>C. forskalaei</i> 2 |
| 2b. Leaf margins not undulate ; spathes ovate - lanceolate ; posticous cell of the capsule keeled | ... | <i>C. hasskarlii</i> 3 |

1. **Commelina erecta** L. Sp. Pl. 41. 1753. *C. undulata* R. Br. Prodr. 1 : 270. 1810 ; Hook. f. Fl. Brit. Ind. 6 : 373. 1892 ; Rolla Rao in Notes Roy. Bot. Gard. Edinb. 26 : 352. 1966 ; Raizada, Suppl. Fl. Upper Gang. Pl. 282. 1976. *C. kurzii* C.B. Clarke in Journ. Linn. Soc. 11 : 444. 1871 ; Hook. f. l. c. 6 : 373. 1892 ; Rolla Rao & Kammathy in Journ. Bombay Nat. Hist. Soc. 59 : 61. t. 1 A, D. 1962.

Profusely branched, erect or decumbent, perennial herbs, 30 - 70 cm. Leaves up to 13.0×3.5 cm, lanceolate, acuminate. Sheaths ciliate along the margin at the mouth. Spathes 2 - 5 together, funnel - shaped, closed at

one end and beaked at the other, accompanied by 2-4 smaller leaves in addition to the 2 mature leaves. Cymes bifid, inner represented by a stump, outer 3-6 flowered. Flowers violet. Capsules 2-3 in each spathe, c. 6 mm long, oblong, 3-seeded. Seeds c. 3.5 × 3.0 mm, oval, black with membranous margin.

Fl. & Fr. : August-September.

Found in Nayagaon on the way to Gar R.F. (Deoli) on sandy soil.

This species is often confused with *C. paludosa* Blume but can be distinguished by the 2-4 smaller leaves accompanying the spathes, in addition to the 2 mature leaves subtending the spathes and by the absence of rusty brown hairs along the margins of leaf sheaths.

2. *Commelina forskalaei* Vahl, Enum. 2 : 172. 1806 ; Hook. f. Fl. Brit. Ind. 6 : 371. 1892 ; Mahesh. Illus. Fl. Delhi f. 204. 1966 ; Raizada, Suppl. Fl. Upper Gang. Pl. 281. 1976. 'Kankawa' (Hindi).

Much branched, diffuse annuals, rooting at nodes. Leaves up to 7.5 × 1.7 cm, narrowly oblong-elliptic, often rather strongly undulate. Sheaths pubescent, ciliate along the margins of mouth. Spathes sparsely hairy with long, slender hairs. Cymes with inner branch bearing a single male flower and outer 2-3 flowers. Flowers blue. Capsules c. 5 mm long, lateral cells 0-1-seeded, posterior cell 1-seeded, indehiscent. Seeds of lateral cells c. 3.0 × 2.5 mm, subglobose or subdiscoid, orange-brown ; seed of indehiscent cell oblong, rounded at both ends.

Fl. & Fr. : August-November.

Common weed in cultivated fields on the way to Rajmahal R.F. (Deoli); also common in marshy places on the way to Siras forest.

3. *Commelina hasskarlii* C.B. Clarke, Comm. & Cyrt. Beng. 13. t. 5. 1874 & in DC. Monogr. Phan. 3 : 157. 1888 ; Hook. f. Fl. Brit. Ind. 6 : 370. 1892 ; Duthie, Fl. Upper Gang. Pl. 3 : 273. 1920 (Repr. ed. 2 : 339. 1960).

Herbs, up to 125 cm. Leaves up to 8.5 × 1.8 cm, lanceolate or ovate-lanceolate, acute. Mouth of sheath oblique, ciliate. Cymes pubescent, the inner branch 1 (-2) flowered, the outer 2 (-4) flowered. Flowers dark blue. Capsules c. 8 mm long, apiculate. Seeds c. 3 × 2 mm, truncate at one end, rounded or subacute at the other, brown.

Fl. & Fr. : September-October.

Common weed in cultivated fields on the way to Rajmahal R.F. (Deoli).

3. MURDANNIA Royle *nom. cons.*

Murdannia nudiflora (L.) Brenan in Kew Bull. 7 : 189. 1952 ; Qaiser & Jafri in Nasir & Ali, Fl. W. Pak. No. 84 : 6. f. 2 A. 1975. *Commelina nudiflora* L. Sp. pl. 41. 1753, *pro parte*. *Aneilema nudiflorum* (L.) R. Br. Prodr. 271. 1810 ; Hook f. Fl. Brit. Ind. 6: 378. 1892 ; Duthie, Fl. Upper Gang. Pl. 3 : 277. 1920 (Repr. ed. 2 : 342. 1960).

Erect or decumbent herbs, 10–20 cm. Leaves sessile, up to 13.0×0.9 cm, linear-lanceolate, acute or acuminate. Sheath ciliate on the margins. Flowers pink. Filaments bearded. Capsules c. 3 mm long, subglobose, mucronate, 3-loculed with 2 seeds in each locule. Seeds c. 1.2×1.0 mm, subtriangular, angular on the inner and rounded on the outer face, tuberculate, dark brown.

Fl. & Fr. : August–September.

Common in fallow fields on the way to Rajmahal R.F. (Deoli).

78. JUNCACEAE

JUNCUS L.

Juncus bufonius L. Sp. Pl. 328. 1753 ; C.A. Backer in Fl. Males. I. 4 : 212. 1951 ; Hook. f. Fl. Brit. Ind. 6 : 392. 1892 ; Duthie, Fl. Upper Gang. Pl. 3: 282. 1920 (Repr. ed. 2: 346. 1960). '*Pola*' (Hindi).

Slender, tufted annuals, up to 15 cm. Leaves basal and cauline, grass-like, channelled above, lower up to 8 cm long, the higher shorter. Inflorescence taller than the leaves, branched, consisting of 1-sided cymes. Flowers laxly arranged, solitary or in clusters of 2–6. Bracts and bracteoles membranous, ovate. Tepals lanceolate, very acute, green with membranous margins. Stamens 6, often 3 in terminal flowers. Capsules shorter than the tepals, obovate, trigonous. Seeds numerous, minute, c. 0.4 mm long, ellipsoid, brown.

Fl. & Fr. : February–March.

Common weed in wheat fields ; Tordi Sagar.

79. ARECACEAE

PHOENIX L.

Phoenix sylvestris (L.) Roxb. Fl. Ind. ed. Carey 3 : 787. 1832 ; Beccari & Hook. f. in Hook. f. Fl. Brit. Ind. 6 : 425. 1892 ; Brandis, For. Fl. N. W. India 554. 1874 & Ind. Trees 645. 1906 ; Duthie, Fl. Upper Gang. Pl. 3 : 286. 1929 (Repr. ed. 2 : 354. 1960) ; Blatter, Palms Brit. Ind. & Ceylon 5, pl. 2 & 3. 1926. *Elate sylvestris* L. Sp. Pl. 1189. 1753. 'Khajur' (Hindi).

Trees, 10 15 m. Trunk rough due to the persistent bases of the leaf stalk. Leaves 2 3 m long ; petiole bearing a few spines reaching 8 10 cm long. Pinnules numerous, fascicled, 10 35 × 1.5 2.5 cm, ensiform, spinous pointed, glaucous. Inflorescence a spadix. Spathe about the size of inflorescence, woody, scurfy, separating into boat shaped valves. Male flowers numerous, cream, fragrant. Female flowers distant, roundish. Fruits scattered, 2 3 cm long, oblong ellipsoid, orange yellow, surrounded at the base by persistent calyx. Seeds 1.0 2.0 cm long, rounded at the ends, deeply grooved on one side.

Fl. & Fr. : February May.

Common in wastelands and in moist shaded or dry situations ; Nayagaon near Aligarh and Tordi village near Malpura.

Wild date palm is tapped in many parts of India for its sap which is converted into palm jaggry (*Gur*). Fresh unfermented sap (*Nira*) is a refreshing, sweet drink. The sap after it has undergone spontaneous fermentation for 8 to 10 hours is a common beverage (toddy) in certain parts of India. The fruits are edible, but are of an inferior quality. The leaves are widely used for thatching and for making mats, fans, baskets, bags, brooms, fishing nets etc. The petioles are beaten and made into ropes, used for drawing water from wells. Female spadix forms a good brush for white washing.

80. TYPHACEAE

TYPHA L.

Typha angustata Bory & Chaub. in Bory, Exp. Sci. Moree Bot. 3 : 338. 1833 ; Hook. f. Fl. Brit. Ind. 6 : 489. 1893 ; Graebner. in Engl. Pflanz.

zenr. 2 : 14. f. 4 F. 1900 ; Duthie, Fl. Upper Gang. Pl. 3 : 293. 1929 (Repr. ed. 2 : 359. 1960) ; Subram. Aquat. Angiosp. 74. 1962 ; Mahesh. Illus. Fl. Delhi f. 206. 1966. '*Patera*' (Hindi).

Erect, perennial, rhizomatous herbs, c. 2 m. Leaves spongy, thick. linear, acute, convex beneath. Spikes c. 0.5 m long, cylindrical ; the upper male and the lower female spikes often separated by long interval, dark brown. Stamens 2-3 on a minute common stalk, intermixed with narrowly linear or narrowly spatulate hairs ; connective produced ; pollen grains simple, free. Female flowers intermixed with many bracteoles ; bracteoles shorter than stigma, clavate, acuminate. Ovary borne on gynophore, surrounded by close set white hairs at the base. Achenes elongate ovoid with obtuse apex and acute base, brownish.

Fl. & Fr. : August - May.

Abundant in marshy/aquatic places ; Chandlai and Frazer bridge near Tonk.

Leaves are used for making mats and screens.

81. ARACEAE

PISTIA L.

Pistia stratiotes L. Sp. Pl. 963. 1753 ; Hook. f. Fl. Brit. Ind. 6 : 497. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 297. 1929 (Repr. ed 2 : 361. 1960) ; Subram. Aquat. Angiosp. 75. f. 49. 1962.

Free floating, stemless, stoloniferous, aquatic herbs. Leaves up to 5.5×4.0 cm, rosette, sessile, base covered with membranous, pubescent sheath, obovate-cuneate, apex retuse, truncate or rounded, nerves many, flabellate. Spathe greenish or yellowish-white, obliquely campanulate, gibbous.

Fl. & Fr. : September - November.

Common in fresh water streams ; Niwai temple.

82. LEMNACEAE

- 1a. Fronds with 2 or more roots, conspicuously 5-18-nerved ; anthers longitudinally dehiscent ; urticellae winged

...

Spirodela 2

- 1b. Fronds with a solitary root, nerveless or faintly 1 - 3 -
nerved ; anthers transversely dehiscent ; utricle smooth,
not winged ...

Lemna 1

1. LEMNA L.

Lemna perpusilla Torrey in Fl. N. York 2 : 245. 1843 ; Hartog & Plas in Blumea 18 : 363. 1970. *L. paucicostata* Hegelm. Lemnac. 138, t. 8. 1868 ; Hook. f. Fl. Brit. Ind. 6 : 556. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 305. 1929 (Repr. ed. 2 : 368. 1960) ; Subram. Aquat. Angiosp. 78. 1962. 'Chowpatti' (Hindi).

Minute, floating, aquatic herbs. Fronds up to 3.0 × 1.5 mm, flat, obovate, obovate oblong or suborbicular, asymmetric at the base, entire. Spathe membranous, with two male flowers and a female flower.

Fl. & Fr. : July - September.

Common in ponds, canals and in stagnant water ; Mor village (Malpura).

This species can be distinguished from *L. minor* L. in having root cap acute, root - sheath slightly winged at the base and fronds asymmetric at the base.

2. SPIRODELA Schleid.

Spirodela polyrhiza (L.) Schleid. in Linnaea 13 : 392. 1839 ; Duthie, Fl. Upper Gang. Pl. 3 : 305. 1929 (Repr. ed. 2 : 367. 1929) ; Subram. Aquat. Angiosp. 77. 1962 ; Hartog & Plas in Blumea 18 : 360. 1970. *Lemna polyrhiza* L. Sp. Pl. 970. 1753 ; Hook. f. Fl. Brit. Ind. 6 : 557. 1893. *L. maxima* Blatt. & Hallb. in Journ. Indian Bot. 2 : 49. 1921. *Spirodela maxima* (Blatt. & Hallb.) McC. in Journ. Bombay Nat. Hist. Soc. 43 : 158. 1942.

Minute, aquatic herbs. Fronds up to 8 × 7 mm. flat, orbicular or broadly ovate obovate, opaque, dark green above and purplish beneath. Spathe open at the top, with 2 male flowers and a female flower.

Fl. & Fr. : July September.

Rare ; found in ponds and in stagnant water ; Mor village (Malpura).

83. ALISMATACEAE

SAGITTARIA L.

Sagittaria guayanensis H.B.K. Nov. Gen. Sp. 1 : 250. 1816. subsp. *lappula* (D. Don) Bogin in Mem. N. York Bot. Gard. 9 : 192. f. 5. 1955 ; Hartog in Fl. Males. I. 5 : 328. f. 6. 1957 ; Subram. Aquat. Angiosp. 87. 1962. *S. lappula* D. Don, Prodr. Fl. Nep. 22. 1825. *S. guayanensis* auct. pl. non H. B. K. 1816 ; Hook. f. Fl. Brit. Ind. 6 : 561. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 310. 1929 (Repr. ed. 2 : 372. 1960).

Laticiferous, aquatic or semiaquatic herbs. Leaves floating. 2.0 - 5.5 × 1.5 - 3.5 cm, ovate, base deeply cordate with subacute basal lobes, apex rounded ; petiole 6-25 cm long. Peduncles 2 - 5, more or less as long as the petiole. Racemes with 2 - 4 whorls of 2 - 3 flowers ; lower whorls with bisexual and upper whorls with male flowers. Bracts 3 in each whorl, connate at the base. Pedicels up to 1 cm long. Sepals 6 - 9 mm long, broadly ovate-triangular, obtuse, keeled. Petals delicate, 1.0 - 1.3 cm long, obovate - orbicular, denticulate at the apex, white. Stamens 8 - 12 in bisexual flowers, 7 - 10 in male flowers. Carpels many, with a dorsal and a ventral, undulate, membranous crest. Achenes many, 3 - 4 × 3.0 - 3.5 mm, obovoid - elliptic, shortly stalked, with broad, blunt, spiny crest ; spines connected by a thin membrane. Seeds *c.* 1.5 mm long, pale brown.

