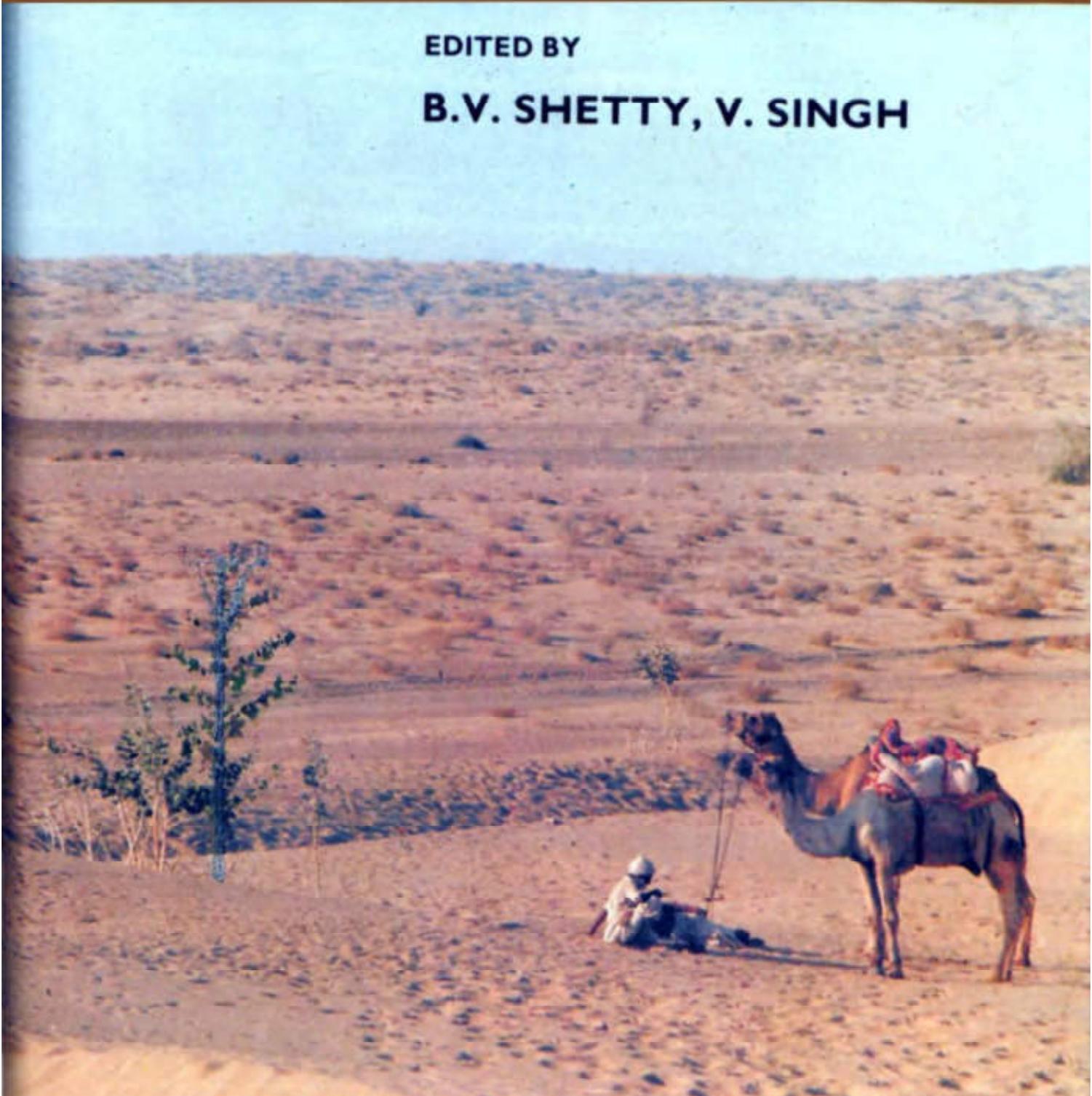


FLORA
OF INDIA
SERIES - 2

FLORA OF RAJASTHAN

EDITED BY

B.V. SHETTY, V. SINGH



BOTANICAL SURVEY OF INDIA

ABOUT THE BOOK

Flora of Rajasthan contains about 2000 species of vascular plants in two volumes. Besides up-to-date nomenclature, important synonyms, short diagnostic description, local names, phenological and ecological data, dichotomous keys from family to infra-specific level, the selected specimens on which descriptions are based have also been cited to indicate distribution pattern of the taxa in the state. The introductory chapters not only include important references of previous work, geological position and physiography, geology and soil types, climatic data etc., but also deal with floral composition of different habitats in various physiographic units. The cultivated species have been arranged alphabetically at the end of respective families and so also the doubtful taxa whose occurrence or identity was found doubtful.

Besides this about 20 black and white & 16 colour photographs of vegetation types along with 10 photographs of individual plants are included in this work.

The authors have studied the herbarium specimens deposited in various Indian herbaria and consulted all available literature on the vegetation of Rajasthan to bring out this comprehensive work. They would welcome any suggestions from its readers that may be valuable in the further improvement of this flora.

FLORA OF INDIA
Series 2
FLORA OF RAJASTHAN
Volume 1

EDITORS

B.V. SHETTY and V. SINGH

With contributions by

V. Singh, P.J. Parmar and R.P. Pandey



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FOREWORD

Botanical Survey of India has started publishing the Flora of India under four series viz. (1) National flora of India, (2) State flora/analysis, (3) District flora or flora of such other similar region and (4) Monographs and works which would not be covered under series 1-3. Flora of Rajasthan is being published under series 2.

Rajasthan is one of the large states of India, located on western border of the country. The ecological features and vegetation of Rajasthan have attracted the attention of botanists and phytogeographers and as a result a large number of scientific papers have been published during last fifty years. Recently published floras have not only enriched our knowledge on the flora and floristic composition of about seven districts of the state but also accelerated Botanical Survey of India to bring out a comprehensive flora of the state as a whole.

The Flora of Rajasthan in two volumes by Shri B.V. Shetty and Dr. V. Singh (Editors) with contributions by Dr. V. Singh, S/Shri P.J. Parmar and R.P. Pandey, is one of the pioneer comprehensive works on phytogeographically interesting region. The Flora of Rajasthan presented here gives an up-to-date knowledge on the floristic wealth of the state. The flora presents simplified dichotomous keys from family to infraspecific level, up-to-date nomenclature, short diagnostic description, phenological data, ecological notes. Local names dealt under each species have made the work further useful.

I hope, the present flora should not only serve the purpose of identification, but also should be useful for students, teachers, ecologists, agriculturists, foresters and persons concerned with the utilization and conservation of plant resources. The information will also be useful for phytogeographers, environmental biologists and those revising the National flora of India.

The editors and authors have done their best in bringing out this book at a time when interest in desert ecosystems is getting prominent attention.

Calcutta

Date 23.2.1988

M.P. NAYAR
Director
Botanical Survey of India

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The editors and authors of this flora are grateful to the Director, Botanical Survey of India, Calcutta for the encouragement and facilities provided during the course of the present study. They are also thankful to the authorities of various institutions viz. National Botanical Research Institute, Lucknow, Forest Research Institute and Colleges, Dehra Dun, St. Xaviers College, Bombay, Central National Herbarium, Calcutta, Regional offices of Botanical Survey of India located at Allahabad, Pune and Dehra Dun, and Central Arid Zone Research Institute, Jodhpur for the facilities provided to work in their herbaria.

Thanks are also extended to the Heads of Botany Departments of Rajasthan University, Jaipur, Mohanlal Sukhadia University, Udaipur, Jodhpur University, Jodhpur and Government College, Ajmer for the facilities extended to work in their herbaria.

They are highly indebted to the staff of Botanical Survey of India, Jodhpur and authorities of the Forest Department, Govt. of Rajasthan for their help in various ways in the field and laboratory.



Common land form of unestablished barren sand-dunes in the Western Rajasthan.



Partially established sand-dunes colonised by *Calotropis procera* (Ait.) Ait. f., *Capparis decidua* (Forssk.) Edgew. *Aerva javanica* (Burm. f.) Juss. ex Schult. etc. in the desert.



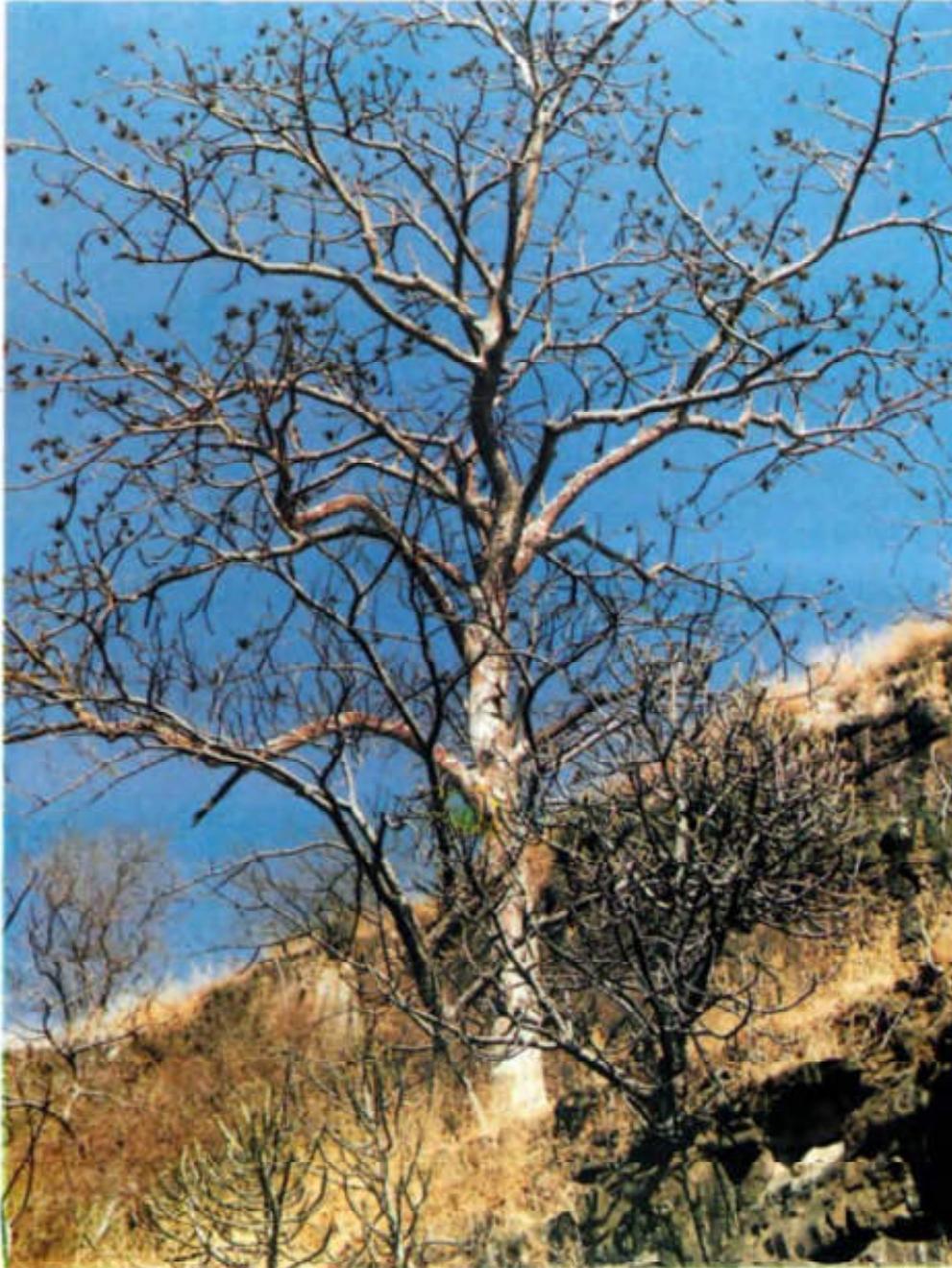
Rocky plateau dominated by *Euphorbia caducifolia* Haines, in the West of Aravalli.



Dichrostachys cinerea (L.) Wt. & Arn. - A chief component of open forest.



Gloriosa superba L. - A beautiful climber in deciduous forest.



Sterculia urens Roxb. - An associate of *Anogeissus* in deciduous forest.



Phoenix sylvestris (L.) Roxb. - forming pure strands in low sands in the east of Aravalli.



Plumbago zeylanica L. -



Maerua arenaria (DC.) Hook.f.



A view of biotic pressure on the vegetation by way of grazing.



Ranthambhor Tiger Reserve - A suitable habitat for wild-life.



A view of Ranthambhore Tiger Reserve.



Deep gorge caused by water erosion in rocky plateau maintaining deciduous flora.



Outskirts of forest, maintain a good pasture lands (*Aristida* spp. - in view).
in the east of Aravalli.



A view of deciduous forest of *Anogeissus*, *Lannea* and *Boswellia* at Ranthambhore Tiger Reserve.



Dense forest at Ranthambhore Tiger Reserve.

INTRODUCTION

The state of Rajasthan, formed by the union of numerous large and small princely states, is the second largest state of India. It occupies an area of about 3,42,274 sq km i.e. nearly 11 per cent of the total area of India. It has a wide range of habitats, climatic factors, physiography, soil types and geological antiquity. Phytogeographically, the state of Rajasthan forms the eastern extremity of the great arid and semi-arid belt of the world; the great Sahara desert belt passes through the western part of Rajasthan state. The major part of eastern and south-eastern region forms the western part of the gangetic plains; the southern region forms a part of Malva plateau and south-eastern region a part of Deccan plateau.

Prior to the publication of Hooker's flora (1872-97), local floras and lists were available for several regions of India, but almost nothing was written for Rajasthan. The lacuna was, however, very amply filled during the middle part of the century and a large number of technical and semi-technical papers were published. The four floras published recently from Rajasthan have further enriched our knowledge regarding the flora and floral composition of the different regions of the state. However, a comprehensive flora of the state as a whole is not available. Therefore, the present work was undertaken to bring out a detailed flora of the state dealing mainly with the angiosperms, in two volumes.

PREVIOUS WORK AND PRESENT STUDY

The earliest recorded information on botanical explorations in Rajasthan is about Jacquemont's journey in 1832 from Delhi to Bombay via Ajmer and Neemuch. Later in 1868, Sir George King made collections in Rajasthan which resulted in his paper "Sketch of the flora of Rajputana, 1878". In the year 1869-70, Brandis botanized Rajputana forests which appeared in his "Forest Flora of N.W. & C. India, 1874". The next work on the botany of Rajputana was a report of tour by Duthie (1886). In 1890, Macadam published a list of plants from Mt. Abu. Adans (1899) in his book "The western Rajputana states" listed about 50 species of plants. Between 1918 and 1921, Blatter and Hallberg published the "Flora of the Indian

Desert" which for about 30 years remained the only authentic systematic account of the plants of Rajasthan. Parker (1918) recorded a number of plants from Jaipur and Duthie (1903-29) in his "Flora of the Upper Gangetic Plain" included the major part of eastern and south-eastern Rajasthan. Ramachandra Rao (1941) and Sankhala (1951) published lists of some plants of the desert region.

In recent years a large number of publications dealing with the flora, floral composition, ecology etc. of Rajasthan have been published. These have been reviewed by Jain (1972), Bhandari (1978), Majumdar (1979), Shetty & Pandey (1979) and Sharma (1980). The important contributions from different physiographic regions of the state are summarized below.

The aridity and other factors influencing the vegetation in the west of Aravalli have attracted the attention of the whole nation and also the UNESCO. As a result, a number of lists of plants and accounts on the vegetation of Rajasthan desert have been published during the last 35 years (Das and Sarup, 1951; Biswas, 1952; Biswas and Rolla, 1953; Sarup, 1953, 54, 57, 58a, 1958b; Joshi, 1956, 58; Nair and Nathawat, 1956; Nair & Joshi, 1957; Sarup and Vyas, 1957, 58; Tondon, 1958; Sarup & Puri, 1960; Rolla & Kanodia, 1962, 63; Kanodia & Gupta, 1969 etc.) More recently Puri *et al.* (1964), Bhandari (1978), Dawre *et al.* (1981); Pandey *et al.* (1983), Pandey & Shetty (1984), Pandey (1984), Parmar *et al.* (1985), Pandey *et al.* (1986) etc. have further contributed to our knowledge of the flora of Rajasthan desert.

Detailed ecological studies on the vegetation of Rajasthan desert have also been undertaken by a number of workers (Krishnaswamy & Gupta, 1952; Sarup & Dutta, 1954; Barucha, 1960; Verma, 1964; Sharma, 1967, 68 etc.). Air photograph analysis of plant communities in the desertic zone of Rajasthan was undertaken by Gupta & Abhichandani (1968). The influence of climate on dry zone vegetation has been studied by Waheed Khan (1959), Raheja (1965), Meher-Homji (1977) etc. Badhwar *et al.* (1948), Banerjee (1952), Nair (1954), Sen (1962), Puri & Jain (1962), Bhimaya & Kaul (1962), Bhimaya *et al.* (1964), Mulay & Joshi (1964), Verma (1965), Bora (1973), etc. have added to our knowledge on suitable species for afforestation in arid and semi-arid regions of Rajasthan.

A perusal of literature on the flora of Rajasthan revealed that Mt. Abu, the highest peak between the Nilgiris and the Himalayas, has also attracted

the attention of many botanists after Macadam's work (1890) due to its altitudinal, climatic and edaphic factors and the characteristic vegetation. The important contributions are those of Sutaria (1941), McCann (1942-43), Mahabale & Kharadi (1946), Raizada (1954), Puri & Jain (1958), Chavan & Sabnis (1960), Jain (1962, 67), Abluwalia (1965), Kanodia & Rolla (1965), Shah & Patel (1967), Kanodia & Deshpande (1967), Gupta & Saxena (1968) etc.

After the publication of Duthie's "Flora of the Upper Gangetic Plain 1903-29", the floristic contributions from eastern Rajasthan were negligible till 1950. Since then, however, a large number of papers have been published on the vegetation of the Aravallis and the parts in the east of it. The notable contributions are those of Mulay & Ratnam (1950), Bakshi (1954), Nair & Nathawat (1956, 57), Joshi (1957, 58), Sharma (1958), Nair (1961), Nair *et al.* (1959, 61), Jain & Kotwal (1960), Sharma (1961), Vyas (1962, 64, 65, 67), Raizada & Sharma (1962), Gupta (1965), Vyas & Ramdeo (1965, 69), Majumdar (1971, 73, 79a, 79b), Maheshwari & Singh (1974, 75, 76), Singh (1975, 77, 80), Singh & Pandey (1979), Parmar & Singh (1982) etc.

The publication of the "Flora of N.E. Rajasthan" (Sharma & Tiagi, 1979), "Flora of Banswara" (Singh, 1983) and "Flora of Tonk district" (Shetty & Pandey, 1983) have further added to our knowledge of the flora and floral composition of eastern Rajasthan.

Phytogeographical studies on different physiographic regions have also received due consideration during recent years (Vyas, 1964; Sharma, 1967; Jain, 1967; Singh, 1978 etc.), as also phytosociological studies (Vyas, 1964; Bhandari & Sharma, 1977; Singh, 1978 etc.).

Some of the genera which are well represented in Rajasthan or N.W. India like *Aristida* L. (Kanodia & Nanda, 1968), *Cassia* L. (Singh, 1976), *Eragrostis* P. Beauv. (Roy, 1976), *Indigofera* L. (Nair & Koshy, 1963), *Ipomoea* L. (Johri & Sharma, 1984) have been studied in greater detail.

Since studies on ethnobotany and economic botany can play a vital role in the economic development of an area, adequate attention has also been given to these aspects with a view to focus attention on these potential resources for the benefit of the local people (King, 1969, 70; Chopra & Abrol, 1964; Singh, 1964; Bhandari, 1974; Gupta & Saxena, 1977; Roa & Shiva, 1977; Srivastava, 1977; Singh & Shetty, 1977; Singh & Pandey,

1980, 81a, 81b, 83; Singh & Parmar, 1980, 81a, 81b; Singh & Singh, 1981, 82, 83; Singh, 1983 etc.).

Thus, the perusal of literature and the examination of the specimens in the various Indian herbaria revealed that a lot of work has been done on the different aspects of the vegetation of Rajasthan, but no comprehensive flora of the state as a whole has been published so far.

GEOGRAPHICAL POSITION AND PHYSIOGRAPHY

Rajasthan is situated in the north-western part of India between 23°3' and 30°12' N. latitude and 69°30' and 78°17' E. longitude, occupying an area of about 3,42,274 sq km. The elevation of land surface varies from 214 to 1375 m. In shape, it is an irregular rhomb with north-south and east-west diagonals, the former about 784 km and the latter 850 km long. The western and north-western boundaries are marked by Pakistan. In the north and north-east, it is bounded by Punjab, Haryana and Uttar Pradesh, in the east and south-east by Madhya Pradesh and in the south-west by Gujarat states of India.

The present state of Rajasthan is the product of successive merger of nineteen princely states between 1948-1956. Rajasthan state has been divided into 27 administrative units/districts, namely Ganganagar, Bikaner, Jaisalmer, Barmer, Jodhpur, Churu, Nagaur, Pali, Jalore, Jhunjhunu, Sikar, Ajmer, Sirohi, Alwar, Bharatpur, Dholpur, Jaipur, Tonk, Sawaimadhopur, Bhilwara, Bundi, Kota, Jhalawar, Chittorgarh, Udaipur, Dungarpur and Banswara.

The remarkable feature of Rajasthan is the Aravalli range, perhaps the oldest folded mountain range in the world. It intersects Rajasthan from end to end, diagonally running from Delhi to the plains of Gujarat for a distance of about 692 km. Within Rajasthan, the range runs from Khetri in the north-east to Khed Brahma in the south-west for a length of about 550 km. The elevation of Aravalli range gradually rises in south-west direction, as it is 335 m at Delhi and in Rajasthan 792 m at Khetri, 913 m at Harshnath, 920 m at Kho, 1055 m at Raghunathgarh, 1100 m at Bijapur and 1727 m at Mt. Abu. Further south-westwards, the elevation gradually decreases to the plains in Gujarat. The loftiest and the most clearly defined section of the Aravalli is between Mt. Abu and Ajmer where the range stands like a barricade. Beyond Ajmer to the north-east, there are gaps in

the Aravalli range near Sambhar, east of Sikar etc. Structurally, it is composed of rocks belonging originally to the Delhi system, folded in a synclinorium occupying the site of geosyncline which has been deeply eroded.

Aravalli range divides the whole of Rajasthan in to two natural divisions i.e. three fifth lying on north-west and two fifth on the east and south-east.

1. North-western Region :

This region is known as western sandy plain or the Rajasthan desert. It covers a total area of about 1,96,150 sq km spread over the districts of Ganganagar, Bikaner, Jaisalmer, Barmer, Jodhpur, Churu, and parts of Nagaur (96%), Jalore (88%), Jhunjhunu (69%), Sikar (65%), Pali (45%) and Ajmer (9%). Physiographically, it is the eastern extension of Sahara-Thar desert covered by shifting and the fixed sand deposits. The western 2/3 part extending over Bikaner, Jaisalmer, Churu, western parts of Nagaur and western 2/3 parts of Barmer and Jodhpur districts is covered by shifting and stabilised sand-dunes of various types, magnitude and orientation like longitudinal, barkhan, transverse etc. This sandy arid plain tract is also known as Marusthali. The rock outcrops are also a common feature here, particularly in Barmer-Jaisalmer-Bikaner tract where slightly elevated areas of Jurassic and Eocene rocks protrude through the sandy surface.

The eastern 1/3 part lying between sandy arid plains in the west and the Aravallis in the east is semi-arid transitional plain. Here the older rocks protrude above the surrounding sandy surface more frequently. The southern part between the foot of the Aravallis and the Luni river is fertile and known as the Luni basin. The topography is marked with hills with steep slopes and extensive alluvium plains covered with aeolian sand deposits. Gullying is also a common feature in submontane region. North of the Luni basin upto the Rajasthan border is the plain area of interior drainage. This plain is full of sand hills, sand scapes and several low depressions in which salt and soda are deposited on drying. The important salt lakes in this area are Sambhar, Degana, Kuchaman and Didwana. The Ganganagar district, further north, forms the Ghaggar plain where the Ghaggar river used to flow in the past, and now has been filled up by sand deposits forming fertile agricultural plains with few sand ridges. The advent

of Gang canal and other irrigation facilities have further intensified the reclamation process for agriculture in the Ghaggar plain.

2. Eastern Region :

The eastern plains cover the north-east, east and south-east of the main Aravalli range. The Aravalli hills spread out in the east, particularly in the north-east and south-east, in the form of outliers. Vindhyan hills also enter in the south-east and spread out west-wards. Thus, almost the entire region in the east of Aravallis presents a topography of isolated chain of hills, undulating tectonic plains and alluvium plains or agricultural plains.

The eastern part of Sirohi, the major part of Udaipur and the entire Dungarpur district fall under "Bhorat Plateau", with an average elevation of 1225 m. The highest section of Aravalli range lies north-west of Udaipur between Kumbalgarh and Gogunda. North of Bhorat plateau lies the north-eastern hilly tract where the elevation varies from 550-670 m, specially in the Alwar hills.

The eastern part of Udaipur, western Chittorgarh, Bhilwara, Tonk, Jaipur, western Sawaimadhapur and the southern part of Alwar districts constitute a gneissic plain sloping eastwards and drained by the river Banas and its tributaries like Khari, Sodra, Moshi, Morel etc. joining on the left, and Berach, Bajaan and Galwa on the right. The maximum height of Banas basin is 582 m near Deogarh. The alluvium deposits are more conspicuous in the east rather than the west where the plain is higher and more irregular.

The south eastern part of Udaipur, Banswara and southern part of Chittorgarh district are drained by Mahi and its tributaries. The land in the south is deeply and intricately dissected resulting in the formation of separate hillocks. This plain is called Chappau plain with red and black fertile soils.

The area falling between Banas and Chambal rivers is called the Vindhyan scarpland extending over Bharatpur, Dholpur and Sawaimadhapur districts at an average elevation between 350-580 m. These scarplands are formed in massive sandstones separated by shales. They are facing towards south-south-east.

The western part of Vindhyan plateau of Madhya Pradesh extends as a triple plateau of three concentric scraps formed by the outcrop of three strong sandstones with intervening shales. This physiographic unit extends

over Kota, Bundi and Jhalawar districts and is called 'Pathar' or "Deccan Lava plateau". It is a wide and stony upland. The river Chambal and its tributaries namely Kali Sindh and Parbati form a triangular alluvial basin in Kota district. Occasional tracts of black soils are also evident in river valleys.

3. Drainage :

The area in the west of Aravalli has inland drainage system with a large number of separate drainage basins like Kanti basin, Sota, Sahobi basin, Barab basin and misfit streams in Luni basin. The water in all these basins sinks into the desert tract. There is no perennial river in this physiographic unit. The only significant water course is the Luni river which originates at Ana Sagar at Ajmer and flows towards the south-west through the districts of Jodhpur, Barmer and Jalore. The river ends itself in brine near the Rann of Kutch. It is a seasonal river which receives a tributary from Pushkar valley and several hill torrents from the western slope of the Aravalli range like Lalri, Ghuhia, Bandi, Sukri, Jawai, Jojri and Sagai.

In the east of Aravalli, the river Chambal, its tributaries and riverlets form a network in the area. The Chambal originates in the Vindhya and enters Rajasthan near Kaukhera village (Chittorgarh district). Up to Kota city it passes through bare rocks and hilly tracts. Near Kota city, it enters the alluvial plains and passes through tectonic plain up to Sawaimadhopur. Ultimately Chambal joins the river Yamuna in Uttar Pradesh passing through Dholpur district.

On its way, the river Chambal receives many tributaries like Kali Sindh, Parbati, Banas, Mej, Parvan etc. These tributaries are also fed by a number of riverlets like Kali Sindh by Amjhar, Parvan by Chhapi, Dhar, Ajnar, Ghora Pachhar and Nevas, Parbati by Andheri and Koolu, Mej by Talera and Mangli. The tributary Banas originates in the catchment area lying between Kankroli and Nathdwara and flows towards east up to Mandhalgarh and then towards north-east up to Tonk. Later, it flows towards south to join Chambal. Its main feeding riverlets are Khari, Sodra, Moshi and Morel on the left bank and Berach, Najaen and Galwa on the right.

The river Ban Ganga rises in Jaipur and flows eastwards through Bharatpur and Dholpur to join Yamuna in Uttar Pradesh. Its beds are sandy

and dry up after rains. The southern part of Rajasthan has the network of Mahi and its tributaries. The river Mahi originates in Madhya Pradesh and enters Banswara district from the east. It flows in northerly, westerly and south-westerly directions in Banswara district forming a natural boundary between Banswara and Dungarpur districts. Ultimately, it falls in the Arabian Sea passing through Gujarat state. The river Mahi receives a number of tributaries on its way. Anas, originating in Madhya Pradesh and fed by Haran stream on its way, joins Mahi in Banswara district. Som river, originating in Udaipur district, joins Mahi at Baneshwar in Dungarpur district; it is fed by the stream Jhalam. A small stream originating in Chittorgarh district receives several hilly torrents on its way and joins directly Mahi in Banswara district. The stream Chap, originating in the hills north-east of Kalinjara, joins Mahi on the western border of Banswara district.

The bottom and beds of the rivers like Mahi and Chambal and most of the tributaries are stony. In the hilly tracts they form deep gorges and in tectonic and sandy or alluvial plains form ravines which are very conspicuous in Kota, Sawaimadhopur and Dholpur districts. Luxuriant vegetation can be seen on the sandy beds and where some soil accumulates in rocky habitats.

Lakes, Tanks, Ponds etc :

There are no natural fresh water lakes in Rajasthan. The only considerable basin are the salt lakes at Sambhar, Pachpadra, Lunkarnsar and Didwana. The Sambhar lake is situated about 60 km west of Jaipur on Jaipur-Jodhpur railway line at a height of about 360 m. Along the south-west and north-west of the lake, the Aravalli spurs form a natural barrier, protecting it from aeolian desert sand. It covers an area of about 234 sq km, during rainy season. During summers the area sinks to 130 sq km.

Pachpadra lake is situated about 128 km south-west of Jodhpur. It occupies an area of 83.2 sq km. The rain water leaches out the salts from the catchment area and carries them to subsoil in this depression.

About 50 km north-west of Sambhar lake is the Didwana lake. The depression is surrounded by sand hills on all sides except its western boundary. The beds of depression show the presence of black clay.

About 80 km north-east of Bikaner is located another salt depression near Lunkaransar where the salt is no longer being produced. All these depressions support several salt-loving species on the drying banks and in shallow water.

Rajasthan is well known for its artificial lakes which are the chief source of irrigation and drinking water. They are frequently cleared by way of weed removal. Very sparse vegetation, therefore, exists in such habitats. Important artificial lakes of the state are: Jaisamand, Udaisagar, Pichola Lake Fetehsagar in Udaipur district, Anasagar, Pushkar, Visalsagar and Faisagar in Ajmer district, Balsamand, Sardarsamad and Kailana in Jodhpur, Jaisamand in Alwar, Nakki talao at Mt. Abu, Gajner lake in Bikaner, Aklara Sagar and Ummed Sagar in Kota district. These lakes are of little significance from vegetation point of view. There are large numbers of tanks, ponds ditches and low lands, spread all over the state, which present variable emporia for aquatic and marshland plants.

GEOLOGY AND SOILS

GEOLOGY

In Rajasthan, the Aravalli range is considered the oldest folded range in the world which was peneplaned in Palaeozoic times and was subsequently re-uplifted in the Mesozoic era. It is composed of metamorphosed rocks of Aravalli, the Rajals and the Delhis. Banded Gneissic complex and Bundelkhand Gneiss, both pre-Aravalli formations, are concealed at great depth indicating that Aravalli and subsequent latter rock formations and structures have been built up over them.

Bundelkhand Gneiss is the oldest in India and extends from Eastern Rajasthan across Bundelkhand. This formation is mostly a normal granite in composition and varies from pink to reddish in colour, medium grained, non foliated and non porphyritic, with quartz, orthoclase and subordinate microcline and some ferro-magnesian minerals, mostly biotite. It is also traversed by veins of apite, microgranite and quartz and dolerite dykes.

Banded Gneissic complex also belongs to pre-Aravalli rocks and in age to the Bundelkhand gneiss. It underlie the alluvial plains of Rajasthan and is best exposed in south Mewar where it has attained its great complexity with a clear erosion unconformity, accompanied by thick conglomerates

and great size of basic lava deposits. In the east of Udaipur, the gneiss is composed of biotite-schist and white or pink aplited and microgranite injected along the foliation, with intrusive bodies of all sizes of grey-foliated biotite granite. In north Mewar and plains of Ajmer, the gneisses are more heterogeneous with the rocks being dark shists and granulites, often garnetiferous, with intrusion of all sizes of dark coloured porphyritic biotite granite. In the central plains of Mewar and towards east up to Banswara occur bead gneiss in which feldspar phenocrysts are strung out along lines in the dark biotitic matrix.

In the plains along the foot hills of the Aravalli range is found another type of ancient gneiss which is composed of grey, rather fine-grained rock of granite composition and texture. The basal conglomerate of the Alwar series rests upon it.

Aravalli system :

Aravalli system has great thickness of Argillaceous rocks which have undergone metamorphic changes. The changes are clearly marked from east to west; in the east one finds shales and towards the west one passes through slates and phyllites to fine mica schists with garnet and magnetite. In some areas, alteration with acid granite has occurred resulting in the formation of composite gneisses. In south Alwar may be noted the northern exposures of the Aravallis. The beds of rocks occur as interrupted outcrop and extend south-west up to the plains of Gujarat. They also cover a large part of Mewar and Ajmer-Merwara interrupted by irregular outcrops of the pre-Aravalli gneisses. Other rocks of this system are arkose, grite and quartzites which rest upon Bundelkhand gneiss or the gneissic complex. Granitic material may also be noted with schists and gneisses. Argillaceous limestone is found near Bundi and eastern Mewar. A black massive limestone is common around Udaipur city. On the eastern side, the Aravallis are represented by brown and olive shales with ferruginous and clay concretions. On the western sides, the Aravallis are represented by slates and impure limestones frequently intruded by dolerites. Ranthambhor quartzites and sandstones occurring in Sawaimadhopur district belong to youngest part of Aravalli system.

Raialo series :

This series occurs between the Aravalli in the lower part and overlain

by the Delhi system. Generally white and crystalline limestone constitute this series. This series is found in widely separated areas such as Jodhpur, north of Udaipur, Nathdwara, Kankroli, Rajnagar etc. The famous Makrana marble which may be composed of white, coloured with pale grey, rose, pink and blue grey varieties of rocks are exposed from the sandy alluvial plains in a narrow ridge of about 80 km long near Makrana city. Near Ras, a much varied type of limestones which are coarse, white calcite marble, with diopside and white mica are exposed for about 80 km length.

Delhi system :

In eastern Rajasthan, the Purana rocks of Rajasthan have undergone more intense folding as well as greater amount of igneous intrusion. The best formations of these are developed in the main synclinorium of Ajmer Merwara and western Mewar, Alwar and Jaipur areas. In Ajmer, the synclinorium consists of two synclines with a long tongue of the pre-Aravalli gneiss between them. The north-western syncline is greatly affected by the igneous intrusions of Erinpura granite and of epidiorite. Towards south-west, beyond Ajmer, it increases to such an extent that one finds complete disappearance of sedimentary rocks in Jodhpur. The syncline becomes broader, additional folds appear and culminate in the Alwar series. Towards the south-west, the Erinpura granite increases. In the east of main synclinorium, there are several lineally arranged outliers in which only Alwar series, basement arkose grits and quartzites are present.

Malani series :

The maximum development of the Vindhyan occurred on the eastern flank of the Aravalli, while in western desertic region, it occurred in lesser form in detached outcrops. The rocks of this system are composed of a group of rhyotitic lavas including felsites. In western Rajasthan, two types of granites namely Jalor and Siwana granite are found.

Vindhyan series :

The Vindhyan system constitutes a vast sedimentary formation of sandstones, shales and limestones. They occupy two separate basins on both sides of Delhi synclinorium. The outcrop of western Rajasthan forms two areas joining near Jodhpur city. In eastern Rajasthan, the sedimentary material is deposited in a large basin extending from Karauli and Dholpur

in the north-east to Nimbahera and Suket in the south-west. The north-east and south-west outcrops are connected by narrow, disconnected patches extending from Sawaimadhopur to Bundi.

SOILS :

On the basis of their occurrence, the soils of Rajasthan may be divided into the following groups:

(a) *Desert soil* : The desert soil occupy an area from west of Aravallis up to the state's border with Pakistan in the west. This tract is covered by sand, hillocks and rock outcrops and is ill-watered and unproductive. The soils contain 90 to 95 per cent sand and 10 to 5 per cent clay, high percentage of soluble salts, high pH value, varying percentage of calcium carbonate and poor organic matter. In most of the aeolian sand, the CaO content varies from 1.0 to 1.5 per cent. In stabilised sandy areas, as near Jodhpur and Jaipur, it is noticed that CaO content decreases downwards resulting in CaCO₃ accumulation or Kankar bed formation. The Calcium content in the subsoil is nearly ten times that of the top soil. In most of desert soils nitrogen is low and this deficiency is balanced to some extent by nitrates. Thus, the phosphates and nitrates have made the desert sand fertile for agriculture.

(b) *Grey-brown desert soil* : This soil occurs in the districts of Barmer, Jalore, Jodhpur, Sirohi, Pali, Nagaur, Sikar and Jhunjhunu, all in the west of Aravallis. The soil is saline and alkaline with high pH value and high phosphate contents. They are calcareous in nature and nitrogen occurs in the form of nitrates.

(c) *Red and yellow soil* : The red and yellow soils usually occur together in the western parts of the districts of Udaipur, Bhilwara and Ajmer. They are poorer in carbonate and humus with the pH ranging from 5.5 to 8.5. These soils have good water holding capacity due to considerable percentage of silty loam and silty clay soils. In Ajmer district the sandy soil, shallow soil and dark medium heavy soil are also common.

(d) *Ferruginous red soil* : The central and southern parts of Udaipur district and the whole of Dungarpur district consist ferruginous red soil formed from ancient crystalline and metamorphic rocks. This soil has smaller content of lime, potash, iron oxide, phosphorous, nitrogen and humus.

(e) *Mixed red and black soil* : The eastern part of Udaipur, Chittorgarh, Dungarpur, Banswara and Bhilwara are covered with this soil. The pH is neutral to alkaline.

(f) *Medium black soil* : Kota, Bundi and Jhalawar districts are covered mainly with black soil and partly with heavy soil with grey brown to dark brown colour, medium heavy soil with grey brown colour and yellow and red light soils.

(g) *Alluvial soil* : Alluvial soil occupies the districts of Alwar, Bharatpur, Jaipur, Sawaimadhopur and central part of Ganganagar district. This soil is red-coloured, deficient in lime, phosphoric acid and humus. It varies from clayey to sandy loam in texture.

CLIMATE

The climate of the desertic zone in the west of Aravalli is characterised by extremes of temperature, severe drought accompanied by high wind velocity, low relative humidity, evaporation far exceeding precipitation and too scanty rainfall to support any appreciable vegetation. The climate in the east of Aravalli is almost semi-arid and comparatively milder. It supports comparatively dense, deciduous vegetation.

Temperature :

January is the coldest month in Rajasthan. The average mean temperature for this month ranges from 12°C to 17°C. At Mt. Abu, the temperature decreases to 7 to 8°C during this month. In the rear of some disturbances which traverse north India, cold waves occur and the temperature sometimes falls to 2 to 5°C below the freezing point, particularly in the north-western parts of the state. From mid February, the temperature adopts increasing tendency, more rapidly in western parts. From mid March hot weather is initiated which prevails up to June. During March the rise in temperature is somewhat uniform in the whole of Rajasthan. From April to June, diurnal range of temperature increases more, the days become hotter and the maximum daily temperature goes up to 32°C to 47°C. The mean monthly temperatures for the months of April to June in sandy arid plains (Marusthali) varies from 34°C to 40°C, in Deccan plateau from 34 to 36°C, in southern Aravalli range (Mt. Abu) from 28 to 32°C and in the remaining regions from 30 to 36°C. During the monsoon season from July to September the temperature shows slight decreasing trend and in the

month of October the maximum varies from 32 to 36°C and the minimum 17 to 21°C. During November-December, there is a gradual decrease in the temperature all over Rajasthan, reaching 12 to 17°C in the month of January.

It should, however, be noted that the differences between day and night temperatures at different stations in Rajasthan and fluctuations in the temperatures from January to December of a year and between maximum and minimum temperatures are so much that mean values convey a very inadequate picture of the true climatic conditions.

Rainfall:

The whole of the state continues to get heated till the onset of monsoon by the middle of June. The state receives the monsoon currents from the Bay of Bengal and Arabian Sea. More than ninety per cent of the rainfall is received from June to September. The general trend of isohyetal line during this period is from north-east to south-west. The south-western parts i.e. at Mt. Abu and its neighbourhood get the maximum rainfall i.e. 700-1250 mm.

In the Chappan plateau and southern parts of Bhorat and Deccan plateau the rainfall is 700-800 mm whereas in the north-western Bhorat plateau, north-eastern hilly tract, the Banas basin and the Vindhyan scarpland it is 500 to 600 mm. There is a rapid and marked decrease in rainfall from east to west of Aravalli making western Rajasthan the most arid part in India. The semi-arid transitional plain receives about 250-300 mm rainfall and the sandy arid plain (Marusthali), further west, receives less than 250 mm rainfall.

The variations in annual rainfall and the number of rainy days from year to year are appreciable. The month of July is the rainiest receiving 90 to 95 per cent rainfall. Five to ten per cent of the annual rainfall occurs in the form of local showers during winter season and thunder storms particularly during June-July. On an average, there are 30 to 40 rainy days in a year.

Relative humidity :

The relative humidity is minimum in the summer season, particularly in April and May when it ranges between 35 to 60 per cent in the morning hours and 10 to 30 per cent in the afternoon. The maximum humidity is noted during the rainy season, particularly mid July to mid August (90%).

During the winter season, particularly mid December to February, the relative humidity varies from 50-60% in the morning and 25 to 35 per cent in the afternoon. The relative humidity in the west of Aravalli is lesser than in the east of it.

Wind :

During post monsoon period and winters i.e. October to February the winds are very light and variable, with north westerly and northerly winds being more frequent. In the hot and rainy seasons, the winds usually move between south-west and west. During summers, dust storms are also very common, particularly in the western arid regions. Maximum dust storms occur in June in the arid regions and in May in south-east.

Hail storms are very rare and they generally occur from January-March. Fogs are comparatively more frequent, usually occurring between December to February.

GENERAL ASPECTS OF VEGETATION

Three physiographic regions may be recognised in Rajasthan for the study of flora and floral composition of the area, namely the western sandy desert, the eastern gravelly/rocky plateau with outliers of Aravallis and the main Aravalli range itself.

1. The western sandy desert :

The western arid and semi-arid region, commonly known as the Rajasthan desert or the Thar desert, covers a total area of 1,96,150 sq. km in the west of Aravalli range. Its geographical position and the topographic, climatic and edaphic characteristics have already been discussed in the preceding pages. The vegetation in arid regions is sparse consisting mainly of stunted, thorny or prickly shrubs and perennial herbs capable of drought resistance. Trees are few and scattered. The ephemerals come up during the rainy season, complete their life cycle before the advent of summer and the bulk of the area is once more transformed into open sandy plain, desolate and barren. Since the climate is more or less homogeneous, the vegetation can better be said to be edaphic controlled. We can study the vegetation of the desert under the following heads:

(a) *Sand-dunes and interdunal areas* : This is by far the most common habitat of this region. Sand-dunes of different types, magnitude and

orientation are encountered. They may be stabilised, partially stabilised or unstabilised and barren. The common trees and shrubs found on stabilised and unstabilised sand-dunes are: *Calligonum polygonoides*, *Clerodendrum phlomidis*, *Haloxylon salicornicum*, *Lycium barbarum* etc. On some of the dunes, trees like *Acacia senegal*, *Prosopis cineraria*, *Salvadora oleoides* etc. are also common. The other common inhabitants of sand-dunes include *Aerva javanica*, *Citrullus colocynthis*, *Crotalaria burhia*, *Dipterygium glaucum*, *Farsetia hamiltonii*, *Indigofera argentea*, *I. cordifolia*, *I. linifolia*, *Leptadenia pyrotechnica*, *Melhania denhamii*, *Sericostemma pauciflorum*, *Tephrosia falciformis*, *Tribulus longipetalus* etc. The common grasses and sedges which play a vital role in soil conservation are: *Aristida adscensionis*, *A. funiculata*, *Cenchrus biflorus*, *C. ciliaris*, *C. prieurii*, *C. setigerus*, *Cymbopogon jwarancusa*, *Dactyloctenium aegyptium*, *D. scindicum*, *Desmostachya bipinnata*, *Eragrostis* species, *Lasiurus indicus*, *Latipes senegalensis*, *Ochthochloa compressa*, *Panicum antidotale*, *P. turgidum*, *Sporobolus helvolus*, *Stipagrostis hirtigluma*, *Cyperus atkinsonii*, *C. conglomeratus* etc.

The interdunal gaps support more luxuriant vegetation due to greater availability of moisture. The common trees and shrubs are: *Acacia jacquemontii*, *A. senegal*, *Prosopis cineraria*, *Salvadora oleoides*, *Tecomella undulata*, *Calotropis procera*, *Capparis decidua*, *Ziziphus nummularia* etc. In addition, almost all the plants found on sand-dunes grow more profusely in the interdunal area.

At the foot of the isolated hills and rock outcrops, the windward sides of which obstruct the movement of sand, obstacle sand-dunes are often formed. On these dunes a mixture of characteristic elements of sand-dunes and rock outcrops like *Acacia senegal*, *Anogeissus pendula*, *Commiphora wightii*, *Maytenus emarginatus* etc. may be seen.

The unstabilised sand-dunes are least covered with plants. However, *Cyperus arenarius*, *Crotalaria burhia*, *Aerva javanica*, *Leptadenia pyrotechnica* etc. are some of the pioneer species to colonize these dunes. The very crest of such sand-dunes are often colonized by varying frequency of *Lasiurus indicus* and *Citrullus colocynthis* etc.

(b) *Sandy and hummocky plains* : Sandy and hummocky plains constitute the major part of the desert and plants growing in such habitats form some of the characteristic associations of the region. The common trees

and shrubs are: *Acacia senegal*, *Calligonum polygonoides*, *Calotropis procera*, *Capparis decidua*, *Maytenus emarginatus*, *Prosopis cineraria*, *Salvadora oleoides*, *S. persica*, *Tecomella undulata* and *Ziziphus nummularia*. In addition, under-shrubs and herbs like *Aerva javanica*, *Arnebia hispidissima*, *Boerhavia diffusa*, *B. elegans*, *Convolvulus microphyllus*, *Crotalaria burhia*, *Farsetia hamiltonii*, *Heliotropium strigosum*, *Indigofera cordifolia*, *Leptadenia pyrotechnica*, *Tephrosia purpurea* etc. are also common. The most common creepers are *Citrullus colocynthis*, *C. lanatus*, *Cucumis melo* and *C. prophetarum*, and of climbers mention may be made of *Coccinia grandis*, *Momordica dioica*, *Mukia maderaspatana* and *Pergularia daemia*. Most of these plants possess well developed root-system and occur in open clump formations with plenty of vacant spaces between them which are occupied by several ephemerals and grasses like the species of *Aristida* and *Cenchrus*, and *Dactyloctenium scindicum*, *Lasiurus indicus*, *Ochthochloa compressa*, *Panicum antidotale*, *Stipagrostis hirtigluma* etc. along with sedges like *Cyperus atkinsonii* and *C. conglomeratus*. The shifting dunes are often successful in over running the low vegetation.

(c) *Gravelly/rocky plains* : Gravel, which is formed by the action of wind, covers fairly large areas of the region. Some of the common plants of these habitats are: *Cleome vahlana*, *C. gracilis*, *Fagonia indica*, *Dactyloctenium aristatum*, *Indigofera linnaei*, *Heliotropium rariflorum*, *Leptadenia pyrotechnica*, *Blepharis sindica*, *Sericostemma pauciflorum*, *Bouchnera marubifolia*, *Salvia aegyptia* etc. Certain plants of gravel are prostrate and star like with the branches remaining appressed to the ground. e.g. *Euphorbia clarkeana*, *E. granulata*, *Indigofera cordifolia*, *I. hochstetteri*, *Mollugo cerviana*, *M. nudicaulis*, *Tribulus terrestris* etc. The common trees and shrubs of this habitat are: *Calotropis procera*, *Capparis decidua*, *Euphorbia caducifolia*, *Maytenus emarginatus*, *Prosopis cineraria*, *Salvadora oleoides*, *Ziziphus nummularia* etc. At certain spots, the gravel plains maintain characteristic grass-legume associations. The common grasses are: *Enneapogon brachystachyus*, *E. schimperanus*, *Melanocenchris abyssinica*, *M. jacquemontii*, *Oropetium thomaeum*, *Tragus roxburghii* etc.

The gravel plains are marked by deep valleys or shallow depressions, particularly near the foot of hills; the typical rock plants which become prominent along with some rambers in such habitats are: *Ephedra foliata*, *Asparagus racemosus* etc. The rocks in the area represent various geological

formations. The rocky plains maintain sparse vegetation without any true forests. *Anogeissus pendula*, *Asparagus racemosus*, *Balanites aegyptiaca*, *Corallocarpus epigaeus*, *Rivea hypocrateriformis* etc. are the common plants of these habitats.

(d) *Isolated hills and rock outcrops* : The region in the west of Aravalli consists isolated hills of low elevation and of various origin. These hills are usually bare at the top; occasionally, however, *Boswellia serrata*, *Rhus mysurensis* among woody plants and *Convolvulus stocksii* and *Viola cinerea* var. *stocksii* among herbaceous ones are found. The hill-slopes, however, maintain better vegetation due to the accumulation of sand and better water holding capacity. The common plants of these habitats are: *Acacia senegal*, *Anogeissus pendula*, *Capparis decidua*, *Commiphora wightii*, *Euphorbia caducifolia*, *Grewia tenax*, *Maytenus emarginatus*, *Ziziphus nummularia* etc.

Among climbers, *Abrus precatorius*, *Asparagus racemosus*, *Boerhavia verticillata*, *Rhynchosia minima*, *Rivea hypocrateriformis* are characteristic. The undergrowth is characterized by the presence of *Anticharis senegalensis*, *Barleria acanthoides*, *B. prionitis*, *Blepharis linaraefolia*, *Boerhavia diffusa*, *Cleome brachycarpa*, *Fagonia indica*, *Heliotropium bacciferum*, *Seetzenia lanata*, *Sida cordata* etc.

The vegetation is comparatively more dense at the foot of hills and nearby areas. *Acacia senegal* is the main jungle forming tree in such habitats. Other characteristic elements include *Blepharis sindica*, *Lipidagathis trinervis*, *Melhania denhamii*, *Monsonia senegalensis*, *Pavonia zeylanica*, *Schweinfurthia papilionacea*, *Seddera latifolia*, *Tephrosia purpurea*, *Tridax procumbens*, *Aristida adscensionis*, *Enneapogon brachystachyus*, *Melanocentris jacquemontii*, *Oropetium thomaeum*, *Stipagrostis hirtigluma*, *S. pogonoptila*, *Tragus roxburghii* etc.

Lipidagathis bandraensis and *Corbichonia decumbens*, the typical lithophytes of this region, are found in crevices of rocks. *Commelina albescens* and *Lindenbergia indica* are some of the other species growing from the crevices of rocks.

(e) *Saline tracts* : There are large saline tracts spread throughout the desert. The common plants of this habitat are: *Cressa cretica*, *Haloxylon recurvum*, *H. salicornicum*, *Portulaca oleracea*, *Salsola baryosma*, *Sesuvium sesuvioides*, *Suaeda fruticosa*, *Tamarix indica*, *Trianthema triquetra*, *Zaleya govindea*, *Zygophyllum simplex* etc.

(f) *Aquatic and Marshland habitats* : The area maintains considerable number of fresh water, artificial, salt lakes and tanks with rocky substratum. These support a reasonable number of aquatic species like *Hydrilla verticillata*, *Lemna paucicostata*, *Najas graminea*, *N. wetwitschii*, *Potamogeton crispus*, *P. pectinatus*, *Spirodela polyrhiza*, *Vallisneria spiralis*, *Wolffia* species etc. *Eichhornia crassipes* is also encountered in certain ponds and lakes.

(g) *Miscellaneous habitats* : The area has a number of old and historical buildings, forts, palaces etc. On the walls of such buildings, plants like *Lindenbergia indica*, *Ficus religiosa*, *Salvadora oleoides*, *Tephrosia strigosa*, *Vernonia cinerea* are frequent. *Cistanche tubulosa* is a common root-parasite particularly on *Capparis*, *Calotropis*, *Salvadora* and *Prosopis* species. *Ephedra foliata* is the only living gymnosperm found in this region.

Certain species escape from cultivation and imperfectly naturalise near habitations e.g. *Citrullus lanatus* var. *fistulosus*, *Lycopersicon esculentum*, *Momordica charantia* etc.

The area includes few biologically significant habitats like the Desert National Park and the Akal Fossil Wood Park. The Desert National Park, situated in Barmer and Jaisalmer districts, occupies an area of about 3000 sq km and represents all the characteristics of the desert ecosystem. It has been established to preserve the flora and fauna of the Thar desert and to restore the degraded natural ecosystem. It has good concentration of Chinkara, Black-Buck and Great Indian Bustard, the last being an endangered species.

The Akal Fossil wood park, located at Hirschindani in Jaisalmer district, has further enhanced the importance of the Thar desert by the discovery of fossil wood logs of the lower Jurassic age.

Saphari National Park, located at Kailana in Jodhpur district, is a recent effort being taken for the preservation of desert flora and fauna, including some of the rare and threatened plants and animals of W. Rajasthan.

(h) *Endemic and rare taxa* : The desertic zone due to its characteristic topography, geology, edaphic and climatic factors maintains a peculiar type of vegetation, not found elsewhere in India. About 16 taxa of angiosperms are endemic to the desert. They are: *Cenchrus rajasthanensis*, *Convolvulus*

blatteri, *Farestia macrantha*, *Pulicaria rajputanae*, *Ziziphus truncata*, *Abutilon bidentatum* var. *major*, *A. fruticosum* var. *chrysocarpa*, *Alysicarpus monilifer* var. *venosa*, *Barlaria prionitis* var. *diacantha*, *Cenchrus prieurii* var. *scabra*, *Cleome gynandra* var. *nana*, *Convolvulus auricomus* var. *ferruginosus*, *Ipomoea carica* var. *semine-glabra*, *Pavonia arabica* var. *glutinosa* and *P. arabica* var. *massuriensis*.

Most of these endemic taxa have very restricted distribution probably due to the greatly disturbed ecosystems in the desert and due to the limited range of adaptability of these taxa.

Besides these, the over exploitation of certain species for various uses in the desert pose a serious threat to them e.g. *Citrullus colocynthis*, *Commiphora wightii*, *Ephedra foliata*, *Tecomella undulata* etc.

The other rare taxa found in Rajasthan are: *Ammannia desertorum*, *Glossonema varians*, *Heliotropium rariflorum*, *Lineum indicum*, *Moringa concanensis*, *Seddera latifolia*, *Sesuvium sesuvioides*, *Tephrosia falciformis* and *Tribulus rajasthanensis*.

2. Aravalli Range :

The second physiographic region of interest is the Aravalli range which runs diagonally across the state extending from Champaner in Gujarat in the south-west to near Delhi in the north-east for a distance of about 692 km. Within Rajasthan, the range runs from Khed Brahma in the south-west to Khetri in the north-east for a length of about 550 km. The elevation of the Aravalli range gradually rises in the south-west direction and so also the vegetation pattern and floral composition changes due to the changes in climatic and edaphic factors. On Khetri hills (792 m) the vegetation is scrubby and in degraded stage. The top of the hills are practically barren while on the slopes, where some sand and moisture accumulate, thick growth of plants such as *Acacia leucophloea*, *A. senegal*, *Balanites aegyptiaca*, *Capparis decidua*, *Euphorbia nivulia*, *Grewia tenax*, *Justicia adhatoda*, *Securinega leucopyrus* etc. are noticed. On Harshnath hills (913 m), the floral composition up to 600 m is similar to that of Khetri hills; but above 600 m. plants like species of *Calotropis*, *Clerodendrum*, *Justicia* etc. disappear and their places are taken by elements like *Dichrostachys cinerea*, *Euphorbia nerifolia*, *Triumfetta rhomboidea* etc. Trees like *Anogeissus latifolia*, *A. pendula*, *balanites aegyptiaca*, *Prosopis cineraria*, *Wrightia*

arborea etc. which are stunted at lower elevations become more and more prominent.

Further south-westwards at Kho (920 m), Raghunathgarh (1055 m) and Todgarh in Ajmer district the scrub vegetation merges to some extent with the deciduous type. The floral composition of these hills include *Anogeissus pendula*, *Acacia leucophloea*, *Bauhinia racemosa*, *Boswellia serrata*, *Commiphora wightii*, *Dichrostachys cinerea*, *Mimosa hamata*, *Prosopis cineraria*, *Rhus mysorensis*, *Securinega leucopyrus*, *Sterculia urens* etc.

From Bijapur forest range (1100 m) in Pali district to further south-westwards, the hills are covered over with mixed deciduous type of forests dominated by *Anogeissus pendula*. The other common associates at Bijapur are *Aegle marmelos*, *Anogeissus latifolia*, *Bauhinia racemosa*, *Boswellia serrata*, *Butea monosperma*, *Cassia fistula*, *Diospyros melanoxylon*, *Mitragyna parvifolia*, *Wrightia tinctoria* etc.

Mt. Abu (1727 m) at the south-western border of the state is the highest peak not only of the Aravallis but also between western Himalayas and Nilgiri hills. The vegetation here falls into fairly distinct elevational zones though they intermingle to certain extent. The chief components up to 1300 m are the same as between Bijapur and Mt. Abu with only a little change in the frequency and abundance. But above 1300 m, the vegetation gradually changes to subtropical evergreen type with species like *Boswellia serrata*, *Carvia callosa*, *Crateva nurvala*, *Flacourtia indica*, *Girardinia zeylenica*, *Jasminum humile*, *Lansea coromandelica*, *Mallotus philippensis*, *Mangifera indica*, *Rosa brunoni*, *R. involucreata*, *Sterculia urens*, *Syzygium cumini* etc. At certain places *Albizia* spp., *Erythrina* spp., *Emblia officinalis*, *Kydia calycina*, *Trema orientalis* etc. are also found at higher elevations. Several species of ferns and fern-allies also occur at Mt. Abu.

The ground cover comprising of *Acanthospermum hispidum*, *Blainvillea acmella*, *Sclerocarpus africanus*, species of *Alysicarpus*, *Cassia* and *Desmodium*, *Borreria articularis*, *B. pusilla*, many grasses etc. become very dense at lower elevations at Mt. Abu. In the north-eastern direction from Bijapur, right up to Khetri hills, not only the density of the above mentioned taxa decreases but species like *Boerhavia diffusa*, *Borreria articularis*, *Dactyloctenium aegyptium*, *Evolvulus alsinoides*, *Glossocardia bosvallea* and species of some ferns like *Actinopteris*, *Adiantum* etc. become more common.

Endemic and Threatened plants : Mt. Abu maintains a characteristic vegetation due to the relatively high altitude coupled with the climatic and edaphic factors. The endemic taxa of Mt. Abu are: *Bonnaya bracteoides*, *Dicliptera abuensis*, *Oldenlandia clausa*, *Strobilanthes hallbergii* and *Veronica anagallis* var. *bracteosa*. These taxa were described by Blatter and Hallberg between 1918-1931 with the type specimens deposited in Blatter Herbarium, Bombay (BLAT). Since then many botanists have explored Mt. Abu, but none could collect these taxa; probably they have become extinct.

3. The area in the east of Aravalli :

The area situated in the east of Aravalli range constitutes the third physiographic region. From Ajmer onwards several parallel outliers of Aravallis become conspicuous and begin to spread to the south and south-east. This area may be subdivided into the following physiographic units for a better understanding of the flora and floral composition.

(a) *Bhorat plateau* : The eastern part of Sirohi, major part of Udaipur and the entire Dungarpur district fall under 'Bhorat Plateau'. The highest section of the outliers of the Aravallis lies to the north-west of Udaipur between Kumbalgarh and Gogunda. The average elevation of this plateau is 1225 m above m.s.l. The vegetation on the hills is of mixed deciduous type, showing three altitudinal zonation with the higher elevations dominated by *Boswellia serrata*, associated with *Anogeissus latifolia*, *Lannea coromandelica*, *Sterculia urens* etc. In the middle zone *Anogeissus pendula* is dominant and it is associated with *Albizia odoratissima*, *Diospyros melanoxylon*, *Holoptelea integrifolia*, *Wrightia tinctoria* etc. The lower elevations are dominated by *Cassia auriculata*, associated with *Annona squamosa*, *Butea monosperma*, *Dichrostachys cinerea*, *Diospyros cordifolia* etc. Shrubs and undershrubs are usually not affected by elevation, the common ones being *Capparis sepiaria*, *Dyrophytum indicum*, *Grewia flavescens*, *Justicia adhatoda*, *Spermodictyon suaveolens*, *Woodfordia fruticosa* etc.

(b) *Banas basin* : The eastern part of Udaipur, western Chittorgarh, Bhilwara, western Ajmer, Tonk, Jaipur, western Sawaimadhopur and southern part of Alwar district constitute 'Banas Basin'. The maximum height of hills is about 582 m near Deogarh. The forests located here are of the mixed deciduous type dominated by *Anogeissus pendula*, associated with *Acacia senegal*, *Bauhinia racemosa*, *Boswellia serrata*, *Capparis sepiaria*, *Cassia fistula*, *Dichrostachys cinerea*, *Diospyros melanoxylon*,

Lannea coromandelica, *Wrightia tinctoria* etc. There is no significant elevational effect on the vegetation of Banas basin except that *Boswellia serrata* becomes more abundant at the summit of the hills and *Butea monosperma* and *Cassia auriculata* on the outskirts. *Sterculia urens* is usually found at the top or on higher slopes. The vegetation is comparatively denser in the valleys of the hills.

(c) *Chappan plateau* : South-eastern part of Udaipur, southern Chittorgarh and Banswara district constitute "Chappan plateau" The average height of the plateau is 350 m and the outliers hardly exceed 700 m above m.s.l. The forests are of deciduous type, dominated mainly by *Tectona grandis*. The altitude does not have much effect on the zonation of vegetation except that on higher slopes teak is replaced by species like *Bauhinia racemosa*, *Boswellia serrata*, *Dalbergia latifolia*, *Emblica officinalis*, *Lannea coromandelica*, *Sterculia urens* etc. The vegetation is richer on the gentle slopes, where additional associates of teak like *Adina cordifolia*, *Aegle marmelos*, *Albizia odoratissima*, *Diospyros melanoxylon*, *Hymenodictyon excelsum*, *Lagerstroemia parviflora*, *Madhuca longifolia*, *Mitragyna parvifolia*, *Terminalia arjuna*, *Wrightia tinctoria* occur. *Dendrocalamus strictus* grows in isolated patches. The steep slopes with big boulders of rocks support *Euphorbia nerifolia*, *E. nivulia* etc. At the foot of the hills *Nyctanthes arbor-tristis* is abundant. On the outskirts, dry teak forests are reduced to scrubs with many stemmed, crooked branchy teak stocks amidst *Acacia chundra*, *A. leucophloea*, *Butea monosperma*, *Holarrhena pubescens* etc.

(d) *Deccan plateau* : The western part of Deccan plateau extends to the south-eastern part of Rajasthan over Kota, Bundi and Jhalawar districts with the Vindhyan and Aravalli outliers. The forests here are of mixed deciduous type, showing altitudinal zonation of the vegetation to the extent that *Adina*, *Aegle*, *Boswellia*, *Buchanania lanzen*, *Cassia fistula*, *Dendrocalamus*, *Diospyros*, *Lagerstroemia*, *Lannea*, *Sterculia* etc. are more abundant in the middle zone, while *Acacia leucophloea*, *Butea monosperma* etc. are abundant at the foot or outskirts. *Anogeissus pendula* is the dominant species of these forests extending right from the base to the top of the hills.

A natural belt of teak is found in the flat terrain along Parbati river from Atru to Kishanganj in Kota district. In the east of Kishanganj, the terrain becomes hilly and the forests mixed deciduous of *Anogeissus*

pendula type. There are three peripheral zones of vegetation in this flat terrain. The inner part is of pure *Tectona grandis*, with isolated trees of *Diospyros melanoxylon* and *Hardwickia binata* and naked ground floor. In the peripheral region, the destruction of the forest has resulted in scrub woodlands consisting of *Acacia catechu*, *A. nilotica* subsp. *indica*, *A. leucophloea*, *Balanites aegyptiaca*, *Butea monosperma*, *Diospyros melanoxylon* etc. Shrubs and undershrubs are also abundant in the marginal zone. Separating the two, there is a thick belt of *Acacia catechu*, *A. nilotica* and *Ziziphus mauritiana* associated with teak.

A subtropical evergreen forest named "Sitabari" situated near Kelwara village in Kota district, and considered sacred supports species like *Ampelocissus latifolia*, *Bombax ceiba*, *Carissa congesta*, *Cayratia trifolia*, *Cissus repanda*, *Cordia dichotoma*, *Ficus virens*, *Hiptage benghalensis*, *Ixora arborea*, *Mangifera indica*, *Pueraria tuberosa*, *Schleichera oleosa*, *Syzygium cumini*, *Terminalia arjuna*, *Vanda tassellata* etc. Many ferns, aquatic and shade loving spermatophytes grow in this forest fed by a perennial stream.

(e) *Vindhyan scarpland* : The Vindhyan scarpland having an average elevation between 350-580 m above m.s.l. covers the area between Banas and Chambal rivers and includes Bharatpur, Dholpur and Sawai Madhopur districts. In Dholpur and Bharatpur districts, most of the area is either under cultivation or is in the form of ravines and useless. The hillocks are more or less naked with degraded and stunted trees and shrubs. In the protected forests, however, the trees attain considerable height, the common ones being *Acacia leucophloea*, *A. nilotica*, *Anogeissus pendula*, *Balanites aegyptiaca*, *Kirganelia reticulata*, *Maytenus emarginatus*, *Prosopis juliflora*, *Salvadora oleoides*, *S. persica* etc. In addition, *Dichrostachys cinerea*, *Sterculia urens* etc. are also found.

Keoladeo Ghana Bird National Park occupying an area of about 29 sq km and located near Bharatpur is also a protected forest which is comparatively denser than elsewhere. The area is an extensive marshland and it was once the hunting preserve of the princely family of Bharatpur. Besides the taxa already noted above, *Adina cordifolia*, *Azadirachta indica*, *Diospyros montana*, *Mitragyna parvifolia*, *Pithecellobium dulce*, *Phoenix sylvestris*, *Ziziphus mauritiana* etc. also occur in this park where thousands of migratory birds from Afghanistan, Central Asia, Tibet, Siberia, China etc. come and make their nests. *Clerodendrum phlomidis*, *Justicia adhatoda*,

Ziziphus nummularia etc. together with many climbers further make the habitat suitable for wild animals like pythons, porcupines, nilgai, spotted deer, hyenas, sambar and wild boar.

The vegetation of wastelands is identical to other regions except that *Tamarix aphylla* and *Alhagi maurorum* are very common throughout the area. It is interesting to note that thick populations of *Carissa spinarum* are encountered near Sikandra village along the foot of the hills (Bayana-Bharatpur). The area also maintains many aquatic and marshland plants, including algal flora.

(f) *North-eastern hilly region* : North-eastern hilly region (Alwar district) is traversed in the north and north-east to south and south-east by a number of parallel outliers of Aravallis rising up to 800 m. This region is open towards north-west and south-west with flat plains at 300-400 m above m.s.l. The hill slopes are excessively stony and the vegetation shows three distinct elevation zones, dominated by *Boswellia serrata*, associated with *Crateva nurvala*, *Euphorbia nerifolia*, *Holoptelea integrifolia*, *Mallotus philippensis*, *Terminalia bellerica* etc. at higher elevations. The middle zone is dominated by *Anogeissus pendula*, associated with *Commiphora wightii*, *Lannea coromandelica*, *Wrightia tinctoria* etc. In the basal zone *Acacia nilotica*, *Dichrostachys cinerea*, *Butea monosperma*, *Tecomella undulata* etc. grow almost in equal proportions. In the cool and shady valley *Colebrookea oppositifolia*, *Dendrocalamus strictus*, *Mitragyna parvifolia*, *Wrightia arborea* etc. grow in abundance.

The ruthless destruction of vegetation in various ways has resulted in the naked hills with big boulders of rocks throughout eastern Rajasthan. The vegetation in such habitats is very sparse, stunted and bushy with plants like spiny Euphorbias and Acacias, *Diospyros cordifolia*, *D. montana* etc.

(g) *Wasteland vegetation in the east of Aravalli* : The vegetation of wastelands is almost identical in all the physiographic divisions in the east of Aravalli. It is semi-xerophytic with sparse tree layer. The common trees are: *Acacia leucophloea*, *A. nilotica*, *Aegle marmelos*, *Azadirachta indica*, *Balanites aegyptiaca*, *Butea monosperma*, *Cordia dichotoma*, *Dolichandrone falcata*, *Ficus benghalensis*, *F. religiosa*, *Mangifera indica*, *Phoenix sylvestris*, *Pithecellobium dulce*, *Prosopis cineraria*, *Salvadora persica*, *Ziziphus mauritiana* etc. The progressive regeneration of most of the trees, both by seeds and coppice, is negligible due to great biotic pressure on them.

Prosopis juliflora is the only species which shows highest survival percentage under adverse climatic and biotic conditions.

The wasteland habitats are more favourable for shrubs and undershrubs which form a comparatively dense layer. The most common shrubs are: *Abutilon indicum*, *Acacia farnesiana*, *A. jacquemontii*, *Calotropis procera*, *Capparis decidua*, *C. sepiaria*, *C. zeylanica*, *Clerodendrum phlomidis*, *Dichrostachys cinerea*, *Ficus palmata*, *Kirganelia reticulata*, *Lantana camara*, *Leptadenia pyrotechnica*, *Mimosa hamata*, *Opuntia elatior*, *Solanum incanum*, *Ziziphus nummularia* etc. These shrubs usually grow in clumps with trees and in vacant spaces.

A large number of undershrubs also grow in the wastelands, the most common ones are: *Cassia auriculata*, *C. occidentalis*, *Desmodium gangeticum*, *Malvastrum coromadelianum*, *Pavonia zeylanica*, *Pupalia lappacea*, *Sida alba*, *S. cordifolia*, *S. ovata*, *Triumfetta pentandra*, *T. rotundifolia*, *Urena lobata*, *Xanthium strumarium* etc.

The most common climbers are: *Abrus precatorius*, *Argyreia sericea*, *Cissampelos pareira*, *Cocculus hirsutus*, *Cryptostegia grandiflora*, *Leptadenia reticulata*, *Marsdenia tenacissima*, *Mucuna pruriens*, *Pergularia daemia*, *Rivea hypocrateriformis*, *Teramnus labialis*, *Wattakaka volubilis* etc. They usually grow among the trees and shrubs, particularly on the boundaries of fields and gardens.

Besides these, a large number of annual and perennial herbs are encountered in the wastelands. With the advent of the winter season a considerable number of compositaceous meadow herbs, in association with *Acalypha ciliata*, *Achyranthes aspera*, *Argemone mexicana*, *Leucas cephalotes*, *Nepeta hindostana*, *Solanum nigrum* etc. come into bloom. The most common compositaceous herbs are: *Ageratum conyzoides*, *Echinops echinatus*, *Eclipta alba*, *Gnaphalium polycaulon*, *Lagascea mollis*, *Launaea procumbens*, *Pulicaria angustifolia*, *Sonchus oleraceus* and *Sphaeranthus indicus*; the last mentioned species often forms dense mats at certain places.

Decreasing moisture content, increasing temperature and high velocity winds during March and April result in the disappearance of most meadow herbs excepting those growing in somewhat moist habitats. The dry meadow herbs appearing during summer months are very few e.g. *Alhagi maurorum*, *Chrozophora rotleri*, *Solanum surrattense*, *Tridax procumbens* and *Dipcadi serotinum* which possesses underground bulbs and become visible above the ground only during the summers.

During the rainy season, the area presents a glorious appearance of a green carpet of semi-xerophytic and meadow herbs which help in increasing the humus content of the soil and extend the vegetation to the barren areas. The life-cycle of most of the herbs comes to close before the winter sets in. The rainy season herbs are dominated by leguminous plants like species of *Alysicarpus*, *Cassia*, *Crotalaria*, *Indigofera*, *Psoralea*, *Tephrosia*, *Vigna* etc. The common associates of the above are: *Aristolochia bracteolata*, *Borreria articularis*, *Cleome gynandra*, *C. viscosa*, *Convolvulus prostratus*, *Evolvulus alsinoides*, *Glossocardia bosvallea*, *Merremia tridentata*, *Polygala eriopiera*, *Tridax procumbens* and several grasses among which the species of *Aristida*, *Cenchrus*, *Chloris*, *Eragrostis*, *Tragus*, *Urochloa* etc. are more common.

On the boundaries of fields, gardens and orchards, *Antigonon leptopus*, *Canavalia ensiformis*, *Cardiospermum halicacabum*, *Coccinia grandis*, *Dioscorea bulbifera*, *Momordica dioica*, *Mukia maderaspatana* etc. besides reducing wind velocity also act as an obstacle in the path of moving sand particles.

A few sciophytic humus and shade loving herbs fairly distributed in the gardens, orchards and other similar habitats are: *Baliospermum montanum*, *Biophytum sensitivum*, *Chenopodium album*, *Corchorus olitorius*, *Euphorbia hirta*, *Hybanthus enneaspermus*, *Lindernia crustacea*, *Oldenlandia corymbosa*, *Oxalis corniculata*, *Phyllanthus fraternus*, *Physalis minima*, *Solanum nigrum* etc.

The neglected corners of fields and gardens which escape ploughing and have lower percentage of nitrates, humus and low water holding capacity are most suitable for the growth of lime loving species like *Chenopodium album*, *Desmostachya bipinnata*, *Echinops echinatus*, *Euphorbia hirta*, *Perotis indica*, *Saccharum spontaneum*, *Vetiveria zizanioides* etc.

Parks and play grounds are most suitable localities for many grasses which form dense mental and act as an effecient soil-binder e.g. *Bothriochloa pertusa*, *Cynodon dactylon*, *Dichanthium annulatum*, *Imperata cylindrica*, *Iseilema laxum*, *Tragus roxburghii* etc.

Inhabiting semi-demolished walls of ancient buildings and monuments, there are well recognisable associations of meadow herbs like *Bidens biternata*, *Euphorbia hirta*, *Glossocardia bosvallea*, *Haplanthodes verticillata*, *Indoneesiella echioides*, *Lindenbergia indica*, *Tridax procumbens*

etc. The seedlings of *Ficus benghalensis* and *F. religiosa* cause damage to the buildings by sending their roots deep down into the walls.

Utricularia exoleta and *U. stellaris* are the insectivorous representatives of the area. *Aerides crispum* and *Vanda tassallata* are the common epiphytes inhabiting the region.

The floristic composition of the wastelands i.e. the presence of sparse ground cover during winter and summer, abundant ground cover during rainy season, distantly scattered deciduous trees and comparatively dense growth of xerophytic shrubs suggest semi-arid climate in the area.

(h) *Grasslands in the east of Aravalli* : The grasslands, managed for grass production and subsequent grazing and to check the exposure of soil to the action of rain and high velocity winds, are few. They are usually managed on the outskirts of the forests, on naked hillocks, in the degraded forests, protected forests, wastelands etc. The grasslands of such habitats are dominated by tall grasses like *Aristida adscensionis*, *Bothriochloa pertusa*, *Cenchrus ciliaris*, *Chloris barbata*, *Cymbopogon martinii*, *Dichanthium caricosum*, *Digitaria adscendens*, *Dinebra retroflexa*, *Eragrostis unioloides*, *Heteropogon contortus*, *Iseilema laxum*, *Pennisetum hordeoides*, *Setaria nervosum*, *Themeda quadrivalvis*, *Tripogon jacquemontii* etc.

Besides many-stemmed, crooked, branchy *Bauhinia recemosa*, *Dichrostachys cinerea*, *Mimosa hamata*, *Tectona grandis*, *Ziziphus mauritiana* etc which are sparsely distributed in the grasslands, some weed species like *Alysicarpus tetragonolobus*, *Celosia argentea*, *Cleome simplicifolia*, *Crotalaria hirsuta*, *Ipomoea indica*, *Cyperus rotundus* etc. also compete with grasses in several ways and are harmful to the grasslands.

Another category of grasslands occupy large, open undulating rocky terrain. These grasslands are deteriorated for want of protection against grazing and also due to the spread of undesirable thorny bushes and a number of weeds. The most common grasses of these habitats are: *Alloteropsis cimicina*, species of *Aristida*, *Cenchrus ciliaris*, *Chloris montana*, *Cynodon dactylon*, *Dactyloctenium aegyptium*, species of *Eragrostis*, *Hackelochloa granularis*, *Melanocentris jacquemontii*, *Setaria tomentosa*, *Sporobolus tenuissimus*, *Tetrapogon villosus*, *Tragus roxburghii*, *Tripogon purpurascens*, *Urochloa panicoides* etc. which grow on rather thin layer of soil. Besides these, many characteristic long-stemmed grass species of the first category also form distant patches.

The scope for the development of good pasture lands along suitable gentle slopes of hills, on the outskirts of forests and wastelands is very bright, if the work is done under proper scientific management.

(i) *Aquatic and marshland vegetation in the east of Aravalli* : The area in the east of Aravalli receives enough rainfall, the water table is normal, a number of rivers pass through the terrain and maintains a large number of temporary and permanent lakes, tanks, ponds, puddles etc. These habitats provide variable emporia for the growth of aquatic and marshland plants. It has been observed that in the deep water habitats mostly used for irrigation etc., the vegetation is poor in comparison to shallow tanks and ponds.

On the basis of their contact with soil, water and air, the hydrophytes of the area may be broadly classified into the following life-forms.

1. *Free floating* : Species like *Pistia stratiotes*, *Utricularia stellaris* etc. come in this group.

2. *Attached with floating leaves and/or shoots* : Species like *Ipomoea aquatica*, *Nymphaea nouchali*, *N. pubescens*, *Nymphoides cristata*, *Potamogeton nodosus* etc. fall in this category.

3. *Suspended submerged* : Species like *Ceratophyllum demersum*, *Hydrilla verticillata*, *Najas minor*, *Nechamandra alternifolia*, *Potamogeton pectinatus*, *Zannichellia palustris* etc. come in this category.

4. *Attached submerged* : Species like *Ottelia alismoides*, *Potamogeton crispus*, *Vallisneria spiralis* etc. fall in this category.

5. *Aquatic and/or amphibious emerged* : *Aeschynomene indica*, *Hydrolea zeylanica*, *Linnophila indica*, *Polygonum glabrum*, *Sagittaria sagittifolia*, *Typha angustata* etc. constitute this group of hydrophytes.

6. *Marshland* : A large number of plants grow in marshland habitats, particularly in low lands, rice fields and road-side puddles. The most common ones are: *Ammannia baccifera*, *Hygrophila auriculata*, *Phyla nodiflora*, most of the sedges and few grasses like *Coix lacryma-jobi*, *Hemarthria compressa*, species of *Paspalum*, *Paspalum* etc.

The area apparently unsuitable for the growth of luxuriant vegetation is rich in marshland species. The paucity of aquatic species may be due to rocky bottom and wide amplitude of water level in reservoirs. Most of the aquatic and marshland species grow in a number of associations excepting

few like *Pistia*, *Typha* etc. which often form pure stands. *Eicchornia crassipes* is a troublesome American weed widely distributed throughout the area in different habitats. Most often it completely covers the reservoirs and gives a beautiful appearance both in vegetative and blooming state.

WEEDS AND ALLIENS

A large number of weeds grow with the crops. Most of them are well equipped for dissemination by wind, water, man and animals. In the winter season the highest weed density may be noted during the months of January and February. The typical weeds of the winter crops are: *Ageratum conyzoides*, *Anagallis arvensis*, *Asphodelus tenuifolius*, *Chenopodium album*, *Cynodon dactylon*, *Euphorbia dracunculoides*, *Fumaria indica*, *Lepidium sativum*, *Lathyrus aphaca*, *Melilotus alba*, *M. indicus*, *Oxalis corniculata*, *Polypogon monspeliensis*, *Striga angustifolia* etc.

The typical weeds associated with the summer crops are *Alhagi maurorum*, *Gomphrena celosioides*, *Solanum nigrum*, *S. surratense*, *Tribulus terrestris*, *Ziziphus nummularia* etc. The paucity in the number of summer weeds is due to unfavourable climatic and soil conditions. Some winter season weeds like *Euphorbia dracunculoides*, *Cynodon dactylon*, *Cyperus rotundus* which have lower susceptibility to receding soil moisture and to the rise of temperature give considerable cover during summers.

The density and frequency of rainy season weeds is higher due to high moisture content during this period. The common weeds of Kharif crop are: *Aerva lanata*, *Alysicarpus longifolius*, *Ammannia baccifera*, *Caesulia axillaris*, *Celosia argentea*, *Commelina benghalensis*, *Corchorus aestuans*, *C. olitorius*, *C. trilocularis*, *Cyperus rotundus*, *Digera muricata*, *Eclipta alba*, *Euphorbia hirta*, *Launaea procumbens*, *Leucas cephalotes*, *L. nutans*, *Oldenlandia corymbosa*, *Oxalis corniculata*, *Trianthema portulacastrum*, *Vernonia cinerea* etc.

It is interesting to note that the majority of weeds are annual and therophytes, excepting *Cynodon dactylon*, *Cyperus rotundus*, *Oxalis corniculata* and *Ziziphus nummularia* which propagate by means of seeds as well as root-stocks. Some weeds like *Ageratum*, *Eclipta* and *Oxalis* show wide range of adaptability.

Further, with the advent of Indira Canal and increasing canal irrigation facilities, a large number of weeds have migrated from Punjab to the canal

command areas in western Rajasthan. These species are: *Antirrhinum orontium*, *Arenaria serpyllifolia*, *Astragalus tribuloides*, *Centaureum centauroides*, *Gastrocotyle hispida*, *Hypocotyle procumbens*, *Kochia indica*, *Lophochloa pumila*, *Malcolmia africana*, *Malva sylvestris*, *Oenanthe javanica*, *Phalaris minor*, *Plantago amplexicaulis*, *Polygonum lanigerum*, *Psammogeton canescens* etc.

EXOTIC FLORA/CULTIVATED PLANTS

1. *Cultivated crops* : Three main seasonal crops, namely Rabi crop during winter season, Zayad crop during summer season and Kharif crop during rainy season are cultivated on a commercial scale.

The food crops of the winter season include the cereals, mainly *Triticum aestivum* and *Hordeum vulgare* and few pulses like *Cicer arietinum* and *Pisum sativum*. Important vegetables of winter season are *Brassica campestris* var. *rapa*, different varieties of *Brassica oleracea*, *Daucus carota*, *Lycopersicon esculentum*, *Solanum tuberosum*, *Trigonella faenum-graecum* etc.

The condimental crops include *Coriandrum sativum* and *Foeniculum vulgare*. The oil-yielding crops include *Brassica campestris* var. *sarson* and *B. nigra*. *Saccharum officinarum*, *Nicotiana tobacum* and *Papaver somniferum* are the cash crops of winter season.

In the desertic zones the cultivation of Rabi and Zayad crops is limited to a very small area where irrigation facilities are available. The population of this area mainly depends on rainy season crops.

During summers, when the soil and climate are dry, a few cucurbitaceous plants are cultivated for fruits and vegetables in the fields and on the sandy river-beds. The most common ones are the species of *Citrullus*, *Cucumis*, *Cucurbita*, *Lageneria*, *Luffa*, *Momordica* etc.

The food crops of the rainy season include cereals like *Echinochloa frumentacea*, *Oryza sativa*, *Pennisetum typhoides*, *Setaria italica*, *Sorghum saccharatum*, *Zea mays* etc. and pulses like *Cajanus cajan* and several species of *Vigna*.

The important vegetables of the rainy season are *Abelmoschus esculentus*, *Capsicum annum*, *Lablab purpureus*, *Cucumis melo* var. *culta* and *Solanum melongena*. *Cyamopsis tetragonoloba*, besides providing

edible pods and fodder, is the main source of Gaur gum particularly in desertic zones.

Oil-yielding crops include *Arachis hypogaea*, *Gossypium* species and *Sesamum indicum*. *Crotalaria juncea*, *Gossypium* species and *Hibiscus cannabinus* constitute the fiber-yielding crops.

2. *Orchards and gardens* : A large number of orchards and gardens are scattered throughout the area, particularly in the east of Aravalli. The common fruit-yielding plants are: *Aegle marmelos*, *Annona reticulata*, *A. squamosa*, *Carica papaya*, *Citrus* spp., *Mangifera indica*, *Psidium guajava*, *Punica granatum*, *Syzygium cumini*, *Ziziphus mauritiana* etc.

3. *Ornamental/Avenue plants* : Much of the greenery of the area is provided by a large number of avenue and ornamental trees, shrubs and climbers which have been planted along the roads, canals, in the gardens and parks. The common ones are:

(a) *Trees* : *Acacia pinnata*, *Adansonia digitata*, *Allanthus excelsa*, *Albizia lebbek*, *Bombax ceiba*, *Cassia fistula*, *C. siamea*, *Crateva nurvala*, *Delonix regia*, *Eucalyptus* species, *Gardenia resinifera*, *Metia azedarach*, *Morinda tomentosa*, *Pithecellobium dulce*, *Polyalthia longifolia*, *Sapindus laurifolius* etc.

(b) *Shrubs* : *Clerodendrum inerme*, *Dodonaea viscosa*, *Euphorbia pulcherima*, *Hibiscus* spp., *Lagerstroemia indica*, *Lawsonia inermis*, *Murraya paniculata*, *Nerium indicum*, *Rosa* spp., *Tabernaemontana divaricata*, *Thevetia peruviana* etc.

(c) *Climbers* : *Antigonon leptopus*, *Bougainvillea spectabilis*, *Clitoria ternatea*, *Ipomoea palmata*, *Jasminum grandiflorum* etc.

Besides these, a large number of seasonal herbs and climbers are cultivated in the gardens and parks for their decorative flowers. It is interesting to note that most of the cultigens are introductions from Madagascar, South Africa, South America, Java, Malaya, Burma, China, Australia, Brazil etc.

MATERIAL, METHODS AND PLAN OF THE FLORA

Material and Methods :

The results presented in this flora are based on intensive and extensive

explorations, exhaustive study of the plants of the state by the authors spread over twelve years (1972-84) and on the study of the specimens of earlier collectors deposited in the various Indian herbaria like BSI, BSA, CAL, DD, BLAT, LWG, JAC, RUBL, Govt. College Ajmer, Sukharia University, Udaipur etc.

The herbarium specimens collected by different scientists of the Regional Station of the Botanical Survey of India, Jodhpur are lodged in its herbarium at Jodhpur (BSJO) and the Central National Herbarium, Howrah (CAL). An attempt has been made to bring the nomenclature of all the taxa up-to-date in accordance with International Code of Botanical Nomenclature (ed. 1983). The short diagnostic descriptions, given in the present work, are based on the authors' own observations. However, wherever sufficient material was not available to the authors or where the taxa have been included on the authority of publications, the descriptions have been borrowed from recent authentic literature. During field and laboratory studies, observations on habit, habitat, abundance, ecological feature, flowering and fruiting periods were recorded which are reflected in the text. Certain taxa recorded in literature have been considered to be of doubtful occurrence in the area due to non availability of authentic herbarium material, interrupted range of distribution or some other reasons and these have been given in the end of the respective families. The local names and local uses wherever available have been included. To present a full account of the vegetation of the state, well established cultivated plants have been included in the present flora at the end of the respective families. Those cultigens, escapes and introductions which have perfectly naturalised in the area and form a part of the flora of the region have been included in the text of the flora.

Plan of the flora :

The present Flora of Rajasthan state will be published in two volumes and will deal mainly with the angiosperms. Volume 1 includes introductory chapters like introduction, previous work and present study, material, methods and plan of the flora, geographical position and physiography, geology and soils, general aspects of vegetation, key to the families and enumeration of species of about 70 families from Ranunculaceae to Asteraceae. The families are arranged according to Bentham and Hooker's classification (1862-83) except in a few cases in which Hutchinson's (1959)

concept regarding splitting of the families is followed. The names of the families are without the names of the authors and descriptions. In case of genera, the names are followed by the names of authors, but without descriptions. Below the name of each family, in parenthesis, the name of the scientist who has prepared the account of the family concerned is given. The general chapters have been prepared by V. Singh and key to families by R.P. Pandey and V. Singh. The genera and subordinate taxa in the text are arranged alphabetically under each family.

Keys : Dichotomous keys, based mostly on macroscopic characters, for the identification of the indigenous taxa from the rank of family to infra-specific level are given. Cultivated and doubtful taxa have not been included in the keys or text.

Nomenclature : Attempts have been made to adopt the correct name in accordance with the ICBN. Basionym, if any, is given to indicate the source of valid combination and important synonyms to connect the valid name with the names accepted in the "Flora of British India" and "Flora of Upper Gangetic Plain". Wherever the species is not included in these two works, other regional floras or recent literature have been cited.

Local names : The local names in different dialects of Rajasthan (Hindi) are given in inverted commas after citation.

Description : Brief diagnostic description of the species and infra-specific taxa, based on the authors' observations, are provided. However, wherever sufficient material was not available, the descriptions have been borrowed from the literature cited therein.

Flowering and fruiting time : The phenological data given in this work is also based on the authors' own observations and on the data recorded on the herbarium sheets examined during present study.

Ecological data : After phenological data, data about frequency, relative abundance, habitat, associations etc. are given.

Selected specimen : Some selected specimens, out of the material examined by the authors, have been cited to indicate the distribution of the taxa in the state. Wherever a species is included on the authority of some other worker, the same is indicated. The abbreviations of various herbaria are adopted from Index Herbariorum (ed. 1974).

Notes : In the end, remarks on taxonomic affinities, identity or nomenclature of the taxa have been given wherever found necessary.

Cultigens : The well established cultivated species, along with their valid names, important synonyms, primary diagnostic characters, local names and usefulness, are arranged alphabetically at the end of the respective families.

Doubtful taxa : Wherever authentic material was not available to confirm the identity of the taxon and its occurrence in the area is considered doubtful, such elements are given at the end of the respective families.

KEY TO THE FAMILIES

- 1a. Flowers arranged in cones. Ovules naked, borne on the surface of megasporophylls. Stigma absent. 123. *Gnetaceae*
- 1b. Flowers not arranged in cones. Ovules enclosed in megasporophylls. Stigma present:
 - 2a. Leaves with reticulate venation. Vascular bundles of the stem open, arranged in concentric rings. Seeds with cotyledons:
 - 3a. Perianth 2 to many-seriate, differentiated into calyx and corolla:
 - 4a. Corolla polypetalous or at least some of the petals free:
 - 5a. Flowers unisexual or polygamous:
 - 6a. Ovary inferior:
 - 7a. Trees or shrubs. 53. *Combretaceae*
 - 7b. Succulent or aquatic herbs:
 - 8a. Succulent herbs. Leaves alternate, sinuate-dentate to lacinate. 63. *Begoniaceae*
 - 8b. Aquatic herbs. Leaves in whorls, pectinately pinnatifid. 52. *Haloragaceae*
 - 6b. Ovary superior:
 - 9a. Ovaries unilocular, syncarpous or apocarpous:
 - 10a. Carpels 3-5, syncarpous:
 - 11a. Leaves scale-like, appressed and reduced. Fruit a capsule. 21. *Tamaricaceae*
 - 11b. Leaves well developed, long petioled, at the top of stem. Fruit a berry. 62. *Caricaceae*
 - 10b. Carpels 1 to many, apocarpous:
 - 12a. Fruit drupaceous:
 - 13a. Scandent or twining shrubs. Flowers unisexual. 4. *Menispermaceae*
 - 13b. Trees. Flowers polygamous. 44. *Anacardiaceae*
 - 12b. Fruit never drupaceous:
 - 14a. Carpel 1. Fruit a legume 48. *Mimosaceae*
 - 14b. Carpels 4-6. Fruit a follicle 25. *Sterculiaceae*
 - 9b. Ovaries always syncarpous, 2 to many-locular:
 - 15a. Stamens 1-5:

- 16a. Stamens inserted on the margins of disk. Style one, thick. 39. *Celastraceae*
- 16b. Stamens alternating with lobes of intrastaminal disk. Styles 3, entire or branched. 115. *Euphorbiaceae*
- 15b. Stamens 6 to many:
- 17a. Leaves pinnately 2 to many-foliolate:
- 18a. Trees or shrubs. Disk annular, basal, 10-lobed. Fruit an indehiscent drupe or samara:
- 19a. Leaflets more than 2. Ovary deeply divided. Fruit samaroid. 35. *Simaroubaceae*
- 19b. Leaflets 2. Ovary entire. Fruit a drupe. 36. *Balanitaceae*
- 18b. Twining herbs. Disk unilateral, of 2 glands, opposite the lower petals. Fruit an inflated, dehiscent, 3-valved capsule. 43. *Sapindaceae*
- 17b. Leaves simple, entire or palmately lobed. 115. *Euphorbiaceae*
- 5b. Flowers bisexual:
- 20a. Carpels 1 to many, apocarpous:
- 21a. Stamens 1 or 2-adelphous:
- 22a. Flowers actinomorphic. Corolla not papilionaceous. Calyx and corolla valvate in bud:
- 23a. Fruit a legume. 48. *Mimosaceae*
- 23b. Fruit a capsule. 25. *Sterculiaceae*
- 22b. Flowers zygomorphic. Corolla papilionaceous. Calyx and corolla imbricate in bud. 46. *Fabaceae*
- 21b. Stamens free:
- 24a. Corolla zygomorphic, caesalpinaceous. 47. *Caesalpinaceae*
- 24b. Corolla actinomorphic, not caesalpinaceous:
- 25a. Petals imbricate:
- 26a. Trees:
- 27a. Stem with resin passages. Gynoecium of 1 carpel. Fruit a drupe. 44. *Anacardiaceae*
- 27b. Stem without resin passages. Gynoecium of many, free carpels. Fruit a follicle of capsules. 2. *Magnoliaceae*
- 26b. Herbs, undershrubs or shrubs, never trees:
- 28a. Calyx polysepalous:
- 29a. Stem only subterranean and rhizomatous, no aerial stem. Leaves peltate. Flowers 8-20 cm in diam., showy. 7. *Nelumbonaceae*

- 29b. Stem aerial; subterranean and rhizomatous stem may or may not be present. Flowers less than 2 cm in diam. Leaves not peltate. 1. *Ranunculaceae*
- 28b. Calyx gamosepalous. 49. *Rosaceae*
- 25b. Petals valvate:
- 30a. Ovary superior. Fruit a legume. 48. *Mimosaceae*
- 30b. Ovary inferior. Fruit coriaceous or drupaceous, never a legume. 53. *Combretaceae*
- 20b. Carpels 2-many, syncarpous:
- 31a. Ovary 1-celled:
- 32a. Placentation parietal:
- 33a. Plants climbing with tendrils. 61. *Passifloraceae*
- 33b. Plants, if climbers, without tendrils:
- 34a. Stamens 1-adelphous. 13. *Resedaceae*
- 34b. Stamens free, diadelphous or polyadelphous:
- 35a. Stamens 2-6:
- 36a. Trees. Inflorescence a panicle 45. *Moringaceae*
- 36b. Herbs. Inflorescence racemose, usually raceme or corymb or flowers axillary solitary or geminate:
- 37a. Flowers irregular, with gibbous or spurred outer petals:
- 38a. Sepals 2. Stamens 6, in two bundles. 9. *Fumariaceae*
- 38b. Sepals 5. Stamens 5, free. 14. *Violaceae*
- 37b. Flowers regular. Petals normal, cruciform 10. *Brassicaceae*
- 35b. Stamens more than 6, usually indefinite:
- 39a. Stem spiny, succulent, flattened, jointed i.e. modified into phylloclades. Ovary inferior. 54. *Cactaceae*
- 39b. Stem normal, sometimes may have stipular spines, not phylloclade. Ovary superior:
- 40a. Fruit an indehiscent berry. 12. *Cappariaceae*
- 40b. Fruit a dehiscent capsule:
- 41a. Capsules up to 1 cm long, open at the top. 13. *Resedaceae*
- 41b. Capsules more than 1 cm long, dehiscent along the valves:

- 42a. Capsules 2-valved:
- 43a. Small trees. Sepals and petals 5 each. Fruit echinate. 16. *Bixaceae*
- 43b. Herbs. Sepals and petals 4 each. Fruits may be hairy, not echinate. 11. *Cleomaceae*
- 42b. Capsules 3 to 5-valved
- 44a. Trees or shrubs. Leaves compound or deeply divided. Sepals 5.
- 45a. Leaves 2 to 3-pinnate. Capsules cylindric, 15-50 cm long. Seeds smooth, 3-winged. 45. *Moringaceae*
- 45b. Leaves palmately deeply 3 to 5-lobed. Capsules obovoid, 5 to 10 cm long. Seeds cochleate, not winged. 15. *Cochlospermaceae*
- 44b. Herbs. Leaves simple, entire or dentate, not deeply divided. Sepals 2 to 3. 8. *Papaveraceae*
- 32b. Placentation free-central, axile, basal or apical, never parietal:
- 46a. Leaves scale like, appressed and reduced. 21. *Tamaricaceae*
- 46a. Leaves well developed:
- 47a. Succulent herbs. Sepals or calyx-lobes 2. 20. *Portulacaceae*
- 47b. Plants, even if herbs, not succulent. Sepals or calyx-lobes more than 2:
- 48a. Ovary superior. Placentation free central at least in upper region of the ovary; in the lower region it may be axile due to the formation of septa:
- 49a. Corolla caryophyllaceous. Stamens arising directly from the receptacle. Styles 2-5. Embryo curved. 19. *Caryophyllaceae*
- 49b. Corolla not caryophyllaceous. Stamens arising from the calyx-tube. Style 1. Embryo straight. 56. *Lythraceae*
- 48b. Ovary inferior. Placentation basal or apical:
- 50a. Calyx-lobes 4. Placentation basal. 54. *Myrtaceae*
- 50b. Calyx-lobes 5-10. Placentation apical:
- 51a. Shrubs or small trees. Leaves alternate. Style one. Fruit a berry. 68. *Atangiaceae*
- 51b. Herbs. Leaves opposite. Styles 2. Fruit a capsule. 50. *Vahliaceae*
- 31b. Ovary 2 to many-celled:
- 52a. Fruits dehiscent, liberating the seeds:
- 53a. Flowers zygomorphic:
- 54a. Capsules 2-celled, 2-valved and 2-seeded. Seeds strophiolate. 18. *Polygalaceae*
- 54b. Capsules 5-celled, 5-valved, many-seeded. Seeds estrophiolate. 33. *Balsaminaceae*

- 53b. Flowers actinomorphic:
- 55a. Ovary inferior or semi-inferior. 58. *Onagraceae*
- 55b. Ovary superior:
- 56a. Corolla cruciform. Placentation parietal. 10. *Brassicaceae*
- 56b. Corolla not cruciform. Placentation axile, basal or apical:
- 57a. Stamens free, distinct:
- 58a. Leaves alternate:
- 59a. Leaves simple, entire or pinnately divided, not compound:
- 60a. Sepals valvate. 26. *Tiliaceae*
- 60b. Sepals imbricate. 30. *Geraniaceae*
- 59b. Leaves pinnately or palmately compound:
- 61a. Styles 5, distinct from the base. 32. *Oxalidaceae*
- 61b. Style 2, with 2 to 5-lobed stigma or style branches upwards:
- 62a. Ovules 2 in each-cell of ovary. 37. *Burseraceae*
- 62b. Ovule 1 in each cell of ovary. 43. *Sapindaceae*
- 58b. Leaves opposite or whorled:
- 63a. Leaves simple:
- 64a. Stipules present. Sepals imbricate:
- 65a. Capsule-cells 1 to 2-seeded. 30. *Geraniaceae*
- 65b. Capsule-cells more than 2-seeded, usually many seeded. 22. *Elatinaceae*
- 64b. Stipules absent. Sepals valvate. 56. *Lythraceae*
- 63b. Leaves pinnately or digitately compound. 32. *Oxalidaceae*
- 57b. Stamens united, atleast at the base:
- 66a. Anthers 1-celled:
- 67a. Trunk or stem unarmed. Stamens 1-adelphous. Pollens rough. Pericarp of fruits normal, not as below. 23. *Malvaceae*
- 67b. Trunk armed with spines. Stamens polyadelphous. Pollens smooth. Pericarp of fruits pithy or woolly. 24. *Bombacaceae*
- 66b. Anthers 2-celled:
- 68a. Stamens distinctly 1-adelphous. 25. *Sterculiaceae*
- 68b. Stamens slightly connate at the base only:
- 69a. Stamens 5. Radicle superior. 27. *Linaceae*
- 69b. Stamens more than 5, usually indefinite or twice the number of petals. Radicle next to hilum. 26. *Tiliaceae*

- 52b. Fruits indehiscent, not liberating the seeds, often separating into mericarps, cocci or carpels:
- 70a. Fruit acutely angled or winged:
- 71a. Scandent shrubs. Leaves simple. Fruit samaroid. 28. *Malpighiaceae*
- 71b. Trees. Leaves imparipinnate. Fruit a berry, acutely angled. 31. *Averrhoaceae*
- 70b. Fruit neither angled nor winged, occasionally terete:
- 72a. Ovary inferior or semi-inferior:
- 73a. Fruits 1-seeded:
- 74a. Aquatic herbs. Fruits with 2 spines. 59. *Trapaceae*
- 74b. Terrestrial trees. Fruits smooth:
- 75a. Leaves opposite, gland-dotted. 54. *Myrtaceae*
- 75b. Leaves alternate, not gland-dotted. 55. *Boraginaceae*
- 73b. Fruits 2 to many-seeded:
- 76a. Flowers in umbels. Ovary 2-locular. Fruit of 2 mericarps. 67. *Apiaceae*
- 76b. Flowers axillary, solitary or clustered. Fruit a berry. 57. *Punicaceae*
- 72b. Ovary superior:
- 77a. Aquatic herbs with peltate leaves. Carpels embedded in the torus and forming a compound, many-celled ball resembling a syncarpous ovary. 6. *Nymphaeaceae*
- 77b. Plants terrestrial. Leaves not peltate. Carpels truly syncarpous or very close to one another resembling syncarpous ovary, never embedded in the torus:
- 78a. Stamens 1-adelphous:
- 79a. Anthers 1-celled. 23. *Malvaceae*
- 79b. Anthers 2-celled:
- 80a. Leaves pinnately compound. Hypogynous disk present. 38. *Meliaceae*
- 80b. Leaves simple. Hypogynous disk absent. 25. *Sterculiaceae*
- 78b. Stamens free, distinct:
- 81a. Placentation parietal. 12. *Capparaceae*
- 81b. Placentation axile or basal:
- 82a. Leaves simple:
- 83a. Leaves exstipulate. Petals 6, in two series, of 3 each. 3. *Annonaceae*
- 83b. Leaves stipulate. Petals 4 to 5, in one series:

- 84a. Tendril bearing plants:
- 85a. Fruit a berry. 41. *Vitaceae*
- 85b. Fruit a samara. 40. *Rhamnaceae*
- 84b. Tendrils absent:
- 86a. Stamens arising directly from the receptacle. True hypogynous disk absent. 26. *Tiliaceae*
- 86b. Stamens arising from hypogynous disk, not directly from the receptacle. 40. *Rhamnaceae*
- 82b. Leaves compound:
- 87a. Leaves opposite. 29. *Zygophyllaceae*
- 87b. Leaves alternate:
- 88a. Leaflets gland-dotted. 34. *Rutaceae*
- 88b. Leaflets not gland-dotted:
- 89a. Stamens as many as and opposite the petals. 41. *Vitaceae*
- 89b. Stamens twice as many as petals or as many as and alternating with the petals or lesser than the number of petals:
- 90a. Styles 2-5, free throughout or at least at the base or connate by stigmas only:
- 91a. Leaflets more than 2. Fruit samaroid. 35. *Simaroubaceae*
- 91b. Leaflets 2. Fruit a drupe. 36. *Balanitaceae*
- 90b. Style 1, simple or branched at the apex. 43. *Sapindaceae*
- 4b. Petals united variously, usually forming a short or a long tube:
- 92a. Ovary inferior:
- 93a. Plants climbing with the help of tendrils. Stem with bicolateral vascular bundles. 60. *Cucurbitaceae*
- 93b. Plants not climbers, or if climbers then without tendrils. Stem with colateral vascular bundles:
- 94a. Stem flattened, modified into phylloclades. Leaves reduced to spines. 64. *Cactaceae*
- 94b. Stem normal, with well developed normal leaves:
- 95a. Leaves exstipulate:
- 96a. Inflorescence a head. Calyx modified into pappus. Anthers syngeneisus. Ovary 1-celled. Achenes 1-seeded. 70. *Asteraceae*

96b. Inflorescence racemose or subpaniculate or spicate. Calyx sepeloid. Anthers free. Ovary 2 to 5-celled. Capsules or berries many seeded:

97a. Flowers in spikes. Placentation apical. Capsules with circumscissile dehiscence. 72. *Sphenocleaceae*

97b. Flowers solitary or in racemes or subpanicles. Placentation axile or superficial. Capsules dehiscing loculicidally. 71. *Campanulaceae*

95b. Leaves stipulate; stipules usually intrapetiolar or interpetiolar. 69. *Rubiaceae*

92b. Ovary superior:

98a. Gynoecium of 2-4, distinct, apocarpous ovaries and 2-4, distinct styles having their own stigmas or distinct styles and a common stigma or a common style with single stigma:

99a. Stamens 8, in two series of 4 each. 51. *Crassulaceae*

99b. Stamens 5, in one series:

100a. Pollens in pollinia. Styles 2, distinct in lower region, united in stigmatic region and bearing a single stigma. Anthers united with the stigma to form a gynostegium:

101a. Pollen masses granular. Pollen carrier spatulate. 81. *Periplocaceae*

101b. Pollen masses waxy. Pollen carrier slender. 80. *Asclepiadaceae*

100b. Pollens distinct, not in pollinia. Styles 2, united from the base forming a common style with a stigma. Gynostegium absent. 79. *Apocynaceae*

98b. Gynoecium of a single ovary made up of 1 or many syncarpous carpels. Styles may be united, indistinct from the base of branched in upper region. Stigmas entire or lobed:

102a. Ovary 1-celled:

103a. Flowers unisexual. 4. *Menispermaceae*

103b. Flowers bisexual:

104a. Style solitary, with entire or lobed stigma:

105a. Fruits woody, beetle shaped, 2-horned. 98. *Martyniaceae*

105b. Fruits not as above:

106a. Placentation basal:

- 107a. Aquatic, insectivorous herbs. Leaf segments modified into bladders. Stamens 2. 93. *Lentibulariaceae*
- 107b. Terrestrial herbs or trees. Leaves normal. Stamens 4:
- 108a. Trees. Fruit an indehiscent berry or drupe. 78. *Salvadoraceae*
- 108b. Herbs. Fruit a circumscissile capsule. 102. *Plantaginaceae*
- 106b. Placentation marginal, parietal or free central:
- 109a. Placentation marginal. Corolla papilionaceous. Fruit a legume. 46. *Fabaceae*
- 109b. Placentation parietal or free-central. Corolla not papilionaceous. Fruit a capsule:
- 110a. Stamens opposite the corolla-lobes. Placentation free-central. 74. *Primulaceae*
- 110b. Stamens alternating with the corolla-lobes. Placentation parietal:
- 111a. Flowers zygomorphic. Stamens didynamous:
- 112a. Plants root-parasites. Leaves absent or scaly and without chlorophyll. 94. *Orobanchaceae*
- 112b. Plants autotrophic. Leaves normal, with chlorophyll. 95. *Gesneriaceae*
- 111b. Flowers actinomorphic. Stamens 4-7, not didynamous:
- 113a. Aquatic herbs. Leaves alternate, floating on water surface. Corolla-lobes induplicate-valvate in bud. 85. *Menyanthaceae*
- 113b. Terrestrial herbs. Leaves opposite. Corolla-lobes contorted in bud. 84. *Genianaceae*
- 104b. Styles 5, distinct, with their own stigmas. 73. *Phumbaginaceae*
- 102b. Ovary more than one-celled:
- 114a. Corolla always uniseriate and stamens less than the corolla-lobes:
- 115a. Flowers actinomorphic. 77. *Oleaceae*
- 115b. Flowers zygomorphic:
- 116a. Inflorescence verticillaster. Mature ovary separating into 1-seeded nutlets. Style gynobasic. 101. *Lamiaceae*
- 116b. Inflorescence otherwise. Mature ovary not separating into nutlets, dehiscing variously or indehiscent. Style terminal:
- 117a. Seeds prominently winged. 96. *Bignoniaceae*
- 117b. Seeds not winged:

- 118a. Seeds attached on upcurved processes i.e. retinaculæ. 99. *Acanthaceae*
- 118b. Seeds without retinaculæ:
- 119a. Flowers with extra-floral glands at the base of pedicels. 97. *Pedaliaceae*
- 119b. Flowers without extra-floral glands:
- 120a. Each cell of ovary 1 to 2-ovuled. Fruits indehiscent. 100. *Verbenaceae*
- 120b. Each cell of ovary more than 2-ovuled. Fruits dehiscent. 92. *Scrophulariaceae*
- 114b. Corolla, if uniseriate then with stamens as many as the corolla-lobes or more; if multiseriate then the stamens as the petals of one series or more:
- 121a. Flowers unisexual. 76. *Ebenaceae*
- 121b. Flowers bisexual:
- 122a. Stamens free from petals. 32. *Oxalidaceae*
- 122b. Stamens epipetalous:
- 123a. Plants stem-parasites, with yellow, leafless, much branched climbing stem. 90. *Cuscutaceae*
- 123b. Plants either autotrophic or root-parasites. Stem normal in both conditions:
- 124a. Carpels placed obliquely. Placenta swollen. 91. *Solanaceae*
- 124b. Carpels not placed obliquely. Placenta not swollen:
- 125a. Fruit a capsule, dehiscing in various ways:
- 126a. Leaves radical or alternate or both:
- 127a. Scapigerous herbs. Petals scarious. Capsule circumscissile. Tests of seeds mucilaginous. 102. *Plantaginaceae*
- 127b. Plants, if herbs, not scapigerous. Petals petaliferous. Fruit, if capsule, not circumscissile. Seeds not mucilaginous:

- 128a. Climbers, twiners or creepers, rarely erect shrubs. Vascular bundles in stem bicollateral. Seeds 1-4 in each cell. 89. *Convolvulaceae*
- 128b. Erect or decumbent herbs. Vascular bundles in stem collateral. Seeds more than 4 in each cell. 86. *Hydrophyllaceae*
- 126b. Leaves opposite:
- 129a. Capsules compressed contrary to the septum. Carpels first separating and then dehiscent along the inner face. 82. *Spigeliaceae*
- 129b. Capsules globose, not compressed, septicidally 2-valved:
- 130a. Herbs. 84. *Gentianaceae*
- 130b. Trees or shrubs. 83. *Buddlejaceae*
- 125b. Fruit a fleshy or dry and hard berry, drupe or nut, dividing into 2-4 nutlets:
- 131a. Plants with milky juice. Stamens opposite the petals. 75. *Sapotaceae*
- 131b. Plants with watery juice. Stamens alternating with the petals:
- 132a. Stamens free, distinct:
- 133a. Trees. Fruit a drupe. 88. *Ehretiaceae*
- 133b. Erect, prostrate or twining herbs or shrubs. Fruit a nut of 2-4 nutlets or a dry hard berry:
- 134a. Ovary 4-lobed outside. Style gynobasic or rarely subterminal. Fruit a nut of 2-4 nutlets. 87. *Boraginaceae*
- 134b. Ovary not lobed outside. Style terminal. Fruit a dry hard berry. 89. *Convolvulaceae*
- 132b. Stamens united at the base into a 5-lobed staminal tube. 42. *Loasaceae*
- 3b. Perianth absent or when present, not differentiated into calyx and corolla:
- 135a. Perianth absent i.e. flowers naked:
- 136a. Ovary inferior:
- 137a. Trees or shrubs. Ovary 1-celled. Fruits indehiscent. 53. *Combretaceae*
- 137b. Aquatic herbs. Ovary 2 to 4-celled. Fruits separating into carpels. 52. *Haloragaceae*
- 136b. Ovary superior:

- 138a. Inflorescence a cythium. Placentation axile. 115. *Euphorbiaceae*
- 138b. Inflorescence a catkin-like spike. Placentation apical, basal or parietal:
- 139a. Gynoecium apocarpous or syncarpous; ovary 1-celled and 1-ovuled. 110. *Piperaceae*
- 139b. Gynoecium syncarpous. Ovary 1-celled and many-ovuled. 121. *Salicaceae*
- 135b. Perianth present, uni to multiseriate, not differentiated into calyx and corolla:
- 140a. Gynoecium of one or more pistils; ovary 1-celled:
- 141a. Ovary inferior or semi-inferior:
- 142a. Seeds without seed-coat, but attached to the pericarp of the fruit:
- 143a. Partial stem parasites. Ovary 1-ovuled. 113. *Loranthaceae*
- 143b. Partial root-parasites. Ovary 2 to 3-ovuled. 114. *Santalaceae*
- 142b. Seeds with distinct seed-coat, not attached to the pericarp of the fruit:
- 144a. Trees. Stamens 10. 53. *Combretaceae*
- 144b. Herbs. Stamens 5 or less. 105. *Chenopodiaceae*
- 141b. Ovary superior:
- 145a. Stipules ocreate. 108. *Polygonaceae*
- 145b. Stipules, if present, not ocreate:
- 146a. Inflorescence a catkin or hypanthodium. 118. *Moraceae*
- 146b. Inflorescence otherwise or flowers arranged variously:
- 147a. Fruit samaroid. 116. *Ulmaceae*
- 147b. Fruit a berry, nut, urticle or capsule etc., not samara:
- 148a. Plants dioecious, monoecious or polygamous:
- 149a. Placentation parietal:
- 150a. Branches jointed. Leaves reduced to many-toothed sheaths surrounding the nodes. Flowers arranged in cone-like spikes. Stamen 1. 120. *Casuarinaceae*

- 150b. Branches not jointed. Leaves normal, alternate. Flowers not in spikes. Stamens many. 17. *Flacourtiaceae*
- 149b. Placentation basal or apical:
 - 151a. Placentation basal:
 - 152a. Leaves stipulate. 119. *Urticaceae*
 - 152b. Leaves exstipulate:
 - 153a. Fruit drupaceous. 4. *Menispermaceae*
 - 153b. Fruit an utricle, nut or follicle of carpels:
 - 154a. Fruit a follicle of membranous, papillose carpels. 66. *Molluginaceae*
 - 154b. Fruit an utricle or nut, epapillose:
 - 155a. Bracts and tepals scarious. 104. *Amaranthaceae*
 - 155b. Bracts and tepals, if present, green and herbaceous. 105. *Chenopodiaceae*
 - 151b. Placentation apical:
 - 156a. Plants terrestrial. Leaves alternate or opposite. Flowers in axillary cymes or racemes:
 - 157a. Trees or shrubs. Leaves gland-dotted, not palmately divided. Perianth-segments 6 or 4. Fruit a dry or fleshy berry. 111. *Lauraceae*
 - 157b. Herbs or undershrubs. Leaves palmately 3 to 11-partite, eglandular. Perianth segments 5. Fruit a crustaceous nut. 117. *Cannabinaceae*
 - 156b. Plants delicate aquatic herbs. Leaves in whorls. Flowers solitary, axillary. 122. *Ceratophyllaceae*
 - 148b. Plants with bisexual flowers only:
 - 158a. Gynoecium of more than one, apocarpous unilocular pistils:
 - 159a. Ovules 2 to many in each carpel:
 - 160a. Leaves imparipinnate or 1-foliolate and fascicled in the axils of stipular spines. 5. *Berberidaceae*
 - 160b. Leaves simple or digitately compound, exstipulate. 25. *Sterculiaceae*
 - 159b. Ovule 1 in each carpel:
 - 161a. Fruits papillose. 66. *Molluginaceae*
 - 161b. Fruits not papillose. 107. *Phytolaccaceae*
 - 158b. Gynoecium of 1 pistil, made up of 1 carpel or of many syncarpous carpels;

- 162a. Ovary 1-carpelled:
- 163a. Leaves exstipulate:
- 164a. Large trees, with pinnately compound leaves and secund, unilateral racemes. Seeds non-endospermic. 112. *Proteaceae*
- 164b. Herbs or straggling shrubs with simple leaves. Inflorescence, if raceme, not 1-sided. Seeds endospermic. 103. *Nyctaginaceae*
- 163b. Leaves stipulate and stipules modified into spines. 5. *Berberidaceae*
- 162b. Ovary 2 to many-carpelled, syncarpous, 1-celled:
- 165a. Fruit samaroid. 116. *Ulmaceae*
- 165b. Fruit not winged:
- 166a. Trees:
- 167a. Fruit a dry or fleshy berry. Placentation apical. 111. *Lauraceae*
- 167b. Fruit a capsule. Placentation parietal. 17. *Flacourtiaceae*
- 166b. Herbs or herbaceous twiners or undershrubs:
- 168a. Twining, fleshy herbs. Utricles enclosed in fleshy perianth. 106. *Basellaceae*
- 168b. Erect or prostrate herbs or undershrubs. Fruits not enclosed in the perianth:
- 169a. Fruit a nut or utricle:
- 170a. Bracts and tepals scarious. 104. *Amaranthaceae*
- 170b. Bracts and tepals, if present, herbaceous. 105. *Chenopodiaceae*
- 169b. Fruit a dehiscent capsule:
- 171a. Leaves unequal in each pair at the nodes, base dilated into a pouch. Tepals gamophyllous. Stamens epiphyllous. 65. *Aizoaceae*
- 171b. Leaves equal in size, opposite or whorled. Tepals polyphyllous. Stamens hypogynous. 66. *Molluginaceae*
- 140b. Gynoecium of 1 pistil; ovary 2 to many-celled, it may be due to intrusion of placentae:
- 172a. Perianth zygomorphic. Ovary inferior. 109. *Aristolochiaceae*
- 172b. Perianth actinomorphic. Ovary superior:
- 173a. Flowers 1-sexual. 115. *Euphorbiaceae*
- 173b. Flowers 2-sexual:

- 174a. Plants armed with stipular spines. 40. *Rhamnaceae*
- 174b. Plants unarmed:
 - 175a. Fruit an indehiscent berry or drupaceous. 107. *Phytolaccaceae*
 - 175b. Fruit a dehiscent capsule:
 - 176a. Leaves opposite, unequal in each pair, base dilated into a pauch. Placentation basal. 65. *Aizoaceae*
 - 176b. Leaves alternate, whorled or opposite, but equal in size; base not dilated into a pauch. Placentation axile:
 - 177a. Style 1, entire or branched in upper region or in stigmatic region:
 - 178a. Plants with 2-sexual flowers only. 56. *Lythraceae*
 - 178b. Plants polygamo-dioecious. 43. *Sapindaceae*
 - 177b. Styles 2 to 5, free from the base. 66. *Molluginaceae*
- 2b. Leaves with parallel venation. Vascular bundles of stem scattered and closed. Seeds with one cotyledon:
 - 179a. Perianth absent or modified into hairs, bristles or scales:
 - 180a. Plants woody. Leaves with spinous margins. 142. *Pandanaceae*
 - 180b. Plants herbaceous. Leaves without spines:
 - 181a. Plant-body thalloid. 145. *Lemnaceae*
 - 181b. Plant-body differentiated into root, stem and leaves:
 - 182a. Inflorescence a fleshy spadix or dense glomerule. 144. *Araceae*
 - 182b. Inflorescence not as above:
 - 183a. Flowers in the axils of glumes or between two glumes, united in spikelets. Spikelets arranged variously:
 - 184a. Leaf-sheath splitting (open). Fruit a caryopsis. 154. *Poaceae*
 - 184b. Leaf-sheath not splitting (closed). Fruit an achene. 153. *Cyperaceae*
 - 183b. Flowers not enclosed or subtended by glumes, but surrounded by thread-like or spatulate forked scales, arranged in spikes. 143. *Typhaceae*

179b. Perianth always present in bisexual flowers. When flowers are unisexual, atleast one sex with perianth which may or may not be differentiated into calyx and corolla:

185a. Ovary inferior:

186a. Ovary 1-celled:

187a. Stamens 1 or 2:

188a. Aquatics. Flowers regular. Stamens and style distinct. Pollens not in pollinia. 124. *Hydrocharitaceae*

188b. Terrestrials or epiphytes. Flowers irregular. Stamens and style united into a column. Pollen in pollinia. 126. *Orchidaceae*

187b. Stamens more than 2:

189a. Terrestrial herbs:

190a. Seeds endospermic. 130. *Iridaceae*

190b. Seeds non-endospermic. 125. *Burmanniaceae*

189b. Aquatic herbs. 124. *Hydrocharitaceae*

186b. Ovary 2 or more-celled:

191a. Fertile stamen 1:

192a. Anthers 2-celled. 127. *Zingiberaceae*

192b. Anthers 1-celled. 128. *Cannaceae*

191b. Fertile stamens 2 or more:

193a. Flowers 1-sexual:

194a. Dioecious twiners. Leaves cauline. Bracts simple or absent. 135. *Dioscoreaceae*

194b. Monoecious tree-like erect plants with stem formed by imbricate base of petioles. Leaves basal; lamina at the top. Bracts spathaceous. 129. *Musaceae*

193b. Flowers 2-sexual:

195a. Plants scapose:

196a. Flowers subtended or enclosed within spathaceous bracts:

197a. Ovary 6-celled. Styles 6. 124. *Hydrocharitaceae*

197b. Ovary 3-celled. Style 1, may be 3-lobed in stigmatic region. 132. *Amaryllidaceae*

196b. Flowers ebracteate or bracts not spathaceous:

- 198a. Leaves fibrous, spine-tipped. 133. *Agavaceae*
- 198b. Leaves neither fibrous, nor spine-tipped:
- 199a. Flowers blue or purple. 125. *Burmanniaceae*
- 199b. Flowers yellow. 134. *Hypoxidaceae*
- 195b. Plants not scapose. 130. *Iridaceae*
- 185b. Ovary superior:
- 200a. Gynoecium apocarpous:
- 201a. Flowers 2-sexual:
- 202a. Perianth segments 6, arranged in two whorls of 3 each, differentiated into calyx and corolla:
- 203a. Fruit indehiscent, of 3 or more achenes. Ovule and seed solitary in each carpel. 146. *Alismataceae*
- 203b. Fruit dehiscent, of 6-7 follicles. Ovules and seeds many in each carpel. 147. *Butomaceae*
- 202b. Perianth of 1-4, uniseriate segments, sepaloid or petaloid not differentiated into calyx and corolla:
- 204a. Tepals 1-3, white or coloured, Stamens 6 or more. 148. *Aponogetonaceae*
- 204b. Tepals 4, green. Stamens 4. 149. *Potamogetonaceae*
- 201b. Flowers 1-sexual:
- 205a. Stamen 1:
- 206a. Male flowers without perianth. Female flowers with a cupular hyaline perianth. 150. *Zannichelliaceae*
- 206b. Male flowers with double perianth, the outer tubular or inflated, the inner hyaline. Female flowers without perianth or with hyaline perianth adnate to the carpel. 151. *Najadaceae*
- 205b. Stamens 2 to many:
- 207a. Trees or shrubs. Stem with leaf-scars. Leaves pinnately or palmately divided to compound. Inflorescence a spadix. Bracts hard, stony and spathaceous. 141. *Arecaceae*
- 207b. Aquatic or marshland herbs. Stem without leaf-scars. Leaves simple, entire. Inflorescence umbellate or paniculate. Bracts, if any, herbaceous, not spathaceous:
- 208a. Fruit indehiscent, of 3 or more achenes. Ovule solitary in each carpel. 146. *Alismataceae*
- 208b. Fruit dehiscent, of 6-7 follicles. Ovules many in each carpel. 147. *Butomaceae*

200b. Gynoecium syncarpous:

209a. Flowers 1-sexual:

210a. Leaves reduced, having leaf-like branches (cladodes) in the axils. 131. *Ruscaceae*

210b. Leaves normal. Cladodes absent:

211a. Scapigerous herbs. Leaves grass-like, with sheathing base. Flowers in involucrate heads. Fruit a capsule. 152. *Eriocaulaceae*

211b. Climbing shrubs, with tendrils. Leaves normal, ovate-lanceolate. Flowers in umbels. Fruit a berry. 137. *Smilacaceae*

209b. Flowers 2-sexual:

212a. Perianth segments all alike, either sepaloid or petaloid:

213a. Stamens 3:

214a. Filaments connate into a column. 131. *Ruscaceae*

214b. Filaments free:

215a. Aquatic herbs. 138. *Pontederiaceae*

215b. Terrestrial herbs:

216a. Perianth sepaloid. Anthers introrse. 140. *Juncaceae*

216b. Perianth petaloid. Anthers extrorse. 130. *Iridaceae*

213b. Stamens 6:

217a. Filaments connate into a column. 131. *Ruscaceae*

217b. Filaments free:

218a. Plants mesophytic. Leaves not spiny:

219a. Terrestrial herbs. Flowers regular:

220a. Perianth sepaloid. Anthers basifixed. 140. *Juncaceae*

220b. Perianth petaloid. Anthers dorsifixed or versatile. 136. *Liliaceae*

219b. Aquatic herbs. Flowers irregular. 138. *Pontederiaceae*

- 218b. Plants xerophytic. Leaves spine-tipped and spiny on the margins. 133. *Agavaceae*
- 212b. Perianth distinguished into calyx and corolla:
- 221a. Flowers irregular:
- 222a. Terrestrials. Flowers in cymes or panicles. 139. *Commelinaceae*
- 222b. Aquatics. Flowers in racemes or spikes. 138. *Pontederiaceae*
- 221b. Flowers regular. 136. *Liliaceae*

1. RANUNCULACEAE

(P.J. Parmar)

RANUNCULUS L.

Fruiting receptacles globose. Achenes flattened, broad-margined, tuberculate, long-beaked.

1. *R. muricatus*

Fruiting receptacles oblong. Achenes turgid, not margined, smooth or faintly rugose, short-beaked.

2. *R. sceleratus*

1. *Ranunculus muricatus* L. Sp. Pl. 555. 1753; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 20. 1872; Raizada, Suppl. Duthie, Fl. Gangetic Plain 3. 1976.

Erect, glabrous herbs; stem fistular. Leaves long-petioled, 10-15 × 5-10 cm, orbicular to reniform, 3-fid, irregularly dentate. Flowers in terminal or leaf-opposed, 1-2 cm across, pedunculate heads, yellow. Achenes 20-25, 0.6-0.65 × 0.4 cm, ovoid.

Fl & Fr. : February - May.

Rare, in moist and shady places.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 18012, 18013 (BLAT).

Also reported by Majumdar (1969) from Pilani (Jhunjhunu district).

2. *Ranunculus sceleratus* L. Sp. Pl. 551. 1753; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 19. 1872; Duthie, Fl. Gangetic Plain 1: 19. 1903; Mahesh, Illus. Fl. Delhi f. 1. 1966. "*Jai-dhania*" (Hindi).

Erect, glabrous, annual herbs, 30-60 cm high; stem and branches fistular. Radical leaves long-petioled, 2-5 cm across, reniform, palmately 3-lobed with obovate, cuneate segments; cauline leaves 3-partite with narrow oblong segments. Flowers in leaf-opposed, pedunculate heads, yellow. Achenes numerous, c. 0.1 cm across, apiculate.

Fl & Fr. : February - May.

Common in water-logged areas, near canals and streams, particularly in eastern Rajasthan.

Selected specimens : Bharatpur: Bharatpur feeder canal, *Parmar* 8562 (BSJO); Kota: *Majumdar & Mishra* 10432 (BSA); Sirohi: Mt. Abu, *Blatter* 18015 (BLAT). Also reported by Dhillon & Bajwa (1969) from Ganganagar district.

2. MAGNOLIACEAE

(P.J. Parmar)

MICHELIA L.

Michelia champaca L. Sp. Pl. 536. 1753. "Naglichampa" (Hindi).

Tall, evergreen trees, with greyish-brown bark and ovate to lanceolate, coriaceous leaves. Flowers usually axillary, solitary, yellow or orange, fragrant.

Commonly cultivated in the gardens and near temples for its fragrant flowers and handsome foliage.

3. ANNONACEAE

(P.J. Parmar)

Outer series of petals c. 2.5 cm long, inner minute or wanting. Anther cells concealed by the overlapping connectives.

1. *Annona*

Outer series of petals minute, inner c. 1.25 cm long. Anther cells not concealed by the overlapping connectives

2. *Millettia*

1. ANNONA L.

Annona squamosa L. Sp. Pl. 537. 1753; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 78 1872; Duthie, Fl. Gangetic Plain 1: 23. 1903. "Sitaphal, Sarifa" (Hindi).

Evergreen shrubs or small trees. Leaves petioled, 3-10 × 1.75-5.0 cm, oblong, oblong-lanceolate or elliptic, acute at base, obtuse to acuminate at apex, glabrous. Flowers solitary and leaf-opposed or 2-4 on short extra-axillary branchlets, yellowish-green. Petals thick, 3-angular, valvate. Stamens many. Fruits 5-10 cm across, globose, cordate or ovoid with projecting areoles. Seeds smooth, brownish-black.

Fl. : April - July; Fr. : June- August.

Native of Tropical America and West Indies; naturalised in the valleys and along streams throughout the Aravalli range; also cultivated for the edible fruits.

Selected specimens : Banswara: Shergarh forest, Singh 3081 (BSJO); Jaipur: Amer, Sharma 252 (RUBL); Kota: Shahabad, Verma 607 (BSA); Udaipur: Haldi ghati, Sharma 153 (LWG).

2. MILIUSA LESH. EX DC.

Miliusa tomentosa (Roxb.) J. Sinclair in Garden Bull. Singapore 14: 378. 1955. *Uvaria tomentosa* Roxb. Pl. Cor. 1: 31. t. 35. 1795. *Saccopetalum tomentosum* Hook. f. & Thoms. Fl. Ind. 152. 1855 et in Hook. f. Fl. Brit. India 1: 88. 1872; Duthie, Fl. Gangetic Plain 1: 25. 1903. "Kari, Kirua" (Hindi).

Large, deciduous trees, 15-20 m high; bark longitudinally fissured, black; young parts pubescent. Leaves alternate, 6-15 × 5-8 cm, ovate-oblong, rounded or subacute at the base, acute at apex. Flowers in leaf opposed or subterminal, 2 to 4-flowered cymes, greenish-yellow. Fruits subglobose, tapering slightly towards the base, succulent, tomentose, purple when ripe.

FL : March - April; Fr. : June - July.

Common in the forests, particularly in the east of Aravalli.

Selected specimens : Ajmer: Lowrie 5/35 (DD); Alwar: Pandupole, Sharma 3926 (RUBL); Chittorgarh: Verma 280 (BSA); Kota: Chandanbari, Wadhwa 9431 (BSI); Pali: Ghanerao, Shetty 1896 (BSJO).

CULTIVATED SPECIES

Annona reticulata L. "Ramphal" (Hindi) Small trees with membranous, oblong-lanceolate leaves and yellowish green flowers. Fruits subglobose, yellowish brown when ripe. Native of West Indies; occasionally cultivated in the eastern parts of the state for its edible fruits.

Artabotrys hexapetalus (L.f.) Bhandari (*Annona hexapetala* L.f.) "Kathchampa" (Hindi) Evergreen, scandent or sarmentose shrubs with yellowish-green, glabrous leaves and dark green flowers dropping from hooked peduncles. Cultivated in S.E. Rajasthan for its fragrant flowers.

Polyalthia longifolia (Sonnerat) Thw. (*Uvaria longifolia* Sonnerat) "Ashok" (Hindi) Evergreen trees, with blackish-brown bark. Leaves narrowly lanceolate, tapering into an acute apex, margins undulate. Flowers in fascicles or shortly peduncled umbels, yellowish-green. Fruits ovoid. Native of Ceylon and Bengal; planted in the gardens and along the roads as an avenue tree.

4. MENISPERMACEAE

(P.J. Parmar)

- 1a. Leaves peltate. Filaments united. Carpel solitary. 1. *Cissampelos*
- 1b. Leaves not peltate. Filaments free. Carpels 3 or more, rarely less due to abortion;
- 2a. Flowers appearing when the plant is leafless. Seeds oblong or globose. 4. *Tinospora*
- 2b. Flowers appearing with the leaves. Seeds horse-shoe shaped:
- 3a. Leaves pubescent. Flowers in fascicles or cymed along the rachis. Carpels 3. 2. *Cocculus*
- 3b. Leaves glabrous. Flowers in elongate, lax, axillary, racemose panicles. Carpels 3-12. 3. *Tiliacora*

1. CISSAMPELOS L.

Cissampelos pareira L. var. *hirsuta* (Buch.-Ham. ex DC.) Forman in Kew Bull. 22: 356. 1968. *C. hirsuta* Buch.-Ham. ex DC. Syst. Nat. 1: 535. 1817. *C. pareira* auct. non L. 1753; *sensu* Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 103. 1872; Duthie, Fl. Gangetic Plain 1: 30. 1903; Mahesh. Illus. Fl. Delhi f. 2. 1966.

Slender, twining, dioecious shrubs. Leaves alternate, 3-7 × 3-10 cm, orbicular or reniform, cordate or truncate at base, apiculate, densely silky hairy beneath. Flowers greenish yellow; male flowers in axillary cymes; female flowers in pendulous, 4-15 cm long racemes. Drupes subglobose, 0.4-0.6 cm in diam., glabrescent or hairy, red when ripe.

Fl. & Fr. : July - October.

Common among the hedges, clumps of small trees and shrubs in dry deciduous forests and in scrub jungles throughout the state, particularly in the east of Aravalli.

Selected specimens : Banswara: Kotharia forest, Singh 3045 (BSJO); Bikaner: Nal, Kanodia 82503 (BSI); Bhitwara: On the way to Bijolia, Singh 6088 (BSJO); Kota: Shahabad, Jain 28810, 28837 (BSI); Pali: Kanpahar-Bijapur, Shetty 1966 (BSJO); Sirohi: Mt. Abu, Puri 56624 (BSI).

2. COCCULUS DC. *nom. cons.*

Leaves pilose or pubescent. Male flowers in axillary, cymose panicles. Sepals pubescent.

1. *C. hirsutus*

Leaves glabrous or nearly so. Male flowers in axillary clusters. Sepals glabrous.

2. *C. pendulus*

1. *Cocculus hirsutus* (L.) Diels in Engl. Pflanzenr. 46: 236. 1910. *Menispermum hirsutum* L. Sp. Pl. 341. 1753. *Cocculus villosus* DC. Syst. Nat. 1: 525. 1817; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 101. 1872; Duthie, Fl. Gangetic Plain 1: 28. 1903. "*Chhireta, Bajar-bel*" (Hindi).

Scandent, dioecious shrubs; younger parts softly and densely villous. Leaves alternate, 1.5-8.0 × 0.7-4.5 cm, ovate-oblong, cordate-lanceolate or subdeltoid. Flowers minute, yellowish green. Male flowers in small axillary, cymose panicles; sepals 6 in 2 series; petals 6, membranous, emarginate, embracing the stamens. Female flowers in axillary clusters, rarely racemose. Drupes smooth, reddish purple. Seeds transversely rugose, black or dark purple.

Fl. & Fr. : September - April.

Common on the fringes of forests and in wastelands.

Selected specimens : Bharatpur: Raizada 64499 (DD); Banswara: Bari Ghat forest, Singh 3727 (BSJO); Bikaner: Gajner, Roy 2062 (BSJO); Jhalawar: Sharma 254 (RUBL); Pali: Sadri-Ranakpur Rd., Pandey 4156 (BSJO); Sirohi: Mt. Abu, Jain 46763 (BSI); Tonk: Shetty 489 (BSJO).

2. *Cocculus pendulus* (J.R. & G. Forst.) Diels in Engl. Pflanzenr. 46: 237. 1910. *Epibaterium pendulum* J.R. & G. Forst. Char. Gen. Pl. 108. t. 54. 1776. *Cocculus laeaba* DC. Syst. Nat. 1: 529. 1817; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 102. 1872; Duthie, Fl. Gangetic Plain 1: 29. 1903. "*Pilwan*" (Hindi).

Much branched, climbing shrubs. Leaves 2-5 × 0.9-1.8 cm, lanceolate-oblong, ovate or obtusely trapezoidal, usually with cuneate base, coriaceous. Flowers creamish-green. Male flowers sessile or nearly so, in axillary clusters. Female flowers solitary, rarely in pairs. Drupes ovoid-obovoid, compressed, ridged with basal styler scar.

Fl. & Fr. : October - January.

Common throughout N.W. Rajasthan in wastelands among bushes.

Selected specimens : Bhilwara: Borana village, Singh 6536 (BSJO); Churu: Gopalpura hillocks, Roy 2537 (BSJO); Chittorgarh: Srivastava & Party 65171 (LWG); Jaipur: Jaigarh, Sharma 470 (RUBL); Jaisalmer: Nachana, Shetty 3341 (BSJO); Sirohi: Vada-Koda, Jain 60444 (BSI).

3. TILIACORA COLEBR.

Tiliacora acuminata (Lam.) Miers in Ann. & Mag. nat. Hist. ser. 2. 7: 39. 1851. *Menispermum acuminatum* Lam. Encycl. 4: 101. 1797. *Tiliacora*

racemosa Colebr. in Trans. Linn. Soc. 13: 67. 1822; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 99. 1872; Duthie, Fl. Gangetic Plain 1: 27. 1903.

Evergreen, climbing shrubs. Leaves 10-15 × 7-10 cm, ovate or ovate-cordate, acuminate, glabrous. Flowers in 15-70 cm long, axillary panicles, dioecious, yellow; male branches 3 to 7-flowered; females one-flowered. Drupes smooth, red or yellow when ripe.

Fl. & Fr. : September - December.

Rare; occasionally grown in the gardens for ornamental foliage and fragrant flowers.

Selected specimen : Kota: Singh 90537 (LWG). Also reported from Ajmer (Sharma, 1958).

4. TINOSPORA MIERS

Tinospora cordifolia (Willd.) Miers in Ann. & Mag. nat. Hist. ser. 2. 7: 38. 1851; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 97. 1872; Duthie, Fl. Gangetic Plain 1: 26. 1903. *Menispermum cordifolium* Willd. Sp. Pl. 4: 826. 1806. "Neem-Giloi" (Hindi).

Succulent, glabrous, deciduous climbers with corky, grooved bark and lenticelled stem. Leaves petiolate, 8-20 × 8-20 cm, broadly ovate to ovate-triangular, cordate, acute or apiculate, membranous. Flowers in axillary, 2-9 cm long racemes on leafless branches, yellow; the males fascicled; the females usually solitary. Drupes 0.4-0.6 cm across, globose, red, with subterminal style scar.

Fl. & Fr. : December - June.

Common among hedges, particularly in hilly areas.

Selected specimens : Banswara: Talwara village, Singh 4292 (BSJO); Churu: Gopalpura, Roy 2537 (BSJO); Jaipur: Moti Dungari, Sharma 2147 (RUBL); Pali: Manpura, Pandey 4155 (BSJO); Sirohi: Mohibir forest, Puri 37561 (BSI).

DOUBTFUL TAXON

Cyclea peltata (Lam.) Hook. f. & Thoms. Fl. Ind. 201. 1855. *Menispermum peltatum* Lam. Encycl. 4: 96. 1797.

Reported by Sankhala (1951), but no authentic specimen is available in any herbarium. The occurrence of this species in Rajasthan is doubtful.

5. BERBERIDACEAE

(P.J. Parmar)

BERBERIS L.

Berberis asiatica Roxb. ex DC. Syst. Nat. 2: 13. 1821; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 110. 1872; Duthie, Fl. Gangetic Plain 1: 32. 1903. "*Daruhaldi*" (Hindi).

Erect, spinous shrubs with pale bark. Leaves 1- foliolate; leaflets in fascicles, 2.5-7.5 cm long, obovate or orbicular, sub-entire or with large distant spinescent teeth, whitish beneath, rigidly coriaceous. Flowers in short corymbose racemes; nectar glands subcylindric. Berries large, ovoid or subglobose, red or black, glaucous.

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

Rare, in the forests at Mt. Abu.

Selected specimen : Sirohi: Mt. Abu, *Blatter* 18087 (BLAT). Also reported by Raizada (1951) from Mt. Abu.

6. NYMPHAEACEAE

(P.J. Parmar)

Prickly herbs, with partially submerged flowers.

1. *Euryale*

Non-prickly herbs, with floating or erect flowers.

2. *Nymphaea*

1. EURYALE SALISB.

Euryale ferox Salisb. in Kon. & Sims. Ann. Bot. 2: 74. 1806; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 115. 1872; Duthie, Fl. Gangetic Plain 1: 34. 1903. "*Talmakhana*" (Hindi).

Densely prickly, perennial, aquatic herbs. Leaves floating, 30-120 cm in diam., elliptic or orbicular, green above and red or purple and downy beneath. Flowers bright red inside, green and shining outside or violet-blue. Fruits c. 8 cm in diam., round, prickly. Seeds about 20, of the size of a pea.

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

Rare, reported only from Alwar and Ajmer.

Selected specimen : Alwar: Way to Silisar, *H. Lal & Party* 34595 (LWG). Also reported by Nair & Bhartya (1962) and Vyas (1964, 1967) from Ajmer and Alwar respectively.

2. NYMPHAEA L. *nom. cons.*

Leaves irregularly and sharply serrate, lower surface pubescent. Calyx ribbed. Anthers not appendaged. Stigmatic rays with clavate appendages

2. *N. pubescens*

Leaves entire or distantly toothed, lower surface glabrous. Calyx not ribbed. Anthers appendaged. Stigmatic rays without appendages

1. *N. nauchali*

1. *Nymphaea nauchali* Burm. f. Fl. Ind. 120. 1768. *N. stellata* Willd. Sp. Pl. 1153. 1799; Wight, Ic. 1: t. 178. 1839; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 114. 1872; Duthie, Fl. Gangetic Plain 1: 34. 1903; Subram. Aquatic Ang. 6. f. 1. 1962. "Kumudini" (Hindi).

