

FLORA
OF INDIA
SERIES - 3

FLORA
OF
TONK DISTRICT

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BOTANICAL SURVEY OF INDIA

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Flora of Tonk District Rajasthan

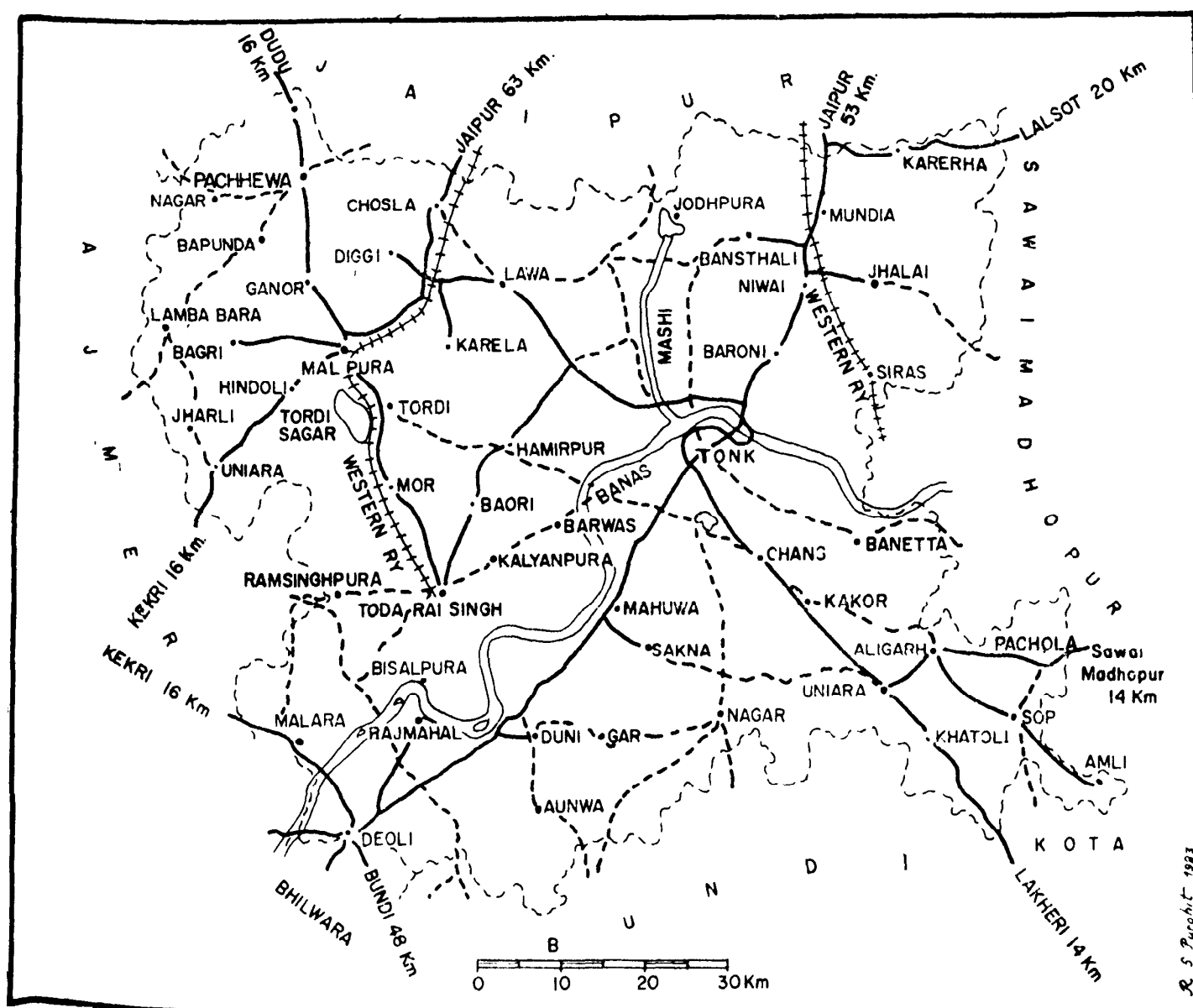
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BOTANICAL SURVEY OF INDIA
Department of Environment



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, Mashī 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 Amla. 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, Tordi, Ghati, Niwai, Sohela, Banetha, Kakor and Amla 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 Bisalpura. A patch of *Pongamia pinnata* forest is also found on the banks of the river Banas at Bisalpura.

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 futeyporensis*, *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 flavesens*, *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*, *Nehamandra 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. leavigatus*, *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*, *Gnephaliun 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*, *Gnephaliun 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. Acanthaceae 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 ... Nymphaeaceae 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; placen-
tation free-central ... CARYOPHYLLACEAE 10
- 24b. Branches in the vegetative
region and the inflores-
cence not dichotomous;
placentation parietal or
marginal :
- 25a. Fruit a capsule :
 - 26a. Indumentum ste-
llate; 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, some-
times indehiscent or
lomentoid :
 - 27a. Leaves bipinnate;
corolla actinomo-
rphic; petals val-
vate ... MIMOSACEAE 29
 - 27b. Leaves simple,
unifoliate, trifoli-
ate or simply
pinnate; corolla
zygomorphic
(sometimes weak-
ly so); petals im-
bricate :
 - 28a. Adaxial petal
interior (as-
cending im-
brication)... CAESALPINIACEAE 28
 - 28b. Adaxial pe-
tal 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 plants 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 dehiscing elastically ... ACANTHACEAE 59
- 62b. Leaves without cystoliths; fruit not elastically dehiscing :
- 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 or 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 cymes 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. 'Satayanashi' (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 $1.04.2 \times 50.25$ 0.4 cm, linear - oblong with wavy margins, flattend, 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 $2.5 \times 9.0 \times 0.25$ 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, subscentent or scandent, 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, cylindric, 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 $3 - 5 \times 2 - 3$ 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. **Portulaca pilosa** L. Sp. Pl. 445. 1753 ; Geesink in Blumea 17 : 294. 1969 ; Ghafoor 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, retrose
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 (Bisalpora) 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 throughout 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 ... *Sterculia* 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 ... *Waltheria* 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 ... *Melhania* 1

1. MELHANIA Forssk.

Melhania 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, $1.0-1.5 \times 0.8-1.0$ 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 $2.0-5.5 \times 1-2$ 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, suffrutescent, 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 ; Bisalpora 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 7×1.5 mm, oblong cylindric; 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 $0.8 - 1.5 \times 0.2$ 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 uncinate 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 $c. 3.0 \times 2.5$ 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 ; Nooteboom 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 whitish. 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 peeling 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, pubescent 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.