Fl. & Fr. : September - November.

Common in marshy places near Banetha village.

The subsp. *lappula* differs from the subsp. *guayanensis*, which is confined exclusively to tropical America, by compressed, larger, deeply crested achenes. In the typical subsp. the achenes are plump, wings shallowly crested, faces 1 - 3 winged and usually strongly echinate.

84. POTAMOGETONACEAE

POTAMOGETON L.

1a. Leaves, atleast the upper ones, floating, broad, elliptic - lanceolate with a very long petiole ; stipules free ; flowers in dense spikes

...

P. nodosus 1

- 1b. Leaves all submerged, narrowly linear or filiform, sessile ; stipules adnate to the sheath ; flowers in interrupted spikes

... *P. pectinatus* 2

1. *Potamogeton nodosus* Poir. in Lam. Encycl. Meth. Bot. Suppl. 4 : 535. 1816 ; Subram. Aquat. Angiosp. 95. 1962 ; Dandy in Fl. Iranica 83 : 3. t. 4. 1971. *P. indicus* Roxb. Fl. Ind. ed. Carey & Wall. 1 : 471, 1820 ; Hook. f. Fl. Brit. Ind. 6 : 565. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 314. 1929 (Repr. ed. 2 : 374. 1960).

Submerged, aquatic herbs, rooting at nodes. Leaves 3 - 8 cm long ; petiole 3 - 15 cm long. Stipules scarious, somewhat sheathing. Spikes dense, 3 - 7 cm long, reddish - brown, projected above the surface of water ; peduncle up to 6 cm long. Perianth lobes 4, clawed, suborbicular, concave. Stamens 4, sessile. Carpels 4, free, sessile. Drupelets 2.5 × 3.0 mm, oblique, shortly beaked and keeled. Seeds subreniform.

Fl. & Fr. : May - September.

Abundant at Chandlai dam near Tonk.

2. *Potamogeton pectinatus* L. Sp. Pl. 127. 1753 ; Hook. f. Fl. Brit. Ind. 6 : 567. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 315. 1929 (Repr. ed. 2 : 375. 1960) ; Subram. Aquat. Angiosp. f. 55, 1 - 3. 95. 1962 ; Dandy in Fl. Iranica, 83 : 8. 1971 ; Saldanha & Nicolson, Fl. Hassan District 639. f. 108 C. 1976.

Submerged, profusely branched, aquatic herbs ; stem filiform. Leaves 3 - 15 cm long, acute. Stipules with short free point. Spikes 2 - 3 cm long. Perianth lobes 4, limb suborbicular or broadly obovate. Stamens 4. Carpels 4, free, sessile. Drupelets 3.0 × 2.5 mm, turgid, dimidiate - obovoid with a very short beak, scarcely keeled.

Fl. & Fr. : February - November.

Common in Banas river near Bisalpora.

85. ZANNICHELLIACEAE

ZANNICHELLIA L.

Zannichellia palustris L. Sp. Pl. 969. 1753 ; Hook. f. Fl. Brit. Ind. 6 : 568. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 316. 1929 (Repr. ed. 2 :

376. 1960). *Z. palustris* L. subsp. *pedicellata* Wahlenb. & Rosen in Nov. Act. Soc. Sci. Upsal. 8 : 254. 1821 ; Subram. Aquat. Angiosp. 97. f. 56, 7-9. 1962 ; Raizada, Suppl. Fl. Upper Gang. Pl. 289. 1976.

Highly variable, fragile, submerged, fresh or brackish water herbs ; stem slender, filiform. Leaves opposit or in whorls, linear or filiform. Spathe with 1 male and 2-5 female flowers. Male flower without perianth. Stamen solitary. Female flowers with a cupular, hyaline perianth. Carpels 1-9 ; stigma peltate. Achenes stipitate, 4.5-6.0 mm long (including the beak and stipe), rostrate, back curved, tuberculate. Seeds pendulous, terete.

Fl. & Fr. : November - February.

Common in Banas river near Rajmahal.

86. ERIOCAULACEAE

ERIOCAULON L.

Eriocaulon cinereum R. Br. Prodr. 254. 1810 ; Moldenke in Phytologia 3 : 185. 1949. *E. sieboldianum* Sieb. & Zucc. ex Steud. Syn. Pl. Glum. 2 : 272. 1855 ; Hook. f. Fl. Brit. Ind. 6 : 577. 1893 ; Fyson in Journ. Indian Bot. 3 : 15. t. 50, 51. 1922 ; Duthie, Fl. Upper Gang. Pl. 3 : 318. 1929 (Repr. ed. 2 : 378. 1960).

Stemless, tufted, glabrous annuals, 5-8 cm. Leaves basal, rosette, up to 3 cm long, linear-subulate, entire, opaque. Peduncles many, slender, up to 8 cm long. Heads 2-3 mm across, ovoid-globose, grey. Involucral bracts many, scarious, the outer oblong or oblong-lanceolate, obtuse, the inner narrower, 1.2-1.5 mm long. Floral bracts 1.2-1.5 mm long, oblong-lanceolate, subacute. Receptacle columnar. Male flowers stipitate. Sepals connate into a glabrous cucullate spathe, 3-toothed at the apex. Corolla tubular, apex irregularly tridentate ; lobes minute with apical glands. Stamens 6. Female flowers stipitate. Sepals 2, free, linear, acute, hyaline. Petals 0. Ovary stipitate, trilocular ; style long ; stigmas 3, filiform. Seeds 0.3-0.4 mm long, ellipsoid-ovoid, smooth, pale brown.

Fl. & Fr. : August - November.

Common in marshy/aquatic places near Rampura village.

87. CYPERACEAE

- 1a. Glumes distichous :
- 2a. Nut triquetrous or dorsiventrally flattened with one side facing rhachilla ... *Cyperus* 1
- 2b. Nut laterally flattened with one angle facing rhachilla ... *Pycreus* 3
- 1b. Glumes spirally arranged :
- 3a. Style ciliate, basally constricted or articulated above the nut ; hypogynous bristles absent ... *Fimbristylis* 2
- 3b. Style glabrous, base neither constricted nor articulated but continuous with the ovary ; hypogynous bristles present or absent ... *Scirpus* 4

1. CYPERUS L.

- 1a. Plants more than 1 m tall ; leaves and involucre bracts 10 - 15 mm wide ; inflorescence usually more than 10 cm long ... *C. alopecuroides* 1
- 1b. Plants less than 1 m tall ; leaves and involucre bracts 1.5 - 4.5 mm wide ; inflorescence up to 10 cm long :
- 2a. Inflorescence capitate or a cluster of sessile spikelets, terminal or pseudo - lateral ; rays absent :
- 3a. Inflorescence pseudo - lateral ; rhachilla quadrangular ; glumes c. 1.5 mm long, dotted with red spots within ... *C. laevigatus* 6
- 3b. Inflorescence terminal ; rhachilla terete ; glumes 3.0 - 4.5 mm long, not dotted with red spots :
- 4a. Spikelets in subglobose or 1 - 3 - lobed head ; stamens 1 - 2 :
- 5a. Spikelets in subglobose head ; anther 1, muticous ; stigmas 2 - 3 ; nut trigonous or plano - convex ... *C. pygmaeus* 10
- 5b. Spikelets in a head of 3 (rarely 1) spikes ; anthers 2, not muticous ; stigmas 2 ; nut biconvex, laterally compressed ... *C. triceps* 11
- 4b. Spikelets in a subglobose head of 3 - 6 (- 8) spikelets or in a single sessile cluster ; stamens 3 :

- 6a. Annual sedge ; spikelets more than 10 ;
filaments ligulate ; nut *c.* 1.5 mm long,
obovoid ... *C. compressus* 4
- 6b. Perennial, rhizomatous sedge ; spikelets 3 - 6
(-8) ; filaments not ligulate ; nut *c.* 0.7 mm
long, obovoid - ellipsoid ... *C. niveus* 7
- 2b. Inflorescence with spikelets in more than one cluster or
spikes, terminal ; rays present :
- 7a. Glumes orbicular or suborbicular ; anthers 2,
c. 0.25 mm long ; nut equal to the subtending
glumes :
- 8a. Spikes subglobose, brown on drying ; spikelets,
stellately spreading ; rhachilla straight, glabrous ;
anthers muticous ; nut yellow or straw
coloured ... *C. difformis* 5
- 8b. Spikes oblong - ovoid, golden yellow on drying ;
spikelets spicately arranged ; rhachilla flexous,
hispid ; anthers with short reddish appendage of
the connective ; nut dark brown ... *C. alulatus* 2
- 7b. Glumes ovate, elliptic or oblong ; anthers 3, 0.5 mm
or more long ; nut shorter than the subtending
glumes :
- 9a. Plants annual ; anthers muticous ; style as long
as the stigmas ... *C. compressus* 4
- 9b. Plants perennial ; anthers with red appendage of
the connective ; style shorter than the stigmas or
hardly any :
- 10a. Glumes apiculate or mucronate ; nut
obovoid or obovate :
- 11a. Spikelets more than 12 mm long, each
more than 15 - flowered ; glumes more
than 3 mm long ; filaments ligulate ;
style shorter than the stigmas ... *C. atkinsonii* 3
- 11b. Spikelets less than 7 mm long, each up
to 10 - flowered ; glumes less than 2
mm long ; filaments not ligulate ;
style hardly any ... *C. nutans* var.
eleusinoides 8
- 10b. Glumes obtuse ; nut linear oblong or
linear - obovate ... *C. pangorei* 9

1. *Cyperus alopecuroides* Rottb. Descr. Pl. Rar. Progr. 20. 1772 & Descr. Icon. Rar. Nov. Pl. 38. t. 8, f. 2. 1773 ; Mahesh. Illus. Fl. Delhi f. 212. 1966 ; Kern in Fl. Males. I. 7 : 603. 1974. *Juncellus alopecuroides* (Rottb.) C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 595. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 340. 1929 (Repr. ed. 2 : 394. 1960).

Rhizomatous perennials. Leaves with the midrib prominent beneath, two lateral nervers marked above. Involucral bracts leaf - like, 3 - 7, longer than the inflorescence. Inflorescence compound or decomposed ; primary rays 5 - 8, unequal. Spikes digitately arranged, straw coloured. Spikelets 3 - 7 mm long, ovate to oblong lanceolate, 10 - 25 flowered. Rhachilla straight, narrowly winged. Glumes *c.* 2 mm long, ovate - elliptic, apiculate, 5 - 7 - nerved. Stamens 2 ; connective produced. Stigmas 2 - 3 ; style longer than the stigmas. Nut *c.* 0.6 × 0.6 mm, plano convex, sometimes sub-triangular, obovoid, shortly apiculate, golden yellow to straw coloured.

Fl. & Fr. : September - November.

Common in ponds and by the side of ponds at Banetha village.

2. *Cyperus alulatus* Kern in Reinwardtia 1 : 463. f. 1. 1952 ; Raizada, Suppl. Fl. Upper Gang. Pl. 293. 1976. *C. iria* (non L. 1753) sensu C.B. Clarke, Illus. Cyper. t. 14, f. 1. 1909. *C. iria* L. var. *rectangularis* Kukenth. in Engl. Pflanzenr. 101 : 152. 1935. *C. rectangularis* (Kukenth.) Bennet in Indian For. 95 : 692. 1969.

Erect, tufted annuals, 15 - 40 cm. Leaves basal, longer than the stem. Involucral bracts 3 - 5, leaf - like, unequal, the longest sometimes reaching 15 - 20 cm. Inflorescence umbellate ; rachis flexuous, hispid on the angles. Spikes 1.0 - 2.5 (-3) × 1.0 - 1.8 (-3) cm. Spikelets 3 - 10 × 2.0 - 2.2 mm, patent, compressed, ovate to oblong - linear, 5 - 15 flowered. Glumes 1.5 - 2.0 mm long, membranous, ovate or suborbicular, emarginate, 7 - nerved ; keel narrowly winged, spinosely ciliate on the back. Stamens 2. Nut *c.* 1.7 × 1.0 mm, obovate - ellipsoid, triquetrous with concave, smooth sides, broadly stipitate, apiculate, brown to dark brown.

Fl. & Fr. : September - November.

Common in moist, sandy and marshy places on Banas river bed at Sopari village and near Haji Ki Kothi (Nlwai).

3. *Cyperus atkinsonii* C. B. Clarke in Journ. Linn. Soc. 21 : 109. 1884 & in Hook. f. Fl. Brit. Ind. 6 : 603. 1893 ; Raizada, Suppl. Fl. Upper Gang. Pl. 295. 1976.

Tufted perennials, 6-70 cm, with woody rhizomes. Leaves basal, shorter than the stem. Involucral bracts 2-3, leaf-like. Inflorescence an umbel, often contracted into a head. Spikes up to 14×4 mm, compressed, narrowly linear, acute, brown. Glumes ovate, cymbiform, with a strong, sharp mucro beyond the obtuse tip. Nut *c.* 1.2 mm long, trigonous, obovate, brown.

Fl. & Fr. : August - October.

Common in sandy areas at Bani plantation, Tonk (*N.N. Sen*, Acc. No. 148964, DD).

4. *Cyperus compressus* L. Sp. Pl. 46. 1753 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 605. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 326. 1929 (Repr. ed. 2 : 384. 1960) ; Mahesh. Illus. Fl. Delhi f. 217. 1966 ; Kern in Fl. Males. I. 7 : 617. 1974.

Tufted annuals, 8-15 cm or more tall. Leaves longer or shorter than the stem, mid nerve prominent. Involucral bracts 4-5, leaf-like, patent. Spikelets 5-20, 2.0-2.5 cm long, digitately clustered, oblong, 10-30 or more flowered. Glumes *c.* 4 mm long, chartaceous, ovate, keel produced into a slightly recurved, laterally compressed mucro. Nut trigonous, broadly stipitate, shining dark brown to blackish.

Fl. & Fr. : September - February.

Common in moist, sandy places on Banas river bed ; Bentheli village.

5. *Cyperus difformis* L. Cent. Pl. 2 : 6. 1756 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 599. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 325. 1929 (Repr. ed. 2 : 384. 1960) ; Kern in Fl. Males. I. 7 : 629. 1974.

Tufted annuals or perennials, 15-50 cm. Leaves shorter or equal to the stem, with prominent mid nerve. Involucral bracts 2-3, leaf-like, unequal, spreading, up to 15 cm long. Spikelets 2-5 mm long, oblong-linear, with 10-20 flowers. Glumes *c.* 0.5 mm long. Nut *c.* 0.75×0.5 mm, elliptic to obovoid, broadly stipitate, conically apiculate.