Perennial, aquatic herbs. Leaves 8-20 cm in diam., orbicular or when young elliptic-sagittate, peltate. Flowers violet, pale-blue or white, solitary. Fruits 1-3 cm across, globose. Seeds longitudinally striate.

Fl. & Fr. : August - February.

Native of S.E. Asia; common in ponds, ditches and tanks, particularly in E. Rajasthan.

Selected specimens : Banswara: Kushalgarh road, Singh 3028 (BSJO); Jaipur: Vinjorai, Wadhwa 5305 (BSA); Kota: Kelwara, Singh 50832 (LWG); Pali: Lodia Tank, Shetty 1992 (BSJO); Tonk: Mor village, Shetty 1308 (BSJO).

2. *Nymphaea pubescens* Willd. Sp. Pl. 2: 1154. 1799. *N. lotus* non L. var. *pubescens* (Willd.) Hook. f. & Thoms. Fl. Ind. 241. 1855. *N. lotus auct. plur.* non L. 1753; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 114. 1872; Duthie, Fl. Gangetic Plain 1: 33. 1903. *N. nauchali auct. plur.* non Burm. f. 1768; Subram. Aquatic Ang. 6. pl. 1. f. 2. 1962. "Kamal" (Hindi).

Perennial, aquatic herbs. Leaves 15-30 cm in diam., orbicular or reniform, prominently veined beneath. Flowers solitary, red, pale-rose or white. Fruits 3.5-5.0 cm across, globose, green, fleshy, ripening under water. Seeds ovoid, rough, with transparent white aril.

Fl. : August - November; *Fr.* : October - January.

Occasionally found in ponds, ditches and lakes in many parts of the state.

Selected specimens : Banswara : Kushalgarh road, Singh 3027 (BSJO); Jodhpur: Bhandari 1922 (JAC); Kota: Singh 90866 (LWG); Pali: Hema was aita, Shetty 1980 (BSJO); Tonk: Chandalai village, Shetty 1257 (BSJO).

CULTIVATED SPECIES

Nymphaea alba L. "*Kamal, Pappa Phool*" (Hindi) - Perennial, aquatic herbs with black rhizome and cordate, entire leaves. Fruits spongy, ripening under water. Seeds minute, striate, punctate, buried in the pulp. Native of Europe & N. Africa. Sometimes cultivated in ponds in gardens for its beautiful white flowers.

7. NELUMBONACEAE

(P.J. Parmar)

NELUMBO ADANS.

Nelumbo nucifera Gaertn. Fruct. Sem. Pl. 1: 73. t. 19. f. 2. 1788; Subram. Aquatic Ang. 8. f. 4. 1962. *Nelumbium speciosum* Willd. Sp. Pl. 2: 1258. 1799; Hook.f. & Thoms. in Hook. f. Fl. Brit. India 1: 116. 1872; Duthie, Fl. Gangetic Plain 1: 35. 1903. "*Kamlani*" (Hindi).

Large, handsome perennial, aquatic herbs with milky juice. Leaves 60-90 cm in diam., orbicular, glaucous. Flowers solitary, 10-20 cm across, white or light pink, mildly fragrant. Anthers orange. Torus in fruit 2.5-10.5 cm in diam. Seeds ovoid, glabrous, black.

Fl. & Fr. : August - November.

Fairly common in tanks, particularly in E. Rajasthan; also cultivated in many localities in the gardens in ponds for ornamental purposes.

Selected specimens : Bhillwara: Banera, Singh 6020 (BSJO); Bundi: Hindoli, Singh 74737 (LWG); Jhalawar: Eklera, Wadhwa 7540 (BSA); Tonk: Bomb tank, Pandey 4844 (BSJO). Also reported from Alwar (Vyas, 1967), Jodhpur (Sarup, 1951) and Udaipur (Ramdeo, 1969).

8. PAPAVERACEAE

(P.J. Parmar)

ARGEMONE L.

1a. Flowers white, turning pale yellow with age. Style 1-3 mm long.

Capsules ovate-lanceolate or lanceolate.

3. *A. ochroleuca*

1b. Flowers yellow or pale yellow. Style minute or absent. Capsules oblong-ellipsoid or subfusiform:

2a. Flowers yellow. Sepal-horns c 8 mm long. Style absent; stigma shallowly dissected, adpressed. Capsules oblong-ellipsoid:

3a. Plants spinescent.

1. *A. mexicana* f. *mexicana*

3b. Plants glabrous, devoid of spines except on leaf margins.

2. *A. mexicana* f. *leiocarpa*

2b. Flowers pale yellow. Sepal-horns 10-14 mm long. Style present; stigma-lobes narrow, spreading. Capsules subfusiform.

4. *A. subfusiformis*

1. *Argemone mexicana* L. Sp. Pl. 508. 1753; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 117. 1872; Duthie, Fl. Gangetic Plain 1: 36. 1903, *pro parte*. "*Pila Dhatura, Satyanasi*" (Hindi).

f. *mexicana*

Glaucous, prickly herbs with yellow sap. Radical leaves 25-35 × 7-9 cm; cauline ones sessile, 5-10 × 2.5-4.0 cm, sinuate-pinnatifid, spiny on margins and veins, bluish green, variegated with white. Flowers solitary, terminal, subtended by leafy bracts at base, yellow. Capsules 3 to 6-valved, prickly with 5-18 erecto-patent spines on each valve. Seeds numerous, reticulate or scrobiculate, brownish-black.

Fl. & Fr. : Almost throughout the year.

Native of Tropical America; common on road-sides, in fallow-fields, waste places and as a weed in cultivated fields.

Selected specimens : Banswara: Sunni village, *Singh* 3002 (BSJO); Barmer: Silly pasture, *Tiwari* 998 (BSJO); Ganganagar: Lalgarh, *Roy* 4974 (BSJO); Jhalawar: Ahu river, *Wadhwa* 9495 (BSA); Sirohi: Mt. Abu, *Jain* 5469 (BSI); Tonk: Near Bhanthali village, *Shenoy* 468 (BSJO).

2. f. *leiocarpa* (Greene) G.B. Ownb. Mem. Torrey Bot. Club 21(1): 37. 1958; Malik & Grover in Ind. For. 95(2): 123-124. 1969. *A. leiocarpa* Greene in Pittonia 3: 345. 1898.

Very similar to f. *mexicana*, but it is distinguished from type by its glabrous nature.

This species is included here on the authority of Malik & Grover (1969) who reported it from Udaipur district.

3. *Argemone ochroleuca* Sweet, Brit. Fl. Gard. 3: t. 242. 1828; Venkatesh, in Curr. Sci. 31: 250. 1962; Raizada, Suppl. Duthie, Fl. Gangetic Plain 5. 1976. *A. mexicana* L. var. *ochroleuca* (Sweet) Lindl. Bot. Reg. 1343. 1830. "*Satyanashi*" (Hindi).

Erect, glaucous, prickly, annual herbs. Leaves 5-10 cm long, ash-coloured; lower leaves in a rosette; upper ones sessile, semi-amplexicaul, sinuate-pinnatifid, prickly on nerves. Flowers solitary, terminal, sessile.

Capsules clothed with erecto-patent spines.

Fl. & Fr. : Almost throughout the year.

Native of Mexico; naturalized in fallow fields, wastelands, road-sides etc.; also found as a weed in cultivated fields.

Selected specimens : Bharatpur: Near Uochain village, *Parmar* 8644 (BSJO); Bhilwara: Kharidam, *Singh* 6515 (BSJO); Ganganagar: Lakuwali, *Roy* 5974 (BSJO). Also reported from Jaipur (Sharma, 1974) and Sirohi (Bhandari & Metha, 1978).

Notes : Very similar to *A. mexicana*, but can be distinguished by its ash-coloured and non stem-clasping leaves, white flowers, narrow spreading stigmas and presence of styles.

4. *Argemone subfusiformis* Owbey in *Brittonia* 13: 97. 1961; Malik & Grover in *Ind. For.* 95: 480. 1969; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 5. 1976.

Erect, prickly, annual herbs, pale green in colour. Flowers lemon-yellow, 2.8-4.6 cm in diam. Flower-buds oblong.

Fl. & Fr. : April - November.

Rare, reported only from Udaipur (Malik & Grover, 1969).

Notes : Very close to *A. mexicana* morphologically, as well as cytologically (Malik & Grover, 1975), but can be distinguished by its oblong buds, longer sepal-horns, large flowers with pale-yellow petals and spindle-shaped capsules having more widely spaced and coarse spines.

CULTIVATED SPECIES

Papaver rhoas L. Erect, hispid, annual herbs. Leaves irregularly pinnatifid, not clasping the stem. Flowers scarlet or variously coloured, showy. Native of temperate Eurasia and North-West Africa; cultivated in the gardens as an ornamental plant.

Papaver somnifera L. '*Doda, Amal, Afeem*' (Hindi) - Branched herbs. Leaves oblong, toothed or serrate. Flowers large, white, purple or scarlet. Native of western Mediterranean region; cultivated for opium in many parts of the state.

9. FUMARIACEAE

(P.J. Parmar)

Stamens 4, free.

2. *Hypecoum*

Stamens 6, diadelphous

1. *Fumaria*

I. FUMARIA L.

Fumaria indica (Haussk.) Pugsley in Journ. Linn. Soc. 44: 313. 1919; Mahesh. Illus. Fl. Delhi f. 4. 1966. *F. vaillantii* Loisel. var. *indica* Haussk. in Flora 56: 443. 1873. *F. parviflora* Lam. subsp. *vaillantii* auct. plur. non *F. vaillantii* Loisel. 1809; Hook.f. & Thoms. in Fl. Ind. 1: 258. 1855; Hook.f. Fl. Brit. India 1: 128. 1872; Duthie, Fl. Gangetic Plain 1: 37. 1903. 'Pitpara' (Hindi).

Erect or diffuse, slender, annual herbs. Leaves 2-3 pinnatisect; ultimate segments linear-oblongate, flat, apiculate, entire. Flowers in 15 to 20-flowered, 2-6 cm long, leaf-opposed racemes, pinkish-red. Bracts acuminate. Capsules subglobose, rugose, pale-brown.

Fl. & Fr. : January - April.

Common weed in cultivated fields and waste places.

Selected specimens : Bhilwara: Kharidam, Singh 7015 (BSJO); Ganganagar: Raisingh Nagar, Roy 5925 (BSJO); Kota: Atru, Singh 90640 (LWG); Pali: Samji-ka-Guda, Shetty 1581 (BSJO).

2. HYPECOUM TOURN.

Hypecoum procumbens L. Sp. Pl. 124. 1753; Hook.f. Fl. Brit. India 1: 120. 1872; Dhillon & Bhandari in J. Bombay nat. Hist. Soc. 70: 578. 1974.

Small, procumbent herbs; stems many, slender. Leaves 5-10 cm long, 2 to 3-pinnatisect; segments linear or oblong, upper ones sessile and whorled. Flowers few, pedicellate, yellow; outer petals 3-lobed; inner ones toothed or fimbriate, obtuse, with the mid lobe entire or 2-fid. Fruits subcompressed, at length breaking up into 1-seeded joints.

Fl. & Fr. : January - March.

Rare, only one collection from Ganganagar.

Selected specimen : Ganganagar: Chak 32, Dhillon 244 (DD, CAL).

10. BRASSICACEAE

(P.J. Parmar)

1a. Flowers greenish. Pods didymous, indehiscent, 2-seeded.

5. *Coronopus*

1b. Flowers yellow, white, purple or pinkish. Pods not didymous, dehiscent, 2 to many-seeded:

2a. Flowers yellow:

3a. Seeds 2-seriate:

- 4a. Plants aquatic or semi-amphibious. 10. *Rorippa*
- 4b. Plants terrestrial:
- 5a. Petals with dark-purple veins. Pods oblong-ovoid, upto 3 cm long; beak about half the length of pod. 6. *Eruca*
- 5b. Petals without dark-purple veins. Pods nearly orbicular, upto 0.75 cm in diameter; beak very short. 4. *Cochlearia*
- 3b. Seeds 1-seriate:
- 6a. Pods with a seed-less, indehiscent beak; valves with mid vein only. 1. *Brassica*
- 6b. Pods without beak, bearing seeds and dehiscing completely; valves with 3 parallel veins. 11. *Sisymbrium*
- 2b. Flowers white, purple or pinkish:
- 7a. Pods 2 to 8 seeded:
- 8a. Pods ellipsoid to sub-orbicular, 2-seeded. 8. *Lepidium*
- 8b. Pods linear, 4 to 8-seeded. 3. *Cardamine*
- 7b. Pods more than 8-seeded:
- 9a. Pods flattened. Seeds 1 or rarely 2-seriate, winged. 7. *Farsetia*
- 9b. Pods linear - terete or sub-cylindrical. Seeds 2-seriate, not winged:
- 10a. Flowers purple. Pods linear-elongate. 9. *Malcolmia*
- 10b. Flowers white. Pods triangular or orbicular. 2. *Capsella*

1. BRASSICA L.

- 1a. Upper cauline leaves with an amplexicaule base. 1. *B. campestris* var. *sarson*
- 1b. Upper cauline leaves without an amplexicaule base:
- 2a. Pods adpressed to the axis; beak thin, seed-less. 3. *B. nigra*
- 2b. Pods spreading or ascending; beak stout, conical, at times as thick as pods, 1 to 2-seeded. 2. *B. juncea*

1. *Brassica campestris* L. var. *sarson* Prain in Dept. Land Rec. & Agric. Bengal Bull. 4: 24. t. 5-7. 1898; Duthie, Fl. Gangetic Plain 1: 45. 1903. *B. campestris* L. subsp. *napus* Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 156. 1872. "Sarson" (Hindi).

Annual, erect herbs. Radical leaves 20-30 × 3-5 cm; cauline ones 3-6 × 1-2 cm. Flowers in 20-45 cm long, terminal raceme, yellow. Siliquae 3-4 cm

long, linear, cylindric, reticulately veined, glabrous. Seeds minute, glabrous, yellowish-brown.

Fl. : January - March; *Fr.* : February - April.

Extensively cultivated as a winter season crop for the edible oil obtained from the seeds. Also met with as an escape in waste places and along the roads.

Selected specimens : Alwar: Gupta A. No. 12057 (RUBL); Bundi: Singh 90627 (LWG); Ganganagar: Azmal Khera, Roy 3820 (BSJO).

2. *Brassica juncea* (L.) Czern. & Coss. in Czern. Consp. Fl. Chark. 8. 1859; Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 157. 1872; Duthie, Fl. Gangetic Plain 1: 44. 1903. *Sinapis juncea* L. Sp. Pl. 668. 1753. 'Barli, Rai' (Hindi).

Erect, annual herbs. Radical leaves 10-25 × 4-8 cm, lyrate pinnatifid; cauline ones 3.5-8.0 × 2.0-3.5 cm, oblong-lanceolate. Flowers in 10-15 cm long, terminal and axillary racemes, bright yellow. Siliquae 2.5-6.0 cm long, linear. Seeds rounded, minutely pitted, blackish brown.

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

Widely cultivated as a cold season crop; also runs wild in garden fertile soils.

Selected specimens : Jaipur: Chaumu, Wadhwa 8360 (BSA); Jaisalmer: Amar Sagar garden, Tivari 847 (BSJO); Kota: Baran, Singh 90472 (LWG).

3. *Brassica nigra* (L.) Koch. in Roehling Deutschl. Fl. ed. 3. 4: 713. 1833; Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 156. 1872; Duthie, Fl. Gangetic Plain 1: 44. 1903. *Sinapis nigra* L. Sp. Pl. 668. 1753; Stella Ross-craig, Drawings Brit. Pl. 3: t. 50. 1949. 'Rai' (Hindi).

Erect, annual herbs. Radical leaves 6-10 cm long, lyrate pinnatifid; cauline ones 2.5-4.0 × 0.8-1.3 cm, linear-lanceolate, entire or pinnatifid to pinnatifid. Flowers in 45-60 cm long, terminal racemes, yellow. Siliquae erect, nearly glabrous. Seeds minutely punctate, glabrous, blackish-brown.

Fl. : January - March; *Fr.* : March - April.

Rare, found as a weed in cultivated fields.

Selected specimen : Ganganagar: Suratgarh, Jain 45116 (BSA).

2. CAPSELLA MEDIK.

Capella bursa-pastoris (L.) Medik. Pflanzen. 1: 85. 1792; Hook. f. &

Anders. in Hook. f. Fl. Brit. India 1: 159. 1872; Duthie, Fl. Gangetic Plain 1: 47. 1903. *Thlaspi bursa-pastoris* L. Sp. Pl. 647. 1753.

Erect, annual or biennial herbs, glabrous or hairy with simple or branched hairs. Radical leaves rosulate, 4-8 × 1.25-2.5 cm, oblong or oblanceolate, acute, toothed; cauline leaves 2.5-4.5 cm long, oblong-lanceolate, amplexicaule, hastate or sagittate at base. Flowers in 20-25 cm long racemes, white. Siliculae ellipsoid, reddish-brown.

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

Common weed in cultivated fields.

Selected specimen : Jaipur: Gangwal garden, Sharma 1990 (RUBL). Also reported from Bikaner (Sarup, 1957), Jhunjhunu (Nair & Kanodia, 1959), Jodhpur (Sarup, 1951) and Sirohi (Raizada, 1954; Jain, 1962).

3. CARDAMINE L.

Petiole with basal auricles. Stamens 6.

1. *C. impatiens*

Petiole without basal auricles. Stamens 4, if 6 then the outer 2 reduced to petaloid staminodes.

2. *C. scutata* subsp. *flexuosa*

1. *Cardamine impatiens* L. Sp. Pl. 655. 1753; Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 138. 1872; Duthie, Fl. Gangetic Plain 1: 40. 1903.

Erect, annual herbs. Leaves crowded at the base and alternate above, imparipinnate; leaflets 3-6 pairs, 0.8-1.5 × 0.3-0.8 cm, ovate-oblong, entire or lobed, ciliate. Flowers in corymbs, elongating into racemes, white. Siliquae 1-2 cm long, flat; valves with a distinct midrib.

Fl. & Fr. : October - December.

Rare, in moist and shady localities.

Selected specimen : Bundi: Kota dam, Singh 74007 (LWG).

2. *Cardamine scutata* Thunb. subsp. *flexuosa* (With.) Hara in Journ. Fac. Sci. Univ. Tokyo Bot. 6: 59. 1952 & Fl. East. Himal. 108. 1966. *Cardamine flexuosa* With. Bot. Arr. Brit. Pl. ed. 3. 578. t. 3. 1796. *C. hirsuta* L. var. *sylvatica sensu* Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 138. 1872, incl. var. *oxycarpa*, non *C. sylvatica* Link 1803; Duthie, Fl. Gangetic Plain 1: 40. 1903.

Erect, glabrous herbs. Stem simple or sparsely branched, flexuous upwards. Basal leaves with 7-11, orbicular-rounded, sinuate-dentate to lobed leaflets; higher ones with 5-11, ovate or rounded to lanceolate, entire-crenulate leaflets. Flowers in 3-15 cm long racemes, white. Siliquae 2-3 cm long, erect, obtuse.

Fl. & Fr. : February - April.

Rare, in damp shady grassy habitats. Recorded only from Mt. Abu (Sirohi) by Raizada (1954).

4. COCHLEARIA L.

Cochlearia cochlearioides (Roth) Sant. & Mahesh, in Journ. Bombay nat. Hist. Soc. 54: 804. 1957. *Alyssum cochlearioides* Roth, Nov. Pl. Sp. 322. 1821. *Cochlearia flava* Buch. Ham. ex Roxb. Fl. Ind. t: 45. 1820; Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 145. 1872; Duthie, Fl. Gangetic Plain 1: 41. 1903.

Erect, diffusely branched, annual herbs. Roots long, fusiform. Radical leaves 2.2-7.0 × 0.5-2.5 cm, lyrate-pinnatifid; cauline ones 0.8-2.0 × 0.4-0.6 cm, elliptic-oblong or obovate-oblong, entire or pinnatifid. Flowers in 3-15 cm long terminal racemes, yellow. Siliculae ovate-oblong or nearly orbicular, smooth; valves without nerves. Seeds many, rugose, with filiform funicles, dark-brown to blackish.

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

Occasional, in river-beds and other damp places.

Selected specimens : Bhilwara: Badnor, Singh 7076 (BSJO); Kota: Majumdar 10133 (BSA). Also recorded from Sawaimadhapur by Majumdar *et al.* (1969).

5. CORONOPUS ZINN *nom. cons.*

Coronopus didymus (L.) Sm. Fl. Brit. 2: 691. 1800; Mahesh. Illus. Fl. Delhi f. 5. 1966. *Lepidium didymum* L. Syst. 2: 433. 1754. *Senebiera pinnatifida* DC. Mem. Soc. Hist. Nat. Paris 144. t. 9. 1799; Duthie, Fl. Gangetic Plain 1: 47. 1903.

Small, pubescent herbs. Leaves pinnately dissected; radical ones 5-10 cm long, cauline ones 1.0-1.5 cm long, segments oblanceolate. Flowers in 1-3 cm long racemes, greenish-white. Siliculae 0.1 × 0.25 cm, emarginate. Seeds 2, reniform, yellowish-brown.

Common weed in cultivated fields.

Fl. & Fr. : January - April.

Selected specimens : Bhilwara: Badnor, Singh 7061 (BSJO); Ganganagar: Lalpuria bagh, Roy 3941 (BSJO); Jodhpur: Public garden, Bhandari 669, 1467 (JAC); Kota: Chhabra, Singh 90682 (LWG); Sirohi: Mt. Abu, Blatter 17638 (BLAT); Udaipur: Banki block, Verma 31 (BSA).

6. ERUCA MILTERR

Eruca sativa Mill. Gard. Dict. ed. 8. 1. 1768; Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 158. 1872; Duthie, Fl. Gangetic Plain 1: 46. 1903. *E. vesicaria* (L.) Cav. var. *sativa* (Mill.) Thell in Hegi, Ill. Fl. Mittl eur. 4(1): 201. 1918 "*Taramira*" (Hindi).

Erect, annual herbs. Lower leaves petioled, upper ones sessile, 1.5-4.0 cm long, lyrate-pinnatifid with entire or sinuate-dentate segments. Flowers in 6-10 cm long terminal racemes, yellow, turning white on maturity. Siliquae turgid, glabrous. Seeds globose or slightly ovate, compressed, smooth, brownish-black.

Fl. : January - March; *Fr.* : February - April.

Occasional, a weed of cultivated fields. Often cultivated for oil-yielding seeds.

Selected specimens : Barmer: Bagundi, *Tiwari* 1153 (BSJO); Bhilwara: Kharidam, *Singh* 7011 (BSJO); Bundi: Kishorapatan, *Singh* 90626 (LWG); Ganganagar: 2 MLD, *Roy* 4063 (BSJO); Jodhpur: Pipad, *Singh* 3554 (BSJO).

7. FARSETIA TURR.

1a. Seeds uni-seriate:

2a. Flowers small; petals slightly exceeding the sepals; sepals c. 5 mm long. 1. *F. hamiltonii*

2b. Flowers large; petals much exceeding the sepals; sepals c. 8 mm long. 2. *F. heliophila*

1b. Seeds bi-seriate:

3a. Leaves linear, 2-8 mm broad, nearly sessile. Flowers 5-10 mm across:

4a. Siliquae 20-48 mm long, 3.0-4.5 mm broad. 3. *F. jacquemontii* subsp. *jacquemontii*

4b. Siliquae 15-20 mm long, 5-7 mm broad. 4. *F. jacquemontii* subsp. *edgeworthii*

3b. Leaves broadly linear-lanceolate to ovate, 15-22 mm broad; petioles 5-10 mm long. Flowers 12-15 mm across. 5. *F. macrantha*

1. *Farsetia hamiltonii* Royle, Ill. Bot. Himal. Mount. 1: 71. 1834; Hook. f. & Anders. in Hook. f. Fl. Brit. India 1: 140. 1872; Duthie, Fl. Gangetic Plain 1: 41. 1903; Mahesh. Illus. Fl. Delhi f. 7. 1966. "*Hiran Chabba*" (Hindi).

Erect shrubs or undershrubs, clothed with appressed, medifixed hairs. Leaves nearly sessile, 1.8-7.5 × 0.2-0.4 cm, linear-lanceolate, slightly falcate. Flowers in 6-15 cm long, terminal racemes, white or purplish-white. Siliquae linear. Seeds suborbicular, with a broad membranous wing, brown.

Fl. & Fr. : Almost throughout the year.

Common in loose open stretches of sand along river-beds and also as a weed in cultivated fields.

Selected specimens : Bundi: Bhimlet forest, *Singh* 74093 (LWG); Ganganagar: Thakuri, *Roy* 3859 (BSJO); Jaisalmer: Near Tanot, *Shetty* 6108 (BSJO); Jhunjhunu: Pilani, *Saran & Party* 41994 (LWG); Tonk: *Pandey* 4798 (BSJO).

2. *Farsetia heliophila* Bunge ex Coss. Comp. Fl. Atl. 2: 227. 1884; Bornm. in Beih. Bot. Centrbl. 28: 104. 1911; Jafri, Fl. W. Pak. 55: 110. 1973; Parmar in J. Econ. Tax. Bot. 4: 639. 1983.

Undershrubs; branches rigid, wiry. Leaves usually not more than 2.0 × 0.2 cm, very narrow. Flowers in c. 20 cm long racemes, pale-purple. Siliquae erect, narrow, 2-3 mm broad. Seeds 2.0-2.5 mm in diam. (including wings).

Fl. & Fr. : October - December.

Rare, in moist sandy-loam soils. The only collection is from Ganganagar.

Selected specimen : Ganganagar: Raisingh Nagar, *Roy* 3886 (BSJO).

3. *Farsetia jacquemontii* Hook.f. & Thoms. in Journ. Linn. Soc. Bot. 5: 148. 1861; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 140. 1872.

subsp. *jacquemontii*

Small shrubs, usually with woody base. Leaves sessile, 1-6 × 0.3-0.7 cm, linear. Flowers in c. 20 cm long, terminal racemes, large, whitish pink. Siliquae 1.8-3.0 × 0.3-0.4 cm, compressed, linear, appressed hairy. Seeds almost orbicular, 2.5-3.0 mm in diam., brown, winged.

Fl. : July - September; *Fr.* : August - October.

Common weed in cultivated and fallow fields.

Selected specimens : Ganganagar : Hanumangarh, *Raizada* 130409 (DD); Jaipur: Phulera Sambhar road, *Wadhwa* 8262 (BSA); Jaisalmer: Pokern-lavan, *Jain* 49450 (BSI); Sikar: *Stower* C 33a (BSI).

4. subsp. *edgeworthii* (Hook.f. & Thoms.) Jafri in Notes Roy. Bot.

Gard. Edin. 22: 213. 1957. *Farsetia edgeworthii* Hook.f. & Thoms. in Journ. Linn. Soc. Bot. 5: 147. 1861. *F. aegyptica auct.* non Turra 1765; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 140. 1872.

Very similar to subsp. *jacquemontii*, but the leaves are generally elongated and siliquae 18-21 × 5-7 mm.

Rare, only collected from Ganganagar.

Selected specimen : Ganganagar: *Shri Dhar Sharma* 1365, *Sharma A.* No. 12033 (RUBL).

5. *Farsetia macrantha* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 220. 1918; Bhandari, Fl. Ind. Desert 34. 1978.

Canescent, rigid undershrubs. Leaves 4-7 × 1.5-2.5 cm, broadly linear-lanceolate, attenuated at the base, sub-coriaceous. Flowers in 5 to 15-flowered terminal racemes, creamy white to pinkish white. Siliquae 30-35 × 5-6 mm, oblong, compressed, densely strigose, narrowed at both ends. Seeds 6 × 3 mm, compressed, brown.

Fl & Fr. : October - January.

Rare, growing on rocks behind mataji's Temple (Barmer dt.). Endemic to N.W. Rajasthan (Barmer).

Selected specimens : Barmer: Behind Mataji temple, *Jain* 4041, *Rao* 66864, 66981 (BSI), *Tiwari* 875, *Shetty* 2303 (BSJO), *Bhandari* 507, 642, 1577 (JAC).

8. LEPIDIUM L.

Plants glabrous. Stamens 6. Pods ellipsoid, longer than the pedicels

1. *L. sativum*

Plants hairy. Stamens 2. Pods sub-orbicular, shorter than the pedicels.

2. *L. virginicum*

1. *Lepidium sativum* L. Sp. Pl. 644. 1753; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 159. 1872; Duthie, Fl. Gangetic Plain 1: 48. 1903. "Halim" (Hindi).

Erect, glabrous, annual herbs. Lower leaves petioled, pinnatifid, with pinnatifid segments; upper ones sessile, nearly entire. Flowers in 10-15 cm long, lax racemes, white or purplish-white. Siliculae shallowly retuse or deeply notched at the apex, broadly winged at the top. Seeds reddish brown.

Fl & Fr. : January - March.

A common weed in cultivated and fallow fields.

Selected specimens : Banswara: Loharia village, Singh 4255 (BSJO); Barmer: Thob, Tiwari 1151 (BSJO); Jaipur: Baragaon, Sharma 2013 (RUBL); Kota: Atru, Singh 90971 (LWG); Udaipur: Near Bhim, Kaul & Party 8513 (LWG).

2. *Lepidium virginicum* L. Sp. Pl. 645, 1753; Babu in Bull. bot. Surv. India 8: 200, 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 7, 1976. *Lepidium ruderale* auct. plur. non L. 1753.

Erect, hairy, annual herbs. Lower leaves lyrate-pinnatifid to pinnatifid, with lobulate-dentate segments; middle ones lyrate or deeply acutely serrate; upper ones linear-lanceolate, irregularly sharply serrate. Flowers in dense, 2-10 cm long racemes, white. Siliculae retuse, narrowly winged at the top. Seeds 0.15 × 0.08 cm, reddish-brown.

Fl. : April - June; Fr. : June - September.

Rare, only one collection from Jaipur. Native of America; naturalized in many parts of India.

Selected specimens : Jaipur: Sharma Acc. No. 9037, 9038 (RUBL).

Note : The above cited specimens collected from Jaipur were identified as *Lepidium ruderale* L., which is a Himalayan species. According to Babu (l.c.) most of the specimens identified as *L. ruderale* L. are actually *L. virginicum* L.

9. MALCOLMIA R. BR. *nom. cons.*

Malcolmia africana (L.) R. Br. in Ait. Hort. Kew. ed. 2. 121.f. 4. 1812; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 146. 1872.

Erect, annual herbs, covered with forked and simple hairs. Leaves petioled, oblong or lanceolate, entire to sinuate-dentate. Flowers in 10 to 30-flowered, lax, terminal racemes, pink to purple, subsessile. Siliquae linear, elongate, clothed with forked hairs. Seeds many, oblong.

Rare, weed during cold season.

Selected specimens : Ganganagar: Dhillon A. No. 520, Sharma 1369, Singh A. No. 6973 (RUBL).

10. RORIPPA SCOP.

Leaves toothed. Fruits slightly beaked.

1. *R. indica*

Leaves slightly toothed or almost entire. Fruits not beaked.

2. *R. montana*

1. **Rorippa indica** (L.) Hiern. Cat. Afr. Pl. Welw. 1: 26. 1896. *Sisymbrium indicum* L. Mant. 1: 93. 1767. *Nasturtium indicum* (L.) DC. Syst. Nat. 2: 199. 1818; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 134. 1872, *pro parte*; Duthie, Fl. Gangetic Plain 1: 39. 1903.

Trailing or suberect, annual or biennial herbs. Leaves 6-10 cm long, pinnatipartite, membranous, terminal lobes largest, gradually smaller towards the base. Flowers in 7-30 cm long racemes, yellow. Siliquae 1.0-1.6 cm long, linear. Seeds rugose, spherical or nearly so, reddish-brown.

Fl : November - January; *Fl* : January - February.

Occasional, found as a weed in agricultural fields and by the sides of irrigation canals, particularly in E. Rajasthan.

Selected specimens : Banswara: Ghatol, *Majumdar* 10217 (BSA); Kota: Rampura, *Verma* 1798 (BSA). Also reported from Sirohi (Raizada, 1954; Jain, 1962) and from Jodhpur (Sarup, 1951).

2. **Rorippa montana** (Wall. ex Hook.f. & J. Anders.) Small, Fl. S.E. United States ed. 2. 1336. 1913. *Nasturtium montanum* Wall. ex Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 134. 1872; Duthie, Fl. Gangetic Plain 1: 40. 1903.

Erect, annual herbs. Radical leaves petiolate, 4-7 cm long, sinuate-pinnatifid; cauline ones sessile, 3-5 × 1.5-2.3 cm, ovate, serrate. Flowers in bracteate racemes, yellow. Siliquae 1.5-2.5 cm long, cylindric. Seeds pitted, brown.

Fl. & Fr. : December - March.

Rare, weed in wet and shady habitats in cultivated fields and wastelands during winter season.

Selected specimen : Jhalawar: Jhalarapatan, *Singh* 83662 (LWG).

11. SISYMBRIUM L.

Sisymbrium irio L.Sp.Pl. 659. 1753; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 150. 1872; Duthie, Fl. Gangetic Plain 1: 42. 1903; Mahesh. Illus. Fl. Delhi f. 6. 1966. "*Asalio, Khub-khala*" (Hindi).

Erect, annual herbs, glabrous or sparsely hairy. Radical leaves petioled, numerous, in rosette, pinnatipartite; cauline ones runcinate or pinnatifid. Flowers in leafless corymbose racemes, yellow. Siliquae 3-5 cm long, slender, ascending, glabrous, sub-torulose. Seeds oblong, minutely granulate, light-brown.

Fl. & Fr. : November - March.

Common throughout from plains to the hills.

Selected specimens : Bundi: Kota dam, Singh 74401 (L.WG); Ganganagar: Dhillon 439 (DD); Jaipur: Sanganer, Singh 14624 (RUBL); Jaisalmer: Rao 67146 (BSA); Pali: Samji-ka-Guda, Shetty 1576 (BSJO).

CULTIVATED SPECIES

***Brassica campestris* L. var. *toria* Duthie & Fuller.**-Erect herbs with dichotomous branches. Flowers yellow. Seeds rugose with distinct circular marks on the testa, bluish-brown. Rarely cultivated in irrigated fields as a winter season crop for fatty edible oil obtained from the seeds.

***Brassica oleracea* L. var. *botrytis* L. 'Phoolgobhi' (Hindi).** Annual herbs. Rachis of young inflorescence and pedicels thickened in to a dense, fleshy, yellowish-white, edible mass. Flowers yellow. Cultivated for vegetables.

***Brassica oleracea* L. var. *capitata* L. 'Pat-ghobi, Karamkalla' (Hindi)**-Annual herbs. Stem abbreviated, erect, with a dense head of leaves before flowering. Flowers pale yellow. Cultivated in many parts of the state for vegetables.

***Brassica oleracea* L. var. *gongyloides* L. 'Ganth-gobi' (Hindi) -**Annual or biennial herbs. Radical leaves bright green; cauline ones glaucous. Flowers usually bright yellow. Cultivated at some places for the tuberous tap roots, used as a vegetable.

***Descuriana sophia* (L.) Webb. & Berth. (*Sisymbrium sophia* L.)**-Annual herbs, with 2 to 3-pinnatisect leaves, yellow flowers in racemes and 1.5-3.5 cm long siliquae. Native of Europe; recently introduced at Mt. Abu (Mehra 573 JAC). Closely allied to *Sisymbrium irio* L., but single veined valves best distinguish it.

***Iberis umbellata* L.** Erect, annual, glabrous herbs. Flowers pink to purplish. Fruits broadly winged from the base. Native of Europe; sometimes cultivated in the gardens during cold months as an ornamental plant.

***Raphanus sativus* L. var. *sativus* 'Muli' (Hindi)**-Annual herbs, with thick, napiform or cylindrical roots. Flowers white to lilac, mostly dark-veined. Native of Europe and temperate Asia; commonly cultivated for its edible roots and fruits which are used as salad & vegetable.

Raphanus sativus L. var. **caudatus** (L.) Vilm.- Can be distinguished from proper species by linear, dark-purple, 30-40 cm long pods. Cultivated in many parts of the state for edible roots.

II. CLEOMACEAE

(P.J. Parmar)

CLEOME L.

1a. Leaves simple:

2a. Stamens 10-12.

8. *C. simplicifolia*

2b. Stamens 4-6:

3a. Leaves palmately 5-nerved. Stamens 4. Fruits covered with short-stalked glands.

6. *C. fimbriata*

3b. Leaves pinninerved. Stamens 6. Fruits glabrous:

4a. Bracts petioled. Flowers dull purple.

5. *C. monophylla*

4b. Bracts sessile. Flowers yellow.

7. *C. scaposa*

1b. Leaves 3-7 (-9) foliolate:

5a. Stamens 6:

6a. Flowers white or dirty white to pinkish.

Androgynophore present:

7a. Tall herbs. Leaves glandular hairy.

3. *C. gynandra* var. *gynandra*

7b. Dwarf herbs. Leaves glabrous except the margins.

4. *C. gynandra* var. *nana*

6b. Flowers yellow. Androgynophore absent.

1. *C. brachycarpa*

5b. Stamens more than 10:

8a. Flowers yellow. Capsules glandular-pubescent, with arched nerves.

9. *C. viscosa*

8b. Flowers rosy. Capsules smooth, with parallel nerves.

2. *C. chelidonii*

1. **Cleome brachycarpa** Vahl ex DC. Prodr. 1: 240. 1824; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 169. 1872; Duthie, Fl. Gangetic Plain 1: 50. 1903; Mahesh. Illus. Fl. Delhi f. 8. 1966. *C. vahliana* Farsen. in Mus. Senck. 2: 110. 1837.

Erect, much branched, glandular hairy, perennial herbs with woody base. Leaves 3 to 5-foliolate, lower petioled, upper most sub-sessile; leaflets 0.6-1.1 × 0.25-0.6 cm, obovate-oblong or oblanceolate, acute or obtuse. Flowers in lax, leafy, bracteate racemes. Capsules 0.9-1.2 × 0.2-0.5 cm,

oblong, inflated, glandular. Seeds many, brown.

Fl. & Fr. : Almost throughout the year.

Common in open gravelly or rocky habitats. Often forms pure associations.

Selected specimens : Barmer: Samdari, *Shetty* 2193 (BSJO); Ganganagar: Dungargarh, *Roy* 4010 (BSJO); Jaisalmer: Devikot, *Shetty* 3376 (BSJO); Jaipur: *Sharma* 2295 (RUBL); Nagaur: Merta road, *Hiralal & Party* 34879 (LWG). Also reported from Alwar (Vyas, 1967), Jhunjhunu (Nair & Kanodia, 1959) and Udaipur (Vyas, 1965).

2. *Cleome chelidonii* L.f. Suppl. 300. 1781; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 170. 1872; Duthie, Fl. Gangetic Plain 1: 50. 1903.

Erect, much branched, glabrous or sparsely glandular-hairy, annual herbs. Leaves compound; leaflets 4-6 × 1.2-2.5 cm, oblong, obovate or linear, entire. Flowers in terminal and axillary racemes, forming corymbs afterwards. Capsules 4-8 cm long, tapering at both ends, finely striated, glabrous. Seeds muricate, yellowish-brown.

Fl. : July - September; *Fr.* : October - February.

Rare, occasionally seen in wastelands in wet places in Kota district.

Selected specimens : Kota: Mangrol, *Singh* 83902 (LWG), *Verma* 462 (BSA).

3. *Cleome gynandra* L. Sp. Pl. 671. 1753; 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. India 1: 171. 1872; Duthie, Fl. Gangetic Plain 1: 51. 1903. "*Safedbagra, Hulhui*" (Hindi).

var. *gynandra*

Erect, glandular-hairy, annual herbs. Leaves 3 to 5-foliolate, lower petioled, upper gradually becoming sessile; leaflets 3.0-6.5 × 1.5-3.5 cm, elliptic-obovate or elliptic-lanceolate, denticulate to subentire. Flowers in 5-8 cm long, terminal racemes. Capsules linear-cylindric, viscidly pubescent, obliquely striated, many-seeded. Seeds depressed-spherical, with concentric ribs and irregular cross-ribs, black-brown.

Fl. : July - September; *Fr.* : October - December.

Common weed in wastelands and cultivated fields during rainy season.

Selected specimens : Ganganagar: Suratgarh, *Wadhwa* 58331 (BSA); Jaisalmer: Salam Sagar (Pokaran), *Tiwari* 702, *Shetty* 3301 (BSJO); Jhunjhunu: Loharu, *Jain* 54461 (BSI); Kota: Shahabad, *Jain* 28843 (BSI);

Sirohi: Mt. Abu, *Blatter* 2229 (BLAT); Tonk: Haji-ki-Kothi (Niwai), *Shetty* 1244 (BSJO).

Notes : Collection Nos. *Tiwari* 702 and *Shetty* 3301 from Pokran (Jaisalmer) bear yellow flowers, which is an exception.

4. var. *nana* (Blatt. & Hallb.) Bhandari in Bull. bot. Surv. India 6: 327. 1964. *Gynandropsis pentaphylla* (L.) DC. var. *nana* Blatt. & Hallb. in Journ. Bombay nat. Hist Soc. 26: 221. 1918.

Dwarf herbs, upto 11 cm tall. Leaves glabrous except the glandular margins. Petals c. 5 mm long.

Fl. & Fr. : During rainy season.

Rare, endemic in sandy habitats in western Rajasthan.

Selected specimens : Jaisalmer: Amar Sagar, *Tiwari* 835 (BSJO); Jodhpur: Lordi tank, *Shety* 313 (BSJO).

5. *Cleome monophylla* L. Sp. Pl. 672. 1753; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 168. 1872; Raizada, Suppl. Duthie, Fl. Gangetic Plain 9. 1976.

Erect, branched, glandular-pubescent herbs. Leaves 2.5-5.0 × 0.7-1.2 cm, ovate-lanceolate to oblong-lanceolate, sub-cordate, acute-acuminate. Flowers dull purple. Capsules 5-10 cm long, linear, slightly curved, striated, beaked. Seeds nearly orbicular, flat, prominently ribbed, black.

Fl. : July - August; *Fr.* : September - October.

Rare, weed in cultivated fields and wastelands.

Selected specimens : Ajmer: Todgarh, *Sharma* 1810 (DD, LWG); Kota: Shahabad, *Verma* 804 (BSA).

6. *Cleome fimbriata* Vicary in J. Asiat. Soc. Bengal 16: 1158. 1847; Nair *et al.* in Proc. Raj. Acad. Sci. 8: 102. 1961; Jafri, Fl. West. Pak. 34: 29. 1973. *Cleome quinquenervia* auct. non DC. 1824; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 168. 1872; Cooke, Fl. Bombay 1: 37. 1901.

Erect, much branched, hairy, perennial or annual herbs with woody base. Leaves 2.4 × 2.0-3.5 cm, sub-orbicular to broadly ovate-cordate or sub-cordate, with obtuse to slightly apiculate apex. Flowers yellow with lilac veins. Capsules 2-3 × 0.3-0.4 cm, linear, tapering at the base, acute at apex. Seeds minutely granulate, glabrous, brownish.

Fl. & Fr. : August - December.

This species is included here on the authority of Nair *et al.* (*l.c.* 1961), who collected it from Jhunjhunu district. We have not seen any specimen of this species.

7. *Cleome scaposa* DC. Prodr. 1: 239. 1824. *Cleome papillosa* Steud. Nom. Bot. ed. 2. 1: 382. 1840; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 168. 1872. *C. gracilis* Edgew. in J. Asiat. Soc. Bengal 16: 1212. 1847; Bhandari, Fl. Ind. Desert 39. 1978.

Erect, scabridly glandular-hairy, annual herbs. Leaves 0.6-2.5 × 0.5-1.5 cm, nearly orbicular to elliptic-ovate or ovate-cordate. Flowers in lax, elongated racemes, yellow. Capsules 2-3 × 0.12 cm, linear, striated, glabrous. Seeds granulate, glabrous, brownish-black.

Fl : August - October; Fr. : October - December.

Common on naked rocky slopes, particularly in W. Rajasthan.

Selected specimens : Bhilwara: Umed Sagar, Singh 5758 (BSJO); Churu: Gopalpura hills, Roy 2680 (BSJO); Jaisalmer: Pokaran Ramdevara road, Shetty 3326 (BSJO); Jodhpur: Beriganga (CAZRI compt. II), Shetty 169 (BSJO).

8. *Cleome simplicifolia* (Camb.) Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 169. 1872; Duthie, Fl. Gangetic Plain 1: 49. 1903. *Polanisia simplicifolia* Camb. in Jacq. Voy. Inde 4: 20. t. 20. 1844. *P. burtporensis* Munro in Wight, Ic. 3(4): 5. t. 1072. 1846.

Erect, scabridly hairy, annual herbs. Leaves 2-7 × 0.8-2.5 cm, obovate-oblong or elliptic-oblong to lanceolate, acute, entire. Flowers in elongated, leafy racemes, violet. Capsules 1.5-3.5 cm long, spindle-shaped, beaked, striated, torulose, glabrous. Seeds reniform, yellowish with brown spots.

Fl. & Fr. : July - September.

Occasional, found in wastlands mostly in E. Rajasthan.

Selected specimens : Banswara: Chiriyavasa, Singh 3000 (BSJO); Bhilwara: Shahpura, Singh 5732 (BSJO); Kota: Darah, Singh 74824 (LWG); Tonk: Gaunri village, Shetty 1212 (BSJO); Udaipur: Devgarh, Udailal Mahatma. A. No. 142568, 135568 (DD).

9. *Cleome viscosa* L. Sp. Pl. 672. 1753; Wight, Ic. 1: t. 2. 1838; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 170. 1872; Duthie, Fl. Gangetic Plain 1: 50. 1903. "*Bagra, Handi - bagro*" (Hindi).

Erect, glandular-hairy herbs. Leaves petiolate, 3 to 5-foliolate; leaflets 1.0-5.5 × 0.5-3.0 cm, obovate to elliptic-oblong. Flowers in lax, leafy racemes. Capsules 2.5-9.0 cm, cylindric, glandular hairy, shortly beaked, obliquely striated. Seeds numerous, reniform, with faint concentric ribs and strong cross-ribs, dark brown to black.

Fl : July - September; Fr. : September - November.

Common weed in cultivated fields and wastlands; often forms pure populations.

Selected specimens : Alwar: Alwar to Balafort, *Hiralal & Party* 34470 (LWG); Banswara: Deoda, *Singh* 2951 (BSJO); Churu: Gopalpura, *Roy* 2685 (BSJO); Jaisalmer: Bhaniana, *Shetty* 3315 (BSJO); Kota: *Singh* 90477 (LWG); Sirohi: Mt. Abu, *Blatter* 18177 (BLAT); Tonk: Kakor R.F., *Shetty* 1263 (BSJO).

12. CAPPARACEAE

(P.J. Parmar)

- | | |
|---|-----------------------|
| 1a. Undershrubs or bushy herbs. Fruits samara, with a membranous wing, 1-seeded. | 4. <i>Dipterygium</i> |
| 1b. Trees or shrubs, sometimes climbing or spreading. Fruits berry or capsule, wingless, many seeded: | |
| 2a. Sepals united at base. Fruits moniliform. | 5. <i>Maerua</i> |
| 2b. Sepals free or slightly connate at the base. Fruits not moniliform: | |
| 3a. Leaves trifoliate. Sepals uniserrate. | 3. <i>Craeva</i> |
| 3b. Leaves simple. Sepals biserrate | |
| 4a. Leaves with a pair of stipular spines (sometimes absent in <i>C. grandis</i>). Stamens 6 or more, inserted at the base of gynophore. | 2. <i>Capparis</i> |
| 4b. Leaves without stipular spines. Stamens 4-5, inserted half way up the gynophore. | 1. <i>Cadaba</i> |

1. CADABA FORSSK.

- | | |
|------------|------------------------|
| Stamens 4. | 1. <i>C. fruticosa</i> |
| Stamens 5. | 2. <i>C. farinosa</i> |

1. *Cadaba fruticosa* (L.) Druce in Rep. Bot. Exch. Club Soc. Brit. Isles 3: 415. 1914. *Cleome fruticosa* L. Sp. Pl. 671. 1753. *Cadaba indica* Lam. Encycl. 1: 544. 1785; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 172. 1872; Bhandari, Fl. Indian Desert 36. 1978. "Dabi" (Hindi).

Much-branched, scandent or subscandent shrubs. Leaves petiolate, 2.9-6.0 × 0.9-1.6 cm, elliptic-oblong, obtuse, mucronate, nearly glabrous. Flowers in few-flowered, terminal, one-sided corymbose racemes, dirty white or creamy yellow. Fruits 2-5 × 0.3-0.5 cm, pendulous, subcylindric, olive-green. Seeds numerous, light brown to black, surrounded by an orange-red aril.

Fl. : November - March; *Fr.* : April - August.

Common in plains, among hedges, dry river-beds, forest under-growth and on hillocks in W. Rajasthan.

Selected specimens : Barmer: Balotra kabristan, *Tiwari* 980 (BSJO); Bikaner: Gajner palace garden, *Roy* 1686 (BSJO); Ganganagar : Suratgarh farm, *Roy* 5921 (BSJO); Jaisalmer: Pokaran, *Wadhwa* 938 (BSA); Pali: Bhandaria village, *Shetty* 1444 (BSJO).

2. *Cadaba farinosa* Forssk. Fl. Aegypt. Arab. 68. 1775; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 173. 1872; Cooke, Fl. Bombay 1: 43. 1901.

Much branched, unarmed, hoary shrubs, with wiry branches. Leaves petiolate, 0.5-5.0 × 0.3-3.0 cm, oblong-ovate or elliptic-oblong, obtuse or retuse, glaucous or whitish and mealy at first, at length glabrate. Flowers in few-flowered, sub-corymbose racemes, creamy yellow. Fruits narrowly cylindrical, 2-5 × 0.3-0.4 cm, obscurely torulose. Seeds many, surrounded by orange flesh.

Fl. : January - March; *Fr.* : March - July.

Rare, in wastelands and in hilly tracts. This species is included on the authority of Vyas, (1965, 1967), who reported it from Udaipur and Alwar respectively. We have not seen any authentic sheet of this species.

2. CAPPARIS L.

- 1a. Plants leafless, if present then minute, linear, deciduous. Flowers red or orange red. 1. *C. decidua*
- 1b. Plants leafy. Flowers white or creamy:
- 2a. Flowers axillary, solitary or in fascicles of 2-3:
- 3a. Leaves orbicular. Flowers solitary in the upper leaf axils. 5. *C. spinosa*
- 3b. Leaves ovate to lanceolate. Flowers supra-axillary, 1-3 together. 6. *C. zeylanica*
- 2a. Flowers in corymbs, umbels or racemes:
- 4a. Trees. Flowers in corymbs or racemes. 2. *C. grandis*
- 4b. Straggling or woody climbers. Flowers in umbels:
- 5a. Branches nearly glabrous. 3. *C. sepiaria* var. *sepiaria*
- 5b. Branches softly tomentose. 4. *C. sepiaria* var. *vulgaris*

1. *Capparis decidua* (Forssk.) Edgew. in Journ. Linn. Soc. Bot. 6: 184. 1862; 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. India 1: 174. 1872; Duthie, Fl. Gangetic Plain 1: 53. 1903. "Ker" (Hindi).

Much branched shrubs or small trees; branches slender, nearly glabrous. Stipular spines straight. Leaves, when present, 0.5-1.2 × 0.2-0.4 cm, fleshy, glabrous, spinous-tipped. Flowers in corymbose racemes or in fascicles. Berries ovoid to subglobose, 0.8-1.5 cm across, many-seeded, glabrous, scarlet red when ripe. Seeds 4-5 mm in diameter.

Fl. & Fr. : March - June; often September - December.

Common in rocky, gravelly and sandy plains, even on sand dunes.

Selected specimens : Bharatpur: Sharma A. No. 8425 (RUBL); Churu: Bhuthia Jodi, Roy 2782 (BSJO); Dungarpur: J.A.V. 29375 (BSD); Jaisalmer: Devikot, Shetty 3386 (BSJO); Jhalawar: Bhawanimandi, Verma 3488 (BSA); Tonk: Amlī R.F., Pandey 4708 (BSJO); Sirohi: Mt. Abu, Mc Cann 1875 (BLAT).

2. *Capparis grandis* L. f. Suppl. 263. 1781; Wight, Ic. 1: t. 21. 1838; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 176. 1872; Duthie, Fl. Gangetic Plain 1: 53. 1903. "Pachunda" (Hindi).

Trees or large shrubs, with yellowish brown longitudinally fissured bark and pubescent branches. Leaves petiolate, 2.5-8.0 × 2-6 cm, broadly ovate to obovate, acute, obtuse or retuse, velvety pubescent. Flowers in terminal corymbs, white, fragrant. Berries 1.5-2.5 cm across, globose, smooth, purple, 2 to 6-seeded.

Fl. & Fr. : Most part of the year.

Rare, in dry deciduous forests.

Selected specimens : Ajmer: Todgarh, Lourie s.n. (DD); Pali: Piprolī R.F., Pandey 4623 (BSJO); Sirohi: Mt. Abu, Blatter 17603, 17606 (BLAT); Udaipur: Prasad, Verma 111 (BSA). Also reported from Jodhpur by Sarup (1951).

3. *Capparis sepiaria* L. Syst. Nat. ed. 10. 2: 1071. 1759; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 177. 1872, incl. vars.; Duthie, Fl. Gangetic Plain 1: 53. 1903; Mahesh. Illus. Fl. Delhi f. 13. 1966. "Jal Chhail" (Hindi).

var. *sepiaria*

Much branched, sub-scandent or scandent, armed shrubs. Leaves 1.5-4.0 × 1.5-3.0 cm, ovate, elliptic, oblong or oblong-lanceolate, sub-acute to retuse, coriaceous, glabrous above and downy beneath. Flowers in umbels at the ends of branches, white. Berries globose, smooth, glabrous, dark purple to black when ripe, 1-seeded.

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

Common in scrub forests and wastelands, particularly in the east of Aravalli.

Selected specimens : Alwar: Alwar Bala fort Road, *Hiralal & Party* 34465 (LWG); Dungarpur: *Verma* 158 (BSA); Kota: Shahabad forest, *Verma* 608 (BSA); Pali: Piproli R.F., *Pandey* 4622 (BSJO); Sirohi: Mt. Abu, *Blatter* 18138, 17604 (BLAT); Tonk: Sopari village, *Pandey* 4764 (BSJO); Udaipur: Jaisamand, *Verma* 57 (BSA).

4. var. *vulgaris* Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 177. 1872.

Differs from proper species in having softly tomentose branches and broad leaves.

Rare, so far collected from Mt. Abu.

Selected specimen : Sirohi: Mt. Abu, *Blatter* 17592 (BLAT).

5. *Capparis spinosa* L. Sp. Pl. 503. 1753; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 173. 1872; Cooke, Fl. Bombay 1: 44. 1901. "Kabar" (Hindi).

Diffuse, prostrate shrubs; branches glabrous or pubescent. Leaves 1.5-3.0 cm long, orbicular or broadly ovate to obovate, retuse or acute, rounded or cuneate at the base, glaucescent. Flowers axillary, solitary, white, handsome. Berries 2.5-5.0 cm long, obovoid, ribbed, red when ripe. Seeds globose, smooth, brown.

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

Said to be common on dry beds of streams throughout the state. Sharma (1958) reported from Ajmer, Vyas (1967) from Alwar, Dhillon & Bajwa (1969) from Ganganagar, Sarup (1951) from Jodhpur and Ramdeo (1969) from Udaipur. We could not see any collection of this species from Rajasthan in the herbaria consulted by us.

6. *Capparis zeylanica* L. Sp. Pl. ed. 2. 720. 1762; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 174. 1872. *Capparis horrida* L.f. Suppl. 264. 1781; Wight, Ic. 1: t. 173. 1839; Hook.f. & Thoms. *Lc.* 1: 174. 1872; Duthie, Fl. Gangetic Plain 1: 53. 1903. "Aradanda" (Hindi).

Rigid, much branched, scandent shrubs, with hooked or straight spines. Young parts clothed with reddish brown tomentum. Leaves 2.5-4.5 × 1.8-3.5 cm, ovate, obovate, elliptic or broadly lanceolate, sub-acute or rounded at base. Flowers axillary, solitary or 2-3 together on a short shoot, white. Berries ellipsoid or nearly globose, glabrous, smooth, deep red to bright-scarlet. Seeds numerous, embedded in the white foetid pulp.

Fl. : December - March; *Fr.* : March - June.

Occasional, in wastlands and fringes of forests among bushes.

Selected specimens : Banswara: *Singh* 4618 (BSJO); Kota: Kathoon, *Singh* 90591 (LWG); Sirohi: Abu road, *McCann* 64 (BLAT).

3. CRATEVA L.

1a. Flowers orange-brown tinged in the herbarium, appear before the leaves. Fruits red-violet, brownish tinged when dry, smooth:

2a. Leaflets 4.0-6.75 × 1.5-3.0 cm, tip 0.5-1.5 cm, acute. 1. *C. adansonii* subsp. *adansonii*

2b. Leaflets 7.5-11.0 × 4-7 cm, greyish green when dry, abruptly acuminate, tip 1.5-2.5 cm, acute. 2. *C. adansonii* subsp. *odora*

1b. Flowers not orange-brown in the herbarium, appear after the leaves. Fruits greyish when dry, with dry flat papillae.

3. *C. nurvala*

1. *Crateva adansonii* DC. Prodr. 1: 243. 1824. *C. religiosa* non Forst. f.; Oliv. Fl. Trop. Afr. 1: 99. 1868.

subsp. *adansonii*

Trees or shrubs. Leaves petiolate; leaflets ovate to lanceolate, acute, nerves 4-5 pairs. Flowers few, in terminal and lateral corymbs, greenish-white, turning yellowish. Berries 4-5 cm in diam., yellow or red. Seeds 0.8-0.9 × 0.7-0.8 cm.

Fl. : December - May; *Fr.* : February - June.

Rare; sometimes planted in the gardens.

Selected specimen : Jaipur: Ram Niwas garden, *Singh* A. No. 12559 (RUBL).

2. subsp. *odora* (Buch. - Ham.) Jacobs in Blumea 12: 198. f. 14. 1964; Mahesh. Illus. Fl. Delhi f. 14. 1966. *C. odora* Buch.-Ham. in Trans. Linn. Soc. Bot. 15: 118. 1827. *C. roxburghii* R. Br. in Denh. & Clapp. Narr. Trav. Disc. Afr. App. 224. 1826. *C. religiosa* non Forst. f. var. *roxburghii* (R. Br.) Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 172. 1872; Duthie, Fl. Gangetic Plain 1: 52. 1903. "Barna, Narnohi" (Hindi).

Moderate-sized, deciduous trees. Petiole 7-10, cm long with small glands above the top. Leaflets elliptic to elliptic-lanceolate, cuneate, acuminate, greyish-green when dry. Flowers few, axillary, greenish-yellow or whitish-yellow. Berries globose on c. 3.5 mm thick stipe, 2.5-3.5 cm across. Seeds reniform, brown.

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

Often planted along the roads; rarely wild.

Selected specimens : Jhalawar: Richwa, *Wadhwa* 950ⁿ (BSA); Kota: *Wadhwa* 9390 (BSA); Pali: Ranakpur temple, *Pandey* 4137 (BSJO); Tonk: Toda Rai Singh R.F., *Shetty* 1294 (BSJO).

3. *Crateva nurvala* Buch. Ham. in Trans. Linn. Soc. Bot. 15: 121. 1827. *Crateva religiosa* Forst. f. var. *nurvala* (Buch. Ham.) Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 172. 1872; Duthie, Fl. Gangetic Plain 1: 52. 1903.

Deciduous tree, with ash-coloured bark. Leaves petiolate; leaflets 5.0-12.5 × 2-5 cm, ovate or ovate-lanceolate, obliquely falcate, gradually acuminate, thinly coriaceous, nerves 10-15 pairs. Flowers in terminal and lateral racemes, creamish-yellow. Berries subglobose or ovate-oblong, 1.5-2.5 cm across.

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

Common in wastelands; rarely found in the forests at low elevation along water streams; occasionally planted in the gardens.

Selected specimens : Banswara: *Singh* 4616 (BSJO); Chittorgarh: Deogarh, *Verma* 284 (BSA); Jhalawar: Richwa forest block, *Wadhwa* 9507 (BSA); Kota: Nahargarh, *Wadhwa* 2390 (BSA); Udaipur: Jaisamand, *Verma* 55 (BSA).

4. DIPTERYGIUM DECASINE

Dipterygium glaucum Decne. in Ann. Soc. Nat. ser. 2(4): 66. 1835; Hook.f. & Anders. in Hook.f. Fl. Brit. India 1: 164. 1872; Bhandari, Fl. Ind. Desert 43. 1978.

Divaricate, rigid, much-branched undershrubs; branches ending in lax racemes. Leaves few, 0.6-2.0 × 0.2-1.0 cm, oblong or obovate, entire. Flowers small, yellow; bracts c. 2.5 cm long, scaly, on short filiform pedicels. Fruits indehiscent, ellipsoidal, compressed, transversely wrinkled.

Fl : August - October; *Fr* : October - December.

Very common in the extreme arid regions of N.W. Rajasthan on low sand-dunes and gravelly soils.

Selected specimen : Barmer: 25 km from Munabao along Sandra road, Shetty 2312 (BSJO); Bikaner: Bhikampur village, Roy 2008 (BSJO); Ganganagar: Lakha, Roy 4955 (BSJO); Jaisalmer: Sam, Shetty 6122 (BSJO).

5. MAERUA FORSSK.

Calyx softly pubescent.

2. *M. arenaria* var. *scabra*

Calyx glabrous.

1. *M. arenaria* var. *arenaria*

1. *Maerua arenaria* (DC.) Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 171. 1872; Duthie, Fl. Gangetic Plain 1: 51. 1903. *Nibuhria arenaria* DC. Prodr. 1: 244. 1824. "Orapa" (Hindi).

var. *arenaria*

Unarmed shrubs, often climbing. Leaves 3.5-7.0 × 1.5-4.0 cm, elliptic or oblong-lanceolate, obtuse or rarely retuse, glaucous, glabrous, coriaceous. Flowers in axillary and terminal corymbs, greenish white to cream-coloured. Fruits 8-12 cm long, elongated berry, twisted and knotted, each knot one-seeded, pale-brown. Seeds more or less globose, minutely echinate, brown.

Fl. & Fr. : November - January.

Common in forests and waste places among clumps of trees and shrubs.

Selected specimens : Ajmer: Todgarh, Duthie 4513 a & b (DD); Alwar: Balafort to Alwar, Hiralal & Party 34410 (LWG); Barmer: Nimbri village, Shetty 2286 (BSJO); Pali: Lampi village, Shetty 1504 (BSJO); Sawaimadhopur: Hindolia forest, Parker 5949 (DD).

Notes : *Maerua arenaria* (DC.) Hk. f. & Th. & *M. oblongifolia* (Forssk.) A. Rich. have been treated as distinct species in the present work and not synonymous as considered by some workers.

2. var. *scabra* Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 171. 1872; Duthie, Fl. Gangetic Plain 1: 51. 1903; Mahesh. Illus. Fl. Delhi f. 11. 1966.

Very similar to var. *arenaria*, but can be distinguished by young shoots and upper leaves being scabrous and calyx softly pubescent.

Fl. & Fr. : November - January.

Selected specimens : Jaipur: Chaumu, Wadhwa 8317 (BSA); Pali: Bar, Duthie 4513 (DD); Kota: Shahabad, Singh 90821 (LWG); Tonk: Aunwa forest, Shetty 485 (BSJO).

DOUBTFUL TAXON

Crateva religiosa Forst. f. Pl. Escul. Ins. Oc: Austral. 45. 1786.
C. nurvala non Buch. Ham. 1827; Kanj. & Das, Fl. Assam 1: 74. 1934.

The above species was collected by McCann from Mt. Abu, and the collection Nos. 1885, 1886, 1889 were deposited in the Blatter herbarium (BLAT). According to Jacob (*l.c.*) the distribution of this species in India is Sikkim, E. Himalaya, Assam etc., so the presence of this species in Rajasthan is doubtful and critical studies on the collections cited above are necessary.

13. RESEDACEAE

(P.J. Parmar)

OLIGOMERIS CAMB. *nom. cons.*

Oligomeris linifolia (Vahl) Macbride in Contr. Gray Herb. n.s. 53: 13. 1918; Mahesh. Illus. Fl. Delhi f. 15. 1966. *Reseda linifolia* Vahl in Hornem. Hort. Hafn. 2: 501. 1815. *Oligomeris glaucescens* Camb. in Jacq. Voy. Bot. 4: 24. t. 25. 1844; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 181. 1872; Duthie, Fl. Gangetic Plain 1: 54. 1903.

Erect, glaucous, much-branched, annual herbs, 15-30 cm high. Leaves 2.5-7.5 × 0.2 cm, linear. Flowers bracteate, in terminal, dense spikes, greenish. Ovaries open at the apex, Capsules small, deeply 4-lobed. Seeds many, shining.

Fl. & Fr. : February - May.

Rare, in fallow fields. Collected only once from Ganganagar (Dhillon & Bajwa, 1969).

CULTIVATED SPECIES

Reseda odorata L. Erect to decumbent annuals. Flowers yellowish white, fragrant. Margins of the petal-appendages fimbriate. Probably a native of N. Africa; rarely cultivated in the gardens.

14. VIOLACEAE

(P.J. Parmar)

Sepals produced at the base. Anthers connate.

2. *Viola*

Sepals not produced at the base. Anthers distinct.

1. *Hybanthus*

1. HYBANTHUS J. JACQ.

Hybanthus enneaspermus (L.) Muell. Fragm. Phyt. Aust. 10: 81. 1876. *Viola enneasperma* L. Sp. Pl. 937. 1753. *V. suffruticosa* L. Sp. Pl. 937. 1753. *Ionidium heterophyllum* Vent. Jard. Malm. t. 27. 1803; Duthie, Fl. Gangetic Plain I: 56. 1903. *I. suffruticosum* (L.) Roem. & Schult. Syst. Veg. 5: 394. 1819; Wight, Ic. 1: t. 308. 1840; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 185. 1872. "*Ratanpurus*" (Hindi).

Erect or diffuse, suffruticose, glabrous or pubescent, perennial herbs. Leaves subsessile, 0.6-4.0 × 0.2-1.0 cm, linear or lanceolate, serrate; stipules subulate, gland-tipped. Flowers axillary, solitary, pinkish purple to red. Capsules 0.5-0.6 cm long, ovoid or sub-globose, glabrous. Seeds numerous, striated, pale yellow to brown.

Fl. : July - October; *Fr.* : October - December.

Common in wastelands, fields and gardens, particularly in the east of Aravalli.

Selected specimens : Banswara: Paloda, *Singh* 2812 (BSJO); Bhitwara: Umed sagar, *Singh* 5759 (BSJO); Jaipur: Ramgarh, *Sharma* 178 (RUBL); Kota: Shahabad, *Verma* 808 (BSA).

2. VIOLA L.

Stigma terminal, 3-lobed.

2. *V. betonicifolia* subsp. *nepalensis*

Stigma lateral, 2-lobed.

1. *V. cinerea* var. *stocksii*

1. *Viola cinerea* Boiss. var. *stocksii* (Boiss.) Becker in Beih. Bot. Centralb. 36: 36. 1918. *V. stocksii* Boiss. Fl. Orient. 1: 435. 1867. *V. cinerea* Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 185. 1872, non Boiss. 1842; Duthie, Fl. Gangetic Plain I: 56. 1903. "*Banafsha*" (Hindi).

Sub-erect or diffuse, almost glabrous, annual herbs. Leaves 2.0-4.5 × 1.0-1.7 cm, oblong-obovate or elliptic, acute, somewhat apiculate, gradually narrowed into a petiole, entire or denticulate. Flowers in all axils, white with a violet blotch on the uppermost petal. Capsules 0.4-0.6 cm long, cylindrical, 3-valved, glabrous, white or grey in colour. Seeds numerous, minute, ovate, shining, white.

Fl. & Fr. : August - November.

Rare, on dry rocky slopes of hills in W. Rajasthan and in moist shady habitats in the east of Aravalli.

Selected specimens : Barmer: *Bhandari* 513 (JAC); Jaipur: Amer hills,

Sharma 2282 (RUBL). Also reported from Jaisalmer (Sarup, 1958; Blatt & Hallb., 1918) & Jhunjhunu (Nair & Kanodia, 1959; Nair *et al.*, 1961).

2. *Viola betonicifolia* J.E. Smith subsp. *nepalensis* (Ging.) Becker, Bot. Jahrb. 54 (Beibl. 120): 166. 1917. *Viola patrinii* DC. var. *nepalensis* Ging. in DC. Prodr. 1: 293. 1824. *Viola patrinii auct. plur.* non DC. 1824; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 183. 1872, *p.p.*; Duthie, Fl. Gangetic Plain 1: 55. 1903.

Ascending, perennial herbs, with stout, woody rhizomes. Petioles winged at the top. Stipules adnate to the petioles upto more than half of their length. Flowers lilac or blue. Capsules ellipsoid. Seeds small.

Fl. & Fr. : August - November.

This species is included here on the authority of Jain (1962) and Sankhala (1951), who reported it from Mt. Abu (Sirohi Dist.) and N.W. Rajasthan respectively.

DOUBTFUL TAXON

Viola odorata L. Sp. Pl. 934. 1753.

Perennials, with orbicular-reniform, deeply cordate leaves. Flowers dark violet or white. Native of Europe & Africa; usually cultivated in the gardens; often naturalized.

Except Sankhala (1951) who reported this species from N.W. Rajasthan, no other reference or authentic specimens are available to prove its presence in Rajasthan.

15. COCHLOSPERMACEAE

(P.J. Parmar)

COCHLOSPERMUM KUNTH

Cochlospermum religiosum (L.) Alston in Trimen, Handb. Fl. Ceylon. 6: 14. 1931. *Bombax religiosa* L. Sp. Pl. 552. 1753. *Cochlospermum gossypium* DC. Prodr. 1: 527. 1824; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 190. 1872; Duthie, Fl. Gangetic Plain 1: 58. 1903.

Small, soft-wooded, deciduous trees. Leaves long-petioled, 10-27 cm across, broadly ovate, palmately 3 to 5-lobed, pubescent; lobes acuminate, entire. Flowers in terminal panicles, bright golden yellow. Capsules 8.5-10.0 × 4.5-6.0 cm, broadly ellipsoid or obovate, glabrous, ribbed. Seeds 0.5-0.7 cm across, minutely tuberculate, cochleate brown, densely silky brown hairy.

Fl : January - February; *Fr* : March - April.

Very rare, in deciduous forests in the east of Aravalli.

Selected specimen : Kota: Shahabad, Jain 28965 (BSI).

16. BIXACEAE

(P.J. Parmar)

BIXA L.

Bixa orellana L. Sp. Pl. 519. 1753.

Large, evergreen shrubs or small trees. Leaves ovate-cordate, entire. Flowers in terminal panicles, rose-coloured or white.

Native of Tropical America; rare, cultivated in the gardens for ornamental purposes.

17. FLACOURTIACEAE

(P.J. Parmar)

Plant unarmed. Flowers bisexual. Fruit a capsule.

1. *Casearia*

Plants usually armed. Flowers unisexual. Fruit a berry.

2. *Flacourtia*

1. CASEARIA JACQ.

Casearia elliptica Willd. Sp. Pl. 2: 628. 1800; Wight, Ic. 5(2): 16. t. 1849. 1852. *C. tomentosa* Roxb. Fl. Ind. 2: 421. 1832; Clarke in Hook.f. Fl. Brit. India 2: 593. 1879; Duthie, Fl. Gangetic Plain 1: 360. 1903. "*Chilla*" (Hindi).

Large shrubs or small trees, with rough, grey, longitudinally fissured bark; young parts tomentose. Leaves 5.5-24.0 × 2-10 cm, elliptic-oblong or obovate-oblong, entire, serrate or crenate, glabrous above, pubescent beneath, gland-dotted. Flowers fascicled in the axils of leaves or on leafless branches, greenish-yellow. Capsules ellipsoidal, glabrous, bright yellow or orange-coloured, many seeded.

Fl & Fr : February - May.

Rare, occasionally found on dry gentle slopes of the hills.

Selected specimens : Bharatpur: Sikandra, Parmar 8750 (BSJO); Kota: Shahabad, Singh 83841 (LWG); Sirohi: Mt. Abu, Blatter 19261, 25501 (BLAT).

2. FLACOURTIA COMMERS. EX L'HERIT.

Flacourtia indica (Burm. f.) Merrill, Interpret. Rumph. Herb. Amboina 377. 1917. *Gmelina indica* Burm. f. Fl. Ind. 132. t. 39. f. 5. 1768. *Flacourtia ramontchi* L' Herit. Strip. Nov. 3: 59. t. 30 & 30B. 1785; Wight, Ic. 1: t. 85. 1838; Hook.f. & Thoms. in Hook.f. Fl. Brit. India 1: 193. 1872; Duthie, Fl. Gangetic Plain 1: 59. 1903. *F. sepiaria* Roxb. Pl. Cor. 1: 48. t. 68. 1796; Hook.f. & Thoms. *l.c.* 1: 194. 1872; Duthie, *l.c.* 1: 59. 1903. "Kankair, Kanju" (Hindi).

Small, deciduous, thorny trees; the thorns usually bearing flowers and fruits. Leaves 2-11 × 1.0-6.5 cm, ovate-elliptic or oblong to obovate or suborbicular, often cuneate at the base, crenate-serrate, glabrous. Flowers very small, greenish-yellow; males in short, clustered racemes; female ones solitary or in pairs. Berries globose, glabrous, deep red or purple. Seeds obovoid-trigonous, pale-yellowish to brown.

Fl. & Fr. : January - May.

Common, in dry deciduous forests in the east of Aravalli.

Selected specimens : Chittorgarh: Deogarh (Pratapgarh), Verma 295 (BSA); Dungarpur: Verma 152 (BSA); Kota: Nahargarh, Wadhwa 9388 (BSA); Sirohi: Mt. Abu, Blatter 17638 (BLAT); Tonk: Amlī R.F., Pandey 4713 (BSJO).

18. POLYGALACEAE

(P.J. Parmar)

POLYGALA L.

1a. Wings of sepals acute or sub-acute. Petals yellow:

2a. Racemes longer than the leaves. Capsules distinctly margined.

3. *P. elongata*

2b. Racemes shorter than the leaves. Capsules not margined.

2. *P. arvensis*

1b. Wings of sepals rounded or obtuse. Petals pinkish, purple to pale purple:

3a. Bracts persistent. Capsules pubescent, at least on margins:

4a. Racemes longer than the leaves.

6. *P. persicariaefolia*

4b. Racemes shorter than the leaves.

4. *P. erioptera*

3b. Bracts caducous. Capsules glabrous:

5a. Bracts and sepals hairy. Seeds crowned with bulbous hairs; strophiole absent.

5. *P. irregularis*

5b. Bracts and sepals glabrous. Seeds not crowned
with bulbous hairs; strophiole conspicuous.

1. *P. abyssinica*

1. *Polygala abyssinica* R. Br. ex Fresen. in Mus. Senck. 2: 273. 1837; Bennett in Hook.f. Fl. Brit. India 1: 202. 1872; Mukerjee in Bull. bot. Soc. Bengal 12: 41. 1960. *P. gerardiana* Wall. ex Hassk. in Miq. Ann. Mus. Bot. Ludg. Bot. 1: 174. 1864.

Small, perennial herbs; branches many from the woody root-stock. Leaves sessile, 0.75-2.0 × 0.3-0.5 cm, linear or linear-lanceolate, acute-acuminate, glabrous, recurved. Flowers in terminal, lax racemes, pale rose. Capsules oblong, retuse, glabrous or nearly so, narrowly winged at the top. Seeds densely hairy.

Fl. & Fr. : July - October.

According to Mukerjee (*l.c.*) the above species is of N.W. Himalayan region, but included here on the authority of Vyas (1967) from Alwar, Nair *et al.* (1961) and Nair (1961) from Jhunjhunu, Nair & Nathawat (1957) & Nair & Malhotra (1961) from Sikar and Ramdeo (1969) from Udaipur.

2. *Polygala arvensis* Willd. Sp. Pl. ed 3. 2: 876. 1802; Burt in Notes Roy. Bot. Gard. Edinb. 32: 404. 1873. *P. chinensis auct. plur.*, non L. 1753; Bennett in Hook.f. Fl. Brit. India 1: 204. 1872; Duthie, Fl. Gangetic Plain 1: 62. 1903; Mukherjee in Bull. Bot. Soc. Bengal 22: 38. 1960; Mahesh. Illus. Fl. Delhi f. 16. 1966. "*Miradu, Golbel*" (Hindi).

Procumbent, pubescent, annual herbs, with slender woody root-stocks. Leaves sessile, 0.5-4.0 × 0.2-0.9 cm, obovate or oblanceolate to linear-lanceolate, margins almost recurved. Flowers few, in short, axillary racemes. Capsules broadly oblong, emarginate, ciliate-margined. Seeds ellipsoid-oblong, hairy, strophiolate.

Fl. : July - August; *Fr.* : August - October.

Common in grassy places, roadsides, cultivated fields and waste places, particularly in the east of Aravalli.

Selected specimens : Banswara: Pipalkhum (Forest Rest house), Singh 2917 (BSJO); Bhilwara: Ganthila village, Singh 6546 (BSJO); Churu: Sardarshahr, Kaul & Party 18544 (LWG); Jhalawar: Bhawanimandi, Singh 83676 (LWG).

3. *Polygala elongata* Klein ex Willd. Sp. Pl. 3: 879. 1800; Bennett in Hook.f. Fl. Brit. India 1: 203. 1872; Mukerjee in Bull. bot. Soc. Bengal 12: 36. 1960.

Erect, annual, glabrous or pubescent herbs with curved hairs. Leaves subsessile, $1.5-2.7 \times 0.2-0.5$ cm, linear-oblong or ovate-oblong, mucronate at apex and tapering at base. Flowers in elongated, lateral, lax racemes. Capsules oblong, emarginate, glabrescent. Seeds pyriform, densely appressed hairy; strophiole 3-lobed, slightly hairy at tip.

Fl. : August - September; *Fr.* : September - October.

Rare, in sandy habitats in the forests.

Selected specimen : Kota: Shahabad, *Verma* 781 (CAL).

4. *Polygala erioptera* DC. Prodr. 1: 326. 1824; Bennett in Hook.f. Fl. Brit. India 1: 203. 1872; Duthie Fl. Gangetic Plain 1: 62. 1903; Mukerjee in Bull. bot. Soc. Bengal 12: 47. 1960. *P. vahliana* DC. Prodr. 1: 326. 1824. *P. erioptera* DC. var. *vahliana* (DC.) Chodat. Mem. Soc. Phys. Hist. Nat. Genev. 31: 2. 345. 1893. "*Sarbhagolia*" (Hindi).

Annual or perennial, more or less pubescent herbs. Leaves $0.6-4.5 \times 0.06-0.8$ cm, linear-filiform to obovate-lanceolate, obtuse or acute, recurved. Flowers in lateral racemes, pink. Capsules oblong, emarginate, hairy, ciliate on margins. Seeds densely pilose; strophiole 3-lobed, with a few hairs.

Fl. & Fr. : Almost throughout the year.

Common in wastelands, cultivated fields, lawns, gardens and crevices of rocks at low elevations.

Selected specimens : Banswara: Dajia-Bowji hills (Ghatol), *Singh* 2863 (BSJO); Ganganagar: Pallu, *Roy* 6460 (BSJO); Jaisalmer: on way to Sam, *Shetty* 3458 (BSJO); Jhunjhunu: Pilani, *Prasad* 31198 (LWG); Kota: Shahabad, *Singh* 90579 (LWG); Sirohi: Mt. Abu, *Blatter* 17673 (BLAT); Tonk: Kachhabundh, *Shetty* 1051 (BSJO).

5. *Polygala irregularis* Boiss. Diagn. Pl. Or. Nov. ser. 1. 1: 8. 1842; Mukherjee in Bull. bot. Soc. Bengal 12: 42. 1960; Raizada, Suppl. Duthie, Fl. Gangetic Plain 13. 1976.

Perennial herbs; branches elongate, twiggy. Leaves shortly petioled, $2.0-3.5 \times 0.4-0.6$ cm, linear-oblong, mucronate, alternate at the base. Flowers in long, lax, terminal racemes, rose-coloured or pale-red. Capsules obliquely emarginate, glabrous, membranous at margins. Seeds conical, very acute, densely clothed with short hairs.

Fl. & Fr. : September - December.

Common in sandy plains, sand-dunes and open gravelly situations particularly in the desertic zones.

Selected specimens : Ajmer: Pushkar valley, *Sharma* 1172 (LWG);

Churn: Sardarshahr, *Roy* 2647 (BSJO); Jaipur: URF, *Sharma* 676 (RUBL); Jaisalmer: Chandan (RMA), *Tiwari* 797 (BSJO); Jodhpur: Shergarh, *Singh* 3131 (BSJO).

6. *Polygala persicariaefolia* DC. Prodr. 1: 326. 1824; Bennett in Hook.f. Fl. Brit. India 1: 202. 1872; Mukerjee in Bull. bot. Soc. Bengal 12: 45. 1960.

Erect, slightly pubescent, much-branched, annual herbs. Leaves subsessile, 2.5-5.0 × 0.5-1.5 cm, linear-lanceolate or linear-oblong, mucronate, glabrous or nearly so. Flowers in terminal, extra-axillary racemes, rose-coloured. Capsules elliptic-oblong, emarginate, ciliate on thickened margins. Seeds oblong, clothed with dense sub-appressed hairs, deep brown; strophiole smooth, glabrous, crescentic.

Fl. & Fr. : Rainy season.

Rare, at high altitude on the hills in shady habitats.

Selected specimens : Sirohi: Mt. Abu, *Bakshi* A. No. 4 (RUBL), Gurushikhar, *Raizada* 21106 (DD), *Jain* 4669 (BSI), *Blatter* 17701, 17695 (BLAT).

19. CARYOPHYLLACEAE

(P.J. Parmar)

1a. Stipules scarious:

- | | |
|--|------------------------|
| 2a. Leaves opposite. Flowers pinkish. | 7. <i>Spergularia</i> |
| 2b. Leaves pseudo-whorled or apparently whorled. Flowers white: | |
| 3a. Leaves apparently whorled. Styles 3, free from base. | 6. <i>Spergula</i> |
| 3b. Leaves pseudo-whorled. Style 1, 3-fid: | |
| 4a. Leaves flat, spatulate. Sepals keeled. Style 3-partite or toothed. | 4. <i>Polycarpon</i> |
| 4b. Leaves needle-like, subulate. Sepals not keeled. Style 3-fid. | 3. <i>Polycarphaea</i> |

1b. Stipules absent:

- | | |
|---|---------------------|
| 5a. Sepals free. Flowers white: | |
| 6a. Petals entire. | 1. <i>Arenaria</i> |
| 6b. Petals deeply lobed. | 8. <i>Stellaria</i> |
| 5b. Sepals united. Flowers pinkish to purplish: | |
| 7a. Styles 2. Capsules 4-valved. | 9. <i>Vaccaria</i> |
| 7b. Styles 3 or 5. Capsules 5 to 6-valved: | |

- 8a. Petals entire. Styles 3. Capsules 6-valved. 3. *Silene*
- 8b. Petals 2-fid with fimbriate limbs. Styles 5. Capsules 5-valved. 2. *Lychnis*

1. ARENARIA L.

Arenaria serpyllifolia L. Sp. Pl. 423. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 239. 1874; Duthie, Fl. Gangetic Plain 1: 66. 1903; Mahesh. Illus. Fl. Delhi f. 18. 1966.

Small, decumbent, glandular pubescent, annual herbs, with many branches from the base. Leaves 0.5-0.8 × 0.3-0.5 cm, ovate or ovate-elliptic, entire, acute. Flowers solitary, axillary and in terminal cymes. Capsules ovoid, narrowed upwards, 6-valved. Seeds reniform, tubercled, brown to black.

Fl. & Fr. : January - April.

Rare, found in moist sandy habitats and in cultivated fields during the winter season.

Selected specimens : Ganganagar. 26 P.S., Roy 4092 (BSJO); Kota: Kelwara, Singh 74055 (LWG). Also reported from Alwar (Vyas, 1967), Sirohi (Raizada, 1954 & Jain, 1962) and Udaipur (Vyas, 1965).

2. LYCHNIS L.

Lychnis indica (Roxb.) Benth. in Royle, Ill. Bot. Himalaya Mount. 81, 183. 1834; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 225. 1874; Sharma & Tiagi, Fl. N.E. Raj. 49. 1979.

Tall, pubescent herbs, with diffusely branched stem. Upper leaves sessile, lower petioled, ovate-lanceolate, acute. Calyx bell-shaped, ventricose in fruit, with 10 anastomosing green nerves. Flowers lax, in many-flowered panicles, purple. Capsules ovoid. Seeds minute, granulate, black.

Fl. & Fr. : January - March.

Temperate Himalayan species; rare, near gardens, probably an escape.

Selected specimen : Jaipur: Univ. Premises, Sharma 662 (RUBL).

3. POLYCARPAEA LAM. *nom. cons.*

Polycarphaea corymbosa (L.) Lam. Tabl. Encycl. 2: 129. 1797; Wight, Ic. 2(4): 6. t. 712. 1843; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 245. 1874; Duthie, Fl. Gangetic Plain 1: 68. 1903. *Achyranthes corymbosa* L. Sp. Pl. 205. 1753. "Dholphuli" (Hindi).

Erect, pubescent, annual herbs, with dichotomous, purplish-white branches. Leaves in pseudo-whorls, sessile, 0.3-3.0 × 0.1-0.3 cm, linear, aristate with a 0.1 cm long bristle, glabrous. Flowers in terminal, paniculate cymes, silvery white to reddish. Sepals scarious. Capsules 3-valved, brown. Seeds reniform, minutely corrugated, yellowish brown.

Fl. : August - October, *Fr.* : October - December.

Common weed in cultivated fields and wastelands along roads, particularly among grasses.

Selected specimens : Barmer: Tapara village, *Shetty* 2276 (BSJO); Bhilwara: Banas river-bed (along Bhilwara-Hamirgarh road), *Singh* 6008 (BSJO); Bundi: Kota dam, *Singh* 74655 (LWG); Dungarpur: *Jain* 47070 (BSI); Sirohi: Mt. Abu, *Gaur* A. No. 46 (RUBL); Tonk: On the way to Rajmahal R.F., *Shetty* 1218 (BSJO).

4. POLYCARPON L.

Polycarpon prostratum (Forssk.) Aschers. & Schweinf. in Oesterr. Bot. Zeitschr. 39: 128. 1889; Mahesh. Illus. Fl. Delhi f. 20. 1966. *Alsine prostrata* Forssk. Fl. Aegypt. - Arab. 207. 1775, non Del. 1813. *Polycarpon loeflingii* Benth. & Hook.f. Gen. Pl. 1: 153. 1862; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 245. 1874; Duthie, Fl. Gangetic Plain 1: 68. 1903.

Erect or diffuse, annual herbs. Stem clothed with simple and branched hairs. Leaves 0.5-1.5 cm long, ovate-oblongate to spatulate, narrowed at base into a short petiole. Flowers many, in effuse, contracted or capitate repeatedly forked cymes. Capsules ovoid, 3-valved, red. Seeds minutely tubercled, pale-brown.

Fl. : July - September, *Fr.* : August - October.

Common in the beds of ponds, puddles etc. when they dry up.

Selected specimens : Alwar: Siliser, *Hiralal & Party* 34560 (LWG); Jaipur: Alhuni ka-kund, *Sharma* 19 (RUBL); Jhalawar: *Majumdar* 10059 (BSA); Ganganagar: Suratgarh, *Wadhwa* 58306 (BSA); Sirohi: Mt. Abu, *Puri* 56676 (BSA).

5. SILENE L.

Silene conoidea L. Sp. Pl. 418. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 218. 1874; Duthie, Fl. Gangetic Plain 1: 65. 1903.

Erect, annual herbs. Stem simple or sparsely branched in the upper part, glandular hairy above and puberulous below. Leaves opposite, 5-10

cm long, linear to lanceolate-oblong, acute. Flowers in dichotomous, leafy, corymbose paniculate cymes, rosy pink. Capsules narrowed towards the apex. Seeds reniform, tuberculate, 5-ribbed, greyish-brown.

Fl & Fr. : February - April.

Common in cultivated fields, particularly in the east of Aravalli.

Selected specimens : Bhilwara: Kharidam, Singh 7014 (BSJO); Ganganagar: Kumbharwali, Roy 5929 (BSJO); Jaipur: On Tonk road, Sharma 1082 (RUBL); Kota: Sitabari, Singh 74751 (LWG).

6. SPERGULA L.

Spergula fallax (Lowe) Krause in Sturm, Deutsch. Fl. ed. 2. 2: 19. 1901; Raizada, Suppl. Duthie, Fl. Gangetic Plain 18. 1976. *Spergularia fallax* Lowe in Hook.f. Kew Journ. Bot. 8: 289. 1856. *Spergula pentandra sensu* Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 243. 1874, *pro parte*, non L. 1753; Duthie, Fl. Gangetic Plain 1: 67. 1903. "*Khandidal*" (Hindi).

Erect or prostrate to decumbent-ascending, annual herbs. Leaves spuriously whorled, 1.5-4.0 × 0.04-0.1 cm, linear, flat, obtuse. Stipules ovate, acute. Flowers in lax, terminal cymes. Sepals white-margined. Capsules ovoid-subglobose, 3-valved. Seeds granulate, polished, black with hyaline wings.

Fl & Fr. : December - March.

Very common weed in cultivated fields and wastelands particularly in moist localities.

Selected specimens : Banswara: Ghatol, Singh 4203 (BSJO); Barmer: Piplum, Tiwari 1161 (BSJO); Kota: Singh 90665 (LWG); Sawaimadhopur: Verma 1924 (BSA).

Notes : This species is closely allied to *S. arvensis* L. & *S. pentandra* L., but can be distinguished by 3 styles and 3-valved capsules. *S. arvensis* L., characterised by 5-valved capsules and 5 styles, is distributed in southern and eastern India, where as *S. pentandra* L. does not occur in India.

7. SPERGULARIA (PERS.) J.S. PRESL ET K.B. PRESL *nom. cons.*

Spergularia rubra (L.) J.S. Presl et K.B. Presl, Fl. Cechica. 94. 1819. *Arenaria rubra* L. Sp. Pl. 423. 1753. *Spergula rubra* (L.) Dietr. Syn. Pl. 2: 1958. 1840; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 244. 1874; Duthie, Fl. Gangetic Plain 1: 67. 1903.

Sub-erect or prostrate, glandular-pubescent, annual herbs. Leaves

1.25-3.5 cm long, flat, linear, fleshy, 1-nerved; stipules broad, silvery. Flowers pinkish-white. Capsules ovoid, longer than the calyx. Seeds ovate, more or less flat, not winged, brown to black.

Fl. & Fr. : January - March.

Rare, near irrigation canals.

Selected specimen : Ganganagar: 15A, *Roy* 4079 (BSJO). Also reported by Nair & Nathawat (1956) from Pilani (Jhunjhunu).

8. STELLARIA L.

Stellaria media (L.) Vill. Hist. Pl. Dauph. 3: 615. 1789; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 230. 1874; Duthie, Fl. Gangetic Plain 1: 66. 1903; Mahesh. Illus. Fl. Delhi f. 17. 1966. *Alsine media* L. Sp. Pl. 272. 1753.

Prostrate or decumbent-ascending, annual herbs. Leaves 1-2 × 0.7-1.0 cm, ovate-elliptic to oblong, entire, acute or shortly acuminate. Flowers axillary, solitary and in terminal cymes. Capsules ovoid, 3-valved. Seeds tubercled, brown.

Fl. & Fr. : January - April.

Common weed in cultivated fields, wastelands, gardens and lawns, particularly in the east of Aravalli.

Selected specimens : Bhilwara: Mejadam, *Singh* 7088 (BSJO); Ganganagar: Layaipuria Bagh, *Roy* 3940 (BSJO); Jaipur: Ram Niwas Bagh, *Sharma* 428 (RUBL); Kota: Nahargarh, *Singh* 74077 (LWG); Jodhpur: *Bhandari* 1421 (JAC). Also reported from Sirohi (Kanodia & Deshpande, 1961) and from Udaipur (Ramdeo, 1969).

9. VACCARIA WOLF.

Vaccaria pyramidata Medic. Philos. Bot. 1: 96. 1789. *Saponaria vaccaria* L. Sp. Pl. 409. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 217. 1874; Duthie, Fl. Gangetic Plain 1: 64. 1903. "Jhutan-kakad" (Hindi).

Erect, glabrous herbs. Leaves sessile, 3-4 × 0.8-1.5 cm, lanceolate, cordate, entire. Flowers in repeatedly forked cymes which are combined into a terminal corymbose panicle, pink. Capsules ovoid-globose, included within the calyx. Seeds somewhat angled, brown-black.

Fl. & Fr. : December - March.

Common weed in cultivated fields.

Selected specimens : Bhilwara: Kharidam, *Singh* 7010 (BSJO); Chittorgarh: *Srivastava* 65184 (LWG); Ganganagar: 6 KLD, *Roy* 4072

(BSJO); Jaipur: Durgapura, *Sharma* 1983 (RUBL); Kota: Chhabra, *Singh* 90921 (LWG).

CULTIVATED SPECIES

***Gypsophila elegans* M. Beib.** - Flowers white, often with purple veins. Seeds with obtuse tubercles. Native of Europe; cultivated in the gardens for ornamental purposes.

20. PORTULACACEAE

(P.J. Parmar)

Fleshy herbs. Capsules circumscissile.

1. *Portulaca*

Woody shrubs or undershrubs. Capsules dehiscent longitudinally.

2. *Talinum*

1. PORTULACA L.

1a. Nodes with hairy appendages:

2a. Leaves alternate. Flowers in terminal clusters:

3a. Nodal hairs short. Flowers 2.5 (-3) cm across.

3. *P. pilosa* subsp.
grandiflora

3b. Nodal hairs long. Flowers 0.8-1.0 cm across.

2. *P. pilosa* subsp.
pilosa

2b. Leaves opposite. Flowers terminal, solitary.

4. *P. quadrifida*

1b. Nodes without appendages.

1. *P. oleracea*

1. *Portulaca oleracea* L. Sp. Pl. 445. 1753; Dyer in Hook.f. Fl. Brit. India 1: 246. 1874; Duthie, Fl. Gangetic Plain 1: 69. 1903. "*Lunkha*" (Hindi).

Prostrate or diffuse herbs. Leaves sessile, alternate, often somewhat crowded towards the end of branches, 1.5-3.0 × 0.7-1.2 cm, obovate-spathulate, truncate or obtuse at the apex. Flowers yellow, surrounded by a cluster of subverticillate leaves. Capsules 0.6-0.9 cm long, obovoid to ovoid. Seeds many, reniform, verrucose-granulate, dull black.

Fl. & Fr. : August - December.

Common weed in cultivated fields, gardens, along railway tracts and other moist grounds, like river-beds.

Selected specimens : Dungarpur : *Kanodia* 67298 (BSI); Ganganagar: Bajuwala forest nursery, *Roy* 4965 (BSJO); Jaisalmer: Along Phalsund-Pokaran road, *Shetty* 3312 (BSJO); Jhalawar: Bhawanimandi, *Verma*

3507 (BSA); Sikar: *Stower* A. 20 (BSI); Sirohi: Mt. Abu, *Jain* 60101 (BSI); Tonk: Banas river-bed, *Pandey* 4777 (BSJO).

2. *Portulaca pilosa* L. Sp. Pl. 445. 1753; Greesink in *Blumea* 17: 295. 1969; Raizada, Suppl. Duthie, Fl. Gangetic Plain 22. 1976. *Portulaca tuberosa* Roxb. Fl. Ind. 2: 464. 1832; Dyer in Hook.f. Fl. Brit. India 1: 247. 1874. *P. suffruticosa* Wall. ex Wt. & Arn. Prodr. 356. 1834; Dyer in Hook.f. *l.c.* 1: 249. 1874.

subsp. *pilosa*

Perennial herbs, with fusiform roots. Leaves 0.4-2.8 × 0.05-0.4 cm, elliptic to linear; nodal appendages of brown hairs, 0.5-1.5 cm long. Flowers yellow, pink or red, surrounded by leaves and tufted hairs. Petals 0.2-1.1 cm long. Style filiform, 3-7 cleft. Capsules ovoid or conical. Seeds granulate or minutely tubercled, dark grey to blackish.

Fl. & Fr. : August - January.

Common in sandy river-beds, waste places and waysides.

Selected specimens : Ajmer: Badla road, *Sharma* 1001 (DD); Jaipur: Manoharpur, *Wadhwa* 8370 (BSA); Jodhpur: Bilara-Pali road, *Singh* 3572 (BSJO); Sirohi: Mt. Abu, *Blatter* 13888 (BLAT); Tonk: Niwai temple, *Shetty* 1249 (BSJO).

3. subsp. *grandiflora* (Hook.) Greesink in *Blumea* 17: 297. 1969; Raizada, Suppl. Duthie, Fl. Gangetic Plain 21. 1976. *Portulaca grandiflora* Hook. Bot. Mag. n.s. 3. t. 2885. 1829; Bailey, Man. Cult. Pl. 364. f. 62. 1949.

Very similar to subsp. *pilosa*, but flowers are much larger c. 3.0 cm across, pink-red, orange or yellow. Style 5 to 18-fid. Capsules c. 0.5 cm across, globose. Seeds 0.07 cm, shining, the marginal ones with a central tubercle.

Fl. & Fr. : Throughout the year.

Frequently cultivated as a pot herb. Sometimes found as an escape from cultivation.

Selected specimens : Churu: Sujangarh, *Roy* 2730 (BSJO); Jaipur: Gujar ke Dhani, *Sharma* 534 (RUBL); Jhalawar: *Singh* 83670 (LWG); Sikar: *Stower* C. 40 a (BSI).

4. *Portulaca quadrifida* L. Mant. 1: 73. 1767; Dyer in Hook.f. Fl. Brit. India 1: 247. 1874; Duthie, Fl. Gangetic Plain 1: 70. 1903. *P. meridiana* L. f. Suppl. Sp. Pl. 248. 1781. *P. quadrifida* L. var. *meridiana* (L.f.) DC. Prodr. 3: 354. 1828. "Lunki" (Hindi).

Diffuse or prostrate, annual herbs, rooting at nodes. Leaves sessile, 0.5-1.5 × 0.2-0.4 cm, ovate, lanceolate or ovate-oblong, acute. Flowers solitary, terminal, pale-yellow. Capsules obscurely tetragonous, acute at apex, red when ripe. Seeds orbicular-reniform, concentrically muricate, dull black.

Fl. & Fr. : September - December.

Common in rocky and gravelly habitats; also found as a weed in moist soils of gardens.

Selected specimens : Alwar: Balafort, *H. Lal & Party* 34425 (LWG); Banswara: Pipalkhunt, *Singh* 4220 (BSJO); Churu: Lodosar hills, *Roy* 2558 (BSJO); Jaisalmer: *Jain* 49508 (BSI); Kota: Kishanganj, *Verma* 707 (BSA); Pali: Dharisar Mahadev forest, *Shetty* 1819 (BSJO).

2. TALINUM ADANS.

Talinum portulacifolium (Forssk.) Asch. ex Sch. in Bull. Herb. Boiss. 4: 172. 1876; Bhandari, *Fl. Ind. Desert* 53. 1978. *Orygia portulacifolium* Forssk. *Fl. Aegypt. - Arab.* 103. 1775. *Talinum cuneifolium* Willd. *Sp. Pl.* 2: 864. 1799; Dyer in *Hook.f. Fl. Brit. India* 1: 247. 1874.

Suffrutescent undershrubs. Leaves alternate, 7-8 × 3-4 cm, exstipulate, obtuse, glabrous, mucronate, attenuated into a very short petiole. Flowers in lax, terminal racemes or raceme of cymes, dark pink or purple. Bracts foliaceous, elliptic or ovate, mucronate, as long as broad. Capsules 3-ridged. Seeds sub-reniform, laterally sub-compressed, shining, black, concentrically striated and granulate.

Fl. & Fr. : August - October.

Rare, on rocks in western Rajasthan.

Selected specimens : Barmer: *Shetty* 2261 (BSJO); Jalore: Sunda hills, *Vyas* 5886 (BSJO); Jodhpur: *Bhandari* 120, 1534 (JAC).

CULTIVATED SPECIES

Talinum paniculatum (Jacq.) Gaertn. (*Portulaca paniculata* Jacq.)-Fleshy perennial herbs, with ovate-elliptic to obovate leaves and pinkish or reddish-purple flowers in long peduncled cymes. Native of America; cultivated in the gardens.

21. TAMARICACEAE

(P.J. Parmar)

TAMARIX L.

- 1a. Flowers unisexual; plants dioecious. 2. *T. dioica*
- 1b. Flowers bisexual:
- 2a. Stamens 5, haplostameneous:
- 3a. Leaves vaginate. Racemes spirally twisted; bracts triangular. 1. *T. aphylla*
- 3b. Leaves pseudovaginate or amplexicaul. Racemes not spirally twisted; bracts ovate-lanceolate to trullate-ovate-lanceolate or trullate-ovate. 4. *T. indica*
- 2b. Stamens 10, diplostameneous. 3. *T. ericoides*

1. *Tamarix aphylla* (L.) Karst. Deut. Fl. 641. 1882. *Thuja aphylla* L. Cent. Pl. 1: 32. 1755, *pro parte*. *Tamarix articulata* Vahl, Symb. Bot. 2: 48. t. 32. 1791; Dyer in Hook.f. Fl. Brit. India 1: 249. 1874; Duthie, Fl. Gangetic Plain 1: 72. 1903. "Farash" (Hindi).

Trees or tall shrubs, 2.5-11 m high. Young branches slender, with impressed punctate glands. Leaves scale-like, free part triangular. Racemes simple or compound or paniculate. Flowers pink or pinkish white. Capsules 3.5-4.5 cm long, pyramidal, 3-valved. Seeds c. 0.5 mm long, with 2-3 mm long coma.

Fl. : December - February; Fr. : February - April.

Common, on alluvial sandy soils along river-beds or lake-margins in saline habitats.

Selected specimens : Ajmer: Govindgarh, Jain 49700 (BSI); Churu: Sujangarh, Roy 2676 (BSJO); Jaipur: Chaksu, Sharma 1714 (RUBL); Jaisalmer: near Ramgarh, Shetty 3437 (BSJO); Jhalawar: Singh 83671 (LWG); Pali: Guda, Shetty 1988 A (BSJO).

2. *Tamarix dioica* Roxb. ex Roth, Nov. Pl. Sp. Ind. Or. 185. t. 22. 1821; Dyer in Hook.f. Fl. Brit. India 1: 249. 1874; Duthie, Fl. Gangetic Plain 1: 71. 1903; Mahesh. Illus. Fl. Delhi f. 21. 1966. *T. longepedunculata* Blatt. & Hallb. in Blatt. et al. J. Ind. Bot. 1: 86. 1919. "Jhau" (Hindi).

Shrubs or small trees. Leaves minute, vaginate, triangular ovate to triangular ovate-lanceolate, acuminate. Racemes simple or compound. Flowers pink to pinkish-red. Capsules 3.5-5.0 mm long, pyramidal, 3-valved. Seeds 0.5 mm long, with c. 3 mm long coma.

Fl. : April - June; *Fr.* : July - August.

Rare, in sandy saline habitats along river-beds and dam sides.

Selected specimens : Banswara: *Kanodia* K - 20 (BSI); Ganganagar: Gharsana, *Roy* 3818 (BSJO); Jodhpur: Birai dam, *Singh* 4407 (BSJO); Kota: Darah, *Singh* 74762 (LWG); Sirohi: Abu road, *McCann* 168, 169 (BLAT).

3. *Tamarix ericoides* Rottl. Ges. Naturf. Freunde Berlin Neue Schr. 4: 214. 1803; Dyer in Hook.f. Fl. Brit. India 1: 249. 1974; Duthie, Fl. Gangetic Plain 1: 72. 1903. "Javuro" (Hindi).

Undershrubs or shrubs. Leaves minute, pseudo-vaginate in the lower part and vaginate in the upper part, broadly triangular to ovate-lanceolate, acuminate or acute. Racemes simple. Flowers pink or pale pink. Capsules 1.0-1.5 mm long, pyramidal, 3-valved. Seeds 1.0-1.5 mm long, with 0.5 mm long coma.

Fl. : November - December; *Fr.* : January - February.

Abundant in sandy saline habitats at the bank of rivers in W. Rajasthan.

Selected specimens : Ajmer: Todgarh, *Laurie* 4521 (DD); Barmer: Luni river-bed (Vithuja), *Tiwari* 1155 (BSJO); Jodhpur: Luni river-bed, *Shetty* 266 (BSJO); Pali: Bandi river-bed, *Shetty* 1355 (BSJO).

4. *Tamarix indica* Willd. Ges. Naturf. Freunde Berlin Neue Schr. 4: 214. 1803. *Tamarix gallica* L. var. *indica* (Willd.) Ehrenb. in Linnaea 2: 268. 1827; Dyer in Hook.f. Fl. Brit. India 1: 248. 1874. *T. gallica auct. plur.*, non L. 1753; Wt. & Arn. Prodr. Fl. Pen. Ind. Or. 40. 1834; Brandis, Forest Fl. N.W. India 20. t. 5. 1874; Duthie, Fl. Gangetic Plain 1: 71. 1903. *T. troupii* Hole in Indian For. 45: 248. 1919.

Shrubs or small trees. Leaves 0.3-0.5 mm long, broadly triangular to triangular-ovate-lanceolate. Racemes simple or paniculate. Flowers pale pink to pink. Capsules 3-4 mm long, pyramidal, 3-valved. Seeds 0.5-0.6 mm long, with 2 mm long coma.

Fl. : September - December; *Fr.* : January - March.

Common in saline sandy moist habitats.

Selected specimens : Bhilwara: Umedsagar, *Singh* 5761 (BSJO); Jaipur: Parasuram devara, *Khisi* 58462 (BSI); Jaisalmer: *Jain* 40572 (BSI); Jodhpur: Birai dam, *Moorthy* 396 (BSJO); Pali: Guda, *Shetty* 1988 (BSJO).

22. ELATINACEAE

(P.J. Parmar)

- Creeping delicate herbs. Flowers 2-4 merous; sepals obtuse. 2. *Elatine*
 Tufted erect herbs. Flowers 5-merous; sepals acute. 1. *Bergia*

BERGIA L.

- 1a. Stamens usually 5. 2. *B. ammannioides*
 1b. Stamens usually 10:
 2a. Perennials:
 3a. Plants nearly glabrous. Flowers pink. Sepals with glabrous margins. 1. *B. aestivosa*
 3b. Plants glandular-pubescent. Flowers white. Sepals with hyaline hairy margins. 5. *B. suffruticosa*
 2b. Annuals:
 4a. Aquatics or semi-aquatics. Stipules caducous. Flowers in fascicles, sessile or sub-sessile. 3. *B. capensis*
 4b. Terrestrials. Stipules persistent. Flowers solitary or geminate on slender pedicels. 4. *B. polyantha*

1. *Bergia aestivosa* Wt. & Arn. Prodr. 1: 41. 1834; Dyer in Hook.f. Fl. Brit. India 1: 251. 1874; Duthie, Fl. Gangetic Plain 1: 73. 1903. *Elatine aestivosa* (Wt. & Arn.) Wt. Icon. 1: t. 222. 1839. *Bergia suffruticosa* (Del.) Fenzl. subsp. *aestivosa* (Wt. & Arn.) Jafri in Biologia 11: 42. 1965.

Glabrous, much-branched undershrubs, with woody base. Leaves obovate-oblong or narrowly oblong; lower leaves 2.5-3.0 × 0.7-1.0 cm, linear and very small on the flowering branches. Flowers solitary or 2 to 4-together in axillary fascicles, pink. Capsules ovoid, whitish-pink. Seeds many, dark-brown to black.

Fl & Fr. : October - February.

Rare, in moist habitats near water lodged areas.

Selected specimens : Jaipur: Gujar-ki-Dhani, Sharma 466 (RUBL); Bhandana, Sharma 1857, 1917 (RUBL); Amer, A. No. 11815 (RUBL). Also reported from Barmer (Rao & Kanodia, 1962).

2. *Bergia ammannioides* Roth, Nov. Pl. Sp. 219. 1821; Dyer in Hook.f. Fl. Brit. India 1: 251. 1874; Duthie, Fl. Gangetic Plain 1: 73. 1903; Mahesh. Illus. Fl. Delhi f. 22. 1966. "*Jalhangara*" (Hindi).

Erect or decumbent, annual herbs; stem and branches pinkish,

glandular-pubescent or subglabrous. Leaves opposite, 1.5-3.0 × 0.4-1.0 cm, oblanceolate or elliptic, gradually tapering to short petiole, acute, serrate. Flowers minute, in dense, axillary cymes, white or reddish. Capsules subglobose, reddish. Seeds minute, with rounded ends, shining, dark brown.

Fl & Fr. : August - December.

Abundant in wet places on the banks of ponds.

Selected specimens : Banswara: *Kanodia* 51100 (BSI); Chittor-garh: *Saran & Party* 65192 (LWG); Ganganagar: 79 GB., *Roy* 4086 (BSJO); Jaipur: Bhandana, *Sharma* 1861 (RUBL); Jaisalmer: Bendalai tank (Pokaran), *Tiwari* 750 (BSJO); Kota: Baran, *Majumdar* 10874 (BSA); Sirohi: Abu road, *Kaul & Party* 9370 (LWG).

3. *Bergia capensis* L. Mant. Alt. 241. 1771; Subram. Aquat. Angiosp. 10. t. 6. 1962. *Bergia verticillata* Willd. Sp. Pl. 2: 770. 1799; Dyer in Hook.f. Fl. Brit. India 1: 252. 1874; Duthie, Fl. Gangetic Plain 1: 73. 1903.

Ascending, glabrous, rather succulent, aquatic annual herbs. Leaves 1.5-3.0 × 0.5-1.0 cm, elliptic-lanceolate, serrate. Flowers minute, in many-flowered, sessile or sub-sessile axillary clusters, white. Capsules subglobose, longitudinally 5-furrowed. Seeds slightly curved, ribbed and transversely rugose.

Fl : August - October; *Fr.* : November - January.

Rare, in sandy marshy places near streams.

Selected specimens : Jaipur: Amer, *Sharma* 1066 (RUBL); Maota, *Sharma* 1922 (RUBL); Baragaon, *Sharma* 2024 (RUBL); Jhalawar: *Singh* 83733 (LWG).

4. *Bergia polyantha* Sond. in Linnaea 23: 16. 1850; Oliver, Fl. Trop. Africa 1: 153 A. 1868; Raizada and Chatt. in Sci. & Cult. 27: 302. 1961; Raizada, Suppl. Duthie, Fl. Gangetic Plain 23. 1976.

Diffuse, much-branched, glabrous, annual herbs. Leaves 0.8-2.5 × 0.5-0.8 cm, ovate-oblong, cuneate at base, acute and denticulate at apex, fleshy. Flowers axillary, solitary or in pairs, pink. Capsules with 5-longitudinal furrows, 5-valved. Seeds many, oblong, with strong scaliform reticulations.

Fl : November - December; *Fr.* : January - February.

Rare, in damp situations.

Selected specimens : Ajmer: Faysagar, *Sharma* 1415 (LWG); Nasirabad road, *Sharma* 133583 (DD); Govt. College, *Sharma* 50 (DD).

5. *Bergia suffruticosa* (Del.) Fenzl. in Denkschr. Bot. Ges. Regensb. 3: 183. 1841. *Lancretia suffruticosa* Del. Fl. Egypt. 69. 1812. *Bergia odorata* Edgew. in Journ. Asiat. Soc. Bengal 7: 765. 1838; Dyer in Hook.f. Fl. Brit. India 1: 251. 1874; Duthie, Fl. Gangetic Plain 1: 73. 1903.

Decumbent or spreading, aromatic undershrubs, with woody base. Leaves 0.3-2.0 × 0.2-1.0 cm, very variable, broadly elliptic to oval or oblong-lanceolate, acute. Flowers solitary or in axillary fascicles, white. Capsules ovoid, 5-locular, whitish pink. Seeds many, minute, oblong-ellipsoid, shining, dark-brown to black.

Fl. & Fr. : September - January.

Common, particularly in western Rajasthan on rocky places, in saline habitats and near cultivated fields.

Selected specimens : Ajmer: Jaipur Ajmer road, *Kaul & Party* 8463 (LWG); Barmer: Pachpadra Salt basin, *Shetty* 2245 (BSJO); Bhilwara: Mawala village, *Singh* 7048 (BSJO); Churu: Khanpur, *Roy* 2649 (BSJO); Jaipur: U.R.F., *Sharma* 1669 (RUBL).

2. ELATINE L.

Elatine triandra Schk. Bot. Handb. 1:345. t. 119b, f. 2. 1808, *sensu lato*; Subraman. Aquatic Angio. 10. 1962. *E. americana* Arn. in Edinb. J. Nat. & Geogr. Sc. 1: 431. 1830; Dyer in Hook.f. Fl. Brit. India 1: 250. 1874.

Small, tender, creeping herbs, rooting at nodes. Leaves opposite or in whorls, 0.5-0.7 × 0.2-0.3 cm, spatulate, acute. Flowers minute, axillary, usually solitary at each node. Petals 2-4. Stamens 2-8, separate. Ovary globose, 2 to 4-celled. Capsules membranous, septicidal, with many straight or curved seeds with ridges or pits on the testa.

Fl. & Fr. : July - September.

Rare, in swamps and marshy places near slow running streams.

Selected specimen : Bharatpur: Ghana bird sanctuary, *Van der Valk* s.n. (BSJO).

23. MALVACEAE

(P.J. Parmar)

1a. Fruits schizocarpic (indehiscent); carpels (mericarps) usually separating:

2a. Epicalyx present:

3a. Epicalyx segments 3:

- 4a. Trees or large shrubs. Leaves entire, acuminate. Flowers c. 10 cm across. 10. *Thespesia*
- 4b. Herbs or small undershrubs. Leaves lobed or coarsely serrate, obtuse or acute. Flowers c. 1-5 cm across:
- 5a. Leaves palmately. Style branches acute. 6. *Malva*
- 5b. Leaves pinnately. Style branches capitate. 7. *Malvastrum*
- 3b. Epicalyx segments 6 or more
- 6a. Leaves always glandular on midrib beneath. Mericarps armed with glochidiate spines. 11. *Urena*
- 6b. Leaves eglandular. Mericarps reticulately veined to armed but never with glochidiate spines:
- 7a. Carpels 5. Styles twice as many as carpels. 8. *Parvonia*
- 7b. Carpels more than 5. Styles as many as carpels. 3. *Althaea*
- 2b. Epicalyx absent:
- 8a. Mericarps usually 2 or more-seeded. 2. *Abutilon*
- 8b. Mericarps 1-seeded. 9. *Sida*
- 1b. Fruit a capsule:
- 9a. Trees. Flowers unisexual or both uni and bisexual on the same plant. 5. *Kydia*
- 9b. Herbs or undershrubs. Flowers bisexual only:
- 10a. Calyx 2 to 3-lobed, spathaceous, caducous. 1. *Abelmoschus*
- 10b. Calyx 5-toothed or lobed, not spathaceous, persistent. 4. *Hibiscus*

1. ABELMOSCHUS MEDICUS

- 1a. Epicalyx segments 6 or more, linear to narrowly lanceolate:
- 2a. Capsules shorter or equalling the epicalyx. 1. *A. crinitus*
- 2b. Capsules much longer than the epicalyx:
- 3a. Epicalyx as long as calyx. Mature capsules more than 6 cm long, truncate at the base; peduncles very short as compared to the length of capsules. 2. *A. esculentus*
- 3b. Epicalyx shorter than calyx. Mature capsules 3-6 cm long, narrow at the base; peduncles nearly as long as capsules. 7. *A. moschatus*

1b. Epicalyx segments 4-6 (-8), ovate, rarely linear to lanceolate and caducous before the expansion of the corolla:

4a. Epicalyx segments large, ovate. Calyx in bud ovoid:

5a. Stem devoid of prickly hairs; pedicels sometimes with prickly hairs. Cultivated or an escape from cultivation.

4. *A. manihot* subsp.
manihot

5b. Stem more or less densely covered with prickly hairs:

6a. Epicalyx segments margined with a dense cloth of white short, soft, simple hairs, never hispid.

5. *A. manihot* subsp.
tetraphyllus
var. *tetraphyllus*

6b. Epicalyx segments margined with stiff, simple hairs, hispid.

6. *A. manihot* subsp.
tetraphyllus var.
pungens

4b. Epicalyx segments small, linear-lanceolate. Calyx in bud flask-shaped.

3. *A. ficulneus*

1. *Abelmoschus crinitus* Wall. Pl. As. Rar. 1: 39, t. 44. 1830; Borssum in *Blumea* 14: 103. 1966. *Hibiscus cancellatus* Roxb. Fl. Ind. 3: 201. 1832, non L. f. 1781; Mast. in Hook.f. Fl. Brit. India 1: 342. 1874; Duthie, Fl. Gangetic Plain 1: 92. 1903. "*Jangli Bhindi*" (Hindi).

Erect, hispid herbs, with usually tuberous roots. Leaves 10-17 cm in diam., orbicular or broadly ovate, 5 to 7-palmilobed, cordate at base, coarsely dentate to serrate. Flowers axillary, solitary or sometimes in short racemes, yellow with purple centre. Capsules ovoid, shortly acuminate, hirsute. Seeds globular to reniform, with concentric ribs.

Fl. & Fr. : August - October.

Rare, on the fringes of forests, in grasslands and neglected corners of nurseries.

Selected specimens : Banswara: Bagaycha forest (Kushalgarh), Singh 3061 (BSJO); Jhalawar: *Wadhwa* 7500 (BSA).

2. *Abelmoschus esculentus* (L.) Moench. Meth. Pl. 617. 1794. *Hibiscus esculentus* L. Sp. Pl. 696. 1753; Mast. in Hook.f. Fl. Brit. India 1: 343. 1874; Duthie, Fl. Gangetic Plain 1: 93. 1903. "*Bhindi*" (Hindi).

Stout, erect, hispidly hairy undershrubs. Leaves 6-25 cm across, broadly ovate to orbicular, angular or 3 to 7-lobed, cordate at the base.

Flowers axillary, solitary, bright yellow with purple base within. Capsules 7-15 cm long, cylindrical, 5-angled, acuminate, hairy. Seeds reniform to ovoid, glabrous, dark brown.

Fl & Fr. : Throughout the year; profuse in monsoon.

Extensively cultivated as a vegetable crop; rarely found as an escape in fallow fields, wastelands, and sometimes even on the hills.

Selected specimens : Ganganagar: Hanumangarh, *Roy* 4979 (BSJO); Jhalawar: Khanpur, *Wadhwa & Prasad* 9586 (BSA); Kota: Atru, *Singh* 90601 (LWG).

3. ***Abelmoschus ficulneus*** (L.) Wt. & Arn. Prodr. 53. 1834; Wight, Ic. 1: t. 154. 1839. *Hibiscus ficulneus* L. Sp. Pl. 695. 1753; Mast. in Hook.f. Fl. Brit. India 1: 340. 1874; Duthie, Fl. Gangetic Plain 1: 91. 1903. "*Malbhindi*" (Hindi).

Perennial, strigosely hairy and prickly herbs. Leaves 3.0-10.0 × 2.5-7.5 cm, shallowly to deeply palmately 3 to 5-lobed, reniform to cordate-orbicular, coarsely crenate. Flowers solitary or in terminal leafless racemes, white or light-yellow with purple centre. Capsules oblong-cylindric, 5-angled, beaked. Seeds globose-reniform, pubescent or minutely stellately hairy, black.

Fl & Fr. : August - December.

Common in the east of Aravalli in forests and wastelands.

Selected specimens : Ajmer: On Jaipur - Ajmer road, *Kaul & Party* 8464 A (LWG); Banswara: Khora forest, *Singh* 3724 (BSJO); Bhilwara: Govata dam, *Singh* 5711 (BSJO); Kota: *Singh* 90352 (LWG).

4. ***Abelmoschus manihot*** (L.) Medicus, Malv. 46. 1787; Borssum in Blumea 14: 96. 1966. *Hibiscus manihot* L. Sp. Pl. 696. 1753.

subsp. *manihot*

Undershrubs, upto 8 m high; stem, petioles and leaf-blades glabrous or pubescent with minute, simple or stellate hairs. Leaves variable in shape and size, orbicular to broadly ovate, cordate or sometimes hastate, entire or 3 to 7-lobed. Flowers solitary axillary or in racemes, white or sulphur yellow with dark-purple centre. Capsules oblong-ovoid, pentagonous.

Fl & Fr. : August - January.

Rare, in scrub forests, ravines, gentle slopes of hills etc.

Selected specimens : Banswara: Vdai Bag, *Kanodia* 75720, 51158, 51104 (BSI). Also reported from Sirohi (Raizada, 1954; Jain, 1962; Rao & Kanodia 1962); Misc. Loc: Banjoli forest, JVC. 13598 (BSI).

5. subsp. *tetraphyllus* (Roxb. ex Hornem.) Borssum in *Blumea* 14: 97-98, 1966. *Hibiscus tetraphyllus* Roxb. ex Hornem. Hort. Hafn. 661. 1815; Mast. in Hook.f. Fl. Brit. India 1: 341. 1874.

var. *tetraphyllus*

Large, suffruticose, prickly, annual herbs. Leaves c. 12 × 10 cm, orbicular, 3 to 5-lobed, hastate at base. Flowers in terminal racemes, bright yellow with dark purple centre. Epicalyx segments ovate-acute. Capsules densely bristly. Seeds smooth.

Fl & Fr. : August - December.

Rare, found along the roads, in wastelands and deciduous forests.

Selected specimens : Kota: Jain 28743 (BSI); Sirohi: Jain 60477 (BSI); Mt. Abu, Blatter 18465, 18453 (BLAT)

6. var. *pungens* (Roxb.) Hochr. in *Candollea* 2: 87. 1924; Borssum in *Blumea* 14: 99, 1966. *Hibiscus pungens* Roxb. Fl. Ind. 3: 213. 1832; Mast. in Hook.f. Fl. Brit. India 1: 341. 1874; Duthie, Fl. Gangetic Plain 1: 92. 1903.

Erect, simple or branched, bristly or hairy, perennial herbs. Leaves long-petioled, ovate-suborbicular, palmately 3 to 7-lobed or partite with triangular, acuminate, serrate lobes, cordate at base. Flowers axillary, solitary or in racemes by the reduction of the upper most leaves, yellow with dark purple centre. Capsules ovoid-oblong, acuminate, bristle-hairy.

Fl & Fr. : September - January.

Rare, found in the scrub forests and ravines.

Selected specimens : Jhalawar: Bijliya Bhodak, Verma 7523 (BSA); Kota: Baran, Majumdar 10447 (BSA); Sirohi: Mt. Abu, Blatter 18450 (BLAT).

Notes : Abedin (in Nasir & Ali, Fl. Pak. 130: 27. 1979) treated this taxon as a distinct species.

7. *Abelmoschus moschatus* Medicus, *Malv.* 46. 1787; Wight, *lc.* 2(1): 8. t. 399. 1840. *Hibiscus abelmoschus* L. *Sp. Pl.* 696. 1753; Mast. in Hook.f. Fl. Brit. India 1: 342. 1874; Duthie, Fl. Gangetic Plain 1: 92. 1903.

Annual or perennial, strigose undershrubs. Leaves 8-13 × 9.0-19.5 cm, 3 to 5-lobed, ovate, cordate, strigose. Flowers in terminal racemes or axillary and solitary, bright yellow with dark purple centre. Capsules acuminate, villous. Seeds reniform, faintly horizontally striated, blackish-brown.

Fl. : August - November; *Fr.* : November - January.

Rare, often met with in scrub and deciduous forests in plains.

Selected specimens : Banswara: Anand Sagar forest, *Kanodia* 752084 (BSI); Chittorgarh: *Majumdar* 12455 (BSA); Jhalawar: Ghatoli block, *Wadhwa* 7561 (BSA); Kota: *Chhabra, Singh* 90548 (LWG). Also reported from Jodhpur, Jaisalmer and Barmer (Blatter & Hallberg, 1918-1921).

2. ABUTILON MILL.

- | | |
|--|--|
| 1a. Mericarps 5. | 10. <i>A. persicum</i> |
| 1b. Mericarps 8-10 or more: | |
| 2a. Mericarps 8-10: | |
| 3a. Fruits cylindrical, less than 1 cm long: | |
| 4a. Mericarps beaked. Leaves glabrescent. | 11. <i>A. ramosum</i> |
| 4b. Mericarps truncate, scarcely beaked. Leaves hairy: | |
| 5a. Schizocarps stellate, white hairy. | 3. <i>A. fruticosum</i>
var. <i>fruticosum</i> |
| 5b. Schizocarps stellate, golden yellow hairy. | 4. <i>A. fruticosum</i> var.
<i>chrysocarpa</i> |
| 3b. Fruits ovoid, more than 1 cm long. | 8. <i>A. pakistanicum</i> |
| 2b. Mericarps more than 10: | |
| 6a. Mericarps truncate and/or with a distinct mucro, exceeding the calyx: | |
| 7a. Flowers pale yellow. Mericarps 6-8 mm long, acuminate: | |
| 8a. Leaves c. 15 × 12 cm. | 1. <i>A. bidentatum</i> var.
<i>bidentatum</i> |
| 8b. Leaves c. 20 × 17 cm. | 2. <i>A. bidentatum</i>
var. <i>major</i> |
| 7b. Flowers yellow to orange-yellow. Mericarps 10-16 mm long, acute with a small mucro: | |
| 9a. Branches, petioles and pedicels densely covered with patent, long, simple hairs, minute stellate hairs and viscid by short glandular hairs. Stipules lanceolate. Corolla orange yellow with purple centre. | 5. <i>A. hirtum</i> |
| 9b. Branches, petioles and pedicels densely covered with stellate hairs and rarely with some slender, simple hairs. Glandular hairs absent. Stipules linear. Corolla | |

yellow or pale yellow, without purple centre:

10a. Flowers c. 6 cm across. Calyx-lobes as long as capsule. 7. *A. indicum* subsp. *guineense*

10b. Flowers c. 3 cm across. Calyx-lobes shorter than capsule. 6. *A. indicum* subsp. *indicum*

6b. Mericarps obtuse, without a mucro, shorter than the calyx. 9. *A. pannosum*

1. ***Abutilon bidentatum*** Hochst. ex A. Rich. Tent. Fl. Abyss. 1: 68. 1847; Mast. in Hook.f. Fl. Brit. India 1: 326. 1874; Bhandari, Fl. Ind. Desert 59. 1978.

var. ***bidentatum***

Erect, perennial undershrubs. Branches slender, downy, intermingled with soft, spreading hairs. Leaves 5-15 × 2-12 cm, broadly ovate, deeply cordate, acute to acuminate, serrate, stellately tomentose. Flowers axillary, solitary or in panicles. Schizocarps 1.2 cm in diam., globose, depressed, truncate. Mericarps 15-20. Seeds obliquely reniform, stellately light dotted, brown.

Fl & Fr. : September - December.

Common, in waste places and fallow fields.

Selected specimens : Churu: Taranagar, Roy 2784 (BSJO); Chittorgarh: Maslana, Majumdar 10184 (BSA); Jaipur: Amer, Sharma 355 (RUBL); Jaisalmer: Amar Sagar, Tiwari 853 (BSJO); Kota: Chambal Dam, Verma 1835 (BSA); Udaipur: Menar, Majumdar 12460 (BSA).

2. var. ***major*** (Blatt. & Hallb.) Bhandari, Fl. Ind. Desert 60. 1978. *A. indicum* (L.) Sweet var. *major* Blatt. & Hallb. in J. Bombay nat. Hist. Soc. 26: 266. 1918.

Very similar to var. *bidentatum*, but can be distinguished by c. 20 × 17 cm leaves and upto 17 cm long petioles.

Fl & Fr. : September - December.

Rare, in waste places and fallow fields in W. Rajasthan.

Selected specimens : Barmer: Bhandari 1166 (JAC); Jaisalmer: Amar Sagar, Blatter 5644 (BLAT); Jodhpur: Bhandari 239 (JAC).

3. ***Abutilon fruticosum*** Guill. & Perr. Fl. Senegamb. Tent. 1: 73. 1831; Mast. in Hook.f. Fl. Brit. India 1: 328. 1874; Bhandari, Fl. Ind. Desert 60. 1978. "*Imrai*" (Hindi).

var. fruticosum

Much-branched, grey or whitish velvety tomentose, rigid undershrubs. Leaves 2.5-7.5 cm long and almost as broad, broadly ovate or sub-orbicular, cordate, acute or obtuse. Flowers axillary, solitary, bright yellow. Schizocarps cylindrical, truncate; mericarps 8-10, pubescent all over. Seeds dark brown, dotted with minute white or brown hairs.

Fl : September - November; *Fr* : November - January.

Common in waste places and on exposed hillocks.

Selected specimens : Barmer: Keradu hillocks, Hatma village, *Tiwari* 939 (BSJO); Jaisalmer: Bap, *Blatter* 5643 (BLAT); Jodhpur: Osian, *Singh* 4422 (BSJO). Also reported from Bikaner (Sarup, 1957), Jhalawar (Majumdar, 1971) and Jhunjhunu (Nair *et al.*, 1961).

4. **var. chrysocarpa** Blatt. & Hallb. in *J. Bombay nat. Hist. Soc.* 26: 227. 1918; Bhandari, *Fl. Ind. Desert* 61. 1978.

Very similar to the type, but can be distinguished by the golden-yellow and densely stellate hairy schizocarps.

Fl & Fr : November - December.

Rare, endemic to Jaisalmer district in rocky habitats.

Selected specimens : Jaisalmer: Vinjorai, *Blatter* 5660 (BLAT), *Wadhwa* 5287 (BSA); Mohangarh, *Wadhwa* 5091 (BSA).

5. ***Abutilon hirtum*** (Lam.) Sweet, *Hort. Brit. ed.* 1. 53. 1826. *Sida hirta* Lam. *Encycl.* 1: 7. 1783. *Abutilon graveolens* Wt. & Arn. *Prodr.* 56. 1834; Mast. in *Hook.f. Fl. Brit. India* 1: 327. 1874, incl. var. *hirtum*; Duthie, *Fl. Gangetic Plain* 1: 83. 1903.

Erect, perennial herbs or undershrubs. Leaves with long petioles, 4-18 cm long and broad, ovate or obovate, cordate, acute to acuminate, crenulate-dentate or serrate. Stipules 0.5-1.0 × 0.15-0.2 cm. Flowers axillary, solitary, yellow or orange-yellow. Schizocarps truncate; mericarps 20-30, oblong, 1.0-1.2 × 0.6-0.8 cm, acute at the back. Seeds with minute stellate hairs, brown.

Fl & Fr : January - March.

Rare, found in waste places, particularly along the roads.

Selected specimens : Jaisalmer: Ramgarh, *Wadhwa* 5162, 5101 (BSA); Kota: Govt. Garden, *Singh* 90693 (LWG). Also reported from Bikaner (Sarup, 1957) and Sikar (Nair & Malhotra, 1961).

6. ***Abutilon indicum*** (L.) Sweet, *Hort. Brit. ed.* 1. 54. 1826; Wight, *lc.*

l: t. 12. 1838; Mast. in Hook.f. Fl. Brit. India 1: 326. 1874; Duthie, Fl. Gangetic Plain 1: 83. 1903. *Sida indica* L. Cent. Pl. 2: 26. 1756. "Tarakanchi" (Hindi).

subsp. **indicum**

Stout, erect undershrubs. Leaves 2-18 × 1.5-16.0 cm, ovate to suborbicular, cordate, acute to acuminate, serrate to crenate, 7 to 9-nerved. Flowers axillary, solitary, yellow to orange-yellow; pedicels jointed near the apex, geniculate. Schizocarps cylindric, truncate, stellate pubescent; mericarps 15-20 (-25), 1.0-1.8 × 0.7-0.9 cm, reniform, acute or somewhat acuminate at the back. Seeds reniform, punctate with minute warts, hairy at the hilum, brown-grey.

Fl. : October - January; Fr. : December-April.

Common in wastepieces, fields and gardens.

Selected specimens : Dungarpur: Verma 173 (BSA); Ganganagar: Roy 5014 (BSJO); Jaisalmer: Amarsagar, Blattner 5648 (BLAT); Kota: Govt. Garden, Singh 90214 (LWG); Sirohi: Abu road, McCann 79 (BLAT).

7. subsp. *guineense* (Schum.) Borssum in Blumea 14: 175. 1966; Bhandari, Fl. Ind. Desert 61. 1978. *Sida guineense* Schum. Kongl. Danske Vidensk. Selsk. Skr. 4: 81. 1829. *S. asiatica* L. Cent. Pl. 2: 26. 1756. *Abutilon asiaticum* (L.) Sweet, Hort. Brit. ed. 1. 53. 1826; Mast. in Hook.f. Fl. Brit. India 1: 326. 1874; Duthie, Fl. Gangetic Plain 1: 82. 1903.

Very similar to subsp. *indica*, but can be distinguished by the long calyx lobes which are as long as fruits; stem densely clothed with long woolly hairs and leaves more or less scabrid on the upper surface. The flowers double the size of the type.

Fl. : September - November; Fr. : October - December.

Occasionally found in open fallow fields, waste places and gardens.

Selected specimens : Jaipur: Univ. Campus, Sharma 1498 (RUBL); Jodhpur: Bhandari 1633, 1821 (JAC); Jhalawar: Sharma A. No. 9577 (RUBL). Also reported from Bikaner (Sarup, 1957), Jaisalmer (Blatt. & Hallb., 1918) and Udaipur (Vyas, 1965).

8. *Abutilon pakistanicum* Jafri & Ali in Fl. Karachi 220. 1966; Bhandari, Fl. Ind. Desert 61. 1978. *A. cornutum* Dalzell ex T. Cooke, Fl. Bomb. 1: 98. 1901, non Sweet, 1826; Blatt. & Hallb. in J. Bombay nat. Hist. Soc. 26: 266. 1918.

Grey tomentose undershrubs. Leaves 6-8 cm in diam., orbicular, cordate, shortly acuminate or subobtusate, crenulate-dentate. Flowers

axillary, solitary or in terminal racemes by reduction of leaves, pale yellow. Schizocarps ovoid; mericarps c. 0.8-1.0 cm broad, stellate pubescent all over, with c. 0.1 cm long awns. Seeds 3 per mericarp, furfuraceous dotted, brown.

Fl & Fr. : October - January.

Very rare, in sandy dry habitats.

Selected specimens : Jaisalmer: Amarsagar, *Blatter* 5656 (BLAT); Jodhpur: *Blatter* 5655 (BLAT).

Notes : Blatter's collections from Jaisalmer (*Blatter* 5656) and Jodhpur (*Blatter* 5655) have been identified as *A. fruticosum* Guill. & Perr., but according to Bhandari (*Lc.*) these elements are *A. pakistanicum* Jafri & Ali.

9. *Abutilon pannosum* (Forst. f.) Schlecht. Bot. Zeit. 9: 828. 1851; Bhandari, Fl. Ind. Desert 62. 1978. *Sida pannosa* Forst. f. Comm. Phy. & Soc. Reg. Goetting. ser. 2. 9. 1787. *S. glauca* Cav. Icon. 1: 8. t. 11. 1791. *S. mutica* DC. Prodr. 1: 470. 1824. *Abutilon glaucum* (Cav.) Sweet, Hort. Brit. 54. 1826; Raizada, Suppl. Duthie, Fl. Gangetic Plain 26. 1976. *A. muticum* (DC.) Sweet, Hort. Brit. ed. 2. 65. 1830; Mast. in Hook.f. Fl. Brit. India 1: 327. 1874.

Erect, tomentose undershrubs; stem terete, densely velvety. Leaves 5-12 cm across, broadly ovate or rounded-ovate, shortly acuminate to acute, irregularly toothed, densely velvety. Flowers large, axillary, solitary, orange. Schizocarps globose, depressed at apex; mericarps 20-30, reniform, densely velvety. Seeds 3 in each mericarp, scabrous.

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

Common in waste places, along roads and near the tanks.

Selected specimens : Barmer: Uterlai, *Shetty* 2292 (BSJO); Bundi: Hindoli, *Singh* 74043 (LWG); Churu: M.G. College, *Roy* 3979 (BSJO); Jaisalmer: Salam Sagar, *Tiwari* 677 (BSJO); Sirohi: *Jain* 60489 (BSI).

10. *Abutilon persicum* (Burm.f.) Merr. Philip. Journ. Sci. 19: 364. 1921; Borssum in Blumea 14: 163. 1966. *Sida persica* Burm.f. Fl. Ind 148. t. 47.f. 1. 1768. *S. polyandra* Roxb. Fl. Ind. 3: 173. 1832. *Abutilon polyandrum* (Roxb.) Wt. & Arn. Prodr. 55. 1834, non G. Don 1831; Mast. in Hook.f. Fl. Brit. India 1: 325. 1874; Duthie, Fl. Gangetic Plain 1: 84. 1903.

Stout, somewhat viscid undershrubs. Leaves 8-18 cm long, roundish, cordate, with a long obtuse acumen, repand-dentate, downy beneath; stipules setaceous, often coloured. Flowers axillary, solitary or by

decrease of leaves partly in terminal racemes or panicles, bright yellow to orange-yellow. Schizocarps more or less campanulate; mericarps c. 1.3×0.3 cm, oblong, with a firm erecto-patent mucro. Seeds 4-6 in each mericarp, reniform, black-brown.

Fl & Fr. : October - May.

Rare, on low lands, hilly tracts and in dry deciduous teak forests.

Selected specimen : Jaipur: Ramgarh, *Sharma* 879 (RUBL). Also reported from Alwar (*Vyas*, 1967) and Udaipur (*Vyas*, 1965).

11. *Abutilon ramosum* (Cav.) Guill. & Perr. in Guill. *et al.* Fl. Senegamb. Tent. 1: 68. 1831; Mast. in Hook.f. Fl. Brit. India 1: 328. 1874; Duthie, Fl. Gangetic Plain 1: 83. 1903. *Sida ramosa* Cav. Diss. 1: 28. t. 6. f. 1. 1785.

Erect, much branched, perennial shrubs; stem somewhat densely glandular-viscid, intermixed with short, stellate and long spreading hairs. Leaves $3-13 \times 3-11$ cm, broadly ovate, cordate, often sub-trilobed, acuminate, crenate-serrate. Flowers on slender, axillary and terminal peduncles, yellow. Schizocarps 0.9-1.1 cm long and broad; mericarps 8-10, glutinous-pubescent, each terminating into a deflexed subulate awn. Seeds 2-3 in each mericarp, rugose, papillose, dull brown.

Fl. : September - November; *Fr.* : October - December.

Common in hilly tracts under the shade of trees and in open waste places.

Selected specimens : Alwar: Pandupole, *Sharma* A. No. 835 (RUBL); Banswara: Bodigana, *Kanodia* 51155 (BSI); Bikaner: Shivbari, *Roy* 1707 (BSJO); Jaipur: Ramgarh, *Sharma* 2114 (RUBL); Kota: *Singh* 90823 (LWG); Sirohi: Mt. Abu, *Rao* 66696 (BSI).

3. ALTHAEA L.

Althaea ludwigii L. Mant. Pl. 98. 1767; Mast. In Hook.f. Fl. Brit. India 1: 319. 1874; Duthie, Fl. Gangetic Plain 1: 78. 1903.

Prostrate or ascending, stellately pubescent, annual herbs; branches many from the base. Leaves 2.5-3.0 cm in diam., sub-orbicular, deeply 5 to 7-lobed; lobes cuneate, 3 to 5-lobed, rounded at apex. Flowers 1-3 in each axil, white. Schizocarps 0.8-1.2 cm in diam.; mericarps 8-9, with 2 keels on the back, not winged, wrinkled at the sides, glabrous. Seeds smooth, pubescent, brown.

Fl & Fr. : January - March.

Rare, on the margins of tanks in dry clay soils.

Selected specimens : Bikaner: Kolayat, *Roy* 2367 (BSJO); Jaisalmer: Bara bagh, *Shetty* 4106 (BSJO); Ganganagar: Hanumangarh, *Sohal* 488 (DD); Kota: *Singh* 90686 (1.WG).

4. HIBISCUS L. *nom. cons.*

1a. Leaves palmately 3 to 7-partite:

2a. Flowers drooping. Capsules distinctly winged. 9. *H. vitifolius*

2b. Flowers not drooping. Capsules not winged or slightly winged at the edges:

3a. Epicalyx needle-like, radiating, equal or longer than calyx. 3. *H. caestus*

3b. Epicalyx strap-shaped, not radiating, shorter or equaling the calyx. 6. *H. palmatus*

1b. Leaves simple, entire or both entire and shallowly 3-lobed:

4a. Leaves entire. Seeds cottony. 5. *H. micranthus*

4b. Leaves both entire and shallowly 3-lobed:

5a. Involucral bracts conspicuous:

6a. Calyx inflated. 8. *H. trionum*

6b. Calyx not inflated:

7a. Involucral bracts linear, acute. 1. *H. amblyocarpus*

7b. Involucral bracts spatulate:

8a. Epicalyx with linear appendages, arising from the base of the spatulated tip. Capsules equaling the calyx. 2. *H. beddomei*

8b. Epicalyx without appendages. Capsules shorter than calyx. 7. *H. panduriformis*

5b. Involucral bracts absent or very rudimentary. 4. *H. lobatus*

1. *Hibiscus amblyocarpus* Hochst. ex Webb. *Fragm. Fl. Aeth. Aegypt.* 45. 1854; Rakshit & Kundu in *Bull. bot. Surv. India* 12: 174. 1972; Riedl, *Fl. Iranica* 120: 31. 1976. *H. punctatus* Dalz. in Dalz. & Gibs. *Bomb. Fl.* 20. 1861; Mast. in Hook.f. *Fl. Brit. India* 1: 340. 1874. *H. obtusilobus auct. plur.*, non Garcke 1849.

Erect, annual undershrubs; branches lax, stellately pubescent and glutinous. Leaves 2.5-8.0 × 1.5-7.0 cm, simple, entire or slightly unequally 3-lobed, middle lobe longest. Stipules 0.5 cm long, linear-lanceolate. Flowers solitary or in sub-panicles, white to pale rose; peduncles shorter

than the petioles. Petals slightly exceeding the sepals. Capsules ovoid, beaked, pubescent, exceeding the calyx. Seeds reniform, muricate, black.

Fl. & Fr. : September - October.

Rare, in wastelands, particularly in rocky gravelly habitats.

Selected specimens : Barmer: Sheo, *Tiwari* 916 (BSJO); Pachpadra, *Bhandari* 486 (JAC); Marwar: *King s.n.* 55226 (CAL). Also reported from Sirohi district (*Bhandari & Mehta*, 1978).

2. *Hibiscus beddomei* Rakshit & Kundu in *Sci. & Cult.* 27: 193. 1961 & *Bull. bot. Surv. India* 12: 160. 1972; Raizada, *Suppl. Duthie, Fl. Gangetic Plain* 28. 1976.

Unarmed shrubs, densely covered with rigid stellate hairs. Leaves 7.0 cm in diam., ovate-cordate, 3-angled or slightly 3-lobed, lobes ovate-acute; upper leaves narrow, ovate-lanceolate, serrate-dentate, hairy. Flowers axillary, solitary or in terminal racemes. Capsules ovoid, beaked, densely hairy.

Fl. : September - November.

Rare, in S.E. Rajasthan and at Mt. Abu in wasteland habitats.

Selected specimens : Jhalawar: Bijliya Bhadak, *Wadhwa* 5353 (BSA); Sirohi: Mt. Abu, *Ahtuwalla* 2494 (BSI).

3. *Hibiscus caesius* Garcke in *Oestr. Bot. Zeit.* 7: 850. 1849; Rakshit & Kundu in *Bull. bot. Surv. India* 12: 173. 1972. *H. gibsonii* Stocks ex Harv. in *Harv. & Sond. Fl. Capensis* 2: 587. 1862; Mast. in *Hook.f. Fl. Brit. India* 1: 339. 1874; *Duthie, Fl. Gangetic Plain* 1: 91. 1903.

Erect herbs; branches bristly or with minute-bristle pointed prickles. Leaves 2.5-7.5 cm long, 3 to 5-partite; lobes oblong-lanceolate, sharply dentate. Flowers axillary, solitary, 6-8 cm across, yellow with purple centre. Capsules broadly ovoid or sub-globose, shortly apiculate, densely hairy. Seeds reniform, pilose, dark brown.

Fl. & Fr. : Almost throughout the year.

Common in forests and in grasslands, particularly in the east of Aravalli.

Selected specimens : Ajmer: Nasirabad, *Sharma* 394 (DD); Chittorgarh: Semalpur, *Verma* 1635 (BSA); Dungarpur: Manelepura, *Kanodia* 82117 (BSI); Jodhpur: Bilara, *Singh* 4435 (BSJO); Kota: *Jain* 28796 (BSI); Pali: Begol, *Shetty* 1872 (BSJO).

4. *Hibiscus lobatus* (Murr.) O. Ktze. *Rev. Gen. Pl.* 3(2): 19. 1898; Rakshit & Kundu in *Bull. bot. Surv. India* 12: 169. 1972. *Solandra lobata*

Murr. Comm. Soc. Reg. Sc. Goetting. 6: 20, t. 1, 1785. *Hibiscus solandra* L' Herit. Strip. Nov. 1: 103, t. 49, 1788; Mast. in Hook.f. Fl. Brit. India 1: 336, 1874; Duthie, Fl. Gangetic Plain 1: 89, 1903.

Erect, pubescent or hispid, annual herbs. Leaves 2.5-11.5 × 1.5-8.5 cm, polymorphous; lower long-petioled, orbicular-ovate; middle ones deeply 3-lobed; uppermost 3-fid. Stipules setaceous. Flowers in terminal racemes, yellow, white or pink. Capsules ovoid, somewhat wrinkled, shortly beaked, hairy. Seeds smooth or tubercled, obovate-tetrahedral.

Fl & Fr. : August - November.

Rather common in rocky habitats in the east of Aravalli than the west.

Selected specimens : Dungarpur: *Kanodia* 82053 (BSI); Jaipur: Amer, *Sharma* 835 (RUBL); Jodhpur: Bhimbharak, *Bhandari* 1681 (JAC); Kota: Devri forest, *Singh* 90558 (LWG); Sirohi: Mt. Abu, *Jain* 60466 (BSI).

5. *Hibiscus micranthus* L. f. Suppl. 308, 1781; Mast. in Hook.f. Fl. Brit. India 1: 335, 1874; Duthie, Fl. Gangetic Plain 1: 89, 1903; Mahesh. Illus. Fl. Delhi f. 29, 1966. *Hibiscus ovalifolius sensu* Boisser, Fl. Or. 1: 839, 1867, *auct. plur.* non (Forssk.) Vahl, 1790. 'Okda' (Hindi).

Small, erect shrubs, scabrid with scattered stellate bristles. Leaves simple, 1.5-3.5 × 1.0-2.5 cm, ovate or oblong, acute or obtuse, serrate, more or less scabrid. Stipules filiform, hairy. Flowers axillary, solitary, white or pink; peduncles longer than petioles. Petals stellately hairy outside. Capsules globose, pubescent. Seeds reniform, cottony.

Fl & Fr. : August - November.

Common in rocky habitats.

Selected specimens : Ajmer: Todgarh, *Duthie* 4564 B (DD); Banswara: Shergarh forest, *Singh* 3079 (BSJO); Jaisalmer: Damodera hillocks, *Shetty* 3446 (BSJO); Jhunjhunu: Ajitsagar, *Kanodia* 111 (DD); Kota: Garari-Mahadeo, *Singh* 74662 (LWG); Sawaimadhopur: Bayana, *Saran & Party* 41902 (LWG); Sirohi: Mt. Abu, *Jain* 62072 (BSI).

6. *Hibiscus palmatus* Forssk. Fl. Aegypt. - Arab. 107, 126, t. 89, f. 5, 1775; Exell & Wild Fl. Zambes. 1(2): 469, 1961. *H. intermedius* A. Rich. Tent. Fl. Abyss. 1: 58, 1847, non Belanger 1834; Mast. in Hook.f. Fl. Brit. India 1: 336, 1874; Rakshit & Kundu in Bull. bot. Surv. India 12: 172, 1972.

Weak, annual herbs; stem hispid with reflexed simple or stellate white hairs. Leaves 3 to 7-palmipartite, outer two lobes much smaller, subcordate or truncate at base. Stipules subulate, 0.2 -0.3 cm long. Flowers axillary.

solitary, yellow with purple centre; peduncles shorter than petioles. Petals twice the length of calyx. Capsules hispid, beaked, valves slightly winged at the edges or not. Seeds sub-reniform, angular, clothed with shining unicellular hairs.

Fl. & Fr. : September - November.

Occasionally found in rocky habitats in W. Rajasthan.

Selected specimens : Barmer: *Bhandari* 442 (JAC); Jodhpur: Barli, *Singh* 4321 (BSJO); Chopsani, *Bhandari* 151 (JAC).

7. *Hibiscus panduriformis* Burm f. Fl. Ind. 151. t. 47. f. 2. 1768; Mast. in Hook.f. Fl. Brit. India 1: 338. 1874; Duthie, Fl. Gangetic Plain 1: 90. 1903; Rakshit & Kundu in Bull. bot. Surv. India 12: 172. 1972.

Annual herbs; stem and branches covered with sticky and pungent hairs. Lower leaves ovate-cordate and shallowly 3 to 5-lobed, upper ones oblong-lanceolate. Stipules linear. Flowers solitary, axillary, yellow with purple centre or purple; peduncles very short. Epicalyx shorter than calyx, linear, spatulate, densely ciliate, persistent. Petals twisted in bud, pubescent hairy outside. Capsules ovoid, shorter than calyx, densely hairy. Seeds densely hairy.

Fl. : October - December; *Fr.* : November - January.

Occasionally found in wastelands in E. Rajasthan and at Mt. Abu.

Selected specimens : Banswara: Barodia village, *Singh* 3745 (BSJO); Jhalawar: Khanpur, *Verma* 6935 (BSA); Kota: Shahabad, *Singh* 90246 (LWG). Also reported from Mt. Abu (Ahluwalia, 1965).

8. *Hibiscus trionum* L. Sp. Pl. 697. 1753; Mast. in Hook.f. Fl. Brit. India 1: 334. 1874; Duthie, Fl. Gangetic Plain 1: 88. 1903; Rakshit & Kundu in Bull. bot. Surv. India 12: 168. 1972.

Erect, annual herbs, pubescent with simple and stellate hairs. Leaves 2.5-7.5 cm long, orbicular-ovate, lower undivided, upper palmately 3 to 5-lobed; lobes obovate or oblong, pinnatisect, punctate, hairy. Stipules subulate, clothed with long stiff hairs. Flowers solitary, axillary, yellow with dark purple centre; peduncles longer than petioles. Capsules oblong, obtuse. Seeds reniform, rugose, glandular pubescent.

Fl. : September - November; *Fr.* : October - December.

Occasionally found on dry sandy soils near tanks.

Selected specimens : Bundi: Nenwa, *Singh* 90602 (LWG); Jaipur: Naraina (Near Ameolav tank), *Sharma* 2294 (RUBL). Also reported from Udaipur (Vyas, 1965 & Ramdeo, 1969).

9. *Hibiscus vitifolius* L. Sp. Pl. 696, 1753; Mast. in Hook.f. Fl. Brit. India 1: 338. 1874; Duthie, Fl. Gangetic Plain 1: 90. 1903; Rakshit & Kundu in Bull. bot. Surv. India 12: 166. 1972.

Weak, suffruticose, annual herbs; stem grey tomentose or villous, sometimes with stellate hairs. Leaves 2.5-10.0 cm in diam., ovate, cordate, palmately 3 to 7-partite; lobes acute or acuminate, crenate-serrate or toothed. Stipules very small, setaceous. Flowers axillary, solitary or clustered at the end of branches, drooping, c. 7 cm in diam., yellow with purple centre; peduncles shorter than petioles. Epicalyx linear, free, hairy, shorter than calyx. Capsules sub-orbicular, apiculate, shorter than calyx, 5-winged. Seeds reniform, minutely tubercled.

Fl. : August - October; *Fr.* : September - November.

Common in E. Rajasthan and near Mt. Abu.

Selected specimens : Banswara: Shergarh forest, Singh 3065 (BSJO); Bhilwara: Karoi village, Singh 6562 (BSJO); Bundi: Kishorapatan, Singh 74488 (LWG); Chittorgarh: Bansi, Verma 1743 (BSA); Sirohi: Abu road, Rao 66507 (BSI).

5 KYDIA ROXB.

Kydia calycina Roxb. Pl. Corom. 3: 12, t. 215, 1819; Wight, Ic. 3(2): 7, t. 879-880. 1843-1845; Mast. in Hook.f. Fl. Brit. India 1: 348. 1874; Duthie, Fl. Gangetic Plain 1: 97. 1903.

Trees, upto 20 m tall. Leaves 3.0-12.5 × 4.0-16.5 cm, truncate-subcordate, entire or 3 to 5-angled or slightly denticulate, acute or obtuse. Flowers in panicles, white or pink. Male flowers: Stamens 15-30, staminal tube sparsely pubescent. Female flowers: Ovary globose, woolly. Capsules 0.4-0.5 cm across. Seeds usually one in each cell, reniform, glabrous, dark brown.

Fl. & Fr. : October - January.

Rare, in dry deciduous forests on the Aravalli hills.

Selected specimens : Alwar: Mathur A. No. 24 (RUBL); Pandupole, Sharma A. No. 848 (RUBL); Sriska, Saxena A. No. 13036 (RUBL); Sirohi: Abu hills, McCann 260 (BLAT). Also reported from Udaipur (Vyas, 1965).

6. MALVA L.

1a. Claw of petals glabrous:

2a. Sepals very sparsely stellately pubescent. Mericarps obscurely reticulate; columella conical.

4. *M. verticillata*

2b. Sepals densely stellately pubescent. Mericarps conspicuously reticulate; columella flat or concave.

1. *M. parviflora*

1b. Claw of petals bearded.

3a. Epicalyx segments ovate-oblong. Flowers c. 5.0 cm across. Carpels reticulately veined on the back.

3. *M. sylvestris*

3b. Epicalyx segments lanceolate. Flowers c. 2.0 cm across. Carpels not reticulately veined on the back.

2. *M. rotundifolia*

1. *Malva parviflora* L. Demonstr. Pl. Hort. Ups. 18. 1753 et Amoen. Acad. 3: 416. 1756; Mast. in Hook.f. Fl. Brit. India 1: 321. 1874; Duthie. Fl. Gangetic Plain 1: 79. 1903; Mahesh. Illus. Fl. Delhi f. 25. 1966. "Golio" (Hindi).

Prostrate or ascending herbs; stem sparsely stellately pubescent. Leaves 2-4(-7) cm in diam., orbicular, cordate, 3 to 7-lobed, crenate-serrate. Stipules lanceolate to ovate, with ciliate margins. Flowers axillary, usually fasciated, rarely solitary, white. Schizocarps discoid, 5-6 mm across; mericarps 8-10, dorsally with raised reticulate venation, radially transversely ribbed. Seeds glabrous, brown to black.

Fl. : January - March; Fr. : February - April.

Common in moist places, particularly near water lodged areas and in cultivated fields.

Selected specimens : Barmer: Piplum, Tiwari 1162 (BSJO); Jaipur: Dudu, Wadhwa 8307 (BSA); Jodhpur: Bilara, Singh 3501 (BSJO); Tonk: Ghati village, Shetty 568 (BSJO); Kota: Atru, Singh 90975 (LWG). Also reported from Ganganagar (Dhillon & Bajwa, 1969).

2. *Malva rotundifolia* L. Sp. Pl. 688. 1753; Mast. in Hook.f. Fl. Brit. India 1: 320. 1874; Cooke, Fl. Bombay 1: 90. 1901.

Much branched herbs, sparingly pubescent and with some stellate hairs. Leaves 1.5-4.0 cm in diam., suborbicular, cordate, crenate. Flowers axillary, 1-5 together, pale purple or white. Mericarps 13-16, pubescent, not reticulated on the back, margins of the back rounded. Seeds brown-black, glabrous.

Fl. : January - March; Fr. : February - April.

Rare, in moist shady habitats, particularly in the gardens.

Selected specimens : Jaipur: Ram Niwas garden, Sharma A. No. 9071 (RUBL).

3. *Malva sylvestris* L. Sp. Pl. 689. 1753; Mast. in Hook.f. Fl. Brit. India 1: 320. 1874; Duthie, Fl. Gangetic Plain 1: 79. 1903.

Pubescent to glabrescent, biennial herbs. Leaves 2-5 cm in diam., 3-lobed, truncate to broadly cordate at base; stipules scarious, lanceolate. Flowers in axillary fascicles of 2-4, pink or purple. Mericarps 10-12, reticulate. Seeds brown.

Fl. & Fr. : February - April.

Occasionally found as a spring season weed. So far reported from Ganganagar (Dhillon & Bajwa, 1969). Often grown in the gardens for ornamental purposes.

4. *Malva verticillata* L. Sp. Pl. 689. 1753; Mast. in Hook.f. Fl. Brit. India 1: 320. 1874; Duthie, Fl. Gangetic Plain 1: 78. 1903. *M. neilgherrensis* Wight, Ic. 3(3): 3, t. 950. 1843-1845.

Annual or biennial herbs; stem green to purplish, stellate hairy or glabrescent. Leaves 3-23 cm in diam., orbicular, usually 5-lobed, cordate or sub-truncate, coarsely crenate-dentate. Stipules lanceolate, with long ciliate margins. Flowers axillary, 2 to many together, purplish. Mericarps 10-12, rugose on the margins, centrally grooved or smooth on the dorsal side, radially rugose, glabrous. Seeds glabrous, dark brown-black.

Fl. & Fr. : January - April.

Rare, found as an escape from cultivation.

Selected specimens : Ajmer: *Lowrie* 18 (DD); Merwara: *Lowrie* 4567 (DD). Also reported from Jhunjhunu (Majumdar, 1969).

7. MALVASTRUM A. GRAY *nom. cons.*

Malvastrum coromandellianum (L.) Garcke in Bonplandia 5: 295. 1857. *Malva coromandeliana* L. Sp. Pl. 687. 1753. *M. tricuspidata* R. Br. in Ait. f. Hort. Kew. ed. 2. 4: 210. 1812. *Malvastrum tricuspdatum* (R. Br.) A. Gray, Pl. Wright 1: 16. 1852; Mast. in Hook.f. Fl. Brit. India 1: 321. 1874; Duthie, Fl. Gangetic Plain 1: 79. 1903; Mahesh. Illus. Fl. Delhi f. 26. 1966.

Robust herbs or undershrubs. Leaves 3-5 × 1.5-2.5 cm, ovate-lanceolate or oblong, crenate-serrate, stellate hairy. Flowers axillary, solitary or 2-3 in fascicles, yellow. Mericarps 5-10, reniform, ciliate, with 3 spines on the margins. Fruits globose, enclosed in the enlarged calyx.

Fl. & Fr. : August - December.

Common in dry sandy & black soils, often found as a weed in the gardens.

Selected specimens : Dungarpur: Verma 171 (BSA); Ganganagar: Layalpuria gardens, Roy 4995 (BSJO); Jaipur: Lalsol, Sharma 861 (RUBL); Jodhpur: Mandore garden, Tiwari 611 (BSJO); Kota: Kathoon, Singh 90595 (LWG); Udaipur: Jaisamand, Verma 98 (BSA).

8. PAVONIA CAV *nom. cons.*

- 1a. Epicalyx segments 5-6, ovate-lanceolate:
- 2a. Flowers yellow with dark purple centre. Mericarps echinate all over. 4. *P. glechomaefolia*
 - 2b. Flowers yellow without dark purple centre. Mericarps with 3, stout prickles on the margins. 6. *P. procumbens*
- 1b. Epicalyx segments 8-14, linear:
- 3a. Mericarps slightly winged. 7. *P. zeylanica*
 - 3b. Mericarps not winged:
 - 4a. Leaves lobed or angular. Ripe carpels glabrous. 5. *P. odorata*
 - 4b. Leaves neither lobed nor angular. Ripe carpels villous:
 - 5a. Petals entire:
 - 6a. Plants densely viscous hairy. 2. *P. arabica* var. *glutinosa*
 - 6b. Plants not viscous hairy. 1. *P. arabica* var. *arabica*
 - 5b. Petals deeply bilobed. 3. *P. arabica* var. *mazzurienis*

1. *Pavonia arabica* Hochst. & Steud. ex Boiss. Fl. Orient. 1: 837. 1867; Mast. in Hook.f. Fl. Brit. India 1: 331. 1874; Bhandari, Fl. Indian Desert 68. 1978.

var. *arabica*

Much branched undershrubs. Leaves 2.0-3.5 × 1.0-2.5 cm, ovate-oblong, cordate or subcordate, obtuse or subtruncate, entire or with 1-3 short dentation at the apex, densely stellately pubescent. Flowers axillary, solitary, pink. Schizocarps c. 0.5 cm in diam., oblong, obtuse; mericarps trigonous, pubescent on sides. Seeds pubescent with long, spirally coiled hairs and with short tubercles in longitudinal rows, brown.

Fl. & Fr. : August - October.

Rare, in rocky and sandy habitats.

Selected specimens : Barmer: *Bhandari* 466, 509, 1607 (JAC); near Seu, *Blatter* 5684 (BLAT); Jodhpur: Massuria hills, *Bhandari* 4 (JAC).

2. var. *glutinosa* Blatt. & Hallb. in J. Bombay nat. Hist. Soc. 26: 227. 1918; *Bhandari*, Fl. Ind. Desert 69. 1978.

Very similar to var. *arabica*, but can be easily distinguished by the plants being densely viscous pubescent.

Fl. & Fr. : August - October.

Endemic to W. Rajasthan. Prefers sandy and rocky habitats.

Selected specimens : Barmer: *Bhandari* 1878 (JAC), *Blatter* 5685 (BLAT); Jaisalmer: *Bhandari* 976 (JAC); Jodhpur: Kailana, *Blatter* 5669, 5668 (BLAT).

3. var. *massuriensis* Bhandari, Fl. Ind. Desert 69. 1978.

Very similar to var. *arabica*, but can be easily distinguished by the petals being deeply bilobed up to the base.

Endemic to Jodhpur. Prefers rocky habitats.

Fl. & Fr. : August - October.

Selected specimen : Jodhpur: Massuria hills, *Bhandari* 4 A (JAC).

4. *Pavonia glechomaefolia* (A. Rich.) Garcke ex Schwenif. Beitr. Fl. Aethiop. 1: 54. 1867; Mast. in Hook.f. Fl. Brit. India 1: 330. 1874, *pro parte*; Abedin in Pak. Journ. Bot. 11(1): 66. 1979. *Lebretonia glechomaefolia* A. Rich. Tent. Fl. Abyss. 1: 54. 1847.

Undershrubs; branches purple, stellately pubescent. Leaves 1.5-6.0 × 1.5-1.75 cm, ovate to orbicular, cordate, acute, irregularly serrate to crenate. Flowers axillary, solitary, yellow with purple centre. Schizocarps 0.5-0.6 cm across; mericarps 5, pyriform, echinate all over. Seeds pyriform, sparsely hairy, more so towards the base and hilum, brown.

Fl. & Fr. : Almost throughout the year.

Rare, in scrub forests. Occasionally mistaken for *P. procumbens* (Wall. ex Wt. & Arn.) Walp.

Selected specimens : Barmer: Junapatherasar, *Tiwari* 1191 (BSJO); Jalore: Harji, *Vyas* 6651 (BSJO).

5. *Pavonia odorata* Willd. Sp. Pl. 3: 837. 1800; Mast. in Hook.f. Fl. Brit. India 1: 331. 1874; Duthie, Fl. Gangetic Plain 1: 86. 1903.

Erect, branched herbs, covered with viscous sticky hairs. Leaves 2.5-5.0 cm across, ovate, cordate, shallowly 5 to 8-lobed. Flowers axillary,

solitary, 2.5 cm across, pink. Schizocarps obovate, glabrous; mericarps 5.

Fl. & Fr. : October - November.

Selected specimens : Jaipur: URF, *Sharma* A. No. 820, 821, 822 (RUBL); Jhalawar: Bijliya Bhodak, *Wadhwa* 5343 (BSA); Jodhpur: Bar, *Wadhwa* 4930 (BSA); Udaipur: Jaisamand, *Kanodia* 82280 (BSI).

6. *Pavonia procumbens* (Wall. ex Wt. & Arn.) Walp. in Rep. Bot. Syst. 1: 301. 1842; Abedin in Pak. J. Bot. 11(1): 63. 1969. *Lebretonia procumbens* Wall. ex Wt. & Arn. Prodr. 47. 1834; Wight, Ic. 1: t. 4. 1838. *Pavonia glechomaefolia* auct. plur., non Garcke 1834; Mast. in Hook.f. Fl. Brit. India 1: 330. 1874, *pro parte*.

Suffruticose, tomentose shrubs with procumbent branches. Leaves entire or 3-angular at apex, 1.5-7.5 × 1.0-5.5 cm, ovate, cordate, acuminate at the apex, serrate-crenate. Flowers 0.5-0.7 cm across, axillary, solitary, pale yellow. Mericarps 0.5-0.6 cm across, depressed globose, angular. Seeds c. 0.3 cm across, glabrous.

Fl. & Fr. : Almost throughout the year.

Occasionally found in wastelands and river-beds.

Selected specimens : Ajmer: Happy valley, *Sharma* 363 (DD); Jaipur: Sambhar, *Lal & Party* 34673 (LWG); Jodhpur: Bilara, *Singh* 4426 (BSJO); Pali: Jawai river-bed, *Shetty* 1431 (BSJO).

7. *Pavonia zeylanica* (L.) Cav. Diss. 3: 134. t. 48.f. 2. 1787; Mast. in Hook.f. Fl. Brit. India 1: 331. 1874; Mahesh. Illus. Fl. Delhi f. 28. 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 32. 1976. *Hibiscus zeylanicus* L. Sp. Pl. 697. 1753.

Much branched, glandular-pubescent undershrubs. Leaves 1-3 × 1.0-2.5 cm, more or less roundish, cordate or truncate at base, usually 3 to 5-lobed, dentate. Flowers axillary, solitary, pink or white. Mericarps 5, trigonous, wedge-shaped, rounded on the back. Seeds 2.5 mm long, brown, with white, spirally curled hairs on the back and sides.

Fl. : September - November; *Fr.* : October - December.

Common in open fields and among hedges of gardens and fields.

Selected specimens : Ajmer: Todgarh, *Duthie* 4535 A (DD); Churu: Lodasar hills, *Roy* 2563 (BSJO); Dungarpur: *Kanodia* 82116 (BSI); Jodhpur: Baroi, *Singh* 4388 (BSJO); Tonk: Gounri village, *Shetty* 1211 (BSJO); Sirohi: Mt. Abu, *Blatter* 2207 (BLAT).

9. SIDA L.

- 1a. Mericarps 5:
- 2a. Plants with 1-3, spiny structures at the base of petioles. Mericarps reticulate, awned. 7. *S. spinosa*
- 2b. Plants without spiny structures at the base of petioles. Mericarps smooth, mucronate:
- 3a. Prostrate or trailing herbs covered with glandular hairs. 2. *S. cordata*
- 3b. Erect herbs or undershrubs covered with glandular hairs. 5. *S. mysorensis*
- 1b. Mericarps 6-12:
- 4a. Mericarps usually 8-12, dehiscent:
- 5a. Mericarps 2-awned, retrorsely hairy, longer than the calyx. 3. *S. cordifolia*
- 5b. Mericarps 1-awned or unawned, if awned then the awn not retrorsely hairy and shorter than the calyx. 6. *S. rhombifolia*
- 4b. Mericarps usually 6-8, indehiscent:
- 6a. Calyx 8-10 mm long. Fruits completely enclosed by the calyx. 8. *S. niagii*
- 6b. Calyx 5-6 mm long. Fruits never completely enclosed by the calyx:
- 7a. Leaves downy on both sides. Flowers white. 4. *S. ovata*
- 7b. Leaves glabrous on both sides. Flowers yellow. 1. *S. acuta*

1. *Sida acuta* Burm.f. Fl. Ind. 147. 1768; *emend.* K. Schum. Fl. Bras. 12: 326. 1891; Wight, Ic. 1: t. 95. 1838; Duthie, Fl. Gangetic Plain 1: 81. 1903. *S. carpinifolia* non L. f. 1781; *sensu* Mast. in Hook.f. Fl. Brit. India 1: 323. 1874. "Bal" (Hindi).

Much branched undershrubs. Leaves 2-6 × 2-3 cm, lanceolate or elliptic-lanceolate, base obtuse or roundish, apex acute, margins regularly serrate. Flowers solitary, axillary, pale yellow. Mericarps 5-6 (-8), 2-awned, with a groove between awns. Seeds smooth, pubescent around the hilum.

Fl. : September - October; Fr. : October - November.

Rare, weed in wastelands and neglected corners of gardens.

Selected specimens : Kota: Atru, Singh 90610 (LWG); Sirohi: Mt. Abu, Jain 60165 (BSI). Also reported from Alwar (Vyas, 1967), Jaipur

(Sharma, 1974), Sikar (Ratnum, 1951); Nair & Malhotra, 1961) and Udaipur (Ramdeo, 1969).

2. *Sida cordata* (Burm.f.) Borssum in Blumea 14: 182. 1966. *Melochia cordata* Burm.f. Fl. ind. 143. 1768. *Sida veronicifolia* Lam. Encycl. 1: 5. 1783; Duthie, Fl. Gangetic Plain 1: 80. 1903. *S. humilis* Cav. Diss. 5: 277, t. 134. f. 2. 1788; Mast. in Hook.f. Fl. Brit. India 1: 322. 1874, incl. vars.

Prostrate or trailing herbs. Leaves 1.5 × 1.4 cm, broadly ovate-cordate to suborbicular-cordate, acute to acuminate, serrate or crenulate-dentate. Flowers axillary, fasciculate or sub-paniculate or solitary, yellow. Mericarps 5, dehiscent, thin-walled. Seeds c. 2. mm long, glabrous, brown.

Fl. & Fr. : Almost throughout the year, but mostly after the rains.

Common in wastelands, particularly among bushes and hedges.

Selected specimens : Banswara: Jua fall, Singh 3733 (BSJO); Jodhpur: Osian, Singh 3249 (BSJO); Kota: Shahabad, Nautiyal 25379 (DD); Sawaimadhopur: Verma 1920 (BSA); Sirohi: Abu road, McCann 150, 71 (BLAT).

3. *Sida cordifolia* L. Sp. Pl. 684. 1753; Mast. in Hook.f. Fl. Brit. India 1: 324. 1874; Duthie, Fl. Gangetic Plain 1: 82. 1903. "Bal" (Hindi).

Erect undershrubs; branches softly villous and densely stellate-pubescent all over. Leaves 2.5-7.0 × 1.4 cm, ovate or ovate-oblong, shallowly cordate, obtuse or sub-acute. Flowers axillary, yellow, upper flowers nearly sessile and fasciculate towards the tip of the branches forming subspicate inflorescence. Mericarps 10; awns up to 4 mm long. Seeds trigonous, glabrous except at the hilum, brown or black.

Fl. : September - November; *Fr.* : October - December.

Common in wastelands, particularly in xeric habitats.

Selected specimens : Banswara: Lasara village, Singh 3612 (BSJO); Barmer: Samdari, Rao 66962 (BSI); Jhalawar: Bijliya Bhada, Verma 7456 (BSI); Jodhpur: Ketu, Singh 3193 (BSJO); Sawaimadhopur: Bayana, Ghosh 46041 (LWG); Sikar: Stower C-33 (BSI); Tonk: Haji-ki-Kothi, Shetty 1242 (BSJO).

4. *Sida ovata* Forssk. Fl. Aegypt. - Arab. 124. 1775; Bhandari, Fl. Ind. Desert 73. 1978. *S. grewioides* Guill. & Pers. in Guill. et al. Fl. Seneg. Tent. 1: 71. 1830; Mast. in Hook.f. Fl. Brit. India 1: 323. 1874; Duthie, Fl. Gangetic Plain 1: 81. 1903. "Dabi" (Hindi).

Erect shrubs or undershrubs; branches grey-tomentose with stellate hairs. Leaves 2.5-5.0 × 1.0-4.5 cm, elliptic-oblong or oblong-ovate, obtuse at apex, crenate. Flowers axillary, solitary or geminate, yellow. Mericarps 7-8, nearly glabrous, dorsally rugose; awns 2, very short. Seeds smooth, except at the hilum, dark brown.

Fl. : October - December; *Fr.* : November - January.

Common in fallow fields and gardens.

Selected specimens : Alwar: Bala fort, *Lal* 34444 (LWG); Banswara: Shergarh village, *Singh* 3088 (BSJO); Ganganagar: Nohar, *Roy* 5972 (BSJO); Jaisalmer: Pokaran, *Jain* 40732 (BSA); Nagaur: Merta road, *Lal* 34882 (LWG); Tonk: Ghati village, *Pandey* 4810 (BSJO); Sirohi: Abu road, *McCann* 25 (BLAT).

5. *Sida mysorensis* Wt. & Arn. Prodr. 1: 59. 1834; Mast. in Hook.f. Fl. Brit. India 1: 322. 1874. *S. glutinosa* Roxb. Fl. Ind. 3: 172. 1832, non Cav. 1785.

Suberect herbs or undershrubs, covered with glutinous hairs. Leaves 5-7 × 3.5-5.0 cm, ovate-cordate, acuminate, base cuneate. Flowers axillary, solitary or geminate, pale yellow. Mericarps 5-6, smooth, grey-puberulous, awned.

Fl. : October - December; *Fr.* : November - January.

Rare, on hills.

Selected specimens : Jhalawar: Asuawar, *Verma* 6911 (BSA); Sirohi: Mt. Abu, *Blatter* 18327 (BLAT).

6. *Sida rhombifolia* L. Sp. Pl. 684. 1753; *emend.* Mast. in Hook.f. Fl. Brit. India 1: 323. 1874; Duthie, Fl. Gangetic Plain 1: 181. 1903. *S. orientalis* Cav. Diss. 1: 21. t. 12. f. 1. 1785.

Erect, much branched, glabrous or stellate hairy herbs. Leaves 3.5-10.0 × 1-5 cm, obovate-rounded to rhomboid, cuneate or rounded at the base, acute to acuminate or obtuse at apex. Flowers axillary, solitary, yellow. Mericarps 8-10, smooth; awns stellate hairy.

Fl. : August - September; *Fr.* : September - October.

Common weed of wastelands and cultivated fields, particularly in the east of Aravalli.

Selected specimens : Alwar: Kali Ghati watch tower, *Sharma* 3864 (RUBL); Bharatpur: *Bhardwaja* 12649 (LWG); Chittorgarh: *Majumdar* 12450 (BSA); Dungarpur: *Verma* 96 (BSA); Jodhpur: *Bhandari* 225 (JAC); Kota: *Majumdar* 13251 (BSA); Sirohi: Mt. Abu, *Rao* 66555 (BSI).

7. *Sida spinosa* L. Sp. Pl. 683. 1753; Mast. in Hook.f. Fl. Brit. India 1: 323. 1874, *pro parte*; Duthie, Fl. Gangetic Plain 1: 80. 1903; Mahesh. Illus. Fl. Delhi f. 23. 1966 "*Kantiobal*" (Hindi).

Erect, densely stellately pubescent undershrubs. Leaves 2-6 × 1.5-3.0 cm, elliptic-oblong, lanceolate or ovate, truncate-cordate at base, obtuse or rounded at apex, margins crenate. Flowers fascicled in the axils of leaves, white. Mericarps 5, more or less reticulate, pubescent. Seeds rounded at the back, smooth, dark brown.

Fl : September - November; Fr : October - January.

Common weed in neglected corners of gardens and wastelands.

Selected specimens : Banswara: Talwara village, *Singh* 4291 (BSJO); Barmer: Gandhav, *Shetty* 2345 (BSJO); Bhilwara: Banara, *Singh* 6027 (BSJO); Churu: Shardarshahr, *Kaul* 18537 (LWG); Kota: Lake, *Wadhwa & Prasad* 9468 (BSA); Sirohi: Mt. Abu, *McCann* 238 (BLAT).

Notes : *S. alba* L. and *S. spinosa* L. are distinct species.

8. *Sida flagii* Bhandari in *Annals Arid Zone* 16: 455. 1977 et Fl. Ind. Desert 74. 1978. *S. pakistanica* Abedin in *Pak. Journ. Bot.* 11: 54. 1979. "*Bal*" (Hindi).

Much branched, perennial undershrubs, densely stellately tomentose all over. Leaves 1.5-3.0 × 1.0-1.5 cm, ovate-oblong to obovate, rounded or truncate at apex, entire. Flowers axillary, solitary, pale yellow. Mericarps 7-8, woody, prominently reticulated on the sides, strongly rugose on the back. Seeds glabrous, black.

Fl & Fr : August - December.

Common in sandy soils, particularly in desertic condition.

Selected specimens : Barmer: Mungaria, *Bhandari* 1570 A (JAC; Type); Jaisalmer: Devikot, *Tiwari* 869 (BSJO); Jodhpur: Kailana, *Shetty* 88 (BSJO); Massuria, *Bhandari* 33 (JAC); Jodhpur fort, *Bhandari* 59 (JAC).

10. THESPESIA SOLAND. EX CORR. *nom. cons.*

Leaves entire.

2. *T. populnea*

Leaves palmately 3-lobed.

1. *T. lampas*

1. *Thespesia lampas* (Cav.) Dalz. & Gibs. *Bombay Fl.* 19. 1861; Mast. in Hook.f. Fl. Brit. India 1: 345. 1874. *Hibiscus lampas* Cav. *Diss.* 3: 154. t. 56. f. 2. 1787. *Thespesia macrophylla auct. plur.*, non Bl. 1825; Duthie, Fl. Gangetic Plain 1: 93. 1903. "*Ban-kapas*" (Hindi).

Deciduous shrubs, 1.0-1.5 m tall. Leaves 7.5-15.0 cm long, cordate or truncate at base, 3-lobed; lobes triangular, acuminate. Peduncles axillary, c. 10 cm long, 3-flowered. Flowers yellow. Capsules 2.5 cm long, ovoid, pointed, 4 to 5-valved, pilose. Seeds glabrous.

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

Rare, in deciduous forests in the east of Aravalli and at Mt. Abu.

Selected specimens : Banswara: Punapathar, *Singh* 2928 (BSJO); Kota: Shahabad, *Singh* 74037 (LWG); Chittorgarh: Bansi, *Majumdar* 13361 (BSA). Also reported from Sirohi (Jain, 1962).

2. *Thespesia populnea* (L.) Soland. & Corr. Ann. Mus. Herb. Paris 9: 290. t. 8. f. 1. 1807; Wight, Ic. 1: t. 8. 1838; Mast. in Hook.f. Fl. Brit. India 1: 345. 1874. *Hibiscus populneus* L. Sp. Pl. 694. 1753.

Tall shrubs or small trees, 4-5 m high. Leaves 8-13 × 7-11 cm, base cordate, with small glands between the veins, acuminate, peltate-scaly beneath. Flowers axillary, solitary and crowded towards the end of branches forming corymbs, yellow to pink. Capsules globose, 5-valved, with persistent calyx at the base.

Fl. : October - December; *Fr.* : December - March.

Commonly planted along roads; occasionally found in wastelands.

Selected specimens : Banswara: Danpur, *Singh* 3731 (BSJO); Bhilwara: Umed Sagar, *Singh* 5755 (BSJO); Kota: Atru, *Singh* 90987 (LWG); Pali: Jakoda hills, *Shetty* 1428 (BSJO). Also reported from Jhatawar (Majumdar, 1971) and Jodhpur (Sarup, 1954).

11. URENA L.

Epicalyx linear-lanceolate, reflexed.

2. *U. lobata* subsp.

sinuata

Epicalyx broad, triangular, acute.

1. *U. lobata* subsp.

lobata

1. *Urena lobata* L. Sp. Pl. 692. 1753; Mast. in Hook.f. Fl. Brit. India 1: 329. 1874; Duthie, Fl. Gangetic Plain 1: 85. 1903; Mahesh. Ilus. Fl. Delhi 1: 27. 1966; Borssum in Blumea 14: 141. 1966.

subsp. *lobata*

Erect, perennial herbs or undershrubs. Leaves broadly ovate-suborbicular, subcordate at base, lower ones angular to lobed, upper ones sinuate-lobed or entire to serrate. Flowers solitary or in clusters of 2-3 in the axils of

upper most leaves, pinkish or reddish purple. Mericarps 0.8-1.0 cm across, densely clothed with hooked hairs.

Fl. : September - November; *Fr.* : November - January.

Common along roads in waste places and forest edges, particularly in the N.E. and S.E. Rajasthan.

Selected specimens : Banswara: Anand Sagar forest, Singh 3744 (BSJO); Sirohi: Mt. Abu, Blatter 17870, 18376, 18378 (BLAT). Also reported from Bikaner (Joshi, 1956), Jodhpur (Sarup, 1954), Jaipur (Bajpai & Verma, 1964) and S.E. Rajasthan (Majumdar, 1971).

2. subsp. *sinuata* (L.) Borssum in Blumea 14: 142. 1966. *U. sinuata* L. Sp. Pl. 692. 1753; Mast. in Hook.f. Fl. Brit. India 1: 329. 1874. "Bachita" (Hindi).

Very similar to subsp. *lobata*, but can be distinguished by the linear-lanceolate, flexible, reflexed, 0.3-0.4 × 0.1-0.15 cm epicalyx.

Fl. : September - November; *Fr.* : November - January.

Rare, in the forests, mostly in S.E. Rajasthan.

Selected specimen : Kota: Kelwara, Singh 90662 (LWG). Also reported from Udaipur (Vyas, 1965; Ramdeo, 1969).

CULTIVATED SPECIES

Althaea rosea (L.) Cav. Biennials. Leaves wavy, angled or lobed. Flowers purple, rose, yellow or white. Schizocarps about 2 cm in diam. Seeds black. Native of Asia; rarely cultivated in the gardens for ornamental purposes.

Gossypium arboreum L. "Kapas" (Hindi) Native of tropical and subtropical regions of old world; commonly cultivated during the rainy season.

Gossypium barbadense L. - Commonly known as "Egyptian Cotton". Native of Tropical South America; cultivated in Kota division in black-cotton soils.

Gossypium herbaceum L. Commonly known as "Levant Cotton". Native of tropical and sub-tropical regions of old world; cultivated as a rainy season crop in many parts of the state.

Gossypium hirsutum L. - Commonly known as "American Cotton". Native of Central America; cultivated extensively in Ganganagar and Jhalawar districts of Rajasthan.

Hibiscus cannabinus L. - "Sun" (Hindi) - Annual or perennial, prickly herbs. Corolla large, spreading, yellow with crimson centre. Native of Africa; cultivated for its silky fibres obtained from the stem.

Hibiscus mutabilis L. Shrubs or small trees. Flowers axillary, solitary or in terminal corymbs, white. Native of China; commonly cultivated in the gardens for ornamental purposes.

Hibiscus rosa-sinensis L. "Gurhal" (Hindi) Evergreen shrubs. Flowers axillary, solitary, pink, red or rose-coloured. Staminal tube exceeding the corolla. Native of China; commonly cultivated in the gardens for ornamental purposes.

Hibiscus sabdariffa L. - Erect, glabrous annuals. Bracteoles adnate to the calyx. Corolla yellow. Native of Tropical Africa and Asia; cultivated for the fleshy edible calyx.

Hibiscus schizopetalus (Mast.) Hook.f. (*H. rosa-sinensis* var. *schizopetalus* Mast.) - Glabrous shrubs. Flowers axillary, solitary, drooping, red. Petals deeply laciniate. Native of Africa; commonly cultivated in the gardens for ornamental purposes.

Hibiscus syriacus L. Erect, glabrous shrubs. Flowers often double, of many shades in pink or purple. Native of China and Japan; commonly cultivated in the gardens for ornamental purposes.

Malvaviscus arboreus Cav. var. *panduriformis* (DC.) Schery. (*M. panduriformis* DC.) "Gurhal" (Hindi) Shrubs with ovate or ovate-lanceolate and serrate leaves. Flowers axillary, solitary, red; petals not spreading. Seeds reniform. Commonly cultivated in the gardens for ornamental purposes.

24. BOMBACACEAE

(P.J. Parmar)

Trees, covered with stout, hard, conical prickles. Flowers in fascicles.

2. *Bombax*

Trees, without prickles. Flowers solitary.

1. *Adansonia*

1. ADANSONIA L.

Adansonia digitata L. Sp. Pl. 1190. 1753; Mast. in Hook.f. Fl. Brit. India 1: 348. 1874; Cooke, Fl. Bombay 1: 119. 1901; Shah, Fl. Gujarat 1: 118. 1978.

Tall, deciduous trees, with smooth, grey bark. Leaflets sessile or subsessile, 3-7 (-9), 2.5-12.0 × 1.2-5.0 cm, obovate-oblong or elliptic-oblong, densely silky-brown hairy. Flowers 10-12 cm across, pendulous. Fruits 20-25 cm long, ellipsoidal, densely hairy, pale-brown.

Fl. : April - May; Fr. : June - December.

Rare, perhaps planted in open forests and near habitations.

Selected Specimens : Ajmer: Mangliawas, Vaid 5302 (DD); Chittorgarb: Pratapgarh, Majumdar 12280 (BSA).

2. BOMBAX L.

Bombax ceiba L. Sp. Pl. 511. 1753, *pro parte*; Robins in Taxon 10: 68, 160. 1961. *B. malabaricum* DC. Prodr. 1: 479. 1824; Mast. in Hook.f. Fl. Brit. India 1: 349. 1874; Duthie, Fl. Gangetic Plain 1: 98. 1903.

Large, deciduous trees. Leaves crowded at the end of branches, petiolate, digitately 5 to 7-foliolate; leaflets 5-23 × 1.5-9.0 cm, ovate-lanceolate or elliptic-lanceolate, glabrous. Flowers crowded at the end of leafless branches, crimson or yellowish. Capsules woody, minutely apiculate, reddish-brown, 5-valved.

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

Common in the deciduous and scrub forests.

Selected specimens : Ganganagar: Lakhwali, Roy 5973 (BSJO); Jaisalmer: Barabagh, Shetty 4111 (BSJO); Jhalawar: Sharma 646, 647 (RUBL); Pali: Ghanerao R.F., Shetty 1592 (BSJO); Udaipur: Near Pali, Kaul & Party 8495 (LWG).

25. STERCULIACEAE

(R.P. Pandey)

1a. Flowers unisexual or polygamous. Petals absent:

2a. Inflorescence covered with orange-red tomentum. FollICLES membranous, dehiscing before ripening.

2. *Firmiana*

2b. Inflorescence not covered with orange-red tomentum. FollICLES woody, dehiscing when ripe.

8. *Sterculia*

1b. Flowers bisexual. Petals present:

- 3a. Herbs or undershrubs. Anthers 5:
- 4a. Petals clawed. Style solitary, unbranched. Capsules 2-valved; cells 1-seeded. 9. *Waltheria*
- 4b. Petals not clawed. Styles 5 or 5-fid. Capsules 5-valved; cells mostly one to many-seeded:
- 5a. Glabrous herbs. Flowers pink or white. Calyx-tube truncate, with 5 small teeth. 6. *Melochia*
- 5b. Tomentose undershrubs. Flowers orange-yellow. Calyx-tube deeply 5-partite. 5. *Melbania*
- 3b. Shrubs or trees. Anthers more than 5:
- 6a. Flowers white. 7. *Pterospermum*
- 6b. Flowers yellow, pink or red:
- 7a. Staminodes present. Seeds not winged:
- 8a. Ovary raised on a gynophore. Follicles spirally twisted. 4. *Helicteres*
- 8b. Ovary not raised on a gynophore. Capsules not spirally twisted. 3. *Guazuma*
- 7b. Staminodes absent. Seeds winged. 1. *Eriolaena*

1. ERIOLAENA DC.

Involucral bracts multisect. Peduncles many-flowered. Sepals linear-lanceolate. Styles pubescent throughout. Stigma 8 to 10-lobed. Capsules tuberculate.

1. *E. hookeriana*

Involucral bracts entire or toothed. Peduncles 1 to 3-flowered. Sepals linear-oblong. Styles hairy at the lower portion only. Stigma 5-lobed. Capsules not tuberculate.

2. *E. quinquelocularis*

1. *Eriolaena hookeriana* Wight & Arn. Prodr. 1: 70. 1834; Mast. in Hook.f. Fl. Brit. India 1: 370. 1874; Duthie, Fl. Gangetic Plain 1: 104. 1903. "Buti" (Hindi).

Shrubs or small trees; young shoots stellately hairy. Leaves 3.5-15.0 cm in diam., ovate-cordate, crenate-dentate, acuminate. Flowers axillary, yellow. Involucral bracts 3-5. Calyx spathaceous in bud. Capsules hard, woody, ovate, 10-valved, with wrinkled epicarp, densely pubescent.

Fl & Fr. : March - May.

Common in forests, particularly on the outliers of Aravalli.

Selected specimens : Banswara: Kotharia forest, Singh 3763 (BSJO); Kota: Dam side road, Wadhwa 9433 (BSA); Udaipur: Sisa forest, Kanodia 82193 (BSI).

2. *Eriolaena quinquelocularis* Wight, Ic. 3(2): 7, t. 882, 1844-45; Mast. in Hook.f. Fl. Brit. India 1: 371, 1874; Cooke, Fl. Bombay 1: 132, 1901.

Small trees; young parts stellately hairy. Leaves c. 10×15 cm, orbicular, cordate, coarsely crenate-serrate, acuminate. Involucral bracts a little distant from the flowers, caducous. Capsules 2.0-3.5 cm long, woody, pointed, 5-celled, 5 to 10-valved, usually silky-villous at the inner angles. Seeds many, falcately curved, wings papery.

Fl. & Fr. : July - October.

Rare, in the forests, particularly on the hills.

Selected specimen : Udaipur: Dabok, Kanodia 223 (BSI).

2. FIRMIANA MARSLI

Firmiana colorata (Roxb.) R. Br. in Bennet & Brown, Pl. Jav. Rar. 235, 1844; Kostermans in Reinwardtia 5: 386, 1961. *Sterculia colorata* Roxb. Pl. Cor. 1: 26, t. 25, 1795; Mast. in Hook.f. Fl. Brit. India 1: 359, 1874; Duthie, Fl. Gangetic Plain 1: 101, 1903.

Trees, up to 15 m high. Leaves $15-20 \times 15-20$ cm, crowded at the end of branches, roundish or reniform, cordate, 3 to 5-lobed; lobes triangular, acuminate, entire. Flowers in panicles, red. Calyx 1-2 cm long; lobes triangular, acute, stellately tomentose outside and bearded inside. Anthers many, yellow. Styles 5. Follicles 2.5-4.0 cm long, deep-orange. Seeds usually 2, ovoid, smooth, pale pinkish.

Fl. : February - May; *Fr.* : March - June.

Common, in dry deciduous forests, particularly on Aravalli.

Selected specimens : Sirohi: Mt. Abu, Kaul 9517 (LWG); Udaipur: Deogarh, Verma 297 (BSA).

3. GUAZUMA MILL.

Guazuma ulmifolia Lam. Encycl. 3: 52, 1789; Robyns in Ann. Miss. Bot. Gard. 51: 103, t. 7, 1964. *Theobroma guazuma* L. Sp. Pl. 782, 1753. *Guazuma tomentosa* Kunth in H.B. & K. Nov. Gen. Sp. Pl. 5: 320, 1823; Mast. in Hook.f. Fl. Brit. India 1: 375, 1874.

Deciduous trees, 4-8 m high; bark brown. Leaves $7-15 \times 3.5-6.5$ cm, ovate-oblong, serrate, hairy. Flowers in axillary, pedunculate cymes, pinkish. Petals with 2-fid, liguliform appendages at the apex. Capsules up to 1.5 cm long, oblong, woody, tuberculate or bearing filiform appendages.

Fl. & Fr. : October - February.

Probably a native of West Indies; occasionally seen in scrub vegetation at the foot of hills.

Selected specimens : Ajmer: *Kaul & Party* 8474 (LWG); Jaipur: Maharaja college, *Sharma* 1620 (RUBL); Jhalawat: *Sharma* 684, 706 (RUBL), *Singh* 83725 (LWG). Also reported from Piloni (Majumdar, 1969).

4. HELICTERES L.

Helicteres isora L. Sp. Pl. 963. 1753; Wight, Ic. 1: t. 180. 1839; Mast. in Hook.f. Fl. Brit. India 1: 365. 1874; Duthie, Fl. Gangetic Plain 1: 102. 1903. "*Maror phali*" (Hindi).

Shrubs or small trees. Leaves 6-18 × 4-15 cm, bifarious, broadly ovate to orbicular, crenate-serrate. Flowers solitary or in few-flowered axillary cymes, red. Corolla 2-lipped, glandular within, clawed. Anther-cells divaricate. Capsules 5-7 cm long, woody, beaked. Seeds angular, wrinkled.

Fl. & Fr. : August - November.

Common in the forests, particularly on hill slopes.

Selected specimens : Ajmer: Todgarh, *Lourie* 4539 (DD); Banswara: Puna Pathar forest, *Singh* 2935 (BSJO); Bharatpur: Bund Baratha, *Bharadwaj* 6567 (LWG); Chittorgarh: Bansi, *Verma* 1741 (BSA); Kota: *Wadhwa* 9427 (BSA); Sirohi: Mt. Abu, *McCann* 4312, 233 (BLAT), *Blatter* 6339 (BLAT).

5. MELHANIA FORSSK.

- 1a. Involucral bracts reniform, enlarged in the fruits. Seeds smooth. 1. *M. denhamii*
- 1b. Involucral bracts ovate, not enlarged in the fruits. Seeds tuberculate:
- 2a. Peduncles mostly axillary. Bracts longer than the sepals:
- 3a. Bracts with recurved margins. 4. *M. hamiltoniana*
- 3b. Bracts without recurved margins. 5. *M. magnifolia*
- 2b. Peduncles terminal. Bracts equal or shorter than the sepals:
- 4a. Leaves more than 8 × 6 cm; petioles more than 4 cm long. Stipules more than 5 mm long. 3. *M. futteyporensis* var. *major*
- 4b. Leaves less than 5 × 3 cm; petioles less than 2 cm long. Stipules less than 3 mm long. 2. *M. futteyporensis* var. *futteyporensis*

1. **Melhania denhamii** R. Br. in Denham & Clapp. Trav. App. 232. 1826; Mast. in Hook.f. Fl. Brit. India 1: 373. 1874.

Suffruticose, stellately tomentose herbs. Leaves 2.0-5.5 × 1.0-3.0 cm, ovate-oblong or elliptic, crenate-serrate, 5-nerved. Peduncles axillary, with orange-yellow flowers. Involucral bracts 3, upto 1.5-1.75 cm broad, membranous, accrescent. Capsules subglobose, densely stellately villous. Seeds 1-2 in each cell, angled.

Fl. & Fr. : September - November.

Mostly found on sand dunes of Rajasthan desert.

Selected specimens : Barmer: Gadra road, Jain 40290 (BSI); Dhorimanna, Shetty 2323, 2309 (BSJO); Jaisalmer: Lobarki, Blatter 7287, 7290, 7292 (BLAT); Jodhpur: Shergarh, Singh 4336 (BSJO).

2. **Melhania futteyporensis** Munro ex Mast. in Hook.f. Fl. Brit. India 1: 373. 1874; Duthie, Fl. Gangetic Plain 1: 106. 1903. *M. tomentosa* Stocks ex Mast. in Hook.f. Lc. 1: 373. 1874.

var. *futteyporensis*

Coarsely pubescent shrubs, upto 1 m tall. Leaves c. 5.5 × 3.0 cm, oblong, cordate, crenate-serrate, acute or acuminate. Flowers in terminal, few-flowered cymes, yellow or pale orange. Involucral bracts 3, oblong-lanceolate. Capsules oblong or subglobose, villous, shorter than the sepals. Seeds angled, muriculate.

Fl. & Fr. : August - October.

Common in wastelands, forests and on the hill-slopes.

Selected specimens : Ajmer: Nand, Jain 49692 (BSI); Banswara: Loharia forest, Singh 3014 (BSJO); Barmer: Meva nagar R.F., Shetty 2256 (BSJO); Bhilwara: Parvatipur, Singh 6593 (BSJO); Sirohi: Mt. Abu, Blatter 17923, 17925 (BLAT); Kota: Singh 74717 (LWG); Tonk: Toda Rai Singh R.F., Pandey 4839 (BSJO).

3. var. *major* (Blatt. & Hallb.) Santapau in Journ. Bomb. Nat. Hist. Soc. 56: 278. 1959. *M. tomentosa* Stocks ex Mast. var. *major* Blatt. & Hallb. in Journ. Bomb. Nat. Hist. Soc. 26: 228. 1918 (Sphalm. 'major').

Cinereo-tomentose, branched herbs. Leaves, petioles and stipules much longer than in var. *futteyporensis*.

Fl. & Fr. : October - November.

Occasional, found on sand-dunes and hills in rocky habitats.

Selected specimens : Barmer: Blatter 7286, 7296 (BLAT); Chittorgarh: Rawat Bhata dam, Verma 1833 (BSA); Jodhpur: Bhandari 723 (JAC); Kota: Kishanganj, Verma 717 (BSA).

4. *Melhania hamiltoniana* Wall. Pl. Asiat. Rar. 1: 69. t. 77. 1830; Mast. in Hook.f. Fl. Brit. India 1: 372. 1874; Duthie, Fl. Gangetic Plain 1: 106. 1903.

Shrubs, with cano-tomentose, spreading branches. Leaves 3.5-7.0 cm long, ovate to ovate-lanceolate, acute to acuminate, serrate. Flowers yellow. Corolla longer than the sepals. Capsules ovoid, shorter than the calyx, villous. Seeds many, oblong.

Fl & Fr. : August - September.

Found in forests, particularly on hill-slopes.

Selected specimens : Ajmer: Todgarh, *Lourie* 4532 (DD); Barmer: Tandon Acc. No. 118967 (DD); Jaipur: Ramgarh, *Sharma* 1340 (RUBL).

5. *Melhania magnifolia* Blatt. & Hallb. in Journ. Bomb. Nat. Hist. Soc. 26: 288. 1918.

Suffruticose, stellately tomentose undershrubs. Leaves 6.5-12.0 × 3.5-5.0 cm, ovate-oblong, cordate or rounded at base, obtuse or rarely acute, crenate-dentate. Flowers on 4-5 cm long peduncles, orange-yellow. Capsules c. 1.5 cm in diam., subglobose, densely tomentose, with persistent calyx. Seeds angular, brown.

Fl & Fr. : August - December.

Occasional, found in rocky habitats.

Selected specimens : Jodhpur: *Bhandari* 219, 1639 (JAC), *Blatter* 7280 (BLAT); Jhalawar: Ameth, *Wadhwa* 7647 (BSA); Kota: *Wadhwa* 1964 (BSA).

6. MELOCHIA L.

Melochia eureborifolia L. Sp. Pl. 675. 1753; Mast. in Hook.f. Fl. Brit. India 1: 374. 1874; Duthie, Fl. Gangetic Plain 1: 107. 1903; Robyns in Ann. Miss. Bot. Gard. 51: 83. 1964; Mahesh. Illus. Fl. Delhi f. 30. 1966.

Annual herbs, 30-70 cm high. Leaves 2.0-8.5 × 1.5-5.5 cm, ovate-oblong, serrate. Flowers densely crowded in terminal and axillary clusters. Involucral bracts lanceolate-subulate. Calyx-lobes triangular, acute, ciliate. Capsules c. 0.5 cm in diam., globose, hispid, 5-celled. Seeds many, angular, smooth, mottled.

Fl & Fr. : August - October.

Common in open wet habitats and as an undergrowth in the forests.

Selected specimens : Banswara: Shergarh forest, *Singh* 3177 (BSJO); Bhilwara: Parvatipur, *Singh* 6572 (BSJO); Bharatpur: *Bharadwaj* 6568,

8619 (LWG); Dungarpur: Ratanpur, *Kanodia* 82096 (BSI); Jhalawar: *Sharma* 97, 191 (RUBL).

7. PTEROSPERMUM SCHREB. *nom. cons.*

Pterospermum acerifolium Willd. Sp. Pl. 3: 729. 1801; Mast. in Hook.f. Fl. Brit. India 1: 368. 1874; Duthie, Fl. Gangetic Plain 1: 103. 1903.

Trees, upto 15 m high, with ashy-grey bark; younger parts clothed with floccose pubescence. Leaves 20-30 cm in diam., bifarious, orbicular, peltate, sinuately lobed, glabrous above, grey-tomentose beneath. Flowers fascicled, 1-3 together, 7.0-14.5 cm long, pedunculate. Calyx brown outside. Petals thin, glabrous inside, stellately hairy outside. Capsules 10-15 cm long, 5-angled, oblong, woody, tomentose, brown. Seeds obliquely ovoid, compressed.

Fl & Fr. : March - August.

Rare, in the forests. Occasionally planted in the gardens for their showy and fragrant flowers.

Selected specimens : Jhalawar: *Verma* 3500 (BSA); Kota: *Sharma* Acc. No. 12900 (RUBL).

8. STERCVLIA L.

- | | |
|---|----------------------|
| 1a. Leaves simple, entire. | 2. <i>S. guttata</i> |
| 1b. Leaves digitate or palmately lobed: | |
| 2a. Leaves palmately lobed. Follicles downy or with stinging hairs: | |
| 3a. Panicles erect. Follicles with sharp stinging hairs. | 3. <i>S. urens</i> |
| 3b. Panicles drooping. Follicles without stinging hairs. | 4. <i>S. villosa</i> |
| 2b. Leaves digitate. Follicles nearly glabrous. | 1. <i>S. foetida</i> |

1. *Sterculia foetida* L. Sp. Pl. 1008. 1753; Wight, Ic. 1: t. 181. 1839; Mast. in Hook.f. Fl. Brit. India 1: 354. 1874.

Tall trees; bark whitish, flaking off. Leaves crowded at the end of the branches; leaflets subsessile, 5-9, 10-15 × 3.5-5.0 cm, oblong-lanceolate, acute or acuminate. Flowers in erect racemose panicles. Follicles 1-3 (-5), 10.0-12.5 cm long, boat-shaped, beaked, woody, bright red. Seeds many, c. 2.0 cm long, ovoid-oblong, the back at the base having a small, yellow caruncle.

Fl. : March - June; *Fr.* : July - September.

Rare, in the forests; perhaps planted.

Selected specimen : Ajmer: Jain 49701 (BSI).

2. *Sterculia guttata* Roxb. ex DC. Prodr. 1: 482. 1824; Wight, Ic. 2(2): 6. t.487. 1841; Mast. in Hook.f. Fl. Brit. India 1: 355. 1874.

Tall trees; bark cracked; young shoots clothed with stellate hairs. Leaves 12-20 × 7.5-10.5 cm, ovate-oblong, acute or acuminate, rounded or subcordate. Stipules ensiform. Flowers in fascicles of threes, yellow with purple spots. Follicles 1-5, c. 7.5 cm long, obovoid, deep orange-coloured. Seeds oblong.

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

Rare, found on the Aravalli and its outliers.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 6387 (BLAT); Jamad forest near Nandore, *Kanodia* 88393 (BSI).

3. *Sterculia urens* Roxb. Pl. Cor. 1: 25. t. 24. 1795; Mast. in Hook.f. Fl. Brit. India 1: 355. 1874; Duthie, Fl. Gangetic Plain 1: 100. 1903.

Soft woody trees, with slippery, papery bark. Leaves crowded at the end of branches, 20-30 cm in diam., tomentose beneath; lobes 5, base cordate, caudate-acuminate at apex. Flowers yellow to olive-yellow. Follicles 4-6, c. 2.5 cm long, oblong to ovoid-oblong, woody, pubescent. Seeds 3-6, oblong, black or dark brown.

Fl. & Fr. : December - April.

Common at the top of the hills in mixed dry deciduous forests.

Selected specimens : Ajmer: Todgarh, *Lourie* 4538 (DD); Banswara: Loharia forest, *Singh* 4245 (BSJO); Kota: Jain 28724 (BSI); Pali: Paras Ram Mahadev R.F., *Pandey* 4178 (BSJO); Sirohi: Mt. Abu, *Blatter* 6355 (BLAT); Sawaimadhopur: *Parker* 6155 (DD).

4. *Sterculia villosa* Roxb. ex DC. Prodr. 1: 483. 1824; Mast. in Hook.f. Fl. Brit. India 1: 355. 1874; Duthie, Fl. Gangetic Plain 1: 100. 1903.

Medium-sized trees; bark pale grey or brown; younger branches downy-tomentose. Leaves 25-40 cm in diam., lobes acuminate, base cordate. Flowers yellow with pink tinge. Follicles c. 5, 3-6 cm long, oblong, spreading, rusty-villous. Seeds oblong, smooth, black.

Fl. & Fr. : December - April.

Found in dry deciduous forests at high elevations.

Selected specimens : Dungarpur: *JAV* 29346 (BSI); Kota: Jain 28903

(BSI); Sawaimadhopur: Jain 18697, 18841 (BSI); Udaipur: Cheeka ghat, Gamawat 168 (LWG).

9. WALTHERIA L.

Waltheria indica L. Sp. Pl. 673. 1753, *excl. syn.* Hort. Cliff., *pro parte, quoad descrip. et spec.*; Mast. in Hook. f. Fl. Brit. India 1: 374. 1874; Duthie, Fl. Gangetic Plain 1: 107. 1903; Robyns in Ann. Miss. Bot. Gard. 51: 74. 1964. *W. americana* L. Sp. Pl. 673. 1753. *W. angustifolia* L. Syst. Nat. ed. 10. 1140. 1759.

Woody herbs or undershrubs, clothed with white tomentum. Leaves 2-10 × 1-8 cm, ovate-lanceolate or oblong-elliptic, crenate-serrate. Flowers sessile, in axillary and terminal clusters, yellow. Calyx 5-lobed, campanulate, 10-ribbed. Capsules, obovoid, pilose at the top. Seeds ovate, glabrous, black.

Fl. & Fr. : August - November.

Common in wastelands, dry thickets and open forests.

Selected specimens : Banswara: Lasara village, Singh 3618 (BSJO); Bhilwara: Meja dam, Singh 6598 (BSJO); Barmer: Haldeshawar, Tiwari 1177 (BSJO); Jhalawar: Lotiajil, Wadhwa 5466 (BSA); Sirohi: Mt. Abu, Blatter 6330, 6326 (BLAT); Sawaimadhopur: Bayana, Ghosh 46056 (LWG).

CULTIVATED SPECIES

Dombeya acutangula Cav. Shrubs or trees, 2-3 m high. Leaves 8-15 × 7-11 cm, broadly ovate-cordate, often 3-angled, crenate-dentate, tomentose. Flowers in axillary and terminal, pendulous cymes. Native of Mauritius; commonly cultivated in the gardens for ornamental purposes.

26. TILIACEAE

(V. Singh)

- | | |
|---|---------------------|
| 1a. Fruits spiny or bristly. | 3. <i>Trumfetta</i> |
| 1b. Fruits neither spiny nor bristly: | |
| 2a. Petals glandular at the base. Fruit a drupe, indehiscent. | 2. <i>Grewia</i> |
| 2b. Petals eglandular. Fruit a capsule, dehiscent. | 1. <i>Corchorus</i> |

1. CORCHORUS L.

- | | |
|--------------------------------------|-------------------------|
| 1a. Capsules globose; beak absent. | 2. <i>C. capsularis</i> |
| 1b. Capsules elongate; beak present: | |

- 2a. Beak ending in three, 2-fid points:
- 3a. Capsules 6-angled, three of the angles winged. Stamens 15 or more. 1. *C. aestuans*
- 3b. Capsules cylindric, neither angled nor winged. Stamens 10. 6. *C. tridens*
- 2b. Beak straight, entire:
- 4a. Capsules 5-valved, 10-ribbed. 5. *C. olivarius*
- 4b. Capsules 3 to 4-valved, cylindric or 3 to 4-angled, not ribbed:
- 5a. Capsules more than 3 cm long, aculeate. 7. *C. irilocularis*
- 5b. Capsules maximum upto 3 cm long, glabrous or hairy, not aculeate:
- 6a. Petiole longer or equal to the blade. Capsules glabrous. 3. *C. depressus*
- 6b. Petiole shorter to the blade. Capsules hairy:
- 7a. Capsules solitary. 8. *C. urticifolius*
- 7b. Capsules in fascicles. 4. *C. fascicularis*

1. *Corchorus aestuans* L. Syst. Nat. ed. 10. 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. India 1: 398. 1874; Duthie, Fl. Gangetic Plain 1: 121. 1903. "Hade-ka-khat" (Hindi).

Glabrous, annual herbs, 40-75 cm high. Leaves 3-9 × 1.5-5.0 cm, ovate or ovate-lanceolate, serrate, the lower serratures produced into filiform appendages. Flowers 2-3 together in leaf-opposed fascicles, yellow. Stamens 8-10. Capsules 2.0-3.5 cm long, cylindric, 3-celled, 6-angled, 3 angles broadly winged. Seeds truncate, dark-brown.

Fl & Fr. : August - October.

Common weed in wastelands and cultivated fields.

Selected specimens: Banswara: Lasara, Singh 3625 (BSJO); Jaisalmer: Amar Sagar, Wadhwa 5181 (BSA); Kota: Shahabad, Majumdar 13217 (RSA); Pali: Rundiya, Shetty 1854 (BSJO); Tonk: Banas river, Shetty 1234 (BSJO).

2. *Corchorus capsularis* L. Sp. Pl. 529. 1753; Mast. in Hook.f. Fl. Brit. India 1: 397. 1874; Duthie, Fl. Gangetic Plain 1: 119. 1903.

Erect, glabrous, annual herbs, upto 1 m high. Leaves 6-10 × 2.0-3.5 cm, ovate-lanceolate, serrate, basal serratures produced into filiform

appendages. Flowers in axillary, short peduncled cymes, yellow. Capsules muricate, 5-valved. Seeds wedge-shaped, smooth, brown.

Fl & Fr. : August - October.

Common in marshy or wet habitats, particularly in low lying areas and rice-fields in E. Rajasthan.

Selected specimens : Bhilwara: Bijolia, Singh 6074 (BSJO); Bundi: Hindoli, Verma 1876 (BSA); Kota: Majumdar 13274 (BSA); Sawaimadhopur: Sharma 3105 (RUBL).

3. *Corchorus depressus* (L.) Stocks in Proc. Linn. Soc. 1: 367. 1. 18; 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. India 1: 398. 1874; Duthie, Fl. Gangetic Plain 1: 121. 1903. "Chamkash, Baphuli" (Hindi).

Prostrate, much branched, woody perennials. Leaves up to 25 × 12 mm, elliptic or obovate-elliptic to roundish, crenate-serrate, plicate in bud. Flowers in leaf-opposed cymes, yellow. Capsules 7-17 × 1.5-2.0 mm, oblong-cylindric; beak short, straight or curved. Seeds 3-gonous, smooth, greyish-brown.

Fl & Fr. : August - March.

Common in open gravelly places, abundant particularly in desert zone.

Selected specimens : Barmer: Sheo Grassland, Tiwari 922 (BSJO); Jaisalmer: Kuri Kotari, Wadhwa 5259 (BSA); Kota: Shahabad, Majumdar 13170 (BSA); Sawaimadhopur: Parker 6113 (DD); Tonk: Shohela forest, Shetty 1077 (BSJO).

4. *Corchorus fascicularis* Lam. Encycl. 2: 104. 1786; Mast. in Hook.f. Fl. Brit. India 1: 398. 1874; Duthie, Fl. Gangetic Plain 1: 121. 1903. "Chonchi" (Hindi).

Woody, annual herbs, 50-60 cm high. Leaves upto 5.0 × 1.5 cm, elliptic-oblong or lanceolate, serrate, lower serratures usually not produced into filiform appendages. Flowers in leaf-opposed, 2 to 5-flowered cymes or fascicles, yellow. Capsules 0.8-1.5 × 0.2 cm, pubescent; valves slightly septate between the seeds. Seeds wedge-shaped, smooth, dark brown.

Fl & Fr. : September - November.

Rare, in sandy soils.

Selected specimens : Banswara: Jua fall, Singh 3733 (BSJO); Jaisalmer: Mool Sagar, Wadhwa 5245 (BSA); Jhalawar: Khanpur, Verma 6924 (BSA); Tonk: Siras forest, Shetty 1021 (BSJO); Udaipur: Bhatewar, Majumdar 12486 (BSA).

5. *Corchorus olitorius* L. Sp. Pl. 529. 1753; Mast. in Hook.f. Fl. Brit. India 1: 397. 1874; Duthie, Fl. Gangetic Plain 1: 120. 1903; Mahesh. Illus. Fl. Delhi f. 33. 1966. "*Chamghas, Rajaan*" (Hindi).

Annual herbs. Leaves 5-10 × 3-5 cm, ovate-lanceolate, serrate, lower serratures produced into filiform appendages. Flowers leaf-opposed, solitary or 2 to 3-together on short peduncle and small pedicels, yellow. Stamens many. Stigma papillose. Capsules 3-7 cm long, cylindric, 10-ribbed; valves transversely septate between the seeds. Seeds 3-gonous, black.

Fl. & Fr. : August - October.

Common weed in wastelands and cultivated fields.

Selected specimens : Hanswara: Lasara, Singh 3627 (BSJO); Barmer: Balotra, Shetty 2205 (BSJO); Bharatpur: Banda Baratha, Bharadwaja 12613 (LWG); Ganganagar: Suratgarh, Roy 5057 (BSJO); Kota: Shahabad, Wadhwa 9263 (BSA); Tonk: Naya Gaon, Shetty 1235 (BSJO).

6. *Corchorus tridens* L. Mant. App. 566. 1771; Mast. in Hook.f. Fl. Brit. India 1: 398. 1874; Duthie, Fl. Gangetic Plain 1: 121. 1903; Mahesh. Illus. Fl. Delhi f. 36. 1966.

Erect or suberect, annual herbs, with terete or angular branches. Leaves 7-12 × 2.0-3.5 cm, ovate-lanceolate, serrate, basal serratures produced into filiform appendages. Flowers in leaf-opposed, 1 to 4-flowered corymbose, more or less sessile cymes, yellow. Calyx-lobes apiculate. Capsules 2-3 × 0.2 cm, 3-valved; valves without partitions. Seeds truncate at both ends.

Fl. & Fr. : August - December.

Occasional, found in fields and sandy river-beds in the E. Rajasthan and on sand-dunes in the west.

Selected specimens : Barmer: Sheo, Tiwari 892 (BSJO); Bharatpur: Bandh Baratha, Bharadwaja 8521 (LWG); Jaipur: Ramgarh, Sharma 1045 (RUBL); Jaisalmer: Shergarh, Wadhwa 5176 A (BSA); Kota: Shahabad, Verma 666 (BSA).

7. *Corchorus trilocularis* L. Mant. 77. 1767; Mast. in Hook.f. Fl. Brit. India 1: 397. 1874; Duthie, Fl. Gangetic Plain 1: 120. 1903; Mahesh. Illus. Fl. Delhi f. 34. 1966. "*Kagli Tambakhu, Karak*" (Hindi).

Erect, annual herbs. Leaves 3-10 × 1.5-4.0 cm, elliptic-oblong, serrate, with basal serratures produced into filiform appendages. Flowers 1 to 3-together in leaf-opposed cymose fascicles, yellow. Stamens 15-20. Capsules upto 8 cm long, 3 to 4-angled, acute or shortly beaked, scabrous or aculeate; valves with transverse partitions. Seeds 3-gonous, black.

Fl. & Fr. : July - November.

Frequent weed in cultivated fields and wastelands.

Selected specimens : Banswara: Lasara, *Singh* 3615 (BSJO); Jaipur: Daosa, *Wadhwa* 8171 (BSA); Jaisalmer: Ramgarh, *Wadhwa* 5106 (BSA); Kota: Shahabad, *Majumdar* 13183 (BSA); Pali: Bijapur, *Shetty* 1949 (BSJO).

8. *Corchorus urticifolius* Wight & Arn. Prodr. 73. 1834; Mast. in Hook.f. Fl. Brit. India 1: 397. 1874; Gamble, Fl. Madras 122. 1915.

Annual herbs. Leaves 4-8 × 1.5-5.0 cm, suborbicular, crenate-serrate, subcordate at the base, acute at the tip. Peduncles extra-axillary, 2 to 3-flowered. Sepals lanceolate. Petals obovate. Stamens 15. Capsules terete or 3-angled, pubescent or hairy, bent down wards; valves with transverse partitions.

Fl. & Fr. : October - December.

Rare; reported from Pilani (Jhunjhunu district) by Majumdar (1969). Very close to *C. trilocularis* L.

2. GREWIA L.

1a. Peduncles leaf-opposed:

2a. Trees. Flowers in umbellate, 3 to many-flowered cymes, dull-yellow.

7. *G. oppositifolia*

2b. Shrubs. Flowers solitary or paired, pure white.

13. *G. tenax*

1b. Peduncles axillary or extra-axillary:

3a. Leaves 3-nerved at the base:

4a. Drupes when dry with a distinct crustaceous rind:

5a. Leaves ovate-oblong. Pedicels as long as peduncles. Petals 2-fid at the apex. Drupes upto 10 mm in diameter.

5. *G. flavescens*

5b. Leaves suborbicular. Pedicels much shorter than peduncles. Petals entire. Drupes more than 10 mm in diameter.

11. *G. sclerophylla*

4b. Drupes fleshy, wrinkled when dry, with no distinct rind:

6a. Plants polygamous, monoecious or dioecious:

7a. Stamens upto 20

9. *G. polygama*

7b. Stamens more than 40.

6. *G. hirsuta*

6b. Plants with bisexual flowers only:

- 8a. Petals 2-fid. 2. *G. damine*
- 8b. Petals entire:
- 9a. Nuts solitary. 7. *G. oppositifolia*
- 9b. Nuts 2-4:
- 10a. Peduncles shorter than petioles. 1. *G. abutilifolia*
- 10b. Peduncles longer than petioles
- 11a. Nuts 1-celled. 3. *G. disperma*
- 11b. Nuts 2 to 4-celled:
- 12a. Leaves glabrescent on both sides. Glands less than half the length of petals. 10. *G. orientalis*
- 12b. Leaves densely tomentose beneath. Glands half as long as the petals. 6. *G. hirsuta*
- 1b. Leaves 4 to 7-nerved at the base:
- 13a. Drupes, when dry, with a distinct rind:
- 14a. Petals dull-yellow. Torus very short, glabrous. Drupes pilose. 15. *G. villosa*
- 14b. Petals white. Torus well developed, hairy. Drupes stellate hairy. 11. *G. sclerophylla*
- 13b. Drupes fleshy, wrinkled when dry, with no distinct rind:
- 15a. Peduncles equal or shorter than petioles:
- 16a. Stipules falcate, auricled at the base, with rounded lobes on lower side. Glands one-third the length of petals. 14. *G. tiliifolia*
- 16b. Stipules lanceolate, not auricled at the base. Glands half the length of petals. 1. *G. abutilifolia*
- 15b. Peduncles longer than petioles:
- 17a. Nuts 1-celled:
- 18a. Petals half the length of sepals and with basal glands. 12. *G. subinaequalis*
- 18b. Petals less than half the length of sepals and without basal glands. 4. *G. elastica*
- 17b. Nuts 2-celled:
- 19a. Glands half the length of petals. Nuts 4. 6. *G. hirsuta*
- 19b. Glands very small or absent. Nuts 1-2. 8. *G. orbiculata*

1. **Grewia abutilifolia** Vent. ex Juss. in Ann. Mus. Paris 4: 92. 1804; Mast. in Hook.f. Fl. Brit. India 1: 390. 1874; Duthie, Fl. Gangetic Plain 1: 115. 1903. "*Gangeti*" (Hindi).

Stellate hairy shrubs, 1.5-3.5 m high. Leaves 2.5-16.0 × 1.3-13.5 cm, ovate or ovate-elliptic to nearly orbicular, shallowly lobed, scabrous above, stellate hairy beneath. Flowers 8-10 mm in diam., in axillary, umbellate cymes, yellow. Petals one-fourth the length of sepals. Drupes 1.0-1.5 cm in diam., faintly 4-lobed, fleshy, rugose, minutely stellate hairy. Nuts 4. 1 to 2-celled.

Fl. & Fr. : March - December.

Occasional in the forests. Very similar to *G. sclerophylla* Roxb.; the latter, however, bears dry fruits.

Selected specimens : Alwar: Bala fort forest, Lat 34433 (LWG); Bundi: Kota-Dam, Singh 74656 (LWG); Jaisalmer: Ramgarh, Jain 49628 (BSI); Sirohi: Mt. Abu, Rao 66644 (BSI)

2 **Grewia damine** Gaertn. Fruct. 2: 113. t. 106. 1790. *G. salvifolia* Heyne ex Roth, Nov. Pl. Sp. 239. 1821; Mast. in Hook.f. Fl. Brit. India 1: 386. 1874; Duthie, Fl. Gangetic Plain 1: 116. 1903.

Shrubs, 1-3 m high; young parts tomentose. Leaves 4-7 × 1.0-2.5 cm, ovate-oblong or ovate-lanceolate, serrulate, hoary-tomentose beneath. Flowers in few-flowered, axillary, umbellate cymes, yellow. Petal-glands hairy, one-third the length of petals. Drupes 4-6 mm in diam., globose, 2 to 4-lobed, reddish-yellow when ripe.

Fl. & Fr. : January - October.

Rare, in wastelands and open forests.

Selected specimens : Ajmer: Todgarh, Lourie 4545 (DD); Jaipur: Ramgarh, Sharma 778 (RUBL); Jodhpur: Bijoli, Jain 40205 (BSI); Kota: Jain 28864 (BSI); Sirohi: Mt. Abu, Soni Acc. no. 12 (RUBL).

3. **Grewia disperma** Rottl. ex Spreng. Syst. 2: 579. 1825. *G. laevigata* auct. non Vahl 1790; Mast. in Hook.f. Fl. Brit. India 1: 389. 1874; Duthie, Fl. Gangetic Plain 1: 116. 1903.

Large shrubs or small trees; branches stellate hairy. Leaves 6.5-16.0 × 1.3-5.5 cm, elliptic-lanceolate, acuminate, serrate, 3-nerved, pilose on the nerves beneath. Flowers in axillary, umbellate cymes, yellow. Petals one-third the length of sepals; glands as long as the petals. Torus ribbed, villous in upper part. Drupes 2-lobed, smooth, black when ripe. Nuts 1-celled.

Fl. & Fr. : June - October (Fruits ripen during cold season).

Very rare: reported from Mt. Abu by Kanodia and Deshpande (1961).

4. *Grewia elastica* Royle, Ill. Bot. Himal. 1: 104. t. 22. 1839; Duthie, Fl. Gangetic Plain 1: 113. 1903. *G. asiatica* L. var. *vestita* Wall. ex Mast. in Hook.f. Fl. Brit. India 1: 387. 1874.

Small trees: young branches densely hoary or rufous with stellate pubescence. Leaves 5-15 × 2.5-9.0 cm, obliquely ovate, acuminate, crenate-serrate, stellate hairy. Flowers yellow. Peduncles axillary, 2-5 together, 3-flowered. Stamens orange-coloured. Drupes globose, obscurely lobed. Nuts 1-2.

Fl. & Fr.: October–November.

Rare, in wastelands. Reported from Alwar by Vyas (1967).

5. *Grewia flavescens* A. Juss. in Ann. Mus. Nation. Hist. Nat. Paris 4: 91. 1804. *G. pilosa* auct. plur. non Lam. 1789; Mast. in Hook.f. Fl. Brit. India 1: 388. 1874, *pro parte*; Duthie, Fl. Gangetic Plain 1: 112. 1903.

Shrubs or small trees, 2-5 m high, with sarmentose, hairy branches. Leaves 1.5-11.0 × 0.9-4.5 cm, acute, serrate, stellate hairy beneath, glaucous above. Flowers in axillary or extra-axillary, pedunculate, umbellate cymes, yellow. Petals spatulate, one-third the length of sepals. Drupes globose, entire or 2 to 4-lobed, stellate hairy, orange-coloured when ripe. Nuts 1-4, 1 to 3-celled, pitted.

Fl. & Fr.: August–November.

Abundant in the forests on the hill-slopes and in plains in the east of Aravalli.

Selected specimens: Banswara: Puna Pathar forest, Singh 2925 (BSJO); Jaipur: Athuni-ka-kund, Sharma 2126 (RUBL); Kota: Shahabad, Majumdar 10483 (BSA); Tonk: Kachha Bundha, Shetty 1062 (BSJO); Sirohi: Abu Road, McCann 15, 153 (BLAT).

6. *Grewia hirsuta* Vahl, Symb. Bot. 1: 34. 1790; Wight, Ic. 1: t. 76. 1838; Mast. in Hook.f. Fl. Brit. India 1: 391. 1874; Duthie, Fl. Gangetic Plain 1: 117. 1903. "Phrongli" (Hindi).

Large shrubs, upto 4 m high, softly rufous-pubescent. Leaves 4-15 × 1.0-3.5 cm, ovate, acute to acuminate, serrate, glaucous hairy beneath, 3-nerved. Flowers in axillary or extra-axillary cymes, pale to bright yellow or rarely white. Petals half the length of sepals. Drupes 6-10 mm in diam.,

rounded or reniform, entire or slightly 2 to 4-lobed, sparsely hairy. Nuts 4, 2-celled.

Fl. & Fr. : July - November.

Rare, in open forests in the east of Aravalli.

Selected specimens : Ajmer: Todgarh, *Lourie* 91/92 (DD); Akhajitgarh, *Duthie* 4543 (DD).

Notes : According to Cooke (1901-1908) bisexual and male flowers are found on the same plant. The author, however, found all the flowers to be bisexual.

7. *Grewia oppositifolia* Roxb. Fl. Ind. 2: 583. 1832; Wight, Ic. 1: t. 82. 1838; Mast. in Hook.f. Fl. Brit. India 1: 384. 1874; Duthie, Fl. Gangetic Plain 1: 111. 1903.

Medium-sized trees; branches stellate hairy. Leaves bifarious, upto 8 × 5 cm, rhomboid-ovate, acuminate, crenate-serrate, scabrous, 3-nerved. Flowers in axillary or leaf-opposed umbellate cymes, white turning. Peduncles longer than petioles. Petals half the length of sepals. Drupes 1 to 4-lobed, glabrous or thinly pilose, dark purple. Nuts 1-celled, 1-seeded.

Fl. : April - June; *Fr.* : October - December.

Rare, in the forests and wastelands. Reported from Alwar by Vyas (1967) and from Jhunjhunu by Nair (1961).

8. *Grewia orbiculata* Rottl. Ges. Naturf. Freunde Berlin Neue Schriften 4: 205. 1803; Mast. in Hook.f. Fl. Brit. India 1: 386. 1874; Duthie, Fl. Gangetic Plain 1: 115. 1903. *G. rotundifolia* A. Juss. Ann. Mus. Natl. Hist. Soc. 4: 92. t. 50. 1804; Wight, Ic. 1: t. 45. 1838.

Large shrubs or small trees, 4-5 m high. Leaves 2.5-7.0 × 1.5-4.5 cm, suborbicular, cordate-oblique at the base, glaucous-hairy, 5-nerved, nerves arched. Flowers in few flowered axillary cymes. Petals notched, half the length of sepals. Drupes globose, slightly 2-lobed, glaucous-tomentose.

Fl. & Fr. : April - July.

Rare, in the forests on the hill-slopes.

Selected specimens : Chittorgarh: Pratapgarh, *Verma* 271 (BSA); Jaipur: *Parker* 6118 (DD).

9. *Grewia polygama* Roxb. Fl. Ind. 2: 588. 1832; Mast. in Hook.f. Fl. Brit. India 1: 391. 1874; Duthie, Fl. Gangetic Plain 1: 117. 1903.

Large shrubs or small trees, with bifarious, spreading, grey tomentose branches. Leaves sessile, 5-10 × 2-5 cm, oblong-lanceolate, acuminate,

serrate, downy beneath. Flowers polygamous (male and bisexual), in axillary, 2 to 6-flowered, pedunculate cymes, yellow. Petal-glands half as long as petals. Stamens 16-20. Drupes 4-lobed, clothed with few, long, scattered hairs. Nuts 4, 1-seeded.

Fl. & Fr. : July - September

Very rare, in the mixed deciduous forests. Fruits are edible.

Selected specimen : Kota: Shahabad, *Majumdar s.n.* (BSA).

10. *Grewia orientalis* L., Sp. Pl. ed. 2. 964. 1762. *G. columnaris* Sm. in Rees, Cyclop. 17: n. 5. 1811; Wight, Ic. 1: t. 44. 1838; Mast. in Hook.f. Fl. Brit. India 1: 383. 1874; Duthie, Fl. Gangetic Plain 1: 111. 1903.

Large shrubs or small trees, upto 3 m high. Leaves 2.6-5.0 × 1.5-2.5 cm, elliptic-oblong to sub-orbicular, subcordate at base, serrate, stellate hairy. Flowers in 1 to 3-flowered, axillary cymes, yellow. Petals half the length of sepals. Drupes 8-10 mm in diam., subglobose, 2 to 4-lobed, hairy when young.

Fl. & Fr. : September - October.

Rare, in scrub forests. Reported from Udaipur and Alwar by Vyas (1965, 1967).

11. *Grewia sclerophylla* Roxb. ex G. Don, Fl. Nepal. 227. 1825; Wight, Ic. 1: t. 89. 1838. *G. scabrophylla* Roxb. Fl. Ind. 2: 584. 1832; Mast. in Hook.f. Fl. Brit. India 1: 387. 1874; Duthie, Fl. Gangetic Plain 1: 112. 1903. "Dhaman" (Hindi).

Trees, 6-8 m high, clothed with white tomentum. Leaves 6-9 cm broad, suborbicular or broadly ovate, crenate-serrate, secondary nerves not arched. Flowers in axillary, pedunculate, 3-flowered cymes, white. Peduncles as long as petioles. Petals one-third the length of sepals, notched. Drupes subglobose, stellate hairy, with yellow pulp. Nuts 4, 1-celled.

Fl. & Fr. : April - July.

Rare, in the forests; usually planted in the gardens for its edible fruits. Resembles closely *G. subinaequalis* DC. in habit.

Selected specimens : Jhunjhunu: Pilani, *Saran* 41987 (LWG); Kota: *Singh* 74714 (LWG).

12. *Grewia subinaequalis* DC. Prodr. 1: 511. 1824. *G. astatica* auct. non L. 1767; Mast. in Hook.f. Fl. Brit. India 1: 386. 1874, *pro parte*; Duthie, Fl. Gangetic Plain 1: 113. 1903. "Phalsa" (Hindi).

Shrubs or trees, upto 10 m high; bark grey; Leaves 2.5-16.0 × 2-15 cm, broadly ovate to almost orbicular, obliquely cordate at the base, crenate, hairy. Flowers in axillary or extra-axillary cymes, yellow. Drupes 4-8 × 4-11 mm, entire or slightly lobed, rugose, dark purple when ripe. Nuts 1-2.

Fl. & Fr. : November - May.

Common in the forests, on hill-slopes etc., often cultivated in the gardens for its edible fruits.

Selected specimens : Chittorgarh: Pratapgarh, Verma 271 A (BSA), Ganganagar: Roy 4939 (BSJO); Jaipur: Ram Niwas Garden, Sharma 507 (RUBL); Jhalawar: Ghatoli block, Wadhwa 7627 (BSA); Sirohi: Mt. Abu, Kaul 9564 (LWG).

13. *Grewia tenax* (Forssk.) Fiori in Bos. Plant. Legn. Eritr. 246, 1909; Mahesh. Illus. Fl. Delhi f. 31, 1966. *Chadara tenax* Forssk. Fl. Agypt.-Arab. 105, 1775. *G. populifolia* Vahl, Symb. Bot. 1: 33, 1790; Mast. in Hook.f. Fl. Brit. India 1: 385, 1874; Duthie, Fl. Gangetic Plain 1: 111, 1903. "*Gagrain, Gangeti*" (Hindi).

Erect or straggling shrubs, 1-3 m high, with pubescent branches. Leaves 2-5 × 1-4 cm, ovate-cordate or ovate-oblong, crenate, glabrous above, hairy beneath, 3 to 5-nerved. Flowers in pedunculate, umbellate cymes, white. Peduncles longer than petioles. Drupes 1.0-1.5 cm in diam., 2 to 4-lobed, glabrous, orange-coloured when ripe. Stones 1-4, 1 to 2-celled.

Fl. & Fr. : August - October.

Common in the forests, on the hill-slopes, wastelands and on the boundaries of fields and gardens.

Selected specimens : Barmer: Rao 66988 (BSI); Jaipur: URF, Sharma 426 (RUBL); Jodhpur: Kailana, Singh 2 (BSJO); Pali: Jawai River, Shetty 1433 (BSJO); Tonk: Malpura, Shetty 1295 (BSJO).

14. *Grewia tiliifolia* Vahl, Symb. Bot. 1: 35, 1790; Beddome, Fl. Sylv. South Ind. 1: L. 108, 1871; Mast. in Hook.f. Fl. Brit. India 1: 386, 1874; Duthie, Fl. Gangetic Plain 1: 114, 1903. "*Jhujhana, Dhamni*" (Hindi).

Trees, 4-8 m high. Leaves 6-15 × 4-15 cm, broadly ovate to suborbicular, oblique-cordate at base, crenate-serrate, pubescent. Stipules falcate, auricled, deciduous. Flowers in axillary, pedunculate cymes, yellow. Petals obovate-oblong, with a basal gland, half the length of sepals. Drupes globose, entire or 2-lobed, black. Nuts 2 and 3-celled or 1 and 6-celled.

Fl. & Fr. : May - August.

Occasionally found in the deciduous forests, chiefly on the hill-slopes.

Selected specimens : Banswara: Loharia, *Singh* 3011 (BSJO); Kota: Shahabad, *Verma* 794 (BSA); Pali: Ghancrao, *Shety* 1898 (BSJO); Sirohi: Mt. Abu, *McCann* 1881, 1883 (BLAT).

15. ***Grewia villosa*** Willd. in Nov. Act. Nat. Cur. Berol. 205. 1803; Mast. in Hook.f. Fl. Brit. India 1: 388. 1874; Duthie, Fl. Gangetic Plain 1: 112. 1903.

Shrubs; young parts clothed with long, soft hairs. Leaves 2.5-8.0 cm broad, suborbicular, acuminate, obliquely cordate at the base, serrate, villous beneath. Stipules broad, leafy. Flowers in axillary tufts or rarely opposite the leaves, yellow. Peduncles very short. Petals much shorter than sepals, notched. Drupes globose, pilose, copper-coloured. Nuts 4, 1 to 2-seeded.

Fl. & Fr. : June - September.

Occasional, in the forests and wastelands.

Selected specimens : Bhilwara: Hatma, *Singh* 938 (BSJO); Jaipur *Parker* 6116 (DD); Jodhpur: Kailana, *Moorthy* 79 (BSJO); Sirohi: *Jain* 60472 (BSI).

3. TRIUMFETTA L.

1a. Stamens 5-10:

2a. Spines on the capsules completely glabrous:

3a. Capsules pubescent or hairy.

4. *T. rhomboidea*

3b. Capsules glabrous.

1. *T. annua*

2b. Spines on the capsules completely hairy or partly hairy:

4a. Spines on the capsules stellate hairy at the base and glabrous above.

3. *T. pilosa*

4b. Spines on the capsules ciliate at upper end and glabrous below

2. *T. pentandra*

1b. Stamens 15 or more.

5. *T. rotundifolia*

1. ***Triumfetta annua*** L. Mant. Pl. 1: 73. 1767; Mast. in Hook.f. Fl. Brit. India 1: 396. 1874; Raizada, Suppl. Duthie, Fl. Gangetic Plain 34. 1976.

Glabrous, annual herbs, upto 75 cm high. Stem with a line of hairs along one side, shifting at each node. Leaves 10.0-12.5 × 5-10 cm, ovate, acuminate, toothed. Stipules subulate. Flowers on 3-flowered, extra-axillary peduncles, orange. Sepals apiculate, as long as petals. Fruits globose, 4-celled, glaucous; spines hooked.

Fl. & Fr. : September - December.

Rare, in shaded habitats in the forests.

Selected specimen : Sirohi: Mt. Abu, Rao 66674 (BSA).

2. *Triumfetta pentandra* A. Rich. in Guill., Perr. & A. Rich. Fl. Seneg. Tent. 1: 93. t. 19. 1831. *T. neglecta* Wight & Arn. Prodr. 75. 1834; Mast. in Hook.f. Fl. Brit. India 1: 396. 1874; Duthie, Fl. Gangetic Plain 1: 119. 1903. "Mandli" (Hindi).

Stout, annual herbs, upto 80 cm high. Leaves 1.2-8.0 × 0.7-7.0 cm, rounded, 3 to 5-palmate-lobed, serrate, thinly hairy; upper leaves rhomboid. Flowers in extra-axillary cymose clusters combined to form interrupted racemes, yellow. Sepals linear. Fruits pubescent; spines hooked, ciliate on upper edges.

Fl. & Fr. : July - November.

Common in wastelands, open forests and along the roads.

Selected specimens : Bharatpur: Bandh Baratha, Bhardwaja 12612 (LWG); Jaipur: Jhalana, Sharma 193 (RUBL); Kota: Shahabad, Majumdar 13138 (BSA); Sirohi: Mt. Abu, Tatake 46427 (BSI).

3. *Triumfetta pilosa* Roth, Nov. Pl. Sp. 233. 1821; Mast. in Hook.f. Fl. Brit. India 1: 394. 1874; Duthie, Fl. Gangetic Plain 1: 118. 1903. *T. cana* Bl. Bijdr. 1: 116. 1825; Mast. in Hook.f. Lc. 1: 396. 1874. *T. tomentosa* Boj. in Ann. Sc. Nat. ser. 2. 20: 103. 1843; Mast. in Hook.f. Lc. 1: 394. 1874.

Undershrubs, upto 2.5 m high, clothed with soft hairs or bulbous-based bristles. Leaves 6-14 × 4-6 cm, ovate-lanceolate, acute or acuminate, subcordate at the base, hairy with bulbous-based hairs. Flowers in congested, lateral, axillary or leaf-opposed cymes, yellow. Sepals stellate hairy, apiculate. Disc pilose. Fruits 1.5-2.5 cm in diam., 4-celled, 4-seeded; spines hooked.

Fl. & Fr. : September - December.

Rare, in wastelands.

Selected specimen : Sirohi: Mt. Abu-Nakki lake, Mehta 1582 (JAC). Also reported from Jhunjhunu (Nair, 1956), Jodhpur (Sarup, 1951) & Alwar (Vyas 1967).

4. *Triumfetta rhomboidea* Jacq. Select. Strip. Am. 147. t. 90. 1763; Mast. in Hook.f. Fl. Brit. India 1: 395. 1874; Duthie, Fl. Gangetic Plain 1: 118. 1903. *T. bartramia* L. Syst. ed. 10. 1044. 1759, *nom. illegit.* "Lapta" (Hindi).

Erect, hirsute, annual herbs, upto 1 m high. Leaves 2.8-5.0 × 3-4 cm, ovate-rounded to rhomboid; lower ones deeply 3-lobed; upper ones lobed or entire, acuminate, coarsely serrate with 1 or 2, glandular, swollen lowest leaf serratures, stellate hairy. Flowers in terminal and leaf opposed cymes, yellow. Stigma 2-dentate. Capsules c. 5 mm in diam., ovoid, stellate hairy; spines hooked, glabrous.

Occasional, in wastelands, on hill-slopes and along the railway lines.

Selected specimens : Dungarpur: Forest office, *Kanodia* 67279 (BSI); Jaipur: Ramgarh, *Sharma* 784 (RUBL); Sirohi: Mt. Abu, *Raizada* 20692 (DD); Tonk: *Maheshwari* 52990 (LWG).

5. *Triumfetta rotundifolia* Lam. Tab. Encycl. Meth. Bot. 3: 421. 1792; Mast. in Hook.f. Fl. Brit. India 1: 395. 1874; Duthie, Fl. Gangetic Plain 1: 118. 1903. "*Mondli, Lapti*" (Hindi).

Undershrubs, upto 1 m high. Leaves 2-5 cm in diam., roundish, coarsely toothed. Flowers in cymes, forming interrupted terminal racemes, yellow. Sepals apiculate. Capsules globose, tomentose; spines hooked, pubescent, bristle-pointed.

Fl. & Fr. : July - November.

Common in wastelands, open forests and along the roads.

Selected specimens : Ajmer: *Jain* 55800 (BSA); Banswara: Loharia, *Singh* 3646 (BSIO); Kota: Shababad, *Majumdar* 13300 (BSA).

27. LINACEAE

(R.P. Pandey)

Small herbs. Leaves obscurely 3-nerved. Styles 5. Capsules 5-celled.

1. *Linum*

Undershrubs. Leaves pinninerved. Styles 3. Capsules 3 to 4-celled.

2. *Reinwardtia*

1. LINUM L.

Flowers solitary, less than 7 mm across, yellow.

1. *L. mysorense*

Flowers in leafy corymba, more than 10 mm across, blue or purplish.

2. *L. usitaterimum*

1. *Linum mysorense* Heyne ex Benth. in Edward's Bot. Reg. 16: t. 1326. 1830; Hook.f. Fl. Brit. India 1: 411. 1874; Duthie, Fl. Gangetic Plain 1: 123. 1903.

Small, erect, glabrous, corymbosely branched, annual herbs. Leaves sessile, c. 1.25 × 0.25 cm, elliptic-oblong or linear. Capsules 2-4 mm across, globose, glabrous. Seeds 10, ovoid, compressed, shining, brown.

Fl. & Fr. : September - November.

Occasionally found as a weed in the cultivated fields and in forest clearings.

Selected specimens : Sirohi: Mt. Abu, Raizada 20666 (DD); Jain 46609, 62169 (BSI).

2. *Linum usitatissimum* L. Sp. Pl. 277. 1753; Hook.f. Fl. Brit. India 1: 410. 1874; Duthie, Fl. Gangetic Plain 1: 122. 1903. "Alsi" (Hindi).

Erect, glaucous, annual herbs, upto 60 cm high. Leaves 3-5 cm long, linear-lanceolate to oblong, acute. Capsules 0.75 -1.0 cm across, globose or ovoid, glabrous, 5-ribbed. Seeds compressed, brownish or black.

Fl. & Fr. : January - April.

Commonly cultivated as winter season crop; sometimes found as an escape or as a weed in winter season crops.

Selected specimens : Bhilwara: Khari dam, Singh 7006 (BSJO); Churu: Adsar village, Roy 2640 (BSJO); Jaipur: Wadhwa 8403 (BSA); Tonk: Deoli, Shetty 460 (BSJO); Kota: Chhabra, Singh 90931 (LWG).

2. REINWARDTIA DUMORTIER

Reinwardtia indica Dumort. Comm. Bot. 19. 1822; Duthie, Fl. Gangetic Plain 1: 123. 1903. *Linum trigynum* Roxb. Asiat. Res. 6: 357. 1799, non L. 1753. *Reinwardtia trigyna* (Roxb.) Planch. in Hook. Lond. Journ. Bot. 7: 522. 1848; Hook.f. Fl. Brit. India 1: 412. 1874.

Erect, tufted, glabrous, perennial undershrubs or shrubs. Leaves c. 8.5 × 3.5 cm, elliptic-oblong, subacute, entire. Flowers solitary, yellow. Capsules 3.5-5.5 cm across, glabrous. Seeds reniform.

Fl. & Fr. : August - November.

Rare, in the forests as an undergrowth.

Reported from Mt. Abu by Jain (1962).

28. MALPIGHIACEAE

(R.P. Pandey)

Leaves cordate at base, with subpalmate venation. Flowers regular. Calyx eglandular. Styles 3.

1. *Aspidopterys*

Leaves acute at base, with pinnate venation. Flowers irregular.
 Calyx with a prominent gland outside. Style (s) one or rarely two

2. *Hiptage*

1. ASPIDOPTERYS A. JUSS.

Aspidopterys cordata (Heyne ex Wall.) A. Juss. Ann. Sci. Nat. Bot. ser. 2. 13: 267. 1840; Hook.f. Fl. Brit. India 1: 421. 1874; Duthie, Fl. Gangetic Plain 1: 125. 1903. *Hiraea cordata* Heyne ex Wall. Pl. Asiat. Rar. 1: 13. 1829.

Whitish-tomentose, slender climbers. Flowers in axillary and terminal, tomentose panicles, mildly fragrant. Samaras 3.0-4.5 cm across, orbicular, glabrous, finely reticulate, pale-brown; wings orbicular or oblong.

Fl & Fr. : August - November.

Found in mixed dry deciduous forests.

Selected specimen : Sirohi: Mt. Abu, *Blatter & McCann* 23481 (BLAT).

2. HIPTAGE GAERTN.

Hiptage benghalensis (L.) Kurz in Journ. Asiat. Soc. Bengal 43(2): 136. 1874. *Banisteria benghalensis* L. Sp. Pl. 427. 1753. *Hiptage medablota* Gaertn. Fruct. 2: 169. t. 116. 1791; Hook.f. Fl. Brit. India 1: 418. 1874; Duthie, Fl. Gangetic Plain 1: 124. 1903.

Large, handsome, woody, evergreen climbers; younger parts silky. Leaves 8-15 × 3.5-6.0 cm, ovate-lanceolate or oblong, entire, acuminate, gland-dotted on the margins and on lower surface. Flowers in axillary racemes, fragrant. Samaras 3-winged; middle wing larger than the other two; wings elliptic, obovate-lanceolate.

Fl & Fr. : March - May.

Rare, in the semi-evergreen forests, climbing on *Mangifera indica* L., *Ficus* spp. and *Carissa congesta* Wight.

Selected specimens : Kota: Sitabari, *Singh* 91060 (LWG); Sirohi: Mt. Abu, *Blatter & McCann* 23481 (BLAT). Also reported from Mt. Abu by *Raizada* (1954)

CULTIVATED SPECIES

Galphimia gracilis Bartl. Shrubs, with elliptic-lanceolate, oblong or ovate-lanceolate and entire leaves. Flowers in the terminal, corymbose racemes. Fruits 3-lobed, with 1-seeded cocci and persistent calyx at the

base. Native of Mexico to Panama and W. Indies; cultivated in the gardens for ornamental purposes.

Galphimia glauca Cavan. An ornamental shrubs cultivated in the gardens.

Malpighia coccigera L. - Shrubs, with suborbicular or oblong leaves; flowers axillary and solitary. Sepals 5, ovate-lanceolate, 4 of them with 2 oblong glands on either side of midrib. Native of America; occasionally cultivated in the gardens and parks for ornamental purposes.

29. ZYGOPHYLLACEAE

(R.P. Pandey)

- | | |
|---|-----------------------|
| 1a. Leaves alternate. Stamens 12-15. | 2. <i>Peganum</i> |
| 1b. Leaves opposite. Stamens 5-10: | |
| 2a. Petals absent. Stamens always 5. | 3. <i>Sesuvia</i> |
| 2b. Petals present. Stamens 6 to 10 or rarely 5: | |
| 3a. Leaves pinnately compound. Fruit a schizocarp. Seeds exalbuminous. | 4. <i>Tribulus</i> |
| 3b. Leaves simple or 1 to 3-foliolate. Fruit a capsule. Seeds albuminous: | |
| 4a. Leaves simple; stipules not spiny. Ovules axile. | 5. <i>Zygophyllum</i> |
| 4b. Leaves 1 to 3-foliolate; stipules spiny. Ovules basal. | 1. <i>Fagonia</i> |

I. FAGONIA TOURN. EX L.

- | | |
|---|---|
| 1a. Internodes quadrangular. Spines longer than leaves: | |
| 2a. Plants glandular hairy. Lower leaves 3 and upper 1-foliolate. | 1. <i>F. bruguieri</i> var. <i>bruguieri</i> |
| 2b. Plants eglandular. All leaves 1-foliolate. | 2. <i>F. bruguieri</i> var. <i>rechingeri</i> |
| 1b. Internodes terete. Spines equal to or shorter than leaves: | |
| 3a. All leaves 1-foliolate. Pedicel equal to or shorter than capsule. | 3. <i>F. indica</i> |
| 3b. Lower leaves 3 and upper 1-foliolate. Pedicel twice as long as capsule. | 4. <i>F. schweinfurthii</i> |

1. *Fagonia burguieri* DC. Prodr. 1: 704. 1824; Boiss. Fl. Orient. 1: 905. 1867; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 425. 1874; Hadidi in Candollea 21 (1): 21. 1966; Ghafoor in Nasir & Ali, Fl. W. Pak. 76: 11. 1974.

var. *bruguieri*

Profusely branched, pale green biennial or perennial shrublets upto 30 cm high; branches distinctly sulcate and 4-angular, internodes upto 3 cm long. Basal leaves mostly 3-foliolate, upper unifoliolate; leaflets 4-12 mm long, fleshy, ovate-oblong, subsessile or on 5 mm long petiole, sharply mucronate. Stipular spines mostly recurved, longer than the leaves. Flowers c. 10 mm across, pale pink. Petals 3.5-4.0 mm long, spatulate, obtuse. Stamens with c. 6 mm long filaments. Capsules up to 4 × 4 mm, pubescent.

Fl & Fr. : September - March.

Rare; in W. Rajasthan.

Selected specimen : Jaisalmer: Near Tanot, Shetty 6104 A (BSJO).

2. var. *rechingeri* Hadidi in Candollea 27: 91. 1972; Ghafoor in Nasir & Ali, Fl. W. Pak 76: 13, f. 2 G. 1974.

This variety can be distinguished from the typical in having all the leaves unifoliolate.

Fl & Fr. : September - March.

Very rare, on gravel plains in N.W. Rajasthan.

Selected specimens : Jaisalmer: Barabag, Shetty 3469 (BSJO); Near Barabagh, Singh 7181 (BSJO).

3. *Fagonia indica* Burm. f. Fl. Ind. 102. t. 34, f. 1. 1768; Ghafoor in Nasir & Ali, Fl. W. Pak. 76: 17. 1974. *F. cretica* auct. non L. 1753; Duthie, Fl. Gangetic Plain 1: 127. 1903. *F. arabica* auct. non L. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 425. 1874. "Dhumasi" (Hindi).

var. *indica*

Profusely branched, pale green, glandular, annual or perennial shrublets upto 60 cm high; internodes 2.5-5.0 cm long. Leaves all uni or lower ones trifoliolate; leaflets 8-16 × 3-4 mm, narrowly ovate-lanceolate, mucronate, distinctly articulate at the base; stipular spines suberect, equal to or shorter than the leaves. Flowers c. 12 mm across, pinkish purple; pedicels 4-6 mm long. Petals c. 6 × 3 mm, spatulate, obtuse. Stamens c. 6 mm long. Capsules c. 4 × 4 mm, softly hairy; pedicels reflexed, equal to the length of the fruits.

Fl & Fr. : September - March.

Occasionally found in gravelly to clayey - sandy soils.

Selected specimens : Ganganagar: Gharsana, Roy 3812 (BSJO); Jodhpur: Beriganga, Roy 1543 (BSJO); Seracha, Singh 444 (BSJO).

4. *Fagonia schweinfurthii* (Hadidi) Hadidi (in Osterr. Bot. ed. 2. 121: 273. 1973) ex Ghafoor in Jafri & El Gadi, Fl. Libya 38: 31. 1977. *F. indica* Burm.f. var. *schweinfurthii* Hadidi in Rech. f. Fl. Iran. 98: 6. t. 6. 1972; Ghafoor in Nasir & Ali, Fl. W. Pak. 76: 19. 1974.

Annual to perennial, prostrate to erect, glandular to glabrous shrublets up to 50 cm tall; internodes 1-3 cm long, striate. Lower leaves trifoliolate, upper unifoliolate; petioles 5-10 mm long; leaflets 10-30 × 2-4 mm, linear-lanceolate, lateral ones (in trifoliolate) shorter than the central. Flowers 8-10 mm across, pinkish purple; pedicels up to 8 mm long, glandular to glabrous. Sepals 3-4 × 1.5-2.0 mm, ovate, sparsely glandular outside, persistent. Petals 4-6 × 2-3 mm, obtuse. Stamens c. 5 mm long. Ovary c. 1 mm across. Capsules c. 4 × 4 mm, softly hairy.

Fl & Fr. : Almost throughout the year.

Common in mixed habitats.

Selected specimens : Bhilwara: Nahar Sagar, Singh 5751 (BSJO); Jaisalmer: Shetty 3389 (BSJO); Jodhpur: Kui, Singh 3166 (BSJO); Ganganagar: Kali Banga, Roy 6414 (BSJO); Tonk: Kotri, Pandey 4702 (BSJO).

2. PEGANUM L.

Peganum harmala L. var. *stenophyllum* Boiss. Fl. Orient. 1: 917. 1867; Singh & Singh in J. Econ. Tax. Bot. 6: 151. 1985. *P. harmala auct. pl.* non L. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 486. 1875; Duthie, Fl. Gangetic Plain 1: 128. 1903. "*Harmal*" (Hindi).

Glabrous, perennial herbs, up to 1 m high, with woody root stock; branches somewhat succulent. Leaves sessile, multifid; lobes 5-6 cm long, linear-lanceolate, acute. Stipules 1.5-2.5 mm long, setaceous. Flowers pedicellate, 2-3 cm across, creamy white to yellowish-white. Sepals 5, linear, usually pinnatifid, acute. Petals 5, oblong to oblong-elliptic. Stamens c. 10 mm long; filaments dilated in the lower half. Capsules 10 mm across, subglobose, depressed at the apex. Seeds triangular, brownish black.

Fl & Fr. : March - October.

Commonly found in the drier parts of N.W. Rajasthan.

Selected specimens : Alwar: Ita Rana Raund, Lal 34501 (LWG);

Ganganagar: Nohar, Roy 6436 (BSJO); Jhunjhunu: Saxena 3692 (CAZRI); Jodhpur: Bhandari 698 (JAC); Nagaur: Lal 34968 (LWG).

3. SEETZENIA R. BR.

Seetzenia lanata (Willd.) Bullock in Kew Bull. 19: 204. 1965; Hadidi in Bot. Not. 125: 534. 1972. *Zygophyllum lanatum* Willd. Sp. Pl. 2(1): 564. 1799. *Seetzenia orientalis* Decne. in Ann. Sc. Nat. Ser. 2. 3: 281. t. 7. 1835; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1. 424. 1874. 'Dhakari' (Hindi).

Prostrate, papillate, perennial herbs. Leaves trifoliolate, petiolate; central leaflets 4-10 × 2-8 mm, obovate-cuneate, emarginate; lateral ones 3-10 × 1-6 mm long, obliquely oblong to reniform. Stipules 1.0-1.5 mm long, triangular, villous. Flowers solitary, axillary, greenish. Sepals 2.5-4.0 × 1.0-1.5 mm, elliptic-lanceolate, acute, inflexed at the tip. Stamens 5, 3-4 mm long. Ovary ribbed. Capsules 6.5-8.0 × 5-6 mm, ovoid, pendulous. Seeds 4.5 × 1.5-2.0 mm, compressed, ovoid, smooth, brown to blackish-brown.

Fl & Fr. : September - March.

Rare, in N.W. Rajasthan particularly in gravelly habitats.

Selected specimens : Bikaner: Near Gollri, Roy 1709 (BSJO); Jaisalmer: Devikot. Shetty 3415, 3490 (BSJO); Jodhpur: Phalodi, Bhandari 936 (JAC).

4 TRIBULUS TOURN. EX L.

1a. Mericarps broadly winged, not spinous:

2a. Wings of mericarps more than 8 mm broad, almost glabrous, straw-yellow, transversely striated.

4. *T. pentandrus* var.
pterophorus

2b. Wings of mericarps less than 8 mm broad, densely pubescent, greyish-green

3a. Flowers 6-8 mm across. Wings of mericarps upto 4 mm broad.

2. *T. pentandrus* var.
pentandrus

3b. Flowers 10-12 mm across. Wings of mericarps 5-8 mm broad.

3. *T. pentandrus* var.
macropterus

1b. Mericarps not winged, but distinctly spinous:

4a. Mericarps with 2 major divergent spines and 20-30 minor spines; basal pairs of spines always absent.

5. *T. rajasthanensis*

4b. Mericarps dorsally tuberculate; spines usually 4:

- 5a. Pedicels 10-15 mm long. Style c. 2 mm long. 1. *T. lanuginosus*
 5b. Pedicels upto 10 mm long. Style subsessile. 6. *T. terrestris*

1. **Tribulus lanuginosus** L. Sp. Pl. 1: 387. 1753 *et* Mant. Alt. 380. 1771; DC. Prodr. 1: 703. 1824; Wight & Arn. Prodr. 1: 145. 1834.

Annual or biennial, usually prostrate, pubescent herbs. Leaves up to 5 cm long; leaflets 3-6 pairs, each 3-10 × 2-5 mm, elliptic-oblong, oblique, acute. Flowers c. 12 mm across, pale yellow. Sepals 5-7 × 2-3 mm, lanceolate. Petals 5-6 × 2-3 mm, obovate-oblong, cuneate, obtuse-truncate. Stamens 10, c. 4 mm long; anthers oblong. Ovary c. 1 mm across. Fruits disc-shaped; mericarps c. 4.0 × 2.5 mm, 2 to 4-spined.

Fl & Fr. : Almost throughout the year.

Selected specimen : Jodhpur: Kailana, *Moorthy* 74 (BSJO).

2. **Tribulus pentandrus** Forssk. Fl. Aegypt.-Arab. 88. 1775. *T. alatus* Del. Fl. Aegypt. III. 62. 1813; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 423. 1874. *T. longipetalus* Viv. Pl. Egypt. Dec. 10. t. 2. f. 5. 1831; Ghaffoor in Nasir & Ali, Fl. W. Pak. 76: 22. 1974.

var. **pentandrus**

Annual or biennial, prostrate to procumbent, pilose to densely villous herbs. Leaves up to 7 cm long; leaflets 4-6 (-7) pairs, 3-10 × 2-5 mm, subsessile, oblong-elliptic, equilateral, oblique at base, acute. Stipules 2-5 mm long, ovate or falcate, acute. Flowers pedicellate, 6-8 mm across, yellow, Sepals c. 4 mm long, linear-lanceolate. Petals c. 5 × 3 mm, membranous. Stamens 8-10, c. 3 mm long. Wings of mericarps c. 4 mm broad, roughly triangular, dentate.

Fl & Fr. : August - November.

Not common, found in sandy habitats of N.W. Rajasthan.

Selected specimens : Bikaner: Shivbari, *Puri* 21955 (BSI); Churu: Sardarshahr, *Roy* 2754 (BSJO).

3. var. **macropterus** (Boiss.) Singh & Singh in J. Econ. Tax. Bot. 6(1): 159. 1985. *T. macropterus* Boiss. Diagn. Pl. Or. Nov. ser. 1(1): 61. 1843. *T. longipetalus* subsp. *Macropterus* (Boiss.) Maire ex Ozenda & Quezel in Trav. l' Inst. Rech. Sahariennes 14: 73. 1956; Ghaffoor in Nasir & Ali, Fl. W. Pak. 76: 23. 1974.

Densely villous, greyish-green herbs, with procumbent branches. Flowers c. 1 cm across; pedicels c. 1.5 cm long. Stamens 5-10. Wings of mericarps irregularly-dentate or sometimes entire.

Fl. & Fr. : After rains.

Fairly common in sandy habitats of N.W. Rajasthan.

Selected specimens : Bikaner: Bichwal, *Raizada* 9156 (DD); Ganganagar: Azmalkhera, *Roy* 4869 (BSJO); Jaisalmer: Pokaran, *Tiwari* 728 (BSJO).

4. var. *pterophorus* (Presl) Singh & Singh in J. Econ. Tax. Bot. 6(1): 159. 1985. *T. pterophorus* Presl, Bot. Bem. 30. 1844. *T. longipetalus* Viv. subsp. *pterophorus* (Presl) Hadidi in Rech.f. Fl. Iran. 98: 14. t. 20.f. 2. 1972; Ghafoor in Nasir & Ali, Fl. W. Pak. 76: 24. 1974.

This variety can easily be distinguished from the proper by having almost glabrous, straw-yellow, transversely-striated and more than 8 mm broad wings of the mericarps.

Fl. & Fr. : August - November.

Rare, in N.W. Rajasthan.

Selected specimen : Jaisalmer: West of Ramgarh, *Shetty* 3469 (BSJO).

5. *Tribulus rajasthanensis* Bhandari et Sharma in Bot. Not. 129: 267. f. 1. 1977; Bhandari, Fl. Ind. Desert 88. f. 30. 1978.

Prostrate to procumbent, annual or perennial herbs; branches hirsute. Leaves 1.5-4.5 cm long, anisophyllous; leaflets 4-7 pairs, 4-12 × 3-6 mm, oblique, elliptic-oblong to ovate-oblong, pubescent above, villous beneath. Flowers yellow. Sepals 5-7 × 1-2 mm, linear-lanceolate, acute. Petals 5.0-7.5 × 3.0-5.0 mm, obovate-cuneate. Stamens 10, c. 5 mm long. Fruits c. 15 mm across; mericarps 6-7 × 4-5 mm, densely hispid.

Fl. & Fr. : August - November.

It was described from W. Rajasthan but its distribution extends southwards to Gujarat and west wards to Pakistan.

Selected specimens : Jodhpur: Massuria rocks, *Bhandari* 12, 627 (JAC); Kuri, *Singh* 4337 (BSJO); Jaisalmer: N. Jaisalmer rocks, *Bhandari* 985 (JAC); Barabag, *Tiwari* 800 (BSJO), *Shetty* 3416 (BSJO).

6. *Tribulus terrestris* L. Sp. Pl. 387. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 423. 1874; Duthie, Fl. Gangetic Plain 1: 127. 1903. "*Gokhru, Kanti*" (Hindi).

Prostrate to procumbent or suberect, annual, hairy herbs. Leaves 5.0-7.5 cm long, unequal; leaflets 4-8 pairs, 5-11 × 2-8 mm, subsessile, ovate to elliptic, acute or obtuse. Stipules 2-5 × 1 mm, subulate to falcate. Flowers yellow. Sepals 2-4 × 1.5-2.0 mm, ovate-lanceolate, acute, hirsute, margins

scarious, ciliate. Petals 2.5-5.0 × 1-3 mm. Stamens 10, 3-4 mm long. Ovary covered with stiff, upwards spreading bulbous-based hairs. Fruits 10-15 mm across, excluding spines; mericarps dorsally tuberculate.

Fl & Fr. : August - December.

Common weed throughout Rajasthan in sandy and gravelly habitats.

Selected specimens : Ajmer: *Wadhwa* 4883 (BSA); Dungarpur: Burpal road, *Majumdar & Mishra* 10360 (BSA); Jaisalmer: Shergarh, *Wadhwa* 4749 (BSI); Kota: Naka, *Verma* 418 (BSA); Sawaimadhopur: Bayana, *Saran & Party* 41864, 41904 (LWG); Sirohi: Vasthanji, *Jain* 60482 (BSI).

5. ZYGOPHYLLUM L.

Zygophyllum simplex L. Mant. 1: 68. 1767; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 424. 1874; Bhandari, Fl. Ind. Desert 89. f. 31. 1978. "*Luni, Lunwo*" (Hindi).

Dichotomously branched, procumbent, green to purple, glabrous, annual herbs. Leaves opposite, simple, unequal, sessile, 10-20 × 1-2 mm, cylindrical, succulent. Flowers c. 5 mm across, yellow. Sepals 5, c. 2 × 1 mm, obovate, obtuse, cucullate. Petals 5, c. 3 × 1 mm, spatulate, membranous. Stamens 10, 2-3 mm long; staminal scales c. 1 mm long, bipartite. Capsules c. 3 mm across, turbinate, 5-angled, rugulose. Seeds c. 1.0 × 0.6 mm, fusiform, brown.

Fl & Fr. : August - January.

Common, particularly in saline habitats of N.W. Rajasthan; also found in sandy or gravel soils.

Selected specimens : Barmer: Shoo, *Shetty* 2247 (BSJO); Bikaner: near Mud village, *Roy* 2369 (BSJO); Jaisalmer: *Shetty* 3406 (BSJO); Jodhpur: Malar, *Singh* 4375 (BSJO); Ganganagar: Gharsana, Hanumangarh, *Roy* 3810, 5046 (BSJO).

CULTIVATED SPECIES

Guaiacum officinale L. - A small tree with bluish-purple flowers fading to white. Capsules compressed, winged, orange-yellow. Native of S. America and West Indies; cultivated in the gardens.

30. GERANIACEAE

(P.J. Parmar)

1a. Fertile stamens 5.

1. *Erodium*

1b. Fertile stamens more than 5:

- 2a. Fertile stamens 10, distinct. 2. *Geranium*
 2b. Fertile stamens 15, connate below. 3. *Monsonia*

1. ERODIUM L'HERIT.

***Erodium cicutarium* (L.) L' Herit. ex Aiton, Hort. Kew. 2: 414. 1789; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 434. 1874; Bhandari, Fl. Ind. Desert 90. 1978. *Geranium cicutarium* L. Sp. Pl. 680. 1753.**

Stem-less, annual herbs or with few decumbent, weak branches clothed with white hairs. Leaves oblong, pinnatisect; segments 7-11 pairs, sessile, ovate-oblong or obovate. Peduncles many-flowered. Flowers purple, often spotted. Seeds very smooth; cotyledons 3-lobed.

Fl & Fr. : September - October.

Very rare, reported from Jaisalmer (Blatter & Hallberg, 1918-21. Sarup, 1958 and Sankhala, 1951). The specimens (Including Blatter, 7121) are not available in the herbaria.

2. GERANIUM L.

***Geranium mascatense* Boiss. Diagn. 1: 59. 1842. *G. ocellatum* Cambess. in Jacq. Voy. Ind. 33. t. 38. 1844; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 433. 1874; Duthie, Fl. Gangetic Plain 1: 130. 1903.**

Much-branched, prostrate or ascending, hoary-pubescent or hairy-glandular, annual herbs. Leaves 1.5-5.0 cm in diam., orbicular, 5 to 7-lobed; lobes 3 to 5-fid, cuneate. Flowers in clusters or solitary, rose-coloured with dark purple eye. Carpels corrugated. Seeds smooth.

Fl & Fr. : After rainy season.

Rare, in damp habitats, ravines, river-banks and on old walls of buildings.

Selected specimen : Sirohi: Mt. Abu, Jain 60180 (BSI).

3. MONSONIA L.

Flowers solitary. Petals longer than the sepals.

2. *M. senegalensis*

Flowers umbellate. Petals shorter than the sepals.

1. *M. heliotropioides*

1. ***Monsonia heliotropioides* (Cav.) Boiss. Fl. Or. 1: 897. 1867; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 428. 1874; Bhandari, Fl. Ind. Desert 91. 1978. *Geranium heliotropioides* Cav. Monad. Class. Diss. Dec. 4: 220. t. 113. f. 2. 1787. 'Mayur-shikha' (Hindi).**

Small, hoary, annual herbs, with a woody root-stock. Leaves mostly radical, 1.2-2.5 × 1.0-1.6 cm, ovate or rhomboid, rounded, cuneate or cordate at base, obtuse at apex, sharply denticulate. Flowers umbellate at the apex of 8-10 cm long, slender scapes, white. Fruits capsule.

Fl. & Fr. : August - October.

Very rare, in sandy, desertic habitats.

Selected specimens : Bikaner: near Devikund sagar, Roy 1727, 2169 (BSJO); Jaisalmer: Mertia 409 (JAC), Bhandari 1067 (JAC).

2. *Monsonia senegalensis* Guill. & Perr. in Guill. *et al.* Fl. Senegamb. Tent. 1: 131. 1831; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 427. 1874; Duthie, Fl. Gangetic Plain 1: 129. 1903.

Erect, viscid, annual herbs or undershrubs. Leaves 2-3 × 1.2-2.0 cm, ovate, cordate or rounded at the base, acute or sub-obtuse, mucronate, denticulate. Flowers solitary on c. 3 cm long, slender, hairy peduncles, violet or pink. Carpels stipitate, obconic, clothed with stiff hairs.

Fl. & Fr. : September - November.

Rare, in sandy and rocky habitats.

Selected specimens : Ajmer: Sharma 1826 (LWG); Bhilwara: Kotra village, Singh 6238 (BSJO); Jaisalmer: 30 km from Jaisalmer along Miajtar road, Shetty 3400 (BSJO); Jodhpur: Kailana, Shetty 87, Singh 4390 (BSJO); Pali: Piprolia R.F., Shetty 1877 (BSJO).

31. AVERRHOACEAE

(P.J. Parmar)

AVERRHOA L.

Averrhoa carambola L. Sp. Pl. 428. 1753. 'Kamarakh' (Hindi).

Small trees, with close drooping branches. Leaves alternate; leaflets 5-11. Flowers chiefly in short, axillary, paniced cymes or sometimes springing from the short branches, variegated white to purple. Fruits oblong, acutely angled, yellow.

Cultivated in gardens and orchards for its edible fruits.

32. OXALIDACEAE

(P.J. Parmar)

Leaves digitately or pinnately 3-foliolate. Capsules longitudinally dehiscent.

2. *Oxalis*

Leaves even-pinnate, with more than 3 pairs of leaflets. Capsules stellately 5-valved.

1. *Biophytum*

1. BIOPHYTUM DC.

Biophytum sensitivum (L.) DC. Prodr. 1: 690. 1824; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 436. 1874; Duthie, Fl. Gangetic Plain 1: 131. 1903. *Oxalis sensitiva* L. Sp. Pl. 434. 1753. "Lazili Chhui-mui" (Hindi).

Erect, annual herbs; stems clothed with appressed or erecto-patent hairs. Leaves with 3-12 pairs of leaflets. Flowers yellow with a yellow or pale lilac striped base. Capsules subglobose, apiculate, stellately 5-valved.

Fl. & Fr. : After rainy season.

Rare, in the forests and gardens in shady habitats.

Selected specimens : Banswara: Royal Hindvela forest, Singh 2869 (BSJO); Chittorgarh: Senwa block, Verma 1615 (BSA); Pratapgarh: Majumdar 10190 (BSA); Jhalawar: Ghatoli block, Verma 7564 (BSA); Pirawa, Verma 6862 (BSA); Udaipur: Jaismand, Verma 68 A (BSA).

2. OXALIS L.

1a. Ascending or creeping herbs. Flowers yellow.

1. *O. corniculata*

1b. Acaulescent herbs, with underground, bulbous root-stocks.

Flowers purplish:

2a. Leaves obtriangular. Pedicels and calyx glabrous.

3. *O. dehradunensis*

2b. Leaves obovate. Pedicels and calyx hairy.

2. *O. corymbosa*

1. ***Oxalis corniculata*** L. Sp. Pl. 435. 1753; Wight, Ic. 1: t. 18. 1838; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 436. 1874; Duthie, Fl. Gangetic Plain 1: 130. 1903. "Kharto" (Hindi).

Appressed-hairy, perennial herbs. Leaves digitately 3-foliolate; leaflets subsessile, 0.6-1.8 × 1.2-2.5 cm, cuneate at the base, appressed-hairy. Flowers 2-8, in umbellate clusters, yellow. Capsules oblong, narrowed to the apex, pubescent. Seeds transversely ribbed.

Fl. & Fr. : Almost throughout the year.

Common in moist and shady localities.

Selected specimens : Bhilwara: Mejadam, Singh 6032 (BSJO); Ganganagar: Bhaduwalla, Roy 4946 (BSJO); Jaisalmer: Barabagh, Shetty 6159 (BSJO); Jhunjhunu: Ajitsagar, Kanodia 228 (DD); Jhalawar: Sharma 429 (RUBL); Sirohi: Mt. Abu, Bakshi 26 (RUBL).

2. *Oxalis corymbosa* DC. Prodr. 1: 696. 1824; Raizada, Suppl. Duthie, Fl. Gangetic Plain 36. 1976; Sharma & Tiagi, Fl. N.E. Raj. 80. 1979. *O. martiana* Zucc. Denkschr. Akad. Munch. 9: 144. 1825; Mahesh. Illus. Fl. Delhi f. 42. 1966.

Perennial, acaulescent herbs, with bulbous root-stocks. Petioles 8-30 cm long, hairy, dilated at the base; leaflets sessile, cuneate at base, deeply notched with rounded lobes at the apex. Flowers 2-many, in subumbellate corymbs, dark purple.

Fl. & Fr. : Almost throughout the year.

Rare, found in damp, shady places.

Selected specimens : Jaipur: Raj. College, *Sharma* 1530 (RUBL); Udaipur: Gulab bagh, *Majumdar* 10379 (BSA). Also reported from Ganganagar (Dhillon & Bajwa, 1969) and Banswara (*Majumdar et al.*, 1969).

3. *Oxalis dehradunensis* Raizada in Suppl. Duthie, Fl. Gangetic Plain 37. 1976. *O. richardiana* Babu, Herb. Fl. Dehradun 104. 1977. *O. latifolia* auct. plur. non H.B.K. 1821; Calder in Rec. Bot. Surv. India 6: 337. 1919.

Perennial, glabrous, acaulescent herbs, with bulbous root-stocks. Petioles 10-20 cm long; leaflets cuneate at base, shallowly notched at apex with oblique lobes, epunctate except two glands below the apex. Flowers in few-flowered umbels, purple with a green-veined base.

Fl. & Fr. : July - November.

Commonly naturalized in damp, shady places.

Selected specimens : Bhilwara: Meja dam, *Singh* 7085 (BSJO); Ganganagar: Loyalpuria bagh, *Roy* 3935 (BSJO); Jhalawar: Patri garden, *Verma* 6903 (BSA); Sirohi: Mt. Abu, *Blatter* 18728 (BLAT).

DOUBTFUL TAXON

Oxalis acetosella L. Sp. Pl. 433. 1753; Edgew. & Hook.f. in Hook.f. Fl. Brit. India 1: 436. 1874.

The species of Temperate Himalayas from Kashmir (alt. 8000 ft) to Sikkim (alt. 8-12000 ft), reported from Jhunjhunu Ratnam, 1957), Jodhpur (Sarup, 1951) and Sikar (Ratnam, 1957; Nair & Malhotra, 1961). No specimens are available in any Indian herbarium.

33. BALSAMINACEAE

(P.J. Parmar)

IMPATIENS L.

Spur c. 2.0 cm long.

1. *I. balsamina* var. *balsamina*

Spur c. 0.7 cm long.

2. *I. balsamina* var. *rosea*

1. *Impatiens balsamina* L. Sp. Pl. 938. 1753; Hook.f. Fl. Brit. India 1: 453. 1874 & in Rec. Bot. Surv. India 4: 19. 1913; Babu, Herb. Fl. Dehradun 105. 1977.

var. *balsamina*

Erect, flaccid, glabrous or sparsely hairy, annual herbs. Leaves alternate, distant, 6-15 × 1.5-2.5 cm, lanceolate-oblong to oblanceolate, subacuminate. Flowers 1-2 (-3) together, in leaf axils, red, purple, white or variegated. Capsules ovoid-ellipsoid, acuminate, pubescent.

Fl. & Fr. : August - November.

Common in moist, shady localities along the Aravalli range.

Selected specimens : Bhilwara: Gangapur, Singh 6521 (BSJO); Jhalawar: Sarhod, Wadhwa 3567 (BSA); Pali: Paras Ram Mahadev temple, Shetty 1925 (BSJO); Sirohi: Mt. Abu, Jain 46710 (BSI); Udaipur: Kewada forest, S. Coll. 2191 bot. (BSI).

2. var. *rosea* (Lindl.) Hook.f. Fl. Brit. India 1: 454. 1874; Duthie, Fl. Gangetic Plain 1: 133. 1903. *I. rosea* Lindl. in Bot. Reg. t. 27. 1841. *I. balsamina* L. var. *brevicalcarata* Cooke, Fl. Bombay 1: 174. 1901.

Differs from the typical variety by longer, linear-lanceolate leaves, smaller rose-coloured flowers with standard winged at the back, horned at the apex and spur very short, stout, incurved.

Fl. & Fr. : August - November.

Occasionally found in moist, shady habitats, particularly in the east of Aravalli.

Selected specimens : Banswara: Anand sagar forest, Singh 2969 (BSJO), Kanodia 75291 (BSI); Sirohi: Mt. Abu, Rao 66584 (BSI). Also reported from Kota and Jhalawar (Singh, 1973).

34. RUTACEAE

(P.J. Parmar)

1a. Plant armed with spines:

2a. Leaflets 3.

1. *Aegle*

2b. Leaflets more than 3:

3a. Flowers tetramerous, white.

4. *Naringi*

3b. Flowers pentamerous, yellowish, tinged with red.

2. *Feronia*

1b. Plants unarmed.

3. *Murraya*1. AEGLE CORR. *nom. cons.*

Aegle marmelos (L.) Corr. in Trans. Linn. Soc. 5: 223. 1800; Wight, Ic. 1: t. 16. 1838; Hook.f. Fl. Brit. India 1: 516. 1875; Duthie, Fl. Gangetic Plain 1: 143. 1903. *Crataeva marmelos* L. Sp. Pl. 444. 1753. "Bel" (Hindi).

Thorny, deciduous trees; bark greyish-white or greyish-brown, smooth. Leaflets 1.5-9.5 × 0.6-6.0 cm, ovate-elliptic or elliptic-lanceolate, glabrous. Flowers in axillary panicles, greenish or creamy white. Berries 6-10 cm across, globose or subglobose, with rough rind. Seeds obliquely lenticular or oblong, wrinkled, glabrous, pale-brown.

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

Common in deciduous and scrub forests; also planted in gardens.

Selected specimens : Ajmer: Ajmer-Udaipur road, *Kaul* 8483 (LWG); Banswara: Kotharia forest, *Singh* 3048 (BSJO); Ganganagar: Biruram bagh, *Roy* 4940 (BSJO); Jhalawar: *Sharma* 462 (RUBL); Sirohi: Mt. Abu, *Jain* 5478 (BSI).

2. FERONIA CORREA

Feronia limonia (L.) Swingle in Journ. Washington Acad. Sci. 4: 328. 1914. *Schinus limonia* L. Sp. Pl. 389. 1753. *Feronia elephantum* Correa in Trans. Linn. Soc. 5: 225. 1800; Wight, Ic. 1: t. 15. 1838; Hook.f. Fl. Brit. India 1: 516. 1875; Duthie, Fl. Gangetic Plain 1: 143. 1903. "Katori, Kaitha" (Hindi).

Medium-sized, spiny trees with greyish bark. Spines straight, stout. Leaves alternate, imparipinnate; leaflets 3-9, opposite, 2.5-5.0 × 1.5-2.5 cm, cuneate or obovate, the tip often crenulate. Flowers small, numerous, in lateral and terminal, pubescent panicles, pale-green. Fruits globose, hard and woody, grey.

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

Common in wastelands, particularly near habitations; also planted in the gardens.

Selected specimens : Ajmer: Puskar Ghati, *Puri* 35820 (BSI); Bikaner: Gajaner, *Roy* 2066 (BSJO); Jaipur: Gulta, *Sharma* 2277 (RUBL); Jodhpur: Mandore, *Bhandari* 1919 (JAC); Kota: *Singh* 90898 (LWG).

3. MURRAYA J.G. KOENIG EX L. *nom. cons.*

Murraya koenigii (L.) Spreng. Syst. Veg. 2: 315. 1825; Hook.f. Fl. Brit. India 1: 503. 1875; Duthie, Fl. Gangetic Plain 1: 137. 1903. *Bergera koenigii* L. Mant. Pl. 1: 565. 1767. "Meetha Neem" (Hindi).

Large, deciduous shrubs or small trees, with dark-brown or nearly black bark. Leaves alternate, imparipinnate, 8-20 cm long; leaflets 11-25, ovate, ovate-lanceolate or somewhat ovate-rhomboid, gland-dotted, glabrous. Flowers in 5-15 cm long, terminal, paniculate cymes, creamy-white or dirty white.

Fl. : April May; *Fr.* : May June.

Occasionally found in wastelands; also planted in gardens or near houses.

Selected specimens : Jhunjhunu: Pileri, *Saran* 41986 (LWG); Kota: Kelwara, *Singh* 91069 (LWG). Also reported from Ajmer (*Sharma*, 1958) and Jodhpur (*Sarup*, 1954).

4. NARINGI ADANSON

Naringi crenulata (Roxb.) Nicolson in Saldanha & Nicolson Fl. Hassan Dist. 387. 1976. *Limonia crenulata* Roxb. Pl. Cor. 1: 604. 86. 1789. *Hesperethus crenulata* (Roxb.) Roemer, Syn. Monogr. 1: 38. 1846. *Limonia acidissima auct.-non* L. 1762; Hook.f. Fl. Brit. India 1: 507. 1875.

Small, spiny trees; spines solitary or geminate. Leaves one-pinnate; petioles and rachis jointed; joints of rachis obovate, oblong, crenulate; leaflets 5-9, 2.0-4.5 × 0.8-1.8 cm, ovate-lanceolate, crenulate. Flowers in subumbellate racemes, white, fragrant. Berries globose, black, pulp acidic, 1 to 4-seeded.

Fl. : April May; *Fr.* : May Cold season.

Occasionally found in deciduous forests in plains and on the hill-slopes.

Selected specimens : Bhilwara: On the way to Bijolia, *Singh* 6087 (BSJO); Kota: Shahabad, *Singh* 90819 (LWG), *Jain* 28894 (BSI). Also reported from Ajmer (*Sharma*, 1958) and Udaipur (*Ramdeo*, 1969).

DOUBTFUL TAXON

Clausena pentaphylla DC. Prodr. 1: 538. 1824; Hook.f. Fl. Brit. India 1: 503. 1875; Duthie, Fl. Gangetic Plain 1: 138. 1903.

Deciduous shrubs, young parts silky tomentose. Leaves large, 3 to 7-foliolate; leaflets 12-25 cm long, ovate, acuminate, tomentose or glabrate beneath. Flowers 4-merous, in erect, terminal, downy panicles, yellowish. Berries ovoid, papillose, pale orange.

Usually met with in Tropical Western Himalayas from Kumaon to Nepal and in the Doom and Sal forests of Oudh. Its occurrence in Rajasthan is doubtful, although, it has been reported from N.W. Rajasthan (Sankhala, 1951).

CULTIVATED SPECIES

Citrus aurantifolia (Christmann) Swingle (*Limon aurantifolia* Christmann). "*Kaghzi-Nimbu*" (Hindi) Large shrubs or small trees, with small, globose or ovoid fruits. Commonly cultivated for edible fruits.

Citrus aurantium L. '*Naranji*' (Hindi) - Trees or shrubs with elliptic-lanceolate or ovate leaves and purple-white flowers. Cultivated in the gardens and orchards for its edible fruits.

Citrus grandis (L.) Osbeck (*Citrus aurantium* L. var. *grandis* L.) Trees, with pubescent young parts. Flowers large, white. Fruits large, globose or pyriform, pale yellow. Occasionally cultivated for its edible fruits.

Citrus javanica Blume '*Chhota nimbu*' (Hindi)-Erect shrubs, with elliptic-lanceolate, undulate leaves and axillary, solitary flowers. Occasionally planted in the gardens for ornamental purposes.

Citrus limetta Risso Shrubs or small trees, with small white flowers and globose, ovoid, shortly mammillate fruits. Occasionally cultivated for its edible fruits.

Citrus medica L. '*Nimbu*' (Hindi) - Large shrubs or trees, with axillary spines, white flowers and globose fruits. Commonly cultivated for its fruits.

Citrus limon (L.) Burm.f. (*Citrus medica* L. var. *limon* L.) -Thorny trees, with ovate-elliptic, crenate leaves, white flowers tinged with pink-purple and oval or oblong fruits. Occasionally cultivated for its fruits.

Citrus sinensis (L.) Osbeck. (*Citrus aurantium* L. var. *sinensis* L.) 'Malta, Musambi' (Hindi) Trees or shrubs, with ovate to elliptic, emarginate leaves. Flowers pure white. Fruits globose, tight skinned. Occasionally cultivated in the gardens.

Murraya paniculata (L.) Jack (*M. exotica* L.) "Marua, Jaswanti" (Hindi) Evergreen trees or large shrubs. Leaflets 3-7, ovate, obovate or rhomboid, shining above, glabrous. Flowers white, fragrant. Fruits red. Commonly cultivated in the gardens for ornamental purposes.

Ruta graveolens L. Strongly scented, perennial herbs. Leaves 2 to 3-pinnate; segments oblong to spatulate. Flowers greenish or yellow. Occasionally cultivated in the gardens for ornamental purposes.