Fl. & Fr. : September - February.

Common in moist, sandy places on Banas river bed at Baisapura, Niwai and Chandlai village.

6. *Cyperus laevigatus* L. Mant. Alt. 179. 1771. *Juncellus laevigatus* (L.) C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 596. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 341. 1929 (Repr. ed. 2 : 395. 1960).

Perennials with horizontally creeping rhizomes. Leaves usually shorter than the stem or scarcely any. Involucral bracts 2, one erect, conspicuous, the other spreading, small. Spikelets 2-6 mm long, oblong-lanceolate, subacute, 5-15 flowered, straw-coloured. Rhachilla wingless. Glumes broadly ovate, minutely mucronulate. Stamens 3 ; connective produced into an acute reddish brown tip. Nut c. 1.25 × 1.0 mm, obovoid, plano convex, stipitate, shortly apiculate, minutely papillose, grey.

Fl. & Fr. : February - September.

Common in moist, sandy places on Banas river bed near Bentheli and Banetha village.

7. *Cyperus niveus* Retz. Obs. Bot. 5 : 12. 1789 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 601. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 327. 1929 (Repr. ed. 2 : 383. 1960) ; Mahesh. Illus. Fl. Delhi f. 215. 1966.

Tufted perennials, up to 18 cm, with woody, creeping rhizomes, base covered with brownish sheaths. Leaves basal, flat, shorter or equalling the stem. Involucral bracts 3-4, leaf-like, unequal, acuminate. Inflorescence a solitary, globose head, white or straw-coloured. Spikelets up to 1.5 × 0.4 cm, ovate lanceolate. Glumes ovate, many nerved, keeled. Anthers mucronate. Stigmas 3. Nut triquetrous, apiculate, dark brown.

Fl. & Fr. : August - October.

Common in wastelands ; Tonk (*Maheshwari* 52943, LWG).

8. *Cyperus nutans* Vahl, Enum. Pl. 2 : 363. 1806 var. *eleusinoides* (Kunth) Haines, Bot. Bihar Orissa 5 : 898. 1924 ; Kern in Fl. Males. I. 7 : 610. 1974. *C. eleusinoides* Kunth, Enum. Pl. 2 : 39. 1837 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 608. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 330. 1929 (Repr. ed. 2 : 386. 1960) ; *C. nutans* Vahl subsp. *eleusinoides* (Kunth) T. Koyama in Gardn. Bull. Sing. 30 : 136. 1977.

Plants 0.5-0.75 m. Leaves shorter or equal to the stem, coriaceous, mid-nerve prominent beneath, two lateral nerves marked above. Involucral bracts 3-6, leaf-like. Spikelets 3-6 mm long, linear or narrowly elliptic

with 8-10 flowers. Rhachilla flexuous. Glumes 2.0 - 2.5 mm long, 5-7-nerved with straight or recurved apiculus. Nut c. 1.25×0.5 mm, shortly stipitate, apiculate.

Fl. & Fr. : August-September.

Common in marshy places near Niwai temple and by the side of Tordi Sagar.

9. *Cyperus pangorei* Rottb. Descr. Pl. Rar. Progr. 18. 1772 & Descr. Icon. Rar. Nov. Pl. 31. t. 7, f. 3. 1773; Koyama in Gardn. Bull. Sing. 30: 131. f. 2 A-J. 1977. *C. tegetum* Roxb. Fl. Ind. ed. Carey 1: 208. 1832; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6: 613. 1893 & Illus. Cyper. t. 17. 1909; Duthie, Fl. Upper Gang. Pl. 3: 334. 1929 (Repr. ed. 2: 389. 1960).

Tall, glaucous, rhizomatous perennials, c. 1 m; base of the stem covered with reddish-brown scales. Leaves few, shorter than the stem; sheath papery. Involucral bracts 2-3, leaf-like, Spikes with 10-15 spikelets. Spikelets 0.5-1.25 cm long, linear, acute, with 10-20 flowers, reddish-brown. Rhachilla flexuous. Glumes c. 2.25 mm long, oblong or elliptic, many-nerved. Nut c. 1.5×0.5 mm, stipitate, minutely papillose.

Fl. & Fr. : August-November.

Abundant in moist, sandy places on Banas river bed, Gar R.F. (Deoli).

It is used for making mats etc.

10. *Cyperus pygmaeus* Rottb. Descr. Icon. Rar. Nov. Pl. 20. t. 14, f. 4-5. 1773; Kern in Fl. Males. I. 7: 634. 1974. *Juncellus pygmaeus* (Rottb.) C.B. Clarke in Hook. f. Fl. Brit. Ind. 6: 596. 1893; Duthie, Fl. Upper Gang. Pl. 3: 341. 1929 (Repr. ed. 2: 395. 1960). *Cyperus miche-lianus* (L.) Delile subsp. *pygmaeus* (Rottb.) Aschers. & Graebn. Synops. Metteleur Fl. 2 (2): 273. 1903.

Tufted annuals, 5-15 cm. Leaves numerous, usually as long as the stem. Involucral bracts 2-6, leaf-like, with dilated base. Heads 1.0-1.5 cm in diam. Spikelets lanceolate, many-flowered. Glumes c. 3 mm long, ovate-lanceolate, keeled, mucronate, 3-4 nerved. Anthers muticous. Stigmas 2-3; style usually shorter than the stigmas. Nut trigonous or plano-convex, slightly apiculate and papillose, straw coloured.

Fl. & Fr. : February - November.

Common in marshy places on the sandy bed of Banas river and on silty soil at Tordi Sagar.

11. *Cyperus triceps* (Rottb.) Endl. Cat. Horti Vindob. 1 : 94. 1842 ; Mahesh. Illus. Fl. Delhi f. 213. 1966 ; Kern in Fl. Males. I. 7 : 659. 1974. *Kyllinga triceps* Rottb. Descr. Icon. Rar. Nov. Pl. 14. t. 4, f. 6. 1773 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 587. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 343. 1929 (Repr. ed. 2 : 396. 1960).

Tufted perennials, 10 - 25 cm, with short rhizomes. Leaves basal, flat, as long as or longer than the stem. Inflorescence a dense, ovoid, cylindric spike, up to 0.8 cm long, white or straw - coloured. Involucral bracts 3 - 5, leaf - like, unequal, longest up to 10 cm. Glumes ovate - lanceolate, keeled, 7 - 8 - nerved. Stamens 2. Stigmas 2. Nut c. 1 mm long, oblong, apiculate, yellowish, brown to brown.

Fl. & Fr. : August - November.

Common in sandy places in Sohela plantation, Tonk (*Raizada* 18/55, DD).

2. FIMBRISTYLIS Vahl *nom. cons.*

1a. Inflorescence consisting of 1 - 2 spikelets ; stamens 3 ... *F. schoenoides* 3

1b. Inflorescence consisting of many spikelets ; stamen 1 :

2a Plants hairy ; stigmas 2 ; style flat, ciliate ; nut lenticular :

3a. Leaves eligulate ; glumes pubescent, distinctly mucronate ; filaments c. 1.25 mm long, ligulate ; style base fringed with a whorl of long, pendent hairs ; nut smooth ...

F. squarrosa 4

3b. Leaves ligulate ; glumes glabrous, mucronulate ; filaments indistinct ; style base not fringed with pendent hairs ; nut distinctly trabeculate by 5 - 7 longitudinal ribs on each face ...

F. bisumbellata 1

2b. Plants glabrous ; stigmas 3 ; style triquetrous, glabrous ; nut obtusely trigonous ...

F. miliacea 2

1. *Fimbristylis bisumbellata* (Forssk.) Bubani, Dodecanthea 30. 1850 ; Kern in Fl. Males. I. 7 : 579. 1974. *Scirpus bisumbellatus* Forssk. Fl. Aeg. - Arab. 1 : 15. 1775. *Fimbristylis dichotoma* auct. pl., non Vahl, 1806 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 635. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 351. 1929 (Repr. ed. 2 : 403. 1960) ; Mahesh. Illus. Fl. Delhi f. 223. 1966.

Rhizomatous perennials, 3 - 30 cm. Involucral bracts 2 - 5, leaf - like, longer than the inflorescence. Spikelets 2 - 8 mm long, ovate, brown. Rhachilla narrowly winged. Glumes *c.* 1.5 mm long, broadly ovate, strongly keeled. Anthers minutely apiculate; style longer than the stigmas. Nut *c.* 0.6 × 0.5 cm, pale straw - coloured, shining.

Fl. & Fr. : February - May.

Common on moist, sandy bed of Banas river near Banetha (Bisal-pura), on silty soil in Tordi Sagar, near Frazer bridge and near Niwai temple.

The leaves are used as forage.

Closely allied to *F. dichotoma* (L.) Vahl, but can easily be distinguished from it by the sharply keeled, mucronate glumes, shorter style and smaller nut.

2. *Fimbristylis miliacea* (L.) Vahl, Enum. Pl. 2 : 287. 1806 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 644. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 356. 1929 (Repr. ed. 2 : 406. 1960) ; Kern in Fl. Males. I. 7 : 552. 1974. *Scirpus miliaceus* L. Syst. Veg. ed. 10. 868. 1759. *S. quinquangularis* Vahl. l. c. 2 : 279. 1806. *Fimbristylis quinquangularis* (Vahl) Kunth, Enum. Pl. 2 : 229. 1837 ; C. B. Clarke, l. c. 6 : 644. 1893 ; Duthie, l. c. 3 : 356. 1929 (Repr. ed. 2 : 406. 1960) ; Mahesh. Illus. Fl. Delhi f. 225. 1966.

Tufted annuals, 10 - 20 cm or more tall. Leaves flat, eligulate. Involucral bracts 2 - 5, leaf - like, shorter than the inflorescence. Spikelets solitary, 2.0 - 3.5 mm long, ovoid, acute, dark brown. Rhachilla narrowly winged. Glumes broadly ovate, obtuse, keeled. Style equal to the stigmas. Nut 0.5 - 0.6 × 0.5 mm, obovate, stipitate, verruculose, pale stramineous.

Fl. & Fr. : July - September.

Common in marshy places ; Tordi Sagar.

3. *Fimbristylis schoenoides* (Retz.) Vahl, Enum. Pl. 2 : 286. 1806 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 634. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 350. 1929 (Repr. ed. 2 : 402. 1960) ; Kern in Fl. Males. I. 7 : 573. 1974. *Scirpus schoenoides* Retz. Obs. Bot. 5. 14. 1789.

Glabrous perennials, up to 25 cm. Leaves ligulate with involute margins. Involucral bracts usually glume - like, erect. Spikelets 5 - 6 mm long, oblong - ovoid, brown. Rhachilla narrowly winged. Glumes *c.* 3 mm long, broadly ovate, shortly apiculate. Anthers minutely apiculate.

Stigmas 2 ; style longer than the stigmas, flat, ciliate. Nut *c.* 1.25 × 1.0 mm, obovate, lenticular, finely longitudinally striate with rows of isodiametric cells, stipitate, pale straw coloured.

Fl. & Fr. : July September.

Common in marshy places ; Saroi village near Deoli.

4. *Fimbristylis squarrosa* Vahl, Enum. Pl. 2 : 289. 1806 ; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 635. 1893 & Illus. Cyper. t. 41, f. 8 10. 1909 ; Duthie, Fl. Upper Gang. Pl. 3 : 352. 1929 (Repr. ed. 2 : 404. 1960) ; Kern in Fl. Males. I. 7 : 585. 1974.

Tufted annuals, 2 10 cm. Leaves filiform. Involucral bracts 4 5, leaf-like, longer than the inflorescence. Spikelets 3 5 mm long, oblong-lanceolate, greenish pale brown. Rhachilla narrowly winged. Glumes 3 4 mm long, ovate with recurved mucro, margins with red spots within. Anthers apiculate. Style longer than the stigmas, hairs at the base closely appressed to the nut and covering 1/2 3/4 of it. Nut *c.* 0.5 × 0.5 mm, pale stramineous.

Fl. & Fr. : February May.

Common in marshy places ; Tordi Sagar.

Closely allied to *F. aestivalis* (Retz.) Vahl, but can easily be distinguished by the much longer, strongly recurved mucros of the glumes, by the long hairs of the style base and by the slightly longer style and nut.

3. PYCREUS P. Beauv.

- | | | |
|---|-----|----------------------|
| 1a. Glumes <i>c.</i> 2 mm long, obtuse, mucicous ; style shorter than the stigmas ; nut apiculate | ... | <i>P. flavidus</i> 1 |
| 1b. Glumes <i>c.</i> 1.5 mm long, retuse at the tip, mucronate ; style equal to the stigmas ; nut truncate at the apex. | ... | <i>P. pumilus</i> 2 |

1. *Pycneus flavidus* (Retz.) T. Koyama in Journ. Jap. Bot. 51 : 313. 1976. *Cyperus flavidus* Retz. Obs. Bot. 5 : 13. 1789 ; Kern in Fl. Males. I. 7 : 648. 1974. *Pycneus globosus* (Allioni) Reich. Fl. Germ. Excurs. 2 : 140. 1830 ; Duthie, Fl. Upper Gang. Pl. 3 : 337. 1929 (Repr. ed. 2 : 392. 1960). *Cyperus capillaris* Koenig ex Roxb. Fl. Ind. ed. Carey & Wall. 1 : 198.

1820. *Pycreus capillaris* (Koenig ex Roxb.) Nees ex C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 591. 1893.

Tufted, often short rhizomatous sedge, 30 - 50 cm. Leaves setaceous. Involucral bracts 2 - 3, leaf-like. Spikes ovoid with 6 - 15 spikelets or more. Spikelets 1 - 2 cm long, spreading, linear to linear-lanceolate, 20 - 35 flowered, brown. Rhachilla straight, stout, tetragonous, wingless. Stamens 2. Nut 0.1 × 0.5 mm, broadly obovoid, distinctly apiculate, papillose, dark chestnut brown.

Fl. & Fr. : Almost throughout the year.

Common in marshy place at Tordi Sagar and near Niwai temple.

2. *Pycreus pumilus* (L.) Nees ex C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 591. 1893, *quoad. basion. excl. descr.* ; Duthie, Fl. Upper Gang. Pl. 3 : 339. 1929 (Repr. ed 2 : 293. 1960). *Cyperus pumilus* L. Cent. Pl. 2 : 6. 1756 ; Kern in Fl. Males. I. 7 : 650. f. 66 a - e. 1974. *Pycreus nitens* Nees, Nov. Act. Cur. 19, Suppl. 1 : 53. 1843 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 591. 1893.