35. SIMAROUBACEAE

(P.J. Parmar)

AILANTHUS DESE. *nom. cons.*

Ailanthus excelsa Roxb. Pl. Cor. 1: 24. t. 23. 1795; Wight, Ill. Indign. Bot. 1: 170. t. 67. 1840; Bennett in Hook.f. Fl. Brit. India 1: 518. 1875; Duthie, Fl. Gangetic Plain 1: 144. 1903. "Arvu" (Hindi).

Tall, deciduous trees, 10-20 m high, with greenish-white or grey, smooth bark. Leaves crowded at the end of branches, 60-100 cm long; leaflets 9-29, subopposite, 5-18 × 2.5-6.5 cm, ovate-lanceolate, coriaceous. Flowers in 15-40 cm long, terminal and axillary, hairy panicles, yellow. Samaras 2-6 × 0.5-1.5 cm, spindle-shaped, glabrous, 1-seeded. Seeds oblong, glabrous.

Fl. : December - March; Fr. : February - May.

Common in wastelands, fringes of forests etc. Sometimes planted along the roads.

Selected specimens : Banswara: Singh 4619 (BSJO); Barmer: Bor, Tiwari 1197 (BSJO); Churu: Sujangarh, Roy 2528 (BSJO); Jaipur: Sharma 1090 (RUBL); Jhalawar: Aklera, Majumdar 10021 (BSA); Sirohi: Mt. Abu, McCann 1920 (BLAT).

36. BALANITACEAE

(P.J. Parmar)

BALANITES DELILE *nom. cons.*

Balanites aegyptiaca (L.) Del. Fl. Aegypt. 77, 221. t. 28. f. 1. 1813; Wight, Ic. 1: t. 274. 1840. *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. India 1: 522. 1875. *B. aegyptiaca* Delile var. *roxburghii* (Planch.) Duthie, Fl. Gangetic Plain 1: 145. 1903. "*Hingotia*" (Hindi).

Spiny, deciduous shrubs or small trees. Leaves 2-foliolate; leaflets 1.0-3.5 × 0.4-1.7 cm, elliptic-oblong or obovate-oblong, glaucous green, pubescent. Flowers in axillary, fascicled cymes, pale or greenish yellow. Fruits ovoid, yellowish-green when ripe.

Fl. : December - March; *Fr.* : March - July.

Common in scrub forests, wastelands, along the roads etc.

Selected specimens : Alwar: Sariska, Singh A. No. 12789 (RUBL); Dungarpur: JAV 29366 (BSI); Jodhpur: Kailana, Singh 59 (BSJO); Kota: Naka, Wadhwa & Prasad 9203 (BSA); Sirohi: Abu hills, McCann 1861 (BLAT); Tonk: Toda Rai Singh, Maheshwari 52916 (LWG).

37. BURSERACEAE

(P.J. Parmar)

1a. Spinous shrubs or small trees. Leaves 1 to 3-foliolate. Flowers 4-merous, brownish-red.

2. *Commiphora*

1b. Medium-sized, unarmed trees. Leaves 7 to many-foliolate. Flowers 5-merous, creamy white:

2a. Bark peeling off in thin flakes. Flowers bisexual only. Drupes trigonous, dehiscent; hypanthium absent.

1. *Boswellia*

2b. Bark not peeling off. Flowers both bisexual and unisexual (plants polygamous). Drupes globose, indehiscent; hypanthium present

3. *Garuga*

1. BOSWELLIA ROXB. EX COLEB.

Boswellia serrata Roxb. ex Coleb. in Asiat. Res. 9: 379, t. 5. 1807; Bennett in Hook.f. Fl. Brit. India 1: 528. 1875; Duthie, Fl. Gangetic Plain 1: 147. 1903. *Boswellia glabra* Roxb. Pl. Cor. 3: 4, l. 207. 1811. "*Salar*" (Hindi).

Tall, deciduous trees, 10-15 m high. Leaves imparipinnate, crowded at the end of the branches, 15-25 cm long; leaflets 9-31, sessile, 2.5-6.5 × 1.0-2.5 cm, oblong-ovate, emarginate. Flowers in 8-20 cm long, axillary racemes at the end of branches, white. Drupes reticulately veined, retuse at one end, glabrous. Seeds 3.

Fl. & Fr. : December - April.

Common in dry deciduous forests, particularly in eastern Rajasthan on the hills.

Selected specimens : Ajmer: *Duthie* 4573 (DD); Banswara: Anand Sagar, *Singh* 4234 (BSJO); Churu: Gopalpura, *Roy* 2534 (BSJO); Jodhpur: Nadia Bhakar (Danwara), *Bhandari* 1632 (JAC); Kota: *Wadhwa & Prasad* 9436 (BSA); Sirohi: Mt. Abu. *McCann* 283 (BLAT).

2. COMMIPHORA N. JACQUIN

Commiphora wightii (Arn.) *Bhandari* in Bull. bot. Surv. India 6: 327. 1964. *Balsamodendron wightii* Arn. in Ann. Nat. Hist. 3: 86. 1839. *B. mukul* Hook. ex Stocks in Kew Journ. Bot. 1: 259. t. 8. 1849; Bennett in Hook.f. Fl. Brit. India 1: 529. 1875. *Commiphora mukul* (Hook. ex Stocks) Engl. in DC. Monogr. Phan. 4: 12. 1883; *Duthie*, Fl. Gangetic Plain 1: 149. 1903. "Gugal" (Hindi).

Tall, bushy, deciduous shrubs; bark peeling off in flakes. Leaflets 1-3, 1.2-2.4 × 0.9-1.7 cm, rhomboid-ovate, serrate near the apex, entire towards the base, lateral leaflets when present much smaller. Flowers solitary or in fascicled cymes at the end of branches. Drupes ovoid, shortly beaked, deep red.

Fl. & Fr. : January - May.

Rare, on the open dry hills and other rocky habitats.

Selected specimens : Alwar: Alwar to Balafort, *Lal & Party* 34406 (LWG); Bhilwara: Bhillon Ki Jhonpari, *Singh* 6212 (BSJO); Jaisalmer: Aakal, *Shetty* 6151 (BSJO); Jodhpur: Kailana, *Singh* 4491 (BSJO); Udaipur: Bhim, *Duthie* 45749 (DD).

3. GARUGA ROXB.

Garuga pinnata Roxb. Pl. Cor. 3: 5, t. 208. 1811; *Wight*, Ic. 4(4): 14, t. 1594-95. 1850; Bennett in Hook.f. Fl. Brit. India 1: 528. 1875; *Duthie*, Fl. Gangetic Plain 1: 148. 1903.

Tall, deciduous trees, 7-15 m high. Leaves crowded at the end of branches, 20-36 cm long; leaflets 11-21, 4-14 × 2.5-4.5 cm, subsessile, elliptic-oblong or ovate-lanceolate, pubescent beneath. Flowers in 7-20 cm long, terminal panicles, creamy white. Drupes subpyriform, fleshy, smooth, glabrous.

Fl. & Fr. : January - May.

Rare, in dry deciduous forests.

Selected specimens : Chittorgarh: Pratapgarh. *Ferma* 298 (BSA); Sirohi: Mt. Abu, *Duthie* 6621 (DD). Also reported from Kota (*Majumdar*, 1971).

38. MELIACEAE

(P.J. Parmar)

1a. Leaves entire. Fruit a capsule. Seeds winged:

2a. Stamens free.

4. *Toona*

2b. Stamens united into a tube.

3. *Soymida*

1b. Leaves serrate or crenate. Fruit a drupe. Seeds not winged:

3a. Flowers white. Drupes 1-loculate, 1-seeded.

1. *Azadirachta*

3b. Flowers lilac. Drupes 5-loculate, each locule 1-seeded.

2. *Melia*

1. AZADIRACHTA A. JUSS.

Azadirachta indica A. Juss. in Mem. Mus. Hist. Nat. Paris 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. India 1: 544. 1875; Duthie, Fl. Gangetic Plain 1: 150. 1903. "Neem" (Hindi).

Tall, evergreen trees, 10-20 m high, with light black, slightly longitudinally furrowed bark. Leaves 15-40 cm long; leaflets 7-17, 4-8 × 1.5-2.0 cm, falcate, ovate-lanceolate, glabrous. Flowers in 10-22 cm long panicles, axillary or on old branches. Drupes ovoid-oblong, smooth, yellow. Seeds ellipsoid, glabrous, hard.

Fl & Fr. : December - May.

Common in wastelands, rarely found in the forests, usually planted along the roads and near habitations.

Selected specimens : Banswara: Loharia R.F., Singh 4243 (BSJO); Churu. Near Ratangarh, Roy 2599 (BSJO); Jhalawar: Dug, Verma 3535 (BSA); Jodhpur: Balsamand, Verma 602 (BSJO); Pali: Ranakpur R.F., Pandey 4135 (BSJO); Sirohi: Near Delwara temple, Kaul & Party 9578 (LWG); Tonk: Near Uniyara, Pandey 4730 (BSJO).

2. MELIA L.

Melia azedarach L. Sp. Pl. 384. 1753; Hiern in Hook.f. Fl. Brit. India 1: 544. 1875; Duthie, Fl. Gangetic Plain 1: 151. 1903. "Bakain" (Hindi).

Tall, deciduous trees, 5-10 m high. Leaves 1-3 pinnate; leaflets 3-13, subsessile, 1.5-6.5 × 1-2 cm, ovate-lanceolate, acuminate, glabrous. Flowers in axillary panicles. Drupes ellipsoid-oblong, yellow, 4 to 5-seeded.

Fl & Fr. : Nearly all round the year.

Rarely found in wastelands; usually planted along the roads.

Selected specimens : Banswara: Parodli village, *Singh* 2954 (BSJO); Ganganagar: Ramawali, *Roy* 4943 (BSJO); Kota: Mangrol, *Wadhwa* 9367 (BSA); Sawaimadhopur: Mahuva, *Saran & Party* 41919 (LWG); Udaipur: Dabok Vigyan Mandir, *Ghamawat* A. No. 58967 (LWG).

3. SOYMIDA A. JUSS.

Soymida febrifuga (Roxb.) A. Juss. Mem. Mus. Hist. Nat. Paris 19: 251, t. 22, f. 26. 1830; Hiern in Hook.f. Fl. Brit. India 1: 567. 1875; Duthie, Fl. Gangetic Plain 1: 153. 1903 *Swietenia febrifuga* Roxb. Pl. Cor. 1: 18, t. 17. 1795. "Rohan" (Hindi).

rough bark exfoliating into large stripes or scales. Leaves crowded at the end of branches, 20-50 cm long; leaflets sessile or subsessile, 7-13, 3-16 × 1-12 cm, elliptic or oblong, coriaceous. Flowers in 15-30 cm long, axillary and terminal panicles, greenish-white. Capsules ovoid, woody, reddish-purple.

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

Occasionally found in the mixed deciduous forests on the hill-slopes of Aravalli and its outliers.

Selected specimens : Chittorgarh: Pratapgarh. *Verma* 259 (BSA); Kota: Shahabad, *Singh* 91038 (LWG). Also reported from Udaipur (*Vyas*, 1965).

4. TOONA ROEM.

Toona ciliata Roem. Syn. Hesper. 139. 1846. *Cedrela toona* Roxb. ex Rottf. & Willd. in Ges. Naturf. Fr. Neue Schr. 2: 198. 1803; Wight, Ic. 1: t. 161. 1839; Hiern in Hook.f. Fl. Brit. India 1: 568. 1875; Duthie, Fl. Gangetic Plain 1: 153. 1903. "Toon" (Hindi).

Tall, deciduous trees, 15-20 m high. Leaves 1-pinnate; leaflets 4-15 pairs, 6-9 × 1.5-3.0 cm, ovate-lanceolate, acuminate, entire. Flowers in drooping panicles, white, scented. Capsules oblong. Seeds winged at both ends.

Fl. & Fr. : Summer season.

Rare, in mixed deciduous forests in Eastern Rajasthan.

Selected specimens : Kota: Shahabad, *Singh* 74756 (LWG); Sirohi: Mt. Abu, *Jain* 62153 (BSA). Also reported from Ajmer (*Sharma*, 1958), Alwar (*Vyas*, 1967), Sikar (*Nair & Nathawat*, 1957) and Udaipur (*Raizada*, 1954).

CULTIVATED SPECIES

Aglaia odoratissima Blume Reported from Mt. Abu (Jain, 1961); perhaps planted. According to Cooke, the distribution of this species is India (W. Peninsula), Sri Lanka, Burma, Singapore, Java, Sumatra.

Chikrassia tabularis A. Juss. Large trees. Leaves pinnate; leaflets alternate to sub-opposite, with upper surface shining and lower pale yellow. Rare, planted along road-sides, in public gardens, lawns and squares.

Swietenia mahagoni Jacq. "Maha Neem" (Hindi)-Evergreen tree. Leaves paripinnate; leaflets obliquely ovate or lanceolate, entire, glabrous. Flowers in axillary panicles, greenish yellow. Native of West Indies; planted in the forest nurseries.

39. CELASTRACEAE

(P.J. Parmar)

1a. Leaves alternate. Fruit a capsule. Seeds arillate:

2a. Unarmed shrubby climbers. Inflorescence paniculate or raceme. Ovary free from disc.

2. *Celastrus*

2b. Usually armed shrubs or small trees. Inflorescence a cyme. Ovary confluent with disc.

3. *Maytenus*

1b. Leaves opposite or subopposite. Fruit a drupe. Seeds not arillate.

1. *Cassine*

1. CASSINE L.

Cassine glauca (Rottb.) Kuntze, Rev. Gen. Pl. 1: 114. 1891. *Mangifera glauca* Rottb. Nye Saml. Kongel. Norske Vidensk. Selsk. Skr. 2: 534. t. 4. f. 1. 1783. *Elaeodendron glaucum* (Rottb.) Pers. Syn. Pl. 1: 241. 1805; Lawson in Hook.f. Fl. Brit. India 1: 623. 1875; Duthie, Fl. Gangetic Plain 1: 160. 1903. *E. roxburghii* Wt. & Arn. Prodr. 157. 1834.

Tall trees, 5-10 m high; bark grey or blackish-brown, rough, longitudinally fissured. Leaves 6-15 × 3.6-6.5 cm, orbicular-elliptic, acuminate with acumen often folded, membranous or subcoriaceous. Flowers numerous, minute, in axillary or extra-axillary, paniculate cymes, greenish-yellow. Drupes obovoid, apiculate, glabrous, 1-seeded.

Fl & Fr. : September - November.

Occasional, in deciduous forests of central and southern Rajasthan

Selected specimens : Dungarpur: Verma 150 (BSA); Jhalawar: Bijliya

Bhadak, *Wadhwa* 7588 (BSA); Kota; Shahabad, *Majumdar* 13135, 10467 (BSA). Also reported from Ajmer (Sharma, 1958)

2. CELASTRUS L.

Flowers in long terminal pendulous panicles; style not lobed. 1. *C. paniculatus*
Flowers in short axillary or terminal racemes; style 3-lobed. 2. *C. stylosa*

1. *Celastrus paniculata* Willd. Sp. Pl. 1: 1125. 1797; Wight, Ic. 1: t. 158. 1839; Lawson in Hook.f. Fl. Brit. India 1: 617. 1875; Duthie, Fl. Gangetic Plain 1: 158. 1903.

Deciduous, shrubby climbers, with warty-lenticellate bark. Leaves 3.5-12.0 × 2-7 cm, ovate or elliptic, crenulate. Flowers in 7-20 cm long, terminal and axillary racemes, greenish-yellow. Capsules subglobose or ovoid, deep red or orange when ripe. Seeds 4-6, ovoid, ribbed, brown.

Fl : April - June; *Fr* : May - November.

Common in dry deciduous forests, particularly in the east of Aravalli.

Selected specimens : Banswara: Badri, *Kanodia* 75415 (BSI); Jhalawar: Dug, *Verma* 3533 (BSA); Sikar: Lohargal, *Jain* 873 (BSI); Sirohi: Mt. Abu, *Jain* 5426 (BSI); Abu hills, *McCann* 1856 (BLAT); Udaipur: Deogarh, *Verma* 294 (BSA).

2. *Celastrus stylosa* Wall. in Roxb. Fl. Ind. 2: 401. 1832; Lawson in Hook.f. Fl. Brit. India 1: 618. 1875; Duthie, Fl. Gangetic Plain 1: 159. 1903.

Climbing, unarmed shrubs. Leaves 5.5-10.0 cm long, elliptic or ovate-oblong, acute or sub-acuminate, serrate. Flowers in short, axillary or terminal racemose cymes. Capsules yellow, 3-celled, 3 to 6-seeded, crowned by the persistent style.

Fl & Fr : April - July.

Rare, in the forests.

Selected specimen : Sirohi: Mt. Abu, sunset point, *Mehta* 355 (JAC).

3. MAYTENUS MOLINA

Maytenus emarginatus (Willd.) Ding Hou in Van Steenis, Fl. Males. 6(1): 241. 1962. *Celastrus emarginatus* Willd. Sp. Pl. 1: 1128. 1798. *C. montana* Roth in Roem. & Schult. Syst. Veg. 5: 427. 1819; Wight, Ic. 2(1): 7. t. 382. 1840. *Gymnosporia montana* (Roth) Benth. Pl. Austr. 1: 400. 1863, *pro comb.*; Lawson in Hook.f. Fl. Brit. India 1: 621. 1875.

Celastrus senegalensis Duthie, Fl. Gangetic Plain 1: 159. 1903. "Malkangni" (Hindi).

Bushy thorny shrubs or small trees. Leaves 1.5-6.5 × 0.7-4.5 cm, obovate, emarginate, serrate. Flowers in 2.0-3.5 cm long, much branched cymes, creamy white. Capsules globose, glabrous, reddish-purple. Seeds glabrous, rugose, chestnut-brown.

Fl & Fr. : November - February.

Common in plains and on the low hills.

Selected specimens : Ajmer: Ajmer-Udaipur road, Kaul 8498 (LWG); Jaisalmer: Jain 40543 A (BSI); Kota: Shahabad, Majumdar & Mishra 10463 (BSA); Pali: Gurupratap Singh village, Shetty 1390 (BSJO); Sirohi: Vadakhoda, Jain 60474 (BSI); Tonk: Rajmahal, Shetty 452 (BSJO).

40. RHAMNACEAE

(R.P. Pandey)

Plants without prickles. Fruits winged.

1. *Ventilago*

Plants armed with sharp prickles. Fruits not winged.

2. *Ziziphus*

1. VENTILAGO GAERTN.

Ventilago denticulata Willd. Ges. Naturf. Fr. Neue Schr. 3: 417. 1801. *V. calyculata* Tulasne in Ann. Sc. Nat. ser. 4. 8: 124. 1857; Lawson in Hook.f. Fl. Brit. India 1: 631. 1875. *V. maderaspatana* Gaertn. var. *calyculata* King in Journ. As. Soc. Bengal 65 (2): 378. 1896; Duthie, Fl. Gangetic Plain 1: 162. 1903. "Kalibel" (Hindi).

Scandent or climbing shrubs with woody tendrils; younger parts pubescent. Leaves 5.0-12.5 × 2.5-5.5 cm, elliptic-oblong, oblique at base, acute or acuminate, entire or crenate. Flowers clustered in terminal and axillary panicles, greenish. Petals deflexed. Samaras globose, more than half embedded in the calyx-tube; wings 2.5-4.0 cm long, terminal, oblong or linear, flat, pubescent, terminated by the remains of the bifid style.

Fl : December - February; Fr. : February - April.

Occasionally found in the deciduous forests, particularly on the hill-slopes. Flowers produce an offensive odour.

Selected specimen : Bundi: Kota Dam, Singh 74408 (LWG).

2. ZIZIPHUS MILL.

1a Petals absent.

6. *Z. rugosa*

1b. Petals 5:

- 2a. Straggling or climbing shrubs. 5. *Z. oenoptia*
- 2b. Erect bushes, shrubs or trees:
- 3a. Styles 3, distinct. Fruits finely pubescent, woody, inedible, hard. 8. *Z. xylopyrus*
- 3b. Styles 2, connate or free above the middle. Fruits with fleshy edible pulp:
- 4a. Leaves glabrous on both surfaces. Usually unarmed trees. 1. *Z. glabrata*
- 4b. Leaves hairy - tomentose, atleast beneath. Armed trees or shrubs:
- 5a. Erect trees. Drupes more than 1.5 cm in diameter.
- 6a. Branches drooping. Leaves densely tomentose beneath. 3. *Z. mauritiana*
- 6b. Branches erect, spreading. Leaves slightly tomentose beneath or glabrescent. 2. *Z. hysudrica*
- 5b. Diffuse, much branched shrubs. Drupes less than 1.25 cm in diameter:
- 7a. Leaves truncate at the apex and glabrous on the upper surface. 7. *Z. truncata*
- 7b. Leaves rounded at the apex and more or less tomentose above. 4. *Z. nummularia*

1. *Ziziphus glabrata* Heyne ex Roth, Nov. Pl. Sp. 159, 1821; Lawson in Hook.f. Fl. Brit. India 1: 633, 1875; Wight, Ic. 1: t. 282, 1840. *Z. trinervis* Roxb. Fl. Ind. 1: 606, 1832, non Poir. 1813. "Bor" (Hindi).

Small, unarmed trees. Leaves 2.5-7.5 × 1.5-3.5 cm, elliptic, subobtusate, serrate, 3-nerved. Stipules filiform, caducous. Flowers in axillary peduncled cymes, greenish-yellow. Drupes c. 10 mm across, globose to obovoid, yellow when ripe.

Fl. : September - October; Fr. : December - January.

Not common, in W. Rajasthan.

Selected specimens : Jaisalmer: Salam Sagar, Tiwari 722 (BSJO); Jodhpur: Bhandari 533 (JAC); Sirohi: Mt. Abu, McCann 278 (BLAT).

2. *Ziziphus hysudrica* (Edgew.) Hole in Ind. For. 44: 505, 1918; Raizada in Journ. Ind. Bot. Soc. 14(4): 346, 1935 & Suppl. Duthie, Fl. Gangetic Plain 42, 1976. *Z. jujuba* Lam. var. *hysudricus* Edgew. in Journ. Linn. Soc. 6: 201, 1862; Lawson in Hook.f. Fl. Brit. India 1: 633, 1875. "Bor" (Hindi).

Medium-sized, evergreen trees; branches erect, not drooping, often spines wanting on older trees. Leaves 2-5 cm long, elliptic to broadly ovate or orbicular, rounded at both ends, 3-nerved. Flowers in axillary clusters or in axillary cymes, greenish yellow. Drupes 12-15 mm across, globose, fleshy, smooth, yellow or orange when ripe; stones 1-2 celled.

Fl & Fr. : September - December.

Rare, reported from Ajmer only.

Selected specimens : Ajmer, *Duthie* 6624, 6623 (DD).

3. *Ziziphus mauritiana* Lam. *Encycl.* 3: 319. 1789; Mahesh. *Illus. Fl. Delhi* f. 44. 1966. *Z. jujuba* Lam. *Lc.* 3: 318. 1789, non Miller 1768; Lawson in *Hook.f. Fl. Brit. India* 1: 632. 1875; *Duthie, Fl. Gangetic Plain* 1: 163. 1903. "*Bor, Bara bor, Pemji bor*" (Hindi).

Evergreen, much-branched trees or large shrubs; branches downy when young. Leaves 2.5-7.0 × 1.5-4.0 cm, ovate-elliptic to suborbicular-ovate, rounded at both the ends, oblique at the base, denticulate, glabrous above and dense whitish tomentose beneath, strongly 3-nerved from the base; petioles upto 1.5 cm long; prickles in pairs, one straight, the other recurved. Flowers in axillary clusters or in short peduncled cymes, greenish yellow. Drupes 1.2-1.5 (-3.5) cm across, globose to ovoid, fleshy, smooth, yellow or orange when ripe, edible. Stones 1-2 celled.

Fl & Fr. : September - February.

Very common in wastelands, scrub forests and on the outskirts of deciduous forests.

Selected specimens : Banswara: Near Ghatol, *Singh* 3696 (BSJO); Bikaner: Bichwal farm, *Roy* 1670 (BSJO); Kota: Sitabari, *Wadhwa* 9304 (BSA); Pali: Ghanerao, *Shetye* 1897 (BSJO); Tonk: Near Tordi sagar, *Shetty* 1102 (BSJO); Sirohi: Mt. Abu, *Jain* 5637, 5644 (BSI).

Notes : This plant is highly polymorphic as regard to its habit, shape and size of leaves and fruits. Large numbers of cultivated hybrids have been developed from this species.

4. *Ziziphus nummularia* (Burm.f.) *Wight & Arn. Prodr.* 162. 1834; Lawson in *Hook.f. Fl. Brit. India* 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. Gangetic Plain* 1: 164. 1903. "*Jhar bor, Bordi, Pala Bor*" (Hindi).

Much-branched, thorny, erect or straggling bushy shrubs; branches zigzag; bark ashy-grey. Leaves 1.0-1.75 × 0.75-1.5 cm, orbicular or ovate,

rounded at both the ends, more or less tomentose above, densely woolly beneath; stipular spines paired, one slender, straight, as long as the leaves, the other one smaller and recurved. Flowers in axillary, sessile, pubescent cymes, greenish-yellow. Drupes 0.75-1.0 cm across, globose, glabrous, red when ripe, edible.

Fl. : August - October; *Fr.* : October - January.

Very common in sandy to gravelly soils in the wastelands and outskirts of forests. Often forms pure associations.

Selected specimens : Banswara: Ghatol, *Singh* 2949 (BSJO); Ganganagar: Kota R.F., *Roy* 5049 (BSJO); Jaisalmer: Devikot, *Shetty* 3366 (BSJO); Pali: Sardar Samand, *Shetty* 235 (BSJO); Kota: *Majumdar* 12412 (BSA); Jaipur: Daosa, *Wadhwa* 8239 (BSA); Sirohi: *Puri* 56540, 56686 (BSI).

5. *Ziziphus oenopia* (L.) Miller, Gard. Dict. ed. 8. no. 3. 1768; Lawson in Hook.f. Fl. Brit. India 1: 634. 1875; Duthie, Fl. Gangetic Plain 1: 164. 1903. *Rhamnus oenopia* L. Sp. Pl. 194. 1753. "Ber" (Hindi).

Thorny, straggling or climbing shrubs; younger branches rusty-tomentose. Leaves 2.5-5.0 × 1.5-2.0 cm, ovate or ovate-lanceolate, base oblique, acute at apex, entire or minutely serrate, pubescent or glabrous above, silky appressed hairy beneath. Stipular spines solitary, rarely paired, tomentose at the base. Flowers fascicled in axillary, pubescent cymes, greenish-yellow. Drupes 0.75 cm across, obovoid to globose, black, shining.

Fl. : August - September; *Fr.* : October - December.

Common in S.E. Rajasthan, particularly in open forests and wastelands among bushes and shrubs in association with *Abutilon indicum* (L.) Sweet and *Flacourtia indica* (Burm.f.) Merr. Fruits mostly not eaten.

Selected specimens : Jhalawar: Lotia-Jhir, *Wadhwa* 5380 (BSA); Kota: Atru, *Singh* 90194 (LWG); Shahabad, *Majumdar* 3219 (BSA), *Verma* 748 (CAL), *Jain* 28812 (BSI).

6. *Ziziphus rugosa* Lam. Encycl. 3: 319. 1789; Lawson in Hook.f. Fl. Brit. India 1: 636. 1875; Duthie, Fl. Gangetic Plain 1: 165. 1903; Wight, Ic. 2 (1): 2. t. 339. 1840. "Ber" (Hindi).

Armed, scandent shrubs, rarely small trees; younger branches, inflorescence and under surface of the leaves densely tomentose. Leaves 5.5-15.0 × 3.0-10.5 cm, broadly elliptic or ovate-oblong, glabrous above, oblique or cordate at the base, 3 to 4-nerved at the base. Flowers in axillary

and terminal, long panicles, greenish-yellow or creamish-yellow. Drupes 0.5-1.0 cm across, globose or pyriform, edible.

Fl. : December - March; *Fr.* : February - April.

Not common; found in open forests and wastelands.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 9308 (BLAT), *Jain* 5327, 62137 (BSI). Also reported from Jaipur (Bajpai & Verma, 1964) and Jhunjhuna (Joshi, 1957; Nair, 1956).

7. *Ziziphus truncata* Blatt. & Halib. in Journ. Bombay Nat. Hist. Soc. 26(1): 234. 1918. "Boti" (Hindi).

Small shrubs, with divaricate branches; younger parts downy. Leaves upto 3.5 × 3.0 cm, orbiculate, somewhat longer than broad, subcordate, serrulate, coriaceous, 3-nerved from the base. Stipular prickles 2, tomentose at the base, one shorter and straight, the other longer and recurved. Flowers in short axillary cymes, greenish yellow. Drupes c. 0.75 cm across, globose, glabrous, yellow when ripe.

Fl. & Fr. : October - January.

Endemic to N.W. Rajasthan desert.

Selected specimens : Jaisalmer: Amarsagar, *Puri* 21916 (BSI); Jodhpur: Balsamand, *Jain* 40248 (BSI), *Bhandari* 747, 748, 783 (JAC).

8. *Ziziphus xylopyrus* (Retz.) Willd. Sp. Pl. 1: 1104. 1797; Lawson in Hook.f. Fl. Brit. India 1: 634. 1875; Duthie, Fl. Gangetic Plain 1: 165. 1903. *Rhamnus xylopyrus* Retz. obs. Bot. 2: 11. 1781. "Gat-Bor" (Hindi).

Erect trees, upto 4.5 m high or straggling shrubs; younger parts covered with grey tomentum. Leaves 3.5-8.0 × 3.0-5.5 cm, elliptic-oblong, ovate-oblong or suborbicular, mucronate, base oblique, crenate-serrate, 3-nerved, glabrous above, tomentose beneath. Stipular prickles paired, one erect the other hooked, rarely absent. Flowers in axillary cymes or paniculate cymes, greenish-yellow. Drupes 2.0-2.5 cm across, globose, covered with dense, grey tomentum.

Fl. : October - November, *Fr.* : December - January.

Occasionally found in mixed deciduous forests at low altitude and in wastelands.

Selected specimens : Banswara: Loharia forest, *Singh* 3015 (BSJO); Jaipur: Charan Mandir, *Sharma* 330 (RUBL); Jhalawar: *Sharma* 169 (RUBL); Jodhpur: *Kisti* 23047 (BSI); Sawaimadhopur: *Jain* 18870 (BSI); Sirohi: Mt. Abu, *Rao* 66697, *Jain* 56984 (BSI), *McCann* 225 (BLAT).

41. VITACEAE

(P.J. Parmar)

- 1a. Inflorescence tendril-bearing. 1. *Ampelocissus*
 1b. Inflorescence not tendril-bearing:
 2a. Leaves simple. Inflorescence leaf-opposed. Berries 1-seeded. 3. *Cissus*
 2b. Leaves trifoliolate. Inflorescence axillary or pseudo-terminal. Berries 2 to 4-seeded. 2. *Cayratia*

1. AMPELOCISSUS PLANCH. *nom. cons.*

Ampelocissus latifolia (Roxb.) Planch. in Journ. Vigne Am. 374. 1884 et in DC. Monogr. Phan 5: 370. 1887. *Vitis latifolia* Roxb. Fl. Ind. 2: 474. 1824; Lawson in Hook. f. Fl. Brit. India 1: 652. 1875; Duthie, Fl. Gangetic Plain 1: 171. 1903. "Pani-bel, Musal, Bechuti" (Hindi).

Large climbers, with hollow, striate branches. Leaves long-petioled, 7.5-18.0 cm long, orbicular-cordate, 3 to 5-angled or lobed, serrate. Flowers small, in short, compact, pyramidal thyrsoid cymes, reddish-brown. Berries globose, black, 2-seeded. Seeds ellipsoid, margins crenate.

Fl. : May - July; *Fr.* : July - September.

Common in the east of Aravalli among hedges and as forest undergrowth.

Selected specimens : Alwar: on the way to Balafort, Lal & Party 34430 (LWG); Banswara: Ghatol, Kanodia 75531 (BSI); Bhilwara: Amarpura, Singh 6230 (BSIO); Kota: Sitabari, Wadhwa 9314 (RSA); Sawaimadhopur: Jain 18845 (BSI); Udaipur: Cheeka Ghat, Ghamawat 173/Bot (LWG).

2. CAYRATIA A. L. JUSS. *nom. cons.*

Cayratia trifolia (L.) Domin in Biblioth. Bot. 89: 371. 1927. *Vitis trifolia* L. Sp. Pl. 203. 1753; Duthie, Fl. Gangetic Plain 1: 174. 1903. *Cissus carnosâ* Lam. Encycl. 1: 31. 1789. *Vitis carnosâ* (Lam.) Wight & Arn. Prodr. 127. 1834; Wight, Ic. 1: t. 171. 1839; Lawson in Hook. f. Fl. Brit. India 1: 654. 1875. *Cayratia carnosâ* (Lam.) Gagnep. in Not. Syst. 1: 347. 1911. 'Char' (Hindi).

Slender, herbaceous climbers, somewhat woody at base. Leaflets ovate-elliptic or obovate, thinly pubescent, glaucous green. Flowers in 4-6 cm broad, branched cymes, greenish white. Berries obovoid-globose, shining, dark-purple to black.

Fl. : July - September; *Fr.* : September - December.

Common in wastelands, outskirts of forests, boundaries of fields and gardens.

Selected specimens : Alwar: Sariska, *Singh* Acc. No. 12787 (RUBL); Dungarpur: Forest office, *Kanodia* 82094 (BSI); Jhalawar: Bijliya Bhadak, *Wadhwa* 5354 (BSA); Pali: Sarandana village, *Shetty* 1788 (BSJO); Sirohi: Mt. Abu, *Blatter* 19606 (BLAT); Tonk: Near Rajmahal R.F., *Shetty* 1106 (BSJO).

3. CISSUS L.

Cissus repanda Vahl, *Symb. Bot.* 3: 18. 1794. *Vitis repanda* (Vahl) *Wight & Arn. Prodr.* 125. 1834; Lawson in *Hook. f. Fl. Brit. India* 1: 648. 1875; Duthie, *Fl. Gangetic Plain* 1: 173. 1903. '*Bhansatat*' (Hindi).

Large, woody climbers with fissured, corky bark and vinaceous-purple stem and branches. Tendrils with flattened disc. Leaves pubescent above, silky tomentose beneath. Flowers in umbel-like clusters, pedicelled, pink. Berries tipped by mucronate style, 1-seeded.

Fl. : May - June; *Fr.* : June - August.

Occasional, in deciduous forests, particularly in the east of Aravallis.

Selected specimens : Chittorgarh: Pratapgarh, *Verma* 260 (BSA); Pali: Manpura block (Malgarh), *Pandey* 4155 (BSJO); Sirohi: Mt. Abu, *McCann* 1904 (BLAT); Udaipur: Cheeka Ghat, *Ghamawat* 172/Bot, Acc. No. 53152 (LWG).

DOUBTFUL TAXON

Cissus heyneana Planch. in *DC. Monogr. Phan.* 5: 476. 1887. *Vitis heyneana* Wall. ex *Wight & Arn.* 125. 1834, non R. & S. 1819; Lawson in *Hook. f. Fl. Brit. India* 1: 647. 1875.

Coarse climbers, with thick fleshy stems and ovate-cordate, scarcely serrate, pale-green, polar-like leaves. Fruiting pedicels clavate. Berries globose at the top. Seeds smooth on the faces.

It has been reported from Sikar (Ratnam, 1951), but its distribution is only in South India i.e. W. Ghats, from Nilgiris to Pulneys and the hills of Travancore at low levels (Gamble, 1935). The presence of this species in Rajasthan is, therefore, doubtful.

CULTIVATED SPECIES

Vitis vinifera L. '*Angoor*' (Hindi) Large, woody climbers, with bifid tendrils. Flowers green, on slender pedicels, arranged in umbel-like cymes

which form large pyramidal compound panicles. Cultivated for its highly valued edible fruits.

42. LEEACEAE

(R.P. Pandey)

LEEAE L. *nom. cons.*

Herbs or undershrubs. Leaves uni or rarely 2-pinnate; leaflets scabrous above, with close and parallel primary nerves.

1. *L. edgeworthii*

Shrubs. Leaves 3 or rarely 2-pinnate; leaflets glabrous, with distant primary nerves.

2. *L. indica*

1. *Leea edgeworthii* Sant. in Rec. Bot. Surv. Ind. 16: 54. 1953. *L. aspera* Edgew. in Trans. Linn. Soc. 20: 36. 1841, non Wall. ex Roxb. 1832; Lawson in Hook. f. Fl. Brit. India 1: 665. 1875; Duthie, Fl. Gangetic Plain 1: 176. 1903.

Annual herbs or undershrubs, 1.0-1.5 m high; stem not winged. Tendrils absent. Leaves unipinnate, but lower ones sometimes bipinnate; leaflets 10-20 × 6-10 cm, ovate-oblong or elliptic-oblong, serrate, cordate or truncate at the base, acuminate. Flowers in dichotomous cymes, greenish. Calyx-lobes gland-tipped. Petals connate at the base. Anthers united to form a funnel. Berries 1.0-1.5 cm across, globose, purple when ripe, 3 to 6-celled.

Fl. & Fr. : August-November.

Common in the forests under the shade of trees.

Selected specimens: Banswara: Bagaycha forest, Singh 3781 (BSJO); Kota: Kelwara, Jain 29123 (BSI); Pali: Neer Paras Ram Mahadev temple, Shetty 1929 (BSJO). Kota: Kelwara, Jain 29123 (BSI).

2. *Leea indica* (N. Burman) Merrill in Philipp. Journ. Sci. 14: 245. 1919; Ridsdale in Blumea 22: 95. 1974. *Staphylea indica* N. Burman, Fl. Ind. 75. t. 23. f. 2. 1768. *Aquilicia sambucina* L. Mant. Alt. 211. 1771, *nom. illegit.* *Leea sambucina* (L.) Willd. Sp. Pl. 1: 1177. 1798, *nom. illegit.*; Lawson in Hook. f. Fl. Brit. India 1: 666. 1875; Duthie, Fl. Gangetic Plain 1: 176. 1903. *L. staphylea* Roxb. Fl. Ind. 1: 658. 1832; Wight, Ic. 1: t. 78. 1838.

Herbaceous shrubs. Tendrils absent. Leaflets 6-17 × 3-6 cm, ovate or oblong-lanceolate, serrate, truncate-cordate at the base, acute or acuminate. Flowers in large, corymbose cymes, greenish white. Petals connate at the

base. Anthers united to form a funnel. Berries c. 6 mm across, depressed globose, 2 to 6-lobed, smooth, purple black, 3 to 6-celled.

Fl & Fr. : July - November.

Occasional, in the forests in shady habitats.

Selected specimens : Banswara: Kushalgarh, *Kanodia* 75692 (BSI); Sirohi: Mt. Abu, *Jain* 46730 (BSI).

43. SAPINDACEAE

(P.J. Parmar)

1a. Petals present:

2a. Herbaceous climbers. Leaves bi(-tri) ternate.

1. *Cardiospermum*

2b. Trees. Leaves pinnate.

2. *Sapindus*

1b. Petals absent.

3. *Schleichera*

1. CARDIOSPERMUM L.

Cardiospermum halicacabum L. Sp. Pl. 366. 1753; Wight, Ic. 2(2): 8. t. 508. 1841; Hiern in Hook.f. Fl. Brit. India 1: 670. 1875; Duthie, Fl. Gangetic Plain 1: 178. 1903; Mahesh. Illus. Fl. Delhi f. 47. 1966. '*Chirphuta, Kanphusa*' (Hindi).

Slender, glabrous or sparsely hairy herbs, with stiff, axillary, 3-fid tendrils. Leaves alternate, 0.6-7.5 × 0.3-1.6 cm, ovate, ovate-lanceolate or elliptic, glabrous or sparsely hairy. Flowers minute, in terminal cymes on the tendrils, white. Capsules winged. Seeds globose, smooth, black, arillate.

Fl & Fr. : August - January.

Common among hedges, clumps of trees and shrubs in wastelands and forests.

Selected specimens : Alwar: to Siliserh, *Lal* 34525 (LWG); Banswara: Hindolia, *Singh* 3051 (BSJO); Barmer: Junapathrasar, *Tiwari* 1190 (BSJO); Bundi: Zardapur, *Kaul* 5403 (LWG); Pali: Ghanerao R.F., *Shetty* 1893 (BSJO); Sirohi: Mt. Abu, *Rao* 66510 (BSI).

2. SAPINDUS L.

Leaves c. 17 cm long; leaflets elliptic-ovate, obtuse or emarginate.

Petals with 2 woolly scales.

1. *S. emarginatus*

Leaves c. 30 cm long; leaflets elliptic-lanceolate, acute. Petals without scales.

2. *S. laurifolius*

1. *Sapindus emarginatus* Vahl, Symb. Bot. 3: 54. 1794. *S. laurifolius* Vahl var. *emarginatus* (Vahl) Cooke, Fl. Bombay 1: 267. 1902. *S. trifolius auct.* non L. 1753; Hiern in Hook.f. Fl. Brit. India 1: 682. 1875, *pro parte*. *S. laurifolius auct.* non Vahl, 1794; Duthie, Fl. Gangetic Plain 1: 180. 1903, *pro parte*.

Tall trees, with longitudinally fissured, rough, brown bark. Leaflets 5-7, 5-13 × 3-5 cm, dull and hairy on nerves above, pubescent beneath. Flowers in terminal panicles, white. Petals glabrous within, except for a few hairs on claw. Fruits of 3 drupelets, connate for half of their length, sparsely hairy.

Fl. : September - December; *Fr.* : November - December.

Rare, in deciduous forests; occasionally planted along the roads and in the gardens.

Selected specimens : Jaipur: Amer, Sharma 1092 (RUBL); Ramgarh, Sharma 1962 (RUBL); Jhalawar: Khanpura, Wadhwa 6902 (BSA); Jodhpur: Balsamand, Singh 4490 (BSJO). Also reported from Ajmer (Sharma, 1958), Alwar (Vyas, 1967), Sirohi (Jain, 1961) and Udaipur (Vyas, 1965).

2. *Sapindus laurifolius* Vahl, Symb. Bot. 3: 54. 1794; Duthie, Fl. Gangetic Plain 1: 180. 1903, *pro parte* (excl. syn. *S. emarginatus* Vahl). *S. trifolius auct.* non L. 1753; Hiern in Hook.f. Fl. Brit. India 1: 682. 1875, *pro parte*. "Ritha" (Hindi).

Large trees, 5-10 m high, with brown, longitudinally fissured bark. Leaflets shortly petiolulate, 5-13 × 3-5 cm, shining above, sparsely hairy beneath. Flowers in 9-12 cm long, terminal, rusty brown-tomentose panicles, white. Petals softly hairy within. Fruits 2 to 3-lobed, rufous-velvety, atleast when young.

Fl. : September - December; *Fr.* : November - March.

Common, planted particularly in the east of Aravalli along the roads.

Selected specimens : Banswara: Kushalgarh, Singh 3767 (BSJO); Bundi: Zardapur, Kaul & Party 5402 (LWG); Pali: Piproli R.F., Shetty 1505 (BSJO); Sirohi: Mt. Abu, McCann 285 (BLAT); Udaipur: Chhapli, Kanodia 82525 (BSI).

3. SCHLEICHERA WILLD. *nom. cons.*

Schleichera oleosa (Lour.) Oken. Alleg. Naturg. 3(2): 1341. 1841. *Pistacia oleosa* Lour. Fl. Cochinch. 615. 1790. *Schleichera trijuga* Willd.

Sp. Pl. 4: 1096. 1805; Hieron in Hook.f. Fl. Brit. India 1: 681. 1875; Duthie, Fl. Gangetic Plain 1: 179. 1903. "*Kusum*" (Hindi).

Tall, deciduous trees, 10-15 m high, with smooth, grey bark. Leaves 6-20 cm long; leaflets in 2-4 pairs, 4.30 × 2.11 cm, elliptic, elliptic-lanceolate or elliptic-oblong, glabrous. Flowers in 6-12 cm long, axillary or extra-axillary, interrupted racemes or panicles, creamy white or pale yellow. Fruits ovoid, glabrous, dark-brown. Seeds oblong, smooth, glabrous.

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

Rare, in evergreen forests in S.E. Rajasthan; often planted in gardens.

Selected specimens : Kota: Kunda Khoh (Shahabad), Verma 801 (BSA); Sitabari, Singh 74095 (LWG).

CULTIVATED SPECIES

***Dodonaea viscosa* (L.) Jacq. (*Ptelea viscosa* L.) 'Vilayati-mehndi'** (Hindi)-Tall, evergreen shrubs, 1-2 m high, with erect, twiggy, often angled branches. Leaves sub-sessile, glabrous. Flowers few, in axillary cymes, greenish yellow. Capsules membranous, winged. Commonly planted in the gardens as a hedge plant.

44. ANACARDIACEAE

(P.J. Parmar)

1a. Leaves pinnate:

2a. Plants armed. Leaflets 3, coarsely serrate. 4. *Rhus*

2b. Plants unarmed. Leaflets usually 7, entire. 2. *Lannea*

1b. Leaves simple:

3a. Flowers bisexual. Stamens 10. 1. *Buchanania*

3b. Flowers polygamous or dioecious. Stamens 1-6:

4a. Flowers polygamous. Stamen and style one. Fruit a drupe. 3. *Mangifera*

4b. Flowers dioecious. Stamens 5-6. Styles 3. Fruit a nut. 5. *Semecarpus*

1. BUCHANANIA SPRENG.

***Buchanania lanzan* Spreng.** in Schrad. Journ. Bot. 2: 234. 1800. *B. latifolia* Roxb. Fl. Ind. 2: 385. 1832; Hook.f. Fl. Brit. India 2: 23. 1876; Duthie, Fl. Gangetic Plain 1: 185. 1903. "*Chiraunji*" (Hindi).

Tall trees, 10-15 m high, with straight trunk and rough, blackish brown bark. Leaves 9-30 × 3.5-11.0 cm, elliptic-oblong, glabrous above, silky pubescent or villous beneath. Flowers in terminal and axillary, pubescent, pyramidal panicles, greenish white. Drupes obliquely lentiform, smooth, one-seeded, chestnut-brown.

Fl. & Fr. : December - April.

Common in deciduous forests in south and south-east Rajasthan.

Selected specimens : Jhalawar: Malanwasa, *Wadhwa* 9592 (BSA); Manoharhana, *Verma* 3467 (BSA); Kota: Balachar, *Wadhwa & Prasad* 9251 (BSA). Also reported from Sirohi (Jain, 1961) and Udaipur (Vyas, 1965).

2. LANNEA A. RICH. *nom. cons.*

Lannea coromandelica (Houtt.) Merrill in Journ. Arn. Arb. 19: 353. 1939. *Dialium coromandelicum* Houtt. Nat. Hist. ser. 2. 2: 39. t. 5. f. 2. 1774. *Odina wodier* Roxb. Fl. Ind. 2: 293. 1832; Wight, Ic. 1: t. 60. 1838; Hook.f. Fl. Brit. India 2: 29. 1876; Duthie, Fl. Gangetic Plain 1: 188. 1903. "Jhingan" (Hindi).

Tall trees, 10-15 m high, with smooth, ash-coloured bark. Leaves c. 28 cm long, crowded at the end of branches; leaflets 5-11, 1.2-12.0 × 1-5 cm, ovate-oblong, acuminate, glabrous, membranous. Flowers minute, sessile, in panicles at the end of leafless branches, yellow, tinged with red. Drupes smooth, reniform, compressed, red.

Fl. : January - June; *Fr.* : February - July.

Common in deciduous forests in the east of Aravalli.

Selected specimens : Banswara: Loharia forest, *Singh* 4244 (BSJO); Kota: Shahabad, *Wadhwa* 9232 (BSA); Pali: Malgarh R.F., *Pandey* 4146 (BSJO); Sirohi: Mt. Abu, *Kanodia* 62190 (BSI); Tonk: Ghati R.F., *Pandey* 4812 (BSJO).

3. MANGIFERA L.

Mangifera indica L. Sp. Pl. 200. 1753; Hook.f. Fl. Brit. India 2: 13. 1876; Duthie, Fl. Gangetic Plain 1: 189. 1903. "Aam" (Hindi).

Tall, evergreen trees, 15-20 m high. Leaves 9-30 × 2.5-8.0 cm, oblong or oblong lanceolate, acute, entire, the margins often undulate. Flowers small, numerous, in long, terminal panicles, yellowish green. Drupes variable in size, fleshy, subovoid or obliquely pyriform, yellow to reddish-yellow when ripe. Seeds oblong, glabrous, smooth.

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

Indigenous in evergreen forests in S.E. Rajasthan and at Mt. Abu usually planted in the orchards, along the roads etc. for its edible fruits.

Selected specimens : Banswara: Ghatol, *Singh* 4208 (BSJO); Bhilwara: Mejadam, *Singh* 7121 (BSJO); Jaisalmer: Barabagh, *Shetty* 4112 (BSJO); Jhalawar: *Sharma* 620 (RUBL); Sawaimadhopur: *Jain* 18863 (BSI); Sirohi: Mt. Abu, *Jain* 5450 (BSI).

4. RHUS L.

Rhus mysurensis G. Don, Gen. Syst. 2: 74. 1832; Heyne ex Wight & Arn. Prodr. 172. 1834; Hook.f. Fl. Brit. India 2: 9. 1876; Duthie, Fl. Gangetic Plain 1: 186. 1903; Mahesh. illus. Fl. Delhi f. 48. 1966. "Darsan" (Hindi).

Small trees or large shrubs. Leaves 3-foliolate; leaflets obovate, cuneate, sinuate-toothed or lobed, softly pubescent; terminal leaflet shortly petiolulate, 2.5-4.0 cm long; lateral ones sessile, sometimes very small. Flowers small, polygamous, in terminal and axillary panicles. Drupes subglobose, small, glabrous, brown.

Fl. : June - August; *Fr.* : July - October.

Common in rocky habitats of deciduous forests in the east of Aravalli

Selected specimens : Alwar: *Kaul* 18648 (LWG); Barmer: between Siv and Gadra road, *Bhandari* 414 (JAC); Bhilwara: Bhojpura, *Singh* 6290 (BSJO); Jaipur: Jhalana Doongari, *Singh* A. No. 11307 (RUBL); Jhunjhunu: Ajit Sagar, *Kanodia* 454 (DD); Udaipur: near Bali, *Kaul* 8484 (LWG).

5. SEMECARPUS L. F.

Semecarpus anacardium L. f. Suppl. 182. 1781; Hook.f. Fl. Brit. India 2: 30. 1876; Duthie, Fl. Gangetic Plain 1: 188. 1903.

Tall, deciduous trees, with dark brown or almost black, rough bark exfoliating into large stripes or scales. Leaves 6.5-33.0 × 4.5-16.0 cm, obovate, oblong, rounded at the apex, coriaceous. Flowers in axillary and terminal panicles, greenish white. Nuts reniform, dark brown to black.

Fl. & Fr. : July - December.

This species is included on the authority of Jain (1961), who reported it from Mt. Abu.

45. MORINGACEAE

(R.P. Pandey)

MORINGA ADANS.

Leaves bipinnate; leaflets 1.5-3.0 × 0.75-1.5 cm; veins distinct. Petals with red streaks or reddish at base.

1. *M. concanensis*

Leaves tripinnate; leaflets 0.5-1.5 × 0.5-1.0 cm; veins obscure. Petals creamy yellow or white, without red streaks.

2. *M. oleifera*

1. *Moringa concanensis* Nimmo ex Dalz. & Gibs. Bombay Fl. 311. 1861; Hook.f. Fl. Brit. India 2: 45. 1876; Duthie, Fl. Gangetic Plain 1: 193. 1903. "*Sainjna*" (Hindi).

Large trees, 8-10 m tall, with rough, greyish-brown trunk. Leaves 25-50 cm long; leaflets 4-6 (-7) pairs and an odd one, broadly elliptic to suborbicular or obovate, glabrous. Flowers in lax panicles, creamy-white or yellow. Capsules acutely 3-quetrous, slightly constricted between the seeds. Seeds 3-winged.

Fl. & Fr. : Most part of the year.

Common in the forests, particularly on hills slopes and in wastelands.

Selected specimens : Churu: Gopalpura, Roy 2536 (BSJO); Jhalawar: Khanpur, Verma 6931 (BSA); Jaisalmer: Near Kuri, Shetty 6143 (BSJO); Pali: Piproli R.F., Pandey 4624 (BSJO); Tonk: Mayola forest-Bisalpura, Shetty 1082 (BSJO).

2. *Moringa oleifera* Lam. Encycl. Meth. Bot. 1: 398. 1785; *M. pterygosperma* Gaertn. Fruct. Sem. Pl. 2: 314. 1791; Hook.f. Fl. Brit. India 2: 45. 1876; Duthie, Fl. Gangetic Plain 1: 192. 1903. "*Sainjna*" (Hindi).

Medium-sized, soft-wooded trees; younger parts pubescent. Leaves upto 50-70 cm long; leaflets 5-9 pairs, 2.0-2.5 × 1.0-1.5 cm, obovate or elliptic-ovate, entire. Flowers in spreading, axillary panicles. Capsules 15-30 (-35) × 1.5-2.0 cm, 3-gonous, 9-ribbed, beaked. Seeds c. 2.5 cm long, globose, 3-angled, with 3 lateral wings which unite at the apex.

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

Mostly cultivated in the gardens and houses; occasionally found in wastelands in the vicinity of habitations. It is a fast growing trees and can be propagated by cuttings.

Selected specimens : Barmer: Piprum, Tiwari 1160 (BSJO); Jaipur: Sharma 403, 1086 (RUBL); Jaisalmer: Amarsagar, Blatter 6117 (BLAT);

Kota: Amar Niwas, Singh 90507 (LWG); Pali: Lunawus, Shetty 1465 (BSJO).

46. FABACEAE (PAPILIONACEAE *nom. alt.*)

(V. Singh)

1a. Stamens 1-adelphous:

2a. Pods jointed:

3a. Leaflets 1 or 3. Anthers uniform. Pods mucicous. 38. *Taverniera*

3b. Leaflets 2. Anthers dimorphic. Pods echinate or prickly. 46. *Zornia*

2b. Pods not jointed:

4a. Trees:

5a. Leaflets alternate:

6a. Anthers basifixed. Pods oblong or linear. 12. *Dalbergia*

6b. Anthers versatile. Pods suborbicular. 32. *Pterocarpus*

5b. Leaflets opposite:

7a. Vexillary stamen connate throughout with others; anthers basifixed. 27. *Millettia*

7b. Vexillary stamens free at base, connate with others in the middle; anthers versatile. 30. *Fongamia*

4b. Erect, prostrate or twining herbs or shrubs:

8a. Erect or prostrate herbs or shrubs. Flowers yellow:

9a. Flowers axillary, solitary. Pods always flattened. 20. *Gonolobus*

9b. Flowers in racemes. Pods turgid. 10. *Crotalaria*

8b. Herbaceous or woody twiners. Flowers not yellow:

10a. Stamens 9 only. 1. *Abrus*

10b. Stamens 10:

11a. Anthers uniform:

12a. Leaflets 5-7. Style bearded below the stigma. 9. *Citaria*

12b. Leaflets 3. Style not bearded below the stigma:

13a. Upper lip of calyx projecting. Pods glabrous, not constricted between the seeds. 8. *Canavalia*

13b. Upper lip of calyx not projecting. Pods bristly hairy, constricted between the seeds. 33. *Pueraria*

11b. Anthers dimorphic:

- 14a. Styles bearded. Pods continuous within. 10. *Crotalaria*
 14b. Styles not bearded. Pods septate between the seeds. 40. *Teramnus*

1b. Stamens 2-adelphous:

15a. Stamens in two bundles of 5 each:

- 16a. Leaves even-pinnate. Ripe pods included in the calyx. 37. *Smithia*
 16b. Leaves odd-pinnate. Ripe pods much exerted from the calyx:
 17a. Herbs or shrubs, never twiners. Pods jointed. 2. *Aeschynomene*
 17b. Trees or twining shrubs. Pods not jointed. 12. *Dalbergia*

15b. Stamens in two bundles of 9 + 1:

- 18a. Leaf-rachis or leaflets modified into tendrils:
 19a. Staminal tube truncate at the mouth. 22. *Lathyrus*
 19b. Staminal tube oblique at the mouth. 44. *Vicia*

18b. Leaf-rachis or leaflets not modified into tendrils, i.e. tendrils absent.

20a. Pods jointed:

- 21a. Trees. 29. *Ougeinia*

21b. Herbs or shrubs:

- 22a. Plants spiny. Leaves exstipellate. 3. *Alhagi*
 22b. Plants not spiny. Leaves stipellate:
 23a. Joints of pods folded on one another. 43. *Uraria*
 23b. Joints of pods not folded:
 24a. Joints of pods turgid, if compressed then corolla not or hardly exerted. 4. *Alysicarpus*
 24b. Joints of pods compressed. Corolla always much exerted. 13. *Desmodium*

20b. Pods not jointed:

25a. Small or large trees:

- 26a. Leaflets 5-7, exstipellate. 32. *Pterocarpus*
 26b. Leaflets 3, stipellate:
 27a. Armed trees. Petals very unequal in size. 17. *Erythrina*
 27b. Unarmed trees. Petals almost equal in size. 7. *Butea*

25b. Herbs, undershrubs, shrubs or twiners:

- 28a. Climbing or twining herbs or shrubs:
 29a. Leaves gland-dotted beneath:

- 30a. Pods 3 to many-seeded. 6. *Alysicur*
- 30b. Pods 1 to 2-seeded:
 - 31a. Calyx-teeth accrescent. Pods enclosed in the calyx. 11. *Cytisra*
 - 31b. Calyx-teeth not accrescent. Pods much exerted from the calyx. 34. *Rhynchosia*
- 29b. Leaves not gland-dotted beneath:
 - 32a. Styles bearded below the stigmas:
 - 33a. Petals almost equal in size:
 - 34a. Stigma terminal. 14. *Dolichos*
 - 34b. Stigma oblique. 45. *Vigna*
 - 33b. Petals very unequal in size. 9. *Clitorea*
 - 32b. Styles not bearded below the stigmas:
 - 35a. Petals very unequal in size. Anthers dimorphic. Pods clothed with brittle, irritant bristles. 28. *Mucuna*
 - 35b. Petals equal in size. Anthers uniform. Pods glabrescent to hairy, not bristly:
 - 36a. Leaflets 3:
 - 37a. Nodes of racemes tumid. Calyx-tube not gibbose:
 - 38a. Leaflets upto 8 cm long, membranous. Two upper calyx-teeth entirely fused into one. Pods 6 to 9-seeded. 19. *Galactia*
 - 38b. Leaflets more than 10 cm long, coriaceous. Two upper calyx-teeth connate, lower 3 free. Pods 1-seeded. 7. *Butea*
 - 37b. Nodes of racemes not tumid. Calyx-tube gibbose:
 - 39a. Calyx truncate; teeth obsolete. Standard auricled at the base. Styles flattened above the middle. 15. *Dumasia*
 - 39b. Calyx-teeth distinct. Standard not auricled at the base. Styles filiform throughout. 36. *Shuteria*
 - 36b. Leaflets more than 3:
 - 40a. Flowers in sessile heads. Pods arranged stellately, soon dehiscent. 5. *Astragalus*
 - 40b. Flowers in racemes. Pods not arranged stellately, late dehiscent or hardly dehiscent. 27. *Millettia*
- 28b. Erect or prostrate herbs, undershrubs or shrubs:

- 41a. Anthers apiculate. 21. *Indigofera*
- 41b. Anthers mucicous or obtuse:
- 42a. Leaves or leaflets entire:
- 43a. Leaflets stipellate:
- 44a. Leaflet 1. 16. *Eleonias*
- 44b. Leaflets 3 to many:
- 45a. Standard much longer than keel. Styles bearded. 9. *Citoria*
- 45b. Keel longer than standard. Styles not bearded. 24. *Macropitulum*
- 43b. Leaflets exstipellate:
- 46a. Pods 1 to 2-seeded:
- 47a. Leaflets gland-dotted beneath. 18. *Flemingia*
- 47b. Leaflets eglandular. 23. *Lespedeza*
- 46b. Pods 3 to many-seeded:
- 48a. Flowers in racemes or in peduncled to sessile heads; inflorescence axillary:
- 49a. Pods transversely septate between the seeds. 35. *Sesbania*
- 49b. Pods aseptate or not transversely septate between the seeds:
- 50a. Flowers in sessile, axillary heads. Pods 10 to 12-seeded. 50. *Astragalus*
- 50b. Flowers in pedunculate, axillary racemes. Pods 4 to 7-seeded. 6. *Atylosia*
- 48b. Flowers axillary or in leaf-opposed and/or terminal racemes. 39. *Tephrosia*
- 42b. Leaves or leaflets dentate, toothed or serrate:
- 51a. Leaves 1-foliolate, gland-dotted. Seeds adherent to the pericarp. 31. *Psoralea*
- 51b. Leaves 3-foliolate, not gland-dotted. Seeds not adherent to the pericarp:
- 52a. Stipules adnate to the petioles:
- 53a. Leaves digitately 3-foliolate. Flowers in axillary, condensed, head-like racemes. Petals persistent, adnate to the staminal tube. 41. *Trifolium*
- 53b. Leaves pinnately 3-foliolate. Flowers in lax, axillary racemes. Petals caducous, free from staminal tube. 26. *Melilotus*

- 52b. Stipules free lateral:
- 54a. Pods spirally twisted, echinate. 25. *Medicago*
- 54b. Pods linear or globose, not echinate:
- 55a. Pods globose or subglobose, 1 to 2-seeded:
- 56a. Flowers sessile, in axillary clusters. 42. *Trigonella*
- 56b. Flowers condensed at the end of axillary peduncles equalling the petioles. 25. *Medicago*
- 55b. Pods linear, straight or slightly curved, more than 2-seeded. 42. *Trigonella*

1. ABRUS ADANS.

- Pods 3 to 5-seeded. Seeds red, with a black blotch around the hilum. 2. *A. precatorius*
- Pods 5 to 10-seeded. Seeds dark brown to black, without a black blotch around the hilum. 1. *A. fruticulosus*

1. **Abrus fruticulosus** Wall. ex Wight & Arn. Prodr. 1: 236. 1834; Wight, Ic. 1: t. 33. 1838; Baker in Hook.f. Fl. Brit. India 2: 176. 1876. *A. pulchellus* Wall. ex Thw. Enum. Pl. Zeyl. 91. 1859; Baker in Hook.f. Lc. 2: 175. 1876; Duthie, Fl. Gangetic Plain 1: 262. 1903.

Deciduous twiners. Leaflets 9-15 pairs, stipellate, 1.5-4.0 × 0.7-1.3 cm, oblong, obtuse, mucronate, entire, glabrous or appressed hairy. Flowers pale-purple or violet at first, afterwards yellowish red, laxly fascicled on the nodes of racemes which are longer than leaves. Calyx appressed hairy; lobes very short. Pods sessile, 5-6 × 1.3 cm, strap-shaped, flat, incurved at the top, appressed hairy.

Fl. & Fr. : September - December.

Rare, in scrub forests, boundaries of fields and gardens among hedges. Included on the authority of Vyas (1965) from Udaipur.

2. **Abrus precatorius** L. Syst. Nat. ed. 12. 472. 1767; Baker in Hook.f. Fl. Brit. India 2: 175. 1876; Duthie, Fl. Gangetic Plain 1: 262. 1903; Mahesh. Illus. Fl. Delhi f. 71. 1966. "*Chirmi, Ratti, Sarmai*" (Hindi).

Deciduous, twining shrubs. Leaflets 10-20 pairs, 1.0-2.5 × 0.5-1.0 cm, oblong or obovate-oblong, apiculate, entire, appressed hairy. Flowers densely fascicled on swollen nodes of axillary racemes which are shorter than leaves, pink or white. Calyx appressed hairy; lobes short. Pods 2-5 × 1.5 cm, oblong, turgid, appressed hairy.

Fl. & Fr. : August - February.

Common among clumps of trees and shrubs in wastelands and forests.

Selected specimens : Banswara: Paloda, *Singh* 2816 (BSJO); Jaipur: Doasa, *Wadhwa* 8109 (BSA); Kota: Shahabad, *Verma* 792 (BSA); Sirohi: Mt. Abu, *Puri* 56974 (BSI); Tonk: Toda Rai Singh, *Shetty* 1302 (BSJO).

2. AESCHYNOMENE L.

Aeschynomene indica L. Sp. Pl. 713. 1753; Wight, Ic. 2(1): 9. t. 405. 1840; Baker in Hook. f. Fl. Brit. India 2: 151. 1876; Duthie, Fl. Gangetic Plain 1: 270. 1903. "Chhuimui" (Hindi).

Annual herbs, upto 1.5 m high. Stem and rachis of leaves warty. Leaves 2-8 cm long; leaflets alternate or subopposite, 21-71 pairs, 2-8 × 2-3 mm, linear-oblong, mucronate, entire, glabrous. Flowers in 1 to 4-flowered, axillary, viscid racemes, yellow. Calyx glabrous. Pods 3-4 cm long, straight, flat, mucronate, indented on the lower suture; joints 4-10. Seeds black.

Fl. & Fr. : August - November.

Common in low-lying areas, ponds and rice-fields. Rarely flowers are white.

Selected specimens : Banswara: Danpur, *Singh* 2987 (BSJO); Jaipur: Ramgarh, *Sharma* 1825 (RUBL); Jaisalmer: Devikot, *Tiwari* 866 (BSJO); Kota: Shahabad, *Verma* 703 (BSA); Sirohi: Mt. Abu, *Raizada* 20591 (DD).

3. ALHAGI GAGNEBIN

Alhagi maurorum Medic. in Vorles, Churpf. Phys. Oek. Ges. 2: 397. 1787; Baker in Hook. f. Fl. Brit. India 2: 145. 1876. *A. camelorum* Fisch. ex DC. Prodr. 2: 352. 1825; Duthie, Fl. Gangetic Plain 1: 279. 1903.

Deep-rooted, bushy undershrubs, upto 1 m high, with axillary, 2.5-6.0 cm long, straight spines bearing flowers. Leaves simple or 1-foliolate, c. 2 × 1 cm, obovate-oblong, mucronate or emarginate at the apex, entire, glabrous or pubescent. Flowers racemed on axillary spines, red or pinkish violet. Calyx glabrous. Pods 2-4 × 0.2 cm, linear-cylindric, irregularly torulose and jointed, beaked. Seeds subreniform, blackish.

Fl. & Fr. : March - July.

Common in alkaline and saline soils, chiefly in the east of Aravalli

Selected specimens : Banswara: Talwara, *Singh* 4295 (BSJO); Barmer: Gandhar, *Tiwari* 1208 (BSJO); Jaipur: Ramgarh, *Sharma* 155 (RUBL); Kota: *Majumdar* 10431 (BSA); Tonk: Uniyara, *Pandey* 4716 (BSJO).

4. *ALYSICARPUS* DESV. *nom. cons.*

- 1a. Upper leaves 3-foliolate, the lower ones 1 and 3-foliolate intermixed. 3. *A. heterophyllus*
- 1b. All leaves 1-foliolate:
- 2a. Pods moniliform:
- 3a. Calyx shorter or as long as the first joint of the pod:
- 4a. Joints of pods reticulately veined. 6. *A. monilifer* var. *venosa*
- 4b. Joints of pods not veined. 5. *A. monilifer* var. *monilifer*
- 3b. Calyx much longer than the first joint of the pod:
- 5a. Joints of pods smooth. 7. *A. roxburghianus*
- 5b. Joints of pods transversely ribbed, corrugate or reticulate:
- 6a. Pods 4-gonous. 11. *A. tetragonolobus*
- 6b. Pods slender, not 4-gonous:
- 7a. Pods longer than calyx; joints reticulately veined:
- 8a. Leaflets upto 1.5 cm broad. 1. *A. bupleurifolius*
- 8b. Leaflets more than 2 cm broad. 4. *A. longifolius*
- 7b. Pods shorter than calyx or as long as calyx; joints transversely ribbed-corrugate:
- 9a. Plants upto 60 cm high, glabrous or finely pubescent. Racemes upto 10 cm long. Pods upto 2.5 mm wide:
- 10a. Plants subglabrous. 8. *A. rugosus* var. *rugosus*
- 10b. Plants finely pubescent. 10. *A. rugosus* var. *styracifolius*
- 9b. Plants 1.0 - 1.5 m high, villous. Racemes 10.5-16.0 cm long. Pods 3 mm or more wide. 9. *A. rugosus* var. *keyneanus*
- 2b. Pods not moniliform:
- 11a. Leaflets broadly elliptic-oblong or linear-lanceolate. Pods turgid, not indented. 12. *A. vaginalis*
- 11b. Leaflets suborbicular. Pods compressed, shallowly indented on both sutures. 2. *A. hamosus*

1. *Alysicarpus bupleurifolius* (L.) DC. Prodr. 2: 352. 1825; Baker in Hook.f. Fl. Brit. India 2: 158. 1876, *pro parte*; Duthie, Fl. Gangetic Plain 1: 277. 1903, *pro parte*; Mahesh. Illus. Fl. Delhi 1. 70. 1966. *Hedysarum bupleurifolium* L. Sp. Pl. 745. 1753. "Lalphuli" (Hindi).

Erect or decumbent, annual herbs. Leaflet 1.3-3.0 × 0.4-1.5 cm, linear-lanceolate to oblong, acute, entire, glabrous except on the nerves beneath. Stipules lanceolate. Flowers in lax, terminal racemes, bluish-pink. Calyx-teeth imbricate in fruiting stage. Joints of pods 2-8, little longer than broad, 1-seeded, frequently reticulate to rugose.

Fl. & Fr. : August - November.

Frequent in grasslands. Sometimes the flower are yellow or white.

Selected specimens : Banswara: Dayla Tank, Kanodia 75190 (BSI); Jaipur: Dogotha Rd., Sharma 3721 (RUBL); Kota: Shahabad, Majumdar 13262 (BSA).

Notes : This taxon is closely allied to *A. roxburghianus* Thoth. & Pramanik. The only reliable character to distinguish the two is the smooth pod-joints in *A. roxburghianus* and reticulate-rugose joints in *A. bupleurifolius* (L.) DC. The description of *A. bupleurifolius* (L.) DC. in Flora of British India and other regional Indian floras is a mixture of these two species. Further, since the selected specimens cited under this species in this flora were not available for examination, it is not possible to separate them into two above mentioned species. Some of them may belong to *A. roxburghianus* Thoth. & Pramanik.

2. *Alysicarpus hamosus* Edgew. in Journ. Asiat. Soc. Beng. 21: 171. 1853; Baker in Hook.f. Fl. Brit. India 2: 157. 1876; Duthie, Fl. Gangetic Plain 1: 276. 1903. *Hedysarum procumbens* Roxb. Fl. Ind. 3: 345. 1832, non Mill. 1768. *Alysicarpus procumbens* (Roxb.) Schindl. in Fedde, Reper. 21: 11. 1925. *nom. elligiti*

Diffuse, annual herbs, clothed with long spreading hairs. Leaflet 1.5-3.0 cm in diam., hairy. Stipules linear, very acute, scarious, striate. Flowers paired along the peduncle, in axillary, 4 to 8-flowered racemes, bluish or purplish. Three lower calyx-teeth linear-lanceolate, acute, ciliate. Pods c. 2.5 cm long, linear, flat, 3 to 7-jointed, clothed with hooked hairs. Seeds oval, smooth, brown.

Fl. & Fr. : August - October.

Common in wastelands and open forests, particularly among grasses. Rare in the desertic zone. Resembles *Desmodium* Desv. in having compressed pods.

Selected specimens : Banswara: Shergarh, Singh 3090 (BSJO); Jaipur: Nariana, Sharma 5007 (RUBL); Pali: Parasram Mahadeo, Shetty 1918 (BSJO); Sirohi: Mt. Abu, Blatter 8783 (BLAT).

3. *Alysicarpus heterophyllus* (Baker) Jafri & Ali in *Biologia* 12: 33. 1966. *A. vaginalis* (L.) DC. var. *heterophyllus* Baker in Hook.f. *Fl. Brit. India* 2: 158. 1876.

Erect, diffusely branched herbs, upto 90 cm high. Leaflets 1-7 × 0.2-1.0 cm, middle one longer than the laterals, lanceolate to oblong-lanceolate, acute. Flowers distantly paired in 6 to 20-flowered racemes, pink; peduncles filiform. Calyx equalling or longer than the first joint of pod; teeth longer than tube, linear, acute. Pods constricted between the seeds, not moniliform; joints 3-5, longer than broad, tetragonal, reticulately veined, minutely hairy, 1-seeded.

Fl. & Fr. : August - October.

Rare, in wastelands. This taxon has recently migrated from Sind (Pakistan) eastwards to Rajasthan.

Selected specimens : Jaipur: Durgapura, Sharma 1024 (RUBL); Jaisalmer: Kanoi Sam Road, Shetty 3447 (BSJO); Jodhpur: Tolasar, Singh 4350 (BSJO).

4. *Alysicarpus longifolius* (Rottl. ex Spreng.) Wight & Arn. *Prodr.* 233. 1834; Wight, *lc.* 1: t. 251. 1840; Baker in Hook.f. *Fl. Brit. India* 2: 159. 1876; Duthie, *Fl. Gangetic Plain* 1: 278. 1903. *Hedysarum longifolium* Rottl. ex Spreng. *Syst.* 3: 319. 1826. "Gubal" (Hindi).

Erect, perennial herbs, upto 1 m high. Leaflet 2-12 × 0.6-3.0 cm, linear-oblong to oblong-obovate, appressed hairy on the veins beneath. Stipules lanceolate, acute, scarious. Flowers in terminal and axillary, spicate racemes, purplish. Calyx-teeth ciliate, enclosing 2-3 joints. Joints of pods 4-6, 1-seeded.

Fl. & Fr. : September - November.

Common in cultivated fields and gardens, particularly in the east of Aravalli. Two forms of this species were noted in the field - viz. (i) dwarf form: bearing linear leaves, and (ii) robust form: having obovate-oblong leaves.

Selected specimens : Banswara: Kushalgarh, Singh 3750 (BSJO); Jaipur: Bhandana, Sharma 1866 (RUBL); Kota: Majumdar 10115 (BSA).

5. *Alysicarpus monilifer* (L.) DC. Prodr. 2: 353. 1825; Baker in Hook.f. Fl. Brit. India 2: 157. 1876; Duthie, Fl. Gangetic Plain 1: 276. 1903. *Hedysarum moniliferum* L. Mant. 1: 102. 1767.

var. *monilifer*

Deep-rooted, prostrate, perennial herbs, clothed with deciduous, bristly hairs. Leaflet 0.5-2.5 × 0.5-1.5 cm, oblong to suborbicular, hairy beneath on the nerves. Stipules as long as petioles, closely appressed to the stem, lanceolate, scarious. Flowers in axillary and terminal, few-flowered racemes longer than leaves, pink. Calyx-teeth lanceolate, acute, striate. Joints of pods 2-8, globose, 1-seeded, downy with minute hooked hairs, not veined.

Fl. & Fr. : August - November.

Common, forming carpets along the roads in wastelands. Rather rare in the desertic zone.

Selected specimens : Banswara: Savania, Singh 2909 (BSJO); Jaipur: Jolana Doongri, Sharma Acc. no. 1928 (RUBL); Jodhpur: Kheria-Meetapur, Singh 3581 (BSJO); Pali: Kantalia, Shetty 1572 (BSJO); Tonk: Bentheli, Shetty 1226 (BSJO).

6. var. *venosa* Blatt. & Hallb. in J. Bomb. nat. Hist. Soc. 26(1): 240. 1918; Bhandari, Fl. Ind. Desert 107. 1978.

This variety differs from the type variety in having reticulately veined, 8-jointed pods.

Fl. & Fr. : October - November.

Rare, in sandy soils. Endemic to N.W. Rajasthan.

Selected specimen : Jaisalmer: Bada-Bag, Blatter 7226 (BLAT; Lactotype).

7. *Alysicarpus roxburghianus* Thoth. & Pramanik in Bull. bot. Surv. India 21: 189. 1981. *Hedysarum bupleurifolium* auct. non L. 1753 & 1763; Roxb. Fl. Cor. t. 194. 1805. *Alysicarpus bupleurifolius* auct. non (L.) DC. 1825; Baker in Hook.f. Fl. Brit. India 2: 158. 1876, *pro parte*; Duthie, Fl. Gangetic Plain 1: 277. 1903, *pro parte*.

Perennial herbs or undershrubs, upto 1 m high. Leaves 2.8-10.0 × 0.3-0.6 cm, linear, subglabrous beneath. Flowers in lax, terminal, 7-15 cm long racemes, pale rose or pinkish brown. Calyx longer than the first joint of pod. Pods moniliform, particularly more clearly on one face, 3 to 6-jointed; joints subglobose, smooth.

Fl. & Fr. : August - October.

Common in wastelands among grasses.

Selected specimens : Tonk: Tordi Sagar, *Shetty* 1319 (BSJO); Udaipur: Rani Ka Bagh, *Patil* 451 (CAL).

8. *Alysicarpus rugosus* (Willd.) DC. Prodr. 2: 353. 1825; Baker in Hook.f. Fl. Brit. India 2: 159. 1876; Duthie, Fl. Gangetic Plain 1: 278. 1903. *Hedysarum rugosum* Willd. Sp. Pl. 3: 1172. 1802.

var. *rugosus*

Erect or ascending-decumbent herbs; stems subglabrous. Leaflet lanceolate-oblong to obovate, entire, ciliate, thinly hairy beneath. Flowers in 3-8 cm long racemes, purplish blue. Calyx glabrous on the back; teeth lanceolate, imbricate. Pods 1.0-1.2 cm long; joints 3-5, broader than long, transversely ribbed.

Fl. & Fr. : September - November.

Common in wastelands, open forests, cultivated fields and gardens.

Selected specimens : Ajmer: Taragarh, *Duthie* 4619 (DD); Jaipur: Digotha, *Sharma* 3720 (RUBL); Jhalawar: Manoharthana, *Singh* 74440 (LWG); Sirohi: Mt. Abu, *Blatter* 8778 (BLAT).

9. var. *heyneanus* (Wight & Arn.) Baker in Hook.f. Fl. Brit. India 2: 159. 1876; Duthie, Fl. Gangetic Plain 1: 278. 1903. *A. heyneanus* Wight & Arn. Prodr. 234. 1834. *A. glumaceus* (Vahl) DC. var. *heyneanus* (Wt. & Arn.) Raizada, Suppl. Duthie, Fl. Gangetic Plain 47. 1976.

Stems villous, erect. Leaflet obovate-oblong. Racemes 10-15 cm long.

Fl. & Fr. : September - January.

Rare, among grasses in wastelands in the east of Aravalli.

Selected specimens : Banswara: Bhimgarh, *Kanodia* 75379 (BSI); Kota: Jain 28962 (BSI).

10. var. *styracifolius* (DC.) Baker in Hook.f. Fl. Brit. India 2: 159. 1876; Duthie, Fl. Gangetic Plain 1: 278. 1903. *A. styracifolius* DC. Prodr. 2: 353. 1825, *excl. syn.*

Dwarf, diffuse herbs, with pubescent stems. Leaflets small, oblong or lanceolate. Racemes 3-8 cm long.

Fl. & Fr. : August - November.

Rare, in grasslands in the east of Aravalli.

Selected specimens : Jhalawar: Manoharthana, *Singh* 74443 (LWG); Kota: *Singh* 90257 (LWG).

Notes : Since, the nature of pubescence, laxness or denseness of racemes are highly variable characters within the same population, it does not seem

proper to consider *A. heyneanus* Wt. & Arn., *A. styracifolius* DC., *A. ludens* (Wall. ex Baker) Sedgwick and *A. rugosus* (Willd.) DC. as distinct species as considered by Sedgwick (J. Ind. Bot. Soc. 1: 18. 1919) and many other workers. Baker's (*l.c.*) view of treating first them as varieties under *A. rugosus* (Willd.) DC. seems more appropriate in the present status of knowledge. Further, *A. rugosus* (Willd.) DC. and *A. glumaceus* (Vahl) DC. are distinct species and treating the former as synonymous of latter is not valid; hence, transferring the varieties of *A. rugosus* (Willd.) DC. to *A. glumaceus* (Vahl) DC. is not correct as done by many workers.

Further, from the original description of *A. rugosus* (Willd.) DC. var. *minor* Prain (J. Asiat. Soc. Beng. 66: 384. 1898), it appears that this element, is a dwarf form of the type.

11. *Alysicarpus tetragonolobus* Edgew. in Journ. Asiat. Soc. Beng. 21: 169. 1853; Baker in Hook.f. Fl. Brit. India 2: 159. 1876; Duthie, Fl. Gangetic Plain 1: 279. 1903.

Diffusely branched, procumbent herbs; stems marked with a line of hairs. Leaflet 1.5-3.5 × 0.3-1.5 cm, elliptic-oblong or lanceolate, hairy beneath. Stipules lanceolate, scarious. Flowers in lax racemes, pink. Calyx deeply divided; teeth lanceolate, imbricate in early fruiting stage, ciliate with long white hairs. Pods furnished with a projecting ridge down the middle of each face making the pods 4-gonous; joints 2-6, transversely ribbed or reticulate, glabrous.

Fl. & Fr. : August - October.

Common in wastelands, open forests and on naked hillocks. Rather rare in desertic zone.

Selected specimens : Banswara: Kotharia forest, Singh 3044 (BSJO); Chittorgarh: Pratapgarh, Majumdar 12207 (BSA); Churu: Sujangarh, Kanodia 82297 (BSI).

12. *Alysicarpus vaginalis* (L.) DC. Prodr. 2: 353. 1825; Baker in Hook.f. Fl. Brit. India 2: 158. 1876, excl. var. *heterophyllus*; Duthie, Fl. Gangetic Plain 1: 277. 1903; Mahesh. Illus. Fl. Delhi f. 69. 1966. *Hedysarum vaginalis* L. Sp. Pl. 746. 1753. *H. nummularifolium* L. Sp. Pl. 746. 1753, *pro parte*, non DC. 1825. *Alysicarpus vaginalis* L. var. *nummularifolius* (L.) Baker in Hook.f. *l.c.* 2: 158. 1876; Duthie, *l.c.* 1: 277. 1903.

Decumbent-ascending, annual to perennial herbs, 50-70 cm long, glabrous or hairy. Leaflet 0.5-6.0 × 0.5-2.0 cm, glabrous above, hairy beneath. Flowers solitary or paired in slender, 6 to 12-flowered, axillary

and/or leaf-opposed racemes longer than leaves, pink. Calyx equalling or little longer than first joint of pod; teeth linear. Pods 1.5-2.5 cm long, slender; joints 4-9, reticulately veined, 1-seeded, longer than broad.

Fl. & Fr. : September - November.

Common weed in cultivated fields, gardens and wastelands. This taxon is very variable in habit, size and shape of leaves, degree of hairiness and denseness of racemes. Variety *stocksii* Baker (*l.c.*) is probably an ecoform.

Selected specimens : Banswara: Lasara, Singh 3610 (BSJO); Barmer: Sheo, Tiwari 872 (BSJO); Jaipur: Amer, Sharma 282 (RUBL); Kota: Shahabad, Majumdar 13125 (BSA); Sirohi: Mt. Abu, Rao 66707 (BSI).

5. ASTRAGALUS L.

Astragalus tribuloides Del. Ill. Fl. Egypt. 696. t. 64. f. 17. 1813; Baker in Hook.f. Fl. Brit. India 2: 122. 1876; Nair, Fl. Punjab Plain 80. 1978.

var. *tribuloides*

Ascending or trailing, annual herbs, branches clothed with long white hairs upwards. Leaflets 11-17, 5-10 mm long, oblong-elliptic to lanceolate, acute, entire, clothed with long white hairs. Flowers sessile, in 2 to 10-flowered, sessile heads, pale yellow to pinkish-white. Pods stellately arranged, 5-10 mm long, turgid, densely pubescent, slightly falcate, 10 to 12-seeded, often longitudinally 2-celled.

Fl. & Fr. : February - April.

Rare, in wastelands. Reported from Ganganagar by Dhillon & Bajwa (1969). Perhaps, recently migrated from Punjab plains.

6. ATYLOSIA WIGHT & ARN.

1a. Erect shrubs. Flowers axillary, solitary or paired, without a common peduncle. Petals marcescent, remaining till the pod is developed.

4. *A. sericea*

1b. Twining herbs or shrubs. Flowers in 1 to many-flowered racemes, with a common peduncle. Petals falling off before pods develop:

2a. Leaflets subdigitate:

3a. Leaflets as long as broad. Calyx not more than half the length of corolla.

1. *A. albicans*

3b. Leaflets much longer than broad. Calyx more than three-fourth the length of corolla.

3. *A. scarabaeoides*

2b. Leaflets not subdigitate; the terminal leaflet with an elongated stalk.

2. *A. platycarpa*

1. *Atylosia albicans* (Wight & Arn.) Benth. in Miq. Pl. Jungh. 243. 1852; Baker in Hook.f. Fl. Brit. India 2: 215. 1876; Duthie, Fl. Gangetic Plain 1: 212. 1903. *Cantharospermum albicans* Wight & Arn. Prodr. 256. 1834, *pro parte*.

Grey-canescens, twining shrubs. Leaflets *c.* 3.0 × 2.7 cm, obovate, obtuse or subacute, coriaceous, pubescent beneath, not reticulately veined beneath. Flowers in 4 to 12-flowered, 3-5 cm long axillary racemes, yellow. Pods 4 × 1 cm, straight, narrowed towards the base, lineate, white-pubescent.

Fl. & Fr. : September - November.

Rare, in the open forests and wastelands.

Selected specimen : Jhalawar: Sharma 228 (RUBL).

2. *Atylosia platycarpa* Benth. in Miq. Pl. Jungh. 243. 1852; Baker in Hook.f. Fl. Brit. India 2: 216. 1876; Duthie, Fl. Gangetic Plain 1: 213. 1903.

Twining, annual herbs, clothed with long, ferruginous greyish-brown hairs. Leaflets 3.5-4.5 × 3.5-4.5 cm, broadly ovate-elliptic to suborbicular, abruptly acuminate. Flowers in axillary, 1 to 2-flowered racemes shorter than leaves, yellow. Bracts ovate, acuminate. Calyx hirsute on the back; lobes ovate-lanceolate, acuminate. Pods *c.* 4.0 × 1.5 cm, flat, reticulate-venose, lineate, clothed with deciduous hairs, 5 to 7-seeded. Seeds ovoid, black.

Fl. & Fr. : August - November.

Rare, in grasslands, fields and boundaries of gardens.

Selected specimens : Jaipur: Sharma Acc. No. 2072, 2075 (RUBL).

3. *Atylosia scarabaeoides* (L.) Benth. ex Baker in Hook.f. Fl. Brit. India 2: 215. 1876; Duthie, Fl. Gangetic Plain 1: 212. 1903. *Dolichos scarabaeoides* L. Sp. Pl. 726. 1753. *Atylosia scarabaeoides* Benth. in Miq. Pl. Jungh. 242. 1852, *nom. nud.*

Twining, hairy-pubescent herbs. Leaflets 1-3 × 0.8-2.0 cm, obovate-oblong or elliptic-oblong, obtuse or mucronate, grey-tomentose. Flowers in axillary, few-flowered corymbose racemes shorter than leaves, yellow. Calyx grey-silky; lobes linear. Pods *c.* 2.0 × 0.6 cm, oblong, lineate, clothed with spreading grey hairs, 2 to 6-seeded. Seeds oblong, black.

Fl. & Fr. : August - November.

Rather common in the east of Aravalli in wastelands and open forests among bushes.

Selected specimens : Banswara: Shyampura, *Kanodia* 75393 (BSI); Jodhpur: *Bhandari* 97 (JAC); Kota: *Jain* 28757 (BSI); Sirohi: Mt. Abu, *Blatter* 11981 (BLAT); Tonk: Gaonri, *Pandey* 4845 (BSJO).

4. *Atylosia sericea* Benth. ex Baker in Hook.f. Fl. Brit. India 2: 213. 1876.

Erect shrubs; branches clothed with silky hairs. Leaflets 2.5-5.0 × 0.4-1.0 cm, oblanceolate, apiculate, silky hairy. Flowers axillary, solitary or paired, red. Calyx-teeth lanceolate. Pods linear-oblong, oblique at the apex, densely silky, 2-seeded, depressed between the seeds. Seeds sub-cylindric, compressed, black, with a divided strophiole.

Fl & Fr. : August - November.

Rare, in scrub forests at the foot of hills.

Selected specimen : Sirohi: Mt. Abu, *Duthie* 663 (DD).

7. BUTEA ROXB. EX WILLD. *nom. cons.*

Trees.

1. *B. monosperma*

Extensive woody twiners.

2. *B. superba*

1. *Butea monosperma* (Lam.) Taub. in Engl. & Prantl, Nat. Pflanzenfam. 3(3): 366. 1894; Mahesh. Illus. Fl. Delhi f. 74. 1966. *Erythrina monosperma* Lam. Encycl. 1: 391. 1785. *Butea frondosa* Koenig ex Roxb. in Asiat. Res. 3: 369. 1792; Baker in Hook.f. Fl. Brit. India 2: 194. 1876; Duthie. Fl. Gangetic Plain 1: 240. 1903. '*Chhola, Palas, Khankhera, Kesu*' (Hindi).

Medium-sized, deciduous trees. Leaflets 3, upto 25 cm in diam., rhomboid or broadly obovate, hairy, prominently nerved beneath. Flowers 5-8 cm long, in terminal and lateral, 8-15 cm long racemes, orange red, showy. Lowest calyx-tooth shortest. Pods 12-18 × 2.5-3.5 cm, flat, stalked, grey-silky, 1-seeded.

Fl & Fr. : March-June.

Common from plains to the hills. It is a perfect invader in the damaged forests and is gradually marching inwards replacing the original flora.

Selected specimens : Banswara: Kotharia forest, *Singh* 4230 (BSJO); Jaipur: *Jain* 49604 (BSI); Jodhpur: *Bhandari* 1912 (JAC); Kota: Naka, *Wadhwa* 9215 (BSA); Sirohi: Mt. Abu, *Dalal* 2339 (BLAT).

2. *Butea superba* Roxb. Pl. Cor. 1: 23. t. 22. 1775; Baker in Hook.f. Fl. Brit. India 2: 195. 1876; Duthie, Fl. Gangetic Plain 1: 240. 1903. "Chhola ki bel" (Hindi).

Large, woody twiners. Leaflets 3, upto 30 cm in diam., rhomboid or broadly obovate. Flowers 9-12 cm long, in racemes upto 30 cm long, orange-red. Pods flat, tomentose.

Fl. & Fr. : March - May.

Rare, in the forests. Closely resembles *B. monosperma* (Lam.) Taub. except that it is a climber.

Selected specimens : Ajmer: Brandis Acc. No. 126106, 126107 (CAL).

8. CANAVALLIA ADANS. emend. DC. nom. cons.

Leaflets ovate. Pods 12-24 cm long, 8 to 20-seeded.

1. *C. ensiformis*

Leaflets obovate. Pods 5-10 cm long, 4 to 6-seeded.

2. *C. virosa*

1. *Canavalia ensiformis* (L.) DC. Prodr. 2: 204. 1825; Baker in Hook.f. Fl. Brit. India 2: 195. 1876; Duthie, Fl. Gangetic Plain 1: 235. 1903. *Dolichos ensiformis* L. Sp. Pl. 725. 1753. *D. gladiatus* Jacq. Coll. Bot. 2: 276. 1788. *Canavalia gladiata* (Jacq.) DC. Prodr. 2: 404. 1825; Wight, Ic. 3(1): 3. t. 753. 1844. "Jangli Sem" (Hindi).

Twining herbs. Leaflets 4-12 × 3.5-9.0 cm, acute or abruptly acuminate. Stipules triangular. Flowers in lax, 12 to 30-flowered, curved, axillary racemes upto 30 cm long, lilac or white. Bracteoles minute, ovate, caducous. Pods 3-5 cm broad, flat. Seeds subreniform, glabrous, reddish-brown or white.

Fl. & Fr. : August - December.

Common on the edges of fields and gardens near habitations.

Selected specimens : Banswara: Ghatol, Kanodia 75420 (BSI); Kota: Chhabra, Singh 90399 (LWG); Nagaur: Soni Acc. No. 84 (RUBL); Udaipur: Meenar, Majumdar 12441 (BSA).

2. *Canavalia virosa* (Roxb.) Wight & Arn. Prodr. 1: 253. 1834. *Dolichos virosus* Roxb. Fl. Ind. 3: 301. 1832, excl. syns. *Canavalia ensiformis* (L.) DC. var. *virosa* (Roxb.) Baker in Hook.f. Fl. Brit. India 2: 196. 1876.

Perennial twiners, branches appressed pubescent. Leaflets 6-18 × 3.5-15.0 cm, ovate, obtuse, glabrous. Flowers in 10-30 cm long, pubescent racemes, lilac. Calyx pubescent. Pods 2-3 cm wide, linear-oblong, with a suture and two lateral ribs, densely brown-pubescent.

Fl. & Fr. : August - November.

Rare, in wastelands, open forests and on the boundaries of fields and gardens, particularly near habitations.

Selected specimens : Churu: Khasoli, *Roy* 4019 (BSJO); Jodhpur: Baori, *Singh* 4387 (BSJO); Pali: Dhorisar Mahadeo, *Shetty* 1816 (BSJO); Tonk: Toda Rai Singh, *Shetty* 556 (BSJO).

9. CLITORIA L.

Erect herbs. Pods upto 5 cm long, deflexed.

1. *C. biflora*

Twining herbs or undershrubs. Pods more than 5 cm long, spreading, never deflexed.

2. *C. ternatea*

1. *Clitoria biflora* Dalz. in Kew Journ. Bot. 2: 35. 1850; Baker in Hook.f. Fl. Brit. India 2: 208. 1876; Raizada, Suppl. Duthie, Fl. Gangetic Plain 48. 1976.

Annual herbs, upto 60 cm high. Stems angular, striate with lines of hairs. Leaves imparipinnate; leaflets 5, 2.5-15.0 × 1.2-4.0 cm, elliptic or ovate-lanceolate, acute. Stipels filiform. Flowers geminate or solitary due to the abortion of one flower, deflexed, blue. Bracteoles ovate-lanceolate, aristate. Pods 3-5 cm long, flat, pubescent, 5 to 6-seeded.

Fl. & Fr. : August - October.

Common in the forests along Aravallis in shaded habitats.

Selected specimens : Banswara: Anand Sagar, *Singh* 2972 (BSJO); Jhalaawar: Purania, *Verma* 782 (BSA); Pali: Parasaram Mahadeo, *Shetty* 1930 (BSJO); Sirohi: Mt. Abu, *Rao* 66709 (BSI); Udaipur: *Kanodia* 82218 (BSI).

2. *Clitoria ternatea* L. Sp. Pl. 753. 1753; Baker in Hook.f. Fl. Brit. India 2: 208. 1876; Duthie, Fl. Gangetic Plain 1: 230. 1903. "Gokarni" (Hindi).

Twining herbs, with terete stems. Leaves imparipinnate; leaflets 5-7, 2-5 × 1.2-2.5 cm, ovate-oblong or elliptic. Flowers axillary, solitary or paired, blue or white. Bracteoles deflexed, suborbicular. Pods 8-15 cm long, linear, flat, pubescent, 6 to 10-seeded. Seeds oblong, glabrous, black.

Fl. & Fr. : December - March; often during August - September.

Common among bushes along the roads, particularly near habitations; also cultivated ornamentally as a wall climber.

Selected specimens : Banswara: *Singh* 2958 (BSJO); Bhilwara: Khiniya-Mangri, *Singh* 6495 (BSJO); Churu: Sardar Shahr, *Roy* 4028

(BSJO); Jodhpur: Pichiyak Dam, Singh 4438 (BSJO); Kota: Baran, Wadhwa 9407 (BSA).

10. CROTALARIA L.

1a. Leaves 1-foliolate or simple:

2a. Stipules present.

3a. Stems and branches acutely triquetrous. 20. *C. triquetra*

3b. Stems and branches cylindric, terete or striate, not triquetrous:

4a. Racemes 1 to 10-flowered:

5a. Pods stalked:

6a. Pods downy:

7a. Racemes 1 to 2-flowered. 2. *C. bifaria*

7b. Racemes 3 to 8-flowered. 4. *C. evolutooides*

6b. Pods glabrous:

8a. Stipules minute, subulate, deciduous. Pods upto 1 cm long, 6 to 10-seeded. 7. *C. hemifusa*

8b. Stipules leafy, persistent. Pods 2.5-5.0 cm long, 20 to 30-seeded. 5. *C. ferruginea*

5b. Pods sessile:

9a. Racemes 2 to 4-flowered. Pods 8 to 10-seeded, downy. 8. *C. hirsuta*

9b. Racemes 6 to 10-flowered. Pods 20 to 30-seeded, glabrous. 12. *C. mysorensis*

4b. Racemes 11 to 50-flowered:

10a. Leaves obtuse or retuse. Stipules and bracts subulate, minute, deciduous. 16. *C. retusa*

10b. Leaves acute. Stipules and bracts foliaceous, persistent. 18. *C. spectabilis*

2b. Stipules absent:

11a. Pods 3 to 4-seeded:

12a. Leaves persistent. Two upper calyx-teeth almost entirely connate. 10. *C. linifolia*

12b. Leaves deciduous. Calyx-teeth free. 3. *C. burhia*

11b. Pods 5 to 25-seeded:

13a. Racemes leaf-opposed or extra-axillary. 6. *C. filipes*

13b. Racemes axillary or terminal:

14a. Two upper calyx-teeth almost entirely connate:

- 15a. Racemes lax. Corolla exerted. 10. *C. unifolia*
 15b. Racemes capitate. Corolla not exerted. 13. *C. nana*
- 14b. Calyx-teeth free:
- 16a. Prostrate, spreading or straggling herbs:
- 17a. Racemes axillary. Bracts minute, subulate. 15. *C. prostrata*
 17b. Racemes terminal. Bracts lanceolate, leafy. 9. *C. atria*
- 16b. Erect, much-branched, woody herbs or undershrubs. 1. *C. albida*
- 1b. Leaves 3-foliolate:
- 18a. Pods subglobose, 2-seeded:
- 19a. Corolla twice the length of calyx. 11. *C. medicaginea*
 19b. Corolla thrice the length of calyx. 19. *C. trifoliastrum*
- 18b. Pods oblong or ellipsoid, more than 3-seeded:
- 20a. Leaflets obovate-oblong. Corolla as long as calyx. Pods stalked, glabrous. 14. *C. orixensis*
 20b. Leaflets linear. Corolla twice the length of calyx. Pods sessile, appressed-pubescent. 17. *C. senegalensis*

1. *Crotalaria albida* Heyne ex Roth, Nov. Sp. Pl. 333. 1821; Baker in Hook.f. Fl. Brit. India 2: 71. 1876; Duthie, Fl. Gangetic Plain 1: 205. 1903.

Annual herbs or woody undershrubs, 20-50 cm high, clothed with appressed hairs. Leaves sessile, 1-3 × 0.5-1.0 cm, elliptic-oblong or oblanceolate, entire, gland-dotted, thinly silky beneath. Racemes terminal or lateral, 2-20 cm long, laxly 4 to 25-flowered. Bracts minute, linear. Three lower calyx-teeth linear, acuminate; upper two broader, subobtusate. Pods c. 1.5 × 0.8 cm, oblong, glabrous, 6 to 12-seeded.

Fl & Fr. : August - October.

Rare, in wastelands, neglected corners of fields and gardens.

Selected specimens : Banswara: *Majumdar* 10293 (BSA); Jhalawar: *Aklara, Verma* 7609 (BSA); Kota: *Sitabari, Wadhwa* 9291 (BSA); Nagaur: *Rupasar, Lal* 34926 (LWG).

2. *Crotalaria bifaria* L. f. Suppl. 322. 1781; Baker in Hook.f. Fl. Brit. India 2: 69. 1876; Wight, Ic. 1: t. 30. 1838.

Much-branched, pubescent herbs. Leaves 2.5-5.0 × 1.0-2.5 cm, round to ovate or the upper ones oblong. Stipules lanceolate, reflexed. Racemes exceeding the leaves. Bracteoles 2, foliaceous, ovate-lanceolate, persistent. Calyx-teeth linear-lanceolate, acute. Corolla exerted. Pods 1.2-2.5 cm long, oblong, mottled with purple, 10 to 12-seeded.

Fl. & Fr. : August - October.

Rare, in the forests. It is a native of W. Peninsula.

Selected specimens : Sirohi: Mt. Abu, *Mehta* 361 (JAC), *Blatter* 10441 (BLAT).

3. *Crotalaria burhia* Buch. Ham. ex Benth. in Hook. Lond. Journ. Bot. 2: 474. 1843; Baker in Hook.f. Fl. Brit. India 2: 66. 1876; Duthie, Fl. Gangetic Plain 1: 202. 1903; Mahesh, Illus. Fl. Delhi f. 50. 1966. 'Sinia' (Hindi).

Xerophytic undershrubs, upto 1 m high, with appressed pubescence. Leaves subsessile, upto 2.5×0.5 cm, oblong-lanceolate, mucronate. Racemes terminal, 6 to 12-flowered. Bracteoles 2, lanceolate. Corolla as long as calyx. Pods c. 5×4 mm, oblong, villous.

Fl. & Fr. : March - August.

Abundant in dry sandy habitats in the desertic zones; rather uncommon in the hilly tracts.

Selected specimens : Banswara: *Majumdar* 10275 (BSA); Bhilwara: Jahajpur, *Singh* 5728 (BSJO); Bikaner: Bhichwal, *Roy* 1677 (BSJO); Bundi: Hindoli, *Singh* 74029 (LWG); Pali: Bala, *Shetty* 1374 (BSJO).

4. *Crotalaria evolvuloides* Wight & Arn. Prodr. 188. 1834; Baker in Hook.f. Fl. Brit. India 2: 68. 1876; Wight, Ic. 1: t. 31. 1838.

Erect herbs, 30-75 cm high, clothed with fine spreading hairs. Leaves rotund-oblong, obtuse. Stipules lanceolate. Racemes exceeding or equalling the leaves. Bracts lanceolate. Calyx-teeth linear. Corolla slightly exerted. Pods oblong, 8 to 10-seeded.

Fl. & Fr. : August - October.

Rare, in the forests. Reported from Mt. Abu by *Bhandari & Mehta* (1978).

5. *Crotalaria ferruginea* Grah. ex Benth. in Hook. Lond. Journ. Bot. 2: 476. 1843; Baker in Hook.f. Fl. Brit. India 2: 68. 1876.

Erect, annual herbs, 40-80 cm high, clothed with yellowish-brown silky hairs. Leaves $5-10 \times 0.7-1.5$ cm, oblong-obovate or lanceolate. Bracts small, linear, persistent. Pods oblong.

Fl. & Fr. : August - October.

Rare, in sandy soils among grasses.

Selected specimen : Kota: Chambal Rest House, *Singh* 74638 (LWG).

6. *Crotalaria filipes* Benth. in Hook. Lond. Journ. Bot. 2: 475. 1843; Baker in Hook. f. Fl. Brit. India 2: 66. 1876.

Prostrate herbs, upto 50 cm long, with many stems from a woody root. Leaves subsessile, ovate-oblong, cordate-oblique at the base, obtuse or acute.

Racemes 1 to 3-flowered, much longer than leaves. Bracts linear-lanceolate, hairy, persistent. Corolla exserted. Pods shortly stalked, glabrous, 8 to 10-seeded.

Fl. & Fr. : October - December.

Rare, in wastelands among grasses. It is a Peninsular element.

Selected specimen : Sirohi: Mt. Abu, *Blatter* 12146 (BLAT). Also reported from Lukupur (Ramdeo, 1969).

7. *Crotalaria humifusa* Grah. ex Benth. in Hook. Lond. Journ. Bot. 2: 476. 1843; Baker in Hook. f. Fl. Brit. India 2: 67. 1876; Duthie, Fl. Gangetic Plain 1: 203. 1903.

Diffuse, trailing herbs, clothed with short spreading, yellowish-brown silky hairs. Leaves sessile, 1.5-3.0 cm long, roundish or oblong, membranous. Racemes longer than leaves, sometimes leafy below; pedicels deflexed. Calyx-teeth linear. Corolla not exserted. Pods oblong.

Fl. & Fr. : August - October.

Rare, in the wastelands. It is a plant of high altitude.

Selected specimens : Kota: Kishanganj, *Verma* 736 (BSA). Also reported from Bikaner by Sarup (1957) and Kota by Majumdar (1971).

8. *Crotalaria hirsuta* Willd. Sp. Pl. 3: 978. 1802; Baker in Hook. f. Fl. Brit. India 2: 68. 1876; Duthie, Fl. Gangetic Plain 1: 203. 1903. *C. rubiginosa* Roxb. Fl. Ind. 3: 269. 1832, non Willd. 1802; Wight. Ic. 3(2): 7. t. 885. 1844-45.

Annual herbs, clothed with long, spreading hairs. Leaves 3.0-6.5 × 1.5-4.0 cm, ovate-lanceolate, acute, entire. Stipules lanceolate, reflexed. Racemes clothed with long, silky hairs. Bracts lanceolate. Corolla exserted. Pods 1.5-2.0 cm long, oblong.

Fl. & Fr. : August - November.

Common in grasslands, crevices of rocks and often in marshy habitats.

Selected specimens : Banswara: Kushalgarh, *Singh* 3032 (BSJO); Bhilwara: Kotra, *Singh* 6237 (BSJO); Kota: Shahabad, *Majumdar* 13157 (BSA); Pali: Piproli, *Shetty* 1881 (BSJO); Sirohi: Mt. Abu, *Blatter* 10503 (BLAT).

9. *Crotalaria hirta* Willd. in Ges. Naturf. Fr. Berlin Neue Schr. 4: 217 1803; Baker in Hook.f. Fl. Brit. India 2: 70. 1876; Duthie, Fl. Gangetic Plain 1: 203. 1903.

Annual herbs, clothed with spreading, rufous hairs. Leaves 2.5-6.5 × 0.8-1.3 cm, linear-lanceolate, obtuse. Racemes capitate, 2 to 6-flowered, leafy in lower region. Calyx-teeth linear, acuminate. Corolla hardly exerted.

Fl. & Fr. : August - October.

Rare, in wastelands and cultivated fields.

Selected specimens : Jhalawar: Bhawanimandi, Singh 83677 (LWG); Kota: Chhabra, Singh 90396 (LWG).

10. *Crotalaria linifolia* L. f. Suppl. 322. 1781; Baker in Hook.f. Fl. Brit. India 2: 72. 1876; Duthie, Fl. Gangetic Plain 1: 204. 1903.

Annual herbs, clothed with appressed hairs. Leaves 2.5-5.0 × 0.8-2.0 cm, oblanceolate or obovate-oblong, obtuse. Racemes terminal, lax, 5 to 20-flowered. Bracts minute, subulate. Pods sessile, ovoid-oblong, glabrous, black when ripe.

Fl. & Fr. : August - October, often upto March.

Common in wastelands, particularly amidst grasses.

Selected specimens : Banswara: Lasara, Singh 3614 (BSJO); Bhilwara: Amarapura, Singh 6231 (BSJO), Jhalawar: Kotia, Wadhwa 1940 (BSA); Sirohi: Mt. Abu, Ruizada 20675 (DD).

11. *Crotalaria medicaginea* Lam. Encycl. Meth. Bot. 2: 201. 1786; Baker in Hook.f. Fl. Brit. India 2: 81. 1876; Duthie, Fl. Gangetic Plain 1: 207. 1903; Mahesh, Illus. Fl. Delhi 1, 49. 1966. *C. neglecta* Wight & Arn. Prodr. 192. 1834. *C. luxurians* Benth. in Hook. Lond. Journ. Bot. 2: 578. 1843. *C. medicaginea* Lam. var. *neglecta* (Wight & Arn.) Baker & var. *luxurians* (Benth.) Baker in Hook.f. *lc.* 2: 81. 1876. 'Gulali' (Hindi).

Erect, annual herbs, upto 1 m high. Leaflets 0.6-2.7 × 0.2-1.0 cm, obovate or obovate-oblong, retuse or obtuse, apiculate. Stipules filiform, minute. Racemes terminal and leaf-opposed, 2 to 12-flowered. Bracts linear-subulate. Calyx-teeth longer than the tube. Pods pubescent, beaked with persistent styler base.

Fl. & Fr. : July - November.

Abundant in open, grassy wastelands, lawns, gardens and neglected corners of fields.

Selected specimens : Banswara : Pipalkhunt. *Singh* 2883 (BSJO); Barmer : Bal. *Shetty* 2203 (BSJO); Jaipur: Daosa, *Wadhwa* 8216 (BSA); Kota: Shahabad, *Majumdar* 13184 (BSA); Sirohi: Mt. Abu, *Blatter* 10414, 10417 (BLAT).

Notes: Baker (*l.c.*) recognised three varieties under this taxon. Varieties *neglecta* and *luxurians* seem to be the ecotypes and, therefore, tentatively merged under the proper species. These infraspecific units, however, need further experimental studies.

12. *Crotalaria mysorensis* Roth, Nov. Pl. Sp. 338. 1821; Baker in Hook. f. Fl. Brit. India 2: 70. 1876; Duthie, Fl. Gangetic Plain 1: 204. 1903. *C. ferruginea sensu* Duthie, *L.c.* 1: 203. 1903, non Grab ex Benth. 1834.

Erect, annual herbs, clothed with ferruginous, erecto-patent hairs. Leaves subsessile, 2-10 × 0.5-1.5 cm, lanceolate or linear-oblong, obtuse, mucronate. Stipules linear or lanceolate. Bracts lanceolate, leafy. Pods 3.0-3.5 cm long, oblong.

Fl & Fr. : August - December.

Rare, amidst grasses in the gardens and neglected corners of fields.

Selected specimens : Banswara: Bhimgarh, *Kanodia* 75378 (BSI); Kota: *Agrawal* 438 (DD); Pali: Piproli, *Shetty* 1882 (BSJO); Sirohi: Mt. Abu, *Blatter* 12140 (BLAT); Tonk: Sohela, *Shetty* 1254 (BSJO).

13. *Crotalaria nana* Burm. f. Fl. Ind. 156, t. 48, f. 2. 1768; Baker in Hook. f. Fl. Brit. India 2: 71. 1876. *C. umbellata* Wight & Arn. Prodr. 191. 1834.

Erect herbs, 30-60 cm high, clothed with silky brown hairs. Leaves 1.3-5.0 × 0.3-1.0 cm, oblong or oblanceolate, pellucido-punctate, appressed silky hairy. Racemes terminal, 6 to 12-flowered. Pods 4-6 mm in diam., subglobose, 6 to 10-seeded. Seeds reniform, compressed.

Fl & Fr. : September - October.

Very rare, in wastelands along the roads.

Selected specimens : Rajasthan: Sewan Dadra Rd., *Patil* without number (CAI).

14. *Crotalaria orixensis* Willd. in Ges. Naturf. Fr. Berlin Neue Schr. 4: 217. 1803; Baker in Hook.f. Fl. Brit. India 2: 83. 1876; Duthie, Fl. Gangetic Plain 1: 207. 1903.

Annual herbs, with many spreading branches from the base. Leaflets 1.5-3.5 × 0.3-1.5 cm, elliptic or oblanceolate to obovate, gland-dotted

beneath. Stipules foliaceous, lanceolate, persistent. Racemes terminal and lateral, 3 to 12-flowered. Pods 1.5-2.0 cm long. Seeds reniform, brown, smooth.

Fl. & Fr. : August - November.

Rare, in wet habitats, particularly amidst grasses.

Selected specimens : Bhilwara: Bijolia, *Singh* 5701 (BSJO); Kota: Shahabad, *Majumdar* 12409 (BSA).

15. ***Crotalaria prostrata*** Rottl. ex Willd. Enum. Hort. Berol. 2: 747. 1809; Duthie, Fl. Gangetic Plain 1: 202. 1903. *C. prostrata* Roxb. ex D. Don, Fl. Nep. 241. 1825; Baker in Hook.f. Fl. Brit. India 2: 67. 1876.

Annual herbs, 20-30 cm high, clothed with yellowish-brown hairs. Leaves sessile, 1.5-3.5 × 0.8-1.5 cm, oblong or ovate-lanceolate, oblique at the base. Racemes longer than leaves. Calyx-teeth linear. Pods 1.2-1.5 cm, linear-oblong, turgid, glabrous, 6 to 20-seeded.

Fl. & Fr. : August - November.

Rare, in wastelands and degraded forests.

Selected specimens : Banswara: Hura Bowji forest, *Singh* 3680 (BSJO); Jhalawar: *Singh* 83904 (LWG).

16. ***Crotalaria retusa*** L. Sp. Pl. 715. 1753; Baker in Hook. f. Fl. Brit. India 2: 75. 1876; Duthie, Fl. Gangetic Plain 1: 205. 1903.

Robust undershrubs. Leaves 2.5-10.0 × 1.5-2.5 cm, oblanceolate-oblong, crenate at the base. Racemes terminal, 15-30 cm long. Corolla much exerted. Pods stalked, 2.5-4.0 cm long, linear-oblong, 15 to 20-seeded.

Fl. & Fr. : August - November.

Rare, in the wastelands and forests.

Selected specimen : Jodhpur: Balsamand, *Blatter* 6937 (BLAT). Also reported from Mt. Abu (Jain, 1961).

17. ***Crotalaria senegalensis*** (Pers.) Bacle ex DC. Prodr. 2: 133. 1825; Majumdar in Bull. bot. Surv. India 13: 122. 1973. *C. uncinella* Lam. var. *senegalensis* Pers. Syn. 2: 285. 1807.

Diffuse herbs, with spreading branches. Leaflets 2.5-3.5 cm long, linear, silky beneath. Racemes terminal, exceeding the leaves. Flowers yellow, turning to orange. Calyx 5 mm long, divided half way down. Pods c. 1.2 cm long, oblong or ellipsoid.

Fl. & Fr. : October - January.

Rare, on the dry margins of rivers and in grasslands. It is an African element.

Selected specimens : Jhalawat: Manghi river bank, Verma 1858 (BSA); Kota: Majumdar 13250 (BSA).

18. *Crotalaria spectabilis* Roth, Nov. Pl. Sp. 341. 1821. *C. sericea* Retz. Obs. Bot. 5: 26. 1789, non L. 1768; Baker in Hook.f. Fl. Brit. India 2: 75. 1876; Duthie, Fl. Gangetic Plain 1: 205. 1903. 'Sani' (Hindi).

Undershrubs, upto 1 m high. Leaves 5-15 × 2.0-4.5 cm, oblong-lanceolate, mucronate, silky beneath. Racemes 20-30 cm long, with a large foliaceous bract at the base of each pedicel and a pair of minute subulate bracts on each pedicel below the middle. Pods 2.5-5.0 cm long, linear-oblong, glabrous, 20 to 30-seeded.

Fl. & Fr. : September - December, often upto April.

Rare, in wastelands near gardens and parks. Native of Argentina; usually cultivated in the gardens for ornamental purposes.

Selected specimens : Kota: Majumdar 10452 (BSA); Sirohi: Mt. Abu, Kaul 8526 (LWG).

19. *Crotalaria trifoliastrum* Willd. Sp. Pl. 3: 983. 1802; Baker in Hook. f. Fl. Brit. India 2: 82. 1876; Wight, Ic. 2(2): 1. t. 421. 1841.

Perennial herbs, upto 1 m high, with erecto-patent, slender branches. Leaflets 1.2-2.5 cm long, obovate-oblong, membranous. Stipules setaceous. Racemes terminal and lateral, 20-30 cm long, 12 to 40-flowered. Bracts setaceous. Calyx-teeth linear. Pods sessile, subquadrangular, thinly hairy.

Fl. & Fr. : August - November.

Rare, in the wastelands and forests. Reported from Alwar by Vyas (1967), from Mt. Abu by Jain (1961) and from Udaipur by Vyas (1965).

20. *Crotalaria triquetra* Dalz. in Hook. Kew Journ. Bot. 2: 34. 1850; Baker in Hook.f. Fl. Brit. India 2: 71. 1876.

Suffruticose herbs, 30-50 cm high. Leaves sessile, c. 2.0 × 0.5 cm, elliptic-oblong, obtuse, glabrous or with few scattered hairs. Racemes terminal and lateral, 1 to 3-flowered, longer than leaves. Bracts ovate, acute. Bracteoles setaceous. Corolla with a tuft of hairs below the apex. Pods 2.5 × 0.4 cm, oblong, 15 to 20-seeded.

Fl. & Fr. : September - November.

Occasional, in wastelands and forests.

Selected specimens : Banswara: Dari wali Dungri, *Kanodia* 75133 (BSI); Jaipur: Ramgarh, *Sharma* 792 (RUBL); Sirohi: Mt. Abu, *Jain* 60195 (BSI); Udaipur: Parshad Guwalia Fort, *Kanodia* 82213 (BSI).

11. CYLISTA AIT.

Cylista scariosa Roxb. Pl. Cor. 1: 64. t. 92. 1798; Wight, Ic. 4(4): 14. t. 1597. 1850; Baker in Hook. f. Fl. Brit. India 2: 219. 1876; Duthie, Fl. Gangetic Plain 1: 215. 1903.

Twining shrubs, with downy branches. Leaves 3-foliolate; leaflets 5-10 × 4-5 cm, rhomboid-ovate or ovate, acute, velvety pubescent. Stipels subulate. Flowers in axillary, peduncled racemes or panicles, yellow. Bracts ovate, caducous. Corolla not exerted. Pods oblique, downy, 1-seeded.

Fl & Fr. : November - February.

Very rare, in the wastelands.

Selected specimen : Jaisalmer: Vinjorai, *Wadhwa* 53184 (BSA).

12. DALBERGIA L. f. *nom. cons.*

1a. Stamens 9, 1-adelphous:

2a. Leaflets rounded or emarginate at the apex. 2. *D. latifolia*

2b. Leaflets abruptly acuminate. 5. *D. sissoo*

1b. Stamens 10, in 2 bundles of 5 each:

3a. Large, woody twiners. 6. *D. rotundilis*

3b. Tall to medium-sized trees:

4a. Leaflets densely appressed pubescent. 4. *D. sericea*

4b. Leaflets glabrous or glaucous:

5a. Panicles terminal and axillary, spreading. Standard with a callosity at the base of the limb. 1. *D. lanceolaria*

5b. Panicles terminal, compact. Standard without a callosity at the base of the limb. 3. *D. paniculata*

1. *Dalbergia lanceolaria* L. f. Suppl. 316. 1781; Baker in Hook. f. Fl. Brit. India 2: 235. 1876; Duthie, Fl. Gangetic Plain 1: 264. 1903. *D. frondosa* Roxb. Fl. Ind. 3: 226. 1832; Wight, Ic. 1: t. 266. 1840.

Deciduous trees, upto 20 m high. Leaves imparipinnate; leaflets 13-15, c. 3.0 × 1.5 cm, obovate, emarginate. Flowers in axillary and terminal, leafless panicles, white. Calyx-teeth half the length of the tube. Petals, except standard, clawed at the base. Pods 4-10 × 1.5 cm, narrowed at both ends, glabrous, 1 to 2-seeded.

Fl. & Fr. : March - May.

Rare, in mixed deciduous forests on the Aravallis.

Selected specimens : Dungarpur: *Verma* 151 (CAL); Jhalawar: Aklera, *Wadhwa* 5382 (BSA). Also reported from Udaipur by *Vyas* (1965).

2. *Dalbergia latifolia* Roxb. Pl. Cor. 2: 7. t. 113. 1799; Wight, Ic. 3(4): 15. t. 1156. 1846, in part; Baker in Hook. f. Fl. Brit. India 2: 231. 1876; Duthie, Fl. Gangetic Plain 1: 263. 1903 '*Safed Sisum, Pai*' (Hindi).

Deciduous trees, upto 10 m high. Leaves imparipinnate; leaflets 5-9, 2.5 × 1.5-4.0 cm, broadly elliptic or elliptic-orbicular, glabrous. Flowers in lax, axillary panicles, pale white. Calyx-teeth shorter than the tube. Petals with long claws. Pods 4-8 × 1.5-2.0 cm, oblong-lanceolate, flat, narrowed at both ends, 1 to 4-seeded. Seeds reniform, glabrous, black.

Fl. & Fr. : March - August.

Sparsely distributed in mixed deciduous forests.

Selected specimens : Ajmer: Todgarh, *Duthie* 4634 (DD); Banswara: Bagaycha forest, *Singh* 3056 (BSJO); Jhalawar: Aklera, *Wadhwa* 1941 (BSA); Sirohi: Mt. Abu, *King* Acc. no. 130326 (CAL).

3. *Dalbergia paniculata* Roxb. Pl. Cor. 2: 8. t. 114. 1799; Baker in Hook. f. Fl. Brit. India 2: 236. 1876; Duthie, Fl. Gangetic Plain 1: 265. 1903. '*Dobin, Sisum*' (Hindi).

Deciduous trees, 6-15 m high. Leaves imparipinnate; leaflets 9-15, 3.5-5.5 × 1.5-2.5 cm, broadly oblong to obovate, obtuse or emarginate. Flowers subsessile, white. Calyx-teeth ciliate, little more than half the length of the tube. Pods 4.5-7.9 × 1.5-2.5 cm, oblong, narrowed at both ends, glabrous, 1 to 2-seeded.

Fl. & Fr. : March - May.

Rare, in wastelands and at the foot of hills.

Selected specimens : Jaipur: *Singh* Acc. No. 7517 (RUBL); Jhalawar: Aklera, *Singh* 83782 (LWG); Udaipur: *Williamson* Acc. no. 11822 (RUBL).

4. *Dalbergia sericea* G. Don, Gen. Syst. 2: 375. 1833; Duthie, Fl. Gangetic Plain 1: 265. 1903. *D. hircina* Wall. ex Benth. in Miq. Pl. Jungh. 256. 1851; Hook. f. Fl. Brit. India 2: 236. 1876. '*Sissu*' (Hindi).

Deciduous trees, 8-12 m high, with tomentose branches. Leaves imparipinnate; leaflets 7-25, 2.0-3.5 × 2.3 cm, ovate or elliptic, obtuse or emarginate. Flowers in axillary, compact panicles, dull yellow or white.

Calyx-teeth as long as the tube. Pods 3-5 cm long, linear-oblong, flat, 1 to 3-seeded.

Fl. & Fr. : March - June.

Very rare, in mixed deciduous forests.

Selected specimen : Kota: Shahabad, *Singh* 91040 (LWG).

5. *Dalbergia sissoo* Roxb. Fl. Ind. 3: 223. 1832; Baker in Hook. f. Fl. Brit. India 2: 231. 1876; Duthie, Fl. Gangetic Plain 1: 264. 1903. 'Sisum' (Hindi).

Deciduous trees, 15-30 m high. Leaves imparipinnate; rachis zigzag; leaflets 3-5, 3-6 × 2.5-5.5 cm, suborbicular, puberulous when young. Flowers subsessile, in axillary panicles, yellowish. Two upper calyx-teeth connate, except at the tip. Pods 4-6 × 1 cm, oblong or strap-shaped, flat, narrowed at the base, mucronate at the apex, glabrous, 1 to 4-seeded.

Fl. & Fr. : March - August.

Common in wastelands, along the roads, boundaries of fields and gardens.

Selected specimens : Banswara: Danpur, *Singh* 4264 (BSJO); Bhilwara: Meja Dam, *Singh* 6036 (BSJO); Jodhpur: Lordi, *Singh* 4361 (BSJO); Kota: Shahabad, *Majumdar* 13225 (BSA); Siorhi: Abu Road, *McCann* 50 (BLAT).

6. *Dalbergia volubilis* Roxb. Pl. Cor. 2: 48. t. 191. 1805; Baker in Hook. f. Fl. Brit. India 2: 235. 1876; Duthie, Fl. Gangetic Plain 1: 265. 1903.

Large, woody climbers; branches thickened at places and twisted into spiral loops. Leaves imparipinnate; leaflets 7-13, c. 3.5 × 2.0 cm, oblong or obovate, obtuse or emarginate, glabrous, coriaceous. Flowers in axillary and terminal, leafless panicles, pale blue. Calyx-teeth about one-third the length of tube. Pods 4.0-10.0 × 1.5 cm, linear-oblong, narrowed at the base, obtuse at the tip, glabrous, 1 to 2-seeded.

Fl. & Fr. : January - May.

Rare, in the forests. Reported from Udaipur by Ramdeo (1969).

13. DESMODIUM DESV. *nom. cons.*

1a. All leaves 1-foliate

2a. Pods indented on both the sutures, but more deeply on the lower edge:

- 3a. Branches angled. Leaflets glabrescent above. Joints of pods longer than broad. 3. *D. gangeticum*
- 3b. Branches terete. Leaflets scabrous above. Joints of pods as broad as long. 10. *D. velutinum*
- 2b. Pods not indented or slightly indented on the lower edge only. 7. *D. rotundifolium*
- 1b. All leaves 3-foliolate or mixed with 1-foliolate ones:
- 4a. 1-foliolate and 3-foliolate leaves intermixed. 1. *D. alysicarpoides*
- 4b. All leaves 3-foliolate:
- 5a. Creeping or trailing herbs. Flowers axillary, 1 to 5-together. 9. *D. triflorum*
- 5b. Erect herbs or undershrubs. Flowers in racemes or umbellate heads:
- 6a. Inflorescence axillary, pedunculate, umbellate head. 8. *D. triangulare*
- 6b. Inflorescence axillary and terminal raceme:
- 7a. Pods spirally twisted, glabrous. 5. *D. procumbens*
- 7b. Pods straight, not spirally twisted, clothed with hooked hairs:
- 8a. Stipules foliaceous, semi-amplexicaul. Joints of pods as long as broad. 2. *D. dichotomum*
- 8b. Stipules linear, obtuse at the base. Joints of pods longer than broad:
- 9a. Bracts boat-shaped, enclosing the buds. 6. *D. repandum*
- 9b. Bracts linear-subulate, not enclosing the buds. 4. *D. laxiflorum*

1. *Desmodium alysicarpoides* Meeuwen in Reinwardtia 6: 246. 1962.
Alysicarpus parviflorus Dalz. in Hook. Lond. Journ. Bot. 3: 211. 1851.
Desmodium parviflorum (Dalz.) Baker in Hook. f. Fl. Brit. India 2: 172.
 1875, non Mart. & Galleotti, 1843.

Much-branched, erect herbs. Leaflets 1.5-4.0 × 1.0-2.5 cm, lateral leaflets elliptic-oblong and terminal ones ovate to obovate, acute or obtuse, appressed hairy beneath. Flowers in terminal racemes, arranged in pairs towards base and solitary upwards. Corolla hardly exerted. Pods falcate, indented at both sutures, glabrous, joints slightly swollen.

Fl. & Fr. : August - October.

Rare, in the forests.

Selected specimen : Sirohi: Mt. Abu-Delwara, Mehta 1586 (JAC).

2. **Desmodium dichotomum** (Willd.) DC. Prodr. 2: 336. 1825. *Hedysarum dichotomum* Willd. Sp. Pl. 3: 1180. 1802. *H. diffusum* Willd. Lc. 3: 1180. 1802. *Desmodium diffusum* (Willd.) DC. Lc. 2: 336. 1825, *nom. illeg.*; Wight, Ic. 1: t. 298. 1840 & 2(1): 9. t. 409. 1840; Baker in Hook. f. Fl. Brit. India 2: 169. 1876; Duthie, Fl. Gangetic Plain 1: 285. 1903. 'Gander-lapto' (Hindi).

Undershrubs, upto 1 m high, with deeply grooved stems and branches clothed with white, spreading hairs. Leaflets 3-8 × 1.5-4.5 cm, ovate-oblong or terminal ones obovate or elliptic, obtuse or emarginate, hairy on both surface. Flowers in axillary and terminal racemes, laxly arranged in few-flowered fascicles, pink. Bracts persistent. Pods 1.3-2.0 cm long, flat, indented on both sutures into 3-8, rectangular joints, hooked-hairy.

Fl. & Fr. : August - October.

Common in the forests in shady habitats.

Selected specimens : Banswara: Khora forest, Singh 3716 (BSJO); Bhilwara: Bijolia, Singh 5702 (BSJO); Jhalawar: Asnawar, Wadhwa 7543 (BSA).

3. **Desmodium gangeticum** (L.) DC. Prodr. 2: 327. 1825; Wight, Ic. 1: t. 271. 1840; Baker in Hook. f. Fl. Brit. India 2: 168. 1876; Duthie, Fl. Gangetic Plain 1: 286. 1903. *Hedysarum gangeticum* L. Sp. Pl. 746. 1753. *H. maculatum* L. Lc. 746. 1753. *Desmodium gangeticum* (L.) DC. var. *maculatum* (L.) Baker in Hook. f. Lc. 2: 168. 1876; Duthie, Lc. 1: 287. 1903. 'Salpiani, Kareti' (Hindi).

Undershrubs, upto 1 m high. Leaflet 3-15 × 2-8 cm, ovate-oblong, entire or repand, hairy beneath. Stipules lanceolate, scarious. Flowers clustered in axillary and terminal racemes, purple-pink. Bracts triangular-subulate. Pods linear, flat, falcate; joints 4-8, sparsely clothed with hooked hairs. Seeds suborbicular, smooth, brown.

Fl. & Fr. : August - November.

Common in wastelands, open forests, neglected corners of gardens. It is a polymorphic species, varying in habit and shape of leaflets.

Selected specimens : Banswara: Kanodia 75185 (BSI); Kota: Wadhwa 9465 (BSA); Pali: Goram Ghat, Pandey 4686 (BSJO); Sirohi: Mt. Abu, Kaul 9398 (LWG).

4. **Desmodium laxiflorum** DC. in Ann. Sci. Nat. Paris ser. 1. 4: 100. 1825; Baker in Hook. f. Fl. Brit. India 2: 164. 1876.

Undershrubs, upto 1 m high. Leaflets 3.5-17.0 × 2-10 cm, ovate or elliptic, acute or acuminate, hairy beneath. Flowers arranged in few-flowered fascicles along the hairy rachis of racemes, blue or white. Pods 2.5-5.0 cm long, hardly indented between the seeds.

Fl. & Fr. : August - October.

Rare, in the forests in shady habitats.

Selected specimens : Jhalawar: Sharod, Verma 3568 (CAL); Sirohi: Mt. Abu, Blatter 179861 (BLAT).

5. *Desmodium procumbens* (Mill.) Hitch. in Rep. Mo. Bot. Gard. 4: 76. 1893. *Hedysarum procumbens* Mill. Gard. Dict. ed. 8. no. 10. 1768. *H. spirale* Sw. Prodr. 107. 1788. *Desmodium spirale* (Sw.) DC. Prodr. 2: 332. 1825; Baker in Hook. f. Fl. Brit. India 2: 164. 1876; Duthie, Fl. Gangetic Plain 1: 284. 1903.

Erect, pubescent, annual herbs, upto 60 cm high. Leaflets 2.5-4.0 × 1.5-2.5 cm, ovate, ciliate, pubescent. Stipules subulate. Flowers in simple or compound racemes, red. Calyx incised half way down. Pods flat, deeply indented on both the sutures; joints rhomboid, pubescent, with strongly involute and revolute margins, thus, giving the pod a spirally twisted appearance; joints connected by a narrow isthmus.

Fl. & Fr. : August - October.

Rare, in the forests. Closely resembles *D. neomexicanum* A. Gray, a native of Tropical America, but the margins of pods in the latter species are merely sinuate.

Selected specimens : Banswara: Hura Bawji forest, Singh 3676 (BSJO); Dungarpur: Ratanpur, Kanodia 82079 (BSI).

6. *Desmodium repandum* (Vahl) DC. Prodr. 2: 334. 1825; Sharma & Tiagi, Fl. N.E. Rajasthan 124. 1979. *Hedysarum repandum* Vahl, Symb. Bot. 2: 82. 1791. *Desmodium scalpe* DC. Prodr. 2: 234. 1825; Baker in Hook. f. Fl. Brit. India 2: 165. 1876.

Erect, downy, woody herbs. Leaflets ovate, roundish or obovate-rhomboid, slightly repand, downy. Flowers in simple or branched racemes, bright purple or red. Calyx incised half way down. Pods falcate; joints 3-6, hooked-hairy.

Fl. & Fr. : August - October.

Rare, near water streams in hilly tracts.

Selected specimens : Alwar: Algal, Sharma 3863 (RUBL); Jaipur: Ramgarh, Sharma 787 (RUBL); Sirohi: Mt. Abu, Blatter 9363 (BLAT).

7. *Desmodium rotundifolium* Baker in Hook. f. Fl. Brit. India 2: 172. 1876; Cooke, Fl. Bombay 1: 359. 1902.

Erect herbs. 15-50 cm high, with terete stem and branches. Leaves 1-foliolate; petioles filiform. Stipules lanceolate-cuspidate. Leaflet 1-3 cm in diam., orbicular, shortly acuminate, glabrous above, appressed hairy beneath; stipels subulate. Racemes 6-15 cm long, axillary and terminal. Flowers distantly paired in lower region, solitary upwards, pink. Pedicels filiform. Bracts ovate, acuminate, concealing the buds, falling afterwards. Calyx-teeth three times as long as tube, subulate, ciliate. Corolla exerted. Pods 5-15 mm long, falcate, rarely slightly indented on the lower suture only; joints 3-6, as broad as long, reticulately veined.

Fl. & Fr. : August - November.

Rare, in the forests and wastelands. Very similar to *Alysicarpus procumbens* (Roxb.) Schindl. It is a peninsular element.

Selected specimens : Sirohi: Mt. Abu, Blatter 12342, 9347, 9359, 12129, 12139 (BLAT). Also reported by Raizada (1954) from Mt. Abu and from Sikar by Nair & Malhotra (1962) and Majumdar (1969).

8. *Desmodium triangulare* (Retz.) Merr. in Journ. Arn. Arb. 23: 170. 1842. *Hedysarum triangulare* Retz. Obs. Bot. 3: 40. 1783. *H. cephalotes* Roxb. Fl. Ind. 3: 360. 1832. *Desmodium cephalotes* (Roxb.) Wight & Arn. Prodr. 224. 1834; Wight, Ic. 2(1): 6. t. 378. 1840-43; Baker in Hook. f. Fl. Brit. India 2: 161. 1876; Duthie, Fl. Gangetic Plain 1: 282. 1903.

Shrubs, with triquetrous branches. Leaflets elliptic-oblong, obovate-oblong or lanceolate, acuminate, densely hairy beneath. Stipules linear-lanceolate, bristle-pointed. Flowers red. Bracts linear-subulate. Pod 2.0-2.5 cm long, slightly falcate, indented on both sutures; joints 3-6, as broad as long, pubescent.

Fl. & Fr. : August - October.

Rare, in the wastelands. Reported from Churu by Sharma (1962).

9. *Desmodium triflorum* (L.) DC. Prodr. 2: 334. 1825, excl. syn. *D. biflorum*; Wight, Ic. 1: t. 291. 1840; Baker in Hook. f. Fl. Brit. India 2: 173. 1876; Duthie, Fl. Gangetic Plain 1: 285. 1903. *Hedysarum triflorum* L. Sp. Pl. 749. 1753.

Creeping or trailing herbs, rooting at the lower nodes, clothed with fine hairs. Leaflets c. 1.5 cm in diam., obovate, truncate or emarginate at the apex. Flowers pink or white. Bracts ovate, acute, ciliate. Pods linear, flat, indented on both the sutures into 3-5, 1-seeded, puberulous joints.

Fl & Fr. : September - November.

Common weed in lawns, gardens and wastelands, particularly in wet and shady habitats.

Selected specimens : Banswara: Lasara, Singh 3689 (BSJO); Jaipur: Ramgarh, Maheshwari Acc. no. 1922 (LWG); Kota: Shahabad, Majumdar 13148 (BSA); Sirohi: Mt. Abu, Rao 66589 (BSI).

10. *Desmodium velutinum* (Willd.) DC. Prodr. 2: 228. 1825. *Hedysarum velutinum* Willd. Sp. Pl. 3: 1174. 1802. *Desmodium latifolium* DC. Prodr. 2: 328. 1825; Wight, Ic. 1: t. 270. 1840; Baker in Hook. f. Fl. Brit. India 2: 168. 1876; Duthie, Fl. Gangetic Plain 1: 287. 1903.

Erect, hairy undershrubs, 1-2 m high. Leaflets 3-12 × 3-11 cm, broadly ovate or suborbicular, obtuse, mucronate, entire, tomentose beneath. Flowers arranged in fascicles of 2, along the hairy rachis of axillary and terminal racemes, pink or purple. Bracts ovate to linear, longer than the calyx. Pods straight; joints 3-6, clothed with hooked hairs.

Fl & Fr. : August - November.

Rare, in the forests along the Aravallis.

Selected specimens : Banswara: Puna Pathar forest, Singh 2926 (BSJO); Kota: Shahabad, Verma 616 (BSA).

14. DOLICHOS L.

Dolichos lobatus L. Sp. Pl. 726. 1753; Verdc. in Taxon 17: 173. 1968. *D. falcatus* Klein ex Willd. Sp. Pl. 3: 1047. 1802; Baker in Hook. f. Fl. Brit. India 2: 211. 1876; Bhandari & Mehta in Ind. Journ. Forestry 1 (2): 47. 1978.

Twining, perennial herbs, with tuberous roots. Leaflets 3, ovate, acute or obtuse, entire or 3-lobed, membranous. Flowers 2-8 on a short common peduncle, yellow. Calyx glabrous; teeth deltoid. Corolla twice the length of the calyx; keel broad, obtuse. Pods linear, flat, sub-stipitate, slightly recurved, 6 to 8-seeded.

Fl & Fr. : January - March.

Rare, in the forests. Reported from Mt. Abu by Bhandari & Mehta (1978).

15. DUMASIA DC.

Dumasia villosa DC. in Ann. Sci. Nat. (Paris) ser. 1. 4: 96. 1825; Baker in Hook. f. Fl. Brit. India 2: 183. 1876; Duthie, Fl. Gangetic Plain 1:

231. 1903. *D. congesta* Grah. ex Wight & Arn. Prodr. 206. 1834; Wight, Ic. 2(2): 2. t. 445. 1841.

Twining herbs, clothed with grey or ferruginous hairs. Leaves pinnately 3-foliolate; leaflets c. 8×5 cm, ovate, truncate at the base, subobtusate, hairy beneath. Stipules setaceous; stipels filiform, caducous. Flowers in axillary, 6 to 10 cm long, 6 to 20-flowered racemes, yellow or purplish. Bracts and bracteoles setaceous. Pods upto 6 cm long, linear, falcate, torulose, velvety, 3 to 4-seeded.

Fl. & Fr. : November - February.

Rare, in the forests.

Selected specimen : Banswara: Bhapur forest, Kanodia 75206 (BSI).

16. ELEIOTIS DC.

Eleiotis monophylla (Burm.f.) DC. Mem. Legum. 2: 350. 1825. *Glycine monophylla* Burm. f. Fl. Ind. 161. t. 50. f. 2. 1768. *Hedysarum sororium* L. Mant. 2: 270. 1771. *Eleiotis sororia* (L.) DC. Mem. Legum. 2: 350. 1825; Baker in Hook.f. Fl. Brit. India 2: 153. 1876; Duthie, Fl. Gangetic Plain 1: 272. 1903. 'Golbel' (Hindi).

Prostrate or decumbent, glabrous, annual herbs. Leaflets $1.0-4.5 \times 0.8-5.0$ cm, ovate-orbicular or subreniform, with few scattered hairs beneath. Stipules and stipels scarious. Flowers in axillary, 6 to 30-flowered racemes, pale to creamy yellow. Calyx-tube almost truncate. Standard emarginate. Pods 2-5 mm long, boat-shaped, compressed, brown. Seeds subreniform, dark-brown, polished.

Fl. & Fr. : August - November.

Rare, in the forests and grasslands.

Selected specimens : Chittorgarh: Majumdar 12346 (BSA); Jhalawar: Bijliya Bhadak, Wadhwa 5346 (BSA).

17. ERYTHRINA L.

1a. Stems armed. Pods seed-bearing throughout the length:

2a. Calyx 2-lipped, not spathaceous. Pods 4 to 6-seeded:

3a. Leaflets glabrous beneath. Limb of standard 2-3 times as long as broad. Pods flatish.

1. *E. arborea*

3b. Leaflets pubescent beneath. Limb of standard 3-4 times as long as broad.

3. *E. suberosa*

2b. Calyx spathaceous, not 2-lipped. Pods 2 to 3-seeded.

2. *E. stricta*

1b. Stems unarmed. Pods seed-bearing in upper half only.

4. *E. subumbrans*

1. *Erythrina arborescens* Roxb. Fl. Ind. 3: 258. 1832; Baker in Hook. f. Fl. Brit. India 2: 190. 1876.

Small trees, with few prickles on the branches. Leaflets as long as broad, pointed at the apex, cordate or truncate at the base, glabrous and greenish both sides. Racemes capitate. Pods 15-25 × 2.5-3.0 cm, narrowed gradually at the apex in to a beak and stalk at the base.

Fl. & Fr. : May - October.

Native of Central and Eastern Himalayas and extends from Kumaon to Sikkim and Khasia, ascending to 7,000 ft. Rare, in the forests at Mt. Abu.

Selected specimen : Sirohi: Mt. Abu, *Mehta* 864 (JAC).

2. *Erythrina stricta* Roxb. Fl. Ind. 3: 251. 1832; Baker in Hook. f. Fl. Brit. India 2: 189. 1876

Deciduous trees, with yellowish prickles. Leaves pinnately 3-foliolate; leaflets upto 10 × 10 cm, ovate-cordate, shortly acuminate. Stipels rounded, gland-like, persistent. Flowers fascicled in terminal and horizontal racemes, bright scarlet. Calyx spathiform, entire at the tip. Pods 7-15 cm long, narrowed at both ends, slightly torulose, compressed. Seeds 2-3, brown.

Fl. & Fr. : February - May.

Rare, in the forests, particularly on the hill-slopes.

Selected specimen : Sirohi: Mt. Abu, *Jain* 62103 (BSI).

3. *Erythrina suberosa* Roxb. Fl. Ind. 3: 253. 1832; Baker in Hook. f. Fl. Brit. India 2: 189. 1876; Duthie, Fl. Gangetic Plain 1: 238. 1903; Roxb. Ic. no. 108. 1971.

Small trees, with deeply cracked bark and yellowish-white prickles. Leaves pinnately 3-foliolate; leaflets 10-15 × 10-15 cm, rhomboid-ovate, pubescent below. Stipules linear-lanceolate; stipels rounded, glanduliform. Flowers in capitate racemes, gathered at the end of branches, scarlet. Pods 6-15 × 0.3-0.8 cm, straight, torulose, 2 to 5-seeded.

Fl. & Fr. : March- June.