Tufted annuals, 5 - 30 cm. Leaves shorter or longer than the stem, mid-nerve prominent. Involucral bracts 3 - 5, leaf-like, up to 10 cm long. Spikes subglobose, dense, with 5 - 20 spikelets. Spikelets 1.0 - 1.5 cm long, divergent, oblong to linear, compressed, 10 - 20 flowered. Rhachilla straight, wingless. Stamens 1 - 2 ; anthers muticous. Nut *c.* 0.75 × 0.5 mm, ellipsoid-obovoid, shining brown to castaneus.

Fl. & Fr. : September - November.

Common in marshy places near Niwai temple and around Tordi Sagar.

Stamens 2 in the upper half and 1 in the lower half in the same spikelet are often found.

4. SCIRPUS L.

1a. Inflorescence terminal with or without rays, or pseudo-lateral with rays present ; hypogynous bristles 3 - 6 ; nut smooth :

2a. Hypogynous bristles unequal, retrorsely scabrid, slender ; glumes bifid at the apex :

- 3a. Inflorescence capitate, rays absent ; spikelets shining yellowish pale brown ; glumes red - spotted ; stigmas 2 ; nut compressed, two sided ... *S. affinis* 1
- 3b. Inflorescence umbelliform, rays present ; spikelets dark reddish - brown ; stigmas 3 ; nut trigonous ... *S. tuberosus* 5
- 2b. Hypogynous bristles equal, plumosely fringed in the upper half with antrorse moniliform hairs ; glumes slightly notched at the apex ... *S. litoralis* 2
- 1b. Inflorescence a lateral, sessile head ; hypogynous bristles absent ; nut rugose with transverse wavy lines : ...
- 4a. Leaves present ; spikelets 3-6 mm long, greenish ; glumes 2.0 - 2.5 mm long, smooth with red spots on the inner side ; nut globosely obovoid ... *S. supinus* 4
- 4b. Leaves reduced to bladeless sheaths ; spikelets 5 - 12 mm long, golden yellow ; glumes c. 3.5 mm long, multistriate, not dotted with red spots ; nut obovoid ... *S. roylei* 3

1. *Scirpus affinis* Roth in Roem. & Schult. Syst. 2 : 140. 1817 & Nov. Pl. Sp. 30. 1821. *S. maritimus* L. var. *affinis* C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 659. 1893 ; Duthie, Fl. Upper Gang. Pl. 3 : 366. 1929 (Repr. ed. 2 : 412. 1960).

Rhizomatous perennials, 10 30 cm or more tall. Leaves 15 20 × 0.3 0.5 cm, mid nerve prominent. Involucral bracts 3 - 5, leaf - like, longer than the inflorescence. Spikelets in clusters of 1 5, c. 0.75 - 2.0 cm. long. Glumes 6 8 mm long, oblong, puberulus, strongly keeled. Stamens 3 ; anthers with bristly pappillate appendage. Nut c. 2.5 × 2.0 mm, obovoid, distinctly apiculate, pale yellow to dark brown.

Fl. & Fr. : February May.

Very common in marshy places at Tordi Sagar and on Banas river bed near Frazer bridge.

2. *Scripus litoralis* Schrad. Fl. Germ. 1 : 142. t. 5, f. 7. 1806 ; C.B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 659. 1893 & Illus. Cyper. t. 50, 1909 ; Duthie, Fl. Upper Gang. Pl. 3 : 362. 1929. (Repr. ed. 2 : 411. 1960) ; Mahesh. Illus. Fl. Delhi f. 227. 1966 ; Kern in Fl. Males. I. 7 : 510. 1974.

Tall, rhizomatous perennials, c. 2 m. Leaves reduced to bladeless or shortly laminate sheaths. Involucral bracts erect, continuous with the stem.

Spikelets solitary, *c.* 0.6–1.5 cm long, oblong ovoid, brown. Glumes scarious, elliptic to oblong with a distinct mucro. Stamens 3; anthers muticous. Stigmas 2. Nut *c.* 1.75 × 1.0 mm, broadly obovoid, plano-convex, distinctly apiculate, dull brown.

Fl. & Fr. : August–November.

Very common in marshy areas on the Banas river bed at Banetha and Chandlai and on Uniyara river bed along Aligarh - Tonk road.

3. *Scirpus roylei* (Nees) Parker in Duthie, Fl. Upper Gang. Pl. 3 : 361. 1929 (Repr. ed. 2 : 410. 1960); Mahesh. in Sci. & Cult. 31 : 195. 1965 & Illus. Fl. Delhi f. 226. 1966. *Isolepis roylei* Nees in Wight, Contr. 107. 1834. *Scirpus quinquefarius* Buch. Ham. ex Boeck. in Linnaea 36 : 701. 1869–70; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 657. 1893 & Illus. Cyper. t. 48, f. 8–10. 1909. 'Morlao' (Hindi).

Erect, tufted sedge, 25–40 cm; stem transversely septate. Involucral bracts absent. Spikelets 2–10, sessile, 0.5–1.25 cm long, ovoid-oblong. Glumes elliptic, concave, keeled. Stamens 3. Stigmas 3. Nut *c.* 1.5 × 1.0 mm, triquetrous, distinctly apiculate, shining blackish dark brown.

Fl. & Fr. : September–November.

Common in marshy places around Tordi Sagar and on the way to Siras Forest.

4. *Scirpus supinus* L. Sp. Pl. 49. 1753, *pro parte*; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 655. 1893 & Illus. Cyper. t. 48, f. 13–14. 1909; Duthie, Fl. Upper Gang. Pl. 3 : 360. 1929 (Repr. ed. 2 : 410. 1960).

Tufted annuals, 10–25 cm. Leaves 5–6 cm long. Involucral bracts absent. Spikelets 1–6, sessile, ellipsoid or oblong. Glumes ovate, strongly keeled. Stamens 3. Stigmas 3. Nut *c.* 1.25 × 1.0 mm, trigonous, obscurely apiculate, pale straw-coloured.

Fl. & Fr. : July–September.

Rare; found in marshy places around Tordi Sagar.

This species is closely allied to *S. roylei* (Nees) Parker, but the latter can easily be recognised by the absence of lamina and by the larger, multi-striate, golden yellow glumes.

5. *Scirpus tuberosus* Desf. Fl. Atlant. 1 : 50. 1798; Beetle in Amer. Journ. Bot. 29 : 84. 1942; Mahesh. Illus. Fl. Delhi f. 228. 1966. *S. maritimus* auct. plur., non L. 1753; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 658. 1893; Duthie, Fl. Upper Gang. Pl. 3 : 363. 1929 (Repr. ed. 2 : 412. 1960).

Erect sedge, 25-50 cm or more tall; rhizomes horizontally creeping, forming hard, ovoid tubers at the nodes. Leaves often as long as the stem, 3-8 mm wide. Involucral bracts 1-3, leaf-like. Spikelets 1.5-3.0 cm long, oblong-ovoid. Glumes 6-7 mm long, broadly ovate, puberulous, strongly keeled, mucro antrorsely scabrid. Stamens 3; anthers apiculate. Nut *c.* 2.5 × 1.5 mm, obovoid, apiculate, pale straw coloured.

Fl. & Fr. : February - August.

Common in water-logged places at Barndi and Uniyara villages.

In most of the older Indian floras this species is described under the name *Scirpus maritimus* L. But according to Beetle (*l. c.*) true *S. maritimus* L. is an European plant, found occasionally in Asia.

S. S. Hooper in Saldanha and Nicolson, Flora of Hassan district 658 (1976) includes the species of the genus *Scirpus* of earlier workers under *Bolboschoenus*, *Hemicarpha*, *Rikliella* and *Schoenoplectus*, based largely on differences in embryo structure. *Scirpus maritimus* L. is treated as *Bolboschoenus maritimus* (L.) Palla. She, however, pointed out that further work is needed to establish satisfactory boundaries for some of the genera mentioned above.

88. POACEAE

1a. Spikelets 2-flowered, usually dorsally compressed, falling entire at maturity :

2a. Spikelets paired or in groups of threes, dissimilar with one sessile and the other pedicelled; glumes more or less similar, as long as the spikelets, more or less rigid; upper lemma often with a geniculate awn :

3a. Spikelets in pairs, one sessile and the other pedicelled :

4a. Inflorescence a simple, spiciform raceme or of digitate spike-like racemes :

5a. Inflorescence a simple spiciform raceme :

6a. Rhizomatous grass; joints of inflorescence semi-cylindric; spikelets indistinct, awnless; sessile spikelet fitted in the hollow cavity of the pedicel

... *Hemarthria* 18

- 6b. Grass not rhizomatous ; joints of inflorescence cylindric ; spikelets distinct, awned ; pedicel cylindric :
- 7a. Raceme usually supported by a spathe - like sheath ; glumes equal, lower one pitted, not channelled ; grain oblong - elliptic ... *Eremopogon* 16
- 7b. Raceme not supported by a spathe - like sheath ; glumes subequal, lower one without a pit, channelled ; grain oblong ... *Sehima* 30
- 5b. Inflorescence of digitately arranged spike - like racemes ... *Dichanthium* 12
- 4b. Inflorescence a panicle :
- 8a. Panicle silvery plumose ; spikelets of each pair pedicelled or one sessile and the other pedicelled, both hermaphrodite :
- 9a. Rhizomatous grass ; rhachis of racemes tough or tardily breaking up ; spikelets of each pair pedicelled ; stamens 2 ; grain oblong - ellipsoid or ellipsoid ... *Imperata* 19
- 9b. Grass not rhizomatous ; rhachis of racemes breaking up ; each pair of spikelets with one sessile and the other pedicelled spikelet ; stamens 3 ; grain oval ... *Saccharum* 28
- 8b. Panicle not plumose ; spikelets of each pair dissimilar, one sessile and the other pedicelled, the sessile hermaphrodite, the pedicelled male or neuter :
- 10.a The basic unit of the inflorescence a pair of erect or epinastic racemes, one sessile and the other pedicelled, supported by a spathe ... *Cymbopogon* 7
- 10b. The basic unit of the inflorescence a pair of spikelets, one sessile and the other pedicelled, not supported by a spathe :
- 11a. Rhizomatous grass ; roots often aromatic ; lower glume muriculate or tuberculate all over the back ; grain oblong, slightly oblique at the top ... *Vetiveria* 36
- 11b. Grass not rhizomatous ; roots not aromatic ; glumes smooth ; grain obovoid ... *Sorghum* 32

- 3b. Spikelets in groups of threes, one sessile and the other two pedicelled :
- 12a. Panicle leafy ; triplet enclosed in a spathe ; callus absent ; upper glume of sessile spikelet gibbous, 5 - nerved, bifid at the apex, not keeled ... *Apluda* 1
- 12b. Panicle not leafy ; triplet not enclosed in a spathe ; callus very distinct, hairy ; upper glume of sessile spikelets not gibbous, less than 5 - nerved, acuminate at the apex, keeled *Chrysopogon* 5
- 2b. Spikelets solitary ; glumes dissimilar, shorter than the spikelets, membranous, the lower glume smaller or sometimes suppressed ; upper lemma usually awnless :
- 13a. Spikelets subtended by bristles or involucre of bristles :
- 14a. Spikelets enclosed in an involucre of bristles united at the base into a cup and falling with it ; upper lemma smooth ; grain enclosed but free within the lemma and palea ... *Cenchrus* 3
- 14b. Spikelets surrounded by free bristles ; upper lemma transversly rugose ; grain tightly enclosed by the hardened lemma and palea ... *Setaria* 31
- 13b. Spikelets naked i.e. not subtended by bristles or involucre of bristles :
- 15a. Inflorescence an open panicle ; spikelets scattered ; rachis slender, not strap - like, pedicel more than 4 mm long ... *Panicum* 22
- 15b. Inflorescence consisting of two or more (rarely one) racemes, spike - like racemes or spike of spikelets attached to a slender strap - like rachis ; spikelets 2 - or 3 - nate, not scattered ; pedicel less than 2 mm long :
- 16a. Inflorescence branches arranged in racemes, spike like - racemes or spikes ; upper lemma crustaceous or coriaceous, margins narrow, inrolled or involute and exposing the palea ; spikelets 2 - nate, glabrous or pubescent :
- 17a. Spikelets with a bead - like swelling at the base ; lower glume reduced to a minute cupular rim clasping the thickened, bead - like swelling ... *Eriochloa* 17
- 17b. Spikelets without a bead - like swelling at the base ; lower glume

- shorter, mucronate, cuspidate or awned or lower glume almost absent :
- 18a. Lower glume present ; upper glume acuminate or awned :
- 19a. Ligule generally present ; spikelets less than 3 mm long, glabrous ; upper lemma mucronate ; grain broadly orbicular ... *Paspalidium* 23
- 19b. Ligule mostly absent ; spikelets more than 3.5 mm long, hairy ; upper lemma obtuse or apiculate ; grain broadly elliptic ... *Echinochloa* 14
- 18a. Lower glume absent ; upper glume acute, not awned ... *Paspalum* 24
- 16b. Inflorescence branches digitate, whorled or verticillate ; upper lemma thinly cartilaginous, usually with flat, hyaline margins, not exposing the palea ; spikelets 3 - nate, covered with clavate hairs ... *Digitaria* 13
- 1b. Spikelets 1 - many - flowered, usually laterally compressed or terete, breaking up at maturity above the more or less persistent glumes or if falling entire then not 2 - flowered :
- 20a. Plants arborescent ; culms covered with white, waxy powder ; leaves with a petiole - like base and articulated with the sheath ; lemmas several ; flowering and fruiting rarely ... *Dendrocalamus* 10
- 20b. Plants herbaceous ; culms not covered with waxy powder ; leaves sessile, not articulated with the sheath ; lemmas few ; flowering and fruiting usually annually :
- 21a. Tall, reed - like grass, more than 2 m high ; culms hollow ; inflorescence plumose ; rachilla and internodes bearing long silky hairs which envelop the lemmas ... *Phragmites* 26
- 21b. Small grass, less than 1.5 m high ; culms solid ; inflorescence not plumose ; rachilla and internodes glabrous or pubescent, hairs not enveloping the lemmas :
- 22a. Glumes minute and represented by two inconspicuous lips ; stamens 6 ; grain with distinct linear hilum ... *Oryza* 21

- 22b. Glumes distinct and conspicuous ; stamens 1 - 3 ; grain with hilum of various types but not linear :
- 23a. Inflorescence a spike, spike - like raceme, spike of spikes or with groups of spikelets spaced on the rhachis :
- 24a. Upper glume furnished with rows of hooked spines or tubercles ... *Tragus 35*
- 24b. Upper glume smooth or scabrid but without rows of hooked spines or tubercles :
- 25a. Leaf - blades subamplexicaul ; inflorescence a delicate, "bottle-brush" like, simple spike ; spikelets 1 - flowered ; grain linear, terete ... *Perotis 25*
- 25b. Leaf - blades not subamplexicaul ; inflorescence a spike of spikes or consisting of groups of spikelets spaced upon a rhachis ; spikelets 2 - many - flowered ; grain obovate - elliptic or obliquely ovoid :
- 26a. Inflorescence of a series of dense spikes arranged on an erect, strap - like rhachis ; spikelets laterally compressed, not awned, many - flowered ; grain obliquely ovoid ... *Desmostachya 11*
- 26b. Inflorescence consisting of groups of spikelets spaced on a thin rhachis ; spikelets dorsally compressed, awned, 2 - flowered ; grain obovate - elliptic *Melanocenchris 20*
- 23b. Inflorescence of digitate spikes or an effuse or compact panicle or in heads :
- 27a. Inflorescence of digitate spikes (rarely spikes solitary in *Tetrapogon*) :
- 28a. Spikelets awned :
- 29a. Spikelets 1 - flowered, with a flexuous, 2.0 - 3.5 cm long awn ; lemmas narrowed upwards ... *Schoenefeldia 29*

- 29b. Spikelets 2 - many - flowered with a less than 1.5 cm long awn ; lemmas widened upward :
- 30a. Spikes 1 - 3 ; fertile florets 2 or more ... *Tetrapogon* 34
- 30b. Spikes more than 4 ; fertile floret only one ... *Chloris* 4
- 28b. Spikelets not awned :
- 31a. Spikelets 1 - flowered ; tip of rhachis not produced ; grain ellipsoid, laterally compressed ... *Cynodon* 8
- 31b. Spikelets many - flowered ; tip of rhachis produced ; grain oblong to globose, angled ... *Dactyloctenium* 9
- 27b. Inflorescence an effuse or compact panicle or a dense head :
- 32a. Inflorescence an ellipsoid or ovoid dense head, heads supported by the inflated sheath ... *Crypsis* 6
- 32b. Inflorescence an effuse or compact panicle, not supported by the inflated sheath :
- 33a. Panicle effuse, branches long and spreading :
- 34a. Lemmas awned ; awn tripartite ... *Aristida* 2
- 34b. Lemmas not awned :
- 35a. Spikelets fusiform, 1 - flowered ... *Sporobolus* 33
- 35b. Spikelets laterally compressed, many - flowered ... *Eragrostis* 15
- 33b. Panicle compact, broadly cylindrical, branches very short ... *Polypogon* 27

1. APLUDA L.

Apluda mutica L. Sp. Pl. 82. 1753 var. **aristata** (L.) Hack. ex Backer, Handb. Fl. Java 2 : 54. 1928 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 204. 1961. *A. aristata*. L. Amoen. Acad. 4. 303. 1756 ; Duthie, Illus. Indig. Fodd. Grass pl. 29. 1886. *A. varia* Hack. subsp. *aristata* (L.) Hack. in DC. Monogr. Phan. 6 : 196. 1889 ; Hook. f. Fl. Brit. Ind. 7 : 150. 1896. *A. mutica* L. ; Bor, Grass. Burm. Ceyl. Ind. Pak. 93. 1960, *pro parte*. *A. mutica* L. subsp. *aristata* (L.) Babu, Herb. Fl. Dehra Dun 582. 1977.

Erect perennials, 1.0 - 1.5 m. Ligule membranous, short, rounded. Sessile spikelets seated upon the bulbous base of the rachis, 2 - flowered, upper male, lower hermaphrodite. Upper lemma ovate, hyaline, cleft half way down, awned.

Fl. & Fr. : September - March.

Common in gravelly habitats with sandy loam soil ; Tordi Sagar, Kakor R. F. and Anwa R. F.

It is a good fodder grass during younger stages.

2. ARISTIDA L.

Aristida funiculata Trin. & Rupr. Sp. Gram. Stip. 159. 1842 & in Mem. Acad. Sci. Petersb. ser. 6. 7 : 159. 1843 ; Henr. Monogr. Aristida 90. pl. 24. 1929 ; Hook. f. Fl. Brit. Ind. 7 : 226. 1896 ; Blatt. & McC. Bombay Grasses 214. pl. 142. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 410. 1960.

Tufted, erect or geniculately ascending grass, 25 - 75 cm. Leaves up to 12.0 × 0.2 cm, convolute or flat, linear, scabridulous on the upper surface, base ciliate ; ligule a short ciliate rim. Panicle up to 20 cm long, linear. Spikelets c. 2.5 cm long, green or pale brown, base of callus pointed. Lower glume slightly longer than the upper, linear with scabrous mid-nerve. Lemma awned ; awn up to 6 cm long, situated on a long column which is articulated at the base.

Fl. & Fr. : July - September.

Common in sandy habitats ; Deoli and Sohela (*Patil* 406 ; *Raizada* 15/55, DD) ; Tonk plantation (*Maheshwari* 53209, LWG).

3. CENCHRUS L.

- 1a. Bristles connate at the base only ; inner bristles ciliate, very slender, slightly widened and thickened downwards, more than 8 mm long ; outer numerous, filiform ... *C. ciliaris* 1
- 1b. Bristles connate into a 1 - 3 mm long cup ; inner bristles not ciliate, flattened, rigid, subulate, grooved on the back, less than 5 mm long ; outer few or absent .. *C. setigerus* 2

1. *Cenchrus ciliaris* L. Mant. Alt. 302 1771 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 287. f. 33. 1960 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 213. 1965 ; Mahesh. Illus. Fl. Dehli f. 237. 1966. *Pennisetum cenchroides* Rich. in Pers. Syn. 1 : 72. 1805 ; Duthie, Illus. Indig. Fodd. Grass. pl. 13. 1886 ; Hook. f. Fl. Brit. Ind. 7 : 88. 1896. *P. ciliare* (L.) Link, Hort. Berol. 1 : 213. 1827 ; Blatt. & McC. Bombay Grasses 181. pl. 116. 1935. 'Dhaman' (Hindi).

Erect or decumbent, tufted perennials, 20 - 50 cm ; rootstock often nodose, the sheath of which woolly. Leaves up to 25.0 × 0.5 cm ; ligule reduced to a ciliate rim. Inflorescence 1.5 - 7.0 cm long, purple. Spikelets (1-) 2 - 4 in each involucre, sessile, 4.0 - 4.5 mm long. Upper and lower glumes 1 - nerved, hyaline.

Fl. & Fr. : August - March.

Common in sandy areas ; Haji Ki Kothi and Sohela R.F.

It is a valuable fodder grass.

2. *Cenchrus setigerus* Vahl, Enum. Pl. 2 : 395. 1806 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 290. 1960 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 215. pl. 10, f. 2. 1965 ; Mahesh. Illus. Fl. Delhi f. 238. 1966. *C. biflorus* sensu Hook. f. Fl. Brit. Ind. 7 : 89. 1896, non Roxb. 1820 ; Blatt. & McC. Bombay Grasses 185. pl. 118. 1935. 'Dhaman' (Hindi).

Erect or ascending from a geniculate base perennials, 15 - 40 cm, sometimes rooting at nodes. Leaves up to 20.0 × 0.8 cm, sparsely pilose ; ligule a narrow ciliate rim. Inflorescence 2 - 8 cm long, pale green or

purple. Spikelets 2-3 in each involucre, sessile, 3.5-4.0 mm long. Upper and lower glumes 1-nerved, hyaline.

Fl. & Fr. : August - March.

Common in sandy areas ; Pachewar village.

It is a good fodder grass with high yielding capacity.

4. CHLORIS SW.

- 1a. Perennials ; spikes usually 20-25 cm long, widely spreading ;
upper glume 5-7 mm long ... *C. dolichostachya* 1
- 1b. Annuals, rooting at the nodes ; spikes up to 6 cm long,
closely crowded ; upper glume c. 3 mm long ... *C. virgata* 2

1. *Chloris dolichostachya* Lag. Gen. Sp. Pl. 5. 1816 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 466. 1960 ; Mahesh. Illus. Fl. Delhi f. 257. 1966. *C. incompleta* Roth, Nov. Pl. Sp. 60. 1821 ; Hook. f. Fl. Brit. Ind. 7 : 290. 1896.

Tufted grass, c. 0.5 m. Leaf - sheath prominently hairy down the margins ; ligule a rim of hairs. Spikelets 4-5 mm long, lanceolate. Rhachilla between the glumes and lemma flattened, hairy, forming the bearded callus. Lemma terminating into a 8-10 mm long awn. Grain 2-3 mm long, enclosed by the persistent lemma and palea.

Fl. & Fr. : September - March.

Common in rocky habitats ; Toda Rai Singh R.F.

It is a good fodder grass before flowering.

2. *Chloris virgata* Sw. Fl. Ind. Occ. 1 : 203. 1797 ; Hook. f. Fl. Brit. Ind. 7 : 291. 1896 ; Blatt. & McC. Bombay Grasses 255. pl. 170. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 468. 1960 & Fl. Iraq 9 : 451 pl. 172. 1968.

Erect or geniculately ascending grass, c. 1 m. Leaf - sheath smooth. Spikes silky hairy, sometimes partly enclosed in the uppermost leaf-sheath. Spikelets 2-3-flowered, shortly 2-awned. Lemma thickly ciliate on the margins in the upper half with long hairs.

Fl. & Fr. : August November.

Common on sandy - loam to clayey soil ; Tordi Sagar.

It is a good fodder grass.

5. CHRYSOPOGON Trin. *nom. cons.*

Chrysopogon fulvus (Spreng.) Chiov. Fl. Somalia 1 : 327. 1929 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 116. 1960. *Pollinia fulva* Spreng. Pugill. 2 : 10. 1815. *Chrysopogon montanus* Trin. ex Spreng. Neue Entdeck 2 : 93. 1821 ; Blatt. & McC. Bombay Grasses 70. pl. 42. 1935 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 219. 1961. *Andropogon monticola* Schult. Syst. Veg. Mant. 3 : 665. 1827 ; Hook. f. Fl. Brit. Ind. 7 : 192. 1896.

Tufted perennials, 1.0 - 1.5 m. Leaves up to 30.0 × 0.8 cm, often folded ; ligule a very shallow rim. Panicle 5 - 10 cm long, the lower axis and whorls very shortly hairy, the upper glabrous ; callus bearded with stiff golden hairs. Pedicelled spikelets c. 7 mm long, slightly longer than the sessile one.

Fl. & Fr. : September February.

Common in gravelly habitats ; Kachha Bundha and Toda Rai Singh R. F.

6. CRYPISIS Ait. *nom. cons.*

Crypsis schoenoides (L.) Lam. Tabl. Encycl. 1 : 166. t. 42, f. 1. 1791 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 622. 1960 & Fl. Iraq 9 : 465. pl. 178. 1968. *Phleum schoenoides* L. Sp. Pl. 60. 1753. *Heleochoa schoenoides* (L.) Host, Icon. Descr. Gram. Austriac. 1 : 23. t. 30. 1801 ; Hook. f. Fl. Brit. Ind. 7 : 235. 1896.

Profusely branched annuals with at first prostrate, finally ascending culms. Leaves up to 5.0 × 0.3 cm, glabrous or sparsely hairy, hairs

mostly with bulbous base. Spikelets 2.0 - 2.5 mm long, lanceolate. Glumes 1 nerved, ciliate on the keel. Grain c. 1.5 mm long, obovate - elliptic, brownish.

Fl. & Fr. : September - November.

Common in moist places ; Banns river bed at Bentheli village.

7. CYMBOPOGON Spreng.

- | | | |
|---|-----|----------------------|
| 1a. Non aromatic grass ; basal sheath woolly to sparsely hairy ; lowest pedicel of the sessile raceme swollen, shining and hairy | ... | <i>C. parkeri</i> 2 |
| 1b. Aromatic grass with woody rootstock ; basal sheath glabrous, shining ; lowest pedicel of the sessile raceme neither swollen nor hairy | ... | <i>C. martinii</i> 1 |

1. *Cymbopogon martinii* (Roxb.) Watson in Atkins. Gaz. N.W. Prov. Ind. 392. 1882 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 129. 1960 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 244. pl. 11, f. 1. 1961. *Andropogon martinii* Roxb. Fl. Ind. ed. Carey & Wall. 1 : 280. 1820. *A. schoenanthus* L. var. *martini* Hook. f. Fl. Brit. Ind. 7 : 204. 1896.

Erect perennials, c. 2 m. Leaves up to 40.0 × 2.5 cm, lanceolate, broadly rounded or cordate at the base, margins scabrid ; ligule 1 - 2 mm long, oblong. Sessile spikelets of the lowest pair male or neuter, others hermaphrodite, awned. Pedicelled spikelets male ; florets reduced to a small scale enclosing 3 stamens only.

Fl. & Fr. : September - March.

Common near moist places ; Tordi Sagar.

It is not a good fodder grass. Rusa oil which is used in medicine as a remedy for rheumatism is obtained from this grass.

There are two forms of this species "Motia" and "Sofia". They can only be distinguished from one another in the field by certain vegetative characters and also by their odours when crushed. In the herbarium material it is not possible to distinguish them from each other. The form "Motia" yields the "Palmarosa oil" which is exported to Europe and America, while "Sofia" yields "Ginger - Grass oil" (Raizada *et al.*, l. c.).

2. **Cymbopogon parkeri** Stapf in Kew Bull. 1929 : 10. 1929 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 131. 1960 & Fl. Iraq 9 : 518. pl. 198. 1968 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 241. pl. 11, f. 3. 1961.

Densely tufted perennials, c. 1 mm. Leaves up to 15.0 × 0.3 cm, very narrow, almost filiform, flexuous. Lowest pair of spikelets of the sessile racemes homogamous, of the other heterogamous. Sessile spikelets hermaphrodite, awned. Palea absent. Pedicelled spikelet male.

Fl. & Fr. : March May.

Common in sandy areas ; Gar R. F. near Banas river, Deoli.