Occasional, in wastelands and on the fringes of forests.

Selected specimens : Banswara: Danpur, *Singh* 4257 (BSJO); Kota: Shahabad, *Singh* 91050 (LWG); Sirohi: Mt. Abu, *Blatter* 12115 (BLAT). Also reported from Jhunjhuanu (Majumdar, 1961).

4. *Erythrina subumbrans* (Hassk.) Merr. Philipp. J. Sci. Bot. 5: 113. 1910. *Hypaphorus subumbrans* Hassk. Hort. Bogor. Desc. 198. 1858. *Erythrina lithosperma* Blume ex Miq. Fl. Ind. Bat. 1: 209. 1859; Baker in Hook. Fl. Brit. India 2: 190. 1876.

Large trees, with unarmed branches. Leaflets 10-15 cm long, acute at the apex, rounded at the base, membranous, greenish, glabrous bothsides. Racemes pilose, cotemporaneous with the leaves. Calyx 2-lipped, velvety. Standard 3-4 cm long, limb oblong, obtuse; keel and wings subequal. Pods 10-13 cm long, much recurved. 1 to 3-seeded.

Fl. & Fr. : April - July.

Native of Burma. Rare in the forests at Mt. Abu.

Selected specimen : Sirohi: Mt. Abu, *Mehra* 759 (JAC).

18. FLEMINGIA AIT. *F. nom. cons.*

1a. Leaves 1-foliolate:

2a. Branches terete. Lateral nerves of leaflets 8-10 pairs, all subequal. Bracts acuminate, glabrous. Flowers white or yellowish. 4. *F. strobilifera*

2b. Branches angled. Lateral nerves of leaflets 4-6 pairs, the basal pair longest. Bracts rounded or emarginate, hirsute. Corolla rosy or purple. 1. *F. bracteata*

1b. Leaves digitately 3-foliolate:

3a. Plants 15-30 cm high. Stem subterranean. Petioles winged. Racemes longer than petioles. Pods glandular. 3. *F. nana*

3b. plants 1-2 m high. Stem aerial, well developed. Petioles angled. Racemes shorter than petioles. Pods eglandular. 2. *F. congesta*

1. *Flemingia bracteata* (Roxb.) Wight, Ic. 1: t. 268. 1840; Duthie, Fl. Gangetic Plain 1: 217. 1903. *Hedysarum bracteatum* Roxb. Fl. Ind. 3: 351. 1832. *Flemingia strobilifera* (L.) R. Br. var. *bracteata* (Roxb.) Baker in Hook. f. Fl. Brit. India 2: 227. 1876.

Erect shrubs, upto 3 m high, with angular branches. Leaflets 7.5-15.0 × 2.5-6.5 cm, ovate or oblong-lanceolate, acute or acuminate, slightly hairy and gland-dotted beneath. Stipules linear, bristle-pointed; stipels absent. Racemes compound, axillary and terminal. Calyx hirsute. Pods 7.5-15.0 cm long, oblong, turgid, eglandular, concealed by the persistent bracts, 1 to 2-seeded.

Fl. & Fr. : August - November.

Rare, in the forests. Reported from Mt. Abu by Raizada (1954).

2. *Flemingia congesta* Roxb. ex Aiton in Hort. Kew. ed. 2. 4: 349. 1812; Wight, Ic. 2(2): 7. t. 390. 1840; Baker in Hook. f. Fl. Brit. India 2: 228. 1876; Duthie, Fl. Gangetic Plain 1: 218. 1903.

Erect shrubs, with angular, pubescent branches. Leaflets 10-18 × 5-7 cm, ovate-oblong, acute or obtuse, strongly 3-nerved from the base. Flowers

in oblong, dense, sessile racemes, white, streaked with pink. Bracts lanceolate, velvety. Calyx dotted with small black glands. Pods 3.5-12.5 mm long, oblong, turgid, apiculate, finely pubescent, 2-seeded.

Fl. & Fr. : September - December.

Very rare, in the forests. Reported from Udaipur by Ramdeo (1969) and Vyas (1965).

3. *Flemingia nana* Roxb. Fl. Ind. 3: 339. 1832; Wight, Ic. 2(1): 7. t. 389. 1840-43; Duthie, Fl. Gangetic Plain 1: 220. 1903. *F. congesta* Roxb. ex Ait. var. *nana* (Roxb.) Baker in Hook. f. Fl. Brit. India 2: 229. 1876, excl. syn. *F. procumbens* Roxb.

Suffruticose, with hardly any aerial stem; branches erect. Leaves long petioled; leaflets 2.5-8.0 cm long, laterals obliquely oblong and terminal one obovate, 3-nerved, downy. Stipules ensiform. Flowers pale, tinged with pink. Bracts lanceolate. Calyx clothed with viscid, bright red glands. Pods upto 1 cm long. Seeds small, rounded, brown.

Fl. & Fr. : August - October.

Rare, in the forests. It is a Himalayan element.

Selected specimen : Chittorgarh: Pratapgarh, Verma 290 (BSA).

4. *Flemingia strobilifera* (L.) R. Br. ex Ait. Hort. Kew. ed. 2. 4: 350. 1812; Wight, Ic. 1: t. 267. 1838; Baker in Hook. f. Fl. Brit. India 2: 227. 1876; Duthie, Fl. Gangetic Plain 1: 216. 1903. '*Kanphuta*' (Hindi).

Shrubs, upto 1 m high. Leaflet 5-12 × 2-5 cm, ovate-lanceolate or oblong, acuminate or acute, entire, gland-dotted above. Racemes terminal, few-flowered, with zig-zag rachis, hidden in large, conduplicate bracts. Calyx-teeth lanceolate, pilose. Pods oblong, turgid, finely downy, 2-seeded.

Fl. & Fr. : November - February.

Rare, in the forests in wet and shady habitats. Often cultivated in the gardens for ornamental purposes.

Selected specimen : Chittorgarh: Pratapgarh, Verma 289 (BSA); Kota: Sitabari forest, Wadhwa 9321 (BSA).

19. GALACTIA P. BR.

Galactia tenuiflora (Klein ex Willd.) Wight & Arn. Prodr. 206. 1834; Baker in Hook. f. Fl. Brit. India 2: 192. 1876. *Glycine tenuiflora* Klein ex Willd. Sp. Pl. 3: 1059. 1802. *Galactia villosa* Wight & Arn. Prodr. 207. 1834; Duthie, Fl. Gangetic Plain 1: 239. 1903. *G. tenuiflora* (Klein ex Willd.) Wight & Arn. var. *villosa* (Wight & Arn.) Baker in Hook. f. Ic. 2: 192. 1876.

Twining herbs, woody at the base. Leaflets 3.5-8.0 × 1.5-4.0 cm, ovate-oblong or lanceolate, obtuse or retuse, hairy beneath. Flowers paired in axillary racemes, pink-purple. Two upper calyx-teeth fused into one. Anthers all fertile. Pods 4-5 × 0.5-0.7 cm, flat, many-seeded.

Fl. & Fr. : August - October.

Common in the forests, particularly in interior parts along the Aravallis.

Selected specimens : Banswara: Anand Sagar forest, Singh 2974 (BSJO); Jaipur: Samod hills, Sharma 912 (RUBL); Jhalawar: Sharma 215 (RUBL).

20. GONIOGYNA DC.

Goniogyna hirta (Willd.) Ali in Taxon 16:463. 1967. *Hallia hirta* Willd. Sp. Pl. 3: 1169. 1802. *Heylandia latibrosa* auct. non (L.) DC. 1825; Baker in Hook. f. Fl. Brit. India 2: 65. 1876; Duthie, Fl. Gangetic Plain 1: 200. 1903. 'Gorakh-but' (Hindi).

Prostrate, annual herbs, clothed with long hairs. Leaves sessile, simple, 0.8-2.0 × 0.5-1.5 cm, ovate, subcordate at the base, subacute, hairy. Anthers dimorphic. Pods oblong, surrounded at the base by the persistent calyx and tipped by the style, silky-hairy, 1 to 2-seeded.

Fl. & Fr. : August - November; often during March - April.

Common in dry habitats. It is a good soil binder.

Selected specimens : Banswara: Anand Sagar, Kanodia 75244 (BSI); Jaipur: Narayana, Sharma 1517 (RUBL); Kota: Shahabad, Majumdar 13193 (BSA); Tonk: Gar, Shetty 531 (BSJO).

21. INDIGOFERA L.

1a. Leaves simple:

2a. Pods 4-gonous or winged, 4 to 6-seeded.

11. *I. dalzellii*

2b. Pods neither 4-gonous nor winged, 1 to 2-seeded:

3a. Leaves linear-lanceolate.

16. *I. linifolia*
var. *linifolia*

3b. Leaves ovate-cordate or ovate-elliptic to obovate:

4a. Leaves obovate. Pods globose. Seeds discoid.

17. *I. linifolia*
var. *campbellii*

4b. Leaves ovate-elliptic or cordate. Pods oblong. Seeds ovate, truncate at one end.

10. *I. cordifolia*

1b. Leaves compound:

5a. Leaflets 3:

6a. Pods oblong, 1 to 2-seeded. 13. *I. glandulosa*

6b. Pods cylindric, straight or slightly curved, turgid or flat, always more than 2-seeded:

7a. Pods quite flat, papery. 15. *I. hochstetteri*

7b. Pods turgid:

8a. Pods torulose. 19. *I. oblongifolia*

8b. Pods 4-gonous or winged, not torulose:

9a. Leaves gland-dotted beneath; the terminal leaflet sessile. 24. *I. trifoliata*

9b. Leaves eglandular, the terminal leaflet stalked:

10a. Racemes 6 to 12-flowered. Pods spreading horizontally, slightly curved at the base. 25. *I. trita* subsp. *trita*
var. *trita*

10b. Racemes more than 12-flowered. Pods deflexed, not curved at the base. 26. *I. trita* subsp. *subulata* var. *subulata*

5b. Leaflets more than 3:

11a. Leaflets alternate:

12a. Flowers in axillary, sessile or short-peduncled, globose, head-like spikes shorter than the leaves:

13a. Pods 2-seeded. 18. *I. linnaei*

13b. Pods 3 to 4-seeded. 20. *I. sessiliflora*

12b. Flowers in axillary, elongate racemes not shorter than leaves:

14a. Leaves argenteo-canescens. Pods torulose, curved outwards at the tip. 19. *I. oblongifolia*

14b. Leaves not argenteo-canescens. Pods 4-gonous, neither torulose nor curved. 21. *I. spicata*

11b. Leaflets opposite:

15a. Pods quite flat and papery. 15. *I. hochstetteri*

15b. Pods turgid:

16a. Pods torulose:

17a. Pods clothed with gland-tipped hairs:

- 18a. Pods 10 to 12-seeded. 8. *I. colutea*
- 18b. Pods 1 to 4-seeded. 5. *I. caerulea* var. *monosperma*
- 17b. Pods glabrous, pubescent or hairy, eglandular:
- 19a. Racemes much exceeding the leaves:
- 20a. Pods 1 to 3-seeded. 1. *I. angulosa*
- 20b. Pods 6 to 12-seeded:
- 21a. Leaflets 7-9. 22. *I. tenuifolia*
- 21b. Leaflets 11-17 3. *I. atropurpurea*
- 19b. Racemes not exceeding the leaves:
- 22a. Pods cylindric, 3 to 4 seeded:
- 23a. Margins of wings and keels glabrous. Calyx-lobes and fruits eglandular:
- 24a. Leaflets glabrous above, pubescent beneath. 4. *I. caerulea* var. *caerulea*
- 24b. Leaflets pilose on both sides. 6. *I. caerulea* var. *occidentalis*
- 23b. Margins of wings and keels hairy. Calyx-lobes and fruits glandular. 5. *I. caerulea* var. *monosperma*
- 22b. Pods 4-gonous, 8 to 12-seeded. 9. *I. constricta*
- 16b. Pods not torulose:
- 25a. Pods glabrous:
- 26a. Leaflets 5.
- 26b. Leaflets more than 5:
- 27a. Bracts lanceolate or boat-shaped, cuspidate-acuminate, exceeding the buds. Standard glabrous on the back.
- 28a. Racemes shorter than the leaves. 7. *I. cassioides*
- 28b. Racemes longer than the leaves. 3. *I. atropurpurea*
- 27b. Bracts subulate, shorter than the buds. Standard pubescent on the back.
- 25b. Pods hairy or pubescent:
- 29a. Pods 4-gonous: 14. *I. hirsuta*
- 29b. Pods cylindric:

3. *E. suberosa* 2. *E. stricta* 4. *E. subumbrans*

30a. Leaflets 7-11, Racemes longer than the leaves.

2. *I. argentea*

30b. Leaflets 13-21. Racemes shorter than the leaves.

27. *I. wightii*

1. *Indigofera angulosa* Edgew. in Journ. Asiat. Soc. Beng. 21: 168. 1853; Baker in Hook. f. Fl. Brit. India 2: 97. 1876; Duthie, Fl. Gangetic Plain 1: 252. 1903.

Suffruticose, perennial herbs. Leaflets 5, 2.5-4.0 cm long, mucronate, pale grey-green. Flowers in 10-15 cm long, 30 to 50-flowered, peduncled racemes, lilac. Pods c. 1.5 cm long, moniliform, beaked. Seeds with a raised ridges in the centre.

Fl. & Fr. : July - February.

Rare, in wasteland.

Selected specimen : Ajmer: *Duthie* 57191 (DD).

2. *Indigofera argentea* Burm. f. Fl. Ind. 17. 1768. *I. semitrijuga* auct. non Forsk. 1775; Baker in Hook. f. Fl. Brit. India 2: 98. 1876.

Diffusely branched, argenteo-canescens undershrubs, with terete branches. Leaflets sessile, broadly obovate, densely clothed with long, silvery appressed hairs. Flowers in 6 to 12-flowered racemes, red. Calyx-teeth linear-lanceolate. Standard pubescent on the back. Pods 1.0-1.5 cm long, mucronate, appressed hairy, white.

Fl. & Fr. : August - October.

Rare, in dry sandy soils, particularly in desertic zones.

Selected specimens : Barmer: Kupardi, *Shetty* 2300 (BSJO); Bikaner: Bhikampur, *Roy* 2011 (BSJO); Jaisalmer: Gamnewala, *Shetty* 6112 (BSJO); Jodhpur: Osian, *Singh* 4423 (BSJO).

3. *Indigofera atropurpurea* Buch. Ham. ex Horn. Hort. Reg. Bot. Hafn. Suppl. 152. 1819; Baker in Hook. f. Fl. Brit. India 2: 101. 1876, ex parte.

Undershrubs, with glabrescent to appressed hairy branches. Leaflets 11-17, 2.5-4.0 × 1.5-3.0 cm, oblong, obtuse, glabrescent. Stipels minute. Flowers in 10-28 cm long, short peduncled racemes, red. Bracts lanceolate, acuminate, longer than the subtended flowers. Calyx-teeth deltoid. Pods 2.5-4.0 cm long, linear, glabrous, 6 to 10-seeded.

Fl. & Fr. : August - October.

Rare, in the forests in hilly tracts. Very close to *I. hamiltonii* Garb. ex Duthie and the latter often considered as synonymous to it, but the flowers are longer than the subtending bracts in *I. hamiltonii* Garb. ex Duthie.

Selected specimen : Pali: Parasram Mahadeo, Pandey 4184 (BSJO).

4. *Indigofera caerulea* Roxb. Fl. Ind. 3: 377. 1832; Wight, Ic. 2(1): 5. t. 366. 1840. *I. argentea* L. var. *caerulea* (Roxb.) Baker in Hook. f. Fl. Brit. India 2: 99. 1876. 'Neel' (Hindi).

var. *caerulea*

Erect herbs, upto 1 m high. Leaflets 5-11, upto 3.5 × 2.5 cm, oblong-ovate, glabrous above, pubescent beneath. Flowers golden brown. Pods curved, indehiscent, 3 to 4-segmented, pubescent.

Fl. & Fr. : Throughout the year.

Rare, in wastelands, neglected corners of fields and gardens.

Selected specimens : Bhilwara: Pichiyak, Singh 4437 (BSJO); Jaipur: Duda, Wadhwa 8309 (BSA). Also reported from Sikar (Nair & Nathawat, 1957) and Udaipur (Ramdeo, 1969).

5. var. *monosperma* (Sant.) Sant. Fl. Saurashtra 130. 1962. *Indigofera articulata* Gouan var. *monosperma* Sant. in Proc. nat. Inst. Sci. India 24 B: 135. t. 1. 1958.

Differs from the proper species and var. *occidentalis* Gillett & Ali in having margins of wings and keels hairy and calyx-lobes and fruits with glandular hairs.

Fl. & Fr. : August - October.

Rare, on naked hillocks in dry habitats.

Selected specimen : Pali: Kalia Pahar, Shetty 1976 (BSJO).

6. var. *occidentalis* Gillett & Ali in Kew Bull. Add. ser. 1: 102. 1958.

Differs from proper species in having leaflets pilose on both sides.

Fl. & Fr. : September - October.

Rare, in wastelands in dry sandy habitats.

Selected specimen : Jhunjhunu: Khetri, Nair 423 (BLAT).

7. *Indigofera cassioides* Rottl. ex DC. Prodr. 2: 225. 1825. *I. pulchella* auct. non Roxb. 1832; Wight, Ic. 2(1): 5. t. 367. 1840; Baker in Hook. f. Fl. Brit. India 2: 101. 1876; Duthie, Fl. Gangetic Plain 1: 256. 1903.

Shrubs, 1.0-1.5 m high. Leaflets 11-21, 1.0-2.5 × 0.7-1.5 cm, oblong or elliptic, obtuse or emarginate, apiculate, appressed hairy. Flowers in short peduncled, axillary racemes shorter than leaves, purple; racemes covered

with sterile scales towards base. Pods 2.0-4.5 cm long, straight, glabrous, turgid, 6 to 12-seeded.

Fl. & Fr. : October - May.

Rare, in wastelands and on the fringes of forests.

Selected specimens : Ajmer: Along Akhjigarh - Taragarh Road, *Duthie* 4599 (DD); Sirohi: Mt. Abu, *Blatter* 12361 (BLAT).

8. *Indigofera colutea* (Burm.f.) Merr. in Philip. Journ. Sci. 19: 335. 1921. *Galega colutea* Burm. f. Fl. Ind. 172. 1768. *Indigofera viscosa* Lam. Encycl. 3: 247. 1789; Wight, Ic. 2(1): 9. t. 404. 1840; Baker in Hook. f. Fl. Brit. India 2: 95. 1876; Duthie, Fl. Gangetic Plain 1: 251. 1903.

Annual herbs, clothed with gland-tipped hairs. Leaflets 7-11, sessile, 0.4-0.8 × 0.2-0.4 cm, obovate-elliptic, apiculate, appressed hairy beneath. Flowers in glandular, 6 to 12-flowered racemes, red. Calyx-teeth setaceous. Pods 1.0-1.5 cm long, straight, subcylindric, faintly torulose, shortly beaked. Seeds quadrate, glabrous.

Fl. & Fr. : September - October.

Rare, in wastelands and forests.

Selected specimens : Ajmer: *Laurie* 57191 (DD); Banswara: Ghatol, *Kanodia* 75478 (BSI).

9. *Indigofera constricta* (Thw.) Trim. Cat. Cey. Pl. 23. 1885; Cooke, Fl. Bombay 1: 340. 1958 (reprint ed.). *I. flaccida* Koenig var. *constricta* Thw. Enum. Pl. Zey. 5: 411. 1864.

Deciduous shrubs, about 1 m high, with terete or angled branches. Leaflets 7-11, opposite, 2.0-2.5 × 0.8-1.5 cm, elliptic-oblong, rounded or emarginate, apiculate, appressed white hairy. Stipules subulate. Flowers in many-flowered racemes about as long as leaves, red. Calyx silky. Pods 3.5-6.0 cm long, linear, somewhat 4-gonous, much constricted between the seeds, appressed hairy, 8 to 12-seeded.

Fl. & Fr. : October - November.

Rare, in the forests on the hills.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 10330, 12424 (BLAT); Udaipur: *Kanodia* 82478 (BSI).

10. *Indigofera cordifolia* Heyne ex Roth, Nov. Pl. Sp. 357. 1821; Baker in Hook. f. Fl. Brit. India 2: 93. 1876; Duthie, Fl. Gangetic Plain 1: 250. 1903. '*Bakario*, *Bekar*, *Meh-phuli*' (Hindi).

Prostrate or diffuse, annual herbs, clothed with long, white hairs. Leaves sessile, 0.7-1.5 × 0.5-1.0 cm, apiculate, hairy. Stipules setaceous. Flowers in small, sessile, 4 to 8-flowered, axillary racemes, red. Pods longer

than broad, cylindric-oblong, slightly torulose when 2-seeded, acute, pubescent.

Fl. & Fr. : August - December.

Common in dry habitats in sandy as well as rocky grounds. It is a good soil binder.

Selected specimens : Banswara: Jhu Fall, *Singh* 3732 (BSJO); Jaipur: Galtore, *Sharma* 12 (RUBL); Jodhpur: Shahpur, *Tiwari* 657 (BSJO); Kota: *Majumdar* 12408 (BSA); Sirohi: Mt. Abu, *Kaul* 9371 (LWG).

11. *Indigofera dalzellii* T. Cooke, Fl. Bombay 1: 311. 1902. *I. triquetra* Dalz. in Hook. Kew Journ. 2: 36. 1850, non Meyer. 1836; Baker in Hook. f. Fl. Brit. India 2: 93. 1876.

Prostrate-ascending, silvery-canescens, perennial herbs, with many, triquetrous stems from a woody root. Leaves subsessile, 1.0-2.5 × 0.5-1.0 cm, elliptic-oblong, mucronate, hairy beneath. Flowers in axillary, 6 to 12-flowered racemes longer than the leaves, purple. Bracts ovate, acuminate. Standard hairy on the back. Pods linear, beaked.

Rare, on bare rocky grounds. Reported from Sikar by Nair & Nathawat (1957).

12. *Indigofera glabra* L. Sp. Pl. 751. 1753; Duthie, Fl. Gangetic Plain 1: 251. 1903. *I. pentaphylla* Murr. Syst. Veg. ed. 564. 1774; Wight, Ic. 2(1): 7. t. 385. 1840; Baker in Hook. f. Fl. Brit. India 2: 95. 1876.

Caespitose, annual herbs. Leaflets 0.4-2.0 × 0.2-1.0 cm, obovate-oblong, membranous, appressed hairy. Flowers in axillary, 2 to 4-flowered racemes, red. Calyx-teeth setaceous. Pods 1-2 cm long, subcylindric, 8 to 12-seeded. Seeds cylindrical, truncate at both ends.

Fl. & Fr. : August - October.

Rare, in wastelands and outskirts of forests.

Selected specimens : Jaipur: Durgapur, *Sharma* 2210 (RUBL); Tonk: Banetha, *Shetty* 1269 (BSJO). Also reported from Sikar (Ratnam, 1957).

13. *Indigofera glandulosa* Willd. Sp. Pl. 3: 1227. 1802; Wight, Ic. 2(1): 2. t. 330. 1840; Baker in Hook. f. Fl. Brit. India 2: 94. 1876; Duthie, Fl. Gangetic Plain 1: 250. 1903. 'Hara Jhohru' (Hindi).

Erect, annual herbs, clothed with appressed, greyish brown hairs. Leaflets 1.5-4.0 × 0.5-1.0 cm, oblanceolate-spathulate, obtuse, mucronate, punctate with black glands beneath. Flowers in dense, short, globose, axillary racemes shorter than leaves, yellow or reddish. Bracts subulate.

Calyx-teeth setaceous. Pods angled or slightly winged at the angles, pubescent. Seeds spherical, smooth, often mottled.

Fl. & Fr. : August - November.

Occasional, weed in the cultivated fields.

Selected specimens : Banswara: Malki Dungri, *Kanodia* 75428 (BSI); Bhilwara: Parvatipur, *Singh* 6576 (BSJO); Chittorgarh: *Patil* 491 (DD); Jhalawar: Asnawar, *Verma* 7544 (BSA).

14. *Indigofera hirsuta* L. Sp. Pl. 751. 1753; Baker in Hook. f. Fl. Brit. India 2: 98. 1876; Duthie, Fl. Gangetic Plain 1: 254. 1903; Mahesh. Illus. Fl. Delhi f. 59. 1966. *I. astragalina* DC. Prodr. 2: 228. 1825.

Annual or biennial herbs, clothed with spreading brown hairs. Leaflets 5-7, 2.5-6.0 × 1.5-3.5 cm, obovate or elliptic-oblong, appressed hairy. Flowers in dense, spicate racemes exceeding the leaves, red. Calyx-teeth setaceous, plumose. Pods straight, tomentose, 6 to 8-seeded, closely appressed to the peduncle.

Fl. & Fr. : August - November.

Common along the railway lines, roads, in wastelands and open forests. It is a highly polymorphic species as regards the length of peduncle, size of pod, number of seeds, colour of hairs, number of leaflets etc.

Selected specimens : Banswara: Bagaycha, *Singh* 3053 (BSJO); Bhilwara: Maja Dam, *Singh* 6597 (BSJO); Jhalawar: Latia Jhir forest Nursery, *Wadhwa* 5379 (BSA); Jodhpur: *Bhandari* 379 (JAC).

15. *Indigofera hochstetteri* Baker in Oliver, Fl. Trop. Afr. 2: 101. 1871; Mahesh. Illus. Fl. Delhi f. 57. 1966. *I. anabaptista* Steud. ex Baker in Hook. f. Fl. Brit. India 2: 102. 1876; Duthie, Fl. Gangetic Plain 1: 251. 1903. '*Adio-bekario*' (Hindi).

Diffuse, annual herbs, with terete branches. Leaflets 5, rarely 3, c. 1.0 × 0.5 cm, elliptic-lanceolate or oblanceolate, apiculate, white-appressed hairy. Flowers in dense, 12 to 20-flowered, axillary racemes shorter than leaves, red. Bracts lanceolate. Calyx-teeth linear-subulate. Pods much recurved, deflexed, appressed hairy, 5 to 8-seeded, partitions between the seeds appear as transverse ridges. Seeds discoid, pale-brown.

Fl. & Fr. : August - November.

Common in dry sandy habitats.

Selected specimens : Banswara: *Kanodia* 75263 (BSI); Bikaner: Bhikampur, *Roy* 2017 (BSJO); Jaipur: Sanganer, *Sharma* Acc. no. 1663 (RUBL); Jhalawar: *Wadhwa* 5394 (BSA); Sirohi: Mt. Abu, *Soni* Acc. no. 70 (RUBL).

16. *Indigofera linifolia* (L. f.) Retz. Obs. 4: 29. 1786; Wight, Ic. 1: 1. 313. 1840; Baker in Hook. f. Fl. Brit. India 2: 92. 1876; Duthie, Fl. Gangetic Plain 1: 249. 1903; Mahesh. Illus. Fl. Delhi f. 54. 1966. *Hedysarum linifolium* L. f. Suppl. 331. 1781. 'Safed Jhohhur, Pandar Phali' (Hindi).

var. *linifolia*

Erect or prostrate, annual or perennial herbs, with many stems from the base. Leaves 1.0-4.5 × 0.2-0.5 cm, apiculate, appressed hairy. Flowers in axillary, 6 to 20-flowered racemes shorter than leaves, red. Calyx-teeth linear, subulate, much longer than the tube. Pods c. 2 mm in diam., globose, apiculate, silky hairy

Fl & Fr. : July - December.

Widely distributed in the forests, wastelands, parks, lawns and other similar habitats.

Selected specimens : Banswara: Bagaycha forest, Singh 2188 (BSJO); Jaipur: Chaumu, Wadhwa 8334 (BSA); Kota: Singh 90211 (LWG); Sirohi: Mt. Abu, Blatter 12302 (BLAT).

17. var. *campbellii* Wight ex Baker in Hook. f. Fl. Brit. India 2:93. 1876; Sharma & Tiagi, Fl. N.E. Rajasthan 133. 1979.

Differs from the proper species is having shorter internodes, shorter obovate or ovate-elliptic leaves.

Fl & Fr. : July - December.

Rare, in rocky grounds, crevices of rocks etc.

Selected specimens : Banswara: Mathola tank, Kanodia 75348 (BSI); Jaipur: Univ. Reserve forest, Sharma 516 (RUBL); Sirohi: Mt. Abu, Blatter 12302 (BLAT).

18. *Indigofera tinnaei* Ali in Bot. Notis. 111: 549. 1958; Mahesh. Illus. Fl. Delhi f. 56. 1966. *I. enneaphylla* auct. plur. non L. 1771; Wight, Ic. 2(1): 8. t. 403. 1840; Baker in Hook. f. Fl. Brit. India 2: 94. 1876; Duthie, Fl. Gangetic Plain 1: 250. 1903.

Prostrate, annual or biennial herbs, clothed with appressed hairs. Leaflets 5-11, 0.2-0.8 × 0.1-0.5 cm, obovate, truncate or emarginate, appressed hairy. Flowers in dense, axillary, 10 to 15-flowered, spicate racemes shorter than the leaves, red. Bracts ovate, acuminate, scarious. Pods c. 6 mm long, oblong, acute, turgid, torulose, appressed hairy.

Fl & Fr. : August - December.

Common in wastelands in dry sandy soils. It is a good soil binder.

Selected specimens : Banswara: Paloda, Singh 2798 (BSJO); Bhilwara: Bhimar, Singh 5986 (BSJO); Jhalawar: Wadhwa 7539 (BSI); Jodhpur: Bar, Wadhwa 4924 (BSA).

19. *Indigofera oblongifolia* Forssk. Fl. Aegypt. Arab. 137. 1775; Duthie, Fl. Gangetic Plain 1: 253. 1903; Mabesh. Illus. Fl. Delhi f. 55. 1966. *I. paucifolia* Delile, Fl. Aegypt. 251. 1812; Baker in Hook. f. Fl. Brit. India 2: 97. 1876. 'Khuaar' (Hindi).

Much-branched shrubs, upto 1 m high. Leaflets 3-5, not more than 1 cm in length, oblong or oblanceolate, hairy. Flowers in long, spicate, 20 to 50-flowered racemes longer than the leaves, red. Calyx-teeth triangular, acute, as long as the tube. Pods borne along the whole length of the peduncle, deflexed, pubescent, 5 to 8-seeded. Seeds oblong, 4-gonous, truncate.

Fl. & Fr. : August - November.

Common in dry, rocky habitats. The plants are usually browsed by the cattle.

Selected specimens : Banswara: Boregama, Kanodia 51007 (BSI); Barmer: Silly Pasture, Tiwari 993 (BSJO); Jaipur: Bhandana, Sharma 1864 (RUBL); Jhalawar: Khanpur, Verma 6932 (BSA); Sawaimadhapur: Bayana, Shankar & Ghosh 46017 (LWG).

20. *Indigofera sessiliflora* DC. Prodr. 2: 228. 1825; Raizada, Suppl. Duthie, Fl. Gangetic Plain 1: 54. 1976. *I. trigonelloides auct. non Jaub. & Spach.* 1857; Baker in Hook. f. Fl. Brit. India 2: 94. 1876.

Caespitose herbs, with many trailing, 3-gonous stems clothed with appressed hairs. Leaflets 5-7, 0.4-1.6 × 0.6-1.8 cm, oblanceolate or elliptic, appressed hairy. Flowers in dense, sessile, villous, 12 to 30-flowered heads, red. Bracts ovate-lanceolate, acute. Pods 0.6-1.0 cm, linear-cylindric, torulose.

Fl. & Fr. : July - October.

Common in dry sandy soils, particularly in desertic zones.

Selected specimens : Ajmer: Pushkar, Sharma 1630 (DD); Barmer: Rani ka Bara, Shetty 2327 (BSJO); Churu: Bhanipura, Roy 2625 (BSJO); Jaipur: Univ. Reserve forest, Sharma 560 (RUBL); Udaipur: Menor, Majumdar 12493 (BSA).

21. *Indigofera spicata* Forssk. Fl. Aegypt. - Arab. 138. 1775; Sharma & Tiagi, Fl. N.E. Rajasthan 134. 1979. *I. endecaphylla* Jacq. Ic. Rar. 3(3): t.

570, 1789 & Collect. 2: 358, 1789; Baker in Hook. f. Fl. Brit. India 2: 98, 1876.

Procumbent herbs, 30-90 cm tall. Leaflets 5-11, 0.8-2.0 × 0.3-1.5 cm, oblanceolate, mucronate, appressed hairy. Flowers purple-violet. Calyx-teeth lanceolate-subulate. Pods 1.5-2.8 cm long, straight, deflexed, 6 to 10-seeded. Seeds oblong, 4-gonous, truncate at both ends.

Fl. & Fr. : August - October.

Rare, on hill-slopes.

Selected specimens : Jaipur: Univ. Reserve forest, *Sharma* 923 (RUBL); Moti-doongari, *Sharma* 1578 (RUBL).

22. *Indigofera tenuifolia* Rottl. ex Wight & Arn. Prodr. 200, 1834; Baker in Hook. f. Fl. Brit. India 2: 95, 1876.

Diffuse herbs, 15-20 cm high. Leaflets 7-9, 6-10 × 3-4 mm, oblanceolate or linear-obovate, apiculate, appressed hairy. Stipules setaceous. Flowers in 3 to 6-flowered racemes, red. Calyx-teeth setaceous. Pods 2.0-2.6 cm long, linear, subcylindric or compressed, 10 to 12-seeded. Seeds oblong, truncate at the ends.

Fl. & Fr. : August - October.

Rare, in wastelands. It is a peninsular element. Reported from Barmer by Puri *et al.* (1964).

23. *Indigofera tinctoria* L. Sp. Pl. 751, 1753; Wight, Ic. 2(1): 5, t. 365, 1840; Baker in Hook. f. Fl. Brit. India 2: 99, 1876; Duthie, Fl. Gangetic Plain 1: 254, 1903. '*Neel*' (Hindi).

Grey pubescent undershrubs, upto 1 m high. Leaflets 7-13, upto 1.8 × 1.0 cm, obovate or oblanceolate, apiculate. Flowers in axillary, 15 or more-flowered racemes shorter than leaves. Pods c. 3.5 cm long, slightly curved, deflexed, glabrous or finely pubescent, brown, 8 to 10-seeded, septate between the seeds. Seeds oblong, truncate at both ends.

Fl. & Fr. : August - November.

Common in wastelands, open forests and along the roads.

Selected specimens : Alwar: Bala fort, *Lal* 34447 (LWG); Chittorgarh: Orai Dam, *Verma* 1658 (BSA); Jaipur: *Kaul* 8359 (LWG); Kota: *Atru, Singh* 90606 (LWG); Tonk: *Maheshwari* 52993 (LWG).

24. *Indigofera trifoliata* L. in Torner, Cent. Pl. 2: 29, 1756; Wight, Ic. 1: t. 314, 1840; Baker in Hook. f. Fl. Brit. India 2: 96, 1876; Duthie, Fl. Gangetic Plain 1: 251, 1903. '*Buigoli*' (Hindi).

Annual or perennial herbs or undershrubs, glabrous or clothed with few appressed hairs. Leaflets 1.2-2.5 × 0.3-1.2 cm, obovate or oblanceolate, retuse or rounded, hairy. Flowers in axillary, 6 to 12-flowered racemes shorter than the leaves, red. Pods deflexed, 1.5-2.0 cm long, linear, 6 to 12-seeded.

Fl. & Fr. : July - November.

Rare, in wastelands and open forests, particularly in wet and shady habitats.

Selected specimens : Banswara: Lalpura forest, *Singh* 2980 (BSJO); Bhilwara: Bijolia, *Singh* 6071 (BSJO); Kota: Shahabad, *Majumdar* 13266 (BSA).

25. *Indigofera trita* L. f. *Suppl.* 335. 1781; *Wight, Ic.* 1: t. 315. 1840; *Baker in Hook. f. Fl. Brit. India* 2: 96. 1876; *Duthie, Fl. Gangetic Plain* 1: 252. 1903.

subsp. *trita* var. *trita*

Undershrubs, c. 1 m high, clothed with fine appressed hairs. Leaflets 3, upto 4 × 3 cm, obovate-oblong, obtuse or retuse, mucronate. Flowers in 6 to 12-flowered, spicate racemes shorter than leaves. Calyx white-canescens; teeth setaceous. Pods c. 2.5 cm long, patent, spreading horizontally, slightly curved at the base, appressed hairy, shortly beaked, 6 to 10-seeded. Seeds oblong, brown.

Fl. & Fr. : September - February.

Common in wastelands, neglected corners of fields and gardens, open forests etc. The plants are usually browsed by the cattle.

Selected specimens : Banswara: Looda, *Majumdar* 10297 (BSA); Bharatpur: Bund Baretha, *Bhardwaja* 8612 (LWG); Jaipur: *Wadhwa* 8166 (BSA); Jhalawar: Khanpur, *Wadhwa & Prasad* 9557 (BSA); Tonk: Suntheli, *Shetty* 1225 (BSJO).

26. subsp. *subulata* var. *subulata* (Vahl ex Poir.) Ali in *Bot. Notis.* 111: 558. 1958. *I. subulata* Vahl ex Poir. in *Lam. Encycl. Suppl.* 3: 150. 1813; *Baker in Hook. f. Fl. Brit. India* 2: 96. 1876; *Duthie, Fl. Gangetic Plain* 1: 252. 1903.

Differs from the proper species in having large leaflets and petioles, more than 12-flowered racemes, drooping pods which are not curved at the base.

Fl. & Fr. : July - December.

Rare, in wastelands and open forests.

Selected specimen : Banswara: Anand Sagar, *Singh* 2975 (BSJO).

27. *Indigofera wightii* Grah. ex Wight & Arn. Prodr. 202. 1834; Baker in Hook. f. Fl. Brit. India 2: 99. 1876.

Erect or straggling shrubs, with silvery grey appressed hairs. Leaflets 13-21, 0.6-1.5 × 0.6 cm, elliptic or oblanceolate, mucronate, appressed white-hairy. Flowers in dense, subsessile racemes, red. Calyx-teeth triangular. Pods 2.5-3.5 cm long, straight, cylindric, mucronate, appressed hairy, 8 to 12-seeded.

Fl. & Fr. : September - November.

Rare, in wastelands. Reported from Jhunjhunu district by Nair and Nathawat (1957).

22. LATHYRUS L.

Leaflets absent. Tendrils unbranched. Stipules foliaceous.

1. *L. aphaca*

Leaflets 2 pairs. Tendrils branched. Stipules linear, not foliaceous.

2. *L. sativus*

1. *Lathyrus aphaca* L. Sp. Pl. 729. 1753; Baker in Hook. f. Fl. Brit. India 2:179. 1876; Duthie, Fl. Gangetic Plain 1: 260. 1903. '*Pili-matter, Jangli-matter*' (Hindi).

*Climbing, annual herbs, with 4-angled, terete stems. Stipules in pairs, 1.5-3.5 × 1.0-2.5 cm, ovate-hastate. Flowers axillary, solitary, yellow; pedicels longer than the stipules. Pods linear, flat, not winged, 4 to 7-seeded. Seeds smooth, black.

Fl. & Fr. : January - March.

Common weed in cultivated fields, preferring wet and shady habitats.

Selected specimens : Banswara: *Singh* 7149 (BSJO); Bhilwara: *Singh* 7149 (BSJO); Churu: *Sujangarh, Roy* 2485 (BSJO); Jhalawar: *Sharma* 503 (RUBL); Jodhpur: *Bhandari* 1446 (JAC).

2. *Lathyrus sativus* L. Sp. Pl. 730. 1753; Baker in Hook. f. Fl. Brit. India 2:179. 1876; Duthie, Fl. Gangetic Plain 1: 260. 1903. '*Chapta-mattar, Hiran Khuri*' (Hindi).

Climbing, annual herbs, with winged branches. Leaves 1-pinnate; rachis winged below the lowest pair of leaflets. Leaflets linear-lanceolate or oblong. Flowers axillary, solitary, 1.0-1.5 cm long, reddish purple or blue. Pods 3-4 cm long, flat, winged on either side of dorsal suture. Seeds 4-6, compressed.

Fl. & Fr. : January - March.

Native of W. Asia to Afghanistan; common weed in cultivated fields.

Selected specimens : Banswara: Ghatol, Singh s.n. (BSJO); Bhilwara: Singh 7152 (BSJO); Jaipur: Bara-gaon, Sharma 2022 (RUBL); Jodhpur: Bhandari 1475 (JAC); Kota: Singh 90891 (LWG).

23. LESPEDEZA MICH.

Lespedeza juncea (L. f.) Pers. var. *sericea* (Thunb.) Lace & Hamsley in Journ. Linn. Soc. (Bot.) 23: 181. 1887. *Hedysarum sericeum* Thunb. Fl. Jap. 289. 1784. *Anthyllis cuneata* du Mont de Courset in Bot. Cult. 6: 100. 1811. *Aspalanthus cuneata* (de courset) D. Don, Prodr. Fl. Nep. 246. 1825. *Lespedeza sericea* (Thunb.) Miq. in Ann. Mus. Lag. Bat. 3: 49. 1867.

Erect undershrubs, upto 1 m high, with long, tough branches. Leaves ascending, crowded; leaflets 3, 0.5-1.5 cm long, linear-cuneate or oblanceolate, emarginate, coriaceous, grey or white silky hairy beneath. Flowers 2-4, on short, axillary pedicels, white tinged with purple. Corolla twice the length of calyx; keel obtuse, much incurved. Pods sessile, thinly silky, tipped by persistent style.

Fl & Fr. : April - June.

Rare, in the forests.

Selected specimens : Sirohi: Mt. Abu, Jain 62164, 46661 (BSI).

24. MACROPTILIUM URB.

Macroptilium lathyroides (L.) Urb. Symb. Ant. 9: 457. 1928. *Phaseolus lathyroides* L. Sp. Pl. ed. 2. 1018. 1763. *P. semierectus* L. Mant. 100. 1767; Baker in Hook. f. Fl. Brit. India 2: 201. 1876.

Annual undershrubs, upto 1 m high; branches terete, clothed with long, deflexed, deciduous hairs. Leaflets 3, 4-8 × 2-5 cm, rhomboid-ovate or oblong-lanceolate, acute, subglabrous. Flowers in spicate racemes, purple. Calyx-teeth triangular, cristate. Pods 7.5-10.0 × 0.3-0.5 cm, cylindrical, straight, silvery-pubescent when young, glabrous when mature. Seeds about 20, truncate at the ends, brown.

Fl & Fr. : September - November.

Rare, in wastelands. Reported from Mt. Abu by Bhandari & Mehta (1978) and from Jhunjhunu by Majumdar (1969).

25. MEDICAGO L.

1a. Pods subglobose, unarmed, 1-seeded.

2. *M. lupulina*

1b. Pods spirally coiled, armed with spines, more than 2-seeded:

- 2a. Pods covered with spines on the margins as well as on exterior faces. 1. *M. laciniata*
- 2b. Pods covered with spines on the margins alone, the exterior faces are reticulate to venose. 3. *M. polymorpha*

1. *Medicago laciniata* (L.) Mill. Gard. Dict. ed. 8. No. 5. 1768; Baker in Hook. f. Fl. Brit. India 2: 90. 1876. *M. polymorpha* L. var. *laciniata* L. Sp. Pl. 781. 1753.

var. *laciniata*

Annual herbs, about 30-50 cm high. Leaflets 0.5-1.0 cm long, obovate-cuneate, truncate or retuse, dentate to pinnatifid. Stipules lacinate. Flowers in 2-flowered, axillary racemes, yellow; peduncle produced into an awn. Corolla slightly exerted. Pods of 4-5 spirals, 8 to 10-seeded.

Fl. & Fr. : December - March.

Rare, weed in the cultivated fields and gardens. Reported from Jaisalmer by Blatter & Hallberg (1918) and from Jodhpur by Sarup (1954).

2. *Medicago lupulina* L. Sp. Pl. 779. 1753; Baker in Hook. f. Fl. Brit. India 2: 90. 1876; Duthie, Fl. Gangetic Plain 1: 210. 1903.

Prostrate or procumbent herbs. Leaflets 0.7-1.0 × 0.5-0.8 cm, obovate, emarginate, apiculate, incise-crenate. Stipules linear, entire or subdentate at the base. Flowers in dense, spicate, 10 to 20-flowered, axillary racemes longer than the leaves, pale yellow. Calyx-teeth linear-lanceolate. Pods shell-like, reticulately veined, black at maturity, pubescent.

Fl. & Fr. : January - March.

Native of Europe; naturalized in wet and shady habitats.

Selected specimens : Banswara: Talwara, Singh 4297 (BSJO); Jhalawar: Aklera, Majumdar 10008 (BSA); Kota: Singh 74793 (LWG).

3. *Medicago polymorpha* L. Sp. Pl. 779. 1753; Mahesh. Illus. Fl. Delhi f. 51. 1966. *M. denticulata* Willd. Sp. Pl. 3: 1414. 1802; Baker in Hook. f. Fl. Brit. India 2: 90. 1876; Duthie, Fl. Gangetic Plain 1: 211. 1903.

Prostrate to erect, annual herbs. Leaflets 1.0-2.5 × 0.6-1.5 cm, obovate-cuneate, emarginate, denticulate. Flowers in 2 to 6-flowered racemes, yellow; peduncle produced into an awn. Calyx-teeth lanceolate, shorter than tube. Pods of 2-4 spirals, 4 to 8-seeded.

Fl. & Fr. : January - March.

Common weed in cultivated fields, particularly in the east of Aravalli.

Selected specimens : Bhilwara: *Singh* 7017 (BSJO); Ganganagar: 79 G.B., *Roy* 4084 (BSJO); Jhalawar: *Sharma* 385 (RUBL); Sirohi: Mt. Abu, *Jain* 62095 (BSI); Tonk: Barundi, *Shety* 537 (BSJO).

26. MELILOTUS MILL.

Flowers white. Seeds smooth.

1. *M. alba*

Flowers yellow. Seeds finely verrucose.

2. *M. indica*

1. *Melilotus alba* Medik. ex Desr. in Lam. Encycl. 4: 63. 1797; Baker in Hook. f. Fl. Brit. India 2: 89. 1876; Duthie, Fl. Gangetic Plain 1: 208. 1903. 'Mokhundo' (Hindi).

Erect, annual herbs, upto 100 cm high. Leaflets 1.7-3.0 × 1.0-1.8 cm, obovate or oblanceolate to elliptic, incise-serrate in upper half, cuneate at the base. Flowers axillary, c. 4 mm long, in many flowered, slender racemes. Pods c. 4 mm long, oblong-ovoid, reticulately veined, 1 to 2-seeded. Seeds ovoid.

Fl. & Fr. : December - April.

Native of Europe and western temperate Asia; common weed in cultivated fields and other moist habitats.

Selected specimens : Banswara: Loharia, *Singh* 4253 (BSJO); Barmer: Gypsum halt, *Tiwari* 1193 (BSJO); Bikaner: Bichwal, *Roy* 1668 (BSJO); Kota: *Singh* 90644 (LWG); Tonk: Banteli, *Shety* 478 (BSJO).

2. *Melilotus indica* (L.) All. Fl. Pedem. 1: 308. 1785; Duthie, Fl. Gangetic Plain 1: 208. 1903; Mahesh. Illus. Fl. Delhi f. 53. 1966. *Trifolium indicum* L. Sp. Pl. 765. 1753. *M. parviflorus* Desf. Fl. Atlant. 2: 192. 1799; Baker in Hook. f. Fl. Brit. India 2: 89. 1876. 'Mortia' (Hindi).

Erect, annual herbs, upto 75 cm high. Leaflets 1.5-2.5 × 0.5-1.5 cm, oblanceolate or obovate-oblong, cuneate at the base, incise-serrate in upper half. Flowers in lax, axillary, slender racemes, c. 5 mm long. Pods 2-4 mm long, ovoid or oblong, 1 to 2-seeded, glabrous, reticulately veined.

Fl. & Fr. : January - April.

Native of southern Europe and south-western Asia; common weed in cultivated fields and gardens.

Selected specimens : Banswara: Ghatol, *Singh* 4219 (BSJO); Bikaner: Richmal, *Roy* 1657 (BSJO); Jaipur: Doasa, *Wadhwa* 8148 (BSA); Jodhpur: Mandore, *Jain* 44409 (BSI); Sirohi: Mt. Abu, *Blatter* 12349 (BLAT).

27. MILLETTIA WIGHT & ARN.

Woody climbers. Standard auricled at the base on both sides of claw.

1. *M. extensa*

Trees. Standard not auricled.

2. *M. peguensis*

1. *Millettia extensa* Benth. in Miq. Fl. Jungh. 249. 1852; Baker in Hook. f. Fl. Brit. India 2: 109. 1876. *M. auriculata* Baker in Hook. f. Fl. Brit. India 2: 108. 1876; Duthie, Fl. Gangetic Plain 1: 246. 1903.

Woody climbers, with finely downy branchlets. Leaves imparipinnate; leaflets 7-9, 7-16 × 4-8 cm, obovate or ovate-oblong, obtuse or cuspidate, appressed silky on both sides, stipellate. Flowers in axillary, 10-30 cm long, slender racemes near the end of branches, dull white. Bracts minute, linear. Calyx and corolla silky. Pods 8-14 × 2.5-3.5 cm, linear-oblong, flat, woody, many-seeded.

Fl. & Fr. : Most part of the year.

Occasionally found in the mixed deciduous forests.

Selected specimen : Kota: Shahabad, Verma 800 (BSA).

2. *Millettia peguensis* Ali in Kew Bull. 21: 489. 1968. *M. ovalifolia sensu* Kurz in Journ. Asiat. Soc. Beng. 42. (2): 68. 1873; Baker in Hook. f. Fl. Brit. India 2: 107. 1876, non *Pongamia ovalifolia* Wight & Arn. 1834.

Deciduous trees, 3-8 m high. Leaves imparipinnate; leaflets 5-7, 3.5-6.5 × 2-4 cm, ovate-elliptic, obtuse to acuminate. Flowers solitary or fasciated in pendulous, 5-20 cm long racemes, purple. Calyx and corolla glabrous except the margins. Pods 4.5-14.0 × 1.5 cm, linear-oblong, flat, distinctly stalked, 4 to 10-seeded. Seeds suborbicular, smooth, brown.

Fl. & Fr. : August - September.

Rare, in wastelands; usually planted along the roads for its showy and fragrant flowers.

Selected specimens : Bikaner: Gajner Palace Garden, Roy 2061 (BSJO); Kota: Singh 91077 (LWG).

28. MUCUNA ADANS. *nom. cons.*

Mucuna pruriens (L.) DC. Prodr. 2: 405. 1825; Hook. f. Fl. Brit. India 2: 187. 1876; Duthie, Fl. Gangetic Plain 1: 237. 1903; Mahesh, Illus. Fl. Delhi f. 73. 1966. *Dolichos pruriens* L. in Stickman, Diss. Herb. Amb. 23. 1754. 'Kaunch' (Hindi).

Twining, hirsute, annual herbs. Leaves 3-foliolate; leaflets 6-9 × 3.5-8.0 cm, rhomboid-ovate, unequilateral at the base, subacute, mucronate, pubescent above, hairy beneath. Flowers 2-3 cm long, in drooping, 6 to 30-flowered racemes, purple. Bracts and bracteoles lanceolate, caducous. Standard shorter than keels. Pods 6-10 × 1.2-2.0 cm, slightly curved at both ends in opposite directions, densely bristly, neither winged nor plaited.

Fl. : August - October; *Fr.* : November - April.

Common in wastelands and open forests among the clumps of trees and shrubs.

Selected specimens : Banswara: Lasara, Singh 3607 (BSJO); Bhilwara: Singh 6568 (BSJO); Jaipur: Ramgarh, Sharma 2178 (RUBL); Jhalawar: Aklera, Wadhwa 7638 (BSA); Sirohi: Mt. Abu, Blatter 22415 (BLAT).

29. OUGEINIA BENTH.

Ougeinia oogeinsis (Roxb.) Hochr. Ann. Cons. Jard. Bot. Geneve 13 & 14: 51. 1909. *Dalbergia oogeinsis* Roxb. Fl. Ind. 3: 220. 1832. *Ougeinia dalbergioides* Benth. in Miq. Pl. Jungh. 216. 1852; Baker in Hook. f. Fl. Brit. India 2: 161. 1876; Duthie, Fl. Gangetic Plain 1: 280. 1903. 'Sandan, Tinsa' (Hindi).

Deciduous trees, with grey or light brown bark. Leaves 3-foliolate; leaflets 6-15 × 3.5-9.0 cm, obliquely ovate to elliptic, acuminate, entire. Flowers in short, fascicled racemes arising from the nodes of old branches, white. Calyx-teeth shorter than the tube and lowest the longest. Pods 5-10 × 0.8 cm, flat; joints reticulately veined.

Fl. & Fr. : March - May.

Rare, in the wastelands; usually planted along the roads and in the gardens.

Selected specimen : Bundi: Singh 74416 (LWG). Also reported from Mt. Abu by Jain (1961).

30. PONGAMIA VENT. *nom. cons.*

Pongamia pinnata (L.) Pierre, For. Fl. Cochinch. 5: t. 385. 1899. *Cytisus pinnatus* L. Sp. Pl. 741. 1753. *Pongamia glabra* Vent. Jard. Malm. 1: 28. t. 28. 1803; Wight, Ic. 1: t. 59. 1838; Baker in Hook. f. Fl. Brit. India 2: 240. 1876; Duthie, Fl. Gangetic Plain 1: 267. 1903.

Trees, 7-10 m high, with greyish bark. Leaves imparipinnate; leaflets 5-9, 4-10 × 3.5-5.0 cm, elliptic or ovate-oblong, entire, acute-acuminate. Flowers in fascicles of 2-4 on the rachis of axillary racemes, pinkish white.

Pods 3.5-6.0 × 1.5-2.5 cm, obliquely oblong, woody, indehiscent, glabrous, not winged.

Fl. & Fr. : March - June.

Common in wastelands, along the roads and often planted in the forests. Sometimes the leaves are insect-variegated.

Selected specimens : Banswara: Jharda, *Kanodiu* 35636 (BSI); Bhilwara: Jahajpur, *Singh* 5726 (BSJO); Jaisalmer: Bada Bag, *Puri* 23178 (BSI); Kota: *Wadhwa* 9212 (BSA); Sirohi: Mt. Abu, *JAV* 22527 (BSI).

Notes : Sometimes considered conspecific to the genus *Derris* Lour. which, however, bears winged fruits.

31. PSORALEA L.

Leaves simple.

1. *P. corylifolia*

Leaves 3-foliolate.

2. *P. plicata*

1. *Psoralea corylifolia* L. Sp. Pl. 764. 1753; Baker in Hook. f. Fl. Brit. India 2: 103. 1876; Duthie, Fl. Gangetic Plain 1: 241. 1903. '*Bavchi*' (Hindi).

Annual herbs, 30-60 cm high, clothed with white hairs and purple glands. Leaves 2-9 × 1.5-8.0 cm, ovate to suborbicular, incise-dentate, hairy and gland-dotted. Stipules lanceolate, acuminate. Flowers upto 1 cm long, closely packed in upper part of axillary racemes, bluish purple. Pods c. 7 × 5 mm, oblong or ovoid, closely pitted, glabrous, black when ripe, 1-seeded. Seeds adhering to the pericarp.

Fl. & Fr. : October - March.

Common weed in wastelands, open forests, along the roads etc., particularly in the east of Aravalli.

Selected specimens : Banswara: Barodia, *Singh* 3746 (BSJO); Bhilwara: Bijolia, *Singh* 6073 (BSJO); Jhalawar: Dug, *Verma* 6861 (BSA); Sirohi: Mt. Abu, *Blatter* 1243 (BLAT).

2. *Psoralea plicata* Delile, Fl. Egypt. 252. t. 27. f. 3. 1812; Baker in Hook. f. Fl. Brit. India 2: 103. 1876; Raizada, Suppl. Duthie, Fl. Gangetic Plain 57. 1976. *P. odorata* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 238. 1918. '*Jhil*' (Hindi).

Undershrubs, 30-60 cm high, with pubescent, gland-dotted stems. Leaflets 1.2-2.5 × 0.5-2.0 cm, linear-oblong to obovate, irregularly sinuate-toothed, appressed hairy, gland-dotted beneath. Stipules linear-oblong. Flowers solitary or fascicled in axillary racemes, yellow or white. Bracts

ovate. Pods ellipsoid, densely hairy, enclosed in accrescent calyx, 1-seeded. Seeds adherent to the pericarp.

Fl. & Fr. : November - March.

Common in the dry sandy habitats, particularly in the desertic zones.

Selected specimens : Ajmer: *Lowrie* 88 (DD); Barmer: Sindari, *Rao* 66958 (BSI); Bikaner: Nal Air Port, *Roy* 3397 (BSJO); Churu: Tal Chhapar, *Roy* 2718 (BSJO); Ganganagar: Suratgarh, *Stower* 142 (BSI).

Notes : Some workers consider *P. plicata* Delile and *P. odorata* Blatt. & Hallb. as distinct species.

32. PTEROCARPUS JACQ. *nom. cons.*

Pterocarpus marsupium Roxb. Pl. Cor. 2: 9. t. 116. 1799; Baker in Hook. f. Fl. Brit. India 2: 239. 1876; Duthie, Fl. Gangetic Plain 1: 266. 1903. 'Bija-sal' (Hindi).

Deciduous trees, with crooked stem and spreading branches. Leaves 4-13 × 2-8 cm, elliptic or ovate to lanceolate, obtuse to acuminate, glabrous. Flowers in lateral and terminal, fusco-pubescent paniculate racemes shorter than the leaves, pale-yellow. Calyx-teeth margined. Pods 2.5-5.0 cm in diam., suborbicular, glabrous, winged.

Fl. & Fr. : April - June.

Rare, in mixed deciduous forests.

Selected specimens : Kota: *Jain* 28826 (BSI); Sirohi: Mt. Abu, *McCann* 1852 (BLAT); Udaipur: Jaisamand, *Kanodia* 82283 (BSI).

33. PUERARIA DC.

Pueraria tuberosa (Roxb. ex Willd.) DC. in Ann. Sci. Nat. 4: 97. 1825; Wight, Ic. 2(1): 9. t. 412. 1840; Baker in Hook. f. Fl. Brit. India 2: 197. 1876; Duthie, Fl. Gangetic Plain 1: 233. 1903. *Hedysarum tuberosum* Roxb. ex Willd. Sp. Pl. 3: 1197. 1802. 'Ghora Bel' (Hindi).

Shrubby twiners, with large tuberous roots. Leaflets 8.5-15.0 × 6-10 cm, broadly ovate, cuneate at the base, acuminate, entire, hairy beneath. Stipules ovate-oblong, cordate at the base; stipels subulate. Flowers in axillary, 20-30 cm long racemes, bluish. Standard spurred at the base. Pods 2.5-7.5 cm long, flat, membranous, 3 to 6-seeded. Seeds glabrous.

Fl. & Fr. : February - April.

Rare, in wastelands among the clumps of trees and shrubs. The fruit hairs cause irritation in the skin like those of *Mucuna pruriens* (L.) DC.

Selected specimens : Kota: Kelwara, *Singh* 90827 (LWG); Sirohi: Mt. Abu, *Blatter* 12071 (BLAT).

34. RHYNCHOSIA LOUR. *nom. cons.*

- 1a. Plants trailing. Flowers in capitate racemes. Pods orbicular. Seeds strophiolate. 2. *R. capitata*
- 1b. Plants twining. Flowers in lax racemes. Pods elliptic-lanceolate.
- 2a. Standard dark purple inside. 5. *R. rothii*
- 2b. Standard yellow inside:
- 3a. Leaflets glabrous above, pubescent on veins beneath. Pods glabrescent. 3. *R. minima*
- 3b. Leaflets thickly downy on both surfaces. Pods thinly pubescent or velvety:
- 4a. Calyx-teeth equal or shorter than the tube. 1. *R. bracteata*
- 4b. Calyx-teeth longer than the tube:
- 5a. Terminal leaflet rhomboid. Seeds ellipsoid. 4. *R. pulverulenta*
- 5b. Terminal leaflet obovate. Seeds orbicular. 6. *R. schimperi*

1. *Rhynchosia bracteata* Benth. ex Baker in Hook. f. Fl. Brit India 2: 225. 1876; Duthie, Fl. Gangetic Plain 1: 223. 1903.

Twining shrubs, with striate branches clothed with velvety pubescence. Leaves 3-foliolate; leaflets 3.5-8.0 × 3-8 cm, the terminal one rhomboid-orbicular, the lateral ones obliquely ovate, shortly acuminate. Stipels absent. Flowers in axillary, simple or branched, peduncled racemes much exceeding the leaves, yellow. Bracts ovate, acuminate. Calyx downy. Standard pubescent on the back, auricled, without callosities at the base. Pods 2-4 × 1 cm, turgid, mucronate, narrowed at the base.

Fl. & Fr. : August - November.

Rare, in wastelands and open forests among the clumps of trees and shrubs.

Selected specimen : Sirohi: Mt. Abu, Jain 46768 (BST).

2. *Rhynchosia capitata* (Heyne ex Roth) DC. Prodr. 2: 386. 1825; Duthie, Fl. Gangetic Plain 1: 222. 1903; Mahesh. Illus. Fl. Delhi f. 77. 1966. *Glycine capitata* Heyne ex Roth, Nov. Pl. Sp. 346. 1821. *Rhynchosia aurea sensu* Baker in Hook. f. Fl. Brit. India 2: 221. 1876, *pro parte*, non DC. 1825.

Twining or creeping, annual herbs, with winged branches clothed with white, spreading hairs. Leaves 3-foliolate; leaflets 2.0-3.5 × 1.5-3.0 cm, rhomboid or obovate-cuneate, entire, minutely pubescent. Flowers in umbellate racemes 1.0-1.5 cm long, yellow. Calyx-teeth 3 to 4 times longer

than the tube. Pods 1.0-1.5 × 0.9-1.5 cm, suborbicular, compressed, transversely striated, hairy, 2-seeded.

Fl. & Fr. : August - October.

Frequent in dry sandy soils. In the absence of support the plants spread on the ground and pods become subterranean.

Selected specimens : Bhilwara: Mandal, *Singh* 5768 (BSJO); Bundi: Hindoli, *Singh* 83613 (LWG); Ganganagar: Hirnowali, *Roy* 3925 (BSJO); Tonk: Deoli, *Shetty* 1217 (BSJO); Udaipur: Jaisamand, *Kanodia* 62276 (BSI).

3. *Rhynchosia minima* (L.) DC. Prodr. 2: 385. 1825; Baker in Hook. f. Fl. Brit. India 2: 223. 1876; Duthie, Fl. Gangetic Plain 1: 222. 1903; Mahesh. Illus. Fl. Delhi f. 76. 1966. *Dolichos minimus* L. Sp. Pl. 726. 1753. *Rhynchosia laxiflora* Camb. in Jacq. Voy. Bot. 44. t. 54. 1844. *R. minima* (L.) DC. var. *laxiflora* (Camb.) Baker in Hook. f. l.c. 2: 223. 1876.

Twining, annual herbs, with finely pubescent, 4-angled branches. Leaves 3-foliolate; leaflets 1-6 × 1-6 cm, rhomboid or rhomboid-ovate to obovate, acute or obtuse, stipellate. Flowers 5-8 mm long, in lax, axillary racemes longer than the leaves, yellow. Calyx-teeth twice the length of tube. Pods 1-2 cm long, linear, flat, slightly falcate, 2-seeded. Seeds compressed, black.

Fl. & Fr. : August - November.

Common among bushes and shrubs in wastelands, open forests and along the roads.

Selected specimens : Banswara: *Singh* 2996 (BSJO); Ganganagar: Loyalpuria, *Roy* 5004 (BSJO); Jaipur: Daosa, *Wadhwa* 8185 (BSA); Sirohi: *Jain* 60440 (BSI); Tonk: Deoli, *Shetty* 1222 (BSJO).

4. *Rhynchosia pulverulenta* Stocks in Hook. Journ. Bot. Kew Misc. 4: 147. 1852; Bhandari, Fl. Indian Desert 125. 1978. *R. memnonia auct. plur.*, non (Delile) DC. 1825; Baker in Hook. f. Fl. Brit. India 2: 224. 1876. *R. rhombifolia* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 242. 1918, non (Willd.) DC. 1825.

Scrambling, perennial herbs; branches velvety tomentose. Leaves 3-foliolate; terminal leaflet 0.4-3.0 × 0.6-4.0 cm, transversely elliptic to rhomboid, lateral ones obliquely ovate, velvety and gland-dotted on both sides. Flowers in axillary, 1 to 12-flowered racemes, yellow. Bracts linear-lanceolate. Calyx glandular and hairy. Standard pubescent outside. Pods 1.5-2.0 × 0.6 cm, pubescent and glandular punctate, 2-seeded.

Fl. & Fr. : September - December.

Rare, in wastelands, particularly in sandy soils of desertic zones.

Selected specimens : Barmer: *Bhandari* 445 (JAC); Bhilwara: Shahpura, *Singh* 5735 (BSJO); Jaipur: Ramgarh, *Sharma* 2080 (RUBL); Jodhpur: *Rao* 67192 (BSI).

5. *Rhynchosia rothii* Roxb. ex Aitch. Cat. Pl. Punjab Sindh 50. 1869. *R. sericea* Spanoghe in Linnaea 15: 195. 1841, non Gill. ex Hook. & Arn. 1833; Baker in Hook, f. Fl. Brit. India 2: 225. 1876; Duthie, Fl. Gangetic Plain 1: 222. 1903.

Woody twiners, clothed with glandular hairs. Leaves 3-foliolate; terminal leaflet 5.0-7.5 × 5.0-7.0 cm, rhomboid to suborbicular; lateral leaflets very oblique, acute or acuminate, sinuate-margined, gland-dotted beneath. Flowers in axillary, pedunculate, 20-30 cm long racemes, yellow. Bracts longer than pedicels. Calyx pubescent and gland-dotted; upper teeth partly connate. Standard pubescent and glandular on the back. Pods 2.5-3.0 cm long, softly tomentose, 2-seeded.

Fl. & Fr. : July - October.

Rare, in wastelands, forests and on the boundaries of fields and gardens.

Selected specimens : Banswara: Bhapur, *Kanodia* 75207 (BSI); Bhilwara: *Singh* 6569 (BSJO); Udaipur: Kamblihat, *Kanodia* 82386 (BSI).

6. *Rhynchosia schimperi* (Hochst. & Steud. ex Steud.) Boiss. Fl. Or, 2: 626. 1872; *Bhandari*, Fl. Ind. Desert 126. 1978. *Glycine schimperi* Hochst. & Steud. ex Steud. Nom. Bot. 2(1): 691. 1840. *Rhynchosia arenaria* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26(1): 243. 1918.

Perennial, suffruticose twiners, grey velvety all over. Leaves 3-foliolate; leaflets 0.7-2.0 × 0.8-2.0 cm, obovate-orbicular, truncate, obtuse or emarginate, entire. Flowers in 1 to 5-flowered, axillary racemes, yellow. Standard hispid outside. Pods 2.0-2.5 cm long, tapering at both ends, 2-seeded.

Fl. & Fr. : September - March.

Rare, in dry sandy soils, particularly in the desertic zones.

Selected specimens : Barmer: Ramsar, *Shetty* 2304 (BSJO); Bikaner: Kolayat, *Roy* 2387 (BSJO); Jaisalmer: Ramgarh, *Wadhwa* 5156 (BSA); Jodhpur: *Bhandari* 98 (JAC).

35. *SESBANIA ADANS* *emend. SUQP nom. cons.*

- 1a. Flowers without a common peduncle. Pods upto 8 cm long. 2. *S. procumbens*
 1b. Flowers in racemes, with a common peduncle. Pods more than 8 cm long:
 2a. Herbs or undershrubs. Branches and leaf-rachis prickly. 1. *S. bispinosa*
 2b. Trees or shrubs. Branches and leaf-rachis not prickly. 3. *S. sesban*

1. *Sesbania bispinosa* (Jacq.) Wight in U.S. Dept. Agr. Bur. Pl. Ind. Bull. 137: 15. 1909. *Aeschynomene bispinosa* Jacq. Ic. Pl. Rar. 3: 13. t. 564. 1792. *Coronilla aculeata* Willd. Sp. Pl. 3: 1147. 1802, *nom. illegit.* *Sesbania aculeata* (Willd.) Poir. in Lam. Encycl. 7: 128. 1806, *nom. illegit.*; Baker in Hook. f. Fl. Brit. India 2: 114. 1876; Duthie, Fl. Gangetic Plain I: 243. 1903. 'Dadon' (Hindi).

Erect, weak-stemmed, annual herbs or undershrubs, 1.0-2.5 m high. Leaflets 12-50 pairs, 0.5-1.5 × 0.2-0.5 cm, linear-oblong, mucronate, glabrous, stipellate. Flowers in axillary, 3 to 6-flowered racemes, yellow. Standard with red dots on the back. Pods 20-30 cm long, linear, subterete, tomentose, beaked, glabrous.

Fl. & Fr. : August - October.

Common in rice-fields and other swampy places. It is also grown as a green manure crop and thrives well in saline and alkaline soils.

Selected specimens : Banswara: Chandan Singh ki Bassi, Singh 3636 (BSJO), Bikaur: Ballabh Garden, Roy 2144 (BSJO); Jaipur: Ramgarh, Sharma 1331 (RUBL); Kota: Sitabari, Wadhwa & Prasad 9301 (BSA); Pali: Mundra, Shetty 1469 (BSJO).

2. *Sesbania procumbens* (Roxb.) Wight & Arn. Prodr. 215. 1834; Baker in Hook. f. Fl. Brit. India 2: 115. 1876. *Aeschynomene procumbens* Roxb. Fl. Ind. 3: 337. 1832.

Diffuse, annual herbs, armed with prickles. Leaflets 15-20 pairs, linear-oblong, obtuse, apiculate, glabrous. Flowers axillary, solitary or paired, without a common peduncle, yellow. Corolla 3 times as long as the calyx. Pods 5-8 cm long, straight, torulose, 15 to 20-seeded.

Fl. & Fr. : August - October.

Rare, in low lying areas. It is a western Peninsular element.

Selected specimen : Nagaur: Stower 31 (BSI).

3. *Sesbania sesban* (L.) Merrill in Philip. Journ. Sci. Bot. 7: 235. 1912. *Aeschynomene sesban* L. Sp. Pl. 714. 1753. *Sesbania aegyptiaca* Poir. in

Lam. Encycl. 7: 128, 1806; Hook. f. Fl. Brit. India 2: 114, 1876; Duthie, Fl. Gangetic Plain 1: 242, 1903, includ. vars. *S. aegyptiaca* Poir. var. *bicolor* Wight & Arn. Prodr. 1: 214, 1834. *S. aegyptiaca* Poir. var. *picta* Prain in Journ. Asiat. Soc. Beng. 66: 367, 1897. 'Jain, Ekad' (Hindi).

Large shrubs or small trees, soft-wooded, 1-7 m high. Leaflets 10-25 pairs, 0.7-2.5 × 0.3-0.5 cm, linear-oblong, obtuse, apiculate, glabrous. Flowers in drooping, axillary racemes, yellow or dark maroon to purple. Standard yellow or purple-spotted. Pods 15-30 cm long, slender, linear, straight, beaked, glabrous, 20 to 40-seeded.

Fl. & Fr. : Most part of the year.

Rare, near habitations. Usually cultivated on the boundaries of fields. It is a fast growing tree.

Selected specimens : Barmer: Sheo, Tiwari 884 (BSJO); Bharatpur: Jameson 79 (DD); Jaipur: Janki Prasad 31160 (LWG); Jodhpur: Tolesar, Singh 4356 (BSJO); Kota: Baran, Singh 90659 (LWG).

36. SHUTERIA WIGHT & ARN. *nom. cons.*

Shuteria involucrata (Wall.) Wight & Arn. Prodr. 1: 207, 1834. *Glycine involucrata* Wall. Pl. Asiat. Rar. 3: 22, t. 241, 1832. *Shuteria vestita* Wight & Arn. var. *involucrata* (Wall.) Baker in Hook. f. Fl. Brit. India 2: 182, 1876.

Twining, hirsute herbs. Leaflets 1.8-5.0 × 1.0-2.5 cm, rhomboid - obovate, lateral ones slightly smaller and ovate-oblong to elliptic, hairy. Stipels linear, subulate. Flowers in dense, 2.5-10.0 cm long racemes, purplish red, two or three racemes sometimes arise from the same node. Bracts ovate-lanceolate, hairy. Pods 3-4 × 0.5 cm, linear, slightly curved, pubescent, 5 to 7-seeded. Seeds ellipsoid, brownish-black.

Fl. & Fr. : August - November.

Rare, in the forests at high altitude.

Selected specimen : Sirchi: Mt. Abu, Raizada 20697 (DD).

37. SMITHIA AIT *nom. cons.*

1a. Stem bristly:

2a. Leaflets 2 pairs.

1. *S. higemina*

2b. Leaflets 3-4 pairs:

3a. Flowers in globose, terminal heads.

5. *S. pycnantha*

3b. Flowers in axillary or terminal racemes.

2. *S. blanda*

1h. Stem not bristly.

- | | |
|---|-------------------------|
| 4a. Flowers solitary or 2-4 in the leaf-axils. | 4. <i>S. conferta</i> |
| 4b. Flowers in racemes, heads or panicles: | |
| 5a. Flowers in globose, terminal heads. | 3. <i>S. capitata</i> |
| 5b. Flowers in axillary or terminal, simple racemes or panicles: | |
| 6a. Flowers in simple, axillary racemes. Calyx-veins parallel; lobes equal. | 7. <i>S. sensitiva</i> |
| 6b. Flowers in terminal, corymbose panicles. Calyx-veins anastomosing; lower lip longer than upper. | 6. <i>S. salsuginea</i> |

1. **Smithia bigemina** Dalz. in Hook. Kew J. Bot. 3: 208. 1851; Baker in Hook. f. Fl. Brit. India 2: 149. 1876.

Annual herbs, 15-30 cm high; branches clothed with yellowish bristly hairs. Leaflets 2 pairs, sessile, 0.8-1.5 × 0.5-1.0 cm, oblanceolate, obtuse and bristle-pointed, cuneate at the base, ciliate, strigose beneath. Stipules produced below into acuminate or lacerate auricles. Flowers 2-8, crowded towards the end of axillary racemes longer than the leaves, yellow. Bracts oblong, bristle-pointed, membranous, glabrous. Calyx reticulately veined; lips equal. Pods 6 to 8-jointed; joints tuberculate.

Fl & Fr. : September - December.

Rare, in moist habitats.

Selected specimens : Sirohi: Mt. Abu, Raizada 20657, Duthie 6627 (DD).

2. **Smithia blanda** Wall. ex Baker in Hook. f. Fl. Brit. India 2: 151. 1876.

Suffruticose perennials, with fragile, densely bristly stem and branches. Leaflets obtuse, bristle tipped, with deciduous bristles on the leaf-rachis. Flowers in dense, terminal, corymbose panicles, yellow; pedicels bristly. Calyx twice the length of the bracteoles, bristly on the back and edges. Pods 5 to 6-jointed, reticulately veined.

Fl & Fr. : September - October.

Rare, in the forests on the hills in wet and shady habitats.

Selected specimen : Sirohi: Mt. Abu, Blatter 9363 (BLAT).

3. **Smithia capitata** Desv. ex Dalz. in Hook. Kew Journ. Bot. Misc. 3: 208. 1851; Baker in Hook. f. Fl. Brit. India 2: 150. 1876.

Annual herbs, 30-60 cm high, with terete branches. Leaf rachis bristly; leaflets 9-15 pairs, subsessile, 0.5-1.0 × 0.3-0.5 cm, linear-oblong, obtuse, bristly beneath on the midrib. Stipules produced below into acute or lacerate auricles. Flowers yellow; peduncles glabrous. Calyx reticulately veined; lips equal. Pods 5 to 7-jointed; joints smooth.

Fl. & Fr. : September - November.

Rare, in moist shaded habitats.

Selected specimen : Sirohi: Mt. Abu, *Raizada* 21104 (DD).

4. *Smithia conferta* J.E. Smith in Rees, Cyclop. 33. no. 2. 1819. *S. geminiflora* Roth, Nov. Pl. Sp. 352. 1821; Baker in Hook. f. Fl. Brit. India 2: 149. 1876; Duthie, Fl. Gangetic Plain 1. 269. 1903. *S. geminiflora* Roth var. *conferta* (Smith) Baker in Hook. f. *l.c.* 2: 149. 1876; Duthie, *l.c.* 1: 270. 1903.

Annual herbs, 30-60 cm high, with straggling, smooth branches. Leaflets 2-8 pairs, subsessile, 0.8-1.2 × 0.2-0.4 cm, linear-oblong, bristly on the margins and midrib beneath. Flowers solitary or 2-4, in the axils of leaves at the end of branches so as to form a congested head, yellow. Bracts and calyx bristly on the back and apex. Calyx-lips equal. Pods 3 to 6-jointed; joints turgid, pillose. Seeds subglobose, glabrous.

Fl. & Fr. : September - January.

Frequent in low-lying areas amidst grasses.

Selected specimens : Banswara: Loharia tank, *Singh* 3704 (BSJO); Bhilwara: Meja Dam, *Singh* 6040 (BSJO); Chittorgarh: Pratargarh, *Majumdar* 10177 (BSA); Jhalawat: Sarhad, *Wadhwa* 3581 (BSA); Sirohi: Mt. Abu, *Raizada* 20662 (DD).

5. *Smithia pycnantha* Benth. ex Baker in Hook. f. Fl. Brit. India 2: 150. 1876; Cooke, Fl. Bombay 1: 338. 1902.

Erect, annual, 15-60 cm high herbs, clothed with bulbous-based bristly hairs. Leaf-rachis bristly and bristle pointed. Leaflets linear-oblong, ciliate, bristly on the midrib beneath. Flowers in dense, globose heads 1 cm in diam., formed of congested racemes, yellow. Bracteoles oblong or oblanceolate-oblong. Calyx glandular and bristly. Pods 5 to 9-jointed; joints venose.

Fl. & Fr. : August - October.

Rare, in the forests in wet and shaded habitats.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 12034, 11978 (BLAT).

6. *Smithia salsuginea* Hence in Journ. Bot. 7: 164. 1869. *S. dichotoma* Dalz. ex Baker in Hook. f. Fl. Brit. India 2: 150. 1876.

Erect, annual herbs. 30-50 cm high. Leaflets 2-4 pairs, 0.5-1.5 × 0.3-0.6 cm, oblanceolate-oblong, obtuse, glabrous. Flowers in terminal, few-flowered, corymbose panicles, yellow. Bracts ovate-lanceolate. Pods 10 to 15-seeded; joints orbicular, papillose. Seeds elliptic, glabrous, smooth, yellow.

Fl. & Fr. : July - September.

Rare, in the forests.

Selected specimens : Sirohi: Mt. Abu, *Mehta* 533, 609 (JAC).

7. *Smithia sensitiva* Ait. in Hort. Kew. 3: 496. 1789; Baker in Hook. f. Fl. Brit. India 2: 148. 1876; Duthie, Fl. Gangetic Plain 1: 269. 1903.

Much-branched, annual herbs. Leaf-rachis bristly; leaflets 3-10 pairs, 0.5-1.5 × 0.5 cm, linear-oblong, obtuse, bristle-pointed, bristly on the midrib beneath. Flowers 2-6, in simple, axillary racemes, yellow. Bracts ovate, bristle-pointed. Pods 4 to 6-jointed; joints orbicular, papillose.

Fl. & Fr. : August - October.

Rare, in the wet and shaded localities in the forests.

Selected specimen : Sirohi: Mt. Abu, *Soni* Acc. no. 76 (RUBL).

38. TAVERNIERA DC.

Taverniera cuneifolia (Roth) Arn. in Nov. Act. Nat. Cur. 18(1): 332. 1836; Wight, Ic. 3(4): 2, t. 1055. 1846; Bhandari, Fl. Ind. Desert 128. 1978. *Hedysarum cuneifolium* Roth, Nov. Pl. Sp. 357. 1821. *Taverniera nummularia sensu* Baker in Hook. f. Fl. Brit. India 2: 140. 1876, non DC. 1825.

Erect, branched shrubs, upto 1 m high. Leaflets 0.6-2.5 × 0.3-1.0 cm, suborbicular to obovate-oblanceolate, mucronate, entire, subglabrous. Stipules connate, amplexicaul. Flowers in axillary, upto 10 cm long racemes, red. Calyx-teeth as long as the tube. Pods 1 to 3-jointed; joints ovoid, echinate, pubescent, 1-seeded.

Fl. & Fr. : September - November.

Rare, in wastelands, hedges of fields and gardens.

Selected specimens : Bhilwara: Shahpur, *Singh* 5733 (BSJO); Jhalawar: Bhawanimandi, *Verma* 3500 (BSA); Jodhpur: Sardar Samand, *Singh* 3569 (BSJO).

39. *TEPHROSIA* PERS. *nom. cons.*

- 1a. Flowers axillary, 1-6 together:
- 2a. Leaves simple. 7. *T. strigosa*
- 2b. Leaves imparipinnate:
- 3a. Calyx-teeth longer than the tube. 5. *T. pumila*
- 3b. Calyx-teeth as long as the tube:
- 4a. Claw of the keel-petal less than half the blade. Stigma penicillate. 9. *T. uniflora* subsp. *petrosa*
- 4b. Claw of keel-petal more than half the blade. Stigma not penicillate. 8. *T. subtriflora*
- 1b. Flowers in racemes:
- 5a. Style hairy:
- 6a. Calyx-teeth velvaceous, longer or as long as the tube. 3. *T. coccolia*
- 6b. Calyx-teeth deltoid, always shorter than the tube. 2. *T. cordata*
- 5b. Style glabrous:
- 7a. Racemes 1 to 3-flowered. 5. *T. pumila*
- 7b. Racemes more than 3-flowered:
- 8a. Pods greatly curved, almost semi-lunar or circinate. 4. *T. falciformis*
- 8b. Pods straight or slightly curved at the ends:
- 9a. Pods velvety tomentose. 10. *T. villosa*
- 9b. Pods glabrous to densely pubescent, not velvety:
- 10a. Leaflets 5-9. Calyx-teeth twice the length of the tube. 1. *T. apollinea*
- 10b. Leaflets 11-21. Calyx-teeth as long as the tube. 6. *T. purpurea*

1. *Tephrosia apollinea* (Delile) Link, Enum. Hort. Berol. 5(2): 252. 1822; Sharma & Triagi in Fl. N.E. Rajasthan 145. 1979. *Galega apollinea* Delile, Fl. Egypt. c. 53. f. 5. 1812.

Suffruticose, perennial herbs, 30-50 cm high. Leaflets 1.8-3.0 × 0.6-1.5 cm, oblong or oblanceolate, truncate or emarginate, mucronate, silky beneath. Flowers in leaf-opposed, 6 to 12-flowered racemes longer than leaves, violet. Calyx silky; teeth equalling the tube. Standard pubescent on the back. Pods 3.0-4.5 cm long, appressed pubescent, 6 to 9-seeded.

Fl. & Fr. : Most part of the year.

Rare, in dry habitats. The plants pcrennate through the root-stock and buds on dry branches.

Selected specimens : Jaipur: Univ. Reserve Forest, *Sharma* 2095 (RUBL); Jolana, *Singh* 13150 (RUBL); Jodhpur: Bariganga, *Jain* 49366 (BSI).

2. *Tephrosia candida* DC. Prodr. 2: 249. 1825; Baker in Hook. f. Fl. Brit. India 2: 111. 1876; Duthie, Fl. Gangetic Plain 1: 244. 1903

Low shrubs, with grooved branches clothed with brown or grey velvety pubescence. Leaflets 19-25, 5-8 cm long, narrowly elliptic, cuspidate, pale-silky beneath. Stipules setaceous. Flowers in 15-25 cm long, terminal and lateral racemes, white, tinged with red. Calyx silky. Standard silky outside. Style flattened. Pods 7-10 cm long, slightly recurved, clothed with brown silky hairs.

Fl. & Fr. : August - October.

Rare, in wastelands.

Selected specimen : Jaipur: Ramgarh, *Sharma* 1830 (RUBL). Also reported from Alwar (Vyas, 1967), Jhunjhunu (Nair and Kanodia, 1959) and Udaipur (Ramdeo, 1969).

3. *Tephrosia coccinia* Wall. Pl. Asiat. Rar. 1: t. 60. 1830; Sharma & Tiagi, Fl. N.E. Rajasthan 146. 1979. *T. tinctoria* Pers. var. *coccinia* (Wall.) Baker in Hook. f. Fl. Brit. India 2: 112. 1876.

Erect shrubs, upto 1 m high, with terete branches clothed with appressed hairs. Leaflets 5, opposite or alternate, 3.5-5.0 × 2.0-3.5 cm, gradually smaller downwards, obovate, mucronate, silvery hairy beneath. Flowers in lax racemes longer than leaves, bright red, showy. Standard hairy on the back. Style flattened. Pods 5-12 cm long, linear, flattened, curved upwards at the apex, minutely silky hairy, 8 to 12-seeded.

Fl. & Fr. : August - October.

Rare, in wastelands, particularly near habitations.

Selected specimens : Jaipur: Rajasthan college, *Sharma* 2283 (RUBL); Jodhpur: *Soni* Acc. no. 91 (RUBL).

4. *Tephrosia falcatiformis* Ramaswami in Journ. Asiat. Soc. Beng. (n.s.)12: 125. 1916; Raizada, Suppl. Duthie, Fl. Gangetic Plain 58. 1976. '*Rati Biyani*' (Hindi).

Shrubs, with angled, white silky branches. Leaflets 5-17, 2.5-4.5 × 0.3-1.0 cm, oblanceolate or oblong, mucronate or emarginate, appressed hairy. Flowers in racemes longer than leaves, purple-red. Calyx-teeth as long as the tube. Standard silvery-white outside. Style incurved. Pods flat, sparsely hairy, 3 to 5-seeded.

Fl. & Fr. : August - October.

Frequent in dry sandy soils, particularly on the sand-dunes in arid zones.

Selected specimens : Ajmer: Pushkar, *Sharma* 1029 (DD); Churu: Ratangarh, *Roy* 3983 (BSJO); Jaisalmer: Khora-Jandha, *Shetty* 6121 (BSJO); Jodhpur: Kailana, *Jain* 40004 (BSI); Pali: *Jain* 4091 (BSI).

5. *Tephrosia pumila* (Lam.) Pers. Syn. Pl. 2: 330. 1807; Duthie, Fl. Gangetic Plain 1: 245. 1903. *Galega pumila* Lam. Encycl. 2: 599. 1786. *T. purpurea* (L.) Pers. var. *pumila* (Lam.) Baker in Hook. f. Fl. Brit. India 2: 113. 1876.

Annual or short-lived perennial herbs, with procumbent, pilose branches. Leaflets 5-11, 0.4-2.0 × 0.8 cm, oblong or oblanceolate, retuse or truncate, mucronate, pilose below. Stipules linear-setaceous. Flowers in 1 to 3-flowered, terminal and leaf-opposed racemes, pale pink or purple. Pods 3.5-4.0 cm long, pubescent, 8 to 14-seeded.

Fl. & Fr. : Most part of the year.

Rare, in dry rocky and sandy wastelands and open forests.

Selected specimens : Banswara: Puna Pathar forest, *Singh* 2933 (BSJO); Jaipur: Daosa, *Wadhwa* 8211 (BSA); Jaisalmer: Pokaran, *Wadhwa* 5029 (BSA).

6. *Tephrosia purpurea* (L.) Pers. Syn. Pl. 2: 329. 1807; Baker in Hook. f. Fl. Brit. India 2: 112. 1876; Duthie, Fl. Gangetic Plain 1: 245. 1903; Mahesh, Illus. Fl. Delhi f. 63. 1966. *Cracca purpurea* L. Sp. Pl. 752. 1753. *Tephrosia leptostachya* DC. Prodr. 2: 251. t. 2. 1825. *T. wallichii* Garh. ex Fawcett & Randle in Journ. Bot. 55: 35. 1917. *T. hamiltonii* Drumm. ex Gamble, Fl. Madras 1: 320. 1918.

Annual or perennial herbs, upto 1 m high. Leaflets 11-21, 1.5-3.0 × 0.4-1.2 cm, elliptic-oblong or oblanceolate, obtuse or truncate, mucronate, glabrous above, hairy beneath. Stipules linear-subulate. Flowers in leaf-opposed racemes longer than the leaves, reddish purple or bright pink. Calyx-teeth as long as the tube. Corolla much exerted; standard pubescent on the back. Style flattened. Pods 1.4-6.0 × 0.4-0.5 cm, linear, glabrescent to thinly hairy, 2 to 9-seeded.

Fl. & Fr. : July - November.

Common in wastelands and forests: often forming dense community of its own.

Selected specimens : Banswara: Ghatol, *Kanodia* 75468 (BSI); Bikaner: Alay, *Roy* 2170 (BSJO); Jaipur: Univ. Reserve forest, *Sharma* 1409 (RUBL); Kota: Shahabad, *Majumdar* 10437 (BSA); Sirohi: Abu road, *Kaul* 9383 (LWG).

7. *Tephrosia strigosa* (Dalz.) Sant. & Mahesh. in Journ. Bombay nat. Hist. Soc. 54(3): 805. 1957; Mahesh. *Illus. Fl. Delhi* f. 61. 1966. *Macronyx strigosa* Dalz. in Hook. *Kew Journ. Bot.* 2: 35. 1850. *Tephrosia tenuis* Wall. ex Dalz. & Gibs. *Bombay Fl.* 61. 1861; Baker in Hook. f. *Fl. Brit. India* 2: 111. 1876; Duthie, *Fl. Gangetic Plain* 1: 244. 1903. '*Jhino Biyano*' (Hindi).

Appressed hairy, annual herbs, 20-30 cm high, with wiry branches. Leaves 3-10 × 0.2-0.8 cm, linear-lanceolate, apiculate, hairy. Stipules subulate. Flowers 1-2 in the axils of leaves, bluish-yellow. Calyx-teeth shorter than the tube. Standard pubescent on the back. Pods 1.0-3.5 × 0.5 cm, linear, flat, appressed hairy, 6 to 10-seeded.

Fl. & Fr. : August - October.

Common in the forests in wet and shaded habitats. When found in grasslands, it can hardly be distinguished from the grasses before fruiting.

Selected specimens : Banswara: Bagaycha forest, *Singh* 3057 (BSJO); Bikaner: Ranjitpura, *Roy* 2106 (BSJO); Jaipur: Ramgarh, *Sharma* 2278 (RUBL); Jhalawar: Aklera, *Wadhwa* 7556 (BSA); Sirohi: Mt. Abu, *Blatter* 10390 (BLAT).

8. *Tephrosia subtriflora* Hochst. ex Baker in Oliver, *Fl. Trop. Afr.* 2: 117. 1871; Bhandari, *Fl. Ind. Desert* 132. 1978. *T. multiflora* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 239. 1918. *T. pauciflora* Grah. ex Baker in Hook. f. *Fl. Brit. India* 2: 114. 1876; Raizada, *Suppl. Duthie. Fl. Gangetic Plain* 59. 1976.

Prostrate or ascending, annual or perennial herbs, clothed with spreading hairs. Leaflets 5-13, upto 2.0 × 0.9 cm, oblong or lanceolate, appressed silky hairy beneath. Flowers 2-6 together in leaf axils, pinkish-purple. Standard densely silky beneath. Style flattened, glabrous. Pods 4.5 × 0.4 cm, linear, slightly curved, thinly silky, 5 to 10-seeded.

Fl. & Fr. : August - October.

Common in dry habitats, particularly in hilly tracts.

Selected specimens : Bikaner: Gharsisar, *Roy* 2152 (BSJO); Jaipur: Amer, *Sharma* 2284 (RUBL); Kota: *Singh* 90229 (LWG).

9. ***Tephrosia uniflora*** Pers. subsp. ***petrosa*** (Blatt. & Hallb.) Gillett & Ali in Kew Bull. 13: 114. 1958; Raizada, Suppl. Duthie, Fl. Gangetic Plain 59. 1976. *T. petrosa* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 239. 1918.

Suffruticose, perennial herbs, upto 1 m high. Leaflets 5-9, 3-8 × 1.0-1.5 cm, oblanceolate or elliptic, acute or obtuse, appressed hairy beneath. Flowers axillary, solitary or geminate, red-purple. Standard pubescent outside. Style flattened, glabrous. Pods 3.5-5.0 × 0.4-0.6 cm, appressed pubescent, 7 to 8-seeded.

Fl. & Fr. : August - November.

Rare, in wastelands, particularly in dry rocky habitats.

Selected specimens : Ajmer: Nag Pahar, *Sharma* 968 (DD); Jaipur: Jolana, *Sharma* Acc. no. 8196 (RUBL); Jaisalmer: Amar sagar, *Shetty* 3438 (BSJO); Jodhpur: Kui, *Singh* 4338 (BSJO); Pali: Jawai Dam, *Shetty* 1946 (BSJO).

10. ***Tephrosia villosa*** (L.) Pers. Syn. Pl. 2: 329. 1807; Baker in Hook. f. Fl. Brit. India 2: 113. 1876; Duthie, Fl. Gangetic Plain 1: 245. 1903; Mahesh. Illus. Fl. Delhi f. 62. 1966. *Cracca villosa* L. Sp. Pl. 752. 1753. *Galega hirta* Buch.-Ham. in Trans. Linn. Soc. London 13: 546. 1822. *Tephrosia incana* Grah. ex Wt. & Arn. Prodr. 212. 1834. *T. villosa* (L.) Pers. var. *incana* (Grah. ex Wight & Arn.) Baker in Hook. f. l.c. 2: 113. 1876.

Perennial undershrubs, upto 1 m high, densely hairy. Leaflets 11-19, 1-2 × 0.5-1.3 cm, obovate-cuneate or oblanceolate, emarginate, mucronate, silky beneath. Stipules linear-lanceolate, hairy. Flowers fascicled or paired in spicate racemes longer than leaves, pink. Calyx-teeth much longer than the tube. Standard silky on the back. Style flattened; stigmas penicillate. Pods 2.5-5.0 × 0.5-0.8 cm, flat, curved upwards, persistently velvety tomentose with spreading hairs.

Fl. & Fr. : July - November.

Common in wastelands and open forests, particularly in the east of Aravalli; often forms dense community of its own.

Selected specimens : Banswara: Paloda, *Singh* 2815 (BSJO); Bundi: Kala Khet, *Verma* 1759 (BSA); Jaipur: Daosa, *Wadhwa* 8105 (BSA); Jodhpur: Khejarola, *Singh* 4443 (BSJO); Sirohi: Mt. Abu, *Blatter* 10392 (BLAT).

40. TERAMNUS R. BR.

Teramnus labialis (L. f.) Spreng. Syst. Veg. 3: 235. 1826; Baker in Hook. f. Fl. Brit. India 2: 184. 1876; Duthie, Fl. Gangetic Plain 1: 233. 1903. *Glycine labialis* L. f. Suppl. 325. 1781; Wight, Ic. 1: t. 168. 1839.

Twining herbs, clothed with spreading hairs. Leaves 3-foliolate; leaflets 1.5-5.5 × 1.5-2.5 cm, rhomboid-oblong or ovate-lanceolate, subacute, appressed hairy beneath. Stipules and bracts caducous. Flowers solitary or clustered in few-flowered, axillary racemes, red. Calyx-teeth as long as the tube. Pods 4-6 cm long, linear, turgid, 2-valved, black when ripe. Seeds 8-12, oblong, glabrous.

Fl. & Fr. : October - March.

Common among bushes and shrubs in wastelands and open forests, particularly in the east of Aravalli.

Selected specimens : Banswara: Near Lodha talab, Kanodia 51119 (BSI); Bhilwara: Singh 6080 (BSJO); Jhalawar: Dug, Verma 6770 (BSA).

41. TRIFOLIUM L.

Flowers pink. Calyx accrescent.

2. *T. resupinatum*

Flowers white. Calyx not accrescent.

1. *T. repens*

1. *Trifolium repens* L. Sp. Pl. 767. 1753; Baker in Hook. f. Fl. Brit. India 2: 86. 1876.

Creeping, glabrous herbs. Leaflets obovate, emarginate, toothed. Flowers finally deflexed. Peduncles naked. Calyx-teeth subequal, shorter than the tube. Petals tinged with pink. Pods minute, linear, 3 to 4-seeded.

Fl. & Fr. : December - April.

Native of Europe; often found as a weed in winter season crops.

Selected specimen : Ganganagar: Roy s.n. (BSJO). Also reported from Jhunjhunu (Nair *et al.*, 1961).

2. *Trifolium resupinatum* L. Sp. Pl. 771. 1753; Baker in Hook. f. Fl. Brit. India 2: 86. 1876; Raizada, Suppl. Duthie, Fl. Gangetic Plain 60. 1976. 'Barseem' (Hindi).

Erect, annual, glabrous herbs. Leaflets 2 × 1.2-1.5 cm, obovate to rhomboid-lanceolate, rounded or truncate, emarginate, serrate. Calyx appressed hairy; teeth subulate; fruiting calyx pyriform, reticulate. Pods 2-seeded.

Fl. & Fr. : January - April.

Native of Europe; rarely found as a weed in winter season crops.

Selected specimens : Ganganagar: Hanumangarh, Roy 5952 (BSJO); Kota: Sitabari, Singh 91062 (LWG).

42. TRIGONELLA L.

- | | |
|---|---|
| 1a. Flowers directly clustered in leaf-axils. Pods ovoid,
1 to 2-seeded. | 4. <i>T. occulta</i> |
| 1b. Flowers clustered at the end of axillary peduncles.
Pods linear, more than 2-seeded: | |
| 2a. Racemes exceeding the leaves. Pods flat, upcurved,
sickle-shaped. | 1. <i>T. corniculata</i> |
| 2b. Racemes equal or shorter than leaves. Pods straight
or slightly curved: | |
| 3a. Pods 4 to 6-seeded. | 2. <i>T. hamosa</i> subsp.
<i>uncata</i> |
| 3b. Pods 10 to 20-seeded. | 3. <i>T. monantha</i> subsp.
<i>incisa</i> |

1. *Trigonella corniculata* (L.) L. Syst. Nat. ed. 10. 1180. 1759; Wight, Ic. 2(1): 7. t. 384. 1840; Baker in Hook. f. Fl. Brit. India 2: 88. 1876; Duthie, Fl. Gangetic Plain 1: 210. 1903. *Trifolium corniculata* L. Sp. Pl. 7. 1753. 'Dandi Methi' (Hindi).

Erect, annual herbs, 30-50 cm high. Leaflets 1.3-3.0 × 0.8-1.5 cm, obovate-cuneate or elliptic-oblong, serrate in the upper half. Stipules lacinate. Flowers 0.5-1.0 cm long, closely racemed at the top of axillary, solitary peduncles, bright yellow; pedicels upcurved. Calyx-teeth shorter than the tube. Pods 3-4 cm long, glabrous, marked with transverse veins, 4 to 8-seeded.

Fl. & Fr. : January - March.

Occasional weed in cultivated fields during winter season.

Selected specimens : Bhilwara: Badnor, Singh 7080 (BSJO); Churu: Roy 2579 (BSJO); Ganganagar: 25 PS, Roy 5902 (BSJO); Jaipur: Sharma 1085 (RUBL); Kota: Atru, Singh 90976 (LWG).

2. *Trigonella hamosa* L. subsp. *uncata* (Boiss. et Noe) Townsend in Kew Bull. 21: 437. 1968. *T. uncata* Boiss. & Noe in Boiss. Diagn. Pl. Or. Nov. 2(2): 12. 1856. *T. hamosa sensu* Baker in Hook. f. Fl. Brit. India 2: 88. 1876, non L. 1756; Duthie, Fl. Gangetic Plain 1: 209. 1903.

Procumbent, glabrous or pubescent, annual herbs. Leaflets 0.3-1.5 × 0.3-0.7 cm, obovate-cuneate, inciso-serrate in upper half. Stipules dentate.

Flowers 0.2-0.3 cm long, in axillary, 4 to 6-flowered, capitate racemes, yellow. Calyx-teeth shorter than the tube. Pods 1.0-1.5 cm long, much curved, transversely wrinkled, hairy.

Fl. & Fr. : December - March.

Rare, weed in moist shaded habitats in the gardens and fields, particularly in the desertic zones.

Selected specimens : Barmer: Navi, *Tiwari* 1148 (BSJO); Bikaner: Gajner lake, *Dhillon* 389 (DD); Churu: Chhapar, *Roy* 2573 (BSJO); Jaipur: Chaksu, *Wadhwa* 8391 (BSA).

3. *Trigonella monantha* C. A. Meyer subsp. *incisa* (Benth.) Ali, Fl. West Pak. 100: 294. 1977. *T. incisa* Benth. in Royle, Illus. Bot. Himal. Mount. 197. 1835. *T. polycerata* auct. non L. 1753; Baker in Hook. f. Fl. Brit. India 2: 87. 1876; Duthie, Fl. Gangetic Plain 1: 209. 1903.

Prostrate or ascending, annual herbs. Leaflets 3-12 × 3-8 mm, oblong to cordate-cuneate, dentate or pinnatifid. Stipules semi-sagittate, denticulate. Flowers in pedunculate, axillary racemes, yellow. Calyx-teeth as long as the tube. Pods 4-10 × 0.1-0.3 cm, reticulately veined.

Fl. & Fr. : January - March.

Common weed in cultivated fields, gardens and other similar habitats. It differs from subsp. *monantha* in having pedunculate inflorescence.

Selected specimens : Barmer: Piplum, *Tiwari* 1186 (BSJO); Bharatpur: Jameson 57171 (DD); Bhilwara: Singh 7146 (BSJO); Kota: Chhabra, Singh 90917 (LWG); Pali: Babra, *Shetty* 1555 (BSJO).

4. *Trigonella occulta* Delile ex DC. Prodr. 2: 185. 1825; Baker in Hook. f. Fl. Brit. India 2: 87. 1876; Duthie, Fl. Gangetic Plain 1: 209. 1903.

Deep-rooted, diffuse, pubescent or glabrous herbs. Leaflets 3-10 × 1-5 mm, oblanceolate, truncate, inciso-dentate. Stipules foliaceous, lacinate. Flowers 2-4 together in sessile, axillary clusters, yellow. Calyx-teeth longer than the tube. Pods ovoid, not much exserted, apiculate, transversely reticulate. Seeds oblong, glabrous, olive.

Fl. & Fr. : December - April.

Common in wet and shaded habitats, on the margins of drying ponds in association with *Polygonum plebeium* R. Br., *Gnaphalium pulvinatum* Del., *Cyperus pygmaeus* Rottb. etc.

Selected specimens : Banswara: Singh 3099 (BSJO); Barmer: Pachpadra, *Tiwari* 1147 (BSJO); Bhilwara: Badnor, Singh 7081 (BSJO); Jhalawar: Khanpur, Verma 6926 (BSA); Pali: Lodia tank, *Shetty* 1635 (BSJO).

43. URARIA DESV.

Uraria picta (Jacq.) Desv. ex DC. Prodr. 2: 324. 1825; Wight, Ic. 2(1): 9. t. 411. 1840; Baker in Hook. f. Fl. Brit. India 2: 155. 1876; Duthie, Fl. Gangetic Plain 1: 273. 1903. *Hedysarum pictum* Jacq. Coll. Bot. 2: 262. 1789 & Ic. t. 567. 1792-94.

Erect, pubescent, perennial undershrubs. Leaves imparipinnate; leaflets 3-9, 4-12 × 1.5-2.5 cm, linear-oblong or lanceolate, rarely suborbicular, acute, blotched with white and glabrous above, finely reticulate and pubescent beneath. Stipels subulate. Flowers closely fasciated along the rachis of spicate racemes, red or purple; peduncles and pedicels downy with hooked hairs. Bracts ovate to lanceolate, scarious, ciliate. Anthers uniform. Pods glabrous, lead-coloured; joints 3-6, seed-like, transverse to their axis.

Fl. & Fr. : September - November.

Rare, in the mixed deciduous forests.

Selected specimens : Banswara: Hura Bowji forest, Singh 3682 (BSJO); Kota: Shahabad, Verma 702 (BSA).

44. VICIA L.

1a. Flowers axillary, solitary or geminate:

2a. Robust forms. Calyx-teeth as long or longer than tube. Corolla 2-3 cm long. Pods yellow or light brown.

3. *V. sativa* var. *sativa*

2b. Dwarf forms. Calyx-teeth shorter than tube. Corolla 1.0-1.8 cm long. Pods black or brown.

4. *V. sativa* var. *angustifolia*

1b. Flowers in axillary, 1 to 5-flowered, pedunculate racemes:

3a. Pods 2-seeded, pubescent.

1. *V. hirsuta*

3b. Pods 3 to 6-seeded, glabrous:

4a. Flowers 4-7 mm long. Pods 3 to 4-seeded.

5. *V. tetrasperma*

4b. Flowers 10-15 mm long. Pods 5 to 7-seeded.

2. *V. monantha*

1. *Vicia hirsuta* (L.) S.F. Gray, Nat. Arr. Brit. Pl. 2: 614. 1821; Baker in Hook. f. Fl. Brit. India 2: 177. 1876; Duthie, Fl. Gangetic Plain 1: 258. 1903. *Erum hirsutum* L. Sp. Pl. 738. 1753.

Climbing, annual herbs, with 4-angled to winged stem. Leaves paripinnate, ending into 2-fid tendrils. Leaflets 4-8 pairs, 0.8-2.5 × 0.1-0.5 cm, linear-oblong, emarginate or truncate, apiculate. Stipules semi-sagittate to lanceolate or laciniate. Flowers 3-5 mm long, in axillary, 1 to 4-flowered.

pedunculate racemes, pale blue. Style bearded all round below the stigma. Pods 8-10 mm long, elliptic-oblong, flat, hirsute.

Fl. & Fr. : January - March.

Native of Europe, W. Africa and continental Asia; common weed in cultivated fields and gardens.

Selected specimens : Bhilwara: Singh 7148 (BSJO); Chittorgarh: Saran 65186 (LWG); Jhalawar: Sharma 583 (RUBL); Sirohi: Mt. Abu, Kanodia 62233 (BSI).

2. *Vicia monantha* Retz. Obs. Bot. 3: 39. 1783. *V. griffithii* Baker in Hook. f. Fl. Brit. India 2: 178. 1876.

Climbing, annual herbs, clothed with short, appressed and spreading hairs. Leaves pinnate, ending into 2 to 3-fid tendrils; leaflets 6-9 pairs, scattered and paired, 0.8-2.5 × 0.1-0.2 cm, linear-oblong, obtuse. Stipules lacinate. Flowers in lax, 2 to 4-flowered, axillary racemes not exceeding the leaves, lilac. Styles finely downy all round the tip. Pods 2.0-3.5 × 0.6-1.0 cm, oblong, flat. Seeds oblong-suborbicular, smooth.

Fl. & Fr. : January - March.

Rare, weed in wheat and barley crops and fallow fields.

Selected specimen : Churu: Sujangarh, Roy 2492B (BSJO).

3. *Vicia sativa* L. Sp. Pl. 736. 1753; Baker in Hook. f. Fl. Brit. India 2: 178. 1876; Duthie, Fl. Gangetic Plain 1: 258. 1903.

var. *sativa*

Prostrate or climbing, annual herbs, with fistular stem and branches. Leaves paripinnate, ending into 2 to 3-fid tendrils; leaflets 3-8 pairs, 1.5-3.0 × 0.3-0.8 cm, lanceolate, oblong or obovate, emarginate, apiculate, hairy. Stipules ovate-lanceolate or lacinate. Flowers reddish-blue. Calyx-teeth as long or longer than the tube. Pods 3.0-4.5 cm long, linear, flat, glabrous or pubescent when young, yellow or light-brown.

Fl. & Fr. : January - March.

Native of Mediterranean region and W. Asia; common weed in cultivated fields and gardens.

Selected specimens : Bhilwara: Meja Dam, Singh 7096 (BSJO); Churu: Sujangarh, Roy 2492 A (BSJO); Ganganagar: 26 PS, Roy 4096 (BSJO); Kota: Atru, Singh 90688 (LWG); Sirohi: Mt. Abu, Kanodia 62235 (BSI).

4. var. *angustifolia* L. Fl. Succ. ed. 2: 2: 255. 1755; Baker in Hook. f. Fl. Brit. India 2: 178. 1876; Duthie, Fl. Gangetic Plain 1: 259. 1903.

V. angustifolia L. Amoen. Acad. 4: 105. 1759. *V. sativa* L. var. *nigra* L. Sp. Pl. ed. 2. 1037. 1763. 'Mutri' (Hindi).

Differs from the proper species in the diffuse and dwarf habit, shorter leaflets having deeply emarginate apex, smaller corolla (10-18 mm), calyx-teeth shorter than tube and pods black or brown.

Fl. & Fr. : January - April.

Rare, weed in the gardens.

Selected specimens : Jodhpur: *Bhandari* 1914 (JAC); Kota: *Atra, Singh* 96688 (LWG).

5. *Vicia tetrasperma* (L.) Schreber, Spicil. Fl. Lips. 26. 1771; Baker in Hook. f. Fl. Brit. India 2: 177. 1876; Raizada, Suppl. Duthie, Fl. Gangetic Plain 61. 1976. *Ervum tetraspermum* L. Sp. Pl. 788. 1753.

Decumbent or climbing herbs. Leaves paripinnate, ending into simple or branched tendrils; leaflets 3-6 pairs, 0.8-1.5 × 0.25-0.3 cm, lanceolate or oblong, obtuse, mucronate, pubescent on the midrib beneath. Flowers in axillary, pedunculate, 1 to 3-flowered racemes, lilac. Calyx-teeth as long as the tube. Pods 0.8-1.5 cm, oblong, glabrous.

Fl. & Fr. : January - March.

Rare, in wet and shaded habitats, particularly in grassy localities. Reported from N.W. Rajasthan by Sankhala (1957).

45. VIGNA SAVI.

1a. Stipules produced below the point of attachment:

2a. Mature pods hairy.

3. *V. radiata* subsp. *sublobata*

2b. Mature pods glabrous:

3a. Leaflets distinctly lobed. Seeds rounded at the ends:

4a. Leaflets ovate, ciliate, obtuse, 8 to 15-nerved, glabrous. Bracteoles ovate. Seeds carunculate.

4. *V. trilobata*

4b. Leaflets more than 3-lobed. Stipules falcate-lanceolate or linear, acuminate, ciliate, pubescent, 3 to 7-nerved. Bracteoles linear. Seeds without caruncle

1. *V. aconitifolia*

3a. Leaflets entire or obscurely lobed. Seeds truncate at the ends:

5a. Stipules upto 4 mm long. Flowers 5-6 mm long. Racemes capitate.

2. *V. daisetziana*

5b. Stipules more than 5 mm long. Flowers 9-12 mm long. Racemes lax.

5. *V. umbellata*

1b. Stipules basifixed, not produced below the point of attachment.

6. *V. vexillata*

1. *Vigna aconitifolia* (Jacq.) Marechal in Bull. Jard. Bot. Nat. Belge 39: 160. 1969. *Phaseolus aconitifolius* Jacq. Obs. 3: 2. t. 52. 1766; Baker in Hook. f. Fl. Brit. India 2: 202. 1876; Duthie, Fl. Gangetic Plain 1: 225. 1903. 'Mor' (Hindi).

Erect or diffuse, glabrous herbs. Leaves 3-foliolate; leaflets palmati-partite, 3.5-6.0 cm long, pubescent. Flowers in axillary, pedunculate, capitate racemes, yellow. Pods 2-6 cm long, subcylindric, torulose, 3 to 8-seeded. Seeds oblong, smooth, brown.

Fl & Fr. : August - January.

Common in open wastelands and grassland.

Selected specimens : Banswara: Lasara, Singh 3628 (BSJO); Bundi: Nenwa, Singh 83635 (LWG); Jaisalmer: Ramgarh, Rao 67087 (BSI); Jodhpur: Bhandari 277 (JAC); Tonk: Maheshwari 53232 (LWG).

2. *Vigna dalzelliana* (O. Kuntze) Verdc. in Kew Bull. 24: 558. 1970. *Phaseolus dalzellianus* O. Kuntze, Rev. Gen. Pl. 1: 202. 1891. *P. pauciflorus* Dalz. in Hook. Kew Journ. 3: 209. 1851, non Sesse & Moc. ex G. Don 1832, nec Benth. 1837; Baker in Hook. f. Fl. Brit. India 2: 202. 1876. *P. dalzellii* T. Cooke, Fl. Bombay 1: 376. 1902.

Twining or creeping, glabrous herbs. Leaves 3-foliolate; leaflets 1.8-5.0 × 1.2-4.0 cm, rhomboid-ovate, acuminate, pubescent. Flowers 5-6 mm long, in axillary, pedunculate, capitate racemes, yellow. Calyx glabrous; teeth shorter than the tube, the upper two mostly connate. Pods 3.0-5.5 cm long, beaked, 8 to 10-seeded.

Fl & Fr. : September - October.

Rare, in wastelands, among grasses.

Selected specimen : Sirohi: Mt. Abu, King Acc. no 127374 (CAL). Also reported from Jhunjhunu (Majumdar, 1969).

3. *Vigna radiata* (L.) Wilczek subsp. *sublobata* (Roxb.) Verdc. in Kew Bull. 24: 559. 1970. *Phaseolus sublobatus* Roxb. Fl. Ind. 3: 288. 1832; Duthie, Fl. Gangetic Plain 1: 226. 1903. *P. trinervius* Wight & Arn. Prodr. 245. 1834; Baker in Hook. f. Fl. Brit. India 2: 203. 1876.

Prostrate, hairy herbs. Leaves 3-foliolate; leaflets 4.5-12.0 × 3.6-7.5 cm, ovate or ovate-rhomboid, appressed hairy, frequently lobed. Flowers in long, condensed, 6 to 12-flowered racemes, yellow. Pods 2-6 cm long, linear-oblong, subterete or sub-compressed, silky hairy, 10 to 15-seeded. Seeds smooth, glabrous, black or green, separated by membranous partitions.

Fl. & Fr. : July - October.

Rare, in the forests. It is probably the form of Mung or Urd.

Selected specimens : Sirohi : Jain 46684 (BSI); Abu, Tatake 46447 (BSI).

4. *Vigna trilobata* (L.) Verd. in *Taxon* 17: 172. 1968. *Dolichos trilobatus* L. Mant. 101. 1767. *Phaseolus trilobus auct. plur. non* (L.) Ait. 1789; Wight, Ic. 1: t. 94. 1838; Baker in Hook. f. *Fl. Brit. India* 2: 201. 1876; Duthie, *Fl. Gangetic Plain* 1: 224. 1903. 'Mungi' (Hindi).

Prostrate or twining, glabrous, annual herbs. Leaves 3-foliolate; leaflets 1.2-3.0 × 1.0-2.5 cm, ovate, oblong or rhomboid; lobes obtuse or subacute. Flowers in subcapitate, few-flowered racemes, yellow. Pods 3-6 cm long, cylindrical, subcompressed, 6 to 12-seeded. Seeds oblong, green or brown with black spots.

Fl. & Fr. : August - October.

Common in wastelands and forests among grasses.

Selected specimens : Banswara: Chandan Singh ki Bassi, Singh 3641 (BSJO); Bhilwara: Singh 6281 (BSJO); Kota: Singh 90224 (LWG).

5. *Vigna umbellata* (Thunb.) Ohwi & Ohashi in *Journ. Jap. Bot.* 44: 31. 1969. *Dolichos umbellata* Thunb. in *Trans. Linn. Soc. London* 2: 339. 1794. *Phaseolus calcaratus* Roxb. *Fl. Ind.* 3: 289. 1832; Baker in Hook. f. *Fl. Brit. India* 2: 203. 1876. 'Arak Mungi' (Hindi).

Suberect or twining herbs, clothed with stiff, deciduous, deflexed hairs. Leaves 3-foliolate; leaflets 5-10 × 3.5-6.5 cm, ovate-elliptic to rhomboid, acuminate, appressed hairy. Stipules peltate, lanceolate. Flowers in few-flowered racemes, yellow. Bracteoles linear. Staminal-tube cordate at the base. Pods 5-8 cm long, compressed, 8 to 12-seeded. Seeds cylindrical, dark green.

Fl. & Fr. : September - October.

Native of Philippines; rare, in wastelands among grasses.

Selected specimens : Bundi: Nenwa, Singh 83634 (LWG); Sirohi: Mt. Abu, Duthie 6635 (DD); Tonk: Maheshwari 53230 (LWG).

6. *Vigna vexillata* (L.) A. Rich. in *Sagra, Hist. Fis. Polit. Nat. Cuba* 11: 191. 1845; Baker in Hook. f. *Fl. Brit. India* 2: 206. 1876; Duthie, *Fl. Gangetic Plain* 1: 228. 1903. *Phaseolus vexillatus* L. *Sp. Pl.* 724. 1753.

Perennial, trailing herbs, with fusiform roots. Leaves 3-foliolate; leaflets 2.5-8.0 × 0.5-2.5 cm, ovate to lanceolate, acute or acuminate.

Flowers in 2 to 6-flowered, subumbellate racemes, reddish purple or yellow. Two upper calyx-teeth partly united. Pods 4-14 × 0.5 cm, clothed with brown, stiff hairs, 1 to 18-seeded.

Fl. & Fr. : August - November.

Rare, in wastelands and forests.

Selected specimens : Pali: Bijapur, *Shetty* 1967 (BSJO); Sirohi: Mt. Abu, *Rao* 66521 (BSI).

46. ZORNIA J.F. GMEL.

Zornia gibbosa Span in *Linnaea* 15: 192. 1841; Mahesh. *Illus. Fl. Delhi* f. 64. 1966. *Z. diphylla auct. plur.* non Pers. 1807; Baker in *Hook. f. Fl. Brit. India* 2: 147. 1876; Duthie, *Fl. Gangetic Plain* 1: 268. 1903.

Erect or ascending, annual herbs. Leaves 2-foliolate; leaflets 0.7-3.0 × 0.3-1.0 cm, sessile, linear-lanceolate, acute, gland-dotted beneath. Petioles shorter than leaflets. Stipules produced below their insertion. Flowers in lax, 3 to 12-flowered, spicate racemes, yellow. Bracts foliaceous, punctate, enclosing the flowers. Pods 1 to 6-jointed; joints indehiscent, echinate.

Fl. & Fr. : August - October.

Common in the wastelands and forests in wet and shaded habitats, particularly in grassy localities.

Selected specimens : Banswara: Bagaycha forest, *Singh* 3059 (BSJO); Bhilwara: Badnor, *Singh* 6242 (BSJO); Jhalawar: *Sharma* 137 (RUBL); Jodhpur: Barli, *Singh* 4319 (BSJO); Sirohi: Mt. Abu, *Blauer* 9351 (BLAT).

DOUBTFUL TAXA

Galactia oxyphylla Benth. *Pl. Jungh.* 233. 1852; Baker in *Hook. f. Fl. Brit. India* 2: 192. 1876.

This species occurs at Tenasserim. Its occurrence at Mt. Abu is rather doubtful and the specimen no. 10381 (BLAT) is not in good condition to confirm the identity of this taxon.

Pueraria stracheyi Baker in *Hook. f. Fl. Brit. India* 2: 198. 1876.

This species is a native of Kumaon hills (Himalaya) and has been reported from Mt. Abu (Jain, 1961). But, the herbarium specimens of this species from Mt. Abu are not available in any Indian herbarium. Its occurrence in Rajasthan is doubtful.

Sophora mollis (Royle) Baker subsp. *griffithii* (Stocks) Ali in *Fl. W. Pakistan* 100: 27. 1977. *S. griffithii* Stocks in *Hook. Kew J. Bot.* 4: 147.

1852. *S. Mollis* (Royle) Baker var. *hydaspidis* Baker in Hook. f. Lc. 2: 251. 1876.

Nair (1954) reported this species from Rajasthan (without exact locality). The area, however, falls in the range of distribution of this taxon, yet, herbarium specimens are not available in any Indian herbarium.

CULTIVATED SPECIES

Arachis hypogaea L. 'Mumphali' (Hindi) Annual herbs, with pinnate leaves, yellow flowers and underground, 1 to 5-seeded pods. Native of Brazil; cultivated during rainy season on commercial scale for extracting edible oil from the seeds.

Cajanus cajan (L.) Millsp. (*Cytisus cajan* L., *Cajanus indicus* Spreng.) 'Arhar, Toor' (Hindi) Shrubs, with 3-foliolate leaves, yellow flowers and 2.5-7.5 cm long pods often blotched with reddish purple. Native of Africa; cultivated during the rainy season for the edible seeds.

Cicer arietinum L. 'Chana' (Hindi) Much branched herbs, with pinnate leaves and turgid, oblong fruits. Native of Mediterranean region; commonly cultivated during the winter season for the edible seeds.

Crotalaria juncea L. 'Sanai' (Hindi) - Shrubs, with elliptic-lanceolate leaves, yellow flowers and turgid, oblong fruits. Cultivated during rainy season as a green manure crop and for fibres obtained from the stem.

Cyamopsis tetragonoloba (L.) Taub. (*Psoralea tetragonoloba* L., *Cyamopsis psoraloides* DC.) 'Guar' (Hindi) - Herbs, with hollow stem, simple leaves, yellow flowers and linear, flat pods. Commonly cultivated during rainy season for its edible pods and as a fodder crop.

Erythrina variegata L. var. *orientalis* (L.) Merr. (*E. corallodendron* L. var. *orientalis* L., *E. indica* Lam.) Small trees, with 3-foliolate leaves, red flowers and black, torulose pods. Commonly cultivated for ornamental purposes. Flowers appear before leaves.

Glycine max (L.) Merr. (*Phaseolus max* L., *Dolichos soza* L., *Glycine soza* (L.) Baker) 'Bhat' (Hindi) Annual herbs, with 3-foliolate leaves, reddish purple flowers, linear-oblong pods and oblong, grey seeds. Native of S.E. Asia; cultivated during the rainy season for the edible seeds.

Lablab purpureus (L.) Sweet (*Dolichos purpureus* L., *D. lablab* L.) 'Sem' (Hindi) Twining herbs with 3-foliolate leaves, white or purple flowers and flat, many-seeded pods. Cultivated for the edible pods; often found as an escape near habitations.

Lathyrus odoratus L. 'Matar' (Hindi) Climbing annuals, with winged stem, 1 pair of leaflets and rest reduced into tendrils, yellow flowers. Native of Italy; commonly cultivated in the gardens; rarely found as an escape near gardens.

Lens culinaris Medik. 'Masur' (Hindi) Herbs, with pinnate leaves, pale-purple flowers and 2-seeded pods. Native of Central Europe, Mediterranean region and W. Asia; commonly cultivated during the winter season for the edible seeds.

Medicago sativa L. 'Rizka' (Hindi) Herbs, with 3-foliolate leaves, purple violet flowers in close racemes and pods with 2-3 spirals. Native of W. Temperate Asia; commonly cultivated as a fodder crop during the winter and summer seasons.

Phaseolus vulgaris L. 'Bakla' (Hindi) - Climbing annual herbs, with 3-foliolate leaves, white, yellow, pink or violet flowers and 5 to 12-seeded, linear pods. Cultivated for its edible pods.

Pisum arvense L. 'Chapta matar' (Hindi) - Tendril bearing herbs, with pinnate leaves and globose, mottled, compressed seeds. Native of Italy; cultivated for the edible seeds during the winter season.

Pisum sativum L. 'Matar' (Hindi) Tendril bearing herbs, with pinnate leaves and globose, turgid, not mottled seeds. Native of W. Asia; cultivated during the winter season for edible seeds.

Sesbania grandiflora (L.) Poir. (*Robina grandiflora* L.) 'August' (Hindi) Soft-wooded trees, with pinnate leaves, white flowers and falcate or straight, pendulous pods. Native of Indonesia; planted in the gardens for ornamental purposes.

Sophora secundiflora (Ortega) DC. (*Broussonetia secundiflora* Ortega) Evergreen shrubs or small trees. Leaflets not ending into spines. Keel-petal not mucronate. Rarely planted for ornamental purposes.

Trifolium alexandrinum L. '*Barseem*' (Hindi) Fast growing herbs, with 3-foliolate leaves and white flowers in condensed, head-like spikes. Native of Egypt and Syria; cultivated as a fodder crop during the winter season.

Trigonella foenum-graecum L. '*Methi*' (Hindi) Herbs, with 3-foliolate leaves, pale-yellow flowers and straight, turgid, beaked pods. Native of South Europe; cultivated as a vegetable and fodder crop during winter season.

Vicia faba L. '*Bakhia*' (Hindi) Annual herbs, with fistular stems, pinnate leaves and white flowers in axillary pairs. Cultivated as a fodder crop.

Vigna radiata (L.) Wilczek (*Phaseolus radiatus* L.) '*Mung*' (Hindi)-Trailing, hispid herbs, with 3-foliolate leaves, white or yellow flowers and turgid, hairy, green pods. Seeds green; cotyledons yellowish. Cultivated during rainy season.

Vigna unguiculata (L.) Walp. (*Dolichos unguiculata* L.) '*Chawali*' (Hindi) Twining, annual herbs, with 3-foliolate leaves, yellow or reddish flowers and long, linear, turgid pods. Seeds oblong. Cultivated during the rainy season as a fodder crop. Fruits are cooked as vegetable.

47. CAESALPINIACEAE

(P.J. Parmar)

1a. Leaves uni-pinnate. (paripinnate) or simple:

2a. Leaves paripinnate:

3a. Leaflets more than 2. Petals present

4a. Corolla with 5, perfect petals. Fertile stamens more than 3, free.

3. *Cassia*

4b. Corolla with 3 perfect petals. Fertile stamens 3, monadelphous.

10. *Tamarindus*

3b. Leaflets 2. Petals absent.

5. *Hardwickia*

2b. Leaves simple:

5a. Erect trees or shrubs:

6a. Calyx spathaceous. Style distinct, slender.

1. *Bauhinia*

6b. Calyx lobed or toothed. Style inconspicuous, minute or thick.

9. *Platystigma*

5b. Extensive shrubby climbers

8. *Phanera*

1b. Leaves 2-pinnate:

7a. Climbing shrubs:

- 8a. Flowers yellow, in axillary racemes. 2. *Caesalpinia*
 8b. Flowers orange-red, in simple or paniced spikes. 6. *Moulaya*

7b. Erect trees or shrubs:

- 9a. Plants armed. Flowers bright yellow. Pods moniliform. 7. *Parkinsonia*
 9b. Plants unarmed. Flowers creamy-white, turning to cream-
 ish yellow. Pods flat. 4. *Delonix*

1. BAUHINIA L.

Bauhinia racemosa Lam. Encycl. 1: 390. 1785; Baker in Hook. f. Fl. Brit. India 2: 276. 1878; Duthie, Fl. Gangetic Plain 1: 298. 1903. 'Seta, Jhira' (Hindi).

Small trees or erect shrubs, with dark, scabrous bark; branches drooping. Leaves 1.8-5.0 × 2.5-6.0 cm, broader than long, divided into two up to the middle; lobes rounded, glabrous above, tomentose beneath. Flowers in terminal or leaf-opposed racemes, white. Fertile stamens 10. Pods 15-25 × 1.0-2.2 cm, blunt at the apex, tapering at the base, somewhat falcate, glabrous.

Fl : May - June; Fr : August - November.

Common in deciduous and scrub forests; also planted along the roads.

Selected specimens : Banswara: Jolana, *Kanodla* 10 (BSI); Bhilwara: Banera, *Singh* 6030 (BSJO); Jhalawar: *Sharma* 213 (RUBL); Jodhpur: *Khisti* 23042 (BSI); Sirohi: Delwara temple, *Kaul* 9569 (LWG); Udaipur: Cheeka Ghat, *Gemawat* 178 (Bot.), Acc. No. 53185 (LWG).

2. CAESALPINIA L.

- 1a. Pods covered with wiry prickles. 1. *C. bonduc*
 1b. Pods not covered with prickles:
 2a. Pinnae 5-10 pairs. Pods glabrous, 6 to 8-seeded. 2. *C. decapetala*
 2b. Pinnae 10-30 pairs. Pods with minute, deciduous bristles,
 2-seeded. 3. *C. mimosoides*

1. *Caesalpinia bonduc* (L.) Roxb. Fl. Ind. 2: 362. 1832; Baker in Hook. f. Fl. Brit. India 2: 255. 1878. *Guilandinia bonduc* L. Sp. Pl. 381. 1753. *G. bonducella* L. Sp. Pl. ed. 2. 545. 1762. *Caesalpinia bonducella* (L.)

Fleming in As. Res. 11: 159. 1810; Baker in Hook. f. Fl. Brit. India 2: 254. 1878; Duthie, Fl. Gangetic Plain 1: 302. 1903. '*Kharkonda*' (Hindi).

Scandent or scrambling shrubs; branches armed with straight prickles. Leaves 11-20 cm long; pinnae 6-8 pairs; leaflets 6-9 pairs, 1.0-4.5 × 0.8-2.5 cm, elliptic-oblong, glabrous above, pubescent beneath. Flowers in terminal and axillary racemes, yellow. Pods ovoid-oblong, somewhat flattened, 1 to 2-seeded. Seeds oblong, smooth, lead-coloured.

Fl. : July - December, *Fr.* : September - December.

Common along hedges in the east of Aravalli .

Selected specimens : Ajmer: Merwara, *Lourie* 4636 (DD); Bhilwara: Amarpura, *Singh* 6220 (BSJO); Jaipur: *Kaul* 8426 (LWG), *Jain* 49584 (BSI); Udaipur: Jaisamand, *Kanodia* 82256 (BSI).

2. *Caesalpinia decapetala* (Roth) Alston in Trimen, Handb. Fl. Ceylon 6 (Suppl.): 89. 1931. *Reichardia decapetala* Roth, Nov. Pl. Sp. 212. 1821. *Caesalpinia sepiaria* Roxb. Fl. Ind. 2: 360. 1832; Wight, Ic. 1: t. 37. 1838; Baker in Hook. f. Fl. Brit. India 2: 256. 1878; Duthie, Fl. Gangetic Plain 1: 302. 1903.

Scandent or scrambling shrubs; branches clothed with hooked or straight prickles. Leaves 9-15 cm long; pinnae 5-10 pairs; leaflets 8-12 pairs, 1.2-2.0 × 0.5-0.8 cm, oblong, glabrescent or nearly so above, hairy beneath. Flowers in axillary and terminal racemes, bright yellow. Pods turgid, slightly winged, constricted between the seeds. Seeds 6-8, glabrous, greenish-mottled.

Fl. & Fr. : November - January.

Common in the east of Aravalli on the outskirts of the forests.

Selected specimens : Kota: *Singh* 90890 (LWG); Sirohi: Mt. Abu, *Kaul* 9569 (LWG), *Jain* 46620 (BSI); Jhalawar: Pirawa, *Verma* 6844 (BSA). Also reported from Ajmer (Sharma, 1958).

3. *Caesalpinia mimosoides* Lam. Encycl. 1: 452. 1785; Wight, Ic. 1: t. 392. 1840; Baker in Hook. f. Fl. Brit. India 2: 256. 1878.

Diffuse, glabrous or pubescent perennials. Leaves 30-45 cm long; pinnae 10-30 pairs; leaflets 10-20 pairs, sessile, oblong, membranous, sensitive. Flowers solitary or 2-3 in leaf axils, bright yellow. Pods obliquely oblong, turgid, narrowed at the base.

Fl. & Fr. : September - January.

Rare, in the forests at high elevations.

Selected specimen : Sirohi: Mt. Abu, *Blatter* 12173 (BLAT).

3. CASSIA L.

1a. Foliar glands present:

2a. Glands on the petioles always present (glands between the leaflets may or may not be present):

3a. Glands distinctly stalked, peltate.

9. *C. pumila*

3b. Glands always sessile:

4a. Stamens 4-5.

4. *C. hochstetteri*

4b. Stamens 7-10:

5a. Rachis winged or serrate. Leaflets 30-60 pairs. Stamens 10, all fertile.

6. *C. mimosoides*

5b. Rachis entire. Leaflets not more than 10 pairs. Fertile stamens 7, three reduced to staminodes:

6a. Leaflets 6-10 pairs, distinctly lanceolate, acute. Bracts obtuse. Pods turgid. Hilum end of the seeds slightly curved on the one side.

11. *C. sophera*

6b. Leaflets 3-5 pairs, ovate-lanceolate, acute or acuminate. Bracts acute. Pods less turgid, comparatively more flattened. Hilum end of the seeds straight.

8. *C. occidentalis*

2b. Glands always between the pairs of leaflets (no glands on the petiole):

7a. Leaflets 2 pairs only.

1. *C. absus*

7b. Leaflets more than 2 pairs:

8a. Stipules foliaceous, auricled. Glands between all the pairs of leaflets.

2. *C. auriculata*

8b. Stipules linear-lanceolate, small, not auricled. Glands between the lower one or two pairs of leaflets only:

9a. Three large anthers distinctly necked at the apex, the remaining 4 rounded at the apex. Seed-areole slit like, not more than 1 mm wide, never extending upto hilum; testa slightly muricate, not distinctly veined.

7. *C. obtusifolia*

9b. All the seven anthers rounded at the apex. Seed-areole broad, 1.5-2.0 mm wide, always extending up to hilum; testa not muricate, but distinctly veined.

12. *C. tora*

1b. Foliar glands absent:

- 10a. Diffuse herbs. Pods flat, papery, with crest or winged on the valves. 5. *C. italica*
- 10b. Trees. Pods cylindrical or strap-shaped, without crest or wings, almost smooth:
- 11a. Flowers in pendulous racemes. Fertile stamens 10. Pods cylindrical. 3. *C. fistula*
- 11b. Flowers in panicles. Fertile stamens 7. Pods strap-shaped. 10. *C. siamea*

1. *Cassia absus* L. Sp. Pl. 376. 1753; Baker in Hook. f. Fl. Brit. India 2: 265. 1878; Duthie, Fl. Gangetic Plain 1: 294. 1903. '*Chimar, Chikisi*' (Hindi).

Erect herbs, covered with glandular based viscous hairs. Rachis grooved. Leaflets 2-5 × 1-2 cm, obliquely elliptic or obovate. Glands linear, between both the pairs of leaflets. Flowers in terminal or leaf-opposed, few-flowered racemes, pink or red. Fertile stamens 5 to 7. Pods flat, hairy. Seeds 4-6, compressed, broadly ovoid.

Fl. & Fr. : August - November.

Common, from plains to the hills in wet and shady localities.

Selected specimens : Banswara: Bhapur R.F., *Singh* 2964 (BSJO); Jaipur: Ramgarh hills, *Sharma* 159 (RUBL); Jhalawar: Bijliya Bhadak, *Wadhwa* 5329 (BSA); Pali: Bijapur R.F., *Shetty* 1971 (BSJO); Sirohi: Mt. Abu, *Blatter* 12343 (BLAT); Udaipur: *Kanodia* 82190 (BSI).

2. *Cassia auriculata* L. Sp. Pl. 379. 1753; Baker in Hook. f. Fl. Brit. India 2: 263. 1878; Duthie, Fl. Gangetic Plain 1: 294. 1903. '*Anwal*' (Hindi).

Tall, bushy shrubs, with finely downy, spreading branches. Leaves 2.5-8.0 cm long; leaflets 8-12 pairs, 0.8-2.1 × 0.5-1.2 cm, glabrous above and pubescent beneath. Flowers in axillary and terminal racemes, yellow with orange veins. Fertile stamens 7; staminodes 3. Pods linear, flat, beaked, pale to dark brown. Seeds laterally compressed, ovate-oblong.

Fl. & Fr. : August - November.

Comparatively gregarious and abundant in dry sandy soils of the desert rather than the gravelly soils in the east of Aravalli; often planted in the gardens or in hedges.

Selected specimens : Ajmer: *Lourie* 4641 (DD); Banswara: Ghatol to Banswara road, *Singh* 2942 (BSJO); Churu: Sardarshahar, *Roy* 3974

(BSJO); Jodhpur: Kailana, *Singh* 4359 (BSJO); Kota: Chhabra, *Singh* 90384 (LWG); Sirohi: Abu road, *McCann* 49 (BLAT).

3. *Cassia fistula* L. Sp. Pl. 377. 1753; Baker in Hook. f. Fl. Brit. India 2: 261. 1878; Duthie, Fl. Gangetic Plain 1: 291. 1903. *C. rhombifolia* Roxb. Fl. Ind. 3: 334. 1832; Wight, Ic. 1: t. 269. 1840. 'Amaltas' (Hindi).

Medium-sized, deciduous trees, with yellowish or greenish-grey bark. Leaves 20-45 cm long; leaflets 4-8 pairs, 8-20 × 3.0-8.5 cm, ovate or elliptic-ovate, glabrous above, glabrescent beneath. Flowers in axillary, pendulous, lax racemes, yellow. Pods 35-40 cm long, dark blackish-brown. Seeds ovate or ellipsoidal, glabrous.

Fl. & Fr. : February - May.

Indigenous on the Aravallis; commonly planted in the gardens and along the roads for ornamental purposes.

Selected specimens : Banswara: Pipalkhunt, *Singh* 2923 (BSJO); Bhilwara: Bijolia, *Singh* 6060 (BSJO); Ganganagar: Abohar, *Roy* 5071 (BSJO); Jodhpur: Balsamand, *Singh* 4495 (BSJO); Kota: Shahabad, *Singh* 91041 (LWG); Sirohi: Mt. Abu, *McCann* 52 (BLAT); Udaipur: *Kaul* 53182 (LWG).

4. *Cassia hochstetteri* Ghesq. in Bull. Jard. Bot. Brux 9: 155. 1932. *C. dimidiata* Roxb. Hort. Beng. 32. 1814, *nom. nud.*, non Ham. ex D. Don 1825; Duthie, Fl. Gangetic Plain 1: 295. 1903. *Senna dimidiata* Ham. ex Roxb. Fl. Ind. 2: 352. 1832. *Cassia mimosoides* L. var. *dimidiata* (Ham. ex Roxb.) Baker in Hook. f. Fl. Brit. India 2: 266. 1878. 'Tkrar' (Hindi).

Annual, prostrate or erect herbs, covered with long, white, spreading hairs. Leaflets 20-30 pairs, 0.4-1.0 × 0.1-0.2 cm, oblong-lanceolate, ciliolate, apiculate, oblique-based. Flowers 1-4, in the axils of leaves, yellow. Pods flat, straight, hairy, 4 to 15-seeded. Seeds rhomboid, smooth, without areole, brown.

Fl. & Fr. : August - November.

Common on the gravelly soils among grasses, particularly in hilly tracts; poorly represented in the desert.

Selected specimens : Jodhpur: *Sharma* 28 (JAC); Sirohi: Mt. Abu, *Blatter* 12013, 12346, 12324 (BLAT); Turumal, *Blatter* 12560 (BLAT).

5. *Cassia italica* (Mill.) Lam. ex Anderws, Fl. Pl. Anglo-Egypt. Sudan 2: 117. 1952. *Senna italica* Mill. Gard. Dict. ed. 8 no. 2. 1768. *Cassia obtusa* Roxb. Hort. Beng. 31. 1814, *nom. nud.*; Wight, Ic. 3(1): 3. t. 757.

1844; Duthie, Fl. Gangetic Plain 1: 294. 1903. *Cassia obovata* Collad. Hist. Cass. 92. t. 15/A. 1816, *nom. illegit.*; Baker in Hook. f. Fl. Brit. India 2: 264. 1878. 'Goral, Gharawal' (Hindi).

Diffuse, perennial herbs, somewhat woody at the base. Leaflets 3-7 pairs, 1-3 × 0.3-1.5 cm, opposite, broadly oblong or obovate, obtuse, mucronate, glabrous. Flowers in axillary and terminal racemes smaller, equal or longer than the leaves, yellow. Pods papery, glabrous, oblong, falcate, septate between the seeds. Seeds obovoid-oblong, cuneate, dark brown.

Fl. & Fr. : July - February.

Common in the arid regions, often found on sand-dunes. Very rarely found in the east of Aravalli in gravelly soils.

Selected specimens : Ajmer: Sharma 451 (DD); Bikaner: Nayagaon, Roy 2032 (BSJO); Jaipur: Sanganer, Sharma 1543 (RUBL); Jaisalmer: Kuri village, Shetty 3410 (BSJO); Jalore: Jaswantpura, Raizada 138024 (DD); Pali: Gundoj hills, Shetty 1400 (BSJO).

6. *Cassia mimosoides* L. Sp. Pl. 379. 1753; Baker in Hook. f. Fl. Brit. India 2: 266. 1878; Duthie, Fl. Gangetic Plain 1: 296. 1903. 'Ikrar' (Hindi).

Diffuse, glabrous or pubescent, perennial undershrubs. Leaves 4-11 cm long; leaflets 0.8-1.1 × 0.1-0.2 cm, linear-oblong, glabrous. Flowers axillary, solitary or 2-3 in fascicles, yellow. Pods flat, linear, pubescent, 15 to 20-seeded. Seeds obliquely obovoid, compressed, polished, brown.

Fl. & Fr. : August - November.

Occasionally found in the forests among grasses, prefers wet habitats in the eastern parts of the state.

Selected specimens : Kota: Shahabad, Majumdar 13122 (BSA); Chittorgarh: Bansi, Majumdar 12340 (BSA); Sirohi: Mt. Abu, Rao 66623 (BSI); Udaipur: Prashad, Kanodia 82191 (BSI).

7. *Cassia obtusifolia* L. Sp. Pl. 377. 1753; Duthie, Fl. Gangetic Plain 1: 293. 1903. *Cassia tora sensu* Baker in Hook. f. Fl. Brit. India 2: 263. 1878, *pro parte*, non L. 1753. *C. tora* L. var. *obtusifolia* (L.) Haines, Bot. Bihar & Orissa 304. 1922. 'Puadia' (Hindi).

Erect, subglabrous herbs or undershrubs. Leaflets 3 pairs, 1.5-4.0 × 1.0-2.8 cm, obovate-oblong, glabrous or nearly so. Flowers in axillary racemes, bright yellow. Pods linear-cylindric, faintly reticulate, beaked. Seeds somewhat rhomboid, smooth, dark brown.

Fl. & Fr. : August - November.

Common from plains to the hills and often dominates the undergrowth of deciduous forests on the Aravalli and in the east of it.

Selected specimens : Banswara: *Kanodia* 75117 (BSI); Bhilwara: Badnor, *Singh* 6268 (BSJO); Jaipur: Digotha hills, *Sharma* 3726 (RUBL); Jodhpur: Bariganga, *Shetty* 166 (BSJO); Kota: Shahabad, *Wadhwa* 9264 (BSA); Sirohi: Mt. Abu, *Shiv Ram* 2 (JAC).