8. CYNODON L. C. Rich. *nom. cons.*

Cynodon dactylon (L.) Pers. Syn. Pl. 1 : 85. 1805 ; Hook. f. Fl. Brit. Ind. 7 : 288. 1896 ; Blatt. & McC. Bombay Grasses 250. pl. 166. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 469. f. 52. 1960 ; Mahesh. Illus. Fl. Delhi f. 260. 1966. *Panicum dactylon* L. Sp. Pl. 58. 1753.

Creeping, stoloniferous and sometimes rhizomatous perennials up to 35 cm, with erect flowering culms. Leaves up to 10.0 × 0.4 cm ; ligule a rim of short hairs. Spikelets crowded, secund, c. 2 mm long. Stamens 3.

Fl. & Fr. : Almost throughout the year.

Very common grass forming a carpet in cultivated and fallow fields ; Ghati village and elsewhere.

9. DACTYLOCTENIUM Willd.

- | | | |
|--|-----|-----------------------|
| 1a. Annuals ; spikes 2 - 6 cm long, straight | ... | <i>D. aegyptium</i> 1 |
| 1b. Perennials ; spikes 0.5 - 1.8 cm long, falcate | ... | <i>D. scindicum</i> 2 |

1. **Dactyloctenium aegyptium** (L.) Willd. Enum. Hort. Berol. 1029. 1809 ; Blatt. & McC. Bombay Grasses 262. pl. 176. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 489. f. 54. 1960 ; Mahesh. Illus. Fl. Delhi f. 263. 1966. *Cynosurus aegyptius* L. Sp. Pl. 72. 1753. *Eleusine aegyptia* (L.) Desf. Fl. Atlant. 1 : 85. 1798 ; Hook. f. Fl. Brit. Ind. 7 : 295. 1896.

Erect or prostrate, hispid grass, 20-60 cm. Leaves up to 20.0×0.6 cm, margins and nerves covered with bulbous-based hairs; ligule a ring of white hairs. Produced tip of rhachis 2-4 mm long. Spikelets c. 4 mm long. Glumes subequal, compressed, with curved mucro. Grain c. 1 mm across, compressed, subglobose, surface coarsely sculptured.

Fl. & Fr. : July - November.

Found in moist, sandy areas; Sohela plantation (*Raizada* 1/55, DD).

2. ***Dactyloctenium scindicum*** Boiss. *Diagn. Pl. Orient. ser. 2. 4* : 131. 1859; Bor, *Grass. Burm. Ceyl. Ind. Pak.* 489. 1960. *Eleusine scindica* (Boiss.) Duthie, *Fodd. Grass. N. Ind.* 58. 1888 & *Illus. Indig. Fodd. Grass.* pl. 36. 1886. *E. aristata* Ehrenb. ex Boiss. *Fl. Orient.* 5 : 557. 1884; Hook. f. *Fl. Brit. Ind.* 7 : 296. 1896.

Stoloniferous perennials, 8-40 cm. Leaves up to 11.0×1.5 cm, glaucous, sparsely hairy, margins ciliate with bulbous-based hairs; ligule membranous with a minute fringe of hairs. Tip of the rhachis shortly produced into a 2-3 mm long mucro. Spikelets c. 3.2 mm long. Glumes unequal. Upper glume aristate with ciliate keel. Grain c. 9 mm long, ovoid, transversely rugose, pale brown.

Fl. & Fr. : Almost throughout the year.

Common in sandy habitats and forming thick tufts of plants matted with the soil; Sohela (*Raizada* 5/55, DD).

10. DENDROCALAMUS Nees

Dendrocalamus strictus (Roxb.) Nees in *Linnaea* 9 : 476. 1834; Bedd. *Fl. Sylv.* pl. 325. 1873; Gamble in Hook. f. *Fl. Brit. Ind.* 7 : 404. 1896 & in *Ann. Roy. Bot. Gard. Cal.* 7 : 78. pl. 69. 1896. *Bambusa stricta* Roxb. *Pl. Cor.* 1 : 58. t. 80. 1798. 'Bans' (Hindi).

Densely tufted bamboo with strong stem; nodess wollen; lower stem-sheaths covered on the back with golden brown, stiff hairs. Leaves up to 12×2 cm; ligule narrow, serrate. Spikelets crowded at the nodes of the inflorescence axis; perfect florets 2 or 3. Lemma densely hairy towards the tip, ending in a sharp spine. Palea fringed on the keel and hairy near the tip.

Fairly common in valleys; Toda Rai Singh R. F.

It is used for building purposes, matting and basket work, punting poles, furniture etc. The leaves are used as fodder. The tender young shoots are pickled and eaten.

11. DESMOSTACHYA Stapf

Desmostachya bipinnata (L.) Stapf in Dyer, Fl. Cap. 7 : 632. 1900 ; Blatt. & McC. Bombay Grasses 244. pl. 162. 1935 ; Bor, Grass. Burm. Cycl. Ind. Pak. 491. 1960. *Briza bipinnata* L. Syst. Nat. ed. 10. 2 : 875. 1759. *Poa cynosuroides* Retz. Obs. Bot. 4 : 20. 1786. *Eragrostis cynosuroides* (Retz.) P. Beauv. Ess. Agrost. 162. 1812 ; Hook. f. Fl. Brit. Ind. 7 : 324. 1896.

Robust, tufted, rhinomatous perennials. Leaves up to 40.0 × 0.6 cm, convolute. Inflorescence 30 40 cm long. Spikelets 20 25 per spike, 2 3 mm long, shining. Glumes very unequal.

Fl. & Fr. : August November

Common in moist places ; Sohela R. F. near Tonk.

Cheap ropes, baskets and mats are prepared from it. It is a useful sand and soil binder.

12. DICHANTHIUM Willemet

- | | | |
|---|-----|-----------------------|
| 1a. Nodes glabrous ; joints and pedicels grooved ; lower glume of the sessile spikelets pitted | ... | <i>D. pertusum</i> 2 |
| 1b. Nodes bearded ; joints and pedicels not grooved ; lower glume of the sessile spikelets not pitted | ... | <i>D. annulatum</i> 1 |

1. **Dichanthium annulatum** (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9 : 178. 1917 ; Blatt. & McC. Bombay Grasses 94. pl. 62. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 133. 1960 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 233. pl. 9, f. 4. 1961 ; Mahesh. Illus. Fl. Delhi f. 268. 1966. *Andropogon annulatus* Forssk. Fl. Aegypt. - Arab. 173. 1775 ; Hook. f. Fl. Brit. Ind. 7 : 196. 1896.

Erect or geniculately ascending, tufted perennials, 30-40 cm. Leaves up to 15.0 × 0.5 cm, margins scabrid; ligule a shallow membrane. Sessile spikelets c. 2.75 mm long, hermaphrodite, awned. Lower glume 7 nerved, upper 3 nerved. Upper lemma with a c. 2 cm long awn. Pedicelled spikelets male or neuter, more or less similar to sessile.

Fl. & Fr. : September - February.

Common in moist and marshy habitats; Barndi near Frazer bridge.

2. **Dichanthium pertusum** (L.) W.D. Clayton in Kew Bull. 32 : 4. 1977. *Holcus pertusus* L. Mant. Alt. 301. 1771. *Andropogon pertusus* (L.) Willd. Sp. Pl. 4 : 922. 1806; Hook. f. Fl. Brit. Ind. 7 : 173. 1896. *Bothriochloa pertusa* (L.) A. Camus in Ann. Soc. Linn. Lyon n. s. 76 : 164. 1931; Bor, Grass. Burm. Ceyl. Ind. Pak. 109. 1960; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 230. pl. 9, f. 3. 1961; Mahesh. Illus. Fl. Delhi f. 267. 1966.

Tufted, rhizomatous perennials, rooting at nodes; cataphylls glabrous. Leaves up to 12.0 × 0.3 cm, ciliate in the throat; ligule a shallow membrane surrounded by long ciliate hairs. Sessile spikelets 3.0-3.5 mm, oblong; callus 2.0-2.5 mm long. Glumes equal.

Fl. & Fr. : September - February.

Common in moist, sandy habitats; Banetha; Kachha Bundha R. F. and Frazer bridge.

It is a good fodder grass and can be made into hay.

13. DIGITARIA Haller *nom. cons.*

Digitaria stricta Roth ex Roem. & Schult. Syst. Veg. 2 : 474. 1817; Bor, Grass. Burm. Ceyl. Ind. Pak. 305. 1960; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 188. pl. 5, f. 3. 1965. *Paspalum royleanum* Nees ex Thw. Enum. Pl. Zeyl. 358. 1864; Hook. f. Fl. Brit. Ind. 7 : 18. 1896.

Erect or decumbent annuals, 20-40 cm. Leaves up to 20.0 × 0.3 cm, scabrid; ligule membranous, lacerate on the upper margins. Inflorescence branch up to 10 cm long. Spikelets in triads, c. 1.5 mm long, elliptic. Lower glume absent; upper glume scaly, one third the length of the spikelet.

Fl. & Fr. : July - September.

Rare; Deoli (S.C. Agrawal 412, 416, DD).

14. ECHINOCHLOA P. Beauv.

- 1a. Spikelets 3.5 - 4.0 mm long ; glumes cuspidate or acuminate and lower lemma produced into a considerable awn ; pedicels of spikelets with prominent bulbous - based white setae ... *E. crusgalli* 2
- 1b. Spikelets 2 - 3 mm long ; glumes and lemmas neither awned nor cuspidate ; pedicels of spikelets devoid of any setae ... *E. colonum* 1

1. *Echinochloa colonum* (L.) Link, Hort. Reg. Bot. Berol. 2 : 209. 1833 ; Blatt. & McC. Bombay Grasses 148. pl. 94. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 308. f. 34. 1960 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 170. 1965. *Panicum colonum* L. Syst. Nat. ed. 10. 2 : 870. 1759 ; Hook. f. Fl. Brit. Ind. 7 : 32. 1896.

Decumbent annuals of variable size, rooting at nodes. Leaves up to 15.0 × 0.8 cm, flaccid, scabrid or smooth, marked by a purplish - brown band at the junction of the blade and sheath. Inflorescence branches 2 - 3 cm long, appressed or ascending. Spikelets sessile, 2.5 - 3.0 mm long, elliptic - ovate.

Fl. & Fr. : March - August.

Common in moist and marshy habitats ; Banas river bed near Bentheli.

It is a good fodder grass. The grain is eaten by poor people in times of scarcity.

2. *Echinochloa crusgalli* (L.) P. Beauv. Ess. Agrost. 53 : 161. 1812 ; Blatt. & McC. Bombay Grasses 150. pl. 95. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 310. 1960 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 171. pl. 3, f. 2. 1965. *Panicum crusgalli* L. Sp. Pl. 56. 1753 ; Hook. f. Fl. Brit. Ind. 7 : 30. 1896.

Erect, rather stout annuals, 1 - 2 m, rooting at the lower nodes. Leaves up to 30 cm long, flat, margins scaberulous. Inflorescence either solitary or 2 - 3 together.

Fl. & Fr. : August - November.

Common in marshy habitats ; Tordi Sagar-

Before flowering it is a good fodder grass. The grain is eaten by poor people in times of scarcity.

15. ERAGROSTIS N. M. Wolf.

- 1a. Panicle compact, dense, spiciform, cylindrical ; keel of palea ciliate, cilia longer than the width of floret, basal glands of the cilia conspicuous ... *E. ciliaris* 1
- 1b. Panicle open, effuse or loose ; keel of palea smooth, scabrid or if ciliate then the cilia not exceeding the width of floret, basal glands of the cilia either absent or inconspicuous :
 - 2a. Plants glandular :
 - 3a. Only lower branches of the panicle glandular below the node ; keel of palea smooth ; stamens 3 ; grain ellipsoid, smooth. ... *E. pilosa* 4
 - 3b. Leaf margins, sheath and pedicels of spikelets with raised crateriform glands ; keel of palea scabrid ; stamens 2 ; grain subglobose, obscurely rugose ... *E. minor* 3
 - 2b. Plant eglandular :
 - 4a. Spikelets breaking up from above downwards ; rhachis fragile ; stamens 3 :
 - 5a. Panicle loose with spreading branches ... *E. tenella* var. *tenella* 5a
 - 5b. Panicle contracted with ascending branches ... *E. tenella* var. *insularis* 5b
 - 4b. Spikelets breaking up from below upwards ; rhachis tough ; stamens 2 :
 - 6a. Panicle branches long, capillary ; spikelets 40 - 50 or more flowered ; grain obscurely rugose ... *E. tremula* 6
 - 6b. Panicle branches short, not capillary ; spikelets 10 - 15 - flowered ; grain smooth ... *E. gangetica* 2

1. *Eragrostis ciliaris* (L.) R. Br. in Tuckey, Narr. Exped. Congo, App. 478. 1818 ; Stapf in Hook. f. Fl. Brit. Ind. 7 : 314. 1896 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 506. 1960 ; Mahesh. Illus. Fl. Delhi f. 252. 1966 ; Roy in Bull. Bot. Surv. India 18 : 103. 1979. *Poa ciliaris* L. Syst. Nat. ed. 10. 2 : 875. 1759.

Geniculately ascending annuals, 8 - 35 cm. Leaves up to 7.5 × 0.25 cm ; ligule a fringe of long hairs at the mouth of the sheath. Panicle 0.5-7.5 cm long. Spikelets 8 - 12 - flowered, clustered, each 1.0 - 1.25 mm long, strongly compressed. Glumes subequal, c. 1 mm long, ovate - lanceolate, acute, 1 nerved. Lemma c. 1. mm. long, obtuse, 3 - nerved. Stamens 2. Grain c. 0.6 mm long, ellipsoid, brown.

Fl. & Fr. : March November.

Common weed in fallow fields and wastelands, Deoli. (*B. D. Patil*, 407, DD).

2. *Eragrostis gangetica* (Roxb.) Steud. Syn. Pl. Glum. 1 : 266. 1854 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 508. 1960 ; Roy in Bull. Bot. Surv. India 18 : 107. 1979. *Poa gangetica* Roxb. Fl. Ind. ed. Carey & Wall. 1 : 341. 1820. *Eragrostis stenophylla* Hochst. ex Miq. in Verh. Konink. Nederl. Inst. 3 : 4. 39. 1851, *pro parte* ; Stapf in Hook. f. Fl. Brit. Ind. 7 : 318. 1896, *pro parte*.

Glaucous perennials. Leaves up to 15.0 × 0.5 cm, linear, flat or inrolled ; ligule reduced to a rim with prominent fine hairs. Spikelets greenish grey. Glumes 0.8 - 0.9 mm long, lanceolate, acute, 1 nerved, nerve scabrid on the back. Lemma boat shaped, 3 nerved. Grain subglobose, dark brown.

Fl. & Fr. : August November.

Common on sandy - loam soil ; Rampura.

3. *Eragrostis minor* Host, Icon. Deser. Gram. Austr. 4 : 15. 1809 ; Stapf in Hook. f. Fl. Brit. Ind. 7 : 321. 1896 ; Blatt. & McC. Bombay Grasses 238. pl. 158. 1935 ; Clayton in Fl. W. Trop. Afr. ed. 2.3 : 390. 1972. *Poa eragrostis* L. Sp. Pl. 68. 1753. *Eragrostis poaeoides* P. Beauv. Ess. Agrost. 162. 1812 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 512. 1960 ; Mahesh. Illus. Fl. Delhi f. 249. 1966 ; Roy in Bull. Bot. Surv. India 18 : 106. 1979.

Erect or geniculately ascending annuals, c. 0.5 m. Mouth of sheath bearded. Panicle 5 - 15 cm long. Spikelets 1.5 - 2.2 mm long, more than 10 - flowered. Grain dorsally flattened, pale brown.

Fl. & Fr. : July November.

Common in moist places ; Banas river bed near Bentheli village.

It is a good fodder grass.

4. *Eragrostis pilosa* (L.) P. Beauv. Ess. Agrost. 71. 162, 175. 1812 ; Stapf in Hook. f. Fl. Brit. Ind. 7 : 323. 1896 ; Blatt. & McC. Bombay Grasses 241. pl. 160. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 512. 1960 ; Mahesh. Illus. Fl. Delhi f. 251. 1966 ; Roy in Bull. Bot. Surv. India 18 : 105. 1979. *Poa pilosa* L. Sp. Pl. 68. 1753.

Erect or geniculately ascending grass. Leaves up to 10.0×0.5 cm, flaccid ; ligule reduced to a narrow rim. Lower branches of the inflorescence verticillate, pilose in the axils. Spikes 6 - 8 or more flowered. Glumes unequal. Lemma 1.0 - 1.2 mm long, narrowly ovate, acute or subobtusate, 3 nerved. Palea 2 nerved. Grain c. 0.5 mm long, yellowish-brown.

Fl. & Fr. : July - February.

Common in moist, sandy places ; Banas river bed at Bentheli village.

5a. *Eragrostis tenella* (L.) P. Beauv. ex Roem. & Schult. Syst. Veg. 2 : 576. 1817 var. *tenella* ; Bor, Grass. Burm. Ceyl. Ind. Pak. 513: 1960 ; Roy in Bull. Bot. Surv. India 18 : 104. 1979. *Poa tenella* L. Sp. Pl. 69. 1753. *P. plumosa* Retz. Obs. Bot. 4 : 20. 1786. *Eragrostis tenella* Roem. & Schult. var. *plumosa* (Retz.) Stapf in Hook. f. Fl. Brit. Ind. 7 : 315. 1896.

Erect or geniculately ascending annuals. Leaf sheath with a few long hairs near the blade ; ligule reduced to a narrow rim of hairs. Panicle 3 - 7 cm or more long ; the branches of rhachis with prominent, long, white hairs in the axils. Spikelets 1.0 - 1.5 mm long, 5 - 9 - flowered. Lower glume longer than the upper. Lemma 3 - nerved, ovate. Palea ciliate on the keel with spreading, long, setose hairs, the hairs clasping the floret above. Grain ovoid.

Fl. & Fr. : August - November.

Common in rocky places ; Kachha Bundha near Tonk.

It is a good fodder grass.

5b. *Eragrostis tenella* (L.) P. Beauv. ex Roem. & Schult. var. *insularis* Hubb. in Kew Bull. 1939 : 654. 1939 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 514. 1960.

Panicle contracted with ascending branches ; axis glabrous.

Fl. & Fr. : August - November.

Common in moist places ; Banas river bed near Bentheli and Rampura.

It is used as fodder.

6. *Eragrostis tremula* Hochst. ex Steud. Syn. Pl. Glum. 1 : 269. 1854 ; Stapf in Hook. f. Fl. Brit. Ind. 7 : 320. 1896 ; Blatt. & McC. Bombay Grasses 239. pl. 159. 1935 ; Bor, Grass. Burm Ceyl. Ind. Pak. 514. 1960 ; Mahesh. Illus. Fl. Delhi f. 250. 1966 ; Roy in Bull. Bot. Surv. India 18 : 108. 1979. *Poa tremula* Lam. Tab. Encycl. 1 : 185. 1791.

Tufted, erect or geniculately ascending grass. Leaves up to 15.0 × 0.5 cm, sparsely hairy. Panicle 10-20 cm long. Spikelets 1.5-2.0 mm long. Lemma 2.0-2.2 mm long, broadly ovate, obtuse. Grain nearly globose, yellowish brown.

Fl. & Fr. : August - November.

Common weed in cultivated and fallow fields ; Rampura village.

It is a good fodder grass.

16. EREMOPOGON Stapf

Eremopogon foveolatus (Delile) Stapf in Prain, Fl. Trop. Afr. 9 : 183. 1917 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 148. 1960 ; Mahesh. Illus. Fl. Delhi f. 232. 1966. *Andropogon foveolatus* Delile, Fl. Egypt. Explic. Pl. 16. t. 8, f. 2. 1812 ; Hook. f. Fl. Brit. Ind. 7 : 168 1896, *pro parte*. *A. strictus* Roxb. Fl. Ind. ed. Carey, 265. 1832. *Eremopogon strictus* (Roxb.) A. Camus in Ann. Soc. Linn. Lyon. (n. s.) 68 : 208. 1922 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 228. 1961.

Erect or decumbent, densely tufted perennials, 50-75 cm ; nodes bearded ; basal sheath silky, woolly or villous. Leaves up to 10.0 × 0.2 cm, linear ; ligule truncate, ciliate. Racemes 2.5-3.5 cm long. Sessile spikelets hermaphrodite, 3-4 mm long, awned ; the pedicelled one male, awnless.

Fl. & Fr. : August - November.

Common in rocky habitats ; Banetha forest.

Serves as a good fodder grass.

17. ERIOCHLOA H. B. K.

Eriochloa procera (Retz.) Hubb. in Kew Bull. 1930 : 256. 1930 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 312. 1960 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 196. pl. 6, f. 2. 1965 ; Mahesh. Illus. Fl. Delhi f. 276. 1966. *Agrostis procera* Retz. Obs. Bot. 4 : 19. 1786. *Eriochloa polystachya* sensu Hook. f. Fl. Brit. Ind. 7 : 20. 1896, non H. B. K. 1816.

Erect, tufted grass, c. 1. m ; nodes swollen and slightly pubescent. Leaves up to 15 × 1 cm, glabrous, inrolled when dry ; ligule a rim of very short hairs. Inflorescence 5 - 15 cm long ; rhachis angular, minutely hairy. Spikelets 3.0 - 3.2 mm long, not awned. Palea absent. Grain free within the hardened lemma, compressed, lenticular, smooth.

Fl. & Fr. : September - November.

Not common ; occurs in marshy habitats ; Tordi Sagar.

18. HEMARTHRIA R. Br.

Hemarthria compressa (L. f.) R. Br. Prodr. 207. 1810 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 161. 1960 ; Raizada *et al* in Indian For. Rec. (n. s.) Bot. 4 : 207. pl. 6, f. 3. 1961 ; Mahesh. Illus. Fl. Delhi f. 244. 1966. *Rottboellia compressa* L. f. Suppl. 114. 1781 ; Hook. f. Fl. Brit. Ind. 7 : 153. 1896.

Spreading perennials, rooting at the lower nodes. Leaves up to 12.0 × 0.3 cm, folded when dry ; ligule a very shallow rim fringed with hairs. Inflorescence 4 - 8 cm long. Sessile spikelets 4.0 - 4.5 mm long. Pedicelled spikelets longer than the sessile.

Fl. & Fr. : August - November.

Common grass in moist and marshy places ; Rampura and Tordi Sagar.

19. IMPERATA Cyr.

Imperata cylindrica (L.) Raeuschel. Nom. Bot. ed. 3. 10. 1797 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 169. 1960 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4: 182. pl. 2, f. 2. 1961 ; Mahesh. Illus. Fl. Delhi f. 243. 1966. *Lagurus cylindricus* L. Syst. Nat. ed. 10. 2 : 878. 1759. *Imperata arundinacea* Cyr. Pl. Rar. Neap. 2 : 26. 1792 ; Hook. f. Fl. Brit. Ind. 7 : 106. 1896.

Very variable perennials, c. 60 cm ; nodes with long white hairs. Leaves up to 15.0 × 0.4 cm, tapering at both the ends, villous at the base. Spikelets 2.5 - 3.0 mm long. Lower and upper lemma hyaline, denticulate.

Fl. & Fr. : May - July.

Very common in marshy, shaded habitats ; Tordi Sagar.

In younger stage it is used as fodder. The grass is also used for making low, rough screens and brushes, the leaves for thatching and the floss for stuffing cushions.

20. MELANOCENCHRIS Nees

Melanocenchrus abyssinica (R. Br. ex Fresen.) Hochst. in Flora 38 : 274. 1855 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 473. 1960 ; Nair & Nayar in Bull. Bot. Surv. India 16 : 142. f. 2. 1977. *Eutriana abyssinica* R. Br. ex Fresen. in Mus. Sencken 2 : 142. 1837. *Gracilea royleana* Hook. f. var. *plumosa* Hook. f. Fl. Brit. Ind. 7 : 284. 1896.

Erect or geniculately ascending, tufted grass, 15 - 25 cm. Leaves up to 5.5 × 0.1 cm, filiform, margins convolute, scabridulous ; sheath covered with scattered tubercle based hairs ; ligule a thick row of short white hairs. Spikelets c. 1 cm long including the awns, many - flowered. Glumes villous at the base. Lemma 3 - nerved. Grain c. 1 mm long ; hilum punctiform.

Fl. & Fr. : August - October.

Found in rocky habitats ; Sohela and Bani plantation (Raizada, 6/55, DD).

21. ORYZA L.

Oryza rufipogon Griff. Notul. 3 : 5. 1851 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 605. 1960. *O. nivara* Sharma & Shastry in Indian Journ. Genet. & Pl. Breed. 25 : 161. 1965.

Tufted, marshy or aquatic perennials, 75 - 100 cm. Leaves up to 30.0×0.8 cm ; ligule 8 - 12 mm long, membranous, finally splitting. Spikelets c. 1 cm long, usually deciduous. Sterile lemma 1 - nerved, keeled. Fertile lemma with a conical callus, coriaceous, sparsely hispid, apex glandular and terminating into about 6 cm long, scabrid awn with jointed base.

Fl. & Fr. : September - December.

Rare ; found in marshy places ; Saroi village near Deoli.

22. PANICUM L.

Panicum psilopodium Trin. Gram. Panic. 217. 1826 ; Hook. f. Fl. Brit. Ind. 7 : 46. 1896, incl. var. *coloratum* Hook. f. ; Bor, Grass. Burm. Ceyl. Ind. Pak. 329. 1960 ; Majumdar in Bull. Bot. Soc. Bengal 27 : 50. f. 17. 1973.

Erect or geniculately ascending annuals, 25 - 50 cm. Leaves up to 12.0×0.7 cm, margins with long white hairs ; ligule a lacerate ring. Panicle up to 20 cm long. Spikelets solitary or binate, 2.5 - 3.0 mm long, ovate-lanceolate ; pedicel longer than spikelets. Lower glume c. 1 mm long, acute, 3 - 5 nerved ; upper glume and lower lemma equal, 2.5 - 3.0 mm long, acuminate, many - nerved. Grain c. 1.75 mm long, ovoid, smooth.

Fl. & Fr. : July - September.

Rare ; Tonk (*Raizada* 17/55, DD).

23. PASPALIDIUM Stapf

Paspalidium geminatum (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9 : 583. 1920 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 333. 1960 ; *Raizada & Jain*

in Indian For. Rec. (n. s.) Bot. 5 : 168. 1965. *Panicum geminatum* Forssk. Fl. Aegypt. - Arab. 18. 1775. *P. paspaloides* Pers. Syn. 1 : 81. 1805 ; Hook. f. Fl. Brit. Ind. 7 : 30. 1896.

Creeping annuals, 1.0 - 1.5 m, rooting at nodes. Leaves up to 15.0 × 0.8 cm, linear, finely acuminate. Racemes 1 - 2 cm long, longer than the internodes, adpressed to the common axis. Spikelets c. 2.5 mm long, acute. Lower lemma coriaceous, shining, granular.

Fl. & Fr. : September - March.

Common in wet and marshy places ; near Niwai temple.

24. PASPALUM L.

Paspalum paspaloides (Michaux) Scribner in Mem. Torr. Bot. Cl. 5 : 29. 1894 ; Bor, Fl. Iraq 9 : 494. pl. 190. 1968 ; Jain and Das in Indian For. 99 : 575. 1973. *Digitaria paspaloides* Michaux, Fl. Bor. Amer. 1 : 46. 1803. *Paspalum distichum* auct. pl. incl. Hook. f. Fl. Brit. Ind. 7 : 12. 1896 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 198. 1965 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 338. 1960, non L. 1759.

Creeping, stoloniferous and rhizomatous perennials, rooting at nodes. Leaves up to 8.0 × 0.8 cm, sparsely hairy ; ligule short, membranous. Spikes usually 2 (rarely 3), one sided, divaricate, 3 - 6 cm long ; rhachis flattened, 1.5 - 2.0 mm wide, hispidulous. Spikelets 2 - 3 mm long. Upper glume acute, 5 nerved, pubescent. Lower lemma 3 nerved.

Fl. & Fr. : September - March.

Common in moist and marshy habitats ; Tordi Sagar.

25. PEROTIS Ait.

Perotis hordeiformis Nees apud Hook. & Arn. Bot. Beech. Voy. 247, 248. 1838 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 611. 1960.

Tufted, decumbent annuals, 50 - 75 cm. Leaves up to 3.5 × 0.6 cm, ovate - lanceolate, margins with cartilaginous teeth. Spikelets 2.5 - 3.0 mm

long, narrowly linear, purplish. Lower glume 1 nerved, with longitudinal lines of shining white hairs on the dorsal surface ; upper glume similar to the lower. Grain pale brown.