8. *Cassia occidentalis* L. Sp. Pl. 377. 1753; Baker in Hook. f. Fl. Brit. India 2: 262. 1878; Duthie, Fl. Gangetic Plain 1: 292. 1903. '*Talka, Chakundra*' (Hindi).

Diffuse, sub-glabrous undershrubs. Leaves 10-15 cm long; leaflets 3-6 pairs, 1.5-10.0 × 0.8-4.0 cm, membranous, lanceolate or ovate-lanceolate, usually acuminate. Flowers in axillary corymbs arranged in terminal panicles, yellow. Pods slightly falcate, linear-oblong, transversely septate. Seeds sycylindric, smooth, greenish-brown.

Fl. & Fr. : August - November.

Common in wastelands, particularly near habitations.

Selected specimens : Banswara: Ghatol, *Singh* 2797 (BSJO); Barmer: *Bhandari* 232 (JAC); Bhilwara: Deoriya village, *Singh* 6541 (BSJO); Churu: Sujangarh, *Roy* 4038 (BSJO); Kota: *Singh* 90514 (LWG); Sirohi: Abu road, *McCann* 1424 (BLAT).

9. *Cassia pumila* Lam. Encycl. 1: 651. 1785; Baker in Hook. f. Fl. Brit. India 2: 266. 1878; Duthie, Fl. Gangetic Plain 1: 295. 1903. '*Karelia*' (Hindi).

Erect or decumbent, annual herbs. Leaflets c. 30 pairs, 0.7-1.8 × 0.15-0.3 cm, linear to linear-oblong. Glands of the petiole persistent. Flowers axillary, 1-3 together, yellow. Pods linear-oblong or linear-lanceolate, pubescent, pale to dark-brown. Seeds subquadrate or tapezoidal, rounded or slightly acute at the ends, brown.

Fl. & Fr. : August - November.

Common in open wastelands, forests and grasslands.

Selected specimens : Banswara: Puna Pathar R.F., *Singh* 2930 (BSJO); Bhilwara: Badnor, *Singh* 6272 (BSJO); Jhalawar: Bijliya Bhadak, *Wadhwa* 7414 (BSA); Jodhpur: Kailana, *Singh* 4315 (BSJO); Sirohi: Mt. Abu, *Jain* 60135 (BSI).

10. *Cassia siamea* Lam. Encycl. 1: 648. 1785; Baker in Hook. f. Fl. Brit. India 2: 264. 1878; Raizada, Suppl. Duthie, Fl. Gangetic Plain 63. 1976.

Tree, 4-10 m high, with light blackish-brown, rough, longitudinally fissured bark. Leaflets 4-14 pairs, 1.8-5.2 × 1.1-2.3 cm, coriaceous, ovate-oblong or elliptic-oblong, minutely petiolulate. Flowers pale yellow. Pods compressed, reticulate, stoutly beaked, blackish-brown. Seeds flat, glabrous, dark-brown.

Fl. & Fr. : Almost throughout the year.

Planted along the roads and in the gardens as an avenue and ornamental tree.

Selected specimens : Banswara: Loharia village, *Singh* 3018 (BSJO); Bhilwara: Gangapur, *Singh* 6543 (BSJO); Jodhpur: Near Medical college, *Pandey* 2441 (BSJO); Jhalawar: Eklera, *Majumdar* 10183 (BSA); Udaipur: *Majumdar* 11662 (BSA).

11. *Cassia sophera* L. Sp. Pl. 379. 1753; Baker in Hook. f. Fl. Brit. India 2: 262. 1878; Duthie, Fl. Gangetic Plain 1: 293. 1903. 'Kasunda' (Hindi).

Tall, glabrous shrubs or undershrubs. Leaflets 4-10 pairs, 4-6 × 1.2-1.8 cm, lanceolate or oblong-lanceolate, acute. Flowers in axillary and terminal, almost umbellate racemes, yellow. Pods turgid, linear, septate. Seeds laterally compressed, ovoid, dark-brown.

Fl. & Fr. : August - January.

Rare, in wastelands, often forming dense populations.

Selected specimens : Banswara: Ghatol, *Majumdar* 10249 (BSA); Barmar: *Tiwari* 969 (BSJO); Jhalawar: Asnawat, *Wadhwa* 6912 (BSA); Jodhpur: Jaswant Sagar dam, *Singh* 4439 (BSJO); Udaipur: *Kaul* 8579 (LWG).

12. *Cassia tora* L. Sp. Pl. 376. 1753; Baker in Hook. f. Fl. Brit. India 2: 263. 1878, *pro parte*; Cooke, Fl. Bombay 1: 447. 1903. 'Puadia' (Hindi).

Tall, suffruticose, glabrous herbs. Leaflets sessile, 1.5-5.5 × 1.0-3.5 cm, obovate. Flowers axillary, geminate, yellow or reddish tinged. Pods narrowly linear, falcate, sub-torulose, reticulate, beaked.

Fl. & Fr. : August - November.

Sparsely distributed from plains to the hills; often found in association with *C. obtusifolia* L.

Selected specimens : Banswara: *Kanodia* 51101 (BSI); Bharatpur: Sewar, *Saran* 41889 (LWG); Kota: Atru, *Singh* 90192 (LWG); Sirohi: Mt. Abu, *Blatter* 12020 (BLAT); Tonk: Mayola Forest, *Shetty* 1083B (BSJO).

4. DELONIX REE.

Delonix elata (L.) Gamble, Fl. Madras 1: 396. 1919. *Poinciana elata* L. Cent. Pl. 2: 16. 1756; Baker in Hook. f. Fl. Brit. India 2: 260. 1878; Duthie, Fl. Gangetic Plain 1: 303. 1903.

Tall, erect, deciduous trees, with ash-coloured or deep reddish-brown, smooth bark. Leaves 4-15 cm long; pinnae 4-6 pairs; leaflets subsessile, 10-20 pairs, 0.7-1.5 × 0.3-0.4 cm, linear-oblong, obtuse, narrowed towards the base. Flowers in terminal racemes, creamy-white to pale yellow. Pods linear-oblong, reticulate, beaked, glabrous, dark-brown.

Fl. : November - April; *Fr.* : December - June.

Common in wastelands; also planted along the roads.

Selected specimens : Banswara: Ghatol, *Singh* 4218 (BSJO); Barmer: Mokalsar, *Tiwari* 1182 (BSJO); Jodhpur: Pichyak, *Singh* 3570 (BSJO). Also reported from Ajmer (Sharma, 1958).

5. HARDWICKIA ROXB.

Hardwickia binata Roxb. Pl. Cor. 3: 6. t. 209. 1819; Baker in Hook. f. Fl. Brit. India 2: 270. 1878; Raizada, Suppl. Duthie, Fl. Gangetic Plain 63. 1976. 'Anjan' (Hindi).

Large, deciduous trees, with drooping branches. Leaflets sessile, 2.5-4.5 cm long, obliquely rhomboid or obovate-obtuse, glabrous. Flowers in axillary and terminal paniced racemes, yellowish-white. Pods samaroid, linear-oblong, one-seeded.

Fl. & Fr. : December - July.

Rare, in the mixed deciduous and teak forests.

Selected specimens : Kota: Atru, *Singh* 91020 (LWG). Also reported from Ajmer (Sharma, 1958).

6. MOULLAVA ADANSON.

Moullava spicata (Dalz.) Nicolson in Manilal, Bot. Hist. Hort. Malab. 181. 1980. *Caesalpinia spicata* Dalz. in Kew Journ. Bot. 3: 89. 1851. *Wagatea spicata* (Dalz.) Wight Ic. 6: 14. t. 1995. 1853; Baker in Hook.f. Fl. Brit. India 2: 261. 1878; Cooke, Fl. Bombay 1: 16. 1903. 'Vagati' (Hindi).

Robust, woody climbers; branches armed with numerous recurved prickles. Leaflets 5-7 pairs, 2.5-4.5 × 1.25-2.0 cm, coriaceous, oblong, obtuse or subacute, rounded or cordate at base. Flowers in sessile, dense, spicate racemes, dark or uge. Pods linear-oblong. Seeds 3-4, obovate-oblong.

Fl. : January - February.

Very rare, in rocky habitats.

Western peninsular element; included here on the authority of Raizada (1958) and Jain (1961) who reported it from Mt. Abu.

7. PARKINSONIA L.

Parkinsonia aculeata L. Sp. Pl. 375. 1753; Baker in Hook. f. Fl. Brit. India 2: 260. 1878; Duthie, Fl. Gangetic Plain 1: 303. 1903. '*Vilayi kikar*' (Hindi).

Large shrubs or small trees, armed, glabrous. Leaves bipinnate; rachis short and ending into a spine; leaflets 25-30 pairs, 0.4-0.5 cm long, ovate-oblong. Flowers in axillary racemes, bright yellow. Pods linear, constricted between the seeds, glabrous. Seeds oblong, smooth, mottled.

Fl. : March - May; *Fr.* : May - June.

Native of tropical America; naturalized in wastelands; also cultivated for ornamental purposes.

Selected specimens : Bhilwara: Khari lamba village, Singh 7026 (BSJO); Bikaner: Shivbari, Roy 2142 (BSJO); Jaisalmer: Kuri, Wadhwa 5225 (BSA); Jhalawar: Chapehreta, Majumdar & Mishra 10001 (BSA); Pali: Near Mitri river, Shetty 1628 (BSJO).

8. PHANERA LOUR

Phanera integrifolia (Roxb.) Benth. in Miq. Pl. Jungh. 263. 1852. *Bauhinia integrifolia* Roxb. Fl. Ind. 2: 331. 1832. *B. vahlii* Wt. & Arn. Prodr. 297. 1834; Baker in Hook. f. Fl. Brit. India 2: 279. 1878; Duthie, Fl. Gangetic Plain 1: 298. 1903.

Extensive climbing shrubs, clothed with brown tomentum. Tendrils circinate, flattened. Leaves 10-20 cm in diam., broadly ovate or suborbicular, entire, apex with a wide deltoid sinus. Flowers in leafy corymbose racemes, yellow, orange or red. Fertile stamens 3. Pods broadly oblong, 2 to 3-seeded, puberulous. Seeds ovate, notched.

Fl. & Fr. : March - June.

Rare, in the forests of S.E. Rajasthan and Mt. Abu.

Selected specimens : Jhalawar: Gagrain, Singh 83711 (LWG); Kota: Wadhwa 9428 (BSA). Also reported from Mt. Abu (Ahluwalia, 1965).

9. PILIOSTIGMA HOCHST. *nom. cons.*

Piliostigma malabarica (Roxb.) Benth. in Miq. Pl. Jungh. 261. 1852. *Bauhinia malabarica* Roxb. Fl. Ind. 3: 321. 1832; Baker in Hook. f. Fl. Brit.

India 2: 277. 1878; Duthie, Fl. Gangetic Plain 1: 298. 1903. '*Amlī, Khatta, Jhinjora*' (Hindi).

Trees, 9-14 m high, with dark-brown, rough bark. Leaves 3-11 × 4.5-13.5 cm, nearly orbicular, coriaceous, bilobed, glabrous above, sparsely hairy beneath. Flowers in 5-10 cm long racemes. Petals spatulate, little exerted. Stamens 10, all fertile. Pods apiculate, slightly curved, flat, glabrous, dark-brown.

Fl. : September - October; *Fr.* : October - December.

Rare, in the deciduous forests in the east of Aravalli.

This species is included on the authority of Sharma (1958), Vyas (1965, 1967) and Gupta (1965) who reported it from Ajmer, Udaipur and Kota districts respectively.

10. TAMARINDUS L.

Tamarindus indica L. Sp. Pl. 34. 1753; Baker in Hook. f. Fl. Brit. India 2: 273. 1878; Duthie, Fl. Gangetic Plain 1: 301. 1903. '*Imli*' (Hindi).

Evergreen trees, 10-15 m high. Leaves 4-10 cm long; leaflets 6-12 pairs, 1.0-1.6 × 0.3-0.4 cm, linear-oblong, subcoriaceous, glabrous. Flowers in lax racemes, yellow with purple streaks. Pods subtorulose, somewhat falcate, linear-oblong, with rough, fibrous, grey epicarp. Seeds dark-chocolate brown, smooth.

Fl. : November - January; *Fr.* : February - April.

Native of Tropical America; naturalized in waste places and often in the forests. Also planted in the gardens and along the roads.

Selected specimens : Banswara: Shergarh, *Singh* 3097 (BSJO); Bikaner: Gajner, *Roy* 2407 (BSJO); Jhalawar: Kyaera, *Verma* 6789 (BSA); Jodhpur: Khaira-Meetapur, *Singh* 3578 (BSJO); Pali: Malgarh hills, *Shetty* 1498 (BSJO); Sirohi: Mt. Abu, *Blatter* 12133 (BLAT).

DOUBTFUL TAXA

Cassia javanica L. Sp. Pl. 379. 1753; Baker in Hook.f. Fl. Brit. India 2: 267. 1878.

The said species is a native of Java and Sumatra, and has been planted in many countries. Seth *et al.* (Trees of Van Mahotsava, N. Delhi, 1962) are of the opinion that it cannot survive in the Arid regions of India, hence, the presence of this species in Rajasthan is doubtful. Further, the specimens so

far identified as *C. javanica* L. from Rajasthan, actually belong to *C. roxburghii* DC.

Cassia kleinii Wt. & Arn. Prodr. 293. 1834; Baker in Hook.f. Fl. Brit. India 2: 266. 1878; Duthie, Fl. Gangetic Plain 1: 295. 1903.

The species was reported by Duthie (1903-1929) from Merwara, Ratnam (1951) and Nair & Malhotra (1961) from Lohargal (Jhunjhunu) and Sarup (1954) and Baltter & Hallberg (1918-1921) from Jodhpur. The specimens Duthie 4644 & 4645 (DD) and Blatter 7247 (BLAT) belong to *Cassia pumila* Lam. No other collections of *C. kleinii* could be found in any of the important Indian herbaria. Hence, records of *C. kleinii* Wt. & Arn. from Rajasthan are doubtful.

Cassia purpurea Roxb. ex Lindl. in Bot. Reg. t. 856. 1824. *Senna purpurea* Roxb. Fl. Ind. 2: 343. 1832. *Cassia sophera* L. var. *purpurea* (Roxb. ex Lindl.) Baker in Hook. f. Fl. Brit. India 2: 263. 1878; Duthie, Fl. Gangetic Plain 1: 293. 1903.

The said species was reported by Duthie (1903-29) from Merwara and Nair (1956) from Chirawa (Jhunjhunu), but no specimens from Rajasthan could be traced out in the important Indian herbaria. This species is very similar to *C. sophera* L. and said to be separated from latter by its small leaflets not exceeding 2.5 cm in length and purple stem and branches. Singh (1979) mentioned that these characters are not co-related with each other and some specimens of *C. occidentalis* L. also bear strongly purple stem and branches. Hence, the report of this species from Rajasthan is doubtful.

CULTIVATED SPECIES

***Bauhinia purpurea* L.** 'Kachnar, Jihra' (Hindi). Shrubs or small trees. Leaves sub-orbicular, coriaceous, deeply lobed, cordate at the base. Flowers in terminal racemes, pink. Fertile stamens 3. Pods linear, flat, apiculate, reddish brown. Commonly planted in the gardens and along the roads.

***Bauhinia retusa* Ham. ex Roxb.** - Trees or erect shrubs. Leaves entire or notched at the apex. Corolla white, the 3 upper petals mottled with purple. Fertile stamens 3-5. Sometimes planted in the gardens.

***Bauhinia variegata* L.** 'Kachnar' (Hindi). Medium-sized, deciduous trees. Leaves orbicular, bilobed, cleft 1/3 of the way down. Flowers white

to pink. Fertile stamens 5. Pods flat, glabrous. Commonly planted in the gardens and along the roads.

Caesalpinia pulcherrima (L.) Swartz. (*Poinciana pulcherrima* L.)
Tall shrubs with rough, greyish brown bark. Pinnae 4-9 pairs; leaflets 8-12 pairs, sessile, oblong, rarely obovate. Flowers in long, terminal racemes, yellow or reddish yellow. Commonly cultivated in the gardens for ornamental purposes.

Cassia alata L. - Shrubs, with 5-14 pairs of leaflets. Flowers in 20-30 cm long racemes, yellow. Fertile stamens 10. Pods transversely septate, dehiscing along the suture. Native of West Indies and South America; rarely planted in the gardens for ornamental purposes.

Cassia artemisioides Gaud. ex DC. Shrubs, clothed with white pubescence. Leaflets 3-4 pairs. Flowers in axillary corymbs, yellow. Fertile stamens 10. Pods flat, glabrous. Native of Australia; rarely planted in the gardens for ornamental purposes.

Cassia nodosa Buch. - Ham. ex Roxb. - Medium - sized trees. Leaflets 8-20 pairs. Flowers in corymbs, pink. Stamens 10; filaments of 4 longer ones swelling in the middle. Pods cylindric, black. Native of tropical Asia; planted in the gardens and along the roads for shade and ornamental purposes.

Cassia phyllodinea R. Br. Shrubs, clothed with white, silky tomentum. Flowers in axillary racemes or corymbs, yellow. Fertile stamens 10. Pods flat, constricted irregularly. Native of south Australia; occasionally planted in the gardens for ornamental purposes.

Cassia roxburghii DC. Medium-sized trees. Leaflets oblong, emarginate or retuse, with oblique base. Flowers in terminal racemes, pink or red. Fertile stamens 10. Pods pendulous; pulp spongy. Native of Sumatra and Java; planted in the gardens and along the roads for shade and showy flowers.

Cassia senna L. - Shrubs, upto 1.5 m high. Leaflets 3-8 pairs. Flowers yellow; racemes longer than leaves. Fertile stamens 7. Pods flat, oblong, purescent, brown. Native of Somaliland and Arabia; rarely cultivated in the gardens for medicinal purposes.

Cassia spectabilis DC. Large shrubs or small trees. Leaves 3-pairs. Flowers in corymbs, yellow. Fertile stamens 7. Native of Tropical America; occasionally planted in the gardens for ornamental purposes.

Cassia suffruticosa Koen. ex Roth Shrubs or small trees. Leaflets 4-10 pairs, upper most pair of leaflets largest, gradually smaller downwards. Flowers in axillary, corymbose racemes, creamy yellow. Fertile stamens 10. Pods black at maturity. Indigenous throughout the tropics, particularly in south-east Asia; commonly planted in the gardens for ornamental purposes.

Cassia surattensis Burm. f. - Shrubs or small trees. Leaflets 4-10 pairs. Flowers in axillary, corymbose racemes, yellow. Fertile stamens 10. Pods flat, irregularly constricted between the seeds, pale-green at maturity. Native of S.E. Asia; occasionally planted in the gardens for ornamental purposes.

Delonix regia (Bojer) Raf. (*Poinciana regia* Bojer). 'Gulmohar' (Hindi) -Large, deciduous trees. Leaflets 20-30 pairs. Flowers orange-vermilion to deep-red. Pods compressed, firm, rather thick. Native of Madagascar; planted in the gardens and along the roads for ornamental purposes.

Peltophorum pterocarpum (DC.) Baker ex K. Heyne (*Inga pterocarpa* DC.) Large, handsome trees, with smooth grey-coloured bark. Leaflets 6-17 pairs, oblong. Flowers in terminal and axillary, reddish-brown panicles, bright yellow. Pods copper-red, oblong, flat, narrowed at both ends. Native of Ceylon; rarely cultivated in the gardens for ornamental purposes.

Saraca asoca (Roxb.) de Wilde (*Jonesia asoca* Roxb.) -Evergreen trees. Leaflets 4-6 pairs, oblong-lanceolate, coriaceous. Flowers yellow or reddish-yellow, in paniculate corymbs on old wood, rarely axillary. Pods linear-oblong, flat, coriaceous. Occasionally planted in the gardens for ornamental purposes.

48. MIMOSACEAE

(R.P. Pandey)

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

2a. Flowers in heads:

- 3a. Plants and fruits prickly. Fruits curved, with segmented valves and indehiscent sutures. 5. *Mimosa*
- 3b. Plants and fruits not prickly. Fruits straight, dehiscing at the sutures:
- 4a. Herbs. Leaflets sensitive. Heads c. 5 mm in diam., yellow. Anthers gland-crested. 6. *Neptunia*
- 4b. Shrubs or trees. Leaflets not sensitive. Heads 1.5-2.5 cm in diam., creamy-white. Anthers not gland-crested. 4. *Leucaena*
- 2b. Flowers in elongated spikes or spike-like racemes:
- 5a. All flowers of spikes or spike-like racemes bisexual and yellow. Pods thick, straight or slightly falcate but never twisted, septate between the seeds. 8. *Prosopis*
- 5b. Upper flowers of spikes bisexual, yellow or cream-coloured; the lower half neuter, rosy-pink or purple. Pods thin, twisted, torulous, aseptate. 3. *Dichrostachys*
- 1b. Stamens indefinite, more than 10:
- 6a. Plants armed with spines or prickles:
- 7a. Pinnae 1-pair. Flowers in heads, dirty-white or greenish-white. Stamens monadelphous. Pods circinate or twisted. 7. *Pithecellobium*
- 7b. Pinnae more than one pair. Flowers in heads or spikes, yellow or creamy-white. Stamens free. Pods flat, straight. 1. *Acacia*
- 6b. Plants unarmed. 2. *Albizia*

1. ACACIA MILL.

- 1a. Climbing or scandent shrubs:
- 2a. Leaflets more than 35 pairs, glabrous. Pods thin, dry:
- 3a. Gland at or above the middle of petiole. Flowers sessile. 9. *A. megaladena*
- 3b. Gland below the middle of the petiole. Flowers pedicelled. 13. *A. pennata*
- 2b. Leaflets less than 30 pairs, pubescent at younger stage. Pods thick, fleshy:
- 4a. Leaflets 12-25 pairs. Pods wrinkled when dry, linear oblong. 16. *A. sinuata*
- 4b. Leaflets 5-15 pairs. Pods strap-shaped, not wrinkled when dry. 17. *A. tortu*
- 1b. Erect trees or shrubs:
- 5a. Flowers in elongate, cylindrical spikes:
- 6a. Pinnae more than 10 pairs:
- 7a. Plants glabrous. Leaflets, calyx and corolla glabrous. 2. *A. chundra*
- 7b. Plants pubescent. Leaflets, calyx and corolla villous or pubescent. 1. *A. catechu*
- 6b. Pinnae less than 6 pairs:

- 8a. Prickles three at each node. Bark peeling off. 15. *A. senegal*
- 8b. Prickles in pairs at each node. Bark not peeling off:
- 9a. Prickles hooked or recurved. Pods straight:
- 10a. Leaflets more than 10 pairs. 5. *A. ferruginea*
- 10b. Leaflets less than 5 pairs. 10. *A. modesta*
- 9b. Prickles straight. Pods falcate. 7. *A. latronum*
- 5b. Flowers in spherical heads:
- 11a. Pods contorted or spirally twisted. 14. *A. raddiana*
- 11b. Pods not spirally twisted:
- 12a. Heads in terminal panicles. 8. *A. leucophloea*
- 12b. Heads axillary, pedunculate:
- 13a. Ovary pilose. Pods moniliform:
- 14a. Plants cupressiform in appearance. 11. *A. nilotica* subsp. *cupressiformis*
- 14b. Plants not cupressiform in appearance. 12. *A. nilotica* subsp. *indica*
- 13b. Ovary glabrous. Pods not moniliform:
- 15a. Peduncle without a distinct joint. Pods cylindrical, turgid, beaked. 4. *A. farnesiana*
- 15b. Peduncle with a distinct joint. Pods flat, papery, not beaked:
- 16a. Bushy shrubs with zigzag branches. Leaflets oblong. Flowers fragrant. Pods horizontally veined. 6. *A. jacquemontii*
- 16b. Small trees; branches straight, with fowl smelling flowers. Leaflets linear. Pods longitudinally veined. 3. *A. eburnea*

1. *Acacia catechu* (L. f.) Willd. Sp. Pl. 4: 1079. 1806; Baker in Hook. f. Fl. Brit. India 2: 295. 1878; Duthie, Fl. Gangetic Plain 1: 316. 1903; Mahesh. Illus. Fl. Delhi f. 83. 1966. *Mimosa catechu* L. f. Suppl. Pl. Syst. Veg. 439. 1781. 'Katha, Kath, Khair' (Hindi).

Trees, 3-6 m high; bark dark grey or greyish-brown, peeling off in long stripes or in narrow rectangular flakes; young branchlets pubescent. Prickles hooked, brown or grey. Leaves 2-pinnate, with a large gland above the middle on the petiole and several small glands between the pinnae, upto 18 cm long. Leaflets 10-30 pairs, subsessile, c. 5 × 1 mm, linear-oblong, subacute, pilose. Flowers pale yellow. Pods 4.0-8.5 × 1.0-1.5 cm, flat, stalked, with a triangular beak at the apex, shining, dark brown, 5 to 10-seeded.

Fl. & Fr. : May - September.

Common in open forests and on the hill slopes; often becoming a dominant tree at places.

Selected specimens : Bhilwara: Bijolian, *Singh* 6049 (BSJO); Dungarpur: Deogarh, *Verma* 272, 6558 (BSA); Kota: Naka, *Verma* 419 (BSA); Shahabad, *Verma* 499 (BSA); Tonk: Toda Rai Singh R.F., *Pandey* 4832 (BSJO).

Notes : Differs from the closely allied *A. chundra* (Roxb. ex Rottler) Willd. by its pubescent leaf, calyx and corolla.

2. *Acacia chundra* (Roxb. ex Rottler) Willd. Sp. Pl. 4: 1078. 1806; Bedd. Fl. Sylv. t. 50. 1870, '*sandra*'; Baker in Hook. f. Fl. Brit. India 2: 295. 1978. *Mimosa chundra* Roxb. ex Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 207. 1803; Roxb. Pl. Cor. t. 225. 1811, '*sundra*'. *Acacia sundra* DC. Prodr. 2: 458. 1825. *Acacia catechu* Willd. var. *sundra* (DC.) Prain in Journ. As. Soc. Bengal 66: 508. 1898; Duthie, Fl. Gangetic Plain 1: 316. 1903. '*Lat Khair*' (Hindi).

Armed trees, 6-10 m high; bark rough, blackish. Leaves upto 20 cm long; leaflets 30-60 pairs, 3.5-5.5 mm long, linear-oblong. Flowers creamy white. Pods 5-10 × 1.75-2.25 cm, lanceolate, apiculate, glabrous, pale to dark brown, 5 to 6-seeded.

Fl. : April - August; *Fr.* : September - November.

Fairly common in open forests and on hill-slopes.

Selected specimens : Ajmer: *Duthie* 4653 (DD); Banswara: Ghatol, *Kanodia* 75286, 75498 (BSI); Pali: Goram Ghat R.F., *Shetty* 1839 (BSJO); Sirohi: Mt. Abu, *Blatter* 10164 (BLAT); Udaipur: Prashad, *Kanodia* 82206 (BSI).

3. *Acacia eburnea* (L. f.) Willd. Sp. Pl. 4: 1051. 1806; Baker in Hook. f. Fl. Brit. India 2: 293. 1878; Duthie, Fl. Gangetic Plain 1: 314. 1903. *Mimosa eburnea* L.f. Suppl. 437. 1781. '*Pahari Kikar*' (Hindi).

Large shrubs or small trees; bark rough, dark grey or purplish-brown. Stipular spines upto 5.0 cm long, tapering from a broad base, white. Leaflets 5-8 pairs, c. 2.5 mm long, glabrous. Flowers yellow to bright yellow, odour disagreeable. Pods 7-20 × 0.5-1.25 cm, 6 to 10-seeded.

Fl. : November - March; *Fr.* : January - March.

Not common; reported by Sankhala (1951) from N.W. Rajasthan.

4. *Acacia farnesiana* (L.) Willd. Sp. Pl. 4: 1083. 1806; Bedd. Fl. Sylv. 52. 1870; Baker in Hook. f. Fl. Brit. India 2: 292. 1878; Duthie, Fl.

Gangetic Plain 1: 313. 1903. *Mimosa farnesiana* L. Sp. Pl. 521. 1753. 'Babool' (Hindi).

Armed shrubs or small trees. Stipular spines in pairs, straight, upto 1.5 cm long. Leaves c. 5 cm long; pinnae 5-8 pairs; leaflets 10-20 pairs, sessile, 2.5-5.5 × 1.0-1.25 mm, linear to linear-oblong, base oblique, acute at apex, glabrous or subglabrous. Flower-heads 0.5-1.25 cm across, yellow, fragrant.

Bracts whorled at or near the apex of the peduncle. Pods 5-8 cm long, dark brown, faintly striate, 4 to 6-seeded; mesocarp pulpy.

Fl & Fr. : August - March.

Common in scrub forests and also planted along the roads, on the edges of cultivated fields and gardens.

Selected specimens : Banswara: Danpur, *Singh* 4263 (BSJO); Bhilwara: Khajari village, *Singh* 7170 (BSJO); Jaipur: Ram Niwas garden, *Sharma* Acc. No. 2200 (RUBL); Jhalawar: *Sharma* 378, 425 (RUBL); Sirohi: Mt. Abu, *Blatter* 12116 (BLAT).

5. *Acacia ferruginea* DC. Prodr. 2: 458. 1825; Reidd. Fl. Sylv. t. 51. 1870; Baker in Hook. f. Fl. Brit. India 2: 295. 1878; Raizada Suppl. Duthie, Fl. Gangetic Plain 65. 1976. *Mimosa ferruginea* (DC.) Roxb. Fl. Ind. 2: 561. 1832, non Rotler 1803.

Deciduous, medium-sized trees, 5-10 m high, with rough bark. Leaves c. 7.5 cm long; petiole-gland above the middle; pinnae 4-6 pairs, upper ones with glands between them; leaflets 10-20 pairs, 0.25-8.0 × 1.0-2.5 mm, linear-oblong, glaucous. Flowers white to creamy-white or yellow. Pods 7.5-15.0 × 1.75-3.0 cm, straight, flat, apiculate, brown, with upper suture narrowly winged, 5 to 8-seeded.

Fl. : March - September; *Fr.* : November - January.

Occasionally found in scrub forests on Aravalli hills.

Selected specimen : Chittorgarh: Majharia Deograh, *Verma* 274 (BSA). Also reported from Alwar (*Vyas*, 1967).

6. *Acacia jacquemontii* Benth. in Hook. Lond. Journ. Bot. 1: 499. 1842; Baker in Hook. f. Fl. Brit. India 2: 293. 1878; Duthie, Fl. Gangetic Plain 1: 314. 1903. 'Bhubavali, Bali' (Hindi).

Erect shrubs, 1.5-2.5 m high; bark greyish brown; twigs zigzag. Stipular spines upto 5.0 cm long, white, connate at the base. Leaves 2.5-5.0 cm long; pinnae 1-4 pairs, with a gland between the upper pair of pinnae. Leaflets 5-10 pairs, sessile, 1.75-3.75 × 0.5-1.5 cm, linear-oblong, obtuse, glabrous. Flowers yellow. Bracts 2-3, about the middle of the peduncle. Pods stalked, 5-8 × 0.75-1.75 cm, glabrous, 5 to 6-seeded.

Fl & Fr. : February - May

Common in sandy habitats.

Selected specimens : Ajmer: *Duthie* 4656 (DD); Bikaner: Jalwali, *Roy* 1726 (BSJO); Banswara: Pipaikhunt, *Singh* 4223 (BSJO); Jaipur: Univ. R.F., *Sharma* 5004 (RUBL); Jhalawar: Richwa, *Wadhwa* 9512 (BSA).

7. *Acacia latronum* Willd. Sp. Pl. 4: 1077. 1806; Wight, Ic 3(4): 15. t. 1157. 1846; Baker in Hook. f. Fl. Brit. India 2: 296. 1878. '*Dev-Bavatio*' (Hindi).

Glabrous shrubs or small trees, forming an umbrella like top when old. Stipular spines in pairs, connate at the base, upto 5.5 cm long, conical, hollow inside. Pinnae 2-5 pairs; leaflets 6-15 pairs, linear, glabrous. Flowers white, turning yellow, fragrant. Pods stalked, 2.5-3.5 × 1.25-2.0 cm, reticulately veined, dark brown to blackish, 2 to 4-seeded.

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

Rare, found in barren tracts at Mt. Abu.

Selected specimen : Sirohi: Ambeshwar, *Jain* 60465 (BSI).

8. *Acacia leucophloea* (Roxb.) Willd. Sp. Pl. 4: 1083. 1806; Baker in Hook. f. Fl. Brit. India 2: 294. 1878; *Duthie*, Fl. Gangetic Plain 1: 315. 1903; Mahesh. Illus. Fl. Delhi f. 80. 1966. *Mimosa leucophloea* Roxb. Pl. Cor. 2: 27. t. 150. 1800. '*Urajio, Ranj, Jhira*' (Hindi).

Moderate-sized trees, 6-8 m high, with yellowish bark; younger branches velvety pubescent. Stipular spines in pairs, upto 2.5 cm long, straight. Pinnae 3-15 pairs, with concave glands in between; leaflets 5-30 pairs, sessile, 2.5-7.5 × 1-2 mm, linear-oblong, base oblique, obtuse at the apex. Flowers tomentose, pale yellow. Pods sessile, 5-10 × 0.7-1.0 cm, flat, brown, velvety when young, 10 to 20-seeded, obliquely septate between the seeds.

Fl & Fr. : August - February.

Common in wastelands and open forests.

Selected specimens : Banswara: Barora, *Singh* 3695 (BSJO); Jodhpur: Kuri, *Singh* 3164 (BSJO); Kota: Atru, *Singh* 90193 (LWG); Sirohi: Mt. Abu, *Jain* 46717 (BSI); Tonk: Kachha bundha R.F., *Shetty* 1279 (BSJO).

9. *Acacia megaladena* Desv. Journ. Bot. 3: 69. 1814, '*megalodena*'. *A. arrophula* D. Don, Prodr. Fl. Nepal. 247. 1825. *A. pennata* (L.) Willd. var. *arrophula* (D. Don) Baker in Hook. f. Fl. Brit. India 2: 298. 1878; *Duthie*, Fl. Gangetic Plain 1: 319. 1903

Large, prickly, scandent bushes or stragglers. Leaves c. 10 cm long, glabrous; leaf-rachis glabrous, usually prickly beneath; petiolar glands large; interpinnular glands 2-3; leaflets 50-60, c. 5×1 mm, linear, membranous. Flowers in paniculate heads, white or pale-yellow. Pods stalked, 12-20 \times 1.5-3.0 cm, strap-shaped, dehiscent, linear-oblong, glabrous, 6 to 10 seeded.

Fl. & Fr. : August - February.

Occasionally found in dry deciduous forests on Aravalli hills.

Selected specimens : Ajmer: Todgarh, *Duthie* 4652A (DD); Banswara: Ghatol, *Kanodia* 75422 (BSI); Udaipur: Kamblighat, *Kanodia* 82420 (BSI). Also reported from Jhalawar (*Majumdar et al.*, 1969).

10. *Acacia modesta* Wall. Pl. As. Rar. 2: 27, t. 130. 1831; Baker in Hook. f. Fl. Brit. India 2: 296. 1878; Duthie, Fl. Gangetic Plain 1: 317. 1903; Mahesh. Illus. Fl. Delhi f. 82, 1966. 'Phulahi' (Hindi).

Medium-sized, deciduous, thorny trees with brownish or greenish-grey, rough bark. Stipular prickles in pairs, recurved, stout, dark brown, prickles sometimes absent. Leaf-rachis upto 5 cm long, downy, with a small gland at the base and sometimes one between the uppermost pair of pinnae; leaflets 3-5 pairs, petiolulate, 3-10 \times 3-7 mm, broadly ovate to obovate, oblique, obtuse, glabrous. Flowers white or pale-yellow, fragrant. Pods stipitate, 5-6 \times 0.8-1.0 cm, linear-oblong, apex deltoid, glabrous, 3 to 5-seeded.

Fl. & Fr. : March - November.

Not common, found in dry wastelands and along the edges of reserve forests, sometimes planted.

Selected specimens : Churu: Jhampu Khurd, *Roy* 2777 (BSJO); Jaipur: Rajasthan University Campus, *Sharma* 11671 (RUBL); Chaumu road, *Wadhwa* 8314 (BSA).

11. *Acacia nilotica* (L.) Willd. ex Del. subsp. *cupressiformis* (J.L. Stewart) Ali & Faruqi in Pak. Journ. Bot. 1: 4. 1969. *A. arabica* (Lam.) Willd. var. *cupressiformis* J.L. Stewart, Punjab Pl. 51. 1869.

This taxon can be easily distinguished from *A. nilotica* (L.) Del. subsp. *indica* (Benth.) Brenan by its cupressiform appearance and the pods being generally narrowly and regularly constricted between the seeds.

Fl. & Fr. : August - April.

Rather common in wastelands and scrub forests in north east Rajasthan.

Selected specimens : Jaipur: Amer, *Singh* Acc. no. 7536 (RUBL); Jodhpur: Bhandari s.n. (JAC).

12. subsp. **indica** (Benth.) Brenan in Kew Bull. 12: 84, 1957. *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. India 2: 293, 1878; Duthie, Fl. Gangetic Plain 1: 314, 1903. '*Babul, Kikar*' (Hindi).

Trees, 3-15 m high; bark rough, fissured, dark grey or brown; young branches glabrous to subtomentose. Stipular spines in pairs, 1-8 cm long, straight, white. Leaves 2-pinnate, with glands on the petiole and between the pinnae especially the upper ones, up to 10 cm long, pinnae 2-11 pairs, leaflets 7-25 pairs, sessile, 1.5-7.0 × 0.5-1.5 mm, linear-oblong, obtuse, glabrous to pubescent. Flowers bright yellow. Pods 10-22 × 1.2-1.75 cm, necklace-like, whitish or grey pubescent. Seeds upto 15, c. 8 × 7 mm, suborbicular or oval, compressed, blackish-brown.

Fl. & Fr. : September - March.

Common in sandy loam to alkaline soils.

Selected specimens : Banswara: Sarania village, *Singh* 2905 (BSJO); Barmer: Pachpadra, *Tiwari* 985 (BSJO); Ganganagar: Gharsana, *Roy* 3817 (BSJO); Kota: Baran, *Singh* 90488 (LWG); Pali: Babra village, *Shetty* 1564 (BSJO); Udaipur: Banki block, *Verma* 20 (BSA).

13. **Acacia pennata** (L.) Willd. Sp. Pl. 4: 1090, 1806; Baker in Hook. f. Fl. Brit. India 2: 297, 1878; Duthie, Fl. Gangetic Plain 1: 318, 1903.

Large, scandent bush or lianas, with dark brown to pale brown polished bark. Prickles slightly recurved. Pinnae 8-15 pairs, 3-5 cm long, with glands between the upper ones; leaflets 40-50 pairs, sessile, obliquely linear-oblong. Flowers in terminal panicles, creamy-white or pale yellow. Pods stalked, 10-15 × 1.25-3.0 cm, linear-oblong, acute to acuminate, glabrous, dark brown, 6 to 10-seeded.

Fl. : July - September, *Fr.* : November - March.

Rare, in mixed dry deciduous forests.

Selected specimens : Banswara: Ghatol, *Kanodia* 75422 (BSI), *Singh* 2940 (BSJO); Sirohi: Mt. Abu, *Jain* 3505 (BSI), *Puri* 56706 (BSI).

14. **Acacia raddiana** Savi, Acad. Egiz. Mem. 1. f. A-G, 1830. *Mimosa tortilis* Forssk. Fl. Aegypt. Arab. 176, 1775. *A. tortilis* (Forssk.) Hayne, Darst. Beschr. Arzneik. Gebrauchl. Gewachse 10, t. 31, 1827, *in part*.

Flat topped or umbrella shaped trees, with young branchlets and leaves glabrous or puberulous; bark reddish brown. Stipular spines straight, upto 1.0 cm long or some slightly recurved or hooked and up to 0.5 cm long. Pinnae 2-5 pairs; leaflets 6-15 pairs. Flowers white or creamy. Pods up to 12 cm long and 4-8 mm broad; valves thinly coriaceous, glabrous, somewhat constricted between the seeds.

Fl. : July - October, *Fr.* : November - February.

Recently introduced; but quite naturalized in the area, particularly in W. Rajasthan desert.

Selected specimens : Barmer: Leeladhora, *Tiwari* 955 (BSJO); Ganganagar: Kota village, *Roy* 6405 (BSJO); Jodhpur: Bilara, *Singh* 4424 (BSJO).

15. *Acacia senegal* (L.) Willd. Sp. Pl. 4: 1077. 1806; Baker in Hook. f. Fl. Brit. India 2: 295. 1878; Duthie, Fl. Gangetic Plain 1: 317. 1903; Basu, Ind. Med. Pl. t. 379. 1918. '*Kumatiyo, Kumbat*' (Hindi).

Trees, 3.0-6.5 m high; bark whitish, whitish-grey or pale brown; young branches pubescent. Stipular prickles in threes, the two lateral ones nearly straight, the middle one recurved, dark brown, c. 5 mm long. Leaves 2.5-7.0 cm long; rachis with a gland at the base and one between the uppermost pair of pinnae; leaflets 6-20 pairs, subsessile, 2-6 × 1.0-2.5 mm, linear to elliptic-oblong, obtuse. Flowers white or creamy, fragrant. Pods 4-10 × 1.5-2.5 cm, oblong, flat, venose, beaked or rounded, sparsely pubescent, pale brown, 4 to 6-seeded. Seeds c. 7 mm across, suborbicular, disk-like, with a horse-shoe shaped depression on either side.

Fl. & Fr. : July - February.

Common in wastelands and scrub forests.

Selected specimens : Ajmer: Todgarh, *Duthie* 4657 (DD); Barmer: Shco, *Tiwari* 925 (BSJO); Pali: Guru Pratap Singh hills, *Shetty* 1387 (BSJO), *Pandey* 4807 (BSJO); Udaipur: Prashad, *Kanodia* 82233 (BSI).

16. *Acacia sinuata* (Lour.) Merr. in Trans. Amer. Phil. Soc. 24(2): 186. 1835. *Mimosa sinuata* Lour. Fl. Cochinch. 653. 1790. *M. concinna* Willd. Sp. Pl. 4: 1039. 1806. *Acacia concinna* (Willd.) DC. Prodr. 2: 464. 1825; Baker in Hook. f. Fl. Brit. India 2: 296. 1878; Duthie, Fl. Gangetic Plain 1: 317. 1903. '*Chikakai*' (Hindi).

Prickly, large climbing shrubs; young parts finely grey-tomentose or pubescent. Leaves 8-10 cm long; upper most pair of pinnae with gland in between; leaflets 1.0-1.3 cm long, linear, unequal sided, glabrous. Pods 7-15

× 1.75-2.75 cm, rugose, often indented on sutures, depressed between the seeds, 6 to 10 (-14) - seeded.

Fl. & Fr. : April - December.

Not common, collected only from mixed dry deciduous forests at Mt. Abu.

Selected specimens : Sirohi: Mt. Abu, *Kanudia* 62186 (BSI), *Blatter* 12359 (BLAT).

17. *Acacia torta* (Roxb.) Craib. in Kew Bull. 1915: 410. 1915. *Mimosa torta* Roxb. Fl. Ind. 2: 566. 1832. *Acacia caesia* auct. non Willd. 1809; Wight & Arn. Prodr. 278. 1834; Duthie, Fl. Gangetic Plain 1: 318. 1903. *A. intsia* auct. non Willd. 1806; Baker in Hook. f. Fl. Brit. India 2: 297. 1878.

Large climbing shrubs; younger parts pubescent. Prickles many, upto 2.5 mm long, hooked; rachis upto 20 cm long, with obliquely conical gland near the base of the petiole and convex glands between the upper pair or pairs of pinnae; glands hirsute. Pinnae 8-15 pairs; leaflets 25-30 pairs, 4-6 × 2-3 mm, linear-oblong, ciliate, pubescent on both sides. Heads in large terminal panicles, white or pale yellow. Pods 8-15 × 1.0-1.5 cm, brown when young, velvety, glabrous when mature, apiculate, 5 to 7-seeded.

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

Rare, in dry deciduous forests.

Selected specimens : Jhalawar: Bakani Modiya, *Verma* 7037, 7441 (BSA); Kota: Shahabad, *Majumdar* 13188 (BSA).

2. ALBIZIA DURAZZ.

1a. Flowers in umbels, pedicelled. Pods straw-coloured. 1. *A. lebbeck*

1b. Flowers in panicles, sessile. Pods dark reddish or brown:

2a. Leaflets ovate-oblong, with a midrib near the lower edge; rachis glabrous. Calyx-teeth distinct, glabrous. 3. *A. procera*

2b. Leaflets obliquely oblong, with a midrib near the upper edge; rachis pubescent. Calyx-teeth obsolete, pubescent. 2. *A. odoratissima*

1. *Albizia lebbeck* (L.) Benth. in Hook. Lond. Journ. Bot. 3: 87. 1844; Bedd. Fl. Sylv. t. 53. 1870; Baker in Hook. f. Fl. Brit India 2: 298. 1878; Duthie, Fl. Gangetic Plain 1: 320. 1903. *Mimosa lebbeck* L. Sp. Pl. 516. 1753. 'Saras, Charas, Siras' (Hindi).

Deciduous trees, 5-15 m high; bark greyish or pale brown; young parts pubescent. Leaves 2-pinnate, upto 40 cm long, with a large gland on the

petiole; pinnae 1-4 pairs, usually with glands between the upper pair of pinnae; leaflets 4-10 pairs, upto 5.5×2.75 cm, the lateral leaflets elliptic-oblong, the terminal ones obovate-oblong, unequal sided, obtuse. Flowers in umbellate heads, greenish pale yellow, fragrant. Pods $12-35 \times 3-5$ cm, linear-oblong. Seeds upto 12, $c.$ 10.0×7.5 mm; ellipsoid-oblong to suborbicular, flattened, pale brown.

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

Common in forests and also planted as an avenue tree along the roads and in the gardens.

Selected specimens : Banswara: Deoda, *Singh* 2950 (BSJO); Bhilwara: Jahajpura, *Singh* 5727 (BSJO); Ganganagar: Gharsana, *Roy* 4901 (BSJO); Kota: *Jain* 28924 (BSI); Sirohi: Mt. Abu, *Jain* 46680, 60417 (BSI).

2. *Albizia odoratissima* (L. f.) Benth. in Hook. Lond. Journ. Bot. 3: 88. 1844; Bedd. Fl. Sylv. t. 54. 1870; Baker in Hook. f. Fl. Brit. India 2: 299. 1878; Duthie, Fl. Gangetic Plain 1: 321. 1903. *Mimosa odoratissima* L. f. Suppl. 437. 1781. *Acacia odoratissima* (L. f.) Willd. Sp. Pl. 4. 1063. 1806. 'Kali-Siras, Kali Churas' (Hindi).

Trees, with dark coloured young branches. Main rachis 10-12 cm long; pinnae 2-4 pairs, 5-10 cm long; leaflets 8-18 pairs, $c.$ 2.0×0.5 cm, obtuse. Flowers in 10 to 12-flowered heads, white or pale yellow; heads in terminal panicles. Pods $10-25 \times 1.5-3.0$ cm, linear-oblong, flat, brown, 5 to 12-seeded.

Fl. & Fr. : April - December.

Common in dry deciduous forests.

Selected specimens : Banswara: Bagaycha forest, *Singh* 3055 (BSJO); Kota: *Jain* 28904 (BSI); Pali: Ghanerao R.F., *Pandey* 4645 (BSJO); Sirohi: Mt. Abu. *Jain* 62083 (BSI); Udaipur: Paras Ram Mahadev R.F., *Shetty* 1601 (BSJO).

3. *Albizia procera* (Roxb.) Benth. in Hook. Lond. Journ. Bot. 3: 89. 1844; Baker in Hook. f. Fl. Brit. India 2: 299. 1878; Duthie, Fl. Gangetic Plain 1: 321. 1903. *Mimosa procera* Roxb. Pl. Cor. 2: 12. t. 121. 1798. 'Safed Siras, Safed Charas, Gurar' (Hindi).

Trees, with grey-white bark. Pinnae 2-6 pairs, 10.0-15.5 cm long; leaflets 6-15 pairs, $3-7 \times 1.5-4.0$ cm. Flowers in corymbose panicles, sessile, pale white. Pods $10-20 \times 2.0-2.5$ cm, linear-oblong, brown, 5 to 10-seeded.

Fl. & Fr. : April - October.

Sparsely distributed in the forests; often planted as an avenue tree.

Selected specimens : Banswara: Bagaycha forest, Singh 3766 (BSJO); Bhilwara: Bijolian, Singh 7154 (BSJO); Jhalawar: Pirawa, Wadhwa 6837 (BSA); Kota: Purania, Verma 767 (BSA).

3. DICHROSTACHYS (DC.) WIGHT & ARN. *nom. cons.*

Dichrostachys cinerea (L.) Wight & Arn. Prodr. 271. 1834; Wight, Ic. 2(1): 4, t. 357. 1840; Baker in Hook. f. Fl. Brit. India 2: 288. 1878; Duthie, Fl. Gangetic Plain 1: 310. 1903. *Mimosa cinerea* L. Sp. Pl. 520. 1753. 'Goya-Khair, Kolai, Kunali' (Hindi).

Polygamous shrubs or small trees; branchlets usually ending in spines, pubescent. Leaves 2-pinnate, up to 6.5 cm long, with stalked, stipiform glands at the insertion of pinnae; pinnae 4-14 pairs; leaflets 12-24 pairs, up to 3 × 1 mm, linear to linear-oblong, base oblique, subacute at the apex, ciliate on the margins. Spikes axillary and extra-axillary. Flowers fragrant. Pods 4-7 × 0.6-1.0 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 open forests on rocky and sandy-loam soils.

Selected specimens : Banswara: Rawal Hindvela forests, Singh 2887 (BSJO); Jaipur: University R.F., Sharma 615, 768 (RUBL); Kota: Shahabad, Majumdar 13154 (BSA); Pali: Sadari, Pandey 4130 (BSJO); Tonk: Toda Rai Singh, Shetty 553 (BSJO).

4. LEUCAENA BENTH.

Leucaena latisiliqua (L.) Gillis in Taxon 23: 190. 1974. *Mimosa latisiliqua* L. Sp. Pl. 514. 1753. *M. glauca* L. Sp. Pl. ed. 2: 2: 1504. 1763. non L. 1753. *M. leucocephala* Lam. Encycl. 1: 12. 1783 *Leucaena glauca* (L.) Benth. in Hook. Lond. Journ. Bot. 4: 416. 1842; Baker in Hook. f. Fl. Brit. India 2: 290. 1878; Duthie, Fl. Gangetic Plain 1: 310. 1903. *L. leucocephala* (Lam.) de Wit. in Taxon 10: 54. 1961. 'Lamba Bavalia' (Hindi).

Large shrubs or small, evergreen trees. 2-6 m high; young branches densely greyish pubescent. Leaves 2-pinnate, 10-25 cm long, main rachis ending in a soft bristle; pinnae 3-8 pairs; leaflets 7-15 (-20) pairs, upto 14.0 × 3.5 mm, linear-lanceolate or linear-oblong, asymmetrical, acute and mucronate. Flowers cream-coloured. Stamens 10. Pods 10-15 × 1.5-1.8 cm, flat, straight, minutely pilose, brown. Seeds 15-25, c. 7.5 × 5.0 mm, ovate-obovate, shining dark brown.

Fl. & Fr. : September - March.

Commonly found along the hedges of cultivated fields and near habitations; sometimes planted.

Selected specimens : Ajmer: *Duthie* 6640 (DD); Bhilwara: Fandal village, *Singh* 7119 (BSJO); Bikaner: Gajner palace garden, *Roy* 2077 (BSJO); Tonk: Near Niwas temple, *Shetty* 516 (BSJO).

5. MIMOSA L.

1a. Prostrate or diffuse herbs or undershrubs. Pinnae 1-2 pairs. Stamens 4.

3. *M. pudica*

1b. Erect or straggling shrubs or small trees. Pinnae more than 2 pairs. Stamens 8:

2a. Leaf-rachis upto 6 cm long. Pods with prickly sutures, pubescent.

1. *M. hamata*

2b. Leaf-rachis more than 10 cm long. Pods usually with smooth sutures, glabrous.

2. *M. himalayana*

1. *Mimosa hamata* Willd. Sp. Pl. 4: 1033. 1806; Baker in Hook. f. Fl. Brit. India 2: 291. 1878; Duthie, Fl. Gangetic Plain 1: 312. 1903; Mahesh. Illus. Fl. Delhi f. 79. 1966. '*Bander-ki-Rakhi, Liptti*' (Hindi).

Much-branched, prickly shrubs, up to 2 m high. Pinnae 3-6 pairs, 1.0-2.5 cm long; leaflets 5-14 pairs, sessile, oblong. Flowers in axillary, globose heads, pink or red. Pods 3.5-8.0 × 1.0-1.75 cm, falcate and twisted, 3 to 8-segmented, indented on the sutures. Seeds 6 × 4 mm, brown.

Fl. : August - November; *Fr.* : December - March.

Common in wastelands, open forests and on the hill-slopes, often gregarious and abundant.

Selected specimens : Banswara: *Kanodia* 75370 (BSI); Jaisalmer: Devikot, *Shetty* 3387 (BSJO); Kota: *Majumdar* 12403 (BSA); Pali: Kantalia, *Shetty* 1826 (BSJO); Tonk: Gaunri village, *Shetty* 1210 (BSJO).

2. *Mimosa himalayana* Gamble in Kew Bull. 1920: 4. 1920. *M. rubicaulis sensu* Baker in Hook. f. Fl. Brit. India 2: 291. 1878, *pro parte*, non Lam. 1783; Duthie, Fl. Gangetic Plain 1: 311. 1903. '*Hajera, Shiah kanta*' (Hindi).

Large, straggling, prickly shrubs, with closely ribbed branches. Leaves 2-pinnate; rachis ending in a bristle; pinnae 5-12 pairs; leaflets 6-20 pairs, 2.5-8.5 mm long, oblong, unequal-sided, obtuse, mucronate. Flowers in globose, pedunculate heads, pink. Pods 7.0-12.5 × 1.0-1.25 cm, slightly curved, with 4-10, 1-seeded joints.

Fl. : July - September; *Fr.* : November - January.

Occasional, in wastelands and open forests.

Selected specimens : Alwar: Pandupole, *Sharma* 3876, 3884 (RUBL); Banswara: Singhpura, *JAV* 29222 (BSI); Jhalawar: Bijliya-Bhadok, *Wadhwa* 5319 (BSA); Kota: Shahabad, *Majumdar* 13113, *Verma* 413 (BSA).

3. *Mimosa pudica* L. Sp. Pl. 518. 1753; Baker in Hook. f. Fl. Brit. India 2: 291. 1878; Duthie, Fl. Gangetic Plain 1: 311. 1903. 'Chhui-mui, Lajwanti' (Hindi).

Much-branched, prickly herbs or undershrubs; prickles paired, recurved, clothed with fine bristles. Pinnae sensitive, 2-4, 3.5-5.0 cm long; leaflets 10-20 pairs, linear-oblong, base obliquely rounded, acute at apex, margins bristled. Flowers in globose heads, borne on axillary, bristly peduncles, pink or red. Pods 1.5-2.0 × 0.3-4.0 cm, flat, slightly curved, 3 to 5-jointed, at the time of maturation the one seeded joints fall away from the bristly persisting sutures.

Fl. & Fr. : September - November.

Native of Brazil; often found as an escape in the gardens; usually cultivated. Leaves are very sensitive to touch.

Selected specimens : Chittorgarh: *Majumdar* 12434 (BSA); Kota: Atru, *Singh* 90603 (LWG). Also reported by Sarup (1951) from Jodhpur.

6. NEPTUNIA LOUR.

Floating herbs with spongy floats. Sterile flowers numerous

1. *N. oleracea*

Terrestrial herbs, without floats. Sterile flowers few or 0.

2. *N. triquetra*

1. *Neptunia oleracea* Lour. Fl. Cochinch. 654. 1790; Baker in Hook. f. Fl. Brit. India 2: 285. 1878; Duthie, Fl. Gangetic Plain 1: 306. 1903. 'Chui-mui' (Hindi).

Floating herbs, with zig-zag branches, rooting from the nodes. Leaves bipinnate, sensitive; pinnae 2-3 pairs, opposite; leaflets sessile, 10-15 pairs, 0.8-1.2 × 0.2-0.3 cm, oblong. Flowers in axillary, long peduncled heads, yellow; upper bisexual and lower neuter. Pods 1.2-2.5 cm long, obliquely oblong, beaked, dehiscing along the upper suture, 6 to 8-seeded.

Fl. & Fr. : During winter season.

Selected specimens : Bharatpur: Ghana bird sanctuary, *Prasad* 330 (BSJO); Sirohi: Mt. Abu, *Mehta* 1033 (JAC).

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

Diffuse or suberect, perennial herbs. Leaves 2-pinnate, 2.5-5.0 cm long; pinnae 1-3 pairs; leaflets 10-15 (-20) pairs, sessile, upto 7.5 × 2.0 mm linear-oblong, obtuse, ciliate on the margins. Flowers yellow; peduncles with 1-2 large bracts. Pods 1.0-2.5 × 0.6-0.8 cm, elliptic-oblong, rounded, with a small beak at the apex, venulose. Seeds 2-8, c, 4.0 × 3.5 mm, oval to suborbicular or obovate-oblong, compressed, polished, blackish-brown

Fl. & Fr. : September - November.

Rare, in moist and marshy habitats.

Selected specimens : Bhilwara: Jahaipura, Singh 5730 (BSJO); Kota: Singh 90577 (LWG); Tonk: Kakor, Shetty 1261 (BSJO).

7. PITHECELLOBIUM MART. *nom cons.*

Pithecellobium dulce (Roxb.) Benth. in Hook. Lond. Journ. Bot. 3: 199. 1844; Baker in Hook. f. Fl. Brit. India 2: 302. 1878; Duthie, Fl. Gangetic Plain 1: 322. 1903. *Mimosa dulcis* Roxb. Pl. Cor. 1: 67. t. 99. 1798. *Inga dulcis* (Roxb.) Willd. Sp. Pl. 4: 1005. 1806; Wight, Ic. 1: t. 198. 1839. 'Jangle Jalebi' (Hindi).

Trees, 5-10 m high. Leaves bipinnate; leaflets 1.5-4.0 × 0.7-2.5 cm, oblique-oblong or ovate-oblong, glabrous; spines erect. Glands present between the leaflets and at the junction of pinnae. Heads in narrow, terminal and axillary panicles, 0.5-0.8 cm across. Bracts at the base of peduncles, spinulose. Pods 5-15 × 0.7-1.0 cm, torulose, circinate-coiled. Seeds broadly ovate, compressed, covered with red or dirty green aril, polished, black.

Fl. & Fr. : March - August.

Native of Tropical America; common on the edges of gardens and orchards. The plants are very sensitive to frost.

Selected specimens : Banswara: Singh 4231 (BSJO); Bhilwara: Badnor, Singh 7068 (BSJO); Jodhpur: Bilara road, Singh 3571 (BSJO); Kota: Amarniwās, Singh 90518 (LWG); Sirohi: Mt. Abu, Jain 5345 (BSI).

8. PROSOPIS L.

Internodes with conical prickles. Petals and ovary glabrous. Pods subcylindric, torulose.

1. *P. cineraria*

Internodes without prickles. Petals and ovary villous within. Pods compressed.

2. *P. juliflora*

1. *Prosopis cineraria* (L.) Druce in Rep. Bot. Soc. Exch. Club Brit. Isles 3: 422. 1914. *Mimosa cineraria* L. Sp. Pl. ed. 2. 1500. 1763. *Prosopis spiciqera* L. Mant. 68. 1767; Bedd. Fl. Sylv. t. 56. 1870; Baker in Hook. f. Fl. Brit. India 2: 288. 1878; Duthie, Fl. Gangetic Plain 1: 309. 1903. 'Khejri, Khejra' (Hindi).

Medium-sized trees, 3-12 m high; bark grey, rough with deep fissures or cracks. Leaves 2-pinnate, upto 12.5 cm long; pinnae usually 2 pairs; leaflets 7-12 pairs, 10-15 × 3-5 mm, obliquely oblong, usually obtuse and mucronate. Flowers yellow. Stamens 10; anthers tipped with deciduous glands. Pods 8.5-20.0 × 0.5-0.8 cm, pendulous, slender, pointed at the apex, pale yellow; pulp edible. Seeds 10-15, 3-8 × 3.5-5.0 mm, oblong to suborbicular, dull-brown.

Fl & Fr. : March - June.

Common in sandy to sandy-loam soils. It is the typical characteristic tree of the desert.

Selected specimens : Banswara: Ghatol, Singh 4212 (BSJO); Churu: Sujangarh, Roy 2550 (BSJO); Jaisalmer: Devikot, Shetty 3487 (BSJO); Tonk: Ghass, Pandey 4734 (BSJO); Udaipur: Dabok, Ram Chandra 68 (BSI).

2. *Prosopis juliflora* (Swartz) DC. Prodr. 2: 447. 1825; Duthie, Fl. Gangetic Plain 1: 309. 1903; Mahesh. Illus. Fl. Delhi 1: 78. 1966; Burkart in Journ. Arn. Arb. 57: 499. 1976. *Mimosa juliflora* Swartz, Prodr. 85. 1788. 'Bilayati-Bahul' Kikar, Bahalia' (Hindi).

Small trees or large shrubs, 2-5 m high, armed with divergent, paired or solitary, axillary, 0.5-4.0 cm long spines. Leaves 2-pinnate, upto 15 cm long; pinnae 1-2 (—3) pairs, main rachis ending in a soft bristle; leaflets 15-25 pairs, upto 17.5 × 4.0 mm, obliquely oblong, obtuse, sometimes mucronate. Flowers greenish yellow. Stamens 10; anthers tipped with deciduous glands. Pods 10-25 × 0.7-1.5 cm, pendulous, sub-falcate, yellow. Seeds 10-25, c. 6 × 4 mm, ovoid to ellipsoid, glossy, brown.

Fl & Fr. : Almost throughout the year.

Native of tropical and subtropical America; completely naturalised in open wastelands, particularly near habitations. Often planted in the reserve forests, road-sides etc. It is the hardiest species suitable for soil conservation.

Selected specimens : Banswara: Barodia, Singh 3747 (BSJO); Bhilwara: Bandor, Singh 6243 (BSJO); Jaisalmer: Pokaran, Tiwari 672 (BSJO); Kota: Baran, Singh 90491 (I.W.G.); Pali: Dingai, Shetty 1410 (BSJO); Tonk: Shett 490 (BSJO).

DOUBTFUL TAXON

Acacia nilotica (L.) Willd. ex Del. subsp. **tomentosa** (Benth.) Brenan in Kew Bull. 1957: 84. 1957. *A. arabica auct.* non Willd. 1806; Baker in Hook. f. Fl. Brit. India 2: 293. 1878; Duthie, Fl. Gangetic Plain 1: 314. 1903.

A critical and experimental study is necessary to decide the taxonomic status of this subspecies. The only difference between the subsp. *cupressiformis* and *tomentosa* is the mode of branching, the other exomorphological characters could not be noticed.

Fl. : September - November; *Fr.* : December - June.

Selected specimens : Jaipur; Rajapark, *Sharma* 617 (RUBL); Kota; *Wadhwa* 9219 (BSA).

CULTIVATED SPECIES

Prosopis glandulosa Torr. Medium-sized, deciduous trees or small shrubs, armed with scattered, axillary, stout, subulate thorns. Flowers in creamy spikes. Pods linear, compressed, beaked. Native of Southern United States and North Mexico; recently introduced in the drier parts of Rajasthan.

49. ROSACEAE

(R.P. Pandey)

1a. Erect, scrambling or climbing, prickly shrubs.

3. *Rosa*

1b. Prostrate or procumbent herbs, without prickles:

2a. Flowers white. Stamens 10. Fruit a depressed cone of 10 connate carpels with spines on the margins, forming a persistent collar around the roots.

1. *Neurada*

2b. Flowers yellow. Stamens numerous. Fruits of numerous small achenes, not forming a persistent collar around the roots.

2. *Potentilla*

1. NEURADA L.

Neurada procumbens L. Sp. Pl. 441. 1753; Wight. Ic. 4(4): 14. t. 1596. 1850; Hook. f. Fl. Brit. India 2: 368. 1878. '*Chapari*' (Hindi).

Diffuse or procumbent, tomentose, annual herbs. Leaves alternate, 1.0-2.25 × 0.75-1.25 cm, ovate-oblong, with 1-3 (-4) obtuse lobes on each side, cuneate or rounded at base, tomentose. Flowers solitary, axillary. Carpels 10, united with one another and also with the calyx-tube, terminated by spinescent style. Fruits c. 1.5 cm across, orbicular, densely woolly, lower surface flat.

Fl. & Fr. : September - December.

Fairly common on sandy and alkaline soils in Rajasthan.

Selected specimens : Barmer: Pachpadra, *Bhandari* 410 (JAC); Ghadra road, *Shetty* 2314 (BSJO); Bikaner: Along Ranjitpura, *Roy* 2107 (BSJO); Jaisalmer: *Bhandari* 972 (JAC); Near Sam, *Shetty* 3453 (BSJO).

2. POTENTILLA L.

Potentilla supina L. Sp. Pl. 497. 1753; Hook. f. Fl. Brit. India 2: 359. 1878; Duthie, Fl. Gangetic Plain 1: 327. 1903.

Diffuse, annual herbs; stems numerous, dichotomously branched, hairy. Radical leaves hairy, with petioles upto 7 cm long, leaves often absent in flowering condition; pinnae with 5-9, obovate, opposite or alternate, lobulate leaflets. Lower cauline leaves long petioled, upper cauline leaves with 3-5 leaflets, short petioled; leaflets shorter, 3-lobed or incised-serrate. Flowers solitary, axillary. Achenes numerous, small, smooth; the receptacle globose, villous.

Fl. & Fr. : December - May.

Common in dried up tanks and ponds.

Selected specimens : Banswara: Raj-talab, *Kanodia* 51017 (BSI); Bhilwara: Bhojpura, *Singh* 7045 (BSJO); Ganganagar: Ghaggar bed, *Roy* 5977 (BSJO); Jaisalmer: Pokaran tank, *Shetty* 6162 (BSJO); Kota: Atru, *Singh* 90979 (LWG).

3. ROSA L.

Rosa involucrata Roxb. Fl. Ind. 2: 513. 1832; Wight, Ic. 1: t. 234. 1839; Hook. f. Fl. Brit. India 2: 365. 1878; Duthie, Fl. Gangetic Plain 1: 327. 1903. '*Gulab*' (Hindi).

Stout, erect or subscandent, tomentose bushes; prickles straight, compressed, often in pairs. Leaves 7-10 cm long; stipules laciniate; leaflets 3-4 pairs, elliptic-oblong, acute or acuminate, finely serrate. Flowers solitary or in short corymbs, 5-7 cm across, white, fragrant. Bracts large, lanceolate, gland-serrate below. Calyx-tube obovoid, unarmed. Petals retuse. Styles distinct. Fruits globose, densely tomentose; Achenes many.

Fl. : December - March; *Fr.* : May - June.

Rare, reported only from Mt. Abu.

Selected specimens : Sirohi: Mt. Abu, *Jain* 5441 (BSI), *Blatter* 18987, 18990 (BLAT).

DOUBTFUL TAXON

Potentilla desertorum Bunge in Ledeb. Fl. Alt. 2: 257. 1830; Hook. f. Fl. Brit. India 2: 355. 1878.

This species has been reported by Puri *et al.* (1964), Vyas (1967) and Ramdeo (1969). No herbarium specimens are available in the Indian herbaria.

It is a high altitudinal plant occurring in W. Himalayas upto 7,000-9,000 ft. So its occurrence in Rajasthan is doubtful.

CULTIVATED SPECIES

***Amygdalus communis* L.** '*Badam*' (Hindi) - Cultivated for its edible fruits.

***Eriobotrya japonica* (Thunb.) Lindl.** (*Mespilus japonicus* Thunb.) '*Lokat*' '*Lukat*' (Hindi) - Commonly cultivated for its sweet edible fruits.

***Malus pumila* Mill.** '*Ser*' (Hindi) - Commonly cultivated for its edible fruits.

***Prunus domestica* L. subsp. *insititia* (L.) Schneid** (*Prunus insitita* L.) '*A'u-bakhara*' (Hindi) - Commonly cultivated for its edible fruits.

***Prunus persica* (L.) Stokes** (*Amygdalus persica* L.) '*Aru*' (Hindi) - Commonly cultivated for its edible fruits.

A large number of varieties of roses are also grown in the gardens for their ornamental purposes.

50. VAHLIACEAE

(R.P. Pandey)

VAHLIA THUNB. *nom. cons.*

***Vahlia digyna* (Retz.) Kuntze**, Rev. 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; Clarke in Hook. f. Fl. Brit. India 2: 399. 1878; Duthie, Fl. Gangetic Plain 1: 331. 1903. *Bistella digyna* (Retz.) Bullock in Act. Bot. Neerl. 15: 85. 1966. '*Agio*' (Hindi).

Erect or diffuse, glandular-pubescent, annual herbs, upto 35 cm high. Leaves sessile, 0.5-4.0 × 0.25-1.25 cm, oblong-lanceolate to ovate, glabrescent. Flowers axillary, solitary or geminate, yellow. Calyx glandular-pubescent; tube hemispheric, entirely adherent to the ovary; lobes 5, triangular-ovate. Petals 5, shorter than the calyx-lobes. Stamens 5. Styles 2. Capsules c. 3.5 mm across, subglobose, dehiscent at the apex. Seeds many, minute, ovoid-cylindric or oblong, straw-coloured.

Fl. & Fr. : October - February.

Common in marshy habitats.

Selected specimens : Barmer: Surpura, *Shetty* 2184 (BSJO); Jhunjhunu: Khetri, *Nair* 433 (BLAT). Kota: Shahabad, *Majumdar* 13199 (BSA); Tonk: Sopari, *Shetty* 1966 (BSJO).

51. CRASSULACEAE

(R.P. Pandey)

KALANCHOE ADANS.

Kalanchoe pinnata (Lam.) Pers. Syn. 446. 1805; Backer in Van Steenis, Fl. Males. ser. 1. 4: 199. 1951. *Cotyledon pinnata* Lam. Encycl. 2: 141. 1786. *Bryophyllum calycinum* Salisb. Lond. t. 3. 1805; Clarke in Hook.f. Fl. Brit. India 2: 413. 1878.

Erect or ascending, glabrous herbs, upto 1 m high; stem obtusely 4-angled, purple spotted. Lower and uppermost leaves simple; middle ones pinnately 3 to 5 (-7) foliolate; leaflets 4-8 × 2.5-5.0 cm, ovate-lanceolate, elliptic-oblong or oblong, obtuse, crenate-serrate. Flowers pendulous, in lax panicles. Calyx purplish; teeth triangular. Corolla included, octagonal at base, constricted at middle, glandular hairy within, reddish-purple above and greenish-below; lobes lanceolate. Disk-scales oblong, retuse. Styles 2.
Fl. & Fr. : December - June.

Native of Tropical Africa; runs wild in shaded places and along water courses; usually cultivated for ornamental purposes.

Selected specimens : Kota: Chhabra, *Singh* 90912 (LWG); Sirohi: Mt. Abu, *Blatter* 19349 (BLAT), *McCann* 113 (BLAT).

CULTIVATED SPECIES

Kalanchoe laciniata (L.) Pers. (*Cotyledon laciniata* L.) -Glandular hairy herbs. Leaves deeply pinnatifid. Flowers erect, yellow. Mostly cultivated in the gardens for ornamental purposes.

52. HALORAGACEAE

(R.P. Pandey)

MYRIOPHYLLUM L.

Myriophyllum spicatum L. Sp. Pl. 992. 1753; Hook. f. Fl. Brit. India 2: 433. 1878; Meijden & Caspers in Van Steenis, Fl. Males. ser. 1. 7(1): 253. f. 12 a-c. 1971.

Aquatic, perennial, emerged herbs. Leaves in whorls. Flowers in terminal spikes, green. Bracts oblong, entire, shorter than the expanded petals. Fruits c. 2.0 mm long, oblong-ovoid; back of the fruiting carpels

columnar; furrows very narrow, hardly noticeable, tubercled on the back.

Fl. & Fr. : October - February.

Abundant; introduced through canal water from the neighbouring states of Punjab and Kashmir.

Selected specimens : Bikaner: Bikaner lift canal Loonkarnsar, Roy 2160, 2424 (BSJO).

53. COMBRETACEAE

(R.P. Pandey)

- | | |
|--|----------------------|
| 1a. Twining or climbing shrubs. Petals 4-5. | 2. <i>Combretum</i> |
| 1b. Erect shrubs or trees. Petals absent: | |
| 2a. Flowers in globose heads. Fruits 2-winged. | 1. <i>Anogeissus</i> |
| 2b. Flowers in spikes or racemes. Fruits smooth, angular or 3 to 5-winged. | 3. <i>Terminalia</i> |

I. ANOGEISSUS (DC.) GUILL.PERR & A.RICH.

- | | |
|--|--|
| 1a. Calyx-cup completely pubescent outside: | |
| 2a. Leaves-elliptic, more than 2 cm long, with long silky hairs beneath. Wings of fruits jagged at the margins; calyx cup deciduous. | 4. <i>A. sericea</i> var.
<i>sericea</i> |
| 2b. Leaves oval to obovate or orbicular, less than 2 cm long, with short hairs beneath. Wings of fruits jagged at the apex only; calyx-cup semipersistent. | 5. <i>A. sericea</i> var.
<i>nummularia</i> |
| 1b. Calyx-cup glabrous or pubescent only at the base: | |
| 3a. Flower-heads racemose, glabrous or sparsely tomentose. Bracts leafy. Calyx-stalk recurved. Fruits orbicular, glabrous; wings entire. | 2. <i>A. latifolia</i> |
| 3b. Flower-heads solitary, densely tomentose. Calyx-stalk straight. Fruits broader than long, often pubescent; wings jagged: | |
| 4a. Branches pendulous. Leaves less than 3 cm long. Beak of the fruits shorter than the nucleus. | 3. <i>A. pendula</i> |
| 4b. Branches erect. Leaves more than 3.5 cm long. Beak of fruits equal or longer than the nucleus. | 1. <i>A. acuminata</i> |

1. *Anogeissus acuminata* (Roxb. ex DC.) Guill. & Perr. Fl. Seneg. Tent. 1: 280. 1832; Bedd. Fl. Sylv. t. 16. 1869; Clarke in Hook. f. Fl. Brit. India 2: 450. 1878; Scott. in Kew Bull. 33 (4): 564. 1979. *Conocarpus acuminata* Roxb. ex DC. Prodr. 3: 16. 1828. & Mem. Combret. 25. t. 3. 1828. 'Dhak' (Hindi).

Deciduous trees, upto 15 m high; bark dark brown. Leaves 3.5-8.0 × 1.2-3.5 cm, elliptic to lanceolate, acute to acuminate, young leaves densely rusty-villous or sericeous, mature leaves sparsely tomentose or sericeous; nerves 5-8, arcuate; petioles 1-4 mm long, tomentose. Flowers in solitary or paired, terminal heads, greenish yellow. Calyx-stalk slender, persistent, 4-6 mm long, rusty-villous. Fruits 4 × 4-6 mm.

Fl. & Fr. : August - November

Common in mixed dry deciduous forests.

Selected specimens : Jaisalmer: Amar Sagar, *Wadhwa* 5188 (BSA); Kota: Shahabad, *Verma & Mishra* 609 (LWG); Sirohi: Mt. Abu, *Kaul* 9512 (LWG); Udaipur: Prasad, *Kanodia* 82235 (BSI). Also reported from Ajmer (*Sharma*, 1958).

2. *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr. Fl. Seneg. Tent. 1: 280. 1832; Bedd. Fl. Sylv. t. 15. 1869; Duthie, Fl. Gangetic Plain 1: 339. 1903; Scott. in Kew Bull. 33 (4): 560. 1979. *Conocarpus latifolia* Roxb. ex DC. Prodr. 3: 16. 1828 & Mem. Combret. 25. 1828; Wight, Ic. 3(3): 10. t. 994. 1845. *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr. var. *glabra* & *villosa* Clarke in Hook.f. Fl. Brit. India 2: 450. 1878. '*Dhauri, Dhao*' (Hindi).

Deciduous trees, 15-20 m tall; bark smooth, white-grey. Leaves 5.0-10.0 × 2-7 cm, obtuse, coriaceous, young leaves sparsely to densely silky tomentose, mature leaves glabrous, rarely pubescent; nerves 7-14, arcuate; petioles upto 15 mm long. Flowers in 2-5 heads, yellow to pinkish yellow. Calyx-stalk 4-6 mm long, persistent. Fruits 4-5 × 5-6 mm, glabrous.

Fl. & Fr. : March - July.

Common in mixed dry deciduous forests, associated with *Anogeissus pendula* Edgew.

Selected specimens : Banswara: Puna Pathar forest, *Singh* 3671 (BSJO); Bhilwara: Bijolian, *Singh* 6050 (BSJO); Kota: Shahabad, *Jain* 28852 (BSI); Pali: Paras Ram Mahadev R.F., *Shetty* 1924 (BSJO); Sirohi: Mt. Abu, *Jain* 60420 (BSI); Mt. Abu, *Blatter* 6451 (BLAT).

3. *Anogeissus pendula* Edgew. in Journ. Asiat. Soc. Bengal 21: 171. 1853; Catal. Pl. Banda 47. 1851; Clarke in Hook. f. Fl. Brit. India 2: 451. 1878; Duthie, Fl. Gangetic Plain 1: 339. 1903; Mahesh. Illus. Fl. Delhi. f. 84. 1966. '*Dhok, Dhao*' (Hindi).

Deciduous, moderate-sized, gregarious trees. Leaves 1.0-3.5 (- 6.0) × 0.5-1.5 (-2.5) cm, oblanceolate or oblong, rarely obovate, base cuneate,

obtuse or acute at apex, young leaves silky, mature ones with appressed, short hairs, often older leaves turning red; nerves 5-7, ascending; petioles up to 2 cm long. Flowers yellow. Calyx-stalk c. 2.75 mm long, villous. Fruits 4-6 × 3-4 mm, glabrous except at the apex, wings narrow.

Fl. & Fr. : July - November.

Very common in mixed dry deciduous forests, often dominates the vegetation.

Selected specimens : Ajmer: Duthie 4661 (DD); Barmer: Naga R.F., Shetty 2239 (BSJO); Bhilwara: Bijolian, Singh 6233 (BSJO); Jaipur: Ramgarh hills, Sharma 179, 294, 1315 (RUBL); Kota: Darah, Jain 28783 (BSI); Sirohi: Mt. Abu, Jain 56982 (BSI).

4. *Anogeissus sericea* Brandis in Indian Forester 25: 287. 1899; Duthie, Fl. Gangetic Plain 1: 340. 1903; Scott in Kew Bull. 33: 558. 1979. *A. latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr. var. *parvifolia* Clarke in Hook.f. Fl. Brit. India 2: 450. 1878. 'Dhaukra' (Hindi).

var. *sericea*

Moderate-sized trees, with pendulous branches. Leaves 2.0-5.5 × 1.5-3.0 cm, acute or acuminate, occasionally obtuse or almost truncate, sometimes mucronulate; nerves 4-6; petioles 2-3 mm long. Flowers in axillary and terminal, pedunculate heads, yellow. Calyx-stalk slender, c. 3.0 mm long, persistent. Fruits c. 3.0 × 4.0 mm, pubescent at the apex.

Fl. & Fr. : July - November.

Not common, found on the hills in mixed dry deciduous forests.

Selected specimens : Sirohi: Mt. Abu, Jain 62101 (BSI), Dalal 56, 2 (BLAT), Acland 441 (BLAT). Also reported from Alwar by Vyas (1967) and from Sikar by Nair & Malhotra (1961).

5. var. *nummularia* King ex Duthie, Fl. Gangetic Plain 1: 340. 1903; Scott in Kew Bull. 33: 559. 1979. *A. coronata* Stapf in Bull. Misc. Inf. Kew 1914: 153. 1914. *A. rotundifolia* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 525. 1919. 'Dhauro' (Hindi).

Small trees; young branches and leaves rusty-silky pubescent. Leaves 8-18 × 10-18 mm, apex obtuse or obcordate, mucronulate; nerves 4-5, arcuate; petioles 1-2 mm long. Flowers in axillary and terminal, solitary or rarely branched pedunculate heads, yellow to brownish-yellow. Calyx-stalk persistent, 3-4 mm long, rather thick. Fruits c. 3.5 × 6.5 mm, glabrous; wings cordate at the base.

Fl. & Fr. : September - January.

Endemic to Rajasthan, prefers dry habitats.

Selected specimens : Jhalawar: *Majumdar* 10390 (BSA); Jodhpur: *Blatter & Hallberg* 6594 (BLAT); Beriganga, *Singh* 193 (BSJO); Pali: Mundra village, *Shetty* 1467 (BSJO); Udaipur: *Majumdar* 10390 (BSA).

2. COMBRETUM LOEFLING *nom. cons.*

Combretum ovalifolium Roxb. Fl. Ind. 2: 256. 1832; Clarke in Hook. f. Fl. Brit. India 2: 458. 1878; Raizada, Suppl. Duthie, Fl. Gangetic Plain 71. 1976.

Large, sameritose, climbing shrubs. Leaves opposite, upto 10 cm long, elliptic or ovate, often nearly orbicular. Flowers in axillary paniced spikes and often in terminal panicles, white. Calyx-limb cup-shaped, deciduous. Disk hairy. Stamens 8, in two series. Fruits 2.0-2.5 × 2.0-2.5 cm, obovate, pale golden yellow or brown, with 4 papery finely transversely striate wings. Seeds 4-sided.

Fl. & Fr. : February - May.

Rare, occuring in the forests; often cultivated in the gardens. The leaves turn red before falling.

Selected specimen : Banswara: *Verma* 222(BSA).

3. TERMINALIA L. *nom. cons.*

- | | |
|---|------------------------|
| 1a. Leaves clustered at the end of branchlets, eglandular; petioles more than 3 cm long. Upper flowers of spike male. | 3. <i>T. bellirica</i> |
| 1b. Leaves not clustered, frequently glandular; petiole less than 2 cm long. Flowers all bisexual: | |
| 2a. Fruits distinctly 5-winged. | |
| 3a. Leaves usually cordate at the base; glands on lower midrib stalked. Calyx glabrous outside: | |
| 4a. Bark smooth. Veins of the wings of fruits curving upwards. | 2. <i>T. arjuna</i> |
| 4b. Bark rough. Veins of the wings of fruits straight, horizontal. | 5. <i>T. crenulata</i> |
| 3b. Leaves not cordate at the base; glands at leaf base sessile. Calyx hairy. | 1. <i>T. alata</i> |
| 2b. Fruits not winged. | 4. <i>T. chebula</i> |

1. *Terminalia alata* Heyne ex Roth, Nov. Pl. Sp. 379. 1821. *Pentaptera tomentosa* Roxb. ex DC. Prodr. 3: 14. 1828. *Terminalia tomentosa* (DC) Wight & Arn. Prodr. 314. 1834; Bedd. Fl. Sylv. t. 17.

1869; Clarke in Hook. f. Fl. Brit. India 2: 447. 1878; Duthie, Fl. Gangetic Plain 1: 337. 1903. 'Soj' (Hindi).

Deciduous trees, 20-35 m high with dark cracked bark. Leaves opposite, c. 10×5 cm, elliptic-lanceolate or obovate, acute, emarginate, entire. Flowers in lax spikes, dull yellow. Fruits c. 5×3 cm, glabrous; wings transversely striated, crenulate.

Fl : November - January; Fr. : February - April.

Found in mixed deciduous forests on the hill-tops, associated with *Boswellia serrata* Roxb. and *Lannea coromandelica* (Houtt.) Merr.; often planted.

Selected specimens : Bundi: Kota dam, Singh 74405 (LWG); Jhalawar: Wadhwa 7444 (BSA); Kota: Shahabad, Majumdar 13128 (BSA).

2. *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. Prodr. 314. 1834; Bedd. Fl. Sylv. t. 28. 1869; Clarke in Hook. f. Fl. Brit. India 2: 447. 1878. *Pentaptera arjuna* Roxb. ex DC. Prodr. 3: 14. 1828, cum descript. *P. glabra* Roxb. Fl. Ind. 2: 440. 1832, cum descript. *Terminalia glabra* (Roxb.) Wight & Arn. Prodr. 314 1834; Duthie, Fl. Gangetic Plain 1: 336. 1903. 'Arjun' (Hindi).

Tall trees, 15-20 m high; bark greenish-white to black, flaking off in flat pieces. Leaves $5-25 \times 3.0-7.5$ cm, elliptic-oblong to suborbicular, margins subentire, with 1-2 glands at base. Flowers in axillary spikes or terminal panicles, white, fragrant. Drupes 3-5 cm long, ovoid or obovoid-oblong, glabrous, woody, dark brown, with entire or serrate wings. Seeds linear, glabrous.

Fl : March - May; Fr. : July - November.

Common in the forests, often occurring along rivers and streams; occasionally planted as an avenue tree along the roads and in the gardens.

Selected specimens : Bhilwara: Bijolian, Singh 6097, 7141 (BSJO); Bundi: Kota dam, Singh 90146 (LWG); Jaisalmer: Bara bagh, Shetty 3425 (BSJO); Kota: Shahabad, Majumdar 13118 (BSA).

3. *Terminalia bellirica* (Gaertn.) Roxb. Pl. Cor. 2: 54. t. 198. 1805, 'bellerica'; Clarke in Hook. f. Fl. Brit. India 2: 445. 1878; Duthie, Fl. Gangetic Plain 1: 335. 1903. *Myrobalanus bellirica* Gaertn. Fruct. Sem. Pl. 2: 90. t. 97. f. a-d. 1790. 'Bahera, Deshi Badam' (Hindi).

Deciduous trees, 10-30 m high; bark dark grey, longitudinally fissured. Leaves $5-25 \times 2.5-15.0$ cm, broadly obovate, cuneate, glabrous, coriaceous. Flowers in axillary spikes, greenish yellow or creamy white, foetid-smelling. Drupes $1.75-2.5 \times 1.5-2.0$ cm, ovoid or ellipsoid, 5-ridged, grey-velvety.

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

Common in mixed deciduous forests and in open wastelands; often planted in the gardens.

Selected specimens : Banswara: Danpur, *Singh* 2985 (BSJO); Jhalawar: *Sharma* 203 (RUBL); Sirohi: Mt. Abu, *Jain* 48175 (BSI); Tonk: Raj Mahal R.F., *Pandey* 4848 (BSJO); Udaipur: Deogarh, *Verma* 296 (BSA).

4. ***Terminalia chebula*** (Gaertn.) Retz. Obs. Bot. 5: 31. 1788; Bedd. Fl. Sylv. 1: t. 27. 1869; Clarke in Hook. f. Fl. Brit. India 2: 446. 1878; Duthie, Fl. Gangetic Plain 1: 336. 1903. *Myrobalanus chebula* Gaertn. Fruct. Sem. Pl. 2: 91. t. 97. 1791.

Large, deciduous trees, 8-20 m high; bark dark brownish grey, fissured; young parts tomentose. Leaves alternate, long petiolate, 7.5-12.0 × 4.0-10.5 cm, elliptic-oblong or ovate-oblong, rounded at both ends, at length glabrous. Flowers in terminal, paniced spikes, white or pale yellow. Fruits 2.5-4.0 × 1.5-2.5 cm, ovoid, ellipsoid or ellipsoid-obovate, glabrous.

Fl. : March - May; *Fr.* : September - November.

Rare, found in dry deciduous forests and wastelands.

Selected specimen : Jhunjhunu: Pilani, *Saran* 42216 (LWG).

5. ***Terminalia crenulata*** Roth, Nov. Pl. Sp. 380. 1821. *T. tomentosa* Wight & Arn. var. *crenulata* (Roth) Clarke in Hook. f. Fl. Brit. India 2: 448. 1878.

Medium-sized trees. Leaves subopposite or alternate, c. 15 × 6 cm, elliptic-obovate, with 2 stalked glands from lower midrib. Flowers pale yellow. Fruits c. 3.0 × 3.5 cm, oblong, glabrous, reddish.

Fl. : February - May; *Fr.* : June - December.

Rare, in dry deciduous forests.

Selected specimens : Banswara: Lalpura forest, *Singh* 2982 (BSJO); Anand Sagar, *Kanodia* 75247 (BSI).

CULTIVATED SPECIES

Quisqualis indica L. Climbing or scandent shrubs. Leaves elliptic, elliptic-oblong or ovate, acuminate. Flowers fragrant, pink, rose, scarlet, white or variegated, in drooping terminal spikes. Fruits 1.5-3.0 × c. 1.3 cm. Native of Java and Malay peninsula; commonly cultivated in the gardens, bungalows for their showy, fragrant and variegated flowers; often found as an escape.

Terminalia catappa L. '*Deshi Badam*' (Hindi) - Small, deciduous trees. Flowers creamy-white or pale-yellow, fragrant. Mature fruits 3.0-5.0 × 1.5-2.5 cm, ellipsoid, slightly compressed, pale yellow, at length brown, edible. Native of Moluccas; commonly planted in the gardens, farms etc. for edible fruits.

54. MYRTACEAE

(P.J. Parmar)

SYZYGIUM GAERTN. *nom. cons.*

- | | |
|---|------------------------|
| 1a. Calyx-limb distinctly lobed. Staminal disc thickened. | 3. <i>S. jambos</i> |
| 1b. Calyx-limb obscurely lobed. Staminal disc absent: | |
| 2a. Petiole 0.5 cm long. | 2. <i>S. heyneanum</i> |
| 2b. Petiole 1.5-2.0 cm long. | 1. <i>S. cumini</i> |

1. **Syzygium cumini** (L.) Skeels, U.S.D.A. Bur. Pl. Industr. Bull. 248: 25. 1912. *Myrtus cumini* L. Sp. Pl. 471. 1753. *Eugenia jambolana* Lam. Encycl. 3: 198. 1789; Wight, Ic. 2(3): 2. t. 535. 1842; Duthie in Hook. f. Fl. Brit. India 2: 499. 1879 et Fl. Gangetic Plain 1: 342. 1903. '*Jamun*' (Hindi).

Large trees. Leaves 10-14 × 3-6 cm, chartaceous, ovate-lanceolate, obtuse-acuminate. Cymes paniced, usually solitary. Flowers fragrant, sessile, in short compact or laxly paniculate axillary cymes, pale-greenish-white. Corolla calyptrate. Berries globose or oblong, purple.

Fl. & Fr. : February - September.

Commonly planted as an avenue tree and for its edible fruits; often found in the forests.

Selected specimens : Banswara: Kushalgarh, Singh 4275 (BSJO); Jhalawar: Kali Sindh river bank, Verma 3396 (BSA); Pali: Goramghat R.F., Pandey 4677 (BSJO); Sirohi: Delwara temple, Kaul 9562 (LWG); Tonk: Near Niwai temple, Pandey 4749 (BSJO).

2. **Syzygium heyneanum** (Duthie) Wall. ex Gamble, Fl. Madras 482 1919. *Eugenia heyneana* Duthie in Hook. f. Fl. Brit. India 2: 500. 1879 et Fl. Gangetic Plain 1: 343. 1903.

Shrubs or small trees. Leaves 7-14 × 1.5-4.5 cm, opposite, oblong-lanceolate to elliptic-lanceolate, obtuse. Cymes paniced, usually extra-axillary, slender, shorter than leaves. Flowers in umbellules, on leafless wood, creamish-white. Berries oblong or ellipsoid, pale-purple, glabrous.

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

Rare, near streams in the forests.

Selected specimen : Sirohi: Pindra-Araua, Jain 47974 (BSI).

3. *Syzygium jambos* (L.) Alston in Trimen, Handb. Fl. Ceylon 6: 115. 1931. *Eugenia jambos* L. Sp. Pl. 470. 1753; Duthie in Hook. f. Fl. Brit. India 2: 474. 1878. *Jambosa vulgaris* DC. Prodr. 3: 286. 1828; Wight, Ic. 2(2): 2. t. 435. 1841. '*Jangli Janun*' (Hindi).

Moderate-sized trees. Leaves 15-20 × 3-4 cm, sub-coriaceous, ovate-lanceolate, acuminate, rounded-attenuate at base. Cymes terminal, branches trichotomously divaricate, short. Flowers fairly large, jointed with the pedicel, greenish white. Berries globose, pinkish white.

Fl. & Fr. : January - June.

Rare, occasionally found in mixed deciduous forests along river banks and water streams in S.E. Rajasthan and at Mt. Abu. Also planted in the gardens.

Selected specimens : Jhalawar: Jhalarapatan, Singh 83799 (LWG); Kota: Darah, Singh 74606 (LWG); Sirohi: Mt. Abu, Kanodia 62211 (BSI).

CULTIVATED SPECIES

***Callistemon linearis* DC.** Large shrubs. Rachis of the spike and calyx usually pubescent or villous. Flowers large. Stamens dark or pale red. Native of Australia; rarely planted in the gardens for ornamental purposes.

***Callistemon coccineus* F. Muell.** Large shrubs, with large flowers. Stamens red with yellow anthers. Native of Australia; rarely planted in the gardens.

***Callistemon citrinus* (Curt.) Stapf (*Metrosideros citrina* Curt.)** Evergreen trees. Flowers in terminal spikes, crimson. Capsules woody, cup-shaped. Native of Queensland and New South Wales; planted in the gardens for ornamental purposes.

***Callistemon viminalis* Cheel** Evergreen trees, with drooping branches. Flowers crimson, in terminal, dense, cylindric spikes. Native of Australia; commonly cultivated in the gardens for ornamental purposes.

***Eucalyptus* species** Many species of Australian *Eucalyptus* have been planted along the roads, in parks, gardens, forests etc.; the most successful ones are:

- Eucalyptus alba* Reinw.
E. brachypoda Turcz.
E. camaldulensis Dehnb.
E. drepanophylla F. Muell.
E. globulus Labill.
E. robusta Sm.
E. viminalis Labill.
E. tereticornis Sm.

Myrtus communis L.-Evergreen shrubs, with white flowers and black berries. Native of Mediterranean region; commonly cultivated in the garden-hedges for their fragrant leaves.

Psidium guajava L. 'Amrood, Jamphal' (Hindi). Small trees, with smooth, thin, greenish-grey bark and white flowers. Berries yellow with age. Native of Mexico; extensively cultivated in the gardens and orchards.

55. BARRINGTONIACEAE

(R.P. Pandey)

BARRINGTONIA FORST. *nom. cons.*

Barringtonia acutangula Gaertn. Fruct. 2: 97. t. 101. 1791.

Small trees. Leaves elliptic-obovate, entire or serrulate. Flowers in axillary and terminal pendulous racemes, pink. Fruits woody, 4-angular, crowned with calyx at the tip.

Rare, planted in the gardens and along the road.

56. LYTHRACEAE

(P.J. Parmar)

1a. Hygrophilous herbs:

- | | |
|--|--------------------|
| 2a. Flowers solitary or sub-solitary. Fruit a septicidal capsule. | 4. <i>Rotala</i> |
| 2b. Flowers in cymes or umbels or crowded into bracteate heads. Capsules irregularly bursting or circumscissile: | |
| 3a. Flowers in bracteate heads or umbels. Petals, if present, corrugated in buds. The dissepiments of the ovary are quite complete and consequently the placenta is continuous with the style. | 3. <i>Nesaea</i> |
| 3b. Flowers in cymes. Petals, if present, not corrugated in buds. Dissepiment of the ovary absent, placenta is never continuous with the style. | 1. <i>Arumanna</i> |

1b. Terrestrials shrubs or trees:

- 4a. Inflorescence an axillary cyme. Hypanthium longer than broad. Stigma bilobed. 5. *Woodfordia*
- 4b. Inflorescence a terminal panicle. Hypanthium broader than long. Stigma capitate. 2. *Lagerstroemia*

I. AMMANNIA L.

- 1a. Sepals 4-winged. Style 3 times as long as the ovary 5. *A. octandra*
- 1b. Sepals not winged. Style almost absent to twice as long as the ovary:
- 2a. Petals present. Style distinct:
- 3a. Cymes distinctly peduncled:
- 4a. Peduncle and pedicels stout. Flowers and capsules large. Style twice as long as the capsule. 1. *A. auriculata*
- 4b. Peduncle and pedicels filiform. Flowers and capsules small. Style as long as the ovary. 4. *A. multiflora*
- 3b. Cymes sessile or subsessile. 3. *A. desertorum*
- 2b. Petals absent. Style absent or nearly so. 2. *A. baccifera*

1. *Ammannia auriculata* Willd. Enum. Pl. Hort. Berol. 1: 7. t. 7. 1803.
A. senegalensis auct. non Lam. 1791; Clarke in Hook. f. Fl. Brit. India 2: 570. 1879; Duthie, Fl. Gangetic Plain 1: 350. 1903.

Erect, annual herbs. Stem and branches winged in the upper part. Leaves 1.5-7.5 × 0.3-1.5 cm, linear or sub lanceolate, auriculate, acute. Flowers in 1 to 3(-15) flowered, axillary cymes, purplish. Stamens 4-8. Capsules as long as the calyx-lobes or slightly longer.

Fl & Fr. : Almost throughout the year.

Common in water lodged habitats, particularly on the banks of tanks and rivers in the eastern Rajasthan.

Selected specimens : Banswara: Lamero talab, Singh 3640 (BSJO); Ganganagar: Ghaggar bridge, Roy 5029 (BSJO); Jaipur: Digotha, Sharma 3708 (RUBL); Kota: Rangbari, Singh 74419 (LWG); Sirohi: Mt. Abu, Rao 66599 (BSI).

2. *Ammannia baccifera* L. Sp. Pl. 120. 1753; Clarke in Hook. f. Fl. Brit. India 2: 569. 1879; Duthie, Fl. Gangetic Plain 1: 350. 1903.

Glabrous, erect or ascending herbs. Leaves 0.7-7.0 × 0.1-1.5 cm, oblong or narrow-elliptic, narrowed at the base or rounded or subcordate or subauriculate, usually obtuse or subacute. Flowers sessile, in very short cymes. Stamens 4. Capsules depressed, globose, longer than the calyx-teeth.

Fl. & Fr. : Almost throughout the year.

Very common throughout the state in water logged areas near tanks, ponds, river etc.

Selected specimens : Banswara: Lasara village, *Singh* 3629 (BSJO); Bhilwara: Amarpura, *Singh* 7058 (BSJO); Jaisalmer: Salam Sagar, *Tiwari* 699 (BSJO); Jhalawar: Manoharthana, *Singh* 74450 (LWG); Sirohi: Mt. Abu, *Blatter* 3421 (BLAT); Tonk: Near Niwai temple, *Shetty* 517 (BSJO).

3. *Ammannia desertorum* Blatt. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 213. 1919; Bhandari, Fl. Ind. Desert 157. 1978.

Coarse, scabrous, papillose herbs; branches stout, subterete below, sharply quadrangular and narrowly winged above. Leaves 1.7 × 0.4-0.8 cm, lanceolate, acute or subobtuse, auricled at the base, margins reflexed. Flowers in 1 to 6-flowered axillary cymes. Calyx 8-nerved. Stamens 8. Style about as long as the ovary. Capsules reddish brown, transparent, crowded together.

Fl. & Fr. : Almost throughout the year.

Common in the moist habitats in the desertic zones.

Selected specimens : Jaisalmer: Devikot, *Tiwari* 867 (BSJO); Jodhpur: Bhandari 203, 294, 1293 (JAC).

4. *Ammannia multiflora* Roxb. Fl. Ind. 1: 447. 1820; Clarke in Hook. f. Fl. Brit. India 2: 570. 1879; Duthie, Fl. Gangetic Plain 1: 351. 1903.

Delicate, erect, glabrous herbs; branches numerous, sharply quadrangular or 4-winged. Leaves sessile, 0.4-2.5 × 0.1-0.3 cm, lanceolate-oblong, with a dilated, rounded or subcordate base, obtuse or subacute. Flowers small, solitary or in 3 to-many-flowered peduncled, axillary cymes, purplish. Styles about as long as the capsules. Capsules half surrounded by the calyx-tube, protruding from between the lobes.

Fl. & Fr. : Almost throughout the year.

Common, particularly in the east of Aravalli in water logged habitats near tanks, pods, river-beds etc.

Selected specimens : Banswara: Khora forest, *Singh* 3713 (BSJO); Bundi: Hindoli, *Verma* 1894 (BSA); Jodhpur: Bhandari 674, 1819 (JAC); Tonk: Kakor village, *Shetty* 1260 (BSJO); Sirohi: Mt. Abu, *Blatter* 3382 (BLAT).

5. *Ammannia octandra* L. f. Suppl. 127. 1781; Clarke in Hook. f. Fl. Brit. India 2: 571. 1879; Sharma & Tiagi, Fl. N.E. Rajasthan 157. 1979.

Erect, stiff herbs. Leaves sessile, 2-8 × 0.25-1.0 cm, broadly linear or narrowly lanceolate, subacuminate. Flowers in 1 to 3-flowered, peduncled cymes, rose-coloured. Stamens 8, exserted; filament dark-red. Capsules included in the calyx, globose-ellipsoid.

Fl & Fr. : October - January.

Rare, in wet habitats.

Selected specimens : Jaipur: Sagar, Sharma 1008 (RUBL); Amer, Sharma 1041 (RUBL); Galta, Sharma 2234 (RUBL).

2. LAGERSTROEMIA L.

Lagerstroemia parviflora Roxb. Pl. Cor. 1: 47. t. 66. 1795; Wight, Ic. 1: t. 69. 1838; Clarke in Hook. f. Fl. Brit. India 2: 575. 1879; Duthie, Fl. Gangetic Plain 1: 353. 1903.

Trees, upto 9-18 m tall, with ash-coloured bark exfoliating in narrow longitudinal flakes. Leaves 3-12 × 2.0-6.5 cm, ovate-lanceolate or elliptic-oblong, glabrous. Flowers white, fragrant. Capsules ovoid or ellipsoid, deep brown. Seeds winged.

Fl. : May - August; *Fr.* : June - December.

Common in deciduous forests, particularly in southern and south east Rajasthan.

Selected specimens : Banswara: Gaidhar forest, Singh 3046 (BSJO); Jhalawar: Manoharthana, Verma 3463 (BSA); Kota: Shahabad, Majumdar 10466 (BSA), Naka, Verma 456 (BSA).

3. NESAEA COMERSON ex H.B. & K.

Nesaea lanceolata Kochnc, Bot. Jahrb. 3: 325. 1882; Blau. & Hallb. in Journ. Bombay nat. Hist. Soc. 26: 216. 1919. *Ammannia lanceolata* Heyne ex Clarke in Hook. f. Fl. Brit. India 2: 570. 1879.

Annual herbs. Stem quadrangular at the apex. Leaves opposite, 1.5-3.5 × 0.5-1.2 cm, oblong or narrowly lanceolate. Flowers sessile or subsessile, 2-5 in each axil. Petals absent. Capsules subglobose, open by a small operculum. Seeds small.

Fl & Fr. : After rainy season.

Rare, in moist places near ponds etc. This species is included on the authority of Nair & Kanodia (1959), Nair *et al.* (1961) and Gaur & Satyanarayan (1967), who reported it from Jhunjhunu and Jodhpur districts respectively.

4. ROTALA L.

- 1a. Leaves decussate. Petals present:
- 2a. Bracteoles longer than the total calyx (tube, lobes & appendages), with a distinct midrib. 1. *R. densiflora*
- 2b. Bracteoles shorter than the total calyx, without midrib:
- 3a. Capsules opening by two valves:
- 4a. Leaves with distinct cartilaginous margins. Bracteoles scarious. Calyx broadly campanulate. 2. *R. indica*
- 4b. Leaves without cartilaginous margins. Bracteoles herbaceous. Calyx suburceolate-tubular. 5. *R. serpyllifolia*
- 3b. Capsule opening by 4 valves. 4. *R. rotundifolia*
- 1b. Leaves in whorls of 3 or more. Petals absent. 3. *R. mexicana*

1. *Rotala densiflora* (Roth ex Roem. & Schult.) Koehne, Bot. Jahrb. 1: 164. 1880. *Ammannia densiflora* Roth ex Roem. & Schult. Syst. Veg. 3: 304. 1818. *A. pentandra* Roxb. Fl. Ind. 1: 448. 1820; Clarke in Hook. f. Fl. Brit. India 2: 568. 1879.

Amphibious or terrestrials, annual herbs; stem tetragonous, winged, glabrous. Leaves 0.5-1.2 cm long, oblong. Flowers axillary, solitary, sessile or subsessile, bright pink. Capsules globose, occasionally flattened above, as long as the calyx-tube, reddish. Seeds numerous, semi-ovoid.

Fl & Fr. : September - October.

Rare, in water lodged areas.

Selected specimen : Sirohi: Mt. Abu, *Blatter* 3328 (BLAT). Also reported by Jain (1961) from Sirohi and from Jodhpur by Sarup (1951).

2. *Rotala indica* (Willd.) Koehne, Bot. Jahrb. 1: 172. 1880. *Peplis indica* Willd. Sp. Pl. 2 (1): 244. 1799. *Ammannia peploides* Sprengel, Syst. Veg. 1: 444. 1824, *nom. illeg.*; Clarke in Hook. f. Fl. Brit. India 2: 566 1879; Duthie, Fl. Gangetic Plain 1: 349. 1903.

Amphibious or terrestrial, annual herbs, rooting at lower nodes. Leaves 0.4-2.2 cm long, obovate to subspathulate-oblong or suborbicular, cuneate to obtuse or somewhat cordate at base, acute, obtuse or emarginate. Flowers axillary, solitary, sessile or subsessile, bright pink. Capsules ellipsoidal, smooth, glabrous. Seeds almost hemispherical, pale brown or reddish-brown.

Fl & Fr. : September - December.

Common in moist places, particularly in the east of Aravalli.

Selected specimens : Bhilwara: On the way to Bijolia, Singh 6058 (BSJO); Kota: Baran-Shahabad road, Majumdar 10457 (BSA). Also reported from Sirohi (Jain, 1961).

3. *Rotala mexicana* Cham. & Schlecht. in *Linnaea* 5: 567. 1830; *Ammannia pygmaea* Kurz in *Seeman's Journ. Bot.* 5: 376. 1867; Clarke in *Hook. f. Fl. Brit. India* 2: 568. 1879; Duthie, *Fl. Gangetic Plain* 1: 349. 1903.

Aquatic, amphibious or terrestrial, annual herbs. Leaves c. 1.0 × 0.5 cm, linear to lanceolate. Flowers solitary, axillary, sessile, occasionally cleistogamous. Calyx red or pink. Capsule globose, red to purple. Seeds semi-ovate.

Fl. & Fr. : August - November.

Rare, in moist and water logged areas in the eastern part of Aravalli and at Mt. Abu.

Selected specimens : Banswara: Bhongra, Kanodia 75451 identified as *Rotala verticillaris* L. (BSI); Bhilwara: On the way to Bijolia, Singh 6055 (BSJO); Sirohi: Mt. Abu, Blatt & Hallb. 3275, 3276 (BLAT).

4. *Rotala rotundifolia* (Buch. - Ham. ex Roxb.) Koehne, *Bot. Jahrb.* 1: 175. 1880, *Ammannia rotundifolia* Buch. - Ham. ex Roxb. *Fl. Ind.* 1: 446. 1820. Clarke in *Hook. f. Fl. Brit. India* 2: 566. 1879; Duthie, *Fl. Gangetic Plain* 1: 349. 1903. *Ameletia rotundifolia* (Buch. - Ham. ex Roxb.) Dalz. & Gibs. *Bombay Fl.* 96. 1891, non Wight, *lc.* 1: t. 258. 1840.

Amphibious perennial herbs; branches extensively creeping forming large patches. Leaves c. 2.0 × 2.5 cm, obovate to orbicular. Flowers in bracteate, axillary racemes, bright pink. Capsules globose. Seeds semi-ellipsoidal, brown to yellow.

Fl. & Fr. : December - March.

Rare, found in slow running water streams or in temporary ponds, particularly in south-east Rajasthan.

Selected specimens : Jhalawar: Kali Sind River, Verma 3382, 3384 (BSA); Kota: Sitabari, Singh 90841 (LWG).

5. *Rotala serpyllifolia* (Roth) Bremek. in *Acta Bot. Neerl.* 3(1): 149. 1954. *Micranthus serpyllifolius* Roth, *Nov. Pl. Sp.* 282. 1821. *Ameletia tenuis* Wight, *lc.* 1: t. 257 B. 1840. *Ammannia tenuis* (Wight) Clarke in *Hook. f. Fl. Brit. India* 2: 567. 1879; Duthie, *Fl. Gangetic Plain* 1: 349. 1903.

Terrestrial or amphibious, often cushion-forming annual herbs. Leaves sessile, 0.2-1.5 cm long, linear to broadly ovate, cuneate at base, acute or

obtuse at apex. Flowers in dense, terminal, bracteate spike-like racemes, pink. Capsules ellipsoidal, somewhat shorter than calyx. Seeds semi-ellipsoidal, brown-yellow.

Fl & Fr. : August - November.

Gregarious on rocks in the streams and rivers, particularly in south-east Rajasthan.

Selected specimens : Banswara: Khora forest, *Singh* 3720 (BSJO); Chittorgarh: *Saran* 65124 (LWG), *Verma* 1675 (BSA); Jhalawar: Kali Sind River, *Verma* 3390 (BSA); Kota: Atru, *Singh* 90344 (LWG).

5. WOODFORDIA R.A. SALISBURY

Woodfordia fruticosa (L.) Kuntz in J. As. Soc. Bengal 40 (2): 56. 1871. *Lythrum fruticosum* L. Syst. ed. 10. 1045. 1759. *Woodfordia floribunda* Salisb. Parad. Loud. t. 42. 1806; Clarke in Hook. f. Fl. Brit. India 2: 572. 1879; Duthie, Fl. Gangetic Plain 1: 351. 1903.

Straggling deciduous shrubs. Leaves sessile, 1.5-13.0 × 0.8-4.0 cm, broadly lanceolate, hoary-tomentose and nigro-punctate beneath. Flowers axillary or extra-axillary, in fascicled cymes, deep-red. Capsules oblong, shining brown. Seeds minute, pale brown, smooth, narrowly obconical-trigonal, cuneate at base.

Fl & Fr. : January - June.

Common in the forests, on the walls of old buildings and in wastelands, particularly along the Aravalli and in the east of it.

Selected specimens : Ajmer: Todgarh, *Duthie* 4665 (DD); Banswara: Anand Sagar forest, *Singh* 4607 (BSJO); Kota: Atru, *Singh* 90957 (LWG); Pali: Ghanerao R.F., *Pandey* 4646 (BSJO); Sirohi: Abu hills, *McCann* 237, 1916 (BLAT).

CULTIVATED SPECIES

Lagerstroemia indica L. - Large shrubs or small trees, with oblong or obovate, almost sessile leaves. Flowers pink, white or purple. Fruiting calyx cup-shaped. Seeds winged. Native of China; commonly cultivated in the gardens for ornamental purposes.

Lagerstroemia reginae Roxb. Medium-sized trees, with drooping branches and oblong or elliptic-oblong, entire leaves. Flowers purple, in large terminal panicles. Capsules beaked. Seeds flat, 3-winged, brown. Native of China; occasionally cultivated in the gardens for ornamental purposes.

Lagerstroemia speciosa (L.) Pers. (*Manchhausia speciosa* L.) -Trees, with spreading branches and grey or yellowish grey, smooth bark. Flowers purple or violet purple, in large terminal panicles. Capsules ellipsoid or subglobose. Native of China; rarely cultivated in the gardens for ornamental purposes.

Lawsonia inermis L. 'Mehndi' (Hindi) Glabrous, much-branched shrubs, with broadly lanceolate, entire leaves. Flowers creamish, fragrant. Capsules globose or depressed-globose, dark brown. Native of Arabia and Persia; commonly cultivated in hedges of gardens and lawns.

57. PUNICACEAE

(P.J. Parmar)

Punica granulata L. Sp. Pl. 472. 1753. 'Anar' (Hindi).

Large shrubs or small trees, with dark grey bark. Leaves ovate or oblong. Flowers bright red, terminal, solitary or in 3-flowered cymes. Fruits reddish-brown, globose. Seeds angled; aril filled with acidic or sweet juice.

Native of Afghanistan and Persia; cultivated in orchards, houses etc. for its edible fruits.

58. ONAGRACEAE

(P.J. Parmar)

1a. Seeds comose.

1. *Epilobium*

1b. Seeds not comose

2a. Calyx-tube distinctly produced beyond the ovary. Capsules narrowed towards the base into a sterile stalk.

3. *Oenothera*

2b. Calyx-tube not produced beyond the ovary. Capsules seeded throughout.

2. *Ludwigia*

1. EPILOBIUM L.

Epilobium hirsutum L. Sp. Pl. 347. 1753; Clarke in Hook. f. Fl. Brit. India 2: 583. 1879; Raizada, Suppl. Duthie, Fl. Gangetic Plain 75. 1976.

Erect herbs; stem rounded, uniformly hairy with glandular pubescent and with scattered long white hairs. Middle cauline leaves opposite, often 7 × 1.5 cm, semi-amplexicaule, softly pubescent on both surfaces. Flowers rose-purple. Capsules 5-9 cm long, hairy, angled. Seeds ellipsoid or obovoid, much longer than broad; coma fulvous.

Fl. & Fr. : September - November.

Rare, in the forests.

Selected specimen : Sirohi: Mt. Abu, Mehta 744 (JAC).

2. LUDWIGIA L.

1a. Stamens twice as many as the sepals:

2a. Plants free floating with spongy floats. 1. *L. adscendens*

2b. Plants of marshy habitats, without spongy floats:

3a. Bracteoles deciduous. Seeds embedded in endocarp. 2. *L. hyssopifolia*

3b. Bracteoles persistent. Seeds free, not embedded in endocarp. 3. *L. octovalvis* subsp. *sessiliflora*

1b. Stamens as many as the sepals:

4a. Seeds pluriserial in each locule of the capsule. 4. *L. perennis*

4b. Seeds uniserial in each locule of the capsule. 5. *L. prostrata*

1. *Ludwigia adscendens* (L.) Hara in Journ. Jap. Bot. 28: 290. 1953. *Jussiaea adscendens* L. Mant. 1: 69. 1767. *J. repens* L. Sp. Pl. 388. 1753; Clarke in Hook. f. Fl. Brit. India 2: 587. 1879; Duthie, Fl. Gangetic Plain 1: 355. 1903, non *Ludwigia repens* Forster 1771.

Free-floating herbs. Leaves 3.0-7.2 × 1.2-2.3 cm, oblong-lanceolate or rounded, cuneate at base, with minute stipules. Flowers solitary, axillary, white, yellow near base. Capsules glabrescent, cylindrical.

Fl. & Fr. : August - October.

Common in permanent tanks, lakes etc. in S.E. Rajasthan.

Selected specimens : Kota: Kelwara, Singh 90825 (LWG); Shahabad, Wadhwa 8291 (BSA).

2. *Ludwigia hyssopifolia* (G. Don) Exell, Garcia de Orta 5: 471. 1957; Raizada, Suppl. Duthie, Fl. Gangetic Plain 75. 1976. *Jussiaea hyssopifolia* G. Don, Gen. Syst. 2: 693. 1832.

Much-branched undershrubs. Leaves 1-9 × 0.3-3.0 cm, lanceolate, narrowly cuneate at base, acuminate at apex. Flowers sessile, borne in all the upper axils, yellow. Capsules slender, minutely pubescent, reddish or light pinkish.

Fl. & Fr. : August - November.

Rare, in marshy localities.

Selected specimen : Ajmer: Jaipur road, Saran 49164 (LWG).

3. *Ludwigia octovalvis* (Jacq.) Raven subsp. *sessiliflora* (Micheli) Raven in Kew Bull. 15: 476. 1962. *Jussiaea octonervia* var. *sessiliflora*

Micheli in Martius, Fl. Bras. 13: 180. 1875. *J. suffruticosa* L. Sp. Pl. 388. 1753; Clarke in Hook. f. Fl. Brit. India 2: 587. 1879; Duthie, Fl. Gangetic Plain 1: 355. 1903, non *Ludwigia suffruticosa* Watt. Fl. Carolin 90. 1788.

Paludose herbs, covered with long erect hairs. Leaves 2-10 × 1.2-5.0 cm, ovate to sub-ovate. Flowers axillary, solitary, yellow. Sepals more than 0.6 cm long, wide spread. Capsules pale to dark-brown, often polished. Seeds globose.

Fl & Fr. : August - January.

Rare, found in low lands and rice fields in S.E. Rajasthan.

Selected specimen : Kota: Kelwara, Singh 90829 (LWG). Also reported from Bundi and Jodhpur by Maheshwari & Singh (1974) and Sarup (1951) respectively.

4. *Ludwigia perennis* L. Sp. Pl. 119. 1753; Mahesh. Illus. Fl. Delhi f. 85. 1966. *L. parviflora* Roxb. Fl. Ind. 1: 440. 1820; Clarke in Hook. f. Fl. Brit. India 2: 588. 1879; Duthie, Fl. Gangetic Plain 1: 356. 1903.

Paludose, erect or diffuse, glabrous herbs. Leaves 2-8 × 0.4-1.5 cm, lanceolate or elliptic-lanceolate. Flowers axillary, solitary, yellow. Capsules thick-walled, pale brown. Seeds numerous, globose, brown.

Fl & Fr. : August - January.

Common in the east of Aravalli in moist places and as a weed in cultivated fields.

Selected specimens : Banswara: Puna Pathar forest, Singh 3654 (BSJO); Bharatpur: Raizada 64496 (DD); Bhilwara: Parvatipur, Singh 6575 (BSJO); Jodhpur: Bhandari 93 (JAC); Kota: Shahabad, Majumdar 13106 (BSA); Sirahi: Mt. Abu, Blatter 19233 (BLAT).

5. *Ludwigia prostrata* Roxb. Fl. Ind. 1: 441. 1820; Wight, Ic. 3(1): 4. t. 762. 1844; Clarke in Hook. f. Fl. Brit. India 2: 588. 1879; Duthie, Fl. Gangetic Plain 1: 356. 1903.

Slender, paludose herbs. Leaves 2-6 × 0.6-2.1 cm, ovate-lanceolate, sub-acuminate, cuneate. Flowers axillary, solitary, yellow. Capsules c. 2.2 cm long. Seeds trigonous.

Fl & Fr. : Almost throughout the year.

Rare, in moist soils like sandy river-beds.

Selected specimen : Alwar: Sariska Tiger Reserve, Parmar 9556 (BSJO). Also reported from Sikar (Nair & Malhotra, 1961).

3. OENOTHERA L.

Oenothera rosea Soland in Ait. Hort. Kew. ed. 1. 2: 3. 1789; Clarke in Hook. f. Fl. Brit. India 2: 582. 1879; Duthie, Fl. Gangetic Plain 1: 357. 1903.

Erect herbs; stem somewhat woody at base, pubescent, reddish. Leaves alternate, ovate-lanceolate, acute, narrowed into a petiole at base. Flowers axillary, solitary, pink with dark veins. Capsules clavate, sharply angled, puberulous.

Fl. & Fr. : January - December.

Native of Mexico; rare, naturalised in moist habitats.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 19221, 19227 (BLAT).

59. TRAPACEAE

(R.P. Pandey)

TRAPA L.

Trapa natans L. var. *bispinosa* (Roxb.) Makino in Linuma, Somoku-Dzusetsu ed. 3. 1: 137. 1907; Brenan in Fl. Trop. E. Africa Pt. 6: 3. 1953. *T. bispinosa* Roxb. Pl. Cor. t. 3: 29. 234. 1815 & Fl. Ind. 1: 449. 1820; Clarke in Hook. f. Fl. Brit. India 2: 590. 1879, *pro parte*; Duthie, Fl. Gangetic Plain 1: 358. 1903. 'Singhora' (Hindi).

Floating or submerged, annual herbs. Floating leaves in rosette, 1.5-6.0 × 1.5-7.0 cm, rhomboid, crenate-toothed on upper margins, glabrous above, tomentose beneath; petioles inflated. Submerged leaves finely dissected into tooth-like linear segments. Flowers solitary, axillary, pedunculate, purple. Stamens 4. Drupes 1.5-2.5 cm long, obscurely 4-angled, glabrous, 2-horned, shortly beaked, black or reddish, 1-seeded.

Fl. : August - September; *Fr.* : September - January.

Common in tanks; grown for its edible fruits.

Selected specimens : Banswara: Lodha tank, *Kanodia* 75328 (BSI); Bhilwara: Parvatipur, *Singh* 6580 (BSJO); Ganganagar: *Roy* 5042 (BSJO); Sawaimadhopur: Padam talab, *Sharma* 3248 (RUBL); Pali: Lodia tank, *Shety* 1404 (BSJO); Kota: *Singh* 90859 (LWG).

60. CUCURBITACEAE

(R.P. Pandey)

1a. Petals lacinate into filiform, fimbriate segments.

13. *Trichosanthes*

1b. Petals entire or shortly dentate, crenate or crispy but not fimbriate:

- 2a. Anther-cells segmoid, flexuous or conduplicate:
- 3a. Pepo dry; endocarp fibrous, operculate. 10. *Luffa*
- 3b. Pepo soft; endocarp fleshy, indehiscent:
- 4a. Male flowers with large, sessile, orbicular-reniform, cucullate or suborbicular-ovate bracts. Petals with 2-3 scales at the base. 12. *Momordica*
- 4b. Male flowers ebracteate. Petals without scales at the base:
- 5a. Corolla rotate or if campanulate then 5-partite to the base:
- 6a. Tendrils simple. Connective produced above the anther-cells into an appendage. Seeds ovate. 6. *Cucumis*
- 6b. Tendrils 2-3 fid. Connective not produced above the anther-cells. Seeds oblong. 3. *Citrullus*
- 5b. Corolla campanulate, divided less than halfway down:
- 7a. Tendrils simple. Flowers small, white. Anthers coherent at base only or completely free. 4. *Coccinia*
- 7b. Tendrils 2 to many-fid. Flowers large, yellow. Anthers united into a column. 7. *Cucurbita*
- 2b. Anther-cells straight or curved, but never conduplicate:
- 8a. Tendrils bifid. Flowers 5-10 mm long, greenish yellow:
- 9a. Seeds narrowly ovate, with prominent central projections on both sides; margins strongly belted without a partition wall. 2. *Bryonopsis*
- 9b. Seeds ovate, attenuate at the base, without projections on the surface; margins conspicuously belted with a partition wall. 9. *Diplocyclos*
- 8b. Tendrils simple. Flowers less than 4 mm long, dull yellow, yellow or white:
- 10a. Petioles with a conspicuous, stipuliform, ciliate or dentate bract at the base:
- 11a. Flowers minute, pale yellow. Seeds 1-3 per fruit, ovoid, much compressed or boat-shaped, black when dry. 1. *Blastaria*
- 11b. Flowers bigger, white. Seeds 6-15 per fruit, asymmetrical, cissoid, oblong, broad at the middle, truncate at both ends, light brown when dry. 8. *Dactyloctenium*
- 10b. Petioles without a stipuliform bract:
- 12a. Style short, surrounded by an annular disc. Fruits not dehiscent by operculum. 11. *Melastoma*
- 12b. Style long, without annular disc. Fruits dehiscent by operculum. 5. *Corallorhiza*

1. BLASTANIA KOTSCHY & PEYR

Leaves tripartite. Fruits globose or ellipsoid. Seed-edges sharp. 1. *B. fimbriatipula*

Leaves 5-lobed. Fruits orbiform. Seed-edges obtuse. 2. *B. garcinii*

1. *Blastania fimbriatipula* (Fenzl.) Kotschy & Peyr. Pl. Tinn. 15: t. 7. 1865; Chakravarty in Fl. India Fasc. 11: 12. 1982. *Bryonia fimbriatipula* Fenzl. in Kotschy, Iter Nub. no. 205: 231. 1841. *Ctenolepis cerasiformis* (Stocks) Naud. in Ann. Sci. Nat. ser. 5. 6: 13. 1867; Clarke in Hook. f. Fl. Brit. India 2: 630. 1879. *Zehneria cerasiformis* Stocks in Hook. Journ. Bot. Kew Gard. Misc. 4: 149. 1852. 'Ankh Phutani ki bel' (Hindi).

Extensive, climbing herbs. Leaves 3-10 × 3-10 cm, shortly scabrid-setose on both surfaces, ultimately white-punctate; segments ovate-oblong or lanceolate, acute, margins denticulate or crenulate; lateral lobes often bilobed. Bracts stipuliform, 5-20 × 3.0-15.5 mm, orbicular, reniform or ovate, long ciliate. Male flowers 3-10 at the apex of filiform peduncles, whitish or yellowish. Fruits 0.8-1.4 cm across, green with white blotches, mature ones smooth, scarlet red, 2-seeded. Seeds 8-10 × 3.5-6.5 mm, ovoid, one side much concave and the other convex, base subacute, smooth.

Fl. : August - December, Fr. : November - February.

Common on the edges of cultivated fields; looks beautiful due to its cherry like scarlet mature fruits.

Selected specimens : Jaipur: Amer, Sharma 309 (RUBL); Dudhu, Wadhwa 8248 (BSA); Jodhpur: Bhandari 291, 1211, 1248 (JAC). Also reported from Jhunjhunu (Nair & Kanodia, 1959; Nair *et al.*, 1961) and Sikar (Nair & Nathawat, 1957).

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

Much-branched, glabrescent climbers. Leaves petiolate, 1.5-4.5 × 2.5-5.5 cm, both surfaces villose, ultimately punctate; lobes subequal, obovate or ovate, acute, denticulate. Bracts stipuliform, subsessile, 4.0-6.5 mm long, ovate. Male flowers on 3 to 4-flowered peduncles, creamy to dull white. Fruits 4.5-7.0 × 7-10 mm, inversely subreniform, smooth, reddish. Seeds 4.0-8.0 × 3.0-4.0 mm, oblong, attenuate at base, apex rounded, sulcate on one face, convex on the other, marginate, dark grey.

Fl. : September - October; *Fr.* : October - December.

Common climber on the boundaries of cultivated fields.

Selected specimens : Banswara: Bijlal hills. *Kanodia* 75681 (BSI); Jaipur: University R.F., *Sharma* 767, 2135 (RUBL); Kota: Gabernath, *Singh* 74645 (LWG); Tonk: Kachha bundha R.F., *Shetty* 1063 (BSJO). Also reported from Bikaner (Joshi, 1956).

2. BRYONOPSIS ARN

Bryonopsis laciniosa (L.) Naud. in Ann. Sci. Nat. ser. 4. 12: 141. 1859; Duthie, Fl. Gangetic Plain 1: 381. 1903; Chakravarty in Fl. India Fasc. 11: 16. f. 1-10. 1982. *Bryonia laciniosa* L. Sp. Pl. 1013. 1753; Clarke in Hook. f. Fl. Brit. India 2: 622. 1879. '*Bilanja, Garunaru*' (Hindi).

Scandent, more or less scabrous, annual herbs; stems slender, angular. Petioles 2.5-5.0 cm long. Leaves deeply palmately 5-lobed, 7-10 cm long, margins denticulate or undulate or sub-crenulate. Male flowers greenish yellow. Calyx-tube 2-4 × 3-6 mm; lobes spreading. Corolla shortly papillose; segments ovate, acute. Anthers c. 2 mm long. Female flowers fasciculate. Fruits 10-15 mm in diam., spherical, narrowly six striped, yellowish-green. Seeds c. 5 × 3 mm, attenuate with raised projections on both faces.

Fl. & Fr. : August - October.

Not common, only reported from Sirohi district.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 19349 (BLAT), *Raizada* 21122 (DD).

3. CITRULLUS SCHRAD. *nom. cons.*

- | | |
|---|---|
| 1a. Perennials. Leaves crisped. Mature fruits yellow; pulp bitter. | 1. <i>C. colocynthis</i> |
| 1b. Annuals. Leaves not crisped. Mature fruits dark green to pale green but not yellow; pulp not bitter. | |
| 2a. Plants softly hairy. Tendrils 2-fid. Fruits more than 15 cm in diam., smooth, glabrous; pulp sweet. Seeds emarginate. | 2. <i>C. lanatus</i> var. <i>lanatus</i> |
| 2b. Plants with erect hairs. Tendrils 3 to 4-fid. Fruits 4-10 cm in diam., sparsely hairy; pulp not sweet. Seeds marginate. | 3. <i>C. lanatus</i> var. <i>fistulosus</i> |

1. *Citrullus colocynthis* (L.) Schrad. in Linnaea 12: 414 1838; Clarke in Hook. f. Fl. Brit. India 2: 620. 1879; Duthie, Fl. Gangetic Plain 1: 374. 1903; Chakravarty in Fl. India Fasc. 11: 20. f. 1-7. 1982. *Cucumis colocynthis* L. Sp. Pl. 1011. 1753. '*Tumba, Tumba, Indrayan*' (Hindi).

Trailing, scabrid herbs, with a long tap root; stems diffuse, angular, hirsute. Leaves 3-10 × 2-6 cm, deltoid, deeply 3-5 lobed, middle lobe the largest, each lobe pinnatifid or sinuate, obtuse or acute; petioles 3-4 cm long, densely villose-hirsute. Tendrils simple or bifid, sparsely villous. Male flowers: Calyx-tube broadly campanulate, hispid; corolla-lobes ovate, acute, pale yellow or greenish-yellow. Female flowers: Ovary obovate, hirsute. Fruits 5-8 cm in diam., globose, slightly depressed at the top, variegated green, mottled with yellowish blotches arranged in undulating bands. Seeds c. 6 × 3 mm, obovate or ovate-oblong, compressed, smooth, pale brown, with 2 oblique grooves one on each surface near the slightly narrowed base.

Fl. & Fr. : Almost throughout the year.

Common in sandy to gravelly-rocky habitats, particularly in desertic zones.

Selected specimens : Bikaner: Khidarat village, Roy 2029 (BSJO); Ganganagar: Lakha, Roy 4956 (BSJO); Jaipur: Lalkothi, Sharma 696 (RUBL); Jaisalmer: Devikot, Shetty 3363 (BSJO); Pali: Guru Pratap Singh Guda, Shetty 1987 (BSJO).

2. *Citrullus lanatus* (Thunb.) Matsumura & Nakai in Cat. Sem. Spar. Hort. Bot. Univ. Imp. Tokyo 1916: 30. 1916; Chakravarty in Fl. India Fasc. 11: 22. 1982. *Momordica lanata* Thunb. Prodr. Pl. Cap. 13. 1794. *Citrullus vulgaris* Schrad. in Eckl. et Zeyher, Enum. Pl. Afr. Austr. 279. 1836; Clarke in Hook. f. Fl. Brit. India 2: 621. 1879; Duthie, Fl. Gangetic Plain 1: 375. 1903. 'Maira, Tarbooz' (Hindi).

var. lanatus

Trailing, hispid herbs. Leaves 6-15 × 4-12 cm, triangular-ovate, cordate, scabrid, deeply 3-fid; lobes pinnatifid, obovate, oblong, lanceolate or linear; middle ones the largest, acute; lateral ones rounded. Bracts cochleariform. Male flowers: Calyx-lobes villose, narrowly lanceolate; corolla-lobes ovate-oblong, obtuse, greenish or pale-yellow. Female flowers: Ovary oblong. Fruits 15-25 cm in diam., subglobose or ellipsoid, green or variegated with longitudinal, irregular dark green bands; pericarp hard, not woody; pulp white, pink or red. Seeds 5-10 mm long, many, pyriform, compressed, black or red or of various colours.

Fl. & Fr. : August - December.

Native of the sandy dry areas of Tropical Africa; completely naturalised in the desertic zones. Also cultivated in the fields and sandy river-beds for edible fruits.

Selected specimens : Banswara: Shergarh, Singh 3094 (BSJO); Bikaner: Ranjitpura, Roy 2099 (BSJO); Jaipur: University R.F., Sharma 695 (RUBL); Jaisalmer: Tiwari 829 (BSJO); Jhalawar: Hati Khedi block, Wadhwa 7670 (BSA).

3. var. *fistulosus* (Stocks) Chakravarty in Fl. India Fasc. 11: 23. 1982. *Citrullus fistulosus* Stocks in Hooker's Kew J. Bot. 3: 74. t. 3. 1851. *C. vulgaris* Schrad. var. *fistulosus* (Stocks) Stewart. Punjab Pl. 96. 1869; Duthie, Fl. Gangetic Plain 1: 375. 1903. *Celocynthis citrullus* (L.) O. Kuntze var. *fistulosus* (Stocks) Chakravarty in Rec. Bot. Surv. India 17 (1): 114. 1959. 'Tinda, Tindsi' (Hindi).

Prostrate herbs; stems thick, fistulous, hispid. Leaves sparingly lobed, hispid hairy. Flowers yellow. Fruits 4-10 cm across, on thick, downwardly curved stalks, subglobose, depressed at both the ends. Seeds 8-10 × 3-5 mm, black, marked on both sides by an elevated marginal ridge.

Fl. & Fr. : July - December.

Cultivated for its fruits cooked as vegetable. Also found as an escape near habitation in imperfectly naturalised state.

Selected specimens : Barmer: Bhandari 1559 (JAC); Jaisalmer: Shergarh, Wadhwa 4701 (BSA); Jodhpur: Bhandari 1726, 1729 (JAC).

4. COCCINIA WIGHT & ARN.

Coccinia grandis (L.) J.O. Voigt, Hort. Suburb. Calc. 59. 1845; Chakravarty in Fl. India Fasc. 11: 24. f. 1-9. 1982. *Bryonia grandis* L. Mant. Pl. 1: 126. 1767. *Coccinia indica* Wight & Arn. Prodr. 347. 1834; Duthie, Fl. Gangetic Plain 1: 376. 1903. *Cephalandra indica* (Wt. & Arn.) Naud. in Ann. Sci. Nat. ser. 5. 5: 16. 1859; Clarke in Hook. f. Fl. Brit. India 2: 621. 1879, *excl. syn.* 'Gol, Golan, Golenda, Kundru' (Hindi).

Perennial, scandent, dioecious herbs. Leaves 3-10 cm long, entire to palmately lobed, bright green above, with few glistering glands beneath, margins minutely denticulate. Petioles 1.5 cm long. Male flowers white, pedunculate. Female flowers pedunculate; ovary 10.0-12.5 × 2.0-3.5 mm; stigma c. 5 mm long, densely papillose. Fruits 2.5-5.0 × 2-3 cm, subglabrous, fusiform-ellipsoidal, streaked with white when immature, bright scarlet and fleshy when mature. Seeds 5-7 × 2.5-3.5 mm, oblong, compressed, rounded at the apex, notched at the base, yellowish.

Fl. & Fr. : Almost throughout the year.

Most common climber on the hedges of fields and gardens, among clumps of trees and shrubs in wastelands and outskirts of forests.

Selected specimens : Banswara: Singh 2966 (BSJO); Jaipur: University R.F., Sharma 649 (RUBL); Barmer: Balotra road, Shetty 2213 (BSJO); Jodhpur: Phalodi, Blatter 6627 (BLAT) Kota: Bhl Ghati, Wadhwa 9444 (BSA); Pali: Sarandana, Shetty 1804 (BSJO).

5 CORALLOCARPUS WELW. EX HOOK.F.

Leaves longer than broad. Peduncles of male flowers 1.5-3.0 cm long. Female flowers sessile. Fruits sessile, sparsely pilose. Seeds grey, with few rounded bulges on the sides, rugulose

1. *C. conocarpus*

Leaves almost equal or broader than long. Peduncles of male flowers more than 3.5 cm long. Female flowers pedunculate. Fruits stalked, glabrous. Seeds yellow, without bulges on the sides, smooth.

2. *C. epigaeus*

1. *Corallocarpus conocarpus* (Dalz. & Gibs.) Hook. f. Gen. Pl. 1: 831. 1862; ex Clarke in Hook.f. Fl. Brit. India 2: 628. 1879. *excl. syn.* Bhandari, Fl. Ind. Desert 164. f. 53. 1978; Chakravarty in Fl. India Fasc. 11: 27. 1982. *Aechmandra conocarpa* Dalz. & Gibs. Bombay Fl. 100. 1861, Sphalm, 'conocarpa'. 'Kadvi Mirchi ki bel' (Hindi).

Much-branched, perennial, climbing, glaucous herbs; roots napiform. Leaves 5-7 × 4-6 cm, rarely very small, both surface densely villous or hirsute, deeply 3 to 5-lobed, cordate at the base; sinus 1-2 cm deep; lobes oblong-lanceolate or narrowly lanceolate, acute to acuminate-mucronate, margins subentire, terminal lobe is the largest. Tendrils simple, slender, glabrous. Male flowers in racemes. Female flowers yellowish-green, fasciculate. Fruits 10-14 mm long, conical or ovoid-oblong, beak conical, thick, orange-red. Seeds 3-4 (-6), 3.5-4.0 × 2.5-3.0 mm, obovoid, turgid, slightly attenuate, entire, slightly marginate.

Fl & Fr. : August - December.

Endemic to Rajasthan and Gujarat; rare, in wastelands.

Selected specimens : Jodhpur: Luni, Tiwari 632 (BSJO), Bhandari 1202, 1253, 1753 (JAC).

2. *Corallocarpus epigaeus* (Rottl. & Willd.) Hook. f. Gen. Pl. 1: 831. 1862. ex Clarke in Hook.f. Fl. Brit. India 2: 628. 1879. Duthie, Fl. Gangetic Plain 1: 380. 1903; Bhandari, Fl. Ind. Desert 165. f. 54. 1978; Chakravarty in Fl. India Fasc. 11: 28. 1982. *Bryonia epigaea* Rottl. & Willd. Neue Schrift. Ges. Naturf. Freunde Berlin 4: 223. 1803. 'Kadwai-nai' (Hindi).

Perennial, climbing herbs; roots napiform. Stems slender, glabrous, angular-sulcate. Leaves variable in size and shape, 2.0-4.5 × 2.5-5.0 cm, broadly suborbicular, densely villose, 3 to 5-lobed, lobes often lobulate, obtuse, rounded at the base, margins subentire. Tendrils simple, subfiliform, glabrous. Male flowers yellowish-green or dirty green; anthers ovoid, yellow; connectives produced, bifurcate. Female flowers often solitary, pedunculate; ovary triplacentiferous. Fruits 1.0-1.5 × 0.7-0.8 cm, ovoid, base attenuate, red, 5 to 8-seeded. Seeds c. 3.5 × 2.0 mm, turgid, pyriform, distinctly marginate.

Fl & Fr. : August - November.

Found in sandy to gravelly habitats; not common.

Selected specimens : Jaipur: Ramgarh, Sharma Acc. No. 4673, 2156 (RUBL); Jodhpur: Mandore, Tiwari 627 (BSJO). Also reported from Sirohi (Jain, 1961).

6. CUCUMIS L.

1a. Fruits smooth or pubescent:

2a. Perennials. Leaves deeply 5 to 7-lobed. Male flowers solitary.

1. *C. callosus*

2b. Annuals. Leaves angular or shallowly lobed. Male flowers fasciculate.

2. *C. melo* var. *momordica*

1b. Fruits setose (bristly) or echinate:

3a. Fruits echinate.

3. *C. prophetarum*

3b. Fruits setose (bristly).

4. *C. setosus*

1. *Cucumis callosus* (Rottl.) Cogn. in Engl. Das. Pflanzenr. 88: 129. 1924; Chakravarty in Fl. India Fasc. 11: 31. 1982. *Bryonia callosa* Rottl. Neue Schrift. Ges. Nat. Freunde Zu Berlin 4: 210. 1803, 'callosa'. *Cucumis trigonus* Roxb. Fl. Ind 2: 722. 1824; Clarke in Hook. f. Fl. Brit. India 2: 619. 1879; Duthie, Fl. Gangetic Plain 1: 373. 1903. 'Kachri, Kachrio' (Hindi).

Prostrate or trailing, rarely climbing, hispid herbs. Leaves 3-7 × 3-7 cm; lobes ovate-oblong or obovate, narrowed at the base, apex rounded, margins dentate or lobulate, scabrous or punctate. Tendrils simple, hispid. Male flowers yellow; appendages of the connectives shorter than anthers. Fruits 3-6 × 3-4 cm, obovoid, rounded, rarely obscurely trigonous, longitudinally variegated with 7-11 green stripes; pulp bitter when immature, but mature one edible. Seeds 3.5-5.0 × 2.0-2.5 mm, oblong or ellipsoid, white, margined.

Fl & Fr. : August - November.

Common in sandy areas, particularly in the west of Aravalli.

Selected specimens : Barmer: Samadari, *Shetty* 2175 (BSJO); Churu: Adsar, *Roy* 2697 (BSJO); Jaipur: Ramgarh, *Sharma* 2173 (RUBL); Jhalawat: Khanpur, *Wadhwa* 9575 (BSA); Jodhpur: Beriganga, *Shetty* 140 (BSJO); Pali: *Jain* 40937 (BSA).

Notes : Many forms of melons differing in size, shape, skin and pulp-colour and taste are cultivated in Rajasthan. They are extensively used as desert fruits and are highly esteemed in hot summer months. Particularly the melon of drier and hot regions are more sweet and tasty than those of moist situations.

2. *Cucumis melo* L. var. *momordica* Duthie & Fuller in *Field & Gard. Crops* 2: 50, t. 49, 1882; Duthie *Fl. Gangetic Plain* 1: 372, 1903. *C. melo* L. var. *melo sensu* Chakravarty in *Fl. India Fasc.* 11: 34, 1982, *in parte*, non L. 1753. *C. melo* L. var. *culta* Kurz in *Journ. As. Soc. Beng.* 46 (2): 102, 1877. '*Kachro, Kakria, Baro Kachro*' (Hindi).

Annual, prostrate, hispid herbs. Leaves 5-10 × 5-10 cm, suborbicular or reniform, 3 to 7-lobed; lobes shallowly rounded, minutely to distinctly dentate, cordate at base, both surface sparsely hirsute, at length scabropunctate. Male flowers yellow, 1-3 on axillary peduncles; appendages of the connectives c. 1 mm long. Fruits variable in form and size, 10-40 × 5-15 cm, yellow or orange on maturation; epicarp thin, easily removable. Seeds 8-10 × 2.5-3.5 mm, oblong, immarginate, obtuse, subacute at base, pale yellow.

Fl. & Fr. : August - December.

Common in sandy soils, particularly in the west of Aravalli.

Selected specimens : Banswara: Khusalgarh, *Singh* 3036 (BSJO); Ganganagar: Dera Sachha Suda, *Roy* 4963 (BSJO); Jodhpur: Chaba, *Singh* 4333 (BSJO); Pali: Manda, *Shetty* 1853 (BSJO).

Notes : *Cucumis melo* L. var. *melo* can be easily distinguished from *C. melo* L. var. *momordica* Duthie & Fuller by the following characters as shown in the table.