Fl. & Fr. : July October.

Common on low sand dunes ; Bentheli (Deoli).

26. PHRAGMITES Trin.

Phragmites karka (Retz.) Trin. ex Steud. Nomencl. Bot. ed. 2. 2 : 324. 1841 ; Hook. f. Fl. Brit. Ind. 7 : 304. 1896 ; Bor in Indian For. Rec. (n. s.) Bot 2 : 180. pl. 48. 1958 & Grass. Burm. Ceyl. Ind. Pak. 416. 1960. *Arundo karka* Retz. Obs. Bot. 4. 21. 1786.

Rhizomatous perennials, up to 3 m. Leaves *c.* 50.0 × 2.5 cm, lanceolate, broadly auricled at the base. Spikelets hermaphrodite. Lower and upper glumes 3 nerved. Lemmas progressively shorter. Grain oblong, cylindrical.

Fl. & Fr. : November February.

Common in moist and marshy places ; Niwai temple.

It is a good soil binder. The young leaves are used as fodder and the old stem for thatching purposes. The stem is also used for making baskets and screens.

27. POLYPOGON Desf.

Polypogon monspeliensis (L.) Desf. Fl. Atlant. 1 : 67. 1798 ; Hook. f. Fl. Brit. Ind. 7 : 245. 1896 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 403. 1960 ; Mahesh. Illus. Fl. Delhi f. 274. 1966. *Alopecurus monspeliensis* L. Sp. Pl. 61. 1753.

Geniculately ascending or erect, tufted annuals, up to 0.5 m. Leaves up to 10.0 × 0.5 cm, flat. Spikelets 2-3 mm long. Glumes notched at the apex, hairy on the margins, with two or three times long, antrorsely barbellate awn. Lemma half the length of the glumes, smooth, awned.

Fl. & Fr. : March - September.

Common in moist places ; Banas river bed.

28. SACCHARUM L.

Saccharum spontaneum L. Mant. Alt. 183. 1771 ; Hook. f. Fl. Brit. Ind. 7 : 118. 1896 ; Blatt. & McC. Bombay Grasses 45. pl. 31. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 214. 1960. Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 185. pl. 2, f. 3. 1961.

Rhizomatous perennials *c.* 2.5 m. Leaves up to 50.0 × 0.5 cm, margins scabridulous ; ligule a membranous rim, with a few long hairs on the auricles. Panicle up to 50 cm long, spreading, with the callus hairs closely appressed to the branches of the panicle. Spikelets 3.0 - 4.5 mm long, sessile and pedicelled similar, hermaphrodite.

Fl. & Fr. : August - November.

Common in marshy habitats ; Gar R. F.

It is a good fodder grass when it is in younger condition. The leaves and culms are used for thatching purpose. It is also a good soil binder.

29. SCHOENEFELDIA Kunth

Schoenefeldia gracilis Kunth, Revis. Gramin. 1 : 283. t. 53. 1830 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 474. 1960. *S. pallida* Edgew. in Journ. Asiat. Soc. Bengal 21 : 183. 1852. *Chloris pallida* (Edgew.) Hook. f. Fl. Brit. Ind. 7 : 289. 1896 ; Blatt. & McC. Bombay Grasses 252. pl. 167. 1935. *C. myosuroides* Hook. f. l. c. 290. 1896.

Geniculately ascending grass, 40 - 60 cm. Leaves up to 25.0 × 0.3 cm, narrow, flaccid, tips capillary. Spikes 1 - 5, up to 15 cm long, golden yellowish - green. Spikelets densely 2 - seriate on either side of the flattened, puberulus rhachis. Glumes subequal, acuminate, 1 nerved, keel ciliate, tip bearing a minutely antrorsely barbellate, curved, *c.* 3.5 cm long awn.

Fl. & Fr. : August November.

Common on gravelly soil ; Kakor R.F.

30. SEHIMA Forssk.

Sehima nervosum (Rottl.) Stapf in Prain, Fl. Trop. Afr. 9 : 36. 1917 ; Blatt. & McC. Bombay Grasses 21. pl. 14. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 218. 1960 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 198. 1961. *Andropogon nervosum* Rottl. in Verh. Ges. Naturf. Freunde. Berlin, Neue Schr. 4 : 218. 1806. *Ischaemum laxum* R. Br. Prodr. 205. 1810 ; Hook. f. Fl. Brit. Ind. 7 : 136. 1896.

Erect, tufted perennials, c. 1 m. Ligule a line of short, white, stiff hairs. Spikelets in pairs, one sessile and the other pedicelled. Sessile spikelets 8 - 9 mm long ; callus bearded, Lower glume bidentate, deeply grooved ; upper glume keeled and with 1 - 2 cm long awn. Upper lemma hermaphrodite, 3 - nerved, awned ; awns up to 3 - 4 cm long. Pedicelled spikelets 8 - 10 mm long, glabrous. Upper and lower lemmas empty or male, hyaline.

Fl. & Fr. : August February.

Common in moist places ; Kachha Bundha R.F. and Kakor R.F.

It is an excellent fodder grass.

31. SETARIA P. Beauv. *nom. cons.*

Setaria pumila (Poir.) Roem. & Schult. Syst. Veg. 2 : 891. 1817 ; Clayton in Tutin *et al.* Fl. Eur. 5 : 263. 1980. *Panicum pumilum* Poir. Encycl. Meth. Bot. Suppl. 4. 273. 1816. *P. pallide - fuscum* K. Schum. Beskr. Guin. Pl. 58. 1827. *Setaria pallide - fusca* (K. Schum.) Stapf & Hubb. in Kew Bull. 1930 : 259. 1930 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 363. 1960 ; Raizada & Jain in Indian For. Rec. (n. s.) Bot. 5 : 204. pl. 8, f. 6. 1965.

Geniculately ascending, tufted annuals, 25 - 45 cm. Leaves up to 20.0 × 0.4 cm, flat or infolded ; ligule hyaline, truncate, ciliate. Inflorescence

0.5 - 3.0 cm long, green. Spikelets solitary, c. 2.1 mm long ; bristles 6 - 8 to each involucre, up to 6 mm long, fine, rigid, antrorsely barbed. Upper lemma yellowish. Grain c. 1.8 mm long, elliptic - rotundate, plano - convex.

Fl. & Fr. : July - September.

Common in rocky habitats ; Tonk (*Maheshwari* 53231, LWG).

The grain is eaten in times of scarcity.

32. SORGHUM Moench, *nom. cons.*

Sorghum verticilliflorum (Steud.) Stapf in Prain, Fl. Trop. Afr. 9 : 116. 1917 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 223. 1960. *Andropogon verticilliflorus* Steud. Syn. Pl. Glum. 1 : 393. 1854.

Tall annuals, 50 - 80 cm ; nodes pubescent. Leaves 30 - 50 cm long, linear from a broad rounded and often clasping base, hairy just behind the ligule, otherwise glabrous ; sheath silky. Sessile spikelets 4 - 5 mm long, awned, straw - coloured ; callus bearded.

Fl. & Fr. : September - November.

Common on sandy - loam soil ; Haji Ki Kothi.

33. SPOROBOLUS R. Br.

- | | | |
|---|-----|----------------------|
| 1a. Plants stoloniferous ; spikelets more than 2 mm long ;
grain 0.8 × 0.6 mm, obovate or narrowly wedge - shaped,
pericarp loose | ... | <i>S. ioclados</i> 2 |
| 1b. Plant not stoloniferous ; spikelets less than 1.5 mm long ;
grain 0.5 × 0.3 mm, globose or ellipsoid, pericarp
adherent | ... | <i>S. helvolus</i> 1 |

1. **Sporobolus helvolus** (Trin.) Th. Durand & Schinz, Consp. Fl. Afric. 5 : 820. 1894 ; Bor, Grass. Burm. Cey. Ind. Pak. 629. 1960. *Vilfa helvola* Trin. in Mem. Acad. Sci. Petersb. ser. 6. 5 : 52. 1839. *Sporobolus glaucifolius* Hochst. ex Steud. Syn. Pl. Glum. 1 : 154. 1854 ; Hook. f. Fl. Brit. Ind. 7 : 250. 1896 ; Blatt. & McC. Bombay Grasses 224. pl. 150. 1935.

Tufted perennials, 30 - 40 cm ; culms wiry. Leaves up to 10.0 × 0.3 cm, flat, glaucous, tapering to a filiform tip. Panicle 5 - 16 cm long. Spikelets c. 1.5 mm long. Glumes narrowly lanceolate, as long as the spikelets or the lower little shorter, acuminate, smooth.

Fl. & Fr. : August - November.

Common on moist, clayey soil ; Bada village on the way to Kakor R.F.

2. *Sporobolus ioclados* (Trin.) Nees, Fl. Afr. - Austr. 161. 1841 ; Clayton in Fl. W. Trop. Afr. ed. 2. 3 : 407. 1972. *Vilfa ioclados* Trin. in Mem. Acad. Sci. Petersb. ser. 6, Sci. Nat. 4 : 65. 1840. *Sporobolus marginatus* Hochst. ex A. Rich. Tent. Fl. Abyss. 2 : 397. 1851 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 632. 1960 ; Mahesh. Illus. Fl. Delhi f. 277. 1966.

Tufted perennials, 25 - 80 cm ; rootlets often covered with minute sand particles. Leaves up to 22.0 × 0.5 cm, convolute or flat, linear - lanceolate, margins finely ciliate - serrulate ; sheath glabrous ; ligule a ring of white hairs. Panicle spreading, up to 22.5 cm long ; lower branches whorled. Spikelets c. 2 mm long, pale green to pale brown, shining. Lower glume much shorter than the upper.

Fl. & Fr. : September - December.

Found on sandy and sandy - clayey soil ; Deoli (S.C. Agrawal 401, 422, DD).

34. TETRAPOGON Desf.

Tetrapogon tenellus (Roxb.) Chiov. in Ann. Ist. Bot. Roma 8 : 352. 1908 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 475. 1960 ; Mahesh. Illus. Fl. Delhi f. 236. 1966. *Chloris tenella* Roxb. Fl. Ind. ed. Carey & Wall. 1 : 330. 1820 ; Hook. f. Fl. Brit. Ind. 7 : 290. 1896.

Loosely tufted, weak annuals, up to 60 cm. Sheath loosely flabellate at the base of culms. Spikes 3.0 - 4.5 cm long. Spikelets awned. Glumes hyaline, acute, 1 - nerved. Grain 1.5 - 2.0 mm long, oblong, brown.

Fl. & Fr. : July - November.

Common on sandy - loam soil ; Amli R.F.

It is a good fodder grass.

35. TRAGUS Haller *nom. cons.*

Tragus roxburghii Panigrahi in Kew Bull. 29 : 495. 1974. *Lappago biflora* sensu Roxb. Fl. Ind. ed. Carey & Wall. 1 : 284. 1820, *quoad descript., excl. typo.* *Tragus biflorus* sensu Schult. Syst. Veg. Mant. 2 : 205. 1824 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 682. 1960 ; Mahesh. Illus. Fl. Delhi f. 242. 1966. *T. racemosus* sensu Hook. f. Fl. Brit. Ind. 7 : 97. 1896, non Scop. 1777.

Erect or geniculately ascending, tufted grass, 7 - 25 cm, often rooting at nodes. Leaves up to 4.0×0.4 cm, acuminate, margins with spaced, tubercle based bristles ; ligule a thick row of short white hairs. Inflorescence up to 5.5 cm long. Spikelets paired, c. 3 mm long. Lower glume very minute ; upper glume coriaceous, 5 - nerved, ribbed. Grain c. 1.5 mm long, oblong - elliptic to elliptic, slightly compressed.

Fl. & Fr. : July - September.

Found in rocky habitats ; Tonk (*Raizada* 8/55, DD).

36. VETIVERIA Lem. Lisanc.

- | | | |
|--|-----|-------------------------|
| 1a. Aromatic grass ; sessile spikelets awnless ; joints and pedicels glabrous ; lower glumes spinulosely muriculate | ... | <i>V. zizanioides</i> 2 |
| 1b. Grass not aromatic ; sessile spikelets distinctly awned ; joints and pedicels with a basal tuft of silky hairs ; lower glume with a row of upwardly directed, white, transparent, marginal tubercles which become spinulose at the tip | ... | <i>V. lawsonii</i> 1 |

1. **Vetiveria lawsonii** (Hook. f.) Blatt. & McC. in Journ. Bombay Nat. Hist. Soc. 32 : 409. 1928 & Bombay Grasses 64. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 258. 1960. *Andropogon lawsonii* Hook. f. Fl. Brit. Ind. 7 : 187. 1896.

Perennial grass, up to 2 m. Leaves up to 40.0×0.6 cm, margins ciliate ; ligule a ridge of hairs. Inflorescence up to 25 cm long. Sessile spikelets 4 5 mm long ; callus bearded with silky hairs. Upper glume cymbiform, awned. Lower lemma 2 dentate, awned. Pedicelled spikelets male, awned, longer and narrower than the sessile ; callus naked ; pedicel nearly equalling the spikelets.

Fl. & Fr. : September - March.

Common in moist, sandy places ; Bisalpur R. F.

It is a good pasture grass.

2. *Vetiveria zizanioides* (L.) Nash. in Small, Fl. South East U. S. 67. 1903 ; Blatt. & McC. Bombay Grasses 65. pl. 40. 1935 ; Bor, Grass. Burm. Ceyl. Ind. Pak. 258. 1960 ; Raizada *et al.* in Indian For. Rec. (n. s.) Bot. 4 : 220. pl. 7, f. 2. 1961 ; Mahesh. Illus. Fl. Delhi f. 275. 1966. *Phalaris zizanioides* L. Mant. Pl. 2 : 183. 1771. *Andropogon squarrossus* sensu Hook. f. Fl. Brit. Ind. 7 : 186. 1896, non L. f. 1781.

Stout grass, c. 1 m. Leaves c. 30.0×1.5 cm, glaucous. Inflorescence 20 30 cm long. Sessile spikelets 3.0 3.5 mm long, with well developed hairless callus. Lower and upper glumes 3- nerved. Lower lemma retrorsely ciliate, upper lemma notched. Pedicelled spikelets 3 4 mm long, male.

Fl. & Fr. : August March.

Common in moist habitats ; Banetha village.

The roots of this grass yield an aromatic oil known as 'Vetiveria oil', a large quantity of which is exported from India. The roots are woven into curtain or "tatties" and the latter, when moistened, cool and scent the air at the same time.

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