From these characters it is clear that both the taxa can very easily be distinguished from each other. Hence, they should not be merged as done by Chakravarty (*l.c.*). But on the herbarium sheets, however, it is hard to identify them because the characters of mature fruits are not well noticeable.

| <i>Cucumis melo</i> L. var. <i>melo</i> | <i>Cucumis melo</i> L. var. <i>momordica</i> Duthie & Fuller |
|---|---|
| 1. Cultivated, robust. | Mostly found in wild state but sometimes cultivated also, not robust. |
| 2. Ripe fruits polymorphic in colour, shape and size. | Ripe fruits always cylindrical, ovoid or oblong. |
| 3. Epicarp very thick, not removable. | Epicarp is very thin, easily removable. |
| 4. Ripe fruits with free central cavity. | Ripe fruits without free central cavity. |
| 5. Ripe fruits not burst spontaneously. | Ripe fruits burst spontaneously. |
| 6. Seeds bigger. | Seeds smaller. |

3. *Cucumis prophetarum* L. Cent. Pl. 33. 1755; Clarke in Hook. f. Fl. Brit. India 2: 619. 1879; Duthie. Fl. Gangetic Plain 1: 373. 1903; Chakravarty in Fl. India Fasc. 11: 35. 1982. '*Khat Chachario*' (Hindi).

Perennial, prostrate or climbing, hispid herbs; stems bristly, whitish when dry, angular. Leaves 2-4 × 2-4 cm, grey-green, rigid, suborbicular or deltoid, cordate to truncate at the base, 3 to 5-lobed, margins crisped or dentate. Tendrils filiform. Male flowers yellow, solitary or fasciculate; connective-appendages glabrous, 0.5-0.75 mm long. Fruits 3-4 × 2.0-3.5 cm, green with 7-10 longitudinal white stripes; mature fruits yellow, spiny; spines white-tipped. Seeds 4-5 × 2.0-2.5 mm, oblong-ellipsoid, immarginate, pale ashy.

Fl. & Fr. : August - January.

Commonly found in gravelly habitats, particularly in western Rajasthan.

Selected specimens : Ajmer: Akhajeetgarh. Duthie 4670 (DD); Bhilwara: Badnor, Singh 6477 (BSJO); Dungarpur: Kanodia 82058 (BSI); Jaisalmer: Shetty 3395 (BSJO); Jodhpur: Osian, Singh 4420 (BSJO); Nagaur: Roopsar, Hira Lal 34991 (LWG).

4. *Cucumis setosus* Cong. in DC. Monog. Phan 3: 491. 1881; Chakravarty in Fl. India Fasc. 11: 38. 1982.

Annual, villose-hirsute climbers. Leaves 3-5 × 3-5 cm, membranous, ovate-triangular, 3-lobed; lobes triangular, acute, denticulate. Tendrils simple, sparsely villose-hirsute. Male flowers yellow, fasciculate or subsolitary; connective-appendages c. 3 mm long, compressed, sparsely papillose. Fruits 20-25 × 10-12 mm, oblong. Seeds c. 3.5 × 2.0 mm, straw-coloured, smooth, faintly margined.

Fl. & Fr. : August - October.

Rare, in wastelands. No more endemic to Maharashtra state (Chakravarty *l.c.*).

Selected specimens : Jaipur: University R.F., Sharma 4653, 4654, 4656, 4657, 4658 (RUBL); Jhalawar: Wadhwa 7629 (BSA).

7. CUCURBITA L.

Cucurbita maxima Duch. ex Lam. Encycl. 2: 151. 1786; Clarke in Hook. f. Fl. Brit. India 2: 622. 1879; Duthie, Fl. Gangetic Plain 1: 377. 1903; Chakravarty in Fl. India Fasc. 11: 40. 1982. '*Kaddu, Sitaphal, Kholo*' (Hindi).

Prostrate or twining, annual herbs. Leaves 5-15 × 5-25 cm, orbicular or reniform in outline, 5-lobed, dentate. Tendrils 2 to 6-fid. Flowers yellow; filaments glanduliform, upto 8 mm long. Fruits large, of various size and shape; pulp more or less fibrous. Seeds 1.75-2.5 × 1.25-1.5 cm, ovate, obscurely marginate, white or pale yellowish.

Fl. & Fr. : March - August.

Cultivated in most of the parts of Rajasthan; also runs wild near habitations, protected grasslands, foot of hills etc.

Selected specimen : Kota: Atru, Singh 90321 (LWG).

8. DACTYLIANDRA (HOOK.F.) HOOK.F.

Dactyliandra welwitschii Hook. f. in Oliver, Fl. Trop. Afr. 2: 557. 1871; Bhandari & Singh in Kew Bull. 19: 133. 1964; Chakravarty in Fl. India Fasc. 11: 46. 1982. '*Badi Ankh Phootani ki Bel*' (Hindi).

Extensive, scabrid climbers. Stems much-branched, angular, furrowed when dry. Leaves 8 × 3-5 cm, 3 to 5-lobed, basal lobes oblique. Bracts stipuliform, 5-15 mm in diam., suborbicular, reniform, shortly setose. Male flowers white, solitary, axillary. Female flowers in fascicles of 3. Fruits 1.0-1.4 × 0.5-1.25 cm, ellipsoid-globose, with greyish blotches. Seeds 8-15,

asymmetrical, cissoid, compressed, obliquely narrowed at ends, apex truncate, obscurely corrugated, pale brown.

Fl. & Fr. : August - November.

Commonly found on sandy loam soils, along hedges of fields and gardens, among clumps of trees and shrubs.

Selected specimens : Barmer: Kelore, *Shetty* 2201 (BSJO); Bhilwara: Badnor, *Singh* 6285 (BSJO); Bikaner: Near Kolayat, *Roy* 2082 (BSJO); Jaipur: University R.F., *Sharma* 1289, 2153, (RUBL); Jodhpur: Sursagar, *Singh* 4302 (BSJO); Pali: Jawai dam hills, *Shetty* 1934 (BSJO).

9. DIPLOCYCLOS (Endl.) POST & KUNTZE

Diplocyclos palmatus (L.) Jeffry in Kew Bull. 15(3): 352. 1962; Chakravarty in Fl. India Fasc. 11: 48. 1982. *Bryonia palmata* L. Sp. Pl. 1012. 1753, *excl. syn. 'Bon-kakra'* (Hindi).

Perennial, glabrous herbs. Leaves three-lobed; lobes obtuse, entire, rarely dentate, base broadly sinuate, upper surface punctate. Tendrils 2-fid. Male flowers white, fasciculate. Fruits 1.0-1.5 cm across, baccate, globose or ovoid. Seeds 5-7 × 3-4 mm, ovate, attenuate, belted with a partition wall slightly raised all round the belt and the central portion surrounded by the belt.

Fl. & Fr. : August - November.

Common in wastelands, usually climbing on hedges and bushes in the east of Aravalli.

Selected specimens : Bundi: *Singh* 74688, 74508 (LWG); Jhalawar: Eklera, *Singh* 83693 (LWG); Kota: Chhabra, *Singh* 909371 (LWG). Reported from Sirohi (Raizada, 1954).

10. LUFFA MILLER

1a. Stamens 5.

3. *L. cylindrica*

1b. Stamens 3:

2a. Fruits 10-angled, elongate. Tendrils trifold. Flowers yellow or pale yellow:

3a. Fruits more than 15 × 6 cm, angular, clavate-oblong, apex obtuse or slightly acute.

1. *L. acutangula* var.
acutangula

3b. Fruits less than 6.0 × 3.5 cm, obovoid, conical at both ends,

2. *L. acutangula* var.
amara

2b. Fruits not angled. Tendrils 2-fid. Flowers white:

4a. Filaments united. Fruits densely covered with bristles.

4. *L. echinata*

4b. Filaments free. Fruits spinous, densely woolly.

5. *L. umbellata*

1. *Luffa acutangula* (L.) Roxb. Fl. Ind. 3: 713. 1832; Clarke in Hook. f. Fl. Brit. India 2: 615. 1879; Duthie, Fl. Gangetic Plain 1: 367. 1903; Chakravarty in Fl. India Fasc. 11: 67. f. 1-7. 1982. *Cucumis acutangula* L. Sp. Pl. 1011. 1753. 'Kali-Tori, Tori' (Hindi).

var. *acutangula*

Extensive, scabrous climbers. Leaves 10-20 × 10-20 cm, palmately 5 to 7-angled or lobed. Flowers yellow to pale yellow. Fruits 15-30 × 5-10 cm, not warty. Seeds 10-12 × 6-8 mm, ovate, compressed, black.

Fl. & Fr. : July - October.

Naturalised in wastelands, outskirts of forests, on the boundaries of gardens and fields, among hedges. Also cultivated for its fruits cooked as vegetable.

Selected specimens : Banswara: Anand Sagar, Kanodia 75272, 75376 (BSI); Bharatpur: Sikandra Jungles Bayana, Uma Shankar & Ghosh 46027 (LWG); Bundi: Singh 74700 (LWG).

2. var. *amara* (Roxb.) Clarke in Hook. f. Fl. Brit. India 2: 615. 1879; Duthie, Fl. Gangetic Plain 1: 367. 1903; Chakravarty in Fl. India Fasc. 11: 70. 1982. *Luffa amara* Roxb. Fl. Ind. 3: 715. 1832. 'Ram Turai, Karui-Toroi, Jangli tori' (Hindi).

This variety can be easily distinguished from the proper by smaller leaves, fruits being ovoid or oblong and smaller ribs on the fruits not prominently winged and seeds smaller.

Fl. & Fr. : June - October.

Commonly found on the hedges of fields and gardens, outskirts of forests etc.

Selected specimens: Alwar: Pandupole, Sharma 3872 (RUBL); Barmer: Bhandari 2034 (JAC); Jaipur: Ramgarh, Sharma 790, 2159, 2773 (RUBL).

3. *Luffa cylindrica* (L.) M. Roem. Fam. 2: 63. 1846; Chakravarty in Fl. India Fasc. 11: 70. 1982. *Momordica cylindrica* L. Sp. Pl. 1009. 1753. *Luffa aegyptiaca* Mill. Dict. ed. 4. 500. 1785; Clarke in Hook. f. Fl. Brit. India 2: 614. 1879; Duthie, Fl. Gangetic Plain 1: 367. 1903. 'Ghia-torai' (Hindi).

Large, glabrous climbers. Leaves 10-20 × 10-20 cm, palmately 5-lobed. Tendrils trifold. Probracts 3-6 × 1.5-3.5 mm, fleshy, ovate, with 3-7 glistening glands on the upper surface. Flowers bright yellow. Fruits 12-40 × 5-10 cm, not angular, smooth, fusiform, obtuse. Seeds c. 10 × 0.5 mm, ovate, smooth, margins winged, black.

Fl. & Fr. : July - October.

Cultivated for its vegetable purpose. Usually found as an escape near habitations. Not so perfectly naturalised as other species.

Selected specimen : Kota: Chhabra, Singh 90381 (LWG).

4. *Luffa echinata* Roxb. Fl. Ind. 3: 716. 1832; Clarke in Hook. f. Fl. Brit. India 2: 615. 1879; Duthie, Fl. Gangetic Plain 1: 367. 1903; Chakravarty in Fl. India Fasc. 11: 71. 1982. '*Duttar-Toru*' (Hindi).

Extensive climbers. Leaves 4-10 × 4-10 cm, reniform-orbicular, obscurely 5-angled or lobed, rounded at the apex, minutely denticulate, scabrous on both surfaces. Male racemes longer than leaves. Flowers white. Fruits 3.5-6.0 mm long, ovoid, not ribbed, densely covered with stiff ciliate bristles except at the apex, ashy. Seeds c. 4 × 3 mm, ovate, slightly verrucose, immarginate, black.

Fl. & Fr. : August - October.

Found along garden hedges and on the fringes of forests among shrubs and bushes.

Selected specimens : Jodhpur: Khejarla, Singh 4444 (BSJO); Kota: Atru, Singh 83792 (LWG); Shahabad, Majumdar 13281 (BSA); Udaipur: Majumdar 12466 (BSA).

5. *Luffa umbellata* (Klein) M. Roem. Fam. 2: 63. 1846; Chakravarty in Fl. India Fasc. 11: 75. 1982. *Cucurbita umbellata* Klein in Willd. Sp. Pl. 4: 608. 1805.

Climbers. Stems sulcate, glabrous. Leaves 3-5 × 3-5 cm, ovate-cordate, obscurely 3 to 5-lobed, acute, subentire or dentate. Male flowers 4-10 on a long peduncle. Fruits small, ecostate, densely long spinous; spines densely woolly.

Fl. & Fr. : July - October.

Very rare, reported only from Kota (Majumdar, 1971). According to Chakravarty (*Lc.*) it is endemic to Kerala.

11. MELOTHRIA L.

- 1a. Plants dioecious. Seeds subspherical, immarginate. 1. *M. heterophylla*
- 1b. Plants monoecious. Seeds ovoid, ovate-oblong or ovoid-oblong, marginate:
- 2a. Male flowers subumbellate. Fruits finely reticulate. 4. *M. perpusilla*
- 2b. Male flowers fascicled. Fruits smooth:
- 3a. Seeds scrobiculate, indistinctly marginate, base apiculate. Fruits upto 7 mm in diam. 3. *M. maderaspatana*
- 3b. Seeds smooth, distinctly marginate, base attenuate. Fruits more than 10 mm in diam. 2. *M. leiosperma*

1. *Melothria heterophylla* (Lour.) Cogn. in DC. Monog. Phan. 3: 618. 1881; Duthie, Fl. Gangetic Plain 1: 367. 1903; Chakravarty in Fl. India Fasc. 11: 80. 1982. *Solena heterophylla* Lour. Fl. Cochinch. 1: 514. 1790; Raizada, Suppl. Duthie, Fl. Gangetic Plain 80. 1976. *Zehneria umbellata* Thw. Enum. Pl. Zeyl. 125. 1853; Clarke in Hook. f. Fl. Brit. India 2: 625. 1879.

Perennial herbs, with tuberous roots. Leaves variable, 5-20 × 5-20 cm, coriaceous, glandular at the base, ovate, suborbicular, oblong or narrowly lanceolate, entire or variously lobed, acute or acuminate, base emarginate. Flowers yellowish. Fruits 3.5-5.0 × 1.75-2.0 cm, oblong, brown. Seeds 4.0-6.5 × 4.0-4.5 mm, turgid, grey, smooth, immarginate, base blunt or obtuse.

Fl. & Fr. : March - November.

Not common, found in rocky habitats.

Selected specimens : Jodhpur: Mandore, *Blatter & Hallberg* 6604 (BLAT); Sirohi: Mt. Abu, *Blatter* 19328, 19342 (BLAT), *Jain* 60193 (BSI), *Rao* 66522 (BSI).

2. *Melothria leiosperma* (Wight & Arn.) Cogn. in DC. Monog. Phan. 3: 622. 1881; Chakravarty in Fl. India Fasc. 11: 81. 1982. *Bryonia leiosperma* Wight & Arn. Prodr. 1: 345. 1834. *Mukia leiosperma* Wight & Arn. in Ann. & Mag. Nat. Hist. 8: 268. 1842; Clarke in Hook. f. Fl. Brit. India 2: 623. 1879.

Villous climbers. Leaves 5-8 × 4.0-6.5 cm, subcoriaceous, ovate-cordate, entire or lobed, acute, denticulate. Flowers fasciculate. Fruits globose, glabrous. Seeds c. 5.0 × 4.0 mm, ovoid, ashy.

Fl. & Fr. : July - August.

Rare, among the hedges of cultivated fields.

Selected specimens : Jaisalmer: Bhikamkor (Sodakoer and Loharki), *Blatter* 6602, 6603, 6695, 6696 (BLAT).

3. *Melothria maderaspatana* (L.) Cogn. in DC. *Mong. Phan.* 3: 623. 1881; Duthie, *Fl. Gangetic Plain* 1: 379. 1903 Mahesh, *Illus. Fl. Delhi* f. 86. 1966; Chakravarty in *Fl. India Fasc.* 11: 83. 1982. *Cucumis maderaspatana* L. *Sp. Pl.* 1012. 1753. *Mukia scabrella* Arn. in Hook. *J. Bot.* 3: 276. 1841; Clarke in Hook. *f. Fl. Brit. India* 2: 623. 1879, *excl. syn.* *Bryonia scabrella* L. *f. Supp. Sp. Pl.* 424. 1781. 'Ankh-phutani ki bel' (Hindi).

Scandent climbers or prostrate annuals. Leaves 3.0-12.5 × 2-10 cm, membranous, ovate or subdeltoid, entire or 3 to 5-lobed, acute, denticulate, basal sinus 1-3 cm deep. Flowers yellow. Fruits globose, juicy, smooth, red when ripe. Seeds *c.* 4.0 × 2.5 mm, grey, ovoid-oblong.

Fl. & Fr. : July - December.

Common on bushes in wastelands, scrub forests and outskirts of deciduous forests.

Selected specimens : Banswara: Paloda, *Singh* 2832 (BSJO); Barmer: Surpura, *Shetty* 2185 (BSJO); Chittorgarh: Bansi forest, *Majumdar* 12334 (BSA); Jaipur: Ramgarh, *Jain* 55794 (BSA); Kota: Shahabad, *Majumdar* 13209 (BSA); Sirohi: Mt. Abu, *Rao* 66722 (BSI) Tonk: *Maheshwart* 52978 (LWG).

4. *Melothria perpusilla* (Blume) Cogn. in DC. *Monog. Phan.* 3: 607. 1881; Duthie, *Fl. Gangetic Plain* 1: 378. 1903; Chakravarty in *Fl. India Fasc.* 11: 85. 1982. *Cucurbita perpusilla* Blume, *Cat. Hort. Buitenz.* 105. 1823. *Zehneria hookeriana* Arn. in Hook. *J. Bot.* 3: 275. 1841; Clarke in Hook. *f. Fl. Brit. India* 2: 624. 1879.

Glabrous climbers or trailers. Leaves 4-8 × 4-6 cm, ovate-cordate, entire, angled or 3 to 5-lobed, acute or mucronate, denticulate, basal sinus 0.5-1.25 cm deep. Flowers yellowish. Fruits 8-10 cm in diam., globose. Seeds *c.* 4.0 × 2.5 mm, ovate-oblong, slightly attenuate, smooth, distinctly marginate, compressed, brown.

Fl. & Fr. : July - December.

Rare, in wastelands in desertic habitats.

Selected specimen : Jaisalmer: Silrot, *Blatter* 6613 (BLAT).

12. MOMORDICA L.

1a. Plants monoecious. Fruits muricate, tuberculate or quite smooth. Seeds compressed:

- 2a. Bracts of male flowers at the apex of the peduncles. 1. *M. balsamina*
- 2b. Bracts of the male flowers about or below the middle of the peduncles. 2. *M. charantia*
- 1b. Plants dioecious. Fruits densely and softly echinate. Seeds turgid:
- 3a. Tendrils filiform. Sepals of male flowers densely villous. Female flowers ebracteate. Fruits less than 5.5 cm long. 4. *M. dioica*
- 3b. Tendrils robust. Sepals of male flowers scabrous. Female flowers bracteate. Fruits more than 10 cm long. 3. *M. cochinchinensis*

1. ***Momordica balsamina*** L. Sp. Pl. 1009. 1753; Clarke in Hook. f. Fl. Brit. India 2: 617. 1879; Duthie, Fl. Gangetic Plain 1: 370. 1903; Chakravarty in Fl. India Fasc. 11: 88. 1982. '*Bara-Karela*' (Hindi).

Perennial, branched climbers with tuberous roots. Leaves 4-10 × 4-10, reniform or orbicular, 5 to 7-lobed; lobes rhomboid or obovate to elliptic-rhomboid, usually constricted at base, irregularly denticulate. Flowers greenish-yellow. Fruits 2.5-6.0 × 2.0 cm, ovoid with a broad, conical rostrum, attenuate at base, muricate-tuberculate, bright orange-red to scarlet when ripe. Seeds 8-14 × 5-8 mm, with a carmine red arilles, grey, ovate or oblong, marked with obscurely raised ridges.

Fl & Fr. : July - October.

Common in wastelands, on the boundaries of fields and gardens, scrub forests etc. among bushes and shrubs.

Selected specimens : Alwar: Siriska, Sharma 3885 (RUBL); Barmer: Mokalsar, Tiwari 1179 (BSJO); Ganganagar: Kumbharuwali, Roy 4922 (BSJO); Kota: Shahabad, Majumdar 13229, 13284 (BSA); Pali: Samaji ka Guda, Shetty 1576 (BSJO).

2. ***Momordica charantia*** L. Sp. Pl. 1009. 1753; Clarke in Hook. f. Fl. Brit. India 2: 616. 1879; Duthie, Fl. Gangetic Plain 1: 369. 1903; Chakravarty in Fl. India Fasc. 11: 89. f. 8-10. 1982. '*Karela*' (Hindi).

Prostrate or climbing annuals. Leaves 5-10 × 5-10 cm, suborbicular or reniform, glabrous, prominently nerved, 5 to 7-lobed; lobes ovate-oblong, base narrowed, dentate, mucronate. Flowers yellow. Bracts leafy, 5-12 × 5-12 mm, reniform or orbicular-cordate, mucronate, entire. Fruits 5-15 cm long, muricate-tuberculate, oblong, 3-valved. Seeds 10-15 × 5-8 mm, base and apex subtridentate, sculptured on surface.

Fl. & Fr. : April - October.

Found in wastelands, particularly near habitations in humus rich soils. Also cultivated for the fruits cooked as vegetable.

Selected specimens : Banswara: Durgapura forest, *Kanodia* 75232 (BSA); Bikaner: Vallabh garden, *Roy* 2146 (BSJO); Ganganagar: *Roy* 5012 (BSJO); Jaipur: Durgapura, *Sharma* 1027, 488 (RUBL); Kota: Shahabad, *Singh* 90463 (LWG).

3. *Momordica cochinchinensis* (Lour.) Spreng. Syst. Veg. 3: 14. 1826; Clarke in Hook. f. Fl. Brit. India 2: 618. 1879; Duthie, Fl. Gangetic Plain 1: 370. 1903; Chakravarty in Fl. India Fasc. 11: 92. 1982. *Muricia cochinchinensis* Lour. Fl. Cochinch. 2: 596. 1790.

Perennial, extensive climbers, with tuberous roots. Leaves 10-20 × 10-20 cm, suborbicular, usually 3(-5)-lobed, emarginate at base, with umbilicate glands; lobes ovate-oblong or lanceolate, divergent, entire. Flowers whitish-yellow or pale-yellow. Bracts c. 3.5 × 4.5 cm, sessile, cucullate, orbicular-reniform, retuse, emarginate at the base, outer surface villous. Fruits 10-15 cm long, ovoid, fleshy, acute, densely aculeate, red. Seeds 22-25 × 16-25 mm, ashy-grey, ovate, sculptured, undulate-sublobulate.

Fl. & Fr. : August - October.

Rare, in wastelands. Included on the authority of Sankhala (1951).

4. *Momordica dioica* Roxb. ex Willd. Sp. Pl. 4: 605. 1805; Clarke in Hook. f. Fl. Brit. India 2: 617. 1879; Duthie, Fl. Gangetic Plain 1: 370. 1903; Chakravarty in Fl. India Fasc. 11: 94. 1982. '*Kankero, Jangli-karela*' (Hindi).

Perennial climbers, with tuberous roots. Leaves 3.5-10.0 × 2.5-7.5 cm, membranous, ovate, mucronate, deeply emarginate at base, entire or 3 to 5-lobed; lobes triangular-ovate or oblong, denticulate, dotted on lower surface. Flowers yellow. Bracts 1.25-1.75 cm long, sessile, cucullate, orbicular-reniform, margins entire, sometimes ciliated. Fruits 2.5-5.5 × 2.5-3.0 cm, ellipsoid or ovoid, beaked, densely echinate with soft spines. Seeds 5-7 × 4.5-5.5 mm, pyriform, attenuated at the base, rounded at the apex, slightly corrugate.

Fl. & Fr. : August - October.

Common on the hedges of cultivated fields, gardens and outskirts of forests.

Selected specimens : Banswara: Paloda, Singh 2846, 2847 A (BSJO); Jaipur: Amer, Sharma 308 (RUBL); Jodhpur: Barhi, Singh 4323 (BSJO); Kota: Shahabad, Majumdar 13216 (BSA); Tonk: Vijayapura, Shetty 1228 (BSJO).

13. TRICHOSANTHES L.

- | | |
|--|-------------------------|
| 1a. Male flowers solitary or bijugate. Anthers free. | 5. <i>T. dioica</i> |
| 1b. Male flowers in racemes. Anthers connate: | |
| 2a. Flowers bracteate. Fruits globose or elongate-cylindric: | |
| 3a. Fruits globose, red: | |
| 4a. Leaves entire. Roots tuberous. Bracts entire. Seeds belted. | 3. <i>T. cordata</i> |
| 4b. Leaves denticulate. Roots not tuberous. Bracts lacinate. Seeds straight, not belted. | 2. <i>T. bracteata</i> |
| 3b. Fruits elongate cylindric, bright orange. | 1. <i>T. anguina</i> |
| 2b. Flowers ebracteate. Fruits ovoid or conical. | 4. <i>T. cucumerina</i> |

1. *Trichosanthes anguina* L. Sp. Pl. 1008. 1753; Clarke in Hook. f. Fl. Brit. India 2: 610. 1879; Duthie, Fl. Gangetic Plain 1: 364. 1903; Chakravarty in Fl. India Fasc. 11: 108. 1982. *Cucumis anguina* L. Syst. ed. 10. 1279. 1759. 'Chachinda' (Hindi).

Annual climbers. Leaves 8-14 × 10-16 cm, broadly ovate-cordate or orbicular-reniform, denticulate, 3 to 5-angled or lobed, scabrid on both the surfaces. Tendrils 2 to 3-fid. Flowers white. Bracts minute, entire. Fruits 25-80 (-150) cm long, often coiled, smooth with 7-8 white stripes along the length. Seeds c. 15 × 8 mm, oblong, finely rugulose, undulate.

Fl & Fr. : July - October.

Occasionally found in wastelands, particularly on the boundaries of fields and gardens. Often cultivated for the fruits cooked as vegetable.

Selected specimen : Kota: Kelwara, Singh 74038 (LWG). Also reported from Pilani (Majumdar, 1969).

2. *Trichosanthes bracteata* (Lam.) Voigt, Hort. Suburb. Calc. 58. 1845; Chakravarty in Fl. India Fasc. 11: 109. 1982. *Modecca bracteata* Lam. Encycl. 4: 210. 1796. *Trichosanthes palmata* Roxb. Fl. Ind. 3: 704. 1832; Clarke in Hook. f. Fl. India 2: 606. 1879; Duthie, Fl. Gangetic Plain 1: 363. 1903. 'Lal-Indrayan' (Hindi).

Climbers. Leaves membranous, glabrous, 5-25 cm in diam., broadly ovate or suborbicular, palmately 3 to 5 (-7)-lobed, deeply cordate. Tendrils robust, 3-fid. Flowers white. Bracts 2.5-3.5 cm long, ovate, deeply-cut. Fruits 3-6 cm across, bright red, with 10 longitudinal streaks. Seeds c. 10 × 5 mm, many, ovate-oblong, smooth, immarginate, attenuate at the base, white.

Fl. & Fr. : August - November

Common in the east of Aravalli in wastelands, fringes of forests and at the foot of hills.

Selected specimens : Banswara: Kalingra, Kanodia 75651 (BSI); Loharia forest, Singh 3016 (BSJO); Bundi: Bhati-Bagia, Singh 74679 (LWG); Kota: Shahabad, Verma 465, 677 (BSA); Pali: Lampi, Shetty 1871 (BSJO); Tonk: Toda Rai Singh R.F., Shetty 1307 (BSJO).

3. *Trichosanthes cordata* Roxb. Fl. Ind. 3: 703. 1832; Clarke in Hook. f. Fl. Brit. India 2: 608. 1879; Duthie, Fl. Gangetic Plain 1: 363. 1903; Chakravarty in Fl. India Fasc. 11: 110. f. 1-2. 1982. *T. microsiphon* Kurz in Journ. As. Soc. Beng. 2: 308. 1872.

Extensive climbers. Leaves 10-20 × 8-10 cm, membranous, broadly ovate-cordate, 3 to 5-angled. Tendrils robust, sulcate. Flowers white. Bracts c. 3.75 × 1.4 cm, villose-hirsute. Fruits 5-7 cm across, bright red. Seeds peculiar, c. 10.0 × 4.5 mm, transversely broad, belted at the middle, belt with raised margins.

Fl. & Fr. : July - October.

Rare, in wastelands and open forests.

Selected specimen : Jhalawar; Wadhwa 9463 (CAL).

4. *Trichosanthes cucumerina* L. Sp. Pl. 1008. 1753; Clarke in Hook. f. Fl. Brit. India 2: 609. 1879; Duthie, Fl. Gangetic Plain 1: 364. 1903; Mahesh. Illus. Fl. Delhi f. 88. 1966; Chakravarty in fl. India Fasc. 11: 112. 1982. '*Jangli-chichinda, Jangli-palval*' (Hindi).

Annual climbers. Leaves 5-10 × 5-10 cm, broadly ovate or orbicular-reniform, denticulate, deeply 5 to 7-lobed. Tendrils slender, 2 to 3-fid. Flowers white. Fruits c. 5.0 × 3.5 cm, 8 to 10-seeded. Seeds c. 10 × 6 mm, ovate-oblong, compressed, undulate, truncate, base attenuate.

Fl. & Fr. : August - October.

Common in the east of Aravalli, particularly in wastelands.

Selected specimens : Banswara: Ghatol, *Kanodia* 75506 (BSI), Singh 2937 (BSJO); Jhalawar: Aklera, *Wadhwa* 7517 (BSA); Kota: Darah, Singh 74605, 74807 (LWG), Verma 464 (BSA); Udaipur: *Kanodia* 82553 (BSI).

5. *Trichosanthes dioica* Roxb. Fl. Ind. 3: 701. 1832; Clarke in Hook. f. Fl. Brit. India 2: 609. 1879; Duthie, Fl. Gangetic Plain I: 364. 1903; Chakravarty in Fl. India Fasc. 11: 114. 1982. '*Palwal*' (Hindi).

Annual, scabrous climbers. Leaves c. 8 × 6 cm, cordate, ovate-oblong, acute, sinuate-dentate, scabrous, basal lobes narrow, rounded. Tendrils short, slender. Flowers white, fimbriate. Fruits 5-10 × 2-5 cm, oblong; glabrous, smooth, green or orangish-red mottled with white. Seeds c. 5 × 5 mm, globose.

Fl. & Fr. : April - July.

Rare, found as an escape from cultivation near habitations.

Selected specimen : Jhalawar: *Wadhwa* 9463 (BSA).

DOUBTFUL TAXON

Dicaelosperma ritchiei Clarke in Hook. f. Fl. Brit. India 2: 630. 1879; Chakravarty in Fl. India Fasc. 11: 47. 1982.

This taxon was collected from Chittorgarh (Semva, Jain 55956 BSA). The specimens were not worthy to confirm the identity, hence, considered doubtful in the present work. From distribution point of view, this taxon is endemic to India, distributed in Karnataka, Maharashtra, Punjab and Tamil Nadu. There are possibilities of its occurrence in Rajasthan.

CULTIVATED SPECIES

Cucumis melo L. var. *melo*. '*Kharbuja*' (Hindi) - Creeping or trailing, hirsute herbs, with broadly ovate-cordate, 3 to 5-angled or lobed leaves, yellow flowers and fruits of various shape and size with free placentae and seeds in the central cavity when mature. Usually cultivated in sandy riverbeds for sweet edible fruits.

Cucumis sativus L. '*Khira, Balam Kakri*' (Hindi) - Creeping or climbing, hirsute herbs with palmately 3 to 5-lobed leaves, yellow flowers and 10-30 cm long, elongate-cylindric, smooth or tuberculate fruits. Cultivated for its edible fruits.

Cucurbita moschata (Duch. ex Lam.) Duch. ex Poir. (*C. pepo* L. var. *moschata* Duch. ex Lam.) '*Sitaphal, Mitha Kaddu*' (Hindi) - Annuals, with

5 to 7-angled or lobed leaves, multifid tendrils, yellow flowers and oblong or subglobose fruits. Cultivated for the fruits cooked as vegetable.

Cucurbita pepo L. '*Vilayti kaddu, Khola*' (Hindi) Annual, hispid herbs, with 5-lobed leaves having club-shaped glandular hairs beneath, yellow flower and furrowed fruits of variable shape and fibrous pulp. Occasionally cultivated for its fruits.

Lagenaria siceraria (Molina) Standl. (*Cucurbita siceraria* Molina) '*Lauki, Kaddu, Tumri*' (Hindi) Climbing herbs, with angular or shortly 3-lobed leaves, white flowers and bottle-shaped fruits. Cultivated for the fruits cooked as vegetable.

61. PASSIFLORACEAE

(P.J. Parmar)

PASSIFLORA L.

Passiflora foetida L. Sp. Pl. 959. 1753; Mast. in Hook. f. Fl. Brit. India 2: 599. 1879; Raizada, Suppl. Duthie, Fl. Gangetic Plain 80. 1976.

Slender, foetid-smelling twiners. Leaves 3.7-7.4 cm long and broad, palmately 3-lobed, denticulate, ciliate with gland-tipped hairs on the margins. Flowers axillary, solitary, white. Fruits globose, orange when ripe. Seeds numerous.

Fl. & Fr. : July - January.

Native of Tropical America; naturalized in the east of Aravalli in wastelands, particularly along the boundaries of fields and gardens.

Selected specimens : Ajmer: Ajmer ghati, Sharma 680 (DD); Bhilwara: Singh 6031 (BSJO); Jaipur: Wadhwa 9364 (BSA); Jhalawar: Verma 6874 (BSA); Kota: Singh 90269 (LWG).

62. CARICACEAE

(P.J. Parmar)

CARICA L.

Carica papaya L. Sp. Pl. 1036. 1753. '*Papita*' (Hindi).

Soft-wooded, dioecious trees, with usually unbranched trunk and milky sap. Flowers cream-coloured, staminate ones in drooping panicles, pistillate in small clusters. Fruits oblong, yellow when ripe.

Native of West Indies and Central America; cultivated in the gardens, orchards and shrubberies around bungalows.

63. BEGONIACEAE

(P.J. Parmar)

BEGONIA L.

Begonia trichocarpa Dalz. in Kew Journ. Bot. 8: 230. 1851; Clarke in Hook. f. Fl. Brit. India 2: 653. 1879; Cooke, Fl. Bombay 1: 550. 1903.

Succulent herbs. Leaves 5-10 × 3.7-7.5 cm, ovate, acute or subacute, more or less pubescent, irregularly sinuate-dentate, lacerate and denticulate on the margins, palmately 7 to 9-nerved. Peduncles longer than the petioles, 4 to 6 flowered at the apex. Flowers monoecious, white. Capsules 3-celled, with 3, almost equal, obtuse, ciliate wings. Seeds ellipsoid.

Fl. & Fr. : August - December.

Rare, in wastelands.

Selected specimen : Sirohi: Mt. Abu, Mehta 1107 (JAC).

64. CACTACEAE

(P.J. Parmar)

OPUNTIA MILL.

- | | |
|---|-------------------------|
| 1a. Spines falling, except the large one on each cushion. | 3. <i>O. monacantha</i> |
| 1b. Several large spines remaining on each cushion: | |
| 2a. All spines straight, slender tawny or purplish black. | 2. <i>O. elatior</i> |
| 2b. Some spines curved, the largest stout, light brown coloured in the field, darkening in herbaria with age. | 1. <i>O. dilleanii</i> |

1. **Opuntia dilleanii** (Ker-Gawler) Haworth, Suppl. Pl. Succ. 79. 1819; Clarke in Hook. f. Fl. Brit. India 2: 657. 1879, *pro parte*; Raizada, Suppl. Duthie, Fl. Gangetic Plain 82. 1976.

Low, spreading bush; branches flat, jointed, more or less obovate, undulate, dull bluish green. Flowers yellow. Berries pear-shaped, depressed, with spine-bearing tubercles near the apex, deep purplish or dull carmine when ripe.

Fl. & Fr. : January - May.

Native of Mexico; naturalised in wastelands, also planted for fencing.

Selected specimens : Banswara: Dagia Bowji, Singh 2853 (BSJO); Churu: Near Ratangarh, Roy 2576 (BSJO); Tonk: on hills (near Kaccha bundha), Pandey 4792 (BSJO).

2. **Opuntia elatior** Mill. Gard. Dict. ed. 8. 4. 1768; Raizada, Suppl. Duthie, Fl. Gangetic Plain 83. 1976. *O. dillenii auct. plur.* non Haw. 1819; Grah. Cat. Bombay Pl. 546. 1839; Clarke in Hook. f. Fl. Brit. India 2: 657. 1879, *pro parte*; Duthie, Fl. Gangetic Plain 1: 384. 1903.

Large, succulent, spiny shrubs. Stem jointed, flat, ovate-oblong. Areoles with 2-5 spines. Flowers yellow, soon turning rose pink. Stamens purple. Fruits red when ripe, marked with areoles, but bristles and spines deciduous.

Fl. & Fr. : January - June.

Native of Tropical America; naturalised in wastelands in sandy as well as rocky habitats. Often cultivated for fencing.

Selected specimens : Bhilwara: Meja dam, Singh 7134 (BSJO); Ganganagar: Kumbharwali, Roy 3921 (BSJO); Pali: Near Ranakpur, Shetty 1614 (BSJO).

3. **Opuntia monacantha** (Willd.) Haworth, Suppl. Pl. Succ. 81. 1819. *Cactus monacantha* Willd. Enum. Pl. Berol. Suppl. 33. 1813. *C. indicus* Roxb. Fl. Ind. 2: 475. 1832. *Opuntia vulgaris auct.*, non Mill. 1768; Raizada, Suppl. Duthie, Fl. Gangetic Plain 83. 1976.

Erect, widely branched, succulent shrubs. Stem jointed, much compressed, obovate to oblanceolate, bright green. Areoles bearing only 1-3 spines of which only one persistent. Leaves linear, subulate, caducuous or absent. Flowers large, 5-7 cm long, solitary. Fruits green or red, nearly smooth.

Native of Tropical America; rare, naturalised in S.E. Rajasthan in dry wastelands.

Selected specimen : Kota: Majumdar 10434 (BSA).

CULTIVATED SPECIES

Opuntia cochenillifera (L.) Mill. (*Cactus cochenillifera* L.) - Arbore-scent, with definite cylindrical trunk and ascending, flattened, fleshy branches. Flowers red. Stamens exerted. Fruits red. Native of Tropical America; rarely planted in the hedges of gardens.

65. AIZOACEAE (FICOIDEAE)

(P.J. Parmar)

1a. Style 1.

2. *Trianthema*

1b. Styles 2-3:

- 2a. Flowers solitary. Operculum entire, not splitting. Seeds more than 4. 1. *Sesuvium*
- 2b. Flowers glomerulate. Operculum splitting into 2-valves. Seeds 4. 3. *Zaleya*

1. SESUVIUM L.

- Stem smooth, rooting at the nodes. Flowers pedicellate. Styles 3. 1. *S. portulacastrum*
- Stem usually rough-warty, not rooting at the nodes. Flowers sessile. Styles 2. 2. *S. sesuviodes*

1. *Sesuvium portulacastrum* (L.) L. Syst. Nat. ed. 10. 1058. 1759; Clarke in Hook. f. Fl. Brit. India 2: 659. 1879; Puri *et al.*, Fl. Raj. 66. 1964. *Portulaca portulacastrum* L. Sp. Pl. 446. 1753.

Perennial, fleshy, prostrate herbs. Leaves 0.8-1.3 × 0.4-0.6 cm, elliptic-oblong, minutely punctate, glabrous. Flowers axillary, solitary, bright pink or purple. Capsules oblong, apiculate, circumscissile. Seeds numerous, black.

Fl. & Fr. : Almost throughout the year.

Rare, in moist and muddy soils in the west of Aravalli.

Selected specimen : Jaisalmer: Buddi Nala, *Wadhwa* 4980 (BSA). Also reported from Jodhpur by Sarup (1951).

2. *Sesuvium sesuviodes* (Fenzl.) Verdc. in Kew Bull. 12: 349. 1957; Raizada, Suppl. Duthie, Fl. Gangetic Plain 85. 1976. *Diplochonium sesuviodes* Fenzl. Nov. Strip. Dec. 7: 58. 1839 & in Ann. Wien. Mus. 2: 292. 1839. *Trianthema hydasypica* Edgew. in Journ. Linn. Soc. Bot. 6: 203. 1862; Clarke in Hook. f. Fl. Brit. India 2: 661. 1879.

Prostrate, succulent herbs. Leaves fleshy, 1.8-4.5 × 0.4-1.0 cm, linear, obovate-oblong or spatulate-oblong. Flowers axillary, solitary, purple red or pink. Capsules dehiscent by conical cap. Seeds rugose, chocolate black.

Fl. & Fr. : August - November.

Common in moist saline habitats throughout the state.

Selected specimens : Barmer: Salt area, *Bhandari* 407 (JAC); Bikaner: Near Bap, *Roy* 2001 (BSJO); Jaisalmer: Falsoond, *Tiwari* 742 (BSJO); Jodhpur: Malar, *Singh* 3229 (BSJO). Also reported from Ajmer (Raizada & Sharma, 1962), Jaipur (Bajpai & Verma, 1964) and Jhunjhunu (Nair, 1956).

2. TRIANTHEMA L.

Flowers in clusters. Stamens 5.

2. *T. triquetra*

Flowers solitary. Stamens 10 or more.

1. *T. portulacastrum*

1. *Trianthema portulacastrum* L. Sp. Pl. 223. 1753; Mahesh. Illus. Fl. Delhi f. 93. 1966. *T. monogyna* L. Mant. 69. 1767; Clarke in Hook. f. Fl. Brit. India 2: 660. 1879; Duthie. Fl. Gangetic Plain 1: 385. 1903.

Procumbent or prostrate herbs. Leaves 1.0-4.0 × 0.5-3.5 cm, opposite, obovate to rounded or spatulate, obtuse or retuse at apex, obtuse or cuneate at base. Flowers axillary, white to pink. Capsules slightly mitriform-oblique, circumscissile. Seeds 5-10, lenticular, reniform, black.

Fl. & Fr. : August - December.

Common weed in waste places, gardens and cultivated fields.

Selected specimens : Banswara: Singh 3019 (BSJO); Bhilwara: Badnor, Singh 6299 (BSJO); Jaisalmer: Amarsagar, Tiwari 842 (BSJO); Kota: Dadabari, Singh 90519 (LWG); Sirohi: Mt. Abu, Blatter 19911 (BLAT).

2. *Trianthema triquetra* Rottl. ex Willd. in Ges. Nat. Fr. Neue Schr. 4: 181. 1803. *Trianthema crystallina auct. plur.* non Vahl 1790; Clarke in Hook. f. Fl. Brit. India 2: 660. 1879; Duthie, Fl. Gangetic Plain 1: 385. 1903.

Prostrate, succulent, annual herbs. Leaves 0.5-1.8 × 0.3-0.5 cm, linear or lanceolate, dilated at the base into a semi-amplexicaule sheath. Flowers axillary, white to pink. Capsules enclosed by perianth-tube. Seeds orbicular, brownish-black.

Fl. & Fr. : August - December.

Common in gravelly and saline soils, particularly in the west of Aravalli.

Selected specimens : Barmer: Sajyali salt bed, Tiwari 986 (BSJO); Bharatpur: Ghana, Jain 54958 (BSA); Bhilwara: Badnor, Singh 6464 (BSJO); Ganganagar: Gharsana, Roy 3809 (BSJO); Jaipur: Chaksu, Sharma 1701 (RUBL); Pali: Khokhra dam, Shetty 1846 (BSJO).

3. ZALEYA BURM.F.

Stamens 5.

2. *Z. govindia*

Stamens 10 or more.

1. *Z. decandra*

1. *Zaleya decandra* (L.) Burm. f. Fl. India 110. t. 31. f. 3. 1768. *Trianthema decandra* L. Mant. 1: 70. 1767; Clarke in Hook. f. Fl. Brit. India 2: 661. 1879; Cooke, Fl. Bombay 1: 555. 1903.

Spreading, prostrate or decumbent herbs. Leaves 0.5-2.0 × 0.2-1.2 cm, elliptic-oblong or slightly obovate. Flowers in axillary fascicles, pink. Capsules 0.3-0.4 cm long. Seeds orbicular or reniform, compressed, rugulose.

Fl. & Fr. : July - December.

Common weed in the gardens, road sides and ruderal habitats.

Selected specimens : Bharatpur: Manderu, *Khisti* 59904 (BSI). Ganganagar: Suratgarh, *Puri* 44401 (BSI); Jaisalmer: Pokran, *Jain* 40716 (BSI); Jaipur: Amber hills, *Lal* 34618 (LWG); Sirohi: *Jain* 48750 (BSI).

2. *Zaleya govindia* (Buch. Ham. ex G. Don) Nair in Bull. bot. Surv. India 8: 86. 1966. *Trianthema govindia* Buch. - Ham. ex G. Don, Gen. Syst. 3: 72. 1834. *T. pentandra* auct. non L. 1767; Clarke in Hook. f. Fl. Brit. India 2: 660. 1879; Duthie, Fl. Gangetic Plain 386. 1903.

Decumbent herbs, somewhat woody at base. Leaves 1.0-3.5 × 0.5-2.0 cm, opposite, oblanceolate, elliptic, obtuse to rounded at apex, cuneate or rounded at base. Flowers in axillary, sessile clusters, pinkish. Capsules 0.4-0.5 cm long, operculum-top saucer-shaped, edges rather sharp, yellow or red.

Fl. & Fr. : July - December.

Common weed in gardens, road sides and other ruderal habitats, particularly in the west of Aravalli.

Selected specimens : Barmer: Sheo, *Tiwari* 903 (BSJO); Bhilwara: Malwala village, *Singh* 7053 (BSJO); Jodhpur: Near Kharda Randhir village, *Shetty* 215 (BSJO); Pali: Hemawas dam, *Shetty* 1359 (BSJO); Tonk: Haji ki Kothi, *Shetty* 1245 (BSJO); Kota: *Wadhwa* 9474 (BSA).

66. MOLLUGINACEAE

(P.J. Parmar)

- | | |
|--|-----------------------|
| 1a. Raphids very distinct in leaves and sepals. Carpels free. | 2. <i>Gisekia</i> |
| 1b. Raphids absent. Carpels united: | |
| 2a. Plants usually viscid-glandular hairy. Ovary bicarpillary, with 2 stigmas. Fruit a schizocarp, splitting into 2 mericarps when ripe. | 4. <i>Limeum</i> |
| 2b. Plants never viscid-glandular hairy. Ovary 3 to 5-carpellate, with 3-5 stigmas. Fruits a loculicidal capsule: | |
| 3a. Leaves alternate. Staminodes petaloid. | 1. <i>Corbichonia</i> |
| 3b. Leaves opposite or whorled. Staminodes absent: | |

- 4a. Flowers in axillary fascicles. Seeds appendaged. 3. *Glinus*
 4b. Flowers in terminal paniculate cymes. Seeds not
 appendaged. 5. *Mollugo*

1. CORBICHONIA SCOPOLI

Corbichonia decumbens (Forssk.) Exell in Journ. Bot. 73: 80. 1935; Raizada, Suppl. Duthie, Fl. Gangetic Plain 84. 1976. *Orygia decumbens* Forssk. Fl. Aegypt. Arab. 103. 1775; Clarke in Hook. f. Fl. Brit. India 2: 661. 1876.

Glabrous herbs, with somewhat angular or trigonous stems. Leaves 1.0-5.2 × 0.5-2.5 cm, fleshy, obovate or obovate-oblong, cuspidate. Flowers in terminal and leaf-opposed, lax cymes. Capsules globose, pale yellow, 5-valved. Seeds many, reniform, somewhat compressed, strophiolate, brownish-black.

Fl & Fr. : August - September.

Common in sandy as well as rocky habitats, particularly in western parts of the state.

Selected specimens : Ajmer: Beawar, Sharma 1076 (LWG); Barmer: Keradu hillocks, Tiwari 942 (BSJO); Jaisalmer: Sotali tank (Pokran), Tiwari 762 (BSJO); Jodhpur: Kui, Singh 3158 (BSJO).

2. GISEKIA L.

Flowers in laxly pedunculate, few-flowered umbels; peduncles and pedicels filiform.

2. *G. pharnaceoides* var.
pseudopaniculata

Flowers in crowded, 10 to 30-flowered cymes. Peduncles and pedicels not filiform.

1. *G. pharnaceoides* var.
pharnaceoides

1. **Gisekia pharnaceoides** L. Mant. Alt. 2: 562. 1771; Wight, Ic. 4(1): 1. t. 1167. 1848; Clarke in Hook. f. Fl. Brit. India 2: 664. 1879; Duthie, Fl. Gangetic Plain 1: 388. 1903.

var. **pharnaceoides**

Diffuse or suberect herbs. Leaves 1-3 × 0.3-0.4 cm, linear-oblong or linear-lanceolate, fleshy. Flowers in pedunculate, umbelliform, crowded to lax, 10 to 30-flowered cymes, greenish white. Carpels 5, membranous, one-seeded, surrounded by sepals. Seeds subreniform, compressed, black.

Fl & Fr. : August - November.

Common weed in wet habitats, particularly in western Rajasthan.

Selected specimens : Barmer: Lecladhora, *Tiwari* 956 (BSJO); Ganganagar: Bonde, *Roy* 3840 (BSJO); Jodhpur: Khirja, *Singh* 3120 (BSJO); Pali: Near Sojat road, *Shetty* 1811 (BSJO); Tonk: Niwai tank, *Pandey* 4755 (BSJO).

2. var. *pseudopaniculata* Jeffrey in Kew Bull. 14: 35. 1960; Bhandari, Fl. Indian Desert 179. 1978.

Differs from type variety in having laxly pedunculate, few-flowered umbels; peduncles being filiform, cymosely branched and pedicels filiform, 3-13 mm long. Sepals 1.0-1.8 mm long in fruit.

Fl & Fr. : August - November.

Rare, in the west of Aravalli in desertic habitats.

Selected specimens : Barmer: *Bhandari* 1555 (JAC); Jaisalmer: Near Chandan, *Shetty* 3349 A (BSJO); Jodhpur: *Bhandari* 1225 (JAC), *Varvani* 43/177, 178 (JAC).

3. GLINUS L.

Densely stellately hairy herbs. Stamens more than 10.

1. *G. lotoides*

Glabrous herbs. Stamens 3.

2. *G. oppositifolius*

1. *Glinus lotoides* L. Sp. Pl. 463. 1753; Mahesh. Illus. Fl. Delhi f. 90. 1966. *Mollugo hirta* Thunb. Prodr. Pl. Cap. 24. 1794; Clarke in Hook. f. Fl. Brit. India 2: 662. 1879; Duthie, Fl. Gangetic Plain 1: 386. 1903.

Radically spreading, prostrate herbs. Leaves 0.4-2.0 × 0.3-0.5 cm, obovate or suborbicular. Flowers in axillary fascicles, greenish-white. Capsules ovoid, enclosed in persistent calyx. Seeds minute, reniform, faintly tuberculate, dark brown to black.

Fl & Fr. : Almost throughout the year.

Common in the dried muddy beds of water reservoirs.

Selected specimens : Bhilwara: Bhojpura, *Singh* 7046 (BSJO); Bikaner: Gharsisar tank, *Roy* 1680 (BSJO); Jhalawar: Shyangarh, *Majumdar* 10135 (BSA); Jodhpur: Luni river-bed, *Shetty* 1009 (BSJO); Sirohi: Mt. Abu, *Blatter* 19506 (BLAT).

2. *Glinus oppositifolius* (L.) DC. in Bull. Herb. Boiss. ser. 2. 1: 559. 1901. *Mollugo oppositifolia* L. Sp. Pl. 89. 1753; Duthie, Fl. Gangetic Plain 1: 387. 1903. *M. spargula* L. Syst. ed. 10. 881. 1759; Clarke in Hook. f. Fl. Brit. India 2: 662. 1879.

Dichotomously branched, decumbent herbs. Leaves 1.0-1.8 × 0.1-0.4 cm, spatulate-elliptic, whorled. Flowers in axillary fascicles, white. Capsules ellipsoid. Seeds reniform, dark-brown.

Fl & Fr. : Throughout the year.

Common in moist sandy grounds, particularly in the east of Aravalli in river-beds.

Selected specimens : Alwar: Siliserh, *Lal* 34550 (LWG); Banswara: Nathela tank, *Kanodia* 75347 (BSI); Bhilwara: Bhimar village, *Singh* 5984 (BSJO). Also reported from Jhunjhunu (Nair & Kanodia, 1959) and from Udaipur (Vyas, 1965 & Ramdeo, 1969).

4. LIMEUM L.

Limeum indicum Stocks ex T. Anders. in Journ. Linn. Soc. Bot. 5 (Suppl. 1): 30. 1860; Clarke in Hook. f. Fl. Brit. India 2: 664. 1879; Raizada, Suppl. Duthie, Fl. Gangetic Plain 84. 1976.

Prostrate herbs. Leaves 2.5 × 1-2 cm, broadly-elliptic or rotundate, mucronate. Flowers in crowded, sessile or subsessile, axillary cymes, white. Petals shorter than the sepals. Fruits subglobose, 2-seeded. Seeds reniform, longer than broad, compressed, whitish.

Fl & Fr. : August - October.

Common in sandy and gravelly habitats, particularly in the west of Aravalli.

Selected specimens : Ajmer: Beawar, *Sharma* 1619 (DD); Bikaner: Bhikampur, *Roy* 2009 (BSJO); Churu: Sardarshar, *Roy* 2644 (BSJO); Jaisalmer: near Shahagarh, *Shetty* 3468 (BSJO); Jodhpur: Phalodi, *Singh* 4364 (BSJO).

5. MOLLUGO L.

1a. Leaves radical only.

2. *M. nudicaulis*

1b. Leaves both radical and cauline:

2a. Stem almost filiform; branches umbellate. Seeds smooth or nearly so.

1. *M. cerviana*

2b. Stem rigid; branches dichotomously arranged. Seeds prominently tuberculate.

3. *M. pentaphylla*

1. *Mollugo cerviana* (L.) Seringe in DC. Prodr. 1: 392. 1824; Clarke in Hook. f. Fl. Brit. India 2: 663. 1879; Duthie, Fl. Gangetic Plain 1: 387. 1903; Mahesh. Illus. Fl. Delhi f. 91. 1966.

Erect, annual, glabrous herbs; stems many, with thickened nodes. Leaves sessile. 0.5-1.5 × 0.1-0.3 cm, linear, spatulate. Flowers in axillary and terminal, trichotomously branched cymes, white. Capsules broadly ellipsoid, glabrous. Seeds reniform blackish-brown.

Fl. & Fr. : July - November.

Common in sandy or fine gravelly soils, in wastelands and as a weed in cultivated fields, particularly in the desertic zones.

Selected specimens : Barmer: Sheo fields, *Tiwari* 909 (BSJO); Bharatpur: *Jameson* 11/18 (DD); Bikaner: on the way to Bhikampur, *Roy* 2006 (BSJO); Nagaur: Sambhar lake, *Lal* 34831 (LWG).

2. *Mollugo nudicaulis* Lam. *Encycl.* 4: 234. 1797; Clarke in Hook. f. *Fl. Brit. India* 2: 664. 1879; Duthie, *Fl. Gangetic Plain* 1: 388. 1903; Mahesh. *Rius. Fl. Delhi* f. 92. 1966.

Erect, annual, glabrous herbs. Leaves 0.5-4.6 × 0.3-1.2 cm, oblong-spathulate, glabrous. Flowers in terminal, paniculate cymes, white. Capsules ellipsoid or nearly globose, many-seeded, brown. Seeds reniform, dark-brown.

Fl. & Fr. : July - November.

Common weed on road sides, in open waste places and cultivated lands, particularly in the west of Aravalli; often found in dry crevices of rocks in the eastern part.

Selected specimens : Barmer: Luni river bed, *Shetty* 2208 (BSJO); Bikaner: Mud village, *Roy* 2048 (BSJO); Jaipur: Galta, *Sharma* 2271 (RUBL); Kota: Kishanganj, *Verma* 720 (BSA); Pali: Near Jawai dam, *Shetty* 1943 (BSJO).

3. *Mollugo pentaphylla* L. *Sp. Pl.* 89. 1753; Duthie, *Fl. Gangetic Plain* 1: 387. 1903. *M. stricta* L. *Sp. Pl. ed. 2.* 131. 1762; Clarke in Hook. f. *Fl. Brit. India* 2: 663. 1879.

Diffuse or suberect, annual herbs. Leaves sessile. 1.0-2.5 × 0.4-0.7 cm, linear to linear-lanceolate, glabrous. Flowers in terminal paniculate cymes, minute, white or pale. Capsules globose, glabrous. Seeds many, reniform, dark-brown.

Fl. & Fr. : July - November.

Common in wet and shady localities from plains to the hills, particularly in the east of Aravalli.

Selected specimens : Banswara: Jua falls, *Singh* 2991 (BSJO); Bhilwara: Mandalgarh, *Singh* 5712 (BSJO); Jaipur: *Sharma* 3203 (RUBL);

Jhalawar: Kokand-dam, *Wadhwa* 5444 (BSA); Kota: Shahabad, *Majumdar* 13172 B (BSA).

67. APIACEAE (UMBELLIFERAE nom. Alt.)

(P.J. Parmar)

- | | |
|--|------------------------|
| 1a. Leaves and umbels simple. | 2. <i>Cestella</i> |
| 1b. Leaves and umbels compound: | |
| 2a. Ovary and fruits hairy or bristly. | 6. <i>Psammogelata</i> |
| 2b. Ovary and fruits glabrous: | |
| 3a. Mericarps with winged margins: | |
| 4a. Leaves pinnate or bipinnate, ultimate leaf-segments lanceolate-oblong to oblanceolate. | 4. <i>Peucedanum</i> |
| 4b. Leaves tripinnate, ultimate leaf-segments filiform. | 1. <i>Anethum</i> |
| 3b. Mericarps not with winged margins: | |
| 5a. Fruits laterally compressed. | 5. <i>Pimpinella</i> |
| 5b. Fruits not laterally compressed: | |
| 6a. Fruits ellipsoid; lateral ridges large, triangular, corky. | 3. <i>Oenanthe</i> |
| 6b. Fruits subglobose; ridges thick but not corky. | 7. <i>Seneli</i> |

1. ANETHUM L.

Anethum graveolens L. Sp. Pl. 263. 1753. *A. sowa* Roxb. ex Flem. in As. Res. 11: 156. 1810; Wight, Ic. 2(3): 5. t. 572. 1842. *Peucedanum graveolens* (L.) Benth. & Hook. f. Gen. Pl. 1: 913. 1867; Clarke in Hook. f. Fl. Brit. India 2: 709. 1879; Duthie, Fl. Gangetic Plain 1: 396. 1903. 'Sowa' (Hindi).

Perennial, tall, glaucous green herbs. Leaves 2-3 pinnate, ultimate segments 0.4-1.2 cm long, linear. Flowers in decomposed, terminal umbels, yellow. Fruits 0.4-0.6 cm long, dorsally compressed.

Fl & Fr. : December - March.

Common weed in winter crops, particularly fodder ones. Also cultivated for culinary and medicinal purposes.

Selected specimens : Barmer: Luni river bed (Bhujawas), *Tiwari* 1142 (BSJO); Churu: On Dungargarh road, *Roy* 4016 (BSJO); Jodhpur: Mandore, *Jain* 49411 (BSI); Kota: Baran, *Singh* 90468 (LWG).

2. CENTELLA L.

Centella asiatica (L.) Urban in Mart. Fl. Bras. 11: 287. t. 78. f. 1. 1897. *Hydrocotyle asiatica* L. Sp. Pl. 234. 1753; Wight, Ic. 2(3): 5. t. 565. 1842; Clarke in Hook. f. Fl. Brit. India 2: 669. 1879; Duthie, Fl. Gangetic Plain 1: 391. 1903. 'Brahmi-Buti' (Hindi).

Creeping herbs. Leaves 2-4 cm in diam., broadly suborbicular to reniform, glabrous. Flowers in axillary, fasciculate umbels, pink to red. Fruits 0.4-0.5 cm long, ovoid, reticulately wrinkled, primary and secondary ridges distinct.

Fl & Fr. : Almost throughout the year.

Common in moist places, particularly in eastern parts of the state.

Selected specimens : Bhilwara: Nahar Sagar, Singh 7172 (BSJO); Chittorgarh: Pratapgarh, Verma 291 (BSA); Jhalawar: Sharma 545 (RUBL); Kota: Wadhwa 9311 (BSA); Sirohi: Mt. Abu, Blatter 19557 (BLAT).

3. OENANTHE L.

Oenanthe javanica (Blume) DC. Prodr. 4: 138. 1830. *Sium javanicum* Blume, Bijdr. Fl. Ned. Ind. 15: 881. 1826. *Phelandrium stoloniferum* Roxb. Fl. Ind. 2: 93. 1832. *Oenanthe stolonifera* (Roxb.) Wail. ex DC. Prodr. 4: 138. 1830; Wight, Ic. 2(3): 5. t. 571. 1842; Clarke in Hook. f. Fl. Brit. India 2: 696. 1879; Duthie, Fl. Gangetic Plain 1: 395. 1903.

Perennial herbs; stem creeping below, ascending or erect upwards, fistular. Leaves 1-2 pinnate, with shallowly serrate or pinnati-lobed-fid to partite leaflets. Flowers in terminal or leaf-opposed umbels, white. Fruits 0.2-0.3 cm long, with swollen ribs.

Fl & Fr. : During cold season.

Rare, in marshy area. Included on the authority of Dhillon & Bajwa (1969) and Dhillon & Bhandari (1973) who reported it from Ganganagar district.

4. PEUCEDANUM L.

Peucedanum dhana Buch. - Ham. var. *dalzellii* Clarke in Hook. f. Fl. Brit. India 2: 709. 1879; Cooke, Fl. Bombay 1: 569. 1903. *Pastinaca glauca* Dalz. in Kew Journ. Bot. 4: 293. 1852.

Perennial, glaucous, glabrous herbs, with large, fusiform roots. Leaves radical, subcoriaceous, pinnately divided; leaflets 3-5, entire or deeply 2 to

3-lobed; lobes obovate-oblong, mucronate, entire. Flowers yellow. Fruits 0.9×0.6 cm, broadly elliptic; vittae linear, solitary between the ridges.

Fl & Fr. : July - November.

Included on the authority of Majumdar (1971), Raizada (1951) and Jain (1961) who reported it from Kota and Mt. Abu respectively.

5. PIMPINELLA L.

1a. Fruits hispidulous. 3. *P. involucrata*

1b. Fruits glabrous:

2a. Involucral bracts 5-6; bracteoles 3-5. 1. *P. acuminata*

2b. Involucral bracts absent; bracteoles 1-2. 2. *P. heyneana*

1. *Pimpinella acuminata* (Edgew.) Clarke in Hook. f. Fl. Brit. India 2: 686. 1879; Shetty *et al.* in Bull. bot. Surv. India 22: 78. 1982. *Reutera acuminata* Edgew. in Trans. Linn. Soc. Bot. 20: 52. 1851.

Glabrous herbs. Leaves bipinnate; secondary pinnae 2.5-5.0 cm long. Bracts and bracteoles linear. Flowers white with pinkish tinge. Fruits nearly globose, laterally compressed, with 2-3 vittae in each furrow, yellowish brown.

Fl. & Fr. : September - February.

Rare, in rocky habitats on Aravallis.

Selected specimens : Jalore: Suda hills, Vyas 5249, 6732 (BSJO); Sirohi: Mt. Abu, McCann s.n. (BLAT).

2. *Pimpinella heyneana* (DC.) Kurz in J. Asiat. Soc. Beng. 46: 115. 1877; Clarke in Hook. f. Fl. Brit. India 2: 684. 1879; Cooke, Fl. Bombay 1: 565. 1903. *Helioscadium heyneanum* DC. Prodr. 4: 106. 1830.

Annual herbs, with fusiform roots. Leaves cauline, trifoliolate; leaflets 4.0×1.5 cm, ovate, serrate, cuneate, sometimes lateral leaflets deeply divided. Flowers white or pale-pink. Fruits ovoid or subglobose.

Fl. & Fr. : November - January.

Rare, in rocky habitats at Mt. Abu.

Selected specimen : Sirohi: Mt. Abu, Blatter 19974 (BLAT). Also reported by Ahluwalia (1965) from Mt. Abu.

3. *Pimpinella involucrata* (Roxb. ex Flem.) Wt. & Arn. Prodr. 369. 1834; Mukerjee in Monogr. Syst. Bot. Missouri Bot. Garden 6: 52. 1982. *Apium involucratum* Roxb. ex Flem. Ind. Med. Pl. 11: 157. 1812; Wight, Ic. 2(3): 5. t. 567. 1842. *Carum strictocarpum* Clarke in Hook. f. Fl. Brit. India

2: 681. 1879; Duthie, Fl. Gangetic Plain 1: 392. 1903, including var. *hebecarpa*.

Glabrous or minutely hairy herbs, with fusiform roots. Leaves bipinnate; leaflets 2.5-6.2 × 0.7-2.0 cm, ovate-lanceolate, upper ones gradually becoming pinnatifid to pinnatisect, with narrowly linear or linear-lanceolate segments. Flowers white. Fruits 0.1-0.2 cm long, ovoid.

Fl & Fr. : September - December.

Rare, in rocky habitats. Included on the authority of Jain (1961) who reported it from Mt. Abu.

6. PSAMMOGETON EDGEW.

Psammogeton canescens (DC.) Vatke in App. ad. Ind. Sem. Hort. Berol. 3. 1876; Raizada, Suppl. Duthie, Fl. Gangetic Plain 87. 1976. *Athamantha canescens* DC. Prodr. 4: 155. 1830. *Psammogeton biternatum* Edgew. in Trans. Linn. Soc. Bot. 20: 57. 1841.

Annual, pubescent herbs. Leaves 1-2 pinnate; pinnae lacinate; segments of lower leaves ovate, pinnatifid into narrow lobes, of the upper narrowly cuneate and lacinate. Flowers whitish. Fruits \approx 0.2 cm long, ovate-oblong or lanceolate, thinly hairy.

Fl & Fr. : February - June.

Common, particularly in northern parts of Rajasthan.

Selected specimen : Ganganagar: Bhukarka, Roy 5964 (BSJO). Also reported from Alwar (Vyas, 1964, 67), Jhunjhunu (Nair & Kanodia, 1959; Nair *et al.*, 1961) and Udaipur (Vyas, 1967).

7. SESELI L.

Seseli diffusum (Roxb. ex Sm.) Sant. & Wagh in Bull. bot. Surv. India 5: 108. 1963. *Ligusticum diffusum* Roxb. ex Sm. in Rees, Cycl. 21: 11. 1812. *Seseli indicum* Wt. & Arn. Prodr. 371. 1834; Clarke in Hook. f. Fl. Brit. India 2: 693. 1879; Duthie, Fl. Gangetic Plain 1: 395. 1903.

Much-branched, erect or diffuse, pubescent or hairy herbs. Leaves 2-3 pinnate or partite; secondary segments ovate, lobed. Flowers white. Fruits subglobose or oblong, ridged, glabrous or hispid, stellately hairy at the apex.

Fl & Fr. : April - May.

Rare, found in drying ponds in the south-eastern parts of the state.

Selected specimen : Kota: Atru, Singh 91024 (LWG).

DOUBTFUL TAXA

Angelica glauca Edgew. in Trans. Linn. Soc. Bot. 20: 53. 1951; Clarke in Hook. f. Fl. Brit. India 2: 706. 1879.

The herbarium sheets of this species from Rajasthan are not represented in any Indian herbaria. This species was reported from Mt. Abu by Raizada (1954) and Jain (1961).

According to Mukherjee (in Monogr. Syst. Bot. Missouri Bot. Garden 6: 52. 1982), the distribution of this species is N.W. Himalaya, hence, presence of this species in Rajasthan is doubtful.

Bunium macura Boiss. Elench. 44. Voy Espaque 2: 239. t. 66. 1839-1846. *Carum bulbocastanum auct.* non Koch. 1825; *sensu* Clarke in Hook. f. Fl. Brit. India 2: 681. 1879.

This species is collected from Banswara and Chittorgarh by Majumdar 10283 (BSA) and Majumdar & Mishra 10157 (BSA) respectively.

According to Mukherjee (*loc.*) this species is so far reported only from N.W. Himalayas and Central Asia. Hence the identity of the said herbarium specimens in the herbarium of BSA is to be confirmed.

Scandix stellata Soland in Russel, Aleppo ed. 2. 2: 249. 1794. *S. pinnatifida* Vent. Deser. Pl. Jard. Cels. 14. 1800.

This plant is collected by *Wadhwa* 8302 (BSA) from Jaipur (Phuleru-Dudu road). Confirmation about the identity of this Mediterranean element is to be checked.

CULTIVATED SPECIES

Ammi majus L. - Glabrous, annual herbs. Leaf segments lanceolate to oval. Rays slender in fruits. Fruits oblong. Native of Europe; cultivated sometimes as a garden ornamental.

Coriandrum sativum L. '*Dhania*' (Hindi) - Glabrous, annual herbs, with pale to bright rose or nearly white flowers. Fruits subglobose, prominently ribbed. Native of Mediterranean region, cultivated as a winter season crop.

Cuminum cyminum L. '*Zira*' (Hindi) - Glabrous, annual herbs, with rose-coloured flowers. Fruits setulose, narrowly oblong. Native of Mediterranean region; cultivated as a winter season crop.

Daucus carota L. 'Gajar' (Hindi) - Annual herbs, with conical, fleshy roots and yellow, white or light purple flowers. Native of Europe, N. Africa and Continental Asia; cultivated during cold season for its edible roots.

Foeniculum vulgare Mill. 'Saunf' (Hindi) - Glabrous, glaucous-green, aromatic herbs. Flowers yellow. Fruits oblong, ribbed, on drying become pale-green. Native of South Europe; cultivated as a winter crop.

Trachyspermum ammi (L.) Sprague (*Sison ammi* L.) 'Ajwain' (Hindi) - Erect, annual herbs. Flowers whitish or pinkish. Fruits muricate, sub-hispid. Native of Africa; cultivated in many parts of the state.

68. ALANGIACEAE

(P.J. Parmar)

ALANGIUM LAM. *nom. cons.*

Alangium salvifolium (L. f.) Wangerin, Engl. Pflanz. 4 (220 b): 9. 1910. *Grewia salvifolia* L. f. Suppl. Sp. Pl. 409. 1781. *Alangium lamarckii* Thw. Enum. Plant. Zeyl. 133. 1857; Clarke in Hook. f. Fl. Brit. India 2: 741. 1879; Duthie, Fl. Gangetic Plain 1: 402. 1905.

Large, deciduous shrubs or small trees, with cream-coloured bark. Leaves 10-14 × 3-6 cm, ovate-lanceolate or oblong-elliptic, entire. Flowers in axillary fascicles, fragrant, white. Fruits ovoid when young, globose at maturity, crowned with calyx.

Fl & Fr. : February - June.

Common, on the hill-slopes on Aravalli range; rarely found in open wastelands.

Selected specimens : Banswara: Kalingra, Kanodia 75659 (BSI); Kota: Darah, Jain 28805 (BSI); Sirohi: Mt. Abu, Blatter 20051 (BLAT).

69. RUBIACEAE

(V. Singh)

1a. Herbs:

2a. Ovary 4-celled:

3a. Flowers solitary, axillary.

6. *Fergusonia*

3b. Flowers in axillary or terminal, pedunculate cymes.

17. *Neanotis*

2b. Ovary 2-celled:

4a. Each cell of ovary 1-ovuled:

- 5a. Leaves opposite. Stipules present:
 - 6a. Seeds with a ventral cavity:
 - 7a. Flowers in axillary and terminal, pedunculate cymes. 17. *Neanotis*
 - 7b. Flowers in axillary and terminal, sessile fascicles. 3. *Borreria*
 - 6b. Seeds without a cavity. 13. *Knoxia*
- 5b. Leaves whorled. Stipules absent. 8. *Galium*
- 4b. Each cell of ovary 2 to many-ovuled:
 - 8a. Seeds with a ventral cavity. 17. *Neanotis*
 - 8b. Seeds without cavity:
 - 9a. Stipules entire. Flowers 5-merous. 5. *Dentella*
 - 9b. Stipules lobed or fimbriate. Flowers 4-merous:
 - 10a. Calyx-teeth contiguous on the capsules. 10. *Hedyotis*
 - 10b. Calyx-teeth distant on the capsules:
 - 11a. Corolla divided half way or less. Anthers overtop stigma. 14. *Kohautia*
 - 11b. Corolla divided more than half way down. Anthers do not overtop stigma:
 - 12a. Seeds subglobose, coarsely pitted 21. *Thecagonum*
 - 12b. Seeds angular, smooth 18. *Oldenlandia*
 - 1b. Trees or shrubs:
 - 13a. Inflorescence a head:
 - 14a. Flowers white. Calyx-tubes connate with one-another. Fruit a syncarpium, indehiscent. 16. *Morinda*
 - 14b. Flowers pale or yellow. Calyx-tubes free. Fruit a capsule :
 - 15a. Heads bracteolate. Corolla-lobes valvate. Stigma clavate or mitriform:
 - 16a. Leaves cordate at base. Bracteoles linear. 1. *Adina*
 - 16b. Leaves rounded or acute at base. Bracteoles spatulate. 15. *Mitragyna*
 - 15b. Heads ebracteolate. Corolla-lobes imbricate. Stigma fusiform. 2. *Anthocephalus*
 - 13b. Inflorescence otherwise, not a head:
 - 17a. Stipules amplexicaul. Ovary 1-celled. Placentation parietal. 9. *Gardenia*
 - 17b. Stipules not amplexicaul. Ovary 2-celled. Placentation axile:
 - 18a. Fruit a berry:

- 19a. Corolla-tube glabrous or with scattered hairs within. Pollen grains in tetrads. Placentae attached to the wall of the ovary. Seeds in a single mass in fruit:
- 20a. Flowers 2 or more, in fascicles. Calyx-tube longer than ovary. Fruits 6 to many-seeded. 19. *Oxyceros*
- 20b. Flowers solitary. Calyx-tube not exceeding the ovary. Fruits 4-seeded. 20. *Randia*
- 19b. Corolla with a ring of hairs within. Pollen grains single. Placentae attached to the septum. Seeds in two masses in the fruit. 22. *Xeromphis*
- 18b. Fruit 2-valved, dehiscent capsule or of 2, indehiscent, 1-seeded cocci:
- 21a. Fruit a 2 valved, many-seeded capsule. Seeds winged. 11. *Hymenodictyon*
- 21b. Fruit of 2, 1-seeded cocci. Seeds not winged:
- 22a. Stipules connate with the petioles forming a sheath. Corolla-lobes valvate. Fruits 2-winged. 7. *Gaillonia*
- 22b. Stipules not connate with the petioles. Corolla-lobes twisted. Fruits wingless:
- 23a. Inflorescence terminal or subterminal. Flowers 4-merous. 12. *Ixora*
- 23b. Inflorescence axillary. Flowers 5-merous. 4. *Canthium*

1. ADINA SALISBURY.

Adina cordifolia (Willd. ex Roxb.) Hook. f. ex Brandis, For. Fl. 263. t. 33. 1874; Hook. f. Fl. Brit. India 3: 24. 1880; Duthie, Fl. Gangetic Plain 1: 407. 1905. *Nauclea cordifolia* Willd. ex Roxb. Fl. Cor. 1: 40. t. 53. 1796. 'Haldu' (Hindi).

Large trees, 15-30 m high. Leaves opposite, crowded towards the end of branches, 6-18 × 5.5-15.0 cm, ovate to orbicular-cordate, pubescent. Stipules suborbicular, enclosing the terminal buds, caducous. Heads 2-3 cm across; peduncles 1 to 3 together, with two bracts above the middle. Flowers in axillary, peduncled heads, yellow. Calyx cleft half way down. Stigma clavate. Capsules cuneate, of two cocci, downy. Seeds many, winged.

Fl. : August - September, Fr. : October - March.

Common in forests in hilly tracts. Often confused for *Anthocephalus chinensis* (Lam.) A. Rich. ex Walp.

Selected specimens : Banswara: Puna Pathar forest, Singh 2936 (BSJO); Jaipur: Jaigarh, Sharma 461 (RUBL); Kota: Shahabad, Jain 28896 (BSI); Pali: Bijapur forest, Shetty 1604 (BSJO); Sirohi: Mt. Abu, Jain 46759 (BSI).

2. ANTHOCEPHALUS A. RICH

Anthocephalus chinensis (Lam.) A. Rich. ex Walp. Rep. 2: 461. 1843; Raizada, Suppl. Duthie, Fl. Gangetic Plain 89. 1976. *Cephalanthus chinensis* Lam. Encycl. 1: 678. 1785. *Nauclea cadamba* Roxb. Fl. Ind. 2: 121. 1824. *Anthocephalus indicus* A. Rich. in Mem. Soc. Hist. Nat. Paris 5: 238. 1834; Duthie, Fl. Gangetic Plain 1: 432. 1905. *A. cadamba* (Roxb.) Miq. Fl. Ind. Bat. 2: 135. 1856; Hook. f. Fl. Brit. India 3: 23. 1880.

Large trees, upto 30 m high, with spreading branches. Leaves 15-30 × 10-18 cm, elliptic-oblong to ovate-cordate. Stipules lanceolate, caducous. Flowers in terminal, solitary, peduncled heads, orange-coloured. Calyx tubular, 5-lobed. Corolla funnel-shaped. Stigmas exerted, white. Fruits 4-5 cm across, globose, yellow when ripe. Seeds muriculate.

Fl. : May - July; Fr. : August - November.

Occasionally planted in the gardens, along the roads and often in the forests.

Selected specimens : Sirohi: Mt. Abu, Mehta 836 (JAC). Also reported by Sharma (1958) from Ajmer, Vyas (1967) from Alwar, Gupta (1965) from Kota.

3. BORRERIA G.F.W. MEYER *nom. cons.*

Procumbent herbs. Corolla-tube with a ring of hairs within at the base. Capsules septifragal.

1. *B. articularis*

Erect herbs. Corolla-tube glabrous inside. Capsules septicidal.

2. *B. pusilla*

1. **Borreria articularis** (L. f.) F.N. Will. in Bull. Herb. Boiss. ser. 2: 5: 956. 1905. *Spermacoce hispida* L. Sp. Pl. 102. 1753; Hook. f. Fl. Brit. India 3: 200. 1881; Duthie, Fl. Gangetic Plain 1: 429. 1905. *S. articularis* L. f. Suppl. 119. 1781. *Borreria hispida* (L.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4): 144. 1891, non Spruce ex K. Schum. 1888.

Annual herbs; branches 4-angled, hispid. Leaves opposite, sessile, 2-5 × 0.8-1.5 cm, elliptic-lanceolate, subacute, entire. Stipules hispid, connate with leaf-bases forming a fimbriate cup. Flowers sessile, in axillary clusters within the stipular cup, white or lilac. Mericarps hispid, ventrally dehiscent. Seeds black, oblong or ellipsoid, finely granulate, with a ventral groove.

Fl & Fr. : August - October.

Very common in open moist grounds and grasslands.

Selected specimens : Banswara: Pipalkhunt, Singh 2882 (BSJO); Dungarpur: Ratanpura, Kanodia 82094 (BSI); Jodhpur: Kharda Randhir,

Shetty 195 (BSJO); Kota: Shahabad, *Majumdar* 13213 (BSA); Tonk: *Maheshwari* 53225 (LWG); Bhanthali, *Shetty* 1232 (BSJO).

2. *Borreria pusilla* (Wall.) DC. Prodr. 4: 543. 1830. *Spermacoce stricta* L. f. Suppl. 120. 1781; Hook. f. Fl. Brit. India 3: 200. 1880; Duthie, Fl. Gangetic Plain 1: 429. 1905. *S. pusilla* Wall. in Roxb. Fl. Ind. 1: 379. 1820. *Borreria stricta* (L. f.) K. Schum. in Engl. & Prantl, Pflanzenfam. 4(4): 143. 1891, non Meyer 1818.

Annual herbs; stems 4-angled, hispid. Leaves opposite or verticillate, 2.5-5.0 × 0.5-1.0 cm, linear-lanceolate, acute, revolute-margined. Stipules connate with leaf-bases forming a truncate-fimbriate tube. Flowers in axillary and terminal, head-like clusters surrounded by a whorl of 2-6 leaves, white. Corolla campanulate-urceolate. Stamens and styles exerted. Mericarps pubescent, both ventrally dehiscent. Seeds ellipsoid, brown, smooth, with a ventral groove.

Fl. & Fr. : August - December.

Abundant in the forests and often in wastelands, particularly in the hilly tracts.

Selected specimens : Ajmer: *Wadhwa* 4870 (BSA); Banswara: Rowal Hindvela forest, *Singh* 2870 (BSJO); Chittorgarh: Pratapgarh, *Majumdar* 12249 (BSA); Jodhpur: Shahpura, *Tiwari* 656. (BSJO); Kota: Shahabad, *Singh* 90441 (LWG); Sirohi: Mt. Abu, *Rao* 66596 (BSI).

4. CANTHIUM LAM.

Canthium dicoccum (Gaertn.) Teys. & Binn. in Cat. Hort. Bog. 113. 1866. *Psydrax dicoccos* Gaertn. Fruct. 1: 125. t. 26. 1788. *Canthium didymum* Gaertn. Fruct. 3: 94. t. 196. 1792; Hook. f. Fl. Brit. India 3: 132. 1880.

Unarmed, evergreen shrubs. Leaves 10-15 × 1.5-10.0 cm, ovate-lanceolate or suborbicular, obtuse or cordate at base, caudate-acuminate, eglandular. Flowers 5-merous, in subsessile or shortly peduncled, axillary cymes, white. Style glabrous. Fruits 5-10 mm in diam., globose-ellipsoid or obovoid, compressed, subdidymous.

Fl. & Fr. : November - February.

Rare, in the forests. It is a denizen of high altitude and so far reported only from Mt. Abu (Jain, 1962) in Rajasthan.

5. DENTELLA J. & G. FORST.

Dentella repens (L.) J. & G. Forster, *Charact. Gen. Pl.* 26. t. 13. 1776; Hook. f. *Fl. Brit. India* 3: 42. 1880; Duthie, *Fl. Gangetic Plain* 1: 410. 1905. *Oldenlandia repens* L. *Mant.* 40. 1767.

Dichotomously branched, prostrate herbs, rooting at the nodes. Leaves opposite, sessile, 3-5 mm long, elliptic-oblong to subspathulate, subacute, entire, ciliolate, glabrous or covered with hyaline, hollow setae. Flowers pedicelled, solitary, axillary or in the forks of branches, white. Corolla-lobes valvate, with a tooth on each side. Stigmas 2, filiform. Capsules $c.$ 3 mm across, globose, covered with hyaline setae, crowned by the persistent calyx-limb.

Fl. & Fr. : Most part of the year.

Fairly common in wet and marshy habitats. The fruits develop on the under-side of prostrate branches and are hardly visible from above.

Selected specimens : Ajmer: Beer Tank, *Sharma* 445 (DD); Alwar: *Hiralal* 34551 (LWG); Bhilwara: Jahajpur, *Singh* 5721 (BSJO); Dungarpur: *Verma* 170 (BSA), *Sharma* 542 (RUBL); Jodhpur: Kailana, *Rao* 67226 (BSI), *Singh* 4312 (BSJO); Pali: Kolar village, *Shetty* 1514 (BSJO).

6. FERGUSONIA HOOK.F.

Fergusonia tetracocca (Thw.) Baill. *Hist. Pl.* 7: 413. 1880. *Borreria tetracocca* Thw. *Enum. Pl. Zeyl.* 442. 1864. *Fergusonia zeylanica* Hook. f. in Hook. *lc. Pl.* 12: 33. t. 1124. 1872 & *Fl. Brit. India* 3: 48. 1880. *F. thwaitesii* Hook. f. *Gen. Pl.* 2: 132. 1873.

Procumbent or ascending herbs, 30-60 cm long, rooting at the lower nodes. Leaves subsessile, 2-4 cm long, narrowly oblong-lanceolate, acute, ciliate, bristly-hairy beneath. Stipules linear-lanceolate, rigid, setaceous, connate with the petioles, persistent. Flowers sessile, solitary, axillary. Calyx-lobes 4, lanceolate, ciliate, hairy. Corolla-lobes valvate in bud, ciliate at the tips. Style-arms 2, linear, hairy. Fruit of 4, pyriform cocci crowned with the calyx-teeth.

Fl. & Fr. : August - December.

Rare, in wet and shady localities. It resembles closely *Borreria articularis* (L. f.) Will. Reported by Nair and Malhotra (1961) from Sikar, but the specimens are not available in any of the Indian herbarium.

7. GAILLONIA A. RICH.

Gaillonis calycoptera Jaub. & Spach, *Illus. Pl. Or.* 1: 147. t. 80. 1842; Hook. f. *Fl. Brit. India* 3: 201. 1881; Puri *et al.* in *Rec. Bot. Surv. India* 19(1): 70. 1964.

Dichotomously branched, glabrous shrubs; branches slender, terete. Leaves 1.0-2.5 cm long, linear, stiff, revolute-margined. Petioles of the upper leaves connate with the stipules forming membranous, 6 to 8-toothed sheaths. Flowers sessile, solitary or few together, in 2.5-4.0 cm long spikes or spicate cymes, white. Corolla-throat naked. Fruits 8-10 mm long, 2-winged, of 2, narrowly oblong, puberulous cocci surmounted by an erect, scarious, enlarged calyx-limb; segments of limb free or connate, elliptic, acute, veined, much longer than the cocci, white. Seeds oblong, grooved ventrally. Radicle inferior.

Fl. & Fr. : May - June.

Rare, in the arid rocky habitats in the west of Aravalli. It has been reported by Puri *et al.* (*l.c.*), but the specimens are not available in any of the Indian herbarium.

8. GALIUM L.

Galium asperifolium Wall. in Roxb. *Fl. Ind.* ed. Carey & Wall. 1: 381. 1820; Duthie, *Fl. Gangetic Plain* 1: 431. 1905. *G. mollugo auct. plur.* non L. 1753; Hook. f. *Fl. Brit. India* 3: 207. 1881.

Much-branched, prostrate, perennial herbs. Stems scabridly hairy, rooting at the nodes. Leaves 4-8 in a whorl, sessile, 12-30 × 3-5 mm, linear-lanceolate or linear-obovate, recurved at the margins, bristly hairy on the midrib beneath. Flowers in axillary and terminal, 3 to many-flowered cymes, white. Pedicels recurved in fruit. Corolla-lobes ovate, acuminate. Fruits black, c. 3 mm across, granulate.

Fl. & Fr. : February - April.

Rare, in the forests near streams, particularly in the east of Aravalli.

Selected specimen : Sirohi: Mt. Abu, Mehta 502 (JAC). Also reported by Vyas (1964, 67) from Alwar, Nair and Malhotra (1961) from Sikar and Ramdeo (1969) from Udaipur.

9. GARDENIA J. ELLIS *nom. cons.*

Leaves elliptic to obovate, glabrous.

1. *G. turgida* var.
turgida

Leaves suborbicular, densely tomentose beneath.

2. *G. turgida* var.
montana

1. *Gardenia turgida* Roxb. Fl. Ind. 2: 557. 1824; Wight, Ic. 2(3): 6. t. 579. 1842; Hook. f. Fl. Brit. India 3: 118. 1880; Duthie, Fl. Gangetic Plain 1: 422. 1905.

var. *turgida*

Small, deciduous trees; branches armed with straight thorns. Leaves 2.5-10.0 × 3-5 cm, elliptic to obovate, entire, glabrous. Flowers from the young leafless shoots, white, unisexual, males fascicled, females solitary. Anthers sessile, linear, slightly exerted. Styles included; stigmas 2-lobed. Placentae 5-6. Drupes 3-8 cm in diam., globose, smooth, yellowish brown. Seeds angular.

Fl. & Fr. : April - June.

Occasional, in the forests. Plants often become spinous.

Selected specimens : Jhalawar: Verma 3486 (BSA); Kota: Shahabad, Jain 28944 (BSI); Pali: Ghanerao Forest, Shetty 1887 (BSJO); Udaipur: Kewadi ki Nal, Gemawat 242 (BSI).

2. var. *montana* (Roxb.) Hook. f. Fl. Brit. India 3: 118. 1880; Duthie, Fl. Gangetic Plain 1: 422. 1905. *Gardenia montana* Roxb. Fl. Ind. 2: 556. 1824; Wight, Ic. 2(3): 6. t. 577. 1842.

Leaves suborbicular, densely tomentose beneath. Anthers included in the corolla-tube. Placentae 5-6.

Fl. & Fr. : March - June.

Rare, in scrub forests.

Selected specimen : Banswara: Anand Sagar, Vasavada 29214 (BSI).

10. HEDYOTIS L.

Hedyotis hispida Retz. Obs. Bot. 4: 23. 1786; Hook. f. Fl. Brit. India 3: 60. 1880; Duthie, Fl. Gangetic Plain 1: 412. 1905. '*Mundapata*' (Hindi).

Erect or decumbent herbs, upto 30 cm high; stems many from the base, 4-gonous, scabrid. Leaves 4-6 × 1-2 cm, elliptic-oblong to lanceolate, acute, revolute-margined, scabrid. Flowers in axillary, bracteate clusters, white. Anthers dehiscing laterally. Capsules ovoid, 2-valved. Seeds many, angular.

Fl. & Fr. : August - October.

Rare, confined to the hilly tracts in rocky habitats. Apparently resembles *Borreria articularis* (L. f.) Willd.

Selected specimen : Kota: Darah, Singh 74801 (LWG).

11. HYMENODICTYON WALL. *nom. cons.*

Hymenodictyon excelsum (Roxb.) Wall. in Roxb. Fl. Ind. 2: 149. 1824; Hook. f. Fl. Brit. India 3: 35. 1880; Duthie, Fl. Gangetic Plain 1: 409. 1905. *Cinchona excelsa* Roxb. Pl. Cor. 2: 3. t. 106. 1798. 'Lunkhora' (Hindi).

Trees, 4-12 m high. Bark smooth. Leaves 10-22 × 5.5-12.0 cm, elliptic-oblong, abruptly acuminate. Stipules recurved, deciduous. Flowers cymed along the rachis of spiciform, axillary and terminal, pubescent racemes, white or grey. Pedicels 1-2 mm long. Corolla-lobes 5, valvate. Capsules on stout, decurrent pedicels, 2.0-2.5 cm long, ellipsoid, 2-valved, brown when ripe. Seeds winged all round.

Fl. : August - September; *Fr.* : October - February.

Rather common in hilly tracts in the deciduous forests. Flowers are slightly fragrant and the inflorescence appears like a bottle-brush.

Selected specimens : Banswara: Kotharia forest, *Singh* 3049 (BSJO); Bundi: Kota Dam, *Singh* 74410 (LWG); Kota: Garari-Mahadeo, *Singh* 74644 (LWG); Pali: Dharisav Mahadeo Hill, *Shetty* 1820 (BSJO).

12. IXORA L.

Leaves rounded or cordate at the base. Corolla-tube 1.2-2.0 cm long. Flower-buds ellipsoid.

1. *I. arborea*

Corolla-tube 0.5-1.0 cm long. Leaves narrowed at the base. Flower-buds globose.

2. *I. brachiata*

1. ***Ixora arborea*** Roxb. ex J.E. Sm. in Rees, Cyclop. 19: 5. 1811. *I. parviflora* Vahl, Symb. 3: 11. t. 52. 1794, non Lam. 1791; Wight, Ic. 2(4): 6. t. 711. 1843; Hook. f. Fl. Brit. India 3: 142. 1880; Duthie, Fl. Gangetic Plain 1: 423. 1905. 'Jilpai' (Hindi).

Shrubs or small trees, 2-3 m high. Leaves 8-13 × 2.5-6.0 cm, obovate-oblong or elliptic, subacute, entire, lateral nerves 8-10 pairs. Stipules broadly ovate, cuspidate. Flowers in compact panicles, white, sweet-scented. Calyx-teeth obscure. Styles densely hairy. Fruits 5-8 mm in diam., globose, slightly didymous, red to black on maturity. Radicle inferior.

Fl. & Fr. : January - April.

Occasional, in the forests, particularly in shady habitats.

Selected specimens : Jhalawar: *Wadhwa* 9549 (BSA); Kota: Sitabari, *Singh* 91066 (LWG), *Wadhwa & Prasad* 9320 (BSA).

2. *Ixora brachiata* Roxb. Fl. Ind. 1: 381. 1820; Wight, Ic. 2(4): 6. t. 710. 1843; Hook. f. Fl. Brit. India 1: 142. 1880.

Small trees, 4-5 m high. Leaves opposite or whorled, 4.5-19.0 × 1.9-7.5 cm, obovate-oblong or elliptic-oblong to lanceolate. Flowers in sessile or shortly peduncled cymes with 2-3, 5-13 cm long branches, white, odorous. Fruits 5-8 mm in diam., globose, dark-purple to black. Seeds hemispheric, rugose, with a deep pit on the ventral side. Radicle inferior.

Fl & Fr. : February - June.

Rare, in the forests at high altitude on the Aravalli.

Selected specimen : Sirohi: Malagarh, Jain 60484 (BSI).

13. KNOXIA L.

Knoxia sumatrensis (Retz.) DC. Prodr. 4: 569. 1830. *Spermacoce sumatrensis* Retz. Obs. Bot. 4: 23. 1786. *Knoxia corymbosa auct. plur.*, non Willd. 1797; Hook. f. Fl. Brit. India 3: 128. 1880; Duthie, Fl. Gangetic Plain 1: 428. 1905.

Erect, annual herbs, upto 70 cm high, with 4-angled, pubescent stem; internodes long. Petioles upto 1.5 cm long. Leaves 2-12 × 0.8-4.0 cm, elliptic-lanceolate to oblong, acute. Stipules 3 to 5-toothed, pubescent or hirsute. Flowers in axillary and terminal, corymbose cymes with cinicinnoid branches, violet. Calyx-lobes subequal. Corolla-lobes valvate. Style one. Capsules ellipsoid, didymous, 2-seeded. Radicle superior.

Fl & Fr. : August - October.

Rare, in wastelands among grasses. So far collected only from the southern parts of the state.

Selected specimen : Banswara: Danpur, Singh 2983 (BSJO).

14. KOHAUTIA CHAM. & SCHLECHT.

Stipules fimbriate. Leaves whorled. Capsules didymous.

1. *K. aspera*

Stipules truncate. Leaves opposite. Capsules obovoid or ellipsoid.

2. *K. gracilis*

1. *Kohautia aspera* (Heyne ex Roth) Brem. in Verh. Kon. Ned. Akad. Wet. Nat. 48(2): 113. 1952. *Hedyotis aspera* Heyne ex Roth, Nov. Pl. Sp. 94. 1821. *Oldenlandia aspera* (Heyne ex Roth) DC. Prodr. 4: 428. 1830; Hook. f. Fl. Brit. India 3: 68. 1880; Duthie, Fl. Gangetic Plain 1: 415. 1905. 'Danakav' (Hindi).

Erect, annual herbs, 20-60 cm high. Stem and branches scabrid with minute whitish points. Leaves sessile, 3.5-6.5 × 0.2-0.5 cm, linear-

lanceolate, revolute-margined. Flowers subsessile, 1-few fasciated in lax terminal cymes, pale blue or pink. Anthers included. Capsules globose, didymous, loculicidal, scabrid with white dots. Seeds smooth, angled.

Fl. & Fr. : July - October.

Common throughout the area in sandy soils.

Selected specimens : Banswara: *Kanodia* 75570 (BSI); Jaipur: *Sharma* 1528 (RUBL); Jaisalmer: Devikot, *Wadhwa* 5289 A (BSA); Jodhpur: Beriganga, *Shetty* 137 (BSJO); Kota: Shahabad, *Majumdar* 10816 (BSA).

2. *Kohautia gracilis* (Wall.) DC. Prodr. 4: 430. 1830. *Hedyotis gracilis* Wall. in Roxb. Fl. Ind. 1: 371. 1820. *Oldenlandia gracilis* (Wall.) Hook. f. Fl. Brit. India 3: 68. 1880; Duthie, Fl. Gangetic Plain 1: 415. 1905.

Sparingly branched herbs, upto 30 cm high. Stems scabrid with white hairs. Leaves 2.5-7.5 × 0.05-0.6 cm, linear, acute, revolute-margined, glabrous, 1-nerved. Flowers in terminal, corymbose cymes, blue to purple. Calyx-lobes as long as the tube, hairy. Capsules 2-3 mm across, obovoid or ellipsoid, didymous, glabrous. Seeds angled, smooth.

Fl. & Fr. : July - October.

Common on sandy plains as well as embankments of the bunds and reservoirs in the east of Aravalli.

Selected specimens : Jaipur: Amer, *Sharma* 312 (RUBL); Sirohi: Mt. Abu, *Menon* 4579 (RUBL).

15. MITRAGYNA KORTH. *nom. cons.*

Mitragyna parvifolia (Roxb.) Korth. Obs. Naocl. Ind. 19. 1839; Duthie, Fl. Gangetic Plain 1: 408. 1905; Mahesh. Illus. Fl. Delhi f. 97. 1966. *Nauclea parvifolia* Roxb. Pl. Cor. 40. t. 52. 1796. *Stephegyne parvifolia* (Roxb.) Korth. in Verh. Nat. Ges. Bot. 161. 1840; Hook. f. Fl. Brit. India 3: 25. 1880. 'Kalmi, Kalam, Kambhri' (Hindi).

Trees, 10-15 m high. Leaves 3.6-18.0 × 2.5-11.0 cm, elliptic-oblong, panduriform or ovate to suborbicular. Stipules broadly oblong, enclosing the terminal buds, caducous. Flowers in heads, greenish yellow; heads solitary, pedunculate, c. 2 cm in diam. Calyx truncate; lobes obscure. Styles white, much exerted; stigmas mitriform. Capsules oblong-ellipsoid, 10-ribbed, separating into 2, many-seeded cocci. Seeds winged.

Fl. : August - September; *Fr.* : October - February.

Rather common in deciduous forests in hilly tracts. Very close to *Adina cordifolia* (Willd. ex Roth) Hook. f. ex Brandis. Mature heads persist till the next blossom period.

Selected specimens : Banswara: Dajia Bowji, Singh 2856 (BSJO); Bharatpur: Moti Jheel, Saran 41924 (LWG); Dungarpur: Marwa, Verma 144 (BSA); Jaisalmer: Shetty 6139 (BSJO); Tonk: Toda Rai Singh, Shetty 1087 (BSJO); Udaipur: Jaisamand, Verma 64 (BSA).

16. MORINDA L.

Morinda tomentosa Heyne ex Roth, Nov. Pl. Sp. 147. 1821. *M. tinctoria* Roxb. Fl. Ind. 2: 197. 1824, non Noronha, 1790; Hook. f. Fl. Brit. India 3: 156. 1880. *M. tinctoria* Roxb. var. *tomentosa* (Heyne ex Roth) Hook. f. Lc. 3: 156. 1880; Duthie, Fl. Gangetic Plain 1: 427. 1905. 'Aal Kalmi' (Hindi).

Trees or shrubs, with pubescent or tomentose, 4-angled branchlets. Leaves 8-20 × 5.5-12.0 cm, ovate-elliptic, acuminate, tomentose. Stipules often 2-fid at the apex. Flowers fused together into globose-oblong heads by their hypanthia, white. Corolla-lobes valvate. Fruits of 1-seeded pyrenes, globose, fleshy. Radicle inferior.

Fl : August - September; *Fr* : October - December.

Rare, in the forests and wastelands; commonly planted along the roads as an avenue tree.

Selected specimens : Banswara: Shergarh, Singh 3078 (BSJO); Jodhpur: Mandor, Verma 595 (BSJO); Kota: Singh 91671 (LWG), Wadhwa 9442 (BSA); Tonk: Toda Rai Singh, Pandey 4822 (BSJO).

17. NEANOTIS LEWIS,

1a. Flowers in lax corymbose cymes. Capsules 4 to many-seeded:

2a. Capsules broader than long, 5-6 mm in diam., less than one-fourth produced beyond the calyx.

1. *N. lancifolia*

2b. Capsules globose, 2.0-3.5 mm in diam., half or more produced beyond the calyx.

3. *N. rheedei*

1b. Flowers in clusters or congested cymes. Capsules 1 to 3-seeded.

2. *N. montholoni*

1. *Neanotis lancifolia* (Hook. f.) Lewis in Ann. Miss. Bot. Gard. 53: 39. 1966. *Hedyotis lancifolia* Dalz. in Hook. Journ. Bot. 2: 135. 1850, non Schum. 1827. *Anotis lancifolia* Hook. f. Fl. Brit. India 3: 73. 1880.

Erect, diffusely branched herbs, 30-75 cm high. Leaves 5-8 × 1.8-2.5 cm, ovate or ovate-lanceolate, acuminate, pubescent above, hairy on the veins beneath. Stipules shortly bristly. Flowers in terminal and sub-terminal, many-flowered, corymbose cymes, purple. Capsules compressed,

2-lobed at the apex, crowned by the large, distinct, recurved calyx-teeth, dehiscing across the top. Seeds 4-6, ellipsoid or suborbicular, deeply excavated on the face, pitted, black.

Fl. & Fr. : August - November.

Rare, weed in fields and wastelands.

Selected specimen : Banswara: Bhongra, *Kanodia* 75445 (BSI).

2. *Neanotis montholoni* (Hook. f.) Lewis in Ann. Miss. Bot. Gard. 53: 39. 1966. *Anotis montholoni* Hook. f. Fl. Brit. India 3: 73. 1880; Cooke, Fl. Bombay 2: 22. 1904.

Annual herbs, 20-30 cm high; branches hispid. Leaves 2-3 × 0.5-1.0 cm, ovate or ovate-lanceolate, entire. Flowers in terminal and subterminal cymes, light purple. Calyx-teeth near the pedicel than the top of capsule, tipped with a fine bristle. Capsules sessile, broader than long, didymous, with a large, double convex crown, pubescent; cells 1 to 3-seeded. Seeds subglobose, pitted, with a deep ventral cavity, black.

Fl. & Fr. : August - November.

Rare, weed in cultivated fields. The colour of flower may fade to white or dull violet.

Selected specimen : Jhalawar: Bhawanimandi, *Singh* 83675 (LWG).

3. *Neanotis rheedei* (Wall. ex Wt. & Arn.) Lewis in Ann. Miss. Bot. Gard. 53: 40. 1966. *Hedyotis rheedei* Wall. ex Wt. & Arn. Prodr. 409. 1834. *Anotis rheedei* (Wall. ex Wt. & Arn.) Hook. f. Fl. Brit. India 3: 73. 1880.

Slender, glabrous, annual herbs. Leaves 1.5-5.5 × 0.6-2.5 cm, ovate or ovate-lanceolate, membranous, sparsely hairy. Flowers in axillary and terminal, corymbose cymes, white or rose-coloured. Calyx-teeth very minute. Capsules solitary, sessile or shortly pedicelled, didymous, puberulous. Seeds 2-4 or more, ellipsoid, reticulate, deeply excavated on ventral face.

Fl. & Fr. : August - October.

Rare, in the forests in wet and shady habitats. Calyx-tube in fruit is much smaller than in any other species and dehiscence proportionably low.

Selected specimen : Banswara: Ratlam Road, *Kanodia* 75361 (BSI).

18. OLDENLANDIA L.

1a. Peduncles axillary:

2a. Peduncles 1 to 4-flowered:

- 3a. Top of capsules rounded, much produced beyond the calyx. 3. *O. herbacea*
- 3b. Top of capsules flat, not produced beyond the calyx:
- 4a. Leaves elliptic or elliptic-lanceolate. Base of calyx-teeth touching in fruit. 4. *O. pumila*
- 4b. Leaves linear. Base of calyx-teeth not touching in fruit:
- 5a. Flowers sessile or nearly so, solitary. 2. *O. diffusa*
- 5b. Flowers pedicelled, in pairs or in threes. 1. *O. corymbosa*
- 2b. Peduncles more than 4-flowered. 6. *O. umbellata*
- 1b. Peduncles partly axillary, partly in terminal penicled cymes:
- 6a. Top of capsules produced beyond the calyx. 3. *O. herbacea*
- 6b. Top of capsules not produced beyond the calyx:
- 7a. Axillary peduncles 1-flowered. 5. *O. pusilla*
- 7b. Axillary peduncles 4 to many-flowered. 6. *O. umbellata*

1. ***Oldenlandia corymbosa*** L. Sp. Pl. 119. 1753; Hook. f. Fl. Brit. India 3: 64. 1880, *pro parte*; Duthie, Fl. Gangetic Plain 1: 413. 1905, excl. syn. *Hedyotis burmanniana* R.Br. ex Wt. & Arn; Mahesh. Illus. Fl. Delhi f. 96. 1966.

Erect or diffuse, minutely pubescent, annual herbs. Leaves sessile, 1.5-3.0 × 0.1-0.6 cm, narrowly linear, often revolute-margined, glabrous. Stipules scarious, not lacinate. Flowers on 1 to 8-fid, axillary, solitary or paired peduncles (corymbose cymes), white. Stamens and styles included. Capsules globose, pale-brown, smooth.

Fl & Fr. : September - November.

Common throughout the area in the forests, wastelands and cultivated fields, particularly in wet habitats. It is a highly polymorphic species.

Selected specimens : Banswara: Puna Pathar forest, Singh 3669 (BSJO); Kota: Shahabad, Singh 90438 (LWG); Sirohi: Mt. Abu, Jain 60104 (BSI); Tonk: Tordi Sagar, Shetty 1100 (BSJO); Udaipur: Udia Niwas, Kanodia 82345 (BSI).

2. ***Oldenlandia diffusa*** (Willd.) Roxb. Fl. Ind. 1: 444. 1820; Hook. f. Fl. Brit. India 3: 65. 1880; Duthie, Fl. Gangetic Plain 1: 414. 1905. *Hedyotis diffusa* Willd. Sp. Pl. 1: 566. 1797. 'Loung' (Hindi).

Much-branched, prostrate herbs, rooting at the nodes. Leaves 1-5 × 0.2-0.5 cm, linear-lanceolate to oblong, subacute, revolute-margined. Flowers solitary or 2 to 3-together, axillary, sessile or short-pedicelled, white. Calyx-teeth ovate-lanceolate, cuspidate ciliate, very distant in fruit. Capsules didymous, broader than long, truncate at the top.

Fl. & Fr. : July - October.

Rare, in the forests in wet and shaded places. Closely allied to *O. corymbosa* L.

Selected specimen : Jhalawat: Gagrain forest, Singh 83712 (LWG).

3. ***Oldenlandia herbacea*** (L.) Roxb. Fl. Ind. 1: 445. 1820. *Hedyotis herbacea* L. Sp. Pl. 102. 1753. *Oldenlandia heyneii* G. Don, Gen. Syst. 3: 531. 1834; Hook. f. Fl. Brit. India 3: 65. 1880.

Erect, annual herbs, 10 to 45 cm high. Leaves 3 × 0.2 cm, lower ones often broader than upper ones, linear-lanceolate, acute, recurved margined. Flowers on solitary or 2-nate, axillary, filiform peduncles, white. Calyx-teeth short, triangular-subulate, acute. Anthers partially exerted. Capsules ovoid or subglobose, didymous. Seeds ellipsoid.

Fl. & Fr. : August - October.

Rare, in wastelands and forests in wet habitats.

Selected specimen : Sirohi: Mt. Abu, Blatter 6484 (BLAT).

4. ***Oldenlandia pumila*** (L. f.) DC. Prodr. 4: 425. 1830. *Hedyotis pumila* L. f. Suppl. Pl. 119. 1781. *Oldenlandia crystallina* Roxb. Fl. Ind. 1: 443. 1820; Hook. f. Fl. Brit. India 3: 65. 1880.

Much-branched, annual herbs; stems scabrid on the ribs. Leaves 5-16 × 1-6 mm, elliptic, scabrid on the margins and above. Flowers isostylous, axillary, solitary or in 2-flowered cymes, rarely in terminal, pedunculate, 2 to 3-flowered cymes, white. Capsules longer than wide, oblong-ovoid terete. Seeds conic or ellipsoid, strongly reticulate, brown.

Fl. & Fr. : July - October.

Rare, in wastelands, forests and cultivated fields.

Selected specimens : Banswara: Ghatol Road, Kanodia 75174 (BSI); Jaipur: Amer, Sharma 1047 (RUBL).

5. ***Oldenlandia pusilla*** Rottl. in Ges. Naturf. Fr. Neur. Schr. 4: 216. 1803. *Hedyotis brachiata* Wight in Wt. & Arn. Prodr. 415. 1834. *Oldenlandia brachiata* (Wight) Hook. f. Fl. Brit. India 3: 66. 1880; Duthie, Fl. Gangetic Plain 1: 414. 1905.

Erect, slender, glabrous, annual herbs. Leaves narrowly linear. Flowers solitary on axillary, capillary peduncles and in open dichotomous cymes, white. Calyx-teeth subulate, shorter than the corolla-tube. Capsules broadly didymous.

Fl. & Fr. : August - November.

Very rare, in wet and shady habitats. Reported by Majumdar (1969)

from Jhunjhunu and Nair and Nathawat (1957) from Sikar, but the specimens are not available in any Indian herbarium.

6. *Oldenlandia umbellata* L. Sp. Pl. 119. 1753; Hook. f. Fl. Brit. India 3: 66. 1880; Sharma & Tiagi, Fl. N.E. Raj. 188. 1979.

Profusely branched, prostrate herbs; stems quadrangular. Leaves verticillate, 1.0-1.5 × 0.2 cm, linear, mucronate. Flowers in axillary or terminal umbellate cymes, subtended by leaf-like bracts; pedicels upto 4 mm long. Calyx-teeth subulate, shorter than the corolla-tube. Capsules c. 2 × 2 mm, didymous, with a pointed apex, dehiscing by an apical pore.

Fl & Fr. : August - October.

Common in moist habitats with clayey soils, particularly in the east of Aravalli. Very close to *O. pumila* (L. f.) DC., but the veins of fruiting calyx are pink in this taxon.

Selected specimens : Jaipur: Golimar garden, Sharma 1440 (RUBL); Amer, Sharma 1931 (RUBL).

19. OXYCEROS LOUR.

Oxyceros fasciculata (Roxb.) Yamazaki in J. Jap. Bot. 45: 340. 1970. *Posoqueria fasciculata* Roxb. Fl. Ind. 2: 568. 1824. *Randia fasciculata* (Roxb.) DC Prodr. 4: 386. 1830; Hook.f. Fl. Brit. India 3: 109. 1880; Duthie, Fl. Gangetic Plain 1: 420. 1905.

Erect, rigid shrubs; branches glabrous or tomentose; spines axillary; bark rough. Leaves 2-6 × 1-2 cm, obovate or elliptic, entire and revolute-margined. Flowers white or dull yellow, 2-3 in axillary fascicles. Berries c. 1 cm in diam., globose.

Fl & Fr. : March - June.

Rare, in mixed deciduous forests at the foot of hills. Plants prefer dry habitats.

Selected specimens : Kota: Darah, Singh 83844 (LWG).

20. RANDIA L.

Randia tetrasperma (Roxb.) Benth. & Hook. f. Gen. Pl. 2: 88. 1873; Hook.f. Fl. Brit. India 3: 109. 1880; Raizada, Suppl. Duthie, Fl. Gangetic Plain 1: 97. 1976. *Gardenia tetrasperma* Roxb. Fl. Ind. 1: 709. 1820.

Stiff shrubs, upto 2.5 m high; branches unarmed or spinescent. Leaves crowded towards the end of branchlets, 1-5 cm long, obovate or oblanceolate. Flowers sessile, at the end of branchlets, greenish-white. Calyx-teeth subulate. Stigma spindle-shaped. Berries 7-8 mm in diam., globose, green, 4-seeded.

Fl & Fr. : July - December.

Rare, in wastelands and open forests. Reported by Vyas (1967) from Alwar, but the specimens are not available in any Indian herbarium.

21. THECAGONUM BABU

Thecagonum biflorum (L.) Babu in Bull. Bot. Surv. India 11: 214, 1969. *Oldenlandia biflora* L. Sp. Pl. 119, 1753; Hook. f. Fl. Brit. India 3: 70, 1880. *O. paniculata* L. Sp. Pl. ed. 2, 1667, 1763; Hook. f. *lc.* 3: 69, 1880; Duthie, Fl. Gangetic Plain 1: 415, 1905.

Erect herbs, branching from the base; branches obtusely 4-angled or terete, glabrous, succulent. Leaves 1.5-2.5 × 0.5-1.0 cm, elliptic-lanceolate, entire and revolute-margined. Flowers in axillary and terminal panicles, white. Capsules on slender pedicels, didymous, projecting beyond the calyx, terete or 4-ribbed. Seeds many, subglobose, coarsely pitted.

Fl. & Fr. : October - April.

Rare, in wet habitats in the east of Aravalli.

Selected specimens : Jaipur: *Wadhwa* 8418 (BSA); Kota: *Singh* 90232 (LWG); Baran, *Wadhwa* 9411 (BSA).

22. XEROMPHIS RAF.

Flowers and fruits less than 2.5 cm in diameter. Corolla pubescent outside.

1. *X. spinosa*

Flowers and fruits more than 2.5 cm in diam. Corolla glabrous outside.

2. *X. uliginosa*

1. **Xeromphis spinosa** (Thunb.) Keay in Bull. Jard. Bot. Brux. 28: 37, 1958. *Gardenia spinosa* Thunb. Diss. Gard. no. 7, 1780. *G. dumetorum* Retz. Obs. Bot. 14, 1781. *Randia dumetorum* (Retz.) Lam. Encycl. Suppl. 2: 829, 1811; Wight, *lc.* 2(3): 6, t. 580, 1842; Hook. f. Fl. Brit. India 3: 110, 1880; Duthie, Fl. Gangetic Plain 1: 420, 1905.

Erect or spreading shrubs, armed with stout, axillary, opposite decussate spines. Leaves fascicled on branchlets, 3.5-10.0 × 2-5 cm, obovate or elliptic, subacute, entire. Stipules ovate, acuminate, pubescent. Flowers at the end of short leaf-bearing branchlets, solitary or two together, greenish-yellow or white. Calyx strigose; teeth obovate or lanceolate. Berries globose or ovoid, glabrous. Seeds many, compressed, embedded in the pulp.

Fl. & Fr. : March - June.

Common in wastelands in hilly tracts. The plants are usually browsed by the cattle and seedlings are often confused for *Maytenus* species.

Selected specimen : Jhalawar: *Singh* 83666 (LWG).

2. **Xeromphis uliginosa** (Retz.) Mahesh, in Bull. bot. Surv. India 3(1): 92, 1961. *Gardenia uliginosa* Retz. Obs. Bot. 2: 14, 1781. *Randia uliginosa*

(Retz.) DC. Prodr. 4: 386. 1830; Wight, Ic. 2(1): 8. t. 397. 1840; Hook. f. Fl. Brit. India 3: 110. 1880; Duthie, Fl. Gangetic Plain 1: 419. 1905.

Small trees; branchlets 4-angled, ending into spines. Leaves crowded towards the end of branchlets, c. 15×7 cm. obovate or elliptic-lanceolate. Stipules 3-angular. Flowers sessile or pedicellate, solitary at the end of branches, white. Calyx-lobes rounded, deciduous. Corolla of sessile flowers with a ring of hairs inside. Fruits about 5 cm long, ovoid, smooth, yellow. Seeds many, compressed, smooth, closely packed in the pulp.

Fl. & Fr. : May - August.

Rare, in scrub forests and wastelands. Flowers are slightly fragrant.

Selected specimen : Pali. Ghanerao Reserve forest, *Pundey* 4656 (BSJO).

DOUBTFUL TAXA

Galium asperuloides Edgew. in Trans. Linn. Soc. 20: 61. 1846. *G. triflorum* auct. non Michx. 1803; Hook. f. Fl. Brit. India 3: 205. 1881; Sharma in Univ. Raj. Stud. (Bot.) 21. 1974.

Erect or decumbent, perennial herbs. Leaves 6-8 in a whorl, narrowly elliptic or lanceolate, pinninerved. Cymes few-flowered, axillary and terminal. Fruits clothed with hooked bristles.

It is a high altitude plant (6,000-10,000 ft.) confined to Temperate Himalaya from Kashmir to Bhutan. Specimen No. *Sharma* 1188 (RUBL) is from Ram Niwas Garden (Jaipur) and *Sharma* (l.c.) included it in the check-list of plants from Jaipur district, but omitted it in Fl. N.E. Rajasthan. (*Sharma* and *Tiagi*, 1979). Perhaps, it has been introduced in the garden.

Oldenlandia clausa Blatt. in Journ. & Proc. Asiat. Soc. Beng. 26(1): 343. 1930.

Herbs about 3 cm high, with 4-angular stem. Leaves sessile, 2.7×0.5 cm, linear-lanceolate, margins with spine-like hairs pointing outwards. Stipules cup-like. Flowers several in each axil. Calyx-teeth with stiff spinulose hairs. Stamens 4; anthers dorsifixed. Capsules 4 mm long, subtrigonal, 2-celled, hairy.

Collected from Mt. Abu (Gora chapra) by *Hallberg* and *Blatter* during October 1917. Their collection no 15643 (BLAT) is not available in *Blatter* Herbarium and subsequent workers have also failed to collect it. The species has probably become extinct.

Oldenlandia corymbosa L. var. *nana* (Brem.) Verdc. in Kew Bull. 30(2): 296. 1975. *O. linearis* DC. var. *nana* Brem. in Verh. Akad. Wet. Nat. 48(2): 259. 1952.

Oldenlandia corymbosa L. is a polymorphic species, 1.5 to 7.0 cm tall, varying in the texture, size and shape of leaves and number of flowers per peduncle. Verdcourt (*l.c.*) is also not satisfied with the characters used for separating var. *nana* from the proper species. Specimen number Rao 66606 (BSI) from Mt. Abu may be an ecoform of the proper species.

Richardia brasiliensis Gomes, Mem. Ipecac. 31. t. 2. 1801.

Perennial, prostrate herbs. Leaves elliptic, hairy above. Flowers white or bluish. Coccoi oblong-obovoid. Native of South America. Only one plant (965) was collected by Nair (1961) from Lohargal, but the authors could not trace any herbarium specimen of this taxon in any Indian herbarium. Its occurrence in Rajasthan is doubtful.

CULTIVATED SPECIES

Gardenia resinifera Roth Shrubs or small trees, with white flowers and orbicular, yellowish brown berries. Cultivated in the gardens for ornamental purposes.

Hamelia patens Jacq. Shrubs, with whorled leaves, orange-red flowers and ovoid to globose berries. Native of tropical America; cultivated in the gardens for ornamental purposes.

Ixora coccinea L. Large, compact shrubs, with interpetiolar stipules, scarlet flowers and globose fruits. Cultivated for ornamental purposes.

Ixora congesta Roxb. Small-sized, evergreen trees with interpetiolar stipules, white flowers and globose or ovoid fruits. Cultivated for ornamental purposes.

Mussaenda frondosa L. Shrubs, with yellow flowers and subglobose to obovoid berries. One calyx-lobe foliaceous, ovate, yellow. Native of Tropical Africa; cultivated for ornamental purposes.

Pentas lanceolata (Forssk.) K. Schum. (*Ophiorrhiza lanceolata* Forssk.) - Undershrubs, with pale-purple to dull violet flowers and 2-celled, many-seeded capsules. Native of Tropical Africa and Arabia; cultivated for ornamental purposes.

Rondeletia odorata Jacq. Shrubs, with bright orange-red flowers with yellow throat and ovoid or globose, 2-celled capsules. Native of Cuba and Panama; cultivated for ornamental purposes.

Spermadictyon suaveolens Roxb. Large shrubs, with white flowers and 5-celled capsules. Cultivated for ornamental purposes.

79. ASTERACEAE (COMPOSITAE)

(V. Singh)

- 1a. Invol.-bracts spinescent or aristate:
- 2a. Heads 1-flowered, crowded in dense globose balls (compound heads). 24. *Echinops*
- 2b. Heads many-flowered, distinct, simple:
- 3a. Heads heterogamous:
- 4a. Glabrous or scabrous herbs. Florets purple. 43. *Oligochaeta*
- 4b. White-woolly herbs. Florets white or pale-yellow. 23. *Dicoma*
- 3b. Heads homogamous:
- 5a. Heads dioecious (male and female separate, but on the same plant) or polygamo-dioecious (female and bisexual separate, but on the same plant):
- 6a. Invol.-bracts of female heads united into an ovoid, 2-beaked, herbaceous utricule clothed with hooked spines. Florets apetalous. 63. *Xanthium*
- 6b. Invol.-bracts of female heads free, spine-tipped. Florets petaliferous. 18. *Cirsium*
- 5b. Heads bisexual:
- 7a. Achenes silky-villous. 23. *Dicoma*
- 7b. Achenes glabrous:
- 8a. Pappus 1-seriate. 21. *Cousinia*
- 8b. Pappus absent or 2 to many-seriate:
- 9a. Leaves spinescent. Florets orange yellow. Pappus absent. 12. *Carthamus*
- 9b. Leaves not spinescent. Florets red or lilac. Pappus present. 58. *Tricholepis*
- 1b. Invol.-bracts neither spinescent, nor aristate:
- 10a. Heads homogamous, either male or female or bisexual:
- 11a. Heads with ligulate florets only:
- 12a. Pappus of extremely short, 2 to 3-seriate scales. 17. *Cichorium*
- 12b. Pappus of equal or unequal, multiseriate hairs:
- 13a. Pappus hairs free. Achenes beaked:
- 14a. Scapigerous herbs. Achenes angular or subterete. 57. *Taraxacum*
- 14b. Leafy herbs. Achenes compressed:

- 15a. Peduncles ebracteate. Florets yellow. Achenes 10-ribbed, smooth. 38. *Iseris*
- 15b. Peduncles bracteate. Florets white, purple or pink. Achenes not ribbed, but smooth or mucronately ribbed. 39. *Lactuca*
- 13b Pappus hairs united at the base into a ring. Achenes not beaked
- 16a. Leaves mostly cauline. Involucre campanulate. Achenes with a narrow base and truncate apex. 53. *Sonchus*
- 16b. Leaves mostly rosulate. Involucre cylindrical. Achenes truncate at both ends. 42. *Launaea*
- 11b Heads with tubular florets only.
- 17a Heads compound.
- 18a Each head 1-flowered
- 19a Florets (heads) sessile, in the axils of dilated leaf-sheaths, Pappus of 2-scales. 11. *Caesulia*
- 19b Florets (heads) terminal, solitary or in cymes Pappus of toothed or fimbriate cup or ring. 40. *Lagascea*
- 18b Each head 2 to 5-flowered. 26. *Elephantopus*
- 17b. Heads simple
- 20a Leaves opposite, at least in the lower region:
- 21a Anthers with an apical appendage:
- 22a Pappus of 5, serrate, awn-tipped scales. 3. *Ageratum*
- 22b. Pappus of 6 to many, rigid, 1-seriate hairs. 15. *Chromolaena*
- 21b Anthers without an apical appendage. 2. *Adenostemma*
- 20b Leaves alternate and/or radical.
- 23a Invol.-bracts 1-seriate:
- 24a. All heads on a plant bisexual and fertile. Receptacles flat, naked. Filaments free. Styles 2-fid. 27. *Emilia*
- 24b. Female and bisexual (functionally male) heads on the same plant. Bisexual heads with cylindrical, paleaceous receptacles and pales enclosing the florets, monadelphous filaments and undivided styles. 63. *Xanthium*
- 23b. Invol.-bracts 2 to many-seriate:
- 25a. Outer invol.-bracts with foliaceous tops. 14. *Centratherum*
- 25b Outer invol.-bracts without foliaceous tops:
- 26a. Anther-base sagittate, tailed:
- 27a. Stems acutely 4 to 8-angled. Receptacles paleaceous. 34. *Goniocaulon*
- 27b. Stems cylindrical, terete or striate. Receptacles alveolate:

- 25a. Plants glandular. Outer pappus of toothed or multifold, free scales 45. *Pappoetia*
- 25b. Plants eglandular. Outer pappus of serrate scales, united to form a cup. 48. *Pulicaria*
- 26b. Anthers bases obtuse, not tailed. 61. *Vernonia*
- 10b. Heads heterogamous; outer florets usually female, inner ones bisexual or male:
 - 29a. Heads collected into globular balls (compound heads):
 - 30a. Stems winged. Florets purple. 54. *Sphaeranthus*
 - 30b. Stems not winged. Florets yellow. 30. *Flaveria*
 - 29b. Heads simple, distinct:
 - 31a. Leaves opposite, at least in the lower region:
 - 32a. Leaves 3-foliolate or deeply pinnatifid. 7. *Bidens*
 - 32b. Leaves simple, entire or serrate-dentate:
 - 33a. Palea concave, embracing the florets or achenes:
 - 34a. Ray-florets 2 to many-seriate. 25. *Eclipsa*
 - 34b. Ray-florets 1-seriate:
 - 35a. Florets white:
 - 36a. Receptacles raised, conical. Ligule of ray-florets filiform, included. 55. *Spilanthes*
 - 36b. Receptacles flat. Ligule of ray-florets exerted. 8. *Blainvillea*
 - 35b. Florets yellow:
 - 37a. Ray-florets sterile. 49. *Sclerocarpus*
 - 37b. Ray-florets fertile:
 - 38a. Achenes armed with 2. terminal spines 1. *Acanthospermum*
 - 38b. Achenes unarmed:
 - 39a. Invol.-bracts glandular. 51. *Siegesbeckia*
 - 39b. Invol.-bracts eglandular:
 - 40a. Receptacles raised, conical. Ligule of ray-florets included. 55. *Spilanthes*
 - 40b. Receptacles flat. Ligule of ray-florets exerted. 62. *Wedelia*

- 33b. Palea flat, not embracing the florets or achenes:
- 41a. Florets white. Pappus of fimbriate scales. 31. *Galinsoga*
- 41b. Florets yellow. Pappus absent or of bristles:
- 42a. Achenes with pointed spines:
- 43a. Heads 0.5-1.0 cm in diameter. Achenes of ray-florets winged. 56. *Synedrella*
- 43b. Heads 1.5-3.0 cm in diameter. Achenes of ray-florets not winged. 1. *Acanthospermum*
- 42b. Achenes without spines:
- 44a. Pappus of many, aristate, feathery bristles. 59. *Tridax*
- 44b. Pappus of 2, subulate awns. 60. *Verbesina*
- 31b. Leaves alternate and/or radical:
- 45a. Ray-florets apetalous; disk-florets male or neuter. 52. *Sotiva*
- 45b. Ray-florets petaliferous; disk-florets bisexual:
- 46a. Ray-florets ligulate:
- 47a. Pappus absent. 5. *Anthemis*
- 47b. Pappus present:
- 48a. Pappus of 2, stiff awns:
- 49a. Florets yellow:
- 50a. Leaves 1 to 2-pinnate or pinnatisect. Heads upto 1 cm in diameter. 32. *Glossocardia*
- 50b. Leaves simple, serrate-dentate. Heads 1.5-3.0 cm in diameter. 60. *Verbesina*
- 49b. Florets white. 44. *Parthenium*
- 48b. Pappus of more than 2 hairs, bristles or scales.
- 51a. Anther bases tailed:
- 52a. Pappus 2-seriate, outer scaly, inner hairy or both hairy. Achenes ribbed:
- 53a. Invol. - bracts acute or obtuse. Both series of pappus hairy. 37. *Inula*
- 53b. Invol. bracts acuminate. Outer pappus of short jagged teeth; inner of smooth, filiform bristles. 48. *Pulicaria*
- 52b. Pappus 1-seriate, hairy. Achenes not ribbed. 46. *Pentanema*
- 51b. Anthers bases obtuse, not tailed:
- 54a. Ligule yellow:

- 55a. Achenes of ray-florets dorsally compressed, thick-margined and smooth; the achenes of disk-florets flat, 2-winged. 16. *Chrysanthellum*
- 55b. Achenes of ray-florets dorsally compressed, but 5 to 10-ribbed; the achenes of disk-florets subterete. 50. *Senecio*
- 54b. Ligule of other colours, never yellow:
- 56a. Heads axillary, solitary. 10. *Brachyactis*
- 56b. Heads in corymbose or branched panicles, rarely terminal solitary. 29. *Erigeron*
- 46b. Ray-florets narrow, tubular, not ligulate:
- 57a. Anther-bases tailed:
- 58a. Pappus absent, atleast in ray-florets:
- 59a. Florets reddish, in leafy spikes; disk-florets with a ring of feathery pappus. 36. *Uloga*
- 59b. Florets purple, in corymbs or corymbose panicles; disk florets without pappus. 28. *Epipates*
- 58b. Pappus present in both types of florets:
- 60a. Invol.-bracts dry, scarious
- 61a. Herbs. Heads in leafless clusters or leafy spikes. Styles-arms of bisexual florets truncate. 33. *Gnaphalium*
- 61b. Undershrubs. Heads in leafless corymbs. Style-arms of bisexual florets filiform. 47. *Pluchea*
- 60b. Invol.-bracts herbaceous. 9. *Blumea*
- 57b. Anther-bases obtuse or truncate, not tailed:
- 62a. Pappus absent:
- 63a. Heads in spiciform racemes or panicles:
- 64a. Florets rose-purple. 22. *Cyathocline*
- 64b. Florets white or yellow. 6. *Artemisia*
- 63b. Heads axillary, solitary. 13. *Centipeda*
- 62b. Pappus present:
- 65a. Pappus 1, wedge-shaped, scally. 20. *Cotula*
- 65b. Pappus more than 1, 1-seriate:
- 66a. Disk-florets sterile, with undivided styles. 4. *Anaphalis*
- 66b. Disk-florets fertile, with 2-fid styles:
- 67a. Heads solitary, terminal or leaf-opposed. 35. *Grangea*
- 67b. Heads in clusters or in various inflorescences:
- 68a. Stems winged due to decurrent base leaves. 41. *Laggera*
- 68b. Stems not winged:
- 69a. Achenes compressed, not ribbed. 19. *Conyza*
- 69b. Achenes subterete, if compressed then 5 to 10-ribbed. 50. *Senecio*

1. ACANTHOSPERMUM SCHRANK

Acanthospermum hispidum DC. Prodr. 5: 522. 1836; Raizada, Suppl. Duthie, Fl. Gangetic Plain 99. 1976. *A. australe sensu* Raizada and Sharma in Ind. For. 88 (5): 364. 1962, non Kuntze, 1891.

Dichotomously branched, hispid, annual herbs. Leaves sessile, 2-8 × 1.5 cm, obovate-spathulate or ovate, cuneate at the base, acute at the apex, serrate-dentate. Heads on deflexed peduncles in the leaf-axils or forks of branches, 2-3 cm in diam., yellow. Anthers obtuse. Achenes compressed, with two spines at the apex and many lateral hooked spinules.

Fl. & Fr. : July - October.

Native of south America; naturalized in wastelands, cultivated fields and forests; often gregarious at some spots and spreading very rapidly.

Selected specimens : Ajmer: Johns Gunj, Sharma 631, 1352 (DD); Banswara: Loharia, Singh 4242 (BSJO); Jaipur: Durgapura, Sharma 1023 (RUBL); Jhalawar: Sharma 186 (RUBL); Sirohi: Mt. Abu, Raizada 20551 (DD).

2. ADENOSTEMMA J. & G. FORSTER

Adenostemma lavenia (L.) Kuntze, Rev. Gen. Pl. 1: 304. 1891; Raizada, Suppl. Duthie, Fl. Gangetic Plain 100. 1976. *Verbesina lavenia* L. Sp. Pl. 902. 1753. *Adenostemma viscosum* Forst. Char. Gen. 90. 1776; Hook. f. Fl. Brit. India 3: 242. 1881, incl. var. *elata*; Duthie, Fl. Gangetic Plain 1: 443. 1905.

Erect, annual herbs, 50-80 cm high, rooting at the base; stem terete, glandular pubescent, corymbosely branched above. Leaves 2-12 × 1.5-5.0 cm, linear to ovate-lanceolate, crenate or serrate, 3-nerved. Heads in lax panicles or corymbs, 4-6 mm in diam., white. Achenes compressed, obovoid-oblong, 3 to 5-angled, smooth or with glandular tubercles. Pappus hairs 3, short, rigid, often clavate, inserted in a short ring.

Fl. & Fr. : August - November.

Native of South America; introduced into India during 1872. Rare, in still or slow running shallow streams.

Selected specimen : Kota Kelwara, Singh 90835 (LWG).

3. AGERATUM L.

Heads 60 to 70-flowered. Invol.-bracts acute-acuminate, sparsely hairy or subglabrous. Corolla 1.0-1.5 mm long.

1. *A. conyzoides*

Heads 75 to 100-flowered. Invol.-bracts setaceous, densely hirsute. Corolla 2-7 mm long.

2. *A. houstonianum*

1. *Ageratum conyzoides* L. Sp. Pl. 839. 1753; Hook. f. Fl. Brit. India 3: 243. 1881; Duthie, Fl. Gangetic Plain 1: 443. 1905. 'Bhakumbar' (Hindi).

Hairy, annual herbs. Leaves 4-9 × 2.5-7.0 cm, ovate or rhomboid-ovate to triangular, truncate to subcordate at the base, obtuse to acuminate at the apex, serrate. Heads in terminal corymbs, blue, white or purple. Invol.-bracts 2 to 3-seriate, linear, acute-acuminate, ciliolate, ribbed outside. Anthers appendiculate at the apex. Achenes 1.5-1.8 mm long, angled, black; pappus-scales serrate, awn-tipped.

Fl. & Fr. : All round the year.

Native of South America; common in wet and shaded habitats from plains to the hills, often gregarious in orchards.

Selected specimens : Banswara: Khora forest, Singh 3711 (BSJO); Bundi: Hindoli, Verma 1873 (BSI); Jaipur: Ram Niwas Garden, Sharma 500 (RUBL); Sirohi: Mt. Abu, Raizada 20682 (DD).

2. *Ageratum houstonianum* Mill. Gard. Dict. ed. 8. no. 2. 1768; Raizada, Suppl. Duthie, Fl. Gangetic Plain 101. 1976; Bhandari, Fl. Ind. Desert 192. 1978.

Erect or decumbent herbs, clothed with patent white hairs. Leaves 2-10 × 1.5-5.0 cm, ovate-triangular, subacute or obtuse, thinly patent-hairy. Heads 80 to 100-flowered, in terminal and axillary dense corymbs. Corolla 5-7 mm long, violet or white. Invol.-bracts linear-setaceous, hairy. Achenes 2-3 mm long, 5-angled, hairy, black. Pappus-scales 5, serrate, awn-tipped.

Fl. & Fr. : All round the year.

Native of Mexico. Rare, in wastelands especially in wet and shaded habitats.

Selected specimens : Ganganagar: Roy 5013 (BSJO); Jodhpur: Mandore, Tiwari 1118 (BSJO).

4. ANAPHALIS DC.

Leaf margins recurved.

2. *A. aristata*

Leaf-margins flat.

1. *A. adnata*

1. *Anaphalis adnata* DC. Prodr. 6: 274. 1837; Wight, Ic. 3(4): 10. t. 1119. 1846; Hook. f. Fl. Brit. India 3: 282. 1881.

Robust, erect herbs, 30-60 cm high; stem stout, densely clothed with white silky or cottony wool. Leaves 5-10 × 2-6 cm, obovate-oblong to spatulate or lanceolate, semi-amplexicaul at the base, leathery, 1 to 3-

nerved. Heads numerous, in dense rounded clusters on stout branches of a large corymb or in a simple terminal cluster, subglobose, yellow. Invol.-bracts rounded-ovate, obtuse, white, opaque.

Fl. & Fr. : September - December.

Rare, in wastelands. Reported by Vyas (1967) from Alwar. This taxon is a denizen of temperate Himalayas.

2. *Anaphalis aristata* DC. in Wight, Contrib. Bot. Ind. 21. 1834; Hook. f. Fl. Brit. India 3. 285 1881.

Herbs, woody at the base; branches pubescent or tomentose. Leaves 5-10 × 2.5-5.0 cm, semi-amplexicaul, acute or acuminate, recurved margined, cottony or woolly beneath, 1-nerved. Heads turbinate, in dense, corymbose, globose clusters 2-3 mm in diam. Invol.-bracts linear-oblong, obtuse, white, yellowish or pink.

Fl. & Fr. : August - December.

Rare, in the forests at Mt. Abu. It is a native of Nilgiri hills.

Selected specimens : Sirohi: Mt. Abu, *Blatter* 21747, 20575, 21753 (BLAT).

5. ANTHEMIS L.

Anthemis cotula L. Sp. Pl. 894. 1753; Hook. f. Fl. Brit. India 3: 312. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 103. 1976.

Erect, annual herbs; stem hairy, corymbosely branched above. Leaves sessile, 2-5 cm long, with linear, dentate or pectinately pinnatifid segments. Heads solitary, terminal, often combined into leafy corymbs, 1.5-2.0 cm in diam., white. Invol.-bracts 2-seriate, lanceolate-oblong, hairy. Ligule hairy, obtusely 3-toothed. Ray-florets neuter. Corolla of disk-florets glabrous. Receptacles convex, with linear-subulate pales. Achenes 1.5-2.0 mm long, turbinate, 8 to 10-ribbed, tuberculate on ribs. Pappus absent.

Fl. & Fr. : April - June.

Native of Europe and Continental Asia. Reported by Sankhala (1951) from N.W. Rajasthan.

6. ARTEMISIA L.

1a. Stems sulcate, whitish appressed hairy. Leaves densely white-lanate beneath. Invol.-bracts hairy. Disk-florets fertile.

1. *A. nilagrica*

1b. Stems ribbed, glabrous. Leaves glabrous or pubescent beneath. Invol.-bracts glabrous. Disk-florets sterile:

2a. Lower leaves entire to serrate-lobed.

2. *A. parviflora*

2b. Lower leaves pinnatipartite to 2-pinnate.

3. *A. scoparia*

1. *Artemisia nilagirica* (Clarke) Pamp. in Nuov. Giorn. Bot. Ital. n.s. 33: 452. 1926. *A. vulgaris* L. var. *nilagirica* Clarke, Comp. Ind. 162. 1876. *A. vulgaris auct. plur.* non L. 1753; Hook. f. Fl. Brit. India 3: 325. 1881; Duthie, Fl. Gangetic Plain 1: 478. 1905.

Erect or ascending, aromatic, perennial herbs or undershrubs, with subterranean stolons. Leaves sessile, pinnatipartite to 2-pinnate; segments lanceolate-oblong, entire, glabrate or thinly hairy above, densely white-lanate beneath. Heads sessile, in spiciform racemes which are combined into panicles, white. Invol.-bracts ovate-oblong, obtuse, densely lanate. Ligule glandulate. Corolla of disk-florets about 2mm long. Achenes 1 mm long, glabrous.

Fl. & Fr. : October - February.

Rare, along the roads, in vacant pots, wastelands, orchards and out skirts of forests

Selected specimens : Sirohi: Mt. Abu, *Blatter* 21748, 20731 (BLAT), *Rao* 66682 (BSI), *Jain* 46719 (BSI). Also reported from Jaipur (Joshi, 1957), Jodhpur (Sarup, 1951) and Udaipur (Vyas, 1965).

2. *Artemisia parviflora* Buch.-Ham. ex D. Don, Prodr. 181. 1825; Wight, Ic. 3(4): 9. t. 111. 1846; Hook. f. Fl. Brit. India 3: 322. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 104. 1976.

Erect, perennial herbs; stems ribbed, glabrous except for white cottony young parts. Leaves sessile, 1.5-4.0 × 0.5-2.0 cm, spatulate-cuneate, serrate or lobed, often 3-pinnatifid, hairy. Heads short-peduncled, axillary, combined into panicles, 1.5-2.5 mm in diam., yellow. Invol.-bracts 2 to 3-seriate. Corolla of disk-florets 1 mm long. Achenes upto 1 mm long.

Fl. & Fr. : October - February.

Rare, on the fringes of forests, in wastelands etc.

Selected specimens : Sirohi: Mt. Abu, *Jain* 5379, 48150 (BSI), *Tataka* 46525 (BSI), *Blatter* 5008 (BLAT), *Duthie* 6653 (DD); Kotra Dam, *Rao* 66528 (BSA). Also reported from Sikar (Nair & Malhotra, 1961).

3. *Artemisia scoparia* Waldst. & Kit. Descr. Pl. Rar. Hung. 1: 66. t. 65. 1801; Hook. f. Fl. Brit. India 3: 323. 1881; Duthie, Fl. Gangetic Plain 1: 477. 1905; Mahesh. Illus. Fl. Delhi f. 111. 1966.

Erect, perennial herbs; stems many from the woody base, glabrous except the younger parts. Lower leaves 3-pinnate, middle and upper ones pinnatipartite to 2-pinnate; segments linear-filiform, glabrous or hairy beneath. Heads axillary, sessile or on short peduncles, combined into panicles, 2-3 mm in diam., golden yellow. Invol.-bracts ovate-elliptic, obtuse. Disk-florets 1-2 mm long. Achenes 1 mm long, glabrous.

Fl. & Fr. : October - February.

Common in wastelands, along the roads, in orchards etc.

Selected specimens : Churu: Roy 3991 (BSJO); Ganganagar: Babwala, Rao 5068 (BSJO); Jaipur: Kaul 8408 (LWG); Tonk road, Sharma 347 (RUBL); Durgapura, Sharma 2223 (RUBL). Also reported from Alwar (Vyas, 1967), Jhunjhunu (Nair, 1956), Sikar (Nair and Nathawat, 1957) and Udaipur (Ramdeo, 1969).

7. BIDENS L.

Bidens biternata (Lour.) Merr. & Sherff ex Sherff in Bot. Gaz. 88: 293. 1929. *Coreopsis biternata* Lour. Fl. Cochinch. ed. 1. 508. 1790. *Bidens pilosa* auct. plur. non L. 1753; Hook. f. Fl. Brit. India 3: 309. 1881; Duthie, Fl. Gangetic Plain 1: 472. 1905.

Erect, annual herbs. Leaves 1-pinnate, with 2-3 subopposite pairs and one terminal, often 3-lobed leaflets; lower leaflets pinnately lobed. Heads 10 to 30-flowered, solitary, pedunculate, 2 × 1 cm, yellow. Ray-florets ligulate, neuter or female. Disk-florets tubular, bisexual. Outer invol.-bracts linear, acute, ciliate. Achenes 0.5-2.0 cm long, linear, glabrous, black. Pappus 2-4, rigid, retrorsely hispid, awned.

Fl. & Fr. : August - January.

Native of America; naturalized in the forests from plains to the hills.

Selected specimens : Banswara: Dagia Bowji, Singh 2858 (BSJO); Jaipur: Amer, Sharma 829 (RUBL); Kota: Shahabad, Majumdar 13208 (BSA); Sirohi: Mt. Abu, Puri 46413 (BSI); Udaipur: Majumdar 10370 (BSA).

8. BLAINVILLEA CASS.

Blainvillea acmella (L.) Philipson in Blumea 6: 350. 1950. *Verbestna acmella* L. Sp. Pl. 901. 1753. *Eclipta latifolia* L. f. Suppl. 378. 1781. *Blainvillea rhomboidea* Cass. in Dict. Sci. Nat. 29: 494. 1823; Duthie, Fl. Gangetic Plain 1: 469. 1905. *B. latifolia* (L. f.) DC. in Wight, Contrib. Bot. Ind. 17. 1834; Hook. f. Fl. Brit. India 3: 305. 1881. 'Kanghi' (Hindi).

Hispid, annual herbs, 30-60 cm high. Leaves 4-10 × 2-6 cm, ovate or ovate-lanceolate, serrate. Heads solitary, sessile or pedunculate, white. Ray-florets female, 1-seriate. Disk-florets tubular, bisexual. Invol.-bracts foliaceous, strongly veined. Achenes 3-quetrous, obovoid-cuneate, tubercled, pubescent, those of disk-florets slightly compressed and transversely rugose. Pappus-setae 2-5, plumose.

Fl. & Fr. : August - November.

Native of South America; naturalized in wastelands and forests throughout the state.

Selected specimens : Banswara: Pipalkhunt, *Singh* 2918 (BSJO); Bhilwara: Bhimar village, *Singh* 5997 (BSJO); Jaipur: *Wadhwa* 4864, 4807 (BSA); Kota: Shahabad, *Majumdar* 13105 (BSA); Tonk: Bentheli, *Shetty* 1233 (BSJO).

9. BLUMEA DC. *nom. cons.*

1a. Leaves spinous-toothed:

- 2a. Corolla of both types of florets hairy. 1. *B. eriantha*
 2b. Corolla of ray-florets at least glabrous. 8. *B. oxydonia*

1b. Leaves entire, toothed or lobed, but never spinous:

- 3a. Heads solitary, peduncled, at the end of branches. 7. *B. obliqua*

3b. Heads many, in cymes, panicles, corymbs or clusters etc.:

- 4a. Receptacles hairy around the pita. 3. *B. laciniata*

4b. Receptacles glabrous:

5a. Florets yellow:

- 6a. Leaves viscid. Heads in axillary, spiciform panicles combined into leafy compound panicles. 2. *B. lacera*

6b. Leaves not viscid. Heads in lax, pedunculate panicles:

7a. Stems with stalked glands:

- 8a. Glands on the stems few. Invol.-bracts herbaceous. 4. *B. membranacea*
 var. *membranacea*

- 8b. Glands on the stems many, very dense. Invol.-bracts rigid. 5. *B. membranacea*
 var. *jacquemontii*

- 7b. Stems without glands. 9. *B. virens*

- 5b. Heads purple or lilac. 6. *B. mollis*

1. *Blumea eriantha* DC. in Wight, Contrib. Bot. Ind. 15. 1834; Hook. f. Fl. Brit. India 3: 266. 1881; Duthie, Fl. Gangetic Plain 1: 452. 1905.

Dichotomously branched, pubescent, perennial or annual herbs, upto 1 m high, with fibrous roots. Leaves 2-18 × 0.6-6.0 cm, obovate, apiculate, spinulose-serrate; lower leaves petiolate, pubescent or glabrous; upper ones sessile and hairy. Heads in axillary clusters and terminal panicles, yellow. Invol.-bracts linear, glandular-hairy, reflexed at maturity. Achenes obscurely angled. Pappus white.

Fl & Fr. : November - April.

Common in moist and shaded localities in the forests, orchards etc.

Selected specimens : Banswara: Loharia forest, Singh 4241 (BSJO); Jhalawar: Verma 3522 (CAL.). Also reported from N.W. Rajasthan (Sankhala, 1951).

2. *Blumea lacera* (Burm. f.) DC. in Wight, Contrib. Bot. Ind. 14. 1834; Hook. f. Fl. Brit. India 3: 263. 1881; Duthie, Fl. Gangetic Plain 1: 453. 1905; Mahesh. illus. Fl. Delhi f. 106. 1905. *Conyza lacera* Burm. f. Fl. Ind. 180. t. 59. f. 1. 1768.

Erect, aromatic, glandular-pubescent, annual herbs, with a stout tap root. Leaves 2.5-5.0 × 1-2 cm, obovate-oblong or elliptic-oblong, narrowed into a short petiole at base, entire or coarsely dentate, glandular and densely hairy. Heads pedunculate, crowded at the end of branches and/or in axillary, spiciform panicles combined into leafy compound panicles, 5-6 mm in diam., yellow. Invol.-bracts linear, acute, glandular hairy. Corolla-lobes of disk-florets hairy with colleters and uni- and multicellular hairs. Achenes hairy.

Fl & Fr. : January - May.

Common in wastelands, forest edges, gardens and other wet and shaded localities.

Selected specimens : Bharatpur: Jameson 33527 (DD); Bhilwara: Bijolian, Singh 7144 (BSJO); Jaipur: Daosa, Wadhwa 8118 (BSA); Jhalawar, Shyamgarh, Mayumdar 10092 (BSA).

3. *Blumea laciniata* (Roxb.) DC. Prodr. 5: 436. 1836; Hook. f. Fl. Brit. India 3: 264. 1881; Duthie, Fl. Gangetic Plain 1: 454. 1905. *Conyza laciniata* Roxb. Fl. Ind. 3: 428. 1832.

Erect, glandular hairy, annual herbs. Lower leaves petioled, lyrate-pinnatifid; upper ones obovate, entire or coarsely toothed. Heads combined into large leafy panicles, 5-7 mm in diam., yellow. Invol.-bracts linear-

lanceolate, white hairy. Corolla-lobes of disk-florets hairy with colleters and unicellular hairs. Achenes ribbed, thinly hairy. Pappus-hairs white.

Fl. & Fr. : December - May.

Common in the east of Aravalli in wastelands, gardens, fields, open forests etc., particularly in wet and shaded localities.

Selected specimens : Jaipur: Jholana, *Singh* Acc. No. 9606 (RUBL); Doasa, *Wadhwa* 8138 (BSA); Jhalawar: *Sharma* 276 (RUBL); Sirohi: Mt. Abu, *King* Acc. No. 231595 (CAL); Udaipur: Jaisamand, *Verma* 71 (BSA).

4. *Blumea membranacea* DC. Prodr. 5: 440. 1836; Hook. f. Fl. Brit. India 3: 265. 1881; Duthie, Fl. Gangetic Plain 1: 455. 1905.

var. *membranacea*

Tall, slender, sparsely glandular pubescent herbs. Leaves long-petioled, 4-15 × 2-6 cm, ovate-lanceolate to obovate-lanceolate or lyrate lobed, serrate-dentate. Heads in terminal panicles, 5-7 mm in diam., yellow. Invol.-bracts herbaceous, tinged with purple, longer than florets, reflexed at maturity. Corolla-lobes of disk-florets hairy with colleters and unicellular hairs. Receptacles flat or convex, alveolate. Achenes oblong, ribbed. Pappus upto 5 mm long, white.

Fl. & Fr. : October - May.

Common on the walls of old buildings, in the orchards and forests in wet and shaded habitats, particularly in the east of Aravalli.

Selected specimens : Banswara: Fatehpura forest, *Singh* 3740 (BSJO); Bharatpur: *Nigam* 124496 (DD); Kota: Shahabad, *Nautiyal & Raizada* 25369 (DD); Sirohi: Gomukh, *Jain* 62114 (BSA); Tonk: Toda Rai Singh, *Shetty* 1090 (BSJO).

5. var. *jacquemontii* (Hook.f.) Rand. in *Blumea* 10(1): 271. 1960. *B. jacquemontii* Hook. f. Fl. Brit. India 3: 265. 1881; Duthie, Fl. Gangetic Plain 1: 445. 1905. *B. kingii* Clarke in Hook. f. *Lc.* 3: 265. 1881.

Robust, densely glandular hairy herbs. Heads 7-8 mm in diameter. Invol.-bracts rigid. Achenes ribbed, silky.

Fl. & Fr. : October - May.

Common in wet and shaded habitats in wastelands, orchards and forests.

Selected specimens : Chittorgarh: Bansi, *Verma* 1791 (BSA); Jhalawar: *Verma* 3355 (BSA); Sirohi: Mt. Abu, *Blatter* 20342, 21738 (BLAT). Also reported from N.W. Rajasthan (*Sankhala*, 1951).

6. *Blumea mollis* (D. Don) Merr. Philipp. Journ. Sci. (Bot.) 5: 395. 1910. *Erigeron molle* D. Don, Prodr. Fl. Nep. 172. 1825. *Blumea wightiana* DC. in Wight, Contrib. Bot. Ind. 14. 1834; Hook. f. Fl. Brit. India 3: 261. 1881; Duthie, Fl. Gangetic Plain 1: 453. 1905. *B. neilgherrensis* Hook. f. *Lc.* 3: 261. 1881.

Erect, aromatic, viscid herbs, upto 1 m high. Leaves 1.0-9.5 × 0.6-5.0 cm, ovate-lanceolate or obovate, upper ones gradually smaller, serrate. Heads in compact, spiciform panicles, 3-4 mm in diam. Invol.-bracts 1-5 mm long, reflexed. Receptacles flat, alveolate, glabrous. Achenes pubescent, brown. Pappus 2-4 mm long, white.

Fl. & Fr. : February - May.

Common in wastelands, particularly in the east of Aravalli. Very close to *B. lacera* (Burm. f.) DC.

Selected specimens : Banswara: Parla ka pul, *Majumdar* 10320 (BSA); Jaipur: Amer, *Sharma* 1063 (RUBL); Kota: Shahabad, *Singh* 90458 (LWG); Sirohi: Mt. Abu, *King* Acc. No. 231000 (CAL); Udaipur: Banki Block, *Verma* 27 (BSA).

7. *Blumea obliqua* (L.) Druce, Rep. Bot. Soc. Exch. Club Brit. Isles 4: 609. 1917. *Erigeron obliquum* L. Mant. Alt. 2: 573. 1771. *Blumea pubiflora* DC. Prodr. 5: 434. 1834. *B. amplectens* DC. in Wight, Contrib. Bot. Ind. 13. 1834; Hook. f. Fl. Brit. India 3: 260. 1881; Duthie, Fl. Gangetic Plain 1: 451. 1905. *B. amplectens* DC. var. *pubiflora* (DC) Clarke in Hook. f. *Lc.* 3: 260. 1881; Duthie, *Lc.* 1: 452. 1905.

Deep-rooted, decumbent, hairy herbs. Leaves elliptic-oblong or spatulate, dentate or entire, clasping stem. Heads 6-10 mm in diam., yellow. Invol.-bracts 1-8 mm long, reflexed. Receptacles convex, alveolate, glabrous. Achenes oblong, not ribbed, pubescent, dark brown. Pappus 3-4 mm long, pink.

Fl. & Fr. : October - May.

Common in wastelands and often on the walls of old buildings. It is a highly polymorphic species varying in hairiness, size of heads and shape and size of leaves depending on the habitats.

Selected specimens : Banswara: Chirola vilage, *Singh* 3748 (BSJO); Barmer: Gypsum halt, *Tiwari* 966 (BSJO); Jaipur: Doasa, *Wadhwa* 8193 (BSA); Sirohi: Mt. Abu, *McCann* 188 (BLAT); Tonk: Tordi Sagar, *Shetty* 573 (BSJO).

8. *Blumea oxyodonta* DC. in Wight, Contrib. Bot. Ind. 15. 1834; Hook. f. Fl. Brit. India 3: 266. 1881; Duthie, Fl. Gangetic Plain 1: 452. 1905.

Prostrate or decumbent-ascending, glandular hairy herbs. Leaves obovate or lanceolate-oblong, narrowed into a short petiole, spinous-dentate, glandular, appressed hairy or lanate. Heads on 1-3 cm long peduncles, combined into lax, leafy panicles, 5-7 mm in diam. Invol.-bracts 5-7 mm long, linear, acute, villous. Corolla-lobes of disk-florets clothed with collectors and multicellular hairs. Achenes oblong, thinly hairy, brown. Pappus white, deciduous.

Fl. & Fr. : January - April.

Rare, in open wastelands, specially in the east of Aravalli.

Selected specimens : Banswara: Ghatol, *Singh* 4215 (BSJO); Bundi: Hindoli, *Singh* 74776 (LWG).

9. *Blumea virens* DC. in Wight, Contrib. Bot. Ind. 14. 1834; Hook. f. Fl. Brit. India 3: 264. 1881.

Herbs, 10-100 cm high, with fibrous root-stock. Leaves 3-15 × 0.7-10.0 cm, oblanceolate or obovate, lower ones lyrate-lyobed, serrate with apiculate teeth, glabrous or sparingly pilose. Heads in terminal, leafy panicles, 5-7 mm in diam., yellow. Invol.-bracts linear, longer than florets, reflexed at maturity. Receptacles convex, alveolate. Achenes oblong-columnar, ribbed, sparsely hairy, pale brown. Pappus up to 4 mm long, white.

Fl. & Fr. : January - April.

Rare, in wastelands, especially in dry habitats.

Selected specimen : Kota: *Singh* 90245 (LWG).

IOBRACHYACTIS LED.

Brachyactis pubescens (DC.) Aitch. in Clarke, Journ. Linn. Soc. 18: 68. 1880. *Conyza pubescens* DC. Prodr. 5: 381. 1836. *Brachyactis robusta* Benth. in Hook. Ic. Pl. 12: t. 1106. 1876; Hook. f. Fl. Brit. India 3: 254. 1881.

Erect, glandular-pubescent, annual herbs. Leaves alternate, obovate, narrowed at the base into a short petiole, toothed. Heads sessile or pedunculate, axillary, solitary, 1.0-1.5 mm in diam. Receptacles broad. Achenes obovate, flat, silky. Pappus reddish.

Fl. & Fr. : August - December.

Rare, in wet and swampy habitats. It is a high altitude plant of western Himalayas.

Selected specimen : Jaisalmer: Bundha nala, *Wadhwa* 4800 (BSA).

11. CAESULIA ROXB.

Caesulia axillaris Roxb. Pl. Cor. 1: 64. t. 93. 1798; Wight, Ic. 3(4): 8. t. 1102. 1846; Hook.f. Fl. Brit. India 3: 291. 1881; Duthie, Fl. Gangetic Plain 1: 462. 1905.

Erect or decumbent, succulent, annual herbs, often rooting at the lower nodes. Leaves 4-15 × 0.5-2.0 cm, elliptic-lanceolate, serrate. Heads many, connate in a compound sessile head in the axils of dilated leaf-sheaths, blue or white. Achenes 3 × 2 mm, obovate, notched at the tip, winged on the margins, hairy on flat faces, 1-nerved in the middle. Pappus-scales ovate-lanceolate, 2-ribbed, apiculate.

Fl. & Fr. : August - November.

Common in shallow ditches, rice-fields and other low lying areas.

Selected specimens : Ajmer: Nasirabad, *Sharma* 761 (DD); Banswara: Lamero tank, *Singh* 3639 (BSJO); Barmer: *Tiwari* 994 (BSJO); Kota: Shahabad, *Majumdar* 13205 (BSA); Tonk: Siras forest, *Shetty* 1016 (BSJO).

12. CARTHAMUS L.

Carthamus oxyacantha Bieb. Fl. Taur. Cauc. 2: 283. 1808; Hook. f. Fl. Brit. India 3: 386. 1881; Mahesh. Illus. Fl. Delhi f. 112. 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 106. 1976.

Thistle-like, annual herbs, with corymbosely branched, white stem and branches. Leaves alternate, oblong or oblong-lanceolate, semi-amplexicaul, spinulose-toothed. Heads 1.5-2.0 cm long, orange-yellow. Outer invol-bracts foliaceous, spine-tipped; inner-most lanceolate. Florets bisexual, tubular, homogamous. Achenes obovate, slightly 4-angled, truncate at apex, smooth. Pappus absent.

Fl. & Fr. : January - May.

Rather common in dry habitats in sandy soils.

Selected specimen : Palit Sadri. *Pandey* 4127 (BSJO). Also reported from Alwar (Vyas, 1967), Ganganagar (Dhillon & Bajwa, 1969) and Jodhpur (Sarup, 1954).

13. CENTIPEDA LOUR.

Centipeda minima (L.) A. Br. & Asch. Ind. Sem. Hort. Berol. App. 6. 1867. *Artemisia minima* L. Sp. Pl. 849. 1753. *Centipeda orbicularis* Lour. Fl. Cochinch. 2: 493. 1790; Hook. f. Fl. Brit. India 3: 317. 1881; Duthie, Fl. Gangetic Plain 1: 444. 1905. *Dichrocephala schmidii* Wight, Ic. 4(4): 16. t. 1610. 1850. *Nukchinkni* (Hindi).

Prostrate or decumbent-ascending, much branched, annual herbs. Leaves sessile, 5-15 × 1.5-4.0 mm, spatulate-oblong or obovate, entire or pinnatifid, obtuse, glabrous. Heads sessile, axillary, solitary, 2.5-4.0 mm in diam. Invol.-bracts 2-seriate, lanceolate, obtuse. Ray-florets with 2-toothed corollas, white; disk-florets yellow. Receptacles convex. Achenes oblong, 4-angular, hairy on the angles. Pappus absent.

Fl. & Fr. : January - March.

Common in the east of Aravalli in wet habitats like rice-fields, gardens, river-banks and road-side ponds.

Selected specimens : Bhilwara: Badnor, Singh 7033 (BSJO); Bundi: Shikarburj, Singh 74006 (LWG); Dungarpur: Verma 168 (BSA); Jaipur: Jaigarh, Sharma 463, 471 (RUBL); Sirohi: Mt. Abu, Kanodia 62204 A, Jain 60122 A (BSI).

14. CENTRATHERUM CASS.

Leaves green-pubescent beneath. Achenes hairy.

1. *C. anthelminticum*,

Leaves white-woolly beneath. Achenes glabrous.

2. *C. phyllotaenium*

1. *Centratherum anthelminticum* (L.) O. Kuntze, Rev. Gen. Pl. 1: 320. 1891. *Conyza anthelmintica* L. Sp. Pl. ed. 2. 1207. 1763. *Vernonia anthelmintica* (L.) Willd. Sp. Pl. 3: 1634. 1803; Hook. f. Fl. Brit India 3: 236. 1881; Duthie, Fl. Gangetic Plain 1: 440. 1905.

Erect, aromatic, gland punctate or glandular hairy, annual herbs. Leaves sessile or petiolate, 4-6 × 2.0-2.5 cm, elliptic-obovate or ovate, coarsely serrate. Heads subsolitary, leaf-opposed, combined into terminal leafy corymbs, 1-2 cm in diam., purple. Florets tubular. Receptacles naked. Invol.-bracts 4 to 5-seriate. Achenes terete, 10 to 12-ribbed, glandular hairy. Pappus 2-seriate, plumose, the outer short and rigid, the inner ones long.

Fl. & Fr. : January - March; often in August - November.

Common in wet and shaded habitats in wastelands and forests.

Selected specimens : Banswara: Kanodia 75503 (BSI); Jaipur: Amer, Sharma 263 (RUBL); Kota: Sitabari, Singh 90846 (LWG); Sirohi: Jain 60481 (BSI); Udaipur: Kanodia 82323 (BSI).

2. **Centratherum phyllolaenum** (DC.) Benth. ex Clarke, Comp. Ind. 4. 1876; Hook. f. Fl. Brit. India 3: 228. 1881. *Decaneuron phyllolaenum* DC. Prodr. 7: 264. 1838.

Erect, annual herbs, with glabrous or rough stem and branches. Leaves alternate, 5-15 × 2.5-8.0 cm, ovate-elliptic, cuneate at the base, spinous-serrate to dentate, rough above, white woolly tomentose beneath. Heads peduncled, solitary, purple. Outer invol.-bracts leafy at the top, not cordate at the base; inner scarious. Receptacles flat, scally. Achenes oblong, 10 to 12-ribbed, glabrous. Pappus 1-seriate, denticulate, shorter than corolla-tube.

Fl. & Fr. : October - December.

Rare, in the forests in shaded habitats.

Selected specimens : Banswara: Khora forest, Singh 3721 (BSJO); Sirohi: Mt. Abu, Jain 46668, Tataka 46527, Rao 66506 (BSI).

15. CHROMOLAENA DC.

Chromolaena odorata (L.) King & Robinson in Phytologia 20: 204. 1970. *Eupatorium odoratum* L. Syst. Nat. ed. 10. 2: 1205. 1759; Hook. f. Fl. Brit. India 3: 244. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 115. 1976.

Coarse herbs, with terete, glabrous or softly hairy stems. Leaves 6 × 3 cm, ovate or ovate-rhomboid, cuneate at base, acuminate, serrate-dentate, softly hairy above, densely so and glandular beneath. Heads in corymbs, homogamous. Invol.-bracts many-seriate, outer shorter. Achenes 5-angled, scabridulous along angles. Pappus hairs 1-seriate, scabridulous, white.

Fl. & Fr. : September - November.

Native of West Indies; naturalized in wastelands near habitations.

Selected specimens : Jaipur: Durgapura, Sharma Acc. No. 2340 (RUBL); Jodhpur: Jaswant college, Chiman Lal Acc. no. 116219 (DD). Also reported from Sikar (Nair and Malhotra, 1961).

16. CHRYSANTHELLUM RICH.

Chrysanthellum americanum (L.) Vatke in Abli, Nat. Ver. Brem. 9: 122. 1887. *Artemisia americana* L. Sp. Pl. 895. 1753. *Chrysanthellum indicum* DC. Prodr. 5: 631. 1836; Hook. f. Fl. Brit. India 3: 310. 1881; Duthie, Fl. Gangetic Plain 1: 473. 1905.

Erect or decumbent, annual herbs, 15-25 cm high. Lower leaves petioled, upper ones sessile, 2-7 cm long, 1 to 2-pinnatifid; segments 2.5-4.0 × 1.2-1.5 mm, lanceolate-oblong, mucronate, glabrous. Heads solitary,

axillary and terminal, on long peduncles, 5-6 mm in diam. Invol.-bracts 1 to 3-seriate, few, lanceolate, obtuse. Ligule of ray-florets 3-dentate. Achenes 3.0×1.5 mm, oblong-obovate, dorsally compressed, with thickened and minute, crown-shaped pappus.

Fl & Fr. : August - October.

Rather common in wet and shaded habitats in the forests.

Selected specimens : Bhilwara: Banera, Singh 6023 (BSJO); Kota: Darah, Singh 74817 (LWG). Also reported from Jhalawar (Majumdar, 1973).

17. CICHORIUM L.

Pappus-scales 0.5-2.0 cm long.

1. *C. endivia*

Pappus-scales 4-5 mm long.

2. *C. intybus*

1. *Cichorium endivia* L. Sp. Pl. 813. 1753; Cooke, Fl. Bombay 2: 68. 1904.

Decumbent, annual herbs, up to 1 m high. Cauline leaves sessile, 7×2 cm, lanceolate, semi-amplexicaul, acute or obtuse, mucronate, runcinate or pinnatifid on the margins. Heads clustered in axillary and terminal compound heads, homogamous, pale-blue. Invol.-bracts hairy outside, the outer shorter. Flowers ligulate. Corolla 5-lobed. Achenes 2.5-3.0 mm long. Pappus-scales 0.5-2.0 cm long.

Fl & Fr. : February - May.

Rare, weed in cultivated fields. So far collected only from Tonk district. It is also cultivated in the gardens as an ornamental plant in some parts of India.

Selected specimen : Tonk: Ghass village, Pandey 4737 (BSJO).

2. *Cichorium intybus* L. Sp. Pl. 813. 1753; Hook. f. Fl. Brit. India 3: 391. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 107. 1976. 'Kasni' (Hindi).

Deep-rooted, annual or perennial herbs, with milky juice and terete stems. Radical and lower leaves shortly petioled, lyrate-pinnatifid, with remotely dentate segments; upper leaves sessile, $6-20 \times 1.0-4.5$ cm, oblong or lanceolate, semi-amplexicaul, entire or dentate. Heads sessile, 4 to 10-together in axillary and terminal clusters combined into panicles, homogamous, bright blue. Invol.-bracts 2-seriate, herbaceous, lanceolate-oblong, outer ones with glandular hairy margins. Florets ligulate; ligule hairy on the

back. Achenes 2-3 mm long, turbinate, 5-angular, truncate at the apex. Pappus-scales 2 to 3-seriate.

Fl. & Fr. : February - June.

Native of Europe. Rare, weed in winter season crops; usually cultivated as a fodder crop during winters and early summers.

Selected specimens : Ganganagar: Hanumangarh, Roy 5033 (BSJO); Kota: Chhabra, Singh 91013 (LWG). Also reported from Jaipur (Bajpai & Verma, 1964).

18. CIRSIUM MILL

Heads unisexual.

1. *C. arvense*

Heads bisexual.

2. *C. wallichii*

1. *Cirsium arvense* (L.) Scop. Fl. Carn. ed. 2, 2: 126. 1772; Mahesh. Illus. Fl. Delhi f. 113. 1966. *Serratula arvense* L. Sp. Pl. 820. 1753. *Cnicus arvensis* (L.) Hoffm. Deutschl. Fl. ed. 2, 2: 130. 1804; Duthie, Fl. Gangetic Plain 1: 481. 1905. 'Kateli' (Hindi).

Erect, thistle-like herbs, with subterranean stolons and cottony stem. Leaves sessile, 8-15 × 2-4 cm, oblong-lanceolate, pinnatifid to toothed, amplexicaul at base, spinescent on margins, white-tomentose beneath. Heads peduncled, solitary or in corymbs, dioecious, purple; males 1 cm in diam., globose, with closely arranged invol.-bracts; females 2.0-2.5 × 1.3-5.0 cm, ovoid, with loosely arranged invol.-bracts. Receptacles flat, with filiform, bristly pales. Achenes smooth. Pappus hairs plumose, dull-brown.

Fl. & Fr. : January - May.

Common in wastelands, near fields and along irrigation channels.

Selected specimen : Nenwa, Singh 74753 (LWG). Also reported from Jhunjhunu (Nair *et al.*, 1961) and North-West Rajasthan (Sankhala, 1951).

2. *Cirsium wallichii* DC. Prodr. 6: 643. 1838. *Cnicus wallichii* (DC.) Hook. f. Fl. Brit. India 3: 363. 1881; Duthie, Fl. Gangetic Plain 1: 481. 1905.

Erect, thistle-like, annual or perennial herbs; stem ribbed, glabrescent or cottony. Lower leaves pinnatifid or 2-pinnate; upper ones lanceolate, pinnati lobed-fid, glabrescent or cottony above, white lanate or woolly beneath; segments aciculary lobed or dentate. Heads 2-4 cm in diam., terminal, sessile or on short peduncles, in dense fascicles. Outer invol.-bracts 1.0-1.5 cm long, lanceolate, with aciculate, dilated tips. Pappus hairs dirty white or brown.

Fl & Fr. : February - August.

Rare, in wastelands, along the roads etc.

Selected specimen : Ganganagar: Lyallpur, *Dhillon* 155 (JAC). Also reported from Jhunjhunu (Nair and Kanodia, 1959) and Sikar (Nair and Nathawat, 1957).

19. *CONYZA* LESS *nom. cons.*

- | | |
|---|-------------------------|
| 1a. Leaves fastigiately arranged. Heads 2-3 mm in diam. | 3. <i>C. stricta</i> |
| 1b. Leaves not fastigate. Heads 4-15 mm in diam.: | |
| 2a. Plants viscid. Upper leaves elliptic, narrowed at both ends, crenate-serrate. | 2. <i>C. leucantha</i> |
| 2b. Plants not viscid. Upper leaves pinnati-lobed. | 1. <i>C. aegyptiaca</i> |

1. *Conyza aegyptiaca* (L.) W. Ait. Hort. Kew. ed. 1. 3: 183. 1789; Hook. f. Fl. Brit. India 3: 258. 1881; Duthie, Fl. Gangetic Plain 1: 448. 1905. *Erigeron aegyptiaca* L. Mant. Pl. 2: 112. 1767.

Erect, annual herbs, 30-60 cm high, clothed with spreading hairs. Lower leaves shortly petioled, obovate, crenate-serrate, hispid or pilose; upper ones sessile, 3-8 × 0.5-2.0 cm, oblong-spathulate or lanceolate, pinnati-lobed, semi-amplexicaul at base, obtuse and apiculate, pilose. Heads arranged in terminal, compact corymbs, heterogamous, 5-8 mm in diam., yellow or white. Ray-florets filiform, female. Disk-florets tubular. Invol.-bracts 2 to 3-seriate, lanceolate-linear, scarious-margined, hairy outside, shorter than the pappus. Achenes oblong, compressed, pubescent.

Fl & Fr. : June - October.

Rare, in wastelands in dry sandy soils.

Selected specimens : Bundi: Hindoli, *Singh* 74489 (LWG); Kota: Chhabra, *Singh* 74054 (LWG).

2. *Conyza leucantha* (D. Don) Ludlow & Raven in Kew Bull. 17: 71. 1963. *Erigeron leucanthum* D. Don, Prodr. Fl. Nepal. 171. 1825. *Conyza viscidula* Wall. ex DC. Prodr. 5: 383. 1836; Hook. f. Fl. Brit. India 3: 258. 1881; Duthie, Fl. Gangetic Plain 1: 449. 1905.

Erect, much-branched, annual herbs, 30-100 cm high; stem ribbed, glandular hairy. Leaves 3-10 × 2-3 cm, elliptic-oblong or lanceolate, narrowed at both ends, entire or crenate-dentate. Heads in corymbs, combined into glandular-pubescent, leafy panicles, heterogamous, 0.5-1.5 cm in diam., pink or violet. Invol.-bracts 2 to 3-seriate, linear-lanceolate,

glandular-pubescent. Achenes obovoid, margined, glabrous or thinly hairy. Pappus white or reddish when dry, shorter than bracts.

Fl. & Fr. : December - May.

Rare, on exposed parts of the hills.

Selected specimen : Bundi: Singh 74002 (LWG).

3. *Conyza stricta* Willd. Sp. Pl. 3: 1922. 1803; Hook. f. Fl. Brit. India 3: 258. 1881; Duthie, Fl. Gangetic Plain 1: 449. 1905.

Erect, viscid-pubescent or villous, annual herbs, 15-100 cm high; stem ribbed, glandular villous. Leaves oblanceolate-spathulate, entire in lower part, serrate-dentate in upper region, lower ones petioled, upper ones sessile, top most ones small, linear. Heads in terminal corymbose panicles, 2-3 mm in diam., white. Invol.-bracts 2-seriate, linear, glandular-hairy. Ligule of ray-florets bidentate. Anthers apiculate. Achenes 0.5-0.7 mm long, elliptic, compressed, puberulous or papillose. Pappus hairs white.

Fl. & Fr. : September - March.

Occasional, in the forests and wastelands in the east of Aravalli.

Selected specimens : Sirohi: Mt. Abu, Jain 60172 (BSI), Blatter 20511 (BLAT); Udaipur: Chhapli, Kanodia 82520 (BSI).

20. COTULA L.

Leaves 1-pinnatifid, segments acute. Achenes of ray-florets winged.

1. *C. anthemoides*

Leaves 2-pinnate or pinnatifid; segments acicular-tipped. Achenes of ray-florets margined, not winged.

2. *C. hemisphaerica*

1. *Cotula anthemoides* L. Sp. Pl. 891. 1753; Hook. f. Fl. Brit. India 3: 316. 1881; Duthie, Fl. Gangetic Plain 1: 476. 1905.

Much-branched, decumbent, glabrous, annual herbs, 5-20 cm long. Leaves 1.5-2.0 cm long, pinnatifid; segments linear, lanceolate, acute, entire. Heads terminal or leaf-opposed, solitary on 0.7-1.0 cm long peduncles, 3-4 mm in diam, yellow. Invol.-bracts 2-seriate, oblong, obtuse, with a glandular, brown midrib. Ray-florets without corolla. Achenes of ray-florets 1.0-1.2 mm long, winged, of disk-florets not winged.

Fl. & Fr. : November - May.

Common in rice-fields, ditches along the roads and other wet habitats.

Selected specimens : Bhilwara: Amerpura, Singh 7055 (BSJO); Churu: Jaswantgarh, Roy 4085 (BSJO); Jaipur: Doasa, Wadhwa 8196 (BSI).

2. *Cotula hemisphaerica* (Roxb.) Wall. ex Benth. & Hook. f. Gen. Pl. 2: 429. 1873; Hook. f. Fl. Brit. India 3: 316. 1881; Duthie, Fl. Gangetic Plain 1: 476. 1905; Mahesh. Illus. Fl. Delhi. f. 110. 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 110. 1976.

Diffuse, glabrous herbs, 10-20 cm long, rooting at the lower nodes. Leaves sessile, 1-5 cm long, 2-pinnatifid; segments linear-lanceolate, aristate. Heads solitary, axillary and terminal, pedunculate, 2-6 mm in diam., yellow. Invol.-bracts 2-seriate, oblong, often slightly connate at the base. Ray-florets female, with brown, viscid, exalate achenes. Achenes of disk-florets angled, wingless. Pappus short, ear-shaped.

Fl. & Fr. : January - March.

Common in marshy and semi-aquatic habitats.

Selected specimens : Alwar: Govindgarh, *Mishra* Acc. no. 10251 (RUBL); Jaipur: Nariana, *Sharma* 132 (RUBL); Kota: Atru, *Singh* 7475 (LWG.). Also reported from Ganganagar (Dhillon and Bajwa, 1969), Jodhpur (Sarup, 1954) and N.W. Rajasthan (Sankhala, 1951).

21. COUSINIA CASS.

Cousinia minuta Boiss. Diagn. Pl. Orient. ser. 1. 4: 117. 1844 & Fl. Orient. 3: 489. 1875; Hook. f. Fl. Brit. India 3: 359. 1881.

Small, annual herbs, with spreading branches. Leaves sessile, oblong or lanceolate, membranous, cobwebby on both sides. Heads terminal and in forks of branches, small, globose, yellow. Invol.-bracts triangular-lanceolate, stout, stellately spreading and recurved. Receptacular-bristles smooth. Achenes obovoid, compressed, 5 to 7-angled, subcrenate, truncate at the apex with a crenulate ring. Pappus hairs scabrid, deciduous.

Fl. & Fr. : August - December.

Rare, in wastelands. Reported by Sankhala (1951) from N.W. Rajasthan.

22. CYATHOCLINE CASS.

Cyathocline purpurea (Ham. ex D. Don) O. Ktze. Rev. Gen. Pl. 333. 1891. *Tanacetum purpureum* Ham. ex D. Don, Prodr. Fl. Nepal. 181. 1825. *Cyathocline lyrata* Cass. in Ann. Sci. Nat. ser. 1. 17: 420. 1829; Wight, Ic. 3(4): 8. t. 1098. 1846; Hook. f. Fl. Brit. India 3: 246. 1881; Duthie, Fl. Gangetic Plain 1: 445. 1905. 'Bandhariya' (Hindi).

Erect, delicate, scabrous or pubescent, aromatic, annual herbs, often tinged with reddish-purple. Leaves sessile, 4-12 cm long, lyrate to

2-pinnatifid; segments serrate-dentate to lobed, glabrous or thinly hairy. Heads in terminal, corymbose panicles, 2-4 mm in diam., hemispheric, purple. Invol.-bracts 2-seriate, linear-lanceolate, acute, pilose. Ray-florets filiform, longer than disk-florets. Receptacles convex, naked. Achenes 3 mm long, oblong, smooth, without thickened margins. Pappus absent.

Fl. & Fr. : October - April.

Common in moist habitats, gregarious particularly along water streams in the forests in the east of Aravalli:

Selected specimens : Banswara: Wadita Hillage forest, *Singh* 3688 (BSJO); Bhilwara: Bijolian, *Singh* 7158 (BSJO); Chittorgarh: Bansi, *Verma* 1690 (BSA); Kota: *Wadhwa* 9241 (BSA). Also reported from Jodhpur (Sarup, 1954) and N.W. Rajasthan (Sankhala, 1951).

23. DICOMA CASS.

Dicoma tomentosa Cass. in Bull. Sci. Soc. Philom. Paris 12. 1818; Hook. f. Fl. Brit. India 3: 387. 1881; Duthie, Fl. Gangetic Plain 1: 487. 1905. *D. lanuginosa* DC. in Wight, Contrib. Bot. Ind. 26. 1834; Wight, Ic. 3(4): 12. t. 1140. 1846. 'Vajradanti' (Hindi).

Erect, annual herbs, clothed with white woolly pubescence. Leaves alternate, 4-7 × 0.5-1.0 cm, linear-lanceolate or linear-obovate, entire. Heads sessile, axillary or leaf-opposed and terminal, homogamous, 1.5-2.5 cm long, white. Invol.-bracts multi-seriate, spinescent. Achenes 10-ribbed, truncate at the apex, silky hairy. Pappus hairs longer than achenes.

Fl. & Fr. : August - March.

Common in dry sandy soils and stony grounds.

Selected specimens : Barmer: *Shetty* 2320 (BSJO); Jaipur: Samod hills, *Sharma* 902 (RUBL); Jodhpur: Kailana, *Shetty* 103 (BSJO); Kota: Garari Mahadeo, *Singh* 74659 (LWG); Udaipur: Dabok, *Kanodia* 82384 (BSI).

24. ECHINOPS L.

Echinops echinatus Roxb. Fl. Ind. 3: 447. 1832; Hook. f. Fl. Brit. India 3: 358. 1881; Duthie, Fl. Gangetic Plain 1: 480. 1905. 'Oont-kateli' (Hindi).

Much branched, thistle-like, deep-rooted, annual herbs. Leaves 8-30 × 3-8 cm, oblong, pinnatifid, amplexicaul, spinescent, white-woolly beneath. Heads 1-flowered, clustered in involucre, compound heads 2.0-4.5 cm in diameter, blue, white or yellow. Outer invol.-bracts shorter, pungent; the intermediate ones spatulate and one or two produced into sharp spines; the

inner ones connate for half of their length and form a tube around the achenes. Florets tubular, bisexual. Achenes obconic, silky. Pappus forming a cylindrical brush above the achenes.

Fl & Fr. : October - June.

Common in wastelands and open forests in dry habitats.

Selected specimens : Banswara: Bari Ghata forest, *Singh* 3729 (BSJO); Bikaner: Nal-Diatra, *Roy* 2372 (BSJO); Jaipur: *Kaul* 8439 (LWG); Kota: Shahabad, *Nautiyal & Raizada* 25364 (DD); Sirohi: Mt. Abu, *Jain* 60425 (BSI).

25. ECLIPTA L. *nom. cons.*

Eclipta alba (L.) Hassk. Pl. Jav. Rar. 528. 1848; Hook. f. Fl. Brit. India 3: 304. 1881. *Verbesina alba* L. Sp. Pl. 902. 1753. *V. prostrata* L. Sp. Pl. 902. 1753. *Eclipta erecta* L. Mant. Pl. 2: 286. 1771; Duthie, Fl. Gangetic Plain 1: 468. 1905. *E. prostrata* (L.) L. Mant. Pl. 2: 286. 1771. '*Jalmagra*' (Hindi).

Erect or prostrate, hirsute herbs, often rooting at the lower nodes. Leaves 2-7 × 1.0-2.5 cm, ovate, elliptic, oblong or lanceolate, entire or undulate. Heads solitary, on solitary or paired, unequal, axillary or terminal peduncles, 0.5-1.0 cm in diam., white. Ray-florets female or sterile; disk-florets tubular, bisexual. Achenes cuneate, compressed, tuberculate, with a thickened margin. Pappus absent or of minute hairs.

Fl. & Fr. : All round the year.

Common weed in wet and marshy habitats. The plants growing in dry rocky habitats are very dwarf.

Selected specimens : Banswara: Paloda, *Singh* 2844 (BSJO); Churu: Sujangarh, *Roy* 2498 (BSJO); Jaipur: Amer, *Sharma* 1098 (RUBL); Kota: Kishanganj, *Verma* 728 (BSA); Sirohi: Mt. Abu, *Raizada* 20561 (DD).

26. ELEPHANTOPUS L.

Elephantopus scaber L. Sp. Pl. 814. 1753; Wight, Ic. 3(4): 7. t. 1086. 1846; Hook. f. Fl. Brit. India 3: 242. 1881; Duthie, Fl. Gangetic Plain 1: 442. 1905. '*Hatiphata, Ban-tambakhu*' (Hindi).

Scabrid, perennial herbs, 20-30 cm high; stems arising from the centre of the rosette of leaves. Leaves 10-15 × 4-6 cm, oblong-obovate or elliptic-lanceolate, base tapering into sheathing petiole. Heads closely packed into a flat-tipped terminal compound head, homogamous, violet. Compound heads 1-3 × 0.8-1.0 cm, surrounded by three, broadly ovate-cordate,

conduplicate, leafy bracts. Florets tubular, 2-sexual. Achenes oblong, truncate, finely 10-ribbed, pubescent. Pappus 4-5, 1-seriate, rigid, white.

Fl & Fr. : August - November.

Native of America; rare, in shaded localities in the forests.

Selected specimens : Kota: Sitabari, Singh 90842 (LWG). Also reported from Sikar (Nair and Nathawat, 1957).

27. EMILIA CASS.

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

Erect or decumbent herbs. Lower leaves petioled, 4-10 × 2-4 cm, ovate or obovate to lyrate; upper ones sessile, lanceolate, sagittate-amplexicaul, acute, entire or dentate. Heads solitary or in lax corymbs, 0.5-1.5 × 0.2-0.5 cm, purple. Invol.-bracts 8-10, lanceolate, acute, shorter than florets. Achenes 2-4 mm long, oblong, 5-ribbed, hairy on the ribs. Pappus white, equalling the bracts.

Fl & Fr. : Most part of the year.

Common in wastelands, forests, fields and gardens, particularly in the east of Aravalli.

Selected specimens : Banswara: Kotharia forest, Singh 3041 (BSJO); Jaipur: Ramgarh, Sharma 780 (RUBL); Kota: Shahabad, Majumdar 10841 (BSA); Sirohi: Mt. Abu, Ratzada 206911 (DD); Udaipur: Jaisamand, Kanodia 82240 (BSI).

28. EPALTES CASS.

Epaltes divaricata (L.) Cass. in Bull. Sci. Soc. Philom. Paris 139. 1818; Hook. f. Fl. Brit. India 3: 274. 1881. *Ethulia divaricata* L. Mant. 110. 1767.

Erect, glabrous, annual herbs, 7-20 cm high; stems trigonous; branches winged. Leaves 2-7 × 0.4-0.5 cm, oblong-spathulate, mucronate, dentate. Heads solitary, terminating short winged branchlets, purple. Invol. - bracts ovate-lanceolate, acuminate, aristate. Ray-florets female; ligule 2 to 3-toothed. Anthers tailed at the base. Achenes obovoid-oblong, ribbed, those of 2-sexual florets abortive. Pappus absent.

Fl & Fr. : October - January.

Very rare, found in wet habitats. Reported by Sarup (1954) from Jodhpur.

29. ERIGERON L.

- 1a. Invol.-bracts 1 to 2-seriate, scarious-margined, bristle-tipped.
Achenes glabrous. 1. *E. asteroides*
- 1b. Invol.-bracts 2 to 4-seriate, neither scarious-margined nor bristle-tipped. Achenes thinly hairy:
- 2a. Heads 3-5 mm in diam. Invol.-bracts glabrous. 3. *E. canadensis*
- 2b. Heads 8-18 mm in diam. Invol.-bracts hairy or pubescent:
- 3a. Ray-florets pink. Pappus hairs pinkish-white. 2. *E. bonariensis*
- 3b. Ray-florets white. Pappus hairs dirty white. 4. *E. multicaulis*

1. *Erigeron asteroides* Roxb. Fl. Ind. 3: 432. 1832; Hook. f. Fl. Brit. India 3: 254. 1881; Duthie, Fl. Gangetic Plain 1: 447. 1905.

Erect, hairy, annual herbs, 30-60 cm high. Leaves 2.5-5.0 cm long, oblong or obovate-oblong, basal shortly petioled, upper ones semi-amplexicaul, dentate-lobulate, hairy. Heads 8-13 mm in diam., solitary or in subcorymbs. Invol.-bracts 1 to 2-seriate, scarious margined, shorter than pappus. Ray-florets 1 to 2-seriate, violet-blue; disk-florets yellow, with obtuse anthers. Achenes compressed, margined, glabrous. Pappus hairs pinkish-white.

Fl. & Fr. : August - November.

Rare, in wastelands. So far collected only from Kota district.

Selected specimen : Kota: Shahabad-Kishanganj Road, Verma 660 (BSI).

2. *Erigeron bonariensis* L. Sp. Pl. 863. 1753; Raizada, Suppl. Duthie, Fl. Gangetic Plain 112. 1976. *E. linifolium* Willd. Sp. Pl. 3: 1955. 1804; Hook. f. Fl. Brit. India 3: 254. 1881. *Conyza bonariensis* (L.) Cong. in Bull. Torrey Bot. Club 70: 632. 1943.

Erect, annual-biennial herbs; stems ribbed, clothed with short appressed and long white hairs. Leaves 2-6 × 0.15-0.5 cm, linear-lanceolate or oblanceolate-spathulate, narrowed at base, subacute, entire or serrate-incised. Heads on 1.0-1.5 cm long peduncles, in pyramidal leafy panicles. Invol.-bracts 3-seriate, linear, pilose. Ray-florets filiform. Achenes thinly hairy. Pappus hairs dirty white.

Fl. & Fr. : December - July.

Common in wastelands, but no where abundant.

Selected specimens : Ajmer: Puchkund, Sharma 261 (DD); Bhilwara: Samodi, Singh 7117 (BSJO); Ganganagar: Menawali, Roy 6404 (BSJO);

Pali: Sadri, *Pandey* 4161 (BSJO); Sirohi: Mt. Abu, *Narayan* 22658 (BSI); Tonk: Ghass village, *Pandey* 4735 (BSJO).

3. *Erigeron canadensis* L. Sp. Pl. 863. 1753; Hook. f. Fl. Brit. India 3: 254. 1881; Duthie, Fl. Gangetic Plain 1: 447. 1905.

Erect, annual herbs, about 1 m high; stem ribbed, patent hairy. Leaves 2-6 × 0.3-0.6 cm, linear-lanceolate, apiculate, entire or coarsely and sinuately toothed, ciliate, thinly hairy. Heads in terminal, leafy panicles, 4-5 mm in diam., purplish or white. Invol.-bracts 2 to 3-seriate or many seriate, linear. Ray-florets female, filiform; disk-florets bisexual, tubular. Receptacles flat, naked. Achenes oblong, compressed, ribbed, glabrous or thinly hairy, black. Pappus-hairs dirty white.

Fl. & Fr. : June - September.

Native of North America; perfectly naturalized in dry wastelands throughout the state.

Selected specimens : Kota: Chambal Rest House, *Singh* 74618 (LWG); Udaipur: Jaisamand, *Kanodia* 82270 (BSI). Also reported from Jodhpur (Sarup, 1954) and Sirohi (*Kanodia & Despande*, 1961).

4. *Erigeron multicaulis* Wall. ex DC. Prodr. 5: 202. 1836; Raizada, Suppl. Duthie, Fl. Gangetic Plain 114. 1976. *E. alpinus* L. var. *multicaulis* (Wall. ex DC.) Hook. f. Fl. Brit. India 3: 255. 1881.

Annual, glabrous herbs. Radical leaves petioled, oblong, entire or toothed, spreading; cauline ones sessile, 2.5-6.0 cm long, lanceolate, entire or coarsely toothed. Heads solitary, on long peduncles, in terminal, corymbose panicles, 1.5-1.7 cm in diam. Ray florets pinkish, exceeding the pappus; disk florets yellow. Pappus hairs white, often tinged with red. Achenes hairy.

Fl. & Fr. : August - October.

Rare, in wastelands in dry sandy soils. So far collected from Kota district only.

Selected specimen : Kota: Shahabad, *Singh* 90695 (LWG).

30. FLAVERIA A. JUSS.

Flaveria trinervia (Spreng.) C. Mohr. Contr. U.S. Nat. Herb. 6: 810. 1901; Raizada, Suppl. Duthie, Fl. Gangetic Plain 1: 117. 1976; Bhandari, Fl. Ind. Desert 199. 1978. *Oedera trinervia* Spreng. Bot. Cart. Halle 63. 1880.

Erect, dichotomously branched, glabrous herbs, 30-60 cm high. Leaves 3-10 × 0.8-3.5 cm, elliptic-ovate or oblong-obovate, serrate-dentate, 3-

nerved, lower petioled, upper ones sessile. Heads heterogamous, sessile, closely packed in terminal, globose clusters surrounded by leaves and leafy bracts or in the forks of branches, yellow. Ray florets female, ligulate. Receptacles naked. Achenes oblong, 8 to 12-ribbed, dark-brown. Pappus absent.

Fl. & Fr. : August - October.

Native of Central America; naturalized in the gardens and wastelands throughout the state.

Selected specimens : Chittorgarh: Bansi, *Verma* 1730 (BSA); Jodhpur: Bilara, *Singh* 3279 (BSJO); Kota: Baran, *Singh* 90470 (LWG); Tonk: Aligarh, *Pandey* 4728 (BSJO); Udaipur: Dabok, *Nand Lal* 200 (BSI).

31. GALINSOGA RUIZ & PAVON.

Galinsoga parviflora Cav. Ic. Descr. 3: 41. t. 281. 1795; Hook. f. Fl. Brit. India 3: 311. 1881; Duthie, Fl. Gangetic Plain 1: 474. 1905.

Erect, annual herbs, upto 1 m high; stems glabrescent or thinly gland-hairy. Leaves 3-5 × 2-4 cm, ovate or ovate-oblong, cuneate at base, acute or acuminate, crenate-serrate. Heads in terminal, corymbose panicles, 5 mm in diam. Invol.-bracts 4-8, 2-seriate, ovate. Ray-florets 5, white; corolla 3-dentate. Disk-florets yellow. Pales 3-lobed at the apex. Achenes 2 mm long, viscid, hairy, black. Pappus scales ciliate, not awn-tipped.

Fl. & Fr. : Most part of the year.

Native of Tropical America; naturalized in the forests at high altitude at Mt. Abu.

Selected specimens : Sirohi: Mt. Abu, *Narayan* 22652, *Puri* 56747, *Jain* 60176 (BSI).

32. GLOSSOCARDIA CASS.

Glossocardia bosvallea (L. f.) DC. in Wight, Contrib. Bot. Ind. 19. 1834; Wight, Ic. 3(4): 9. 1110. 1846. *Verbesina bosvallea* L. f. Suppl. 379. 1781. *Glossocardia linearifolia* Cass. in Dict. Sci. Nat. 19: 62. 1821; Hook. f. Fl. Brit. India 3: 308. 1881; Duthie, Fl. Gangetic Plain 1: 471. 1905. *G. setosa* Blatt. & Hallb. in J. Bomb. nat. Hist. Soc. 26(2): 506. 1919. 'Chiriya ka Chugga' (Hindi).

Small, suberect or decumbent, diffuse, annual herbs. Leaves 1-5 cm long, 2 to 3-pinnate; segments linear, apiculate, glabrous. Heads pedunculate, solitary, axillary, c. 10 × 5 mm, yellow. Invol.-bracts 2-seriate; the outer 3 ovate-lanceolate, acute, with scarious margins; the inner many, oblong,

obtuse, longer. Ray-florets ligulate, female; disk-florets tubular, bisexual. Pappus of 2, stiff awns, 3-4 mm long. Achenes 7-8 mm long, oblong, flattened, hairy, brown.

Fl. & Fr. : July - October.

Native of East Indies; naturalized in dry rocky grounds, crevices of rocks and on the walls of old buildings.

Selected specimens : Banswara: Wadita Hillage forest, Singh 2910 (BSJO); Jaipur: Jaigarh, Sharma 116 (RUBL); Jodhpur: Jain 40063 (BSI); Kota: Kishanganj, Verma 715 (BSA); Sirohi: Mt. Abu, Blatter 20561, 20335 (BLAT).

33. GNAPHALIUM L.

1a. Pappus hairs free:

2a. Heads in leafless corymbs:

3a. Stems many from the base, woolly. Leaves oblanceolate or oblong-spathulate, woolly. Bisexual florets in each head about 4:

4a. Heads up to 3 mm in diam. Invol.-bracts golden yellow.

3. *G. luteo-album*
subsp. *affine*

4b. Heads more than 3 mm in diam. Invol.-bracts pale-brown.

2. *G. luteo-album*
subsp. *luteo-album*

3b. Stem single, stout, branched above, not woolly. Leaves linear-acuminate, not woolly. Bisexual florets in each head 10-12.

1. *G. hypoleucum*

2b. Heads in leafy spikes or leafy clusters:

5a. Heads in spikes.

5. *G. polycaulon*

5b. Heads in axillary and terminal clusters.

6. *G. pulvinatum*

1b. Pappus-hairs connate at the base into a ring.

4. *G. pennsylvanicum*

1. *Gnaphalium hypoleucum* DC. in Wight, Contrib. Bot. Ind. 21. 1834 & Prodr. 6: 222. 1838; Wight, Ic. 3(4): 10. t. 1114. 1846; Hook. f. Fl. Brit. India 3: 288. 1881.

Tall, stout, annual herbs, with woolly young parts. Leaves sessile, linear, semi-amplexicaul, acuminate, puberulous or scabrous above and woolly beneath. Heads pale to golden yellow, in corymbose dense clusters. Invol.-bracts oblong, obtuse, yellowish or golden. Achenes papillose.

Fl. & Fr. : September - December.

Rare, in wet and shaded habitats, particularly in the forests. It is a high altitude plant of temperate Himalayas.

Selected specimens : Kota: *Wadhwa* 9457 (BSA); Sirohi: Mt. Abu, *Raizada* 20687 (DD), *Jain* 55200 (BSI). Also reported from Sikar (Nair and Malhotra, 1961).

2. ***Gnaphalium luteo-album*** L. Sp. Pl. 851. 1753; Hook. f. Fl. Brit. India 3: 288. 1881; Duthie, Fl. Gangetic Plain 1: 461. 1905. *G. luteo-album* L. var. *pallidum* Hook. f. *Lc.* 3: 288. 1881.

subsp. ***luteo-album***

Erect or decumbent, woolly, annual herbs. Leaves 1.5-8.0 × 0.35-1.6 cm, oblanceolate, apiculate. Heads in terminal, peduncled corymbose clusters, 3.5-4.0 mm long, white to yellowish. Invol.-bracts 2 to 3-seriate, ovate-oblong, obtuse, shining, pale-brownish. Florets tubular, outer female, inner bisexual. Receptacles pitted. Achenes oblong-ellipsoid, papillose, brown. Pappus-hairs white, shorter than involucre.

Fl & Fr. : January - April.

Common in moist places, particularly in the east of Aravalli.

Selected specimens : Jaipur: *Jain* 49606 (BSI); Sirohi: Mt. Abu, *Jain* 62139 (BSI); Udaipur: *Jain* 48650 (BSI).

3. subsp. ***affine*** (D. Don) Kaster in *Blumea* 4: 484. 1941. *G. affine* D. Don, Prodr. Fl. Nepal. 173. 1825. *G. luteo-album* L. var. *multiceps* Hook. f. Fl. Brit. India 3: 288. 1881; Duthie, Fl. Gangetic Plain 1: 461. 1905.

Heads 2.8-3.0 mm long. Invol.-bracts golden yellow.

Fl & Fr. : January - April.

Common in waste, moist places in association with the typical subspecies.

Selected specimens : Bhilwara: Amarpura, *Singh* 7059 (BSJO); Ganganagar: 34 GB., *Roy* 5914 (BSJO); Jaipur: Amer, *Sharma* 1055 (RUBL); Sawaimadhapur: Ranthambhore, *Sharma* 3247 (RUBL).

4. ***Gnaphalium pensylvanicum*** Willd. Enum. Hort. Berol. 867. 1809. *G. spathulatum* Lam. Encycl. 2: 758. 1786, non Burm. f. 1768. *G. purpureum auct. plur.* non L. 1753; Hook. f. Fl. Brit. India 3: 289. 1881; Duthie, Fl. Gangetic Plain 1: 462. 1905; Mahesh. Illus. Fl. Delhi f. 104. 1966.

Erect, cottony, annual herbs, 15-50 cm high. Leaves 2-10 × 0.5-2.0 cm, spathulate-obovate, tapering at base, apiculate, glabrate or cottony

above and white-woolly beneath. Heads in axillary and terminal, spicate globose clusters, 2.5-3.0 mm long, white or pale. Invol.-bracts 2 to 3-seriate, ovate-lanceolate, acuminate, woolly at base. Receptacles naked. Achenes 2.0-2.5 mm long, oblong, minutely papillose.

Fl. & Fr. : January - May.

Native of Central America; naturalized in wastelands and cultivated fields. *G. purpureum* L. does not occur in India.

Selected specimens : Ganganagar: *Roy* 3938 (BSJO); Jaipur: Ram Niwas garden, *Sharma* 1197 (RUBL); Kota: Kelwara, *Singh* 90670 (LWG); Sirohi: Mt. Abu, *Blatter* 21741 (BLAT).

5. *Gnaphalium polycaulon* Pers. Syn. Pl. 2: 421. 1807. *G. indicum* auct. plur. non L. 1753; Hook. f. Fl. Brit. India 3: 289. 1881; Duthie, Fl. Gangetic Plain 1: 461. 1905.

Prostrate or suberect, woolly, annual herbs, 5-25 cm high. Leaves 2.0-4.5 × 0.8 cm, linear-oblongate to obovate or spatulate, apiculate. Heads sessile, passing into terminal, leafy spikes, yellowish white. Invol.-bracts 2 to 3-seriate, 2.0-2.5 mm long. Receptacles pitted. Achenes c. 0.5 mm long, oblong, hispidulous. Pappus hairs 1-seriate, 1.5 mm long, free.

Fl. & Fr. : November - April.

Common in damp, sandy soils and on rocky grounds.

Selected specimens : Banswara: Ghatol, *Singh* 4204 (BSJO); Bikaner: Mud village, *Roy* 2388 (BSJO); Jodhpur: Kailana, *Singh* 419 (BSJO); Kota: Shahabad, *Wadhwa* 9268 (BSA); Sirohi: Mt. Abu, *Blatter* 20595 (BLAT).

6. *Gnaphalium pulvinatum* Delile, Fl. Egypt. 266. t. 44. 1812; Hook. f. Fl. Brit. India 3: 289. 1881; Duthie, Fl. Gangetic Plain 1: 462. 1905.

Diffuse, prostrate, woolly, annual herbs. Leaves 0.5-1.5 × 0.1-1.0 cm, spatulate, mucronate. Heads crowded in subglobose, leafy or involucrate, terminal clusters, yellow, emerged in white wool. Corolla-tube of ray-florets filiform, narrow. Achenes 0.5 mm long, oblong-obovate, minutely papillose. Pappus hairs 2 mm long, white.

Fl. & Fr. : December - April.

Common in drying ponds along the roads in association with *Chrozophora parvifolia* Klotz. ex Schw., *Heliotropium supinum* L., *Polygonum plebeium* R. Br. etc.

Selected specimens : Banswara: *Singh* 3098 (BSJO); Bikaner: Gajner lake, *Dhillon* 393 (DD); Jodhpur: Birai, *Moorthy* 412 (BSJO); Sirohi: Mt. Abu, *Kanodia* 62205 (BSI).

34. GONIOCAULON CASS.

Goniocaulon glabrum Cass. in Dict. Sc. Nat. 19: 201. 1821; Hook. f. Fl. Brit. India 3: 377. 1881; Duthie, Fl. Gangetic Plain 1: 484. 1905. *Amberboa indica* DC. Prodr. 6: 558. 1838; Wight, Ic. 2(2): 5. t. 479. 1841.

Erect, glabrous, annual herbs, up to 1 m high; stem and branches 4 to 5-angled, with sharp edges. Leaves 6-10 × 1.0-2.5 cm, elliptic-lanceolate or linear-lanceolate, entire, toothed or serrate. Heads fascicled in compound corymbs, with linear bracts at the base of peduncles and pedicels, heterogamous, 1.5-2.5 × 0.5-0.8 cm, ovoid, pinkish or light purple. Achenes ribbed, glabrous.

Fl. & Fr. : August - November.

Native of East Indies; naturalized in open wastelands, gardens and fields especially in south-eastern parts of the state.

Selected specimens : Jhalawar: *Verma* 6715 (BSA); Kota: Baran, *Singh* 90482 (LWG).

35. 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. India 3: 247. 1881; Duthie, Fl. Gangetic Plain 1: 446. 1905. *Artemisia maderaspatana* L. Sp. Pl. 849. 1753.

Prostrate, hairy herbs. Leaves alternate, sessile, up to 6 cm long, sinuate pinnatifid, with coarsely serrate-dentate lobes. Heads globose, solitary or paired on leaf-opposed or terminal peduncles, 5-10 mm in diam. Invol.-bracts 1.5 mm long, oblong, hairy. Corolla-tube of ray-florets filiform, 2 to 4-fid at the apex. Receptacles convex, naked. Achenes 2 mm long, turbinate, compressed.

Fl. & Fr. : Most part of the year.

Common in drying ponds and low-lands, often forming dense mats.

Selected specimens : Banswara: Ghatol, *Singh* 4216 (BSJO); Barmer: Ghandhav Luni bed, *Tiwari* 1203 (BSJO); Jaipur: Bara-gaon, *Sharma* 2247 (RUBL); Kota: Kelwara, *Singh* 74060 (LWG); Sirohi: Mt. Abu, *Puri* 56669 (BSI).

36. IFLOGA CASS.

Ifloga spicata (Forssk.) Schultz-Bip. in Webb. & Berth, Phyt. Canar. 2: 310. 1845. *Chrysocoma spicata* Forssk. Fl. Aegypt.-Arab. 73. 1775.

Ifloga fontanesii Cass. Dict. Sc. Nat. 23: 14. 1822; Hook. f. Fl. Brit. India 3: 277. 1881; Duthie, Fl. Gangetic Plain 1: 460. 1905.

Woolly or glabrous, densely leafy, annual herbs, branched from the base. Leaves spreading, alternate, narrowly linear, acute, involute-margined. Heads 2 to 3-nate, nestling amongst the leaves throughout the length of branches, glabrous, reddish, glistening. Invol.-bracts scarious, aristate. Achenes oblong, smooth. Pappus reddish.

Fl. & Fr. : December - March. .

Rare, in wet sandy soils, chiefly in the desertic zones.

Selected specimens : Churu : Sardar Shahr, Roy 2594 (BSJO); Jaipur: Ramgarh lake, Wadhwa 8408 (BSI); Gandhinagar, Sharma 454 (RUBL). Also reported from Ganganagar (Dhillon & Bajwa, 1969) and Jhunjhunu (Nair and Thomas, 1962).

37. INULA L.

Heads in corymbose panicles. Achenes silky.

1. *I. cappa*

Heads solitary. Achenes glabrous.

2. *I. orientalis*

1. *Inula cappa* (Buch.-Ham. ex D. Don) DC. Prodr. 5: 469. 1839; Hook. f. Fl. Brit. India 3: 295. 1881; Duthie, Fl. Gangetic Plain 1: 463. 1905. *Conyza cappa* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 176. 1825.

Erect, aromatic undershrubs, with yellowish or brown-grey tomentum on young parts. Leaves petioled, 5-20 × 2-5 cm, oblong, acute or rounded at base, mucronate, denticulate, glabrous or hispidulous above, grey-silvery tomentose beneath. Heads in axillary and terminal corymbose panicles, 8-10 mm long. Invol.-bracts 2 to 3-seriate, 3-7 mm long, linear-lanceolate, acuminate, ciliate. Achenes silky. Pappus hairs white.

Fl. & Fr. : September - November.

Rare, in the forests, particularly in drier habitats. Occurs only in Ajmer district.

Selected specimen : Ajmer: Deweyar, Kaul 8551 (LWG).

2. *Inula orientalis* Lam. Encycl. 3: 255. 1789. *Inula grandiflora* Willd. Sp. Pl. 3: 2096. 1803; Hook. f. Fl. Brit. India 3: 294. 1881.

Perennial herbs; stems hirsute, leafy throughout. Leaves sessile, oblong or elliptic-lanceolate, acuminate, gland-serrate, ciliate, glabrous or sparingly hairy, with oblique nerves. Heads solitary, terminal. Invol.-bracts rigid, pubescent. Achenes glabrous. Pappus dirty white.

Fl. & Fr. : September - December.

Very rare, in the forests on the hills. Reported by Vyas (1967) from Alwar. It is a high altitude plant.

38. IXERIS CASS.

Ixeris polycephala Cass. Dict. Sci. Nat. 24: 50. 1822. *Lactuca polycephala* (Cass.) Benth. & Hook. f. Gen. Pl. 2: 526. 1873; Hook. f. Fl. Brit. India 3: 410. 1881; Duthie, Fl. Gangetic Plain, 1: 491. 1905.

Erect, glabrous, annual herbs, 30-60 cm high. Basal leaves in rosette, 10-15 × 0.8-1.2 cm, lanceolate, sometimes lyrate-pinnatifid, with a narrowed base; cauline leaves sessile, 5-10 × 1-2 cm, lanceolate, with a sagittate amplexicaul base, entire. Heads in sub-umbellate corymbs or panicles, 6-7 × 3-6 mm, yellow. Invol.-bracts 2-seriate; outer ones 4-5, ovate-triangular; inner ones 6-8, lanceolate. Ligule 3-toothed. Achenes elliptic-lanceolate, 10-ribbed, beaked, smooth. Pappus hairs white.

Fl. & Fr. : February - May.

Rare, weed in fields and gardens.

Selected specimen : Kota: Kelwara, Singh 74750 (LWG).

39. LACTUCA L.

Branches winged. Achenes pale, narrowed at both ends. Pappus as long as achenes.

1. *L. orientalis*

Branches not winged. Achenes black, narrowed at the apex into a beak which dilates into a cup like disk. Pappus about twice the length of achenes.

2. *L. runcinata*

1. *Lactuca orientalis* (Boiss.) Boiss. Fl. Orient. 3: 819. 1875; Hook. f. Fl. Brit. India 3: 404. 1881. *Phenopus orientalis* Boiss. Voy. Esp. 390. 1838.

Dichotomously branched herbs, upto 1 m high; branches often spinescent, silvery-white, winged by the decurrent bases of leaves. Lower leaves 2.5-5.0 cm long, pinnatifid; lobes triangular, acute, oblanceolate or linear, entire. Heads solitary or in fascicles of 2-5, combined in spikes, 1.0-1.5 cm long, yellow. Achenes narrowed at both ends, smooth, pale. Pappus silvery.

Fl. & Fr. : November - April.

Rare, in dry sandy soils. It is a denizen of high altitude. Very close to *L. viminea* (L.) Presl, which, however, bears black achenes.

Selected specimen : Bikaner: Patil 574 (CAL).

2. *Lactuca runcinata* DC. in Wight, Contrib. Bot. Ind. 26. 1834; Duthie, Fl. Gangetic Plain 1: 490. 1905. *L. heyneana* DC. Prodr. 7: 140. 1838; Hook. f. Fl. Brit. India 3: 403. 1881. *Brachyramphus heyneana* (DC.) Wight, Ic. 3(4): 13. t. 1146. 1846.

Stout, erect herbs, 60-150 cm high. Radical leaves 10-30 cm long, obovate, runcinate or pinnatifid, narrowed at base, obtuse, spinose-ciliate, glabrous; cauline leaves lanceolate, semi-amplexicaul. Heads sessile, solitary or clustered in spikes, 1.0-1.5 cm long, pinkish-white. Invol.-bracts scarious-margined, outer ovate, inner ones linear-oblong. Ligules 5-toothed. Anthers acuminate. Achenes compressed, faintly ribbed, muriculate. Pappus white, longer than achenes.

Fl. & Fr. : November - January.

Rare, on old walls of buildings and in dry habitats.

Selected specimens : Barmer: Shetty 2318 (BSJO); Bhilwara: Badnor, Singh 6473 (BSJO).

40. LAGASCEA CAV. *nom. cons.*

Lagascea mollis Cav. in Anal. Cienc. Nat. 6: 331. t. 44. 1803; Hook. f. Fl. Brit. India 3: 302. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 123. 1976.

Laxly branched, villous, annual herbs. Leaves 3.0-7.5 × 1.5-5.0 cm, ovate, acute, entire or serrulate. Heads clustered at the end of branches, white; clusters subtended by 5, ovate, leafy, free or connate bracts. Involucre tubular, pilose, 4 to 5-toothed. Anthers obtuse at the base. Achenes cuneate, compressed, enclosed within involucre. Pappus forming a laciniate cup.

Fl. & Fr. : August - December.

Native of Central America; naturalized in wastelands, often gregarious among bushes.

Selected specimens : Banswara: Lalpura forest, Singh 2981 (BSJO); Bhilwara: Bijolia, Singh 6092 (BSJO); Jhalawar: Aklera, Majumdar & Mishra 10031 (BSA); Sirohi: Mt. Abu, Kanodia 60401 (BSI); Udaipur: Menar, Majumdar 12461 (BSA).

41. LAGGERA SCH.-BIP. EX KOCH.

Stems winged. Florets purple.

1. *L. alata*

Stems not winged. Florets pink.

2. *L. aurua*

1. *Laggera alata* (D. Don) Sch.-Bip. ex Oliver in Trans. Linn. Soc. London 39: 94. 1873; Hook. f. Fl. Brit. India 3: 271. 1881; Duthie, Fl. Gangetic Plain 1: 456. 1905. *Erigeron alatum* D. Don, Prodr. Fl. Nepal. 171. 1825. *Blumea alata* (D. Don) DC. Prodr. 5: 448. 1836; Wight, Ic. 3(4): 8. t. 1101. 1846.

Erect, perennial herbs, up to 1 m high. Stem glandular-pubescent, broadly winged. Leaves sessile, c. 6 × 2 cm, oblong-lanceolate, decurrent to wing of stem, dentate or subentire, woolly beneath. Heads in leafy racemose panicles, purplish; peduncles glandular. Outer invol.-bracts herbaceous, often recurved, glandular, inner ones longer and erect. Achenes ribbed. Pappus hairs white.

Fl. & Fr. : November - February.

Rare, in wastelands and often on the walls of old buildings.

Selected specimens : Jaipur: Amer, *Sharma* 1110 (RUBL); Jhalawar: *Sharma* 654, 588 (RUBL).

2. *Laggera aurita* (L.f.) Sch.-Bip. ex Clarke, Comp. Ind. 92. 1876; Hook. f. Fl. Brit. India 3: 271. 1881; Duthie, Fl. Gangetic Plain 1: 457. 1905; Mahesh. Illus. Fl. Delhi f. 107. 1966. *Conyza aurita* L. f. Suppl. 367. 1781.

Erect, viscous hairy, perennial herbs, upto 1 m high. Leaves sessile or petiolate; lower 5-10 cm long, obovate or oblanceolate, toothed to pinnatifid; upper ones smaller, bract-like, viscous hairy. Heads peduncled, in corymbose or diffuse terminal panicles, 1.0-1.5 cm in diam., pink. Outer invol.-bracts herbaceous, short, silky hairy; inner ones much longer, scarious. Achenes obscurely ribbed, thinly hairy. Pappus white.

Fl. & Fr. : November - February.

Rare, in dry sandy soils, particularly in desertic zones.

Selected specimens : Jaipur: Daosa, *Wadhwa* 8138 (CAL); Jodhpur: *King* Acc. no. 232304, 232305 (CAL).

42. LAUNAEA CASS.

1a. Achenes winged.

2. *L. capitata*

1b. Achenes not winged:

2a. Heads terminal, on paniculately branched flowering stem:

3a. Invol.-bracts 2-seriate.

1. *L. asplenifolia*

3b. Invol.-bracts 3 to 4-seriate.

5. *L. resedifolia*

2b. Heads axillary, solitary or in fascicles or racemose or fascicled on the flowering stem or on its branches:

- 4a. Stems rooting at the nodes. Heads in the axils of cauline leaves. 6. *L. sarmentosa*
- 4b. Stems not rooting at the nodes. Heads in racemose inflorescence:
- 5a. Heads solitary, on the nodes of branches; peduncles as long or longer than the heads. 4. *L. remaniflora*
- 5b. Heads in clusters on the nodes of branches; peduncles shorter than the heads. 3. *L. procumbens*

1. *Launaea asplenifolia* (Willd.) Hook. f. Fl. Brit. India 3: 415. 1881; Duthie, Fl. Gangetic Plain 1: 494. 1905. *Prenanthes asplenifolia* Willd. Sp. Pl. 3: 1540. 1803.

Erect or ascending, annual or biennial, multicauline-herbs, with milky juice. Leaves in a basal rosette, 5-12 cm long, obovate-oblanccolate, pinnatifid or pinnately lobed, narrowed at the base; segments ovate-oblong, dentate with non-cartilaginous teeth. Heads in terminal panicles, 1.0-1.5 cm long, yellow. Outer invol.-bracts ovate, acute; inner ones lanceolate. Achenes columnar, angled and ribbed. Pappus hairs white.

Fl. & Fr. : December - April.

Occasional, weed in fields and gardens. Leaves are usually infected by some fungi.

Selected specimens : Jaipur: Jagatpura, Sharma 237 (RUBL); Amer, Sharma 2002 (RUBL); Jhalawar: Sharma 508 (RUBL); Kota: Chhabra, Singh 90651 (LWG). Also reported from Jodhpur (Sarup, 1954).

2. *Launaea capitata* (Spreng.) Dandy in Andrews, Fl. Pl. Sudan 3: 40. 1956. *Sonchus capitatus* Spreng. Syst. Veg. ed. 16. 3: 650. 1826. *Lomatolepis glomerata* Cass. Dict. Sc. Nat. 48: 423. 1827. *Launaea glomerata* (Cass.) Hook. f. Fl. Brit. India 3: 417. 1881.

Glabrous, perennial herbs; stems numerous, decumbent, diffuse, almost leafless. Radical leaves sessile, 7-15 × 2.5-4.5 cm, sinuately lobed or pinnatifid; lobes rounded, with white cartilaginous teeth. Flowering branches spreading, sparingly dichotomously branched. Heads sessile, clustered at the end of branches, campanulate, yellow. Outer invol.-bracts ovate, membranous-margined; inner ones oblong-lanceolate. Achenes oblong, winged, truncate at both ends, white or pale-yellow. Pappus hairs white.

Fl. & Fr. : October - December.

Rare, in wet sandy soils. The heads of this taxon are largest among the other species occurring in this area.

Selected specimens : Ganganagar: Palewale, Roy 5950 (BSJO); Sirohi: Mt. Abu, Blatter 50020, 20473 (BLAT).

3. *Launaea procumbens* (Roxb.) Ramayya & Rajagopal in Kew Bull. 23: 465. 1969. *Prenanthes procumbens* Roxb. Fl. Ind. 3: 404. 1824. *Launaea nudicaulis* auct. plur, non (L.) Hook. f. *sensu stricto* Fl. Brit. India 3: 416. 1881; Duthie, Fl. Gangetic Plain 1: 494. 1905; Mahesh. Illus. Fl. Delhi f. 99. 1966.

Glabrous, annual or perennial herbs. Leaves mostly radical, in rosette, up to 20.0 × 4.5 cm, oblong, sinuate-lobed to lyrato-pinnatifid; lobes rounded or acute, with cartilaginous teeth. Heads shortly pedicelled or sessile, in terminal and subracemose clusters or solitary, yellow. Invol.-bracts 3-seriate, the outer ovate, inner ones lanceolate. Achenes 2-4 mm long, columnar, ribbed, rugulose. Pappus white, soft, deciduous, homomorphic.

Fl & Fr. : September - April.

Common in cultivated fields, gardens and wastelands in moist habitats and on low sand-dunes in dry habitats.

Selected specimens : Banswara: Ghatol, Singh 4214 (BSJO); Barmer: Pachpadra, Tiwari 1143 (BSJO); Sindani, Rao 66919 (BSI); Churu: Sujangarh, Roy 2491 (BSJO); Kota: Majumdar 12409 (BSA); Sirohi: Mt. Abu, Blatter 20319, McCann 1925 (BLAT).

4. *Launaea remotiflora* (DC.) Stebbins in Ind. For. Rec. 1(6): 240. 1939. *Lactuca remotiflora* DC. in Wight, Contrib. Bot. Ind. 26. 1834; Hook. f. Fl. Brit. India 3: 403. 1881; Duthie, Fl. Gangetic Plain 1: 490. 1905.

Erect, annual herbs. Leaves radical, sessile, 5-10 × 2.5-4.0 cm, obovate or oblong-pinnatifid, sinuate-toothed. Heads solitary or fascicled along the naked, slender branches, heterogamous, pinkish-white. Outer invol.-bracts ovate, inner ones linear-oblong, both scarious margined. Anther-bases setaceo-acuminate. Achenes compressed, faintly ribbed, muriculate, tapering towards the apex into a beak which is suddenly dilated into a cup-like disk beneath the pappus. Pappus hairs longer than achenes.

Fl & Fr. : December - February.

Occasional, weed in cultivated fields, gardens and wastelands.

Selected specimens : Banswara: Kanodia 51 (BSI); Jaipur: Jal Mahal, Sharma 365 (RUBL). Also reported from Barmer (Blatter and Hallberg, 1919).

5. *Launaea resedifolia* (L.) Kuntze, Rev. Gen. Pl. 1: 351. 1891, *Sphalm. Launaya*; Raizada, Suppl. Duthie, Fl. Gangetic Plain 124. 1976. *Scorzonera resedifolia* L. Sp. Pl. 1198. 1753. *Zollikaferia chondrilloides* DC. Prodr. 7: 183. 1838. *Launaea chondrilloides* (DC.) Hook. f. Fl. Brit. India 3: 415. 1881. 'Dulhphad' (Hindi).

Perennial herbs, with milky sap; stems dichotomously branched, terete, sulcate, woody at base. Radical leaves subrosulate, 4-15 × 2-5 cm, lanceolate, runcinate pinnatifid, spinulose-toothed; cauline leaves sessile, semi-amplexicaul, narrow, pinnatifid; those at forks of peduncles ovate or deltoid, entire, bract-like. Heads on subdivaricate, bracteate peduncles, 1-2 cm long, yellow. Outermost invol.-bracts much smaller and deltoid-ovate; inner ones oblong-lanceolate, with ciliolate tips. Achenes 6-7 mm long, cylindric, 3 to 4-toothed at the base, ribbed, scabrous on ribs. Pappus white.

Fl. & Fr. : Most part of the year.

Common in dry sandy soils. The roots give rise new propagules which establish as independent plants.

Selected specimens : Barmer: Jogidhora, Tiwari 949 (BSJO); Bikaner: Sobhasar, Roy 1722 (BSJO); Ganganagar: Khalsa college, Roy 5946 (BSJO); Jaipur: URF, Sharma 935 (RUBL); Kota: Singh 90231 (LWG).

6. *Launaea sarmentosa* (Willd.) Sch.-Bip. ex Kuntze, Rev. Gen. Pl. 1: 350. 1891. *Prenanthes sarmentosa* Willd. Sp. Pl. 3: 1540. 1804. *Launaea pinnatifida* Cass. in Ann. Sc. Nat. ser. 1, 23: 85. 1831; Hook. f. Fl. Brit. India 3: 416. 1881.

Glabrous, procumbent, perennial herbs. Stems 30-90 cm long, rooting at the nodes and arching between them. Radical leaves 2.5-8.0 cm long, oblong, runcinate-pinnatifid or sinuate-toothed, with cartilaginous teeth; cauline leaves oblong-lanceolate, toothed or subentire. Heads solitary or in clusters of 2-3, arising from the nodes together with the cauline leaves. Invol.-bracts white, membranous-margined, outer oblong, inner linear. Achenes obtusely 4-gonous, pale. Pappus-hairs soft, white.

Fl. & Fr. : November - February.

Occasional, in sandy soils, particularly in desertic zones.

Selected specimens : Barmer: Sindari, Rao 67265 (BSI); Jaipur: Ramgarh, Sharma 146 (RUBL). Also reported from Jhunjhunu (Nair, 1956), Jodhpur (Sarup, 1954) and Sikar (Nair & Nathawat, 1957).

43. OLIGOCHAETA (DC.) C. KOCH.

Oligochaeta ramosa (Roxb.) Wagenitz in Verroffent. Geobot. Inst. 37: 323. 1962. *Carduus ramosus* Roxb. Fl. Ind. 3: 407. 1832. *Volutarella divaricata* Benth. in Benth & Hook. f. Gen. Pl. 2: 476. 1873, *pro parte*; Hook. f. Fl. Brit. India 3: 383. 1881; Duthie, Fl. Gangetic Plain 1: 486. 1905. *Amberboa ramosa* (Roxb.) Jafri in Scientist 3: 29. 1958.

Procumbent, dichotomously branched, annual herbs. Lower leaves oblong or obovate or lyrate; upper ones sinuately pinnatifid, entire or toothed with mucronate lobes. Heads 1.5-2.2 × 1.0-1.5 cm, ovoid-oblong, pale-purple. Invol.-bracts spinescent. Ray-florets tubular, neuter. Receptacles bristly. Achenes acutely angled, pitted in the grooves. Pappus hairs unequal.

Fl & Fr. : October - May.

Common in dry sandy soils and rocky grounds, abundant in the desertic zones.

Selected specimens : Banswara: Jolana, Kanodia 11 (BSI); Barmer: Gadra road, Jain 40406 (BSI); Jaipur: Ramgarh, Sharma 1964 (RUBL); Jodhpur: Mandore, Jain 49419 (BSI); Kota: Nahargarh, Wadhwa 9391 (BSI).

44. PARTHENIUM L.

Parthenium hysterophorus L. Sp. Pl. 988. 1753; Raizada, Suppl. Duthie, Fl. Gangetic Plain 127. 1976.

Erect, profusely branched herbs, upto 1.5 m high; stems angular, hairy or scabrid. Leaves alternate, 2-8 × 3-5 cm, pinnately or bipinnately lobed; segments linear; upper most leaves entire to 3-lobed. Heads in axillary and terminal lax corymbose cymes, heterogamous, 4-5 mm in diam., white. Invol.-bracts 10, in 2-series of 5 each, ovate; outer bracts separate, strigose outside; each inner one attached abaxially to the base of a ray-floret; two disk pales and two included sterile disk-florets also attached to the base of the ray-florets on the adaxial side. Achenes 2.0 × 1.2 mm, flattened, crowned by persistent remnant of corolla, appendage and style.

Fl & Fr. : July - November.

Native of Mexico or West Indies; naturalized in the wastelands and open forests forming dense masses.

Selected specimens : Bhilwara: Near Rly. Station, Singh 6010 (BSJO); Chittorgarh: Hazikhera, Singh & Pandey 7276 (BSJO); Jaipur: Sanganer, Singh Acc. no. 12995 (RUBL).

45. PEGOLETTIA CASS.

Pegolettia senegalensis Cass. in Dict. Sci. Nat. 38: 230. 1825; Bhandari, Fl. Ind. Desert 207. 1978.

Much branched, glandular, odourous, annual herbs, 6-30 cm high. Leaves sessile, 1-3 × 0.2-0.5 cm, linear or oblanceolate, deltoid or subacute, narrowed towards base, distantly dentate, gland-dotted; upper most leaves bract-like, subulate. Heads solitary at the end of numerous corymbose, pedunculate branches, upto 1 cm long, yellow or purple. Invol.-bracts pauciseriate, scally, fimbriate on the margins, gland-dotted outside. Achenes 4 mm long, oblong, 10-ribbed, gland-dotted. Pappus hairs 2-seriate, multifid or plumose.

Fl & Fr. : September - October.

Common in dry rocky grounds and sandy soils in the west of Aravalli.

Selected specimens : Barmer: Umar lai, Tiwari 1154 (BSJO); Churu: Sujangarh, Roy 2553, 4048 (BSJO); Jodhpur: Bhandari 129, 344 (JAC).

46. PENTANEMA CASS.

1a. Lower leaves petiolate.

1. *P. cernuum*

1b. All leaves sessile, semi-amplexicaul:

2a. Pubescent or hispidly hairy herbs. Invol.-bracts linear-lanceolate, acute. Ligule of ray-florets lanceolate.

2. *P. indicum*

2b. White-villous to tomentose herbs. Invol.-bracts squarrose, with filiform, recurved tips. Ligule of ray-florets linear.

3. *P. vestitum*

1. *Pentanema cernuum* (Dalz.) Ling in Acta Phytotax. Sin. 10: 180. 1965. *Vicoa cernua* Dalz. in Dalz. & Gibs. Bombay Fl. 126, 134. 1861; Hook. f. Fl. Brit. India 3: 297. 1881; Mahesh. Illus. Fl. Delhi f. 102. 1966; Raizada, Suppl. Duthie, Fl. Gangetic Plain 136. 1976.

Erect, annual herbs, 30-50 cm high, with terete stems and pubescent branches. Leaves 5-8 × 2-3 cm, elliptic-lanceolate, acute or acuminate, crenate-serrate. Heads axillary, solitary or in terminal corymbose panicles, yellow. Invol.-bracts setaceous, outer ones squarrose. Achenes minute, oblong, sparsely hairy.

Fl & Fr. : November - February.

Rare, in wastelands and open forests.

Selected specimens : Banswara: Bhandaria, Kanodia 51044 (BSI); Sirohi: Mt. Abu, Jain 48181 (BSI).

2. *Pentanema indicum* (L.) Ling in Acta Phytotax. Sin. 10: 179. 1965. *Inula indica* L. Sp. Pl. ed. 2. 1236. 1763; Duthie, Fl. Gangetic Plain 1: 464. 1905. *Vicoa auriculata* Cass. in Ann. Sci. Nat. Paris 17: 418. 1829; Hook. f. Fl. Brit. India 3: 297. 1881. *Vicoa indica* (L.) DC. in Wight, Contrib. Bot. Ind. 10. 1834; Wight, Ic. 3(4): 13. t. 1148. 1846.

Erect, annual or perennial herbs, 30-80 cm high. Leaves 3-6 × 0.5-1.5 cm, oblong-lanceolate. Heads in spreading panicles, 1.0-1.5 cm in diam., yellow. Ray-florets ligulate, female. Disk-florets tubular, 2-sexual. Invol.-bracts 3 to 4-seriate. Achenes 1 mm long, oblong, terete, softly hairy. Pappus hairs few, white.

Fl. & Fr. : August - March.

Common weed in wastelands and Sugercane fields.

Selected specimens : Banswara: Hura Bowji forest, Singh 3679 (BSJO); Barmer: Silly Pasture, Tiwari 995 (BSJO); Bhilwara: Shahpur, Singh 5737 (BSJO); Ganganagar: Kumbharnwali, Roy 3917 (BSJO); Tonk: Kakor forest, Shetty 1032 (BSJO).

3. *Pentanema vestitum* (Wall. ex DC.) Ling in Acta Phytotax. Sin 10: 189. 1965. *Inula vestita* Wall. ex DC. Prodr. 5: 470. 1836; Duthie, Fl. Gangetic Plain 1: 464. 1905. *Vicoa vestita* (Wall. ex DC.) Benth. ex Hook.f. Fl. Brit. India 3: 297. 1881.

Erect, glandular, softly pubescent-villous, annual herbs. Leaves 4-6 × 1-2 cm, oblong-lanceolate, subobtuse or acute, entire or serrate, appressed-villous. Heads solitary, on patently villous peduncles, c. 1.5 cm in diam., yellow. Invol.-bracts 4-seriate, linear-subulate, hairy. Achenes thinly hairy. Pappus hairs few, white.

Fl. & Fr. : December - May.

Rare, in the gardens, fields and wastelands.

Selected specimens : Kota: Devari, Singh 90580 (LWG). Also reported from Alwar (Vyas, 1967), Jaipur (Bajpai & Verma, 1964) and Udaipur (Vyas, 1965).

47. PLUCHEA CASS.

1a. Heads subsolitary.

1. *P. arguta*

1b. Heads in compound corymbs:

2a. Outer invol.-bracts oblong, obtuse.

2. *P. lanceolata*

2b. Outer invol.-bracts ovate, acute:

3a. Leaves serrate-dentate.

3. *P. tomentosa*

3b. Leaves entire or subentire.

4. *P. wallichiana*

1. *Pluchea arguta* Boiss. Diagn. ser. 2. 3: 5. 1856; Hook. f. Fl. Brit. India 3: 273. 1881; Shah, Fl. Gujarat 1: 389. 1978.

Stout, much branched, glandular-pubescent shrubs. Leaves sessile, 2.5-7.0 × 0.8-1.5 cm, obovate-oblong or oblanceolate, entire or incise-pinnatifid, glandular pubescent. Heads solitary or few at the end of long peduncles, 8-10 mm in diam. Invol.-bracts subulate-lanceolate, rigid. Achenes cylindric, slightly ribbed, appressed hairy.

Fl. & Fr. : November - February.

Rare, in wastelands on saline soils. Reported by Sarup (1954) from Jodhpur. It is a halophytic element.

2. *Pluchea lanceolata* (DC.) Clarke, Comp. Ind. 94. 1876; Hook. f. Fl. Brit. India 3: 272. 1881; Duthie, Fl. Gangetic Plain 1:458. 1905; Mahesh. Illus. Fl. Delhi f. 108. 1966. *Berthelotia lanceolata* DC. Prodr. 5: 376. 1836.

Erect undershrubs, with terete, pubescent stems and branches. Leaves sessile, 2-6 × 0.4-1.0 cm, oblong or oblanceolate, obtuse, apiculate, narrowed at base, silky-pubescent. Heads in compound corymbs, 6-7 mm long, ovoid or campanulate, pinkish purple. Outer 3 to 5-series of invol-bracts 2.5-4.0 × 2 mm, silky-pubescent, tinged with purple outside at the apex; inner ones few, longer, linear, scarious. Receptacles flat, naked. Pappus hairs connate at the base. Achenes minute, oblong.

Fl. & Fr. : October - July.

Common in wastelands, often gregarious in the neglected corners of gardens.

Selected specimens : Bundi: Nenwa, Singh 74754 (LWG); Jaipur: Jobner, Sharma 1792; Jodhpur: Birai, Moorthy 402 (BSJO); Pali: Sardar Samand Farm, Shetty 1641 (BSJO); Tonk: Banetha, Pandey 4719 (BSJO).

3. *Pluchea tomentosa* DC. in Wight, Contrib. Bot. Ind. 16. 1834; Hook. f. Fl. Brit. India 3: 272. 1881; Duthie, Fl. Gangetic Plain 1:458. 1905.

Tomentose or glandular-pubescent undershrubs, 1-2 m high. Leaves sessile, 1.5-7.0 × 0.5-3.0 cm, broadly ovate to obovate, semi-amplexicaul, acute or obtuse, coarsely toothed, pubescent. Heads arranged in compound corymbs, 1.0-1.5 cm in diam. Outer invol.-bracts short, ovate, acute; inner ones ciliate at the apex. Receptacles naked. Achenes obscurely angled. Pappus hairs raddish.

Fl. & Fr. : August - December.

Rare, in wet habitats.

Selected specimens : Ajmer: Pushkar, *Sharma* 717 (DD); Udaipur: Jaisamand, *Verma* 72 (BSA).

4. *Pluchea wallichiana* DC. Prodr. 5: 451. 1836; Hook. f. Fl. Brit. India 3: 272. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 129. 1976.

Much-branched, glabrous shrubs, 1-2 m high. Branches glandular-pubescent. Leaves alternate, 3-8 × 1.5-3.0 cm, broadly elliptic or obovate-oblong, semi-amplexicaul, macronate, dentate or entire, glandular-pubescent. Heads 5-6 × 3-4 mm, in terminal, compound corymbs, white. Outer invol.-bracts much shorter, ovate-lanceolate, glandular hairy outside; inner ones narrower, with a pencil of hairs at the tip. Achenes 1 mm long, 5-angled, with fine hairs along the angles, brown. Pappus hairs 1-seriate, dirty white, antrorsely barbellate.

Fl. & Fr. : November - March.

Rare, in wastelands, on the wall of old buildings and along the roads. This is a shade loving species.

Selected specimens : Ajmer: Pushkar, *Sharma* 905 (DD); Chamar-Ghati, *Sharma* 1727 (DD); Jodhpur: *Bhandari* 1264 (JAC).

48. PULICARIA GAERTN.

- | | |
|--|---------------------------|
| 1a. Ray-florets tubular. | 3. <i>P. foliolosa</i> |
| 1b. Ray-florets ligulate: | |
| 2a. Achenes glabrous: | |
| 3a. Leaves crisped, with recurved margins. Pappus three times longer than achenes. | 2. <i>P. crispa</i> |
| 3b. Leaves serrate-dentate, margins flat. Pappus six times longer than achenes. | 4. <i>P. rajputanar</i> |
| 2b. Achenes hairy: | |
| 4a. Peduncles thickened below the heads. | 5. <i>P. wightiana</i> |
| 4b. Peduncles not thickened below the heads. | 1. <i>P. angustifolia</i> |

1. *Pulicaria angustifolia* DC. Prodr. 5: 479. 1836; Hook. f. Fl. Brit. India 3: 299. 1881; Duthie, Fl. Gangetic Plain 1: 465. 1905. 'Soneli' (Hindi).

Erect, annual herbs, upto 60 cm high. Leaves sessile, much variable in size and shape, usually linear to obovate-oblong, glandular-pubescent. Heads solitary, terminal, peduncled, 9-15 mm in diam., yellow. Outer

invol.-bracts linear-oblong, glandular, green; inner ones scarious. Ray-florets ligulate. Achenes ellipsoid or oblong, terete, sparsely hairy. Outer row of pappus forming a setulose-laciniate cup; inner row of white barbellate hairs.

Fl. & Fr. : October - February.

Common in wastelands, barren fields, on hillocks etc. More abundant in the desertic zones.

Selected specimens : Barmer: Sheo, *Tiwari* 873 (BSJO); Kota: Chhabra, *Singh* 90951 (LWG); Sawaimadhopur: Bayana, *Ghosh & Shankar* 46071 (LWG).

2. *Pulicaria crispa* (Forssk.) Benth. & Hook. f. *Gen. Pl.* 2: 336. 1867; ex Hook.f. *Fl. Brit. India* 3: 299. 1881; Duthie, *Fl. Gangetic Plain* 1: 466. 1905; Mahesh. *Illus. Fl. Delhi* f. 103. 1966. *Aster crispus* Forssk. *Fl. Aegypt.-Arab.* 150. 1775. 'Haldwa' (Hindi).

Erect or diffuse herbs or undershrubs. Leaves alternate, sessile, up to 7.0 × 1.5 cm, diminishing in size towards apex, linear or linear-oblong, oblong-obovate or subspathulate, undulate-crisped or denticulate. Heads pedunculate, solitary at the end of paniculate branches, 5-7 mm in diam., yellow. Invol.-bracts 2-3 mm long, linear-lanceolate, recurved, scarious-margined, pubescent outside. Achenes 0.5-0.9 mm long, oblong-ellipsoid. Outer pappus cupular, fimbriate; inner ones antrorsely scabrid.

Fl. & Fr. : Throughout the year.

Common in moist habitats by the side of tanks and rivers.

Selected specimens : Barmer: Revanda, *Tiwari* 1150 (BSJO); Bundi: Hindoli, *Singh* 74766 (LWG); Jaipur: Amer, *Sharma* 1095 (RUBL); Jodhpur; Sarecha, *Singh* 428 (BSJO); Tonk: Banas river, *Pandey* 4771 (BSJO).

3. *Pulicaria foliolosa* DC. *Prodr.* 5: 480. 1836; Hook. f. *Fl. Brit. India* 3: 298. 1881; Duthie, *Fl. Gangetic Plain* 1: 465. 1905.

Much-branched herbs, 6-10 cm high, with woody root-stock. Leaves alternate, sessile, 3-7 × 0.8-1.0 cm, oblong, linear-oblong or oblanceolate to spathulate. Heads disciform, 6-8 mm in diam., yellow. Peduncles villous, glandular. Invol.-bracts subequal, acute, hairy. Achenes 0.5-0.7 mm long, oblong, terete, brown. Pappus of outer series forming a fimbriate cup.

Fl. & Fr. : May - August.

Common on river beds and other similar wet habitats. Plants growing in rocky dry habitats are very dwarf.

Selected specimens : Banswara: Loharia, Singh 4250 (BSJO); Kota: Chhabra, Singh 74788 (LWG); Sirohi: Mt. Abu, King Acc. no. 237638, 237604 (CAL); Udaipur: Jaisamand, Verma 65 (BSA).

4. *Pulicaria rajputanae* Blatt. & Hallb. in J. Bomb. nat. Hist. Soc. 26(2): 535. 1919; Bhandari, Fl. Ind. Desert 209. 1978.

Perennial herbs, woody at the base. Stems terete, densely woolly-white. Leaves 2-6 × 1-2 cm, gradually smaller upwards, linear-oblong or spatulate, semi-amplexicaul at base, serrate or sinuate-dentate. Heads solitary at the end of branches or in corymbs, 6-8 mm in diam., yellow. Invol.-bracts multiseriate, acuminate, scarious-margined. Receptacles foveolate. Achenes 0.6 mm long, glabrous. Outer pappus forming a laciniate cup; inner ones barbellate.

Fl. & Fr. : October - January.

Rare, in saline habitats, particularly on the drying banks of tanks. Endemic to N.W. Rajasthan.

Selected specimens : Barmer: Bhandari 803 (JAC); Jaisalmer: Bhandari 838, 869 (JAC); Jodhpur: Balasmand, Blatter 10039 (BLAT; Lectotype).

5. *Pulicaria wightiana* (DC.) Clarke, Comp. Ind. 118. 1876; Hook. f. Fl. Brit. India 3: 298. 1881. *Poloa wightiana* DC. Arch. Bot. (Paris) 2: 514. 1833. 'Sonela' (Hindi).

Much-branched, annual herbs, upto 60 cm high. Leaves 1.5-6.0 × 0.4-1.0 cm, oblong, obtuse, amplexicaul, entire or serrate, pubescent. Heads in viscidly hairy, much branched corymbose cymes, 0.8-1.2 cm in diam., yellow; peduncles thickened towards tip. Invol.-bracts elliptic-oblong to elliptic-obovate, pubescent. Ligule of ray-florets 2 to 3-toothed. Achenes oblong, terete or 4-angular, hairy. Outer pappus connate, forming a laciniate cup; inner ones barbellate.

Fl. & Fr. : August - December.

Common in plains on exposed rocky to sandy soils.

Selected specimens : Jaisalmer: Wadhwa 4731 (BSA); Jhalawar: Wadhwa & Verma 3554 (BSA); Jodhpur: Bhandari 297, 396 (JAC). Also reported from Barmer (Rao & Kanodia, 1962) and Sikar (Nair and Nathawat, 1957).

49. SCLEROCARPUS JACQ.

Sclerocarpus africanus Jacq. ex Murr. Icon. Pl. Rar. 1: 17. 1782 & Syst. Veg. ed. 14. 783. 1784; Hook. f. Fl. Brit. India 3: 305. 1881; Duthie, Fl. Gangetic Plain 1: 469. 1905.

Erect, hispid, annual herbs, up to 60 cm high. Leaves 2.5-9.5 × 1.0-5.5 cm, ovate, acute or acuminate, remotely serrate, 3-nerved. Heads sessile or pedunculate, solitary, terminal or leaf-opposed, supported by 2-3 floral leaves, 6-10 mm in diam., yellow. Pales boat-shaped, ribbed, glabrous. Achenes 4-5 mm long, smooth. Pappus absent.

Fl. & Fr. : August - November.

Native of South America; naturalized in moist and shaded habitats in the forests, particularly in the east of Aravalli.

Selected specimens : Banswara: Anand Sagar forest, Singh 2971 (BSJO); Jaipur: Ramgarh, Sharma 888 (RUBL); Kota: Shahabad, Majumdar 13244 (BSA); Sirohi: Mt. Abu, Jain 546735 (BSI); Udaipur: Kambli ghat, Kanodia 82434 (BSI).

50. *SENECIO* L.

- | | |
|---------------------------------|--------------------------------|
| 1a. Pappus paleaceous. | 1. <i>S. grahami</i> |
| 1b. Pappus hairy: | |
| 2a. Invol.-bracts many-seriate. | 3. <i>S. laevindulaefolius</i> |
| 2b. Invol.-bracts uniseriate: | |
| 3a. Ray-florets pappose: | |
| 4a. Heads bracteate: | |
| 5a. Scapigerous herbs. | 4. <i>S. nudicaulis</i> |
| 5b. Undershrubs. | 5. <i>S. vestitus</i> |
| 4b. Heads ebracteate. | 2. <i>S. hewrensi</i> |
| 3b. Ray-florets epappose. | 6. <i>S. wightii</i> |

1. *Senecio grahami* Hook. f. Fl. Brit. India 3: 347. 1881; Cooke, Fl. Bombay 2: 52. 1904; Shah, Fl. Gujarat 1: 393. 1978

Erect, much-branched herbs, upto 1 m high. Leaves 3-7 × 2.0-6.5 cm, rhomboid-ovate, tapering at the base, acute, irregularly toothed, prominently veined beneath. Heads in terminal corymbose cymes, 2.0-2.5 cm in diam., yellow. Invol.-bracts connate upto middle, obovate-oblong, caudate-acuminate. Achenes ribbed, scabrid. Pappus absent in ray-florets; those of disk florets setaceous, yellowish.

Fl. & Fr. : August - October.

Rare, in wastelands and forests among grasses.

Selected specimens : Sirohi: Mt. Abu, Jain 46611, Rao 66547 (BSI).

2. *Senecio hewrensis* (Dalz.) Hook. f. Fl. Brit. India 3: 346. 1881; Raizada, Suppl. Duthie, Fl. Gangetic Plain 131. 1976. *Doronicum hewrense* Dalz. in Dalz. & Gibs. Bombay Fl. 130. 1861.

Dwarf, annual herbs, upto 5 cm high. Leaves sessile or shortly petioled, 1.5-3.0 × 0.2-0.6 cm, oblong-lanceolate, auricled at base, obtuse, irregularly toothed or subpinnatifid, membranous. Heads in corymbose cymes, 5-6 × 4-5 mm, yellow. Invol.-bracts oblanceolate or oblong-obovate.

Receptacles convex, naked. Achenes 2-3 mm long, 10-ribbed, truncate at the apex, narrowed at the base. Pappus hairs antrorsely barbellate, absent in ray-florets.

Fl. & Fr. : August - October.

Rare, in wastelands and on the exposed hills. Confined to Ajmer district.

Selected specimen : Ajmer: Nag Pahar, *Sharma* 1137 (DD, LWG).

3. *Senecio lavandulaefolius* Wail. ex DC. in Wight, Contrib. Bot. Ind. 23. 1834 & Prodr. 6: 368. 1838; Wight, Ic. 3(4): 12. t. 1133. 1846; Hook. f. Fl. Brit. India 3: 343. 1881.

Erect, unbranched, annual herbs. Leaves sessile, up to 2.5 × 0.4 cm, linear-oblong, acute, subauricled at base, recurved-margined, 1-nerved, tomentose. Heads in dense or open corymbs, 1.0-1.2 cm in diam., campanulate. Invol.-bracts closely imbricate, outer subulate or lanceolate, acuminate. Achenes slender, glabrous. Pappus white.

Fl. & Fr. : September - December.

Rare, in open forests among grasses.

Selected specimen : Sirohi: Mt. Abu, *Mehta* 531 (JAC).

4. *Senecio nudicaulis* Buch.-Ham. ex D. Don, Prodr. Fl. Nepal. 179. 1825; Hook. f. Fl. Brit. India 3: 340. 1881; Duthie, Fl. Gangetic Plain 1:479. 1905.

Erect, subscapigerous, biennial or perennial herbs, with fleshy roots. Basal leaves in rosette, oblanceolate-spathulate, tapering at the base into a petiole, serrate-dentate or lobed, cottony beneath; cauline ones lanceolate-oblong, semi-amplexicaul. Heads on 1-2 cm long, bracteate peduncles arranged in corymbose panicles, c. 2 cm in diam., yellow. Invol.-bracts lanceolate, scarious-margined. Achenes glandular hairy. Pappus hairs white.

Fl. & Fr. : April - June.

Rare, in the forests in shaded habitats. Confined to Mt. Abu.

Selected specimens : Sirohi: Mt. Abu, King. Acc. no. 246906, 246907, 246908 (CAL).

5. *Senecio vestitus* Berg. Descr. Pl. Cap. 282. 1767; Raizada, Suppl. Duthie, Fl. Gangetic Plain 131. 1976.

Suffruticose, glabrous undershrubs, with terete stems. Leaves oblong or obovate, broadly amplexicaul at base, obtuse, serrate, membranous, netted veined. Heads 20 to 30-flowered, radiate, in much branched corymbs. Invol.-bracts scally. Achenes striate, hispidulous.

Fl. & Fr. : February - March.

Native of S. Africa. Rare, in the wastelands and forests; reported by Majumdar *et al.* (1967) from Chittorgarh.

6. *Senecio wightii* (DC.) Benth. ex Clarke, Comp. Ind. 197. 1876. *Doronicum wightii* DC. in Wight, Contrib. Bot. Ind. 23. 1834; Wight, Ic. 3(4): 11. t. 1124. 1846. *Senecio saxatilis* Wall. ex DC. Prodr. 6: 367. 1838; Hook. f. Fl. Brit. India 3: 344. 1881.

Decumbent or creeping herbs, with perennial root-stock. Leaves sessile, lower 5-7 × 1.0-1.5 cm, upper ones smaller, oblanceolate, auricled based, acute, serrate, 1-nerved. Heads few, bracteolate or ebracteolate, on long peduncles in corymbose cymes. Invol.-bracts 15-20, oblong-lanceolate, acuminate. Achenes as long or longer than pappus, slender, glabrous.

Fl. & Fr. : August - December.

Rare, in swampy habitats in the forests. Confined to Mt. Abu, from where it was reported by Jain (1962).

51. SIEGESBECKIA L.

Siegesbeckia orientalis L. Sp. Pl. 900. 1753; Wight, Ic. 3(4): 8. t. 1103. 1846; Hook. f. Fl. Brit. India 3: 304. 1881; Duthie, Fl. Gangetic Plain 1: 467. 1905.

Erect, much-branched herbs, often tinged with purple. Leaves opposite; lower ones petioled, ovate-triangular or rhomboid, cuneate at base, acute or obtuse; upper ones sessile, 7-20 × 5-10 cm, oblong, coarsely dentate, hispid above, glandular-punctate beneath. Heads terminal, in the centre of forks, combined into leafy panicles, 4-5 mm long, yellow. Invol.-bracts 2-seriate; outer ones 5, spatulate, herbaceous, gland-hairy outside, viscid inside; inner ones 5-7, ovate, glabrous within. Pales elliptic-ovate, gland-hairy. Achenes obpyramidal, 4-gonous, viscid. Pappus absent.

Fl. & Fr. : March - November.

Rare, in open forests and wastelands, often in the fields near forests.

Selected specimens : Sirohi: Mt. Abu, *Jain* 46563, 56991 (BSD). Also reported from Jodhpur (Sarup, 1954).

52. SOLIVA RUTZ. & PAV.

Soliva anthemifolia (Juss.) R. Br. ex Less. Syn. Gen. Compos. 210. 1832; Raizada, Suppl. Duthie, Fl. Gangetic Plain 133. 1976. *Gymnostyles anthemifolia* A. Juss. Ann. Mus. Paris 4: 262. 1804.

Creeping, annual herbs. Leaves alternate, 3-10 cm long, 2-pinnatifid; segments lanceolate-oblong, apiculate, hairy. Heads sessile, axillary, greenish-yellow. Invol.-bracts 2-seriate, ovate-oblong, acute. Ray-florets female, without corolla. Anthers obtuse at the base. Achenes flattened, winged, crowned by a hardened style. Pappus absent.

Fl. & Fr. : February - May.

Native of America; naturalized in wastelands, particularly on the dry exposed banks of tanks and ponds.

Selected specimen : Kota: Atru, *Singh* 74760 (LWG).

53. SONCHUS L.

1a. Outer invol.-bracts glandular hairy.

2. *S. brachyotus*

1b. Outer invol.-bracts eglandular:

2a. Leaf-auricles acute, spreading. Achenes transversely tuberculate.

3. *S. oleraceus*

2b. Leaf-auricles rounded, appressed to the stem. Achenes not tuberculate.

1. *S. asper*

1. *Sonchus asper* (L.) Hill, Herb. Brit. 1: 47. t. 34. 1769; Hook. f. Fl. Brit. India 3: 414. 1881; Duthie, Fl. Gangetic Plain 1: 493. 1905. *S. oleraceus* L. var. *asper* L. Sp. Pl. 794. 1753.

Erect, glabrous, annual herbs, up to 1 m high. Basal leaves petioled, in rosette, spatulate-oblong, entire or pinnatifid, spinulosely dentate; cauline ones semi-amplexicaul, with rounded basal auricles. Heads in terminal, subumbellate corymbs, 1.0-1.3 cm long, yellow. Invol.-bracts 2 to 3-seriate, lanceolate. Achenes obovoid-oblong, 3-ribbed on lateral faces. Pappus hairs white.

Fl. & Fr. : February - May.

Common in wastelands, way sides and agricultural fields, particularly in wet and shaded habitats.

Selected specimens : Barmner: Parlu well, *Tiwari* 1157 (BSJO); Ganganagar: Rai Singh nagar, *Roy* 3899 (BSJO); Jaipur: Ram Niwas garden, *Sharma* 210 (RUBL); Kota: *Wadhwa* 9295 (BSA).

2. *Sonchus brachyotus* DC. Prodr. 7: 186. 1838. *S. arvensis* auct. plur. non L. 1753; Hook. f. Fl. Brit. India 3: 414. 1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Mahesh. Illus. Fl. Delhi f. 100. 1966. *S. wightianus* DC. Ic. 7: 187. 1838; Wight, Ic. 3(4): 13. t. 1412. 1846.

Perennial herbs, with thick, stout, creeping root-stock. Basal leaves in rosette, 10-30 × 2-5 cm; upper ones remote, spatulate-oblong, semi-amplexicauli at base, with rounded auricles. Heads in corymbose panicles, 1.0-1.5 cm long, yellow; peduncles white-floccose, gland-bristly. Invol.-bracts 3 to 4-seriate, lanceolate, glandular hairy. Achenes linear-oblong, curved, 5-ribbed, transversely rugose. Pappus hairs white.

Occasional, in plains in moist, well-drained areas.

Selected specimens : Bhilwara: Badnor, *Singh* 7075 (BSJO); Jaipur: Ram Niwas garden, *Sharma* 434 (RUBL); Jhalawar: *Sharma* 444 (RUBL). Also reported from Alwar (*Vyas*, 1967), Sikar (*Nair and Nathawat*, 1957), Sirohi (*Raizada*, 1954) and Udaipur (*Ramdeo*, 1969).

3. *Sonchus oleraceus* L. Sp. Pl. 794. 1753; Hook. f. Fl. Brit. India 3: 414. 1881; Duthie, Fl. Gangetic Plain 1: 492. 1905. *S. ciliatus* Lam. Fl. Fr. 2: 87. 1779; Wight, Ic. 3(4): 13. t. 1141. 1846.

Erect, annual herbs. Branches, peduncles and invol.-bracts glandular hairy. Leaves obovate-oblong, sagittate at the base, irregularly dentate with acute, spreading lobes; lower leaves narrowed into a petiole, pinnatifid. Heads in irregular, umbellate cymes, yellow. Invol.-bracts 2 to 3-seriate. Achenes ovoid, longitudinally 3-ribbed on lateral faces, transversely muriculate between the ribs. Pappus white, longer than achenes.

Fl. & Fr. : August - March.

Common in wastelands, cultivated fields, gardens etc. in wet and shaded habitats.

Selected specimens : Banswara: Ghatol, *Singh* 4205 (BSJO); Bikaner: Richwali, *Roy* 1663 (BSJO); Jaisalmer: *Wadhwa* 5011 (BSA); Kota: Chhabra, *Singh* 90629 (LWG); Sirohi: Mt. Abu, *Puri* 56731 (BSI).

54. SPHAERANTHUS L.

Sphaeranthus indicus L. Sp. Pl. 927. 1753; Hook. f. Fl. Brit. India 3: 275. 1881, *pro parte*; Duthie, Fl. Gangetic Plain 1: 459. 1905. *S. hirtus* Willd. Sp. Pl. 2395. 1802; Wight, Ic. 3(4): 8. t. 1094. 1846.

Much-branched, prostrate, hairy herbs. Stems narrowly winged; wings toothed. Leaves 4-6 × 0.5-1.5 cm, oblong, double dentate, clothed with stalked glands. Compound heads peduncled, 1.0-1.5 cm long, ovoid-oblong or globose, pinkish purple. Involucre of each head campanulate, membranous, with lobes toothed along the margins. Achenes 1 mm long, oblong, compressed, glabrous or glandular hairy. Pappus absent.

Fl. & Fr. : October - April.

Common in wastelands, neglected corners of fields, road-sides etc. Plants prefer black cotton soils.

Selected specimens : Banswara: Ghatol, *Singh* 4213 (BSJO); Barmer: Uttarlai Aerodrome, *Tiwari* 1192 (BSJO); Jodhpur: Kharia-Meetapur, *Singh* 3574 (BSJO); Kota: Shahabad, *Nautiyal & Ratzuda* 25373 (DD); Udaipur: Nathdwara, *Kaul* 8575 (LWG).

55. SPILANTHES N. JACQ.

Heads solitary, terminal. Achenes glabrous.

1. *S. calva*

Heads collected into panicles, axillary and terminal. Achenes hairy along margins.

2. *S. paniculata*

1. *Spilanthès calva* DC. in Wight, Contrib. Bot Ind. 19. 1834; Wight, Ic. 3(4): 9. 1109. 1846. *S. acmella auct.* non (L.) Murr. 1774; Hook. f. Fl. Brit. India 3: 307. 1881; Duthie, Fl. Gangetic Plain 1: 471. 1905.

Erect or ascending, hairy, annual herbs. Leaves 2-3 × 1-2 cm, ovate-lanceolate, cuneate at base, acute, crenate-serrate, glabrous. Heads 1.0-1.2 × 0.7 cm, ovoid, yellow. Invol.-bracts oblong-lanceolate or ovate-elliptic, subacute, glabrous. Achenes dorsally compressed. Pappus absent.

Fl. & Fr. : September - December.

Rare, in wet and shaded habitats in the forests. Confined to Mt. Abu.

Selected specimen : Sirohi: Mt. Abu, *Blauer* 50161 (BLAT).

2. *Spilanthès paniculata* Wall. ex DC. Prodr. 5: 625. 1836. *S. acmella auct.* non (L.) Murr. var. *paniculata* (Wall. ex DC.) Clarke. Comp. Ind. 139. 1876; Hook. f. Fl. Brit. India 3: 307. 1881.

Erect, annual herbs, 20-40 cm high. Leaves 2.5-6.0 × 1.2-3.0 cm, ovate or ovate-lanceolate, acute, entire or crenate. Heads in corymbose panicles, 0.5-1.0 × 0.3-0.5 cm, ovoid-elliptic, ciliate. Receptacles convex, paleaceous. Achenes compressed, angled, margined, ciliate along margins, verrucose, black.

Fl. & Fr. : December - April.

Rare, in marshy and semi-aquatic habitats. Confined to Jhalarapatan in Jhalawar district.

Selected specimen : Jhalawar, Jhalarapatan, Singh 83823 (LWG).

56. SYNEDRELLA GAERTN. *nom. cons.*

Synedrella nodiflora (L.) Gaertn. Fruct. 2: 456. t. 171. f. 7. 1791; Hook. f. Fl. Brit. India 3: 308. 1881. *Verbesina nodiflora* L. in Juslenius, Cent. Pl. 28. 1755.

Annual herbs, 30-100 cm high. Stems grooved, hairy. Leaves 3-12 × 1.2-6.0 cm, ovate-elliptic, acute, sparsely hairy. Heads axillary or between the forks of branches, up to 5 mm in diam., yellow. Achenes 3-5 mm long, compressed, ribbed or angled, black. Pappus of 2-3 bristly awns.

Fl. & Fr. : July - January.

Native of Tropical America; rare, in plains on moist sandy soils. Reported by Nair & Malhotra (1961) from Sikar.

57. TARAXACUM WIGGERS *nom. cons.*

Taraxacum officinale Wiggers, Prim. Fl. Holsat. 56. 1780; Hook. f. Fl. Brit. India 3: 401. 1881; Duthie, Fl. Gangetic Plain 1: 496. 1905; Raizada, Suppl. Duthie, Fl. Gangetic Plain 134. 1976.

Small herbs, with short stems covered over by the leaf-bases. Leaves radical, in rosette, 8-12 × 1.5-2.5 cm, oblong, pinnatisect; lobes 3-angular. Heads solitary, on 5-10 cm long peduncles with one or two whorls of invol.-bracts at the base, 1-2 × 0.8-1.2 cm, yellow. Receptacles flat, naked. Achenes narrowly obovoid, ribbed, muricate or echinate on the ribs, beaked. Pappus white, shorter than bracts.

Fl. & Fr. : April - October.

Native of Europe; rare, in moist shaded localities in the forests. Confined to Sitabari in Kota district.

Selected specimen : Kota: Sitabari, Singh 74011 (LWG).

58. TRICHOLEPIS DC.

Erect herbs. Paleae of the receptacles reaching above the pappus.

1. *T. glaberrima*

Diffuse herbs. Paleae of the receptacles not reaching above the pappus.

2. *T. radicans*

1. *Tricholepis glaberrima* DC. Prodr. 6: 564. 1837; Hook. f. Fl. Brit. India 3: 381. 1881; Duthie, Fl. Gangetic Plain 1: 484. 1905.

Erect, glabrous herbs, up to 1.5 m high; stems rigid, angled, ribbed. Leaves sessile, 2.0-13.5 × 0.5-4.5 cm, lanceolate or linear-lanceolate, acute, entire or spinous-toothed, glabrous, nigro-punctate. Heads solitary, terminal, ovoid, purple. Invol.-bracts bristle-pointed. Receptacle-bristles linear, longer than pappus. Achenes 4-6 mm long, oblong, faintly ribbed, glabrous, brown. Pappus barbellate.

Fl. & Fr. : September - December.

Rare, in the forests; confined to Mt. Abu.

Selected specimens : Sirohi: Mt. Abu, *Raizada* 103397 (DD), *Jain* 60143 (BSI).

2. *Tricholepis radicans* (Roxb.) DC. Prodr. 6: 584. 1838; Hook. f. Fl. Brit. India 3: 381. 1881. *Carduus radicans* Roxb. Fl. Ind. 3: 408. 1832.

Dichotomously branched, erect or decumbent, annual herbs. Leaves sessile, 2.5-5.0 × 0.6-2.0 cm, lower obovate, upper ones ovate to linear-lanceolate, crenate to pinnatisect with bristle-pointed lobes. Heads pedunculate, solitary, up to 7 mm in diam., woolly-pubescent, purple. Invol.-bracts elliptic-lanceolate, aristate-acuminate; bristles recurved, barbellate. Pales of receptacles linear, shorter than achenes and pappus. Achenes oblong, smooth. Pappus yellowish, subpaleaceous.

Fl. & Fr. : September - December.

Rare, in dry sandy soils. Reported by Dhillon and Bajwa (1969) from Ganganagar, Sarup (1954, 58) from Jodhpur and Jaisalmer respectively.

59. TRIDAX L.

Tridax procumbens L. Sp. Pl. 900. 1753; Hook. f. Fl. Brit. India 3: 311. 1881; Duthie, Fl. Gangetic Plain 1: 475. 1905.

Straggling, hispid, annual or perennial herbs, up to 75 cm long. Leaves 2.5-7.0 × 1.5-2.5 cm, ovate or ovate-lanceolate, cuneate at the base, incised-dentate to pinnatisect. Heads solitary, on terminal, up to 40 cm long peduncles, up to 1.2 cm in diam., yellow. Outer invol.-bracts ovate, acute, herbaceous; inner ones scarious, pinkish above the middle. Achenes oblong, black, silky hairy. Pappus bristles plumose, aristate.

Fl. & Fr. : Most part of the year.

Native of Central America; naturalized in wastelands and open forests among bushes in dry habitats; often found on the walls of old buildings.

Selected specimens : Banswara: Paloda, *Singh* 2803 (BSJO); Churu: Gopalpur hill, *Roy* 4055 (BSJO); Ganganagar: Bhadra, *Roy* 6449 (BSJO);

Jaipur: Ramgarh, *Sharma* 1826 (RUBL); Kota: Shahabad, *Majumdar* 13245 (BSA).

60. VERBESINA L.

Verbesina encelioides (Cav.) Benth. & Hook. f. ex A. Grey in Bot. Calif. 1: 350. 1878; Raizada, Suppl. Duthie, Fl. Gangetic Plain 135. 1976. *Ximenesia encelioides* Cav. Icon. 2: 60. t. 178. 1793.

Much-branched, densely puberulous, annual herbs. Leaves alternate or lower ones opposite, 5.0-7.5 cm long, deltoid ovate, acuminate, dentate. Heads peduncled, in cymes, golden yellow. Invol.-bracts lanceolate. Achenes of disk-florets obovate, winged, with 2, subulate pappus-awns; those of ray-florets rugose, thickened, often wingless.

Fl. & Fr. : June - September.

Native of Tropical America; naturalized in sandy soils in wastelands.

Selected specimens : Ajmer: Puchkund, *Sharma* 267 (DD); Churu: Sujangarh, *Roy* 2651 (BSJO); Ganganagar: Marjanda, *Roy* 4976 (BSJO); Jodhpur: Teori, *Singh* 3261 (BSJO).

61. VERNONIA SCHREBR. *nom. cons.*

1a. Achenes either angled or ribbed, but not terete:

2a. Pappus of biseriate hairs, outer much smaller:

3a. Achenes 4 to 5-ribbed.

3. *V. cinerascens*

3b. Achenes 2 to 3-angled:

4a. Plants white silky.

1. *V. albicans*

4b. Plants hairy or pubescent, not silky.

5. *V. canyzoides*

2b. Outer pappus of a ring of palaceous scales; inner of 1-seriate hairs.

2. *V. anceps*

1b. Achenes neither angled nor ribbed, but terete.

4. *V. cinerea*

1. *Vernonia albicans* DC. in Wight, Contrib. Bot. Ind. 6. 1834; Gamble, Fl. Madras 4: 676. 1921.

Erect, white-silky, annual or perennial herbs or undershrubs, upto 1 m high. Leaves 4-9 × 2-9 cm, ovate-rhomboid, cuncate at base, crenate-dentate, pubescent above, tomentose beneath. Heads in divaricate corymbose cymes, c. 1.0 × 0.5 cm, purple or white. Invol.-bracts linear-lanceolate, acute, pilose. Receptacles naked. Pappus white, 2-seriate, outer much shorter. Achenes densely hairy.

Fl. & Fr. : August - February.

Rare, in wastelands and on the walls of old buildings.

Selected specimen : Kota: Amarniwas, Singh 74614 (LWG).

2. **Vernonia anceps** Clarke in Hook. f. Fl. Brit. India 3: 233. 1881.

Woody undershrubs, with terete branches. Leaves 5-8 × 0.6-2.0 cm, lanceolate or elliptic-lanceolate, acuminate, serrulate, puberulous. Heads in open corymbs. Invol.-bracts oblong-lanceolate, acute. Corolla glabrous. Achenes strongly 4 to 5-ribbed, puberulous. Pappus dirty white.

Fl. & Fr. : August - December.

Rare; included on the authority of Sarup (1954, 1958) from Jodhpur and Jaisalmer.

3. **Vernonia cinerascens** Sch.-Bip. in Schweinf. Beitr. Aethiop: 162. 1867; Hook. f. Fl. Brit. India 3: 237. 1881; Duthie, Fl. Gangetic Plain I: 441. 1905. '*Lolia*' (Hindi).

Undershrubs, 45-60 cm high, clothed with ashy pubescence. Leaves 2.0-5.5 × 0.6-1.5 cm, oblong-spathulate, narrow at the base, grey-pubescent.

Heads in terminal panicles, purple or pink. Invol.-bracts linear, subacute. Achenes obconic, densely silky. Pappus white, outer shorter, rigid,

Fl. & Fr. : August - December.

Common in wastelands, particularly in wet and shady habitats.

Selected specimens : Ajmer: Todgarh, Duthie 4693 (DD); Barmer: Junapathera Sar, Tiwari 1189 (BSJO); Sirohi: Mt. Abu, Cooke 1, 2 (BSI).

4. **Vernonia cinerea** (L.) Less. in Linnaea 4: 291. 1829; Hook. f. Fl. Brit. India 3: 233. 1881; Duthie, Fl. Gangetic Plain I: 441. 1905; Mahesh, Illus. Fl. Delhi f. 101. 1966. *Conyza cinerea* L. Sp. Pl. 862. 1753.

Erect or decumbent, annual-perennial herbs, 5-100 cm high; stems ribbed, glandular pubescent. Leaves 0.5-8.0 × 0.3-3.5 cm, variable in shape from ovate to obovate, cuneate at base, acute, entire to dentate, gland-dotted beneath. Heads in divaricate corymbose cymes, 5-10 mm long, violet or pink. Invol.-bracts 3 to 4-seriate, linear-lanceolate, 1-nerved. Achenes appressed hairy. Pappus hairs 2-seriate, outer shorter.

Fl. & Fr. : Most part of the year.

Common in variable habitats. It is one of the hardiest plants to come into flower on bare rocky and sandy grounds during the hot season.

Selected specimens : Banswara: Jolana, Kanodia 75610 (BSI); Barmer: Balotra, Tiwari 982 (BSJO); Jaipur: Ramgarh, Sharma 779 (RUBL); Jaisalmer: Amar Sagar Garden, Tiwari 850 (BSJO); Kota: Kishanganj, Verma 678 (BSA).

5. *Vernonia conyzoides* DC. in Wight, Contrib. Bot. Ind. 6. 1834; Wight, Ic. 3(4): 6. t. 1076. 1846. *V. candolleana* Wt. & Arn. in Nov. Act. Nat. Cur. 18: 346. 1836; Hook. f. Fl. Brit. India 3: 236. 1881.

Annual herbs, upto 1 m high. Leaves apparently fasciated, 3-7 × 1-2 cm, ovate-lanceolate, acute, crenate-serrate, thin, glabrescent. Heads in spreading, villous corymbs, purple. Invol.-bracts ovate-lanceolate, acute-acuminate, pungent. Achenes densely hairy. Pappus white.

Fl. & Fr. : November - February.

Rare, in wastelands. Reported by Nair & Nathawat (1957) from Sikar and Nair & Kanodia (1959) from Jhunjhunu.

62. WEDELIA JACQ. *nom. cons.*

Leaves subsessile, oblong-elliptic or lanceolate. Invol.-bracts much longer than disk-florets.

1. *W. chinensis*

Leaves petiolate, ovate. Invol.-bracts about equalling the disk-florets.

2. *W. urticaefolia*

1. *Wedelia chinensis* (Osbeck) Merr. in Philip. Journ. Sci. (Bot.) 12: 111. 1977; Raizada, Suppl. Duthie, Fl. Gangetic Plain 136. 1976. *Verbesina calendulacea* L. Sp. Pl. 902. 1753. *Solidago chinensis* Osbeck, Dugbok Ostend. Resa 241. 1757. *Wedelia calendulacea* (L.) Less. Syn. Comp. 222. 1832, non Pers. 1807; Wight, Ic. 3(4): 9. t. 1107. 1846; Hook. f. Fl. Brit. India 3: 306. 1881.

Much-branched, decumbent, perennial herbs. Leaves opposite, 1.5-4.5 × 0.6-1.8 cm, oblong-elliptic or lanceolate, entire or crenate-serrate, scaberulous. Heads solitary, axillary or terminal, heterogamous, 7-11 × 10-17 mm, yellow. Invol.-bracts 2-seriate. Receptacles flat. Achenes 3.0-3.5 mm long, oblong-cuneate, laterally compressed. Pappus cupular, toothed or fimbriate at the rim.

Fl. & Fr. : January - July.

Rare, in wet and shady habitats. Reported by Bajpai & Verma (1964) from Jaipur.

2. *Wedelia urticaefolia* DC. in Wight, Contrib. Bot. Ind. 18. 1834; Wight, Ic. 3(4): 9. t. 1106. 1846; Hook. f. Fl. Brit. India 3: 306. 1881.

Erect, annual herbs, upto 1.2 m high. Leaves 6-17 × 2-7 cm, ovate or ovate-lanceolate, hispidly hairy. Heads in axillary fascicles or solitary or in terminal racemes, 1.5-2.0 cm in diam. Outer invol.-bracts ovate-oblong, acuminate, hairy. Pappus a small, toothed ciliolate cup. Achenes 4-5 mm long, obovate-cuneate, faintly ribbed or 3-quetrous, glabrous.

Fl. & Fr. : September - December.

Rare, in wastelands and forests. Reported by Vyas (1967) from Alwar, Blatter and Hallberg (1919) from Jaisalmer and Sarup (1954) from Jodhpur.

63. XANTHIUM L.

Plants armed with spines.

1. *X. spinosum*

Plants unarmed.

2. *X. strumarium*

1. *Xanthium spinosum* L. Sp. Pl. 987. 1753; Flori, Ic. Fl. Ital. f. 3678. 1904; Davis, Fl. Turkey 5: 48. 1975.

Much-branched, annual herbs, 15-100 cm high. Leaves sessile or shortly petioled, 2-5 cm long, 3 to 5-lobed, green above, white to grey tomentose beneath, subtended by 1 or 2, 3-fid, yellow spines. Female heads sessile, solitary, axillary; males borne at the end of branches. Fruiting involucre 10-15 × 7-9 mm, arachnoid, with hooked spines; beaks acicular, one longer than other.

Fl. & Fr. : October - May.

Rare, in damp habitats. Reported by Bajpai & Verma (1964) from Jaipur.

2. *Xanthium strumarium* L. Sp. Pl. 987. 1753; Hook. f. Fl. Brit. India 3: 303. 1881; Duthie, Fl. Gangetic Plain 1: 467. 1905. *X. indicum* Koen. ex Roxb. Fl. Ind. 3: 601. 1832; Wight, Ic. 3(4): 8. t. 1104. 1846. '*Adhasisi, Chirchita*' (Hindi).

Foetid-smelling herbs, about 1 m high. Leaves 8-12 × 7-10 cm, ovate-suborbicular, entire, toothed or 3-lobed, cuneate at the base. Heads in terminal and axillary racemes, greenish yellow. Invol.-bracts connate into an ellipsoid, 3-locular body covered with hooked bristles and bearing 2-dentate beak at the apex of each cell. Female heads 2-flowered, in the lower region of the inflorescence. Bisexual heads in upper part of the inflorescence. Female florets apetalous. Style-arms included. Achenes oblong-ovoid, compressed, glabrous, those of bisexual florets sterile and enclosed with in pales.

Fl. & Fr. : October - May.

Native of America; naturalized in wastelands near habitations; often gregarious in the forests. Bisexual florets are functionally male.

Selected specimens : Bikaner: Shivbari, Roy 2395 (BSJO); Jaipur: Doasa, Wadhwa 8172 (BSA); Jaisalmer: Pokaran, Tiwari 734 (BSJO); Kota: Shahabad, Majumdar 13257 (BSA); Sirohi: Mt. Abu, Bole 22 (BLAT).

DOUBTFUL TAXA

Blumea lanceolata Warburg in Bot. Jahrb. 13: 446. 1891.

The specimen (*Sharma* 282) deposited in Dchra Dun herbarium (DD) is insufficient to ascertain the identity of this taxon. No other collections are available.

Centratherum ritchiei Hook. f. Fl. Brit. India 3: 228. 1881.

Slender, annual herbs. Leaves elliptic-lanceolate, white-tomentose beneath. Outer invol.-bracts foliaceous, cordate. Pappus reddish.

This species is a denizen of Concan and Canara. The specimens (*McCann* 5893, 5894) deposited in Blatter Herbarium (BLAT) are not in good condition to ascertain the identity of this taxon. None of the subsequent workers have collected this taxon from Mt. Abu or elsewhere.

Centratherum molle Benth. & Hook.f. Gen. Pl. 2: 225. 1873; ex Hook.f. Fl. Brit. India 3: 227. 1881.

Annual herbs. Leaves elliptic-ovate, membranous. Pappus yellowish.

This species is an inhabitant of Western Peninsula. The specimen (*Blatter* 50100) deposited in Blatter Herbarium (BLAT) are not in good condition to determine the identity of this taxon. None of the subsequent workers have collected it from Mt. Abu or elsewhere in Rajasthan.

CULTIVATED SPECIES

Calendula officinalis L. Erect, aromatic, viscid, annual herbs, with obovate-spathulate leaves and yellow, heterogamous heads. Native of South Europe; cultivated for ornamental purposes.

Chrysanthemum indicum L. '*Guldaudi*' (Hindi) - Annual or perennial herbs, with variously divided leaves and ligulate heads of various colours. Native of China and Japan; several varieties are cultivated for ornamental purposes.

Eupatorium cannabinum L. Tall, trailing or erect herbs, with simple or trisect lanceolate leaves and purplish heads borne in corymbs. Cultivated ornamentally.

Eupatorium capillifolium (Lam.) Small (*Artemisia capillifolia* Lam.) - Much branched undershrubs, with ovate-lanceolate leaves and yellow heads. Native of Tropical Africa; cultivated for ornamental purposes.

Helianthus annuus L. '*Suraj Mukhi*' (Hindi) Erect, robust, annual herbs, with ovate or oblong leaves and yellow heads. Native of North America; cultivated for ornamental purposes and the seed-oil.

Hymenatherum tenuifolium Cass. Aromatic, annual herbs, with deeply pinnatisect leaves and yellow, heterogamous heads. Native of Central America; cultivated for ornamental purposes.

Tagetes erecta L. '*Genda*' (Hindi) Erect, annual herbs, with pinnate leaves and yellow, campanulate heads. Native of Mexico; cultivated for ornamental purposes.

Tagetes patula L. '*Genda*' (Hindi) Erect, annual herbs, with pinnate or pinnatisect leaves and orange-yellow heads tinged with red markings. Native of Mexico; cultivated for ornamental purposes.

Tithonia rotundifolia (Mill.) Blake (*Tagetes rotundifolia* Mill.) -Soft-wooded shrubs, with divided leaves and orange heads like sun-flower. Native of Mexico; cultivated for ornamental purposes.

Vittadinia triloba (Gaudich.) DC. (*Brachycome triloba* Gaudich.) -Much branched, tomentose herbs, with oblong-lanceolate leaves and yellow, heterogamous, solitary heads. Native of New Zealand; grown for ornamental purposes.

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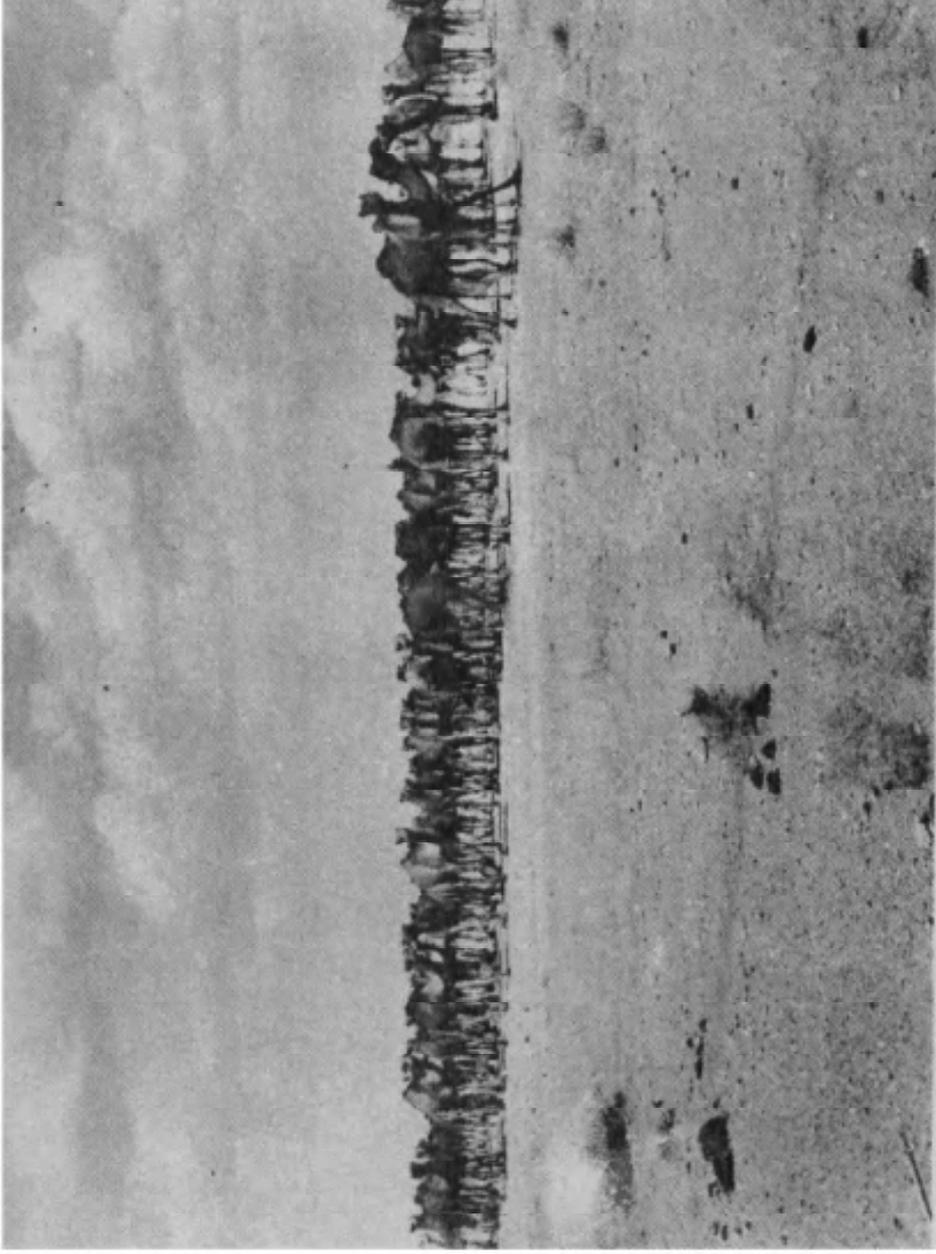


Plate 1. Herd of camels (for jacket of floor).

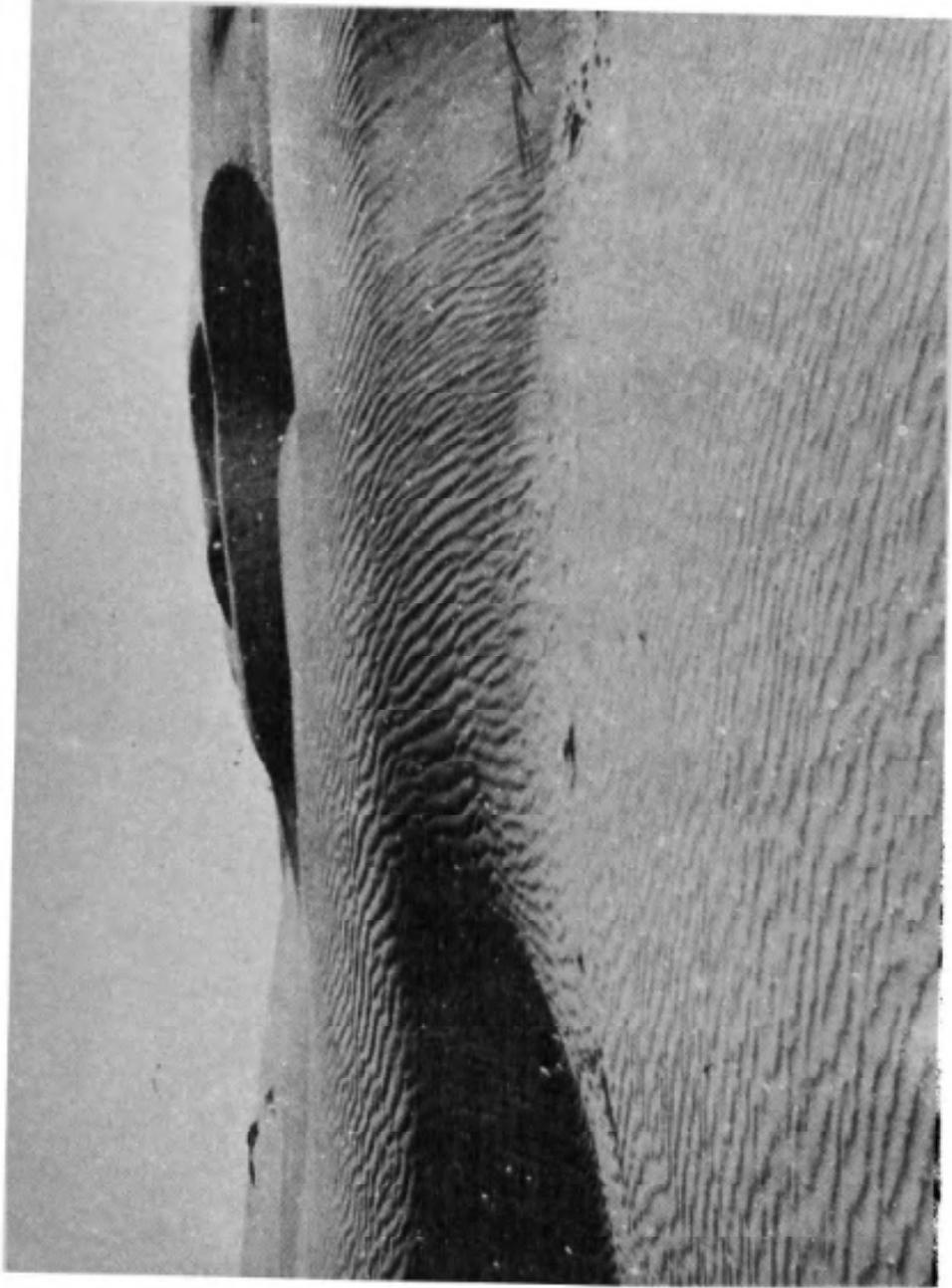


Plate 2. A view of unstabilized sand-dunes; the dunes are devoid of vegetation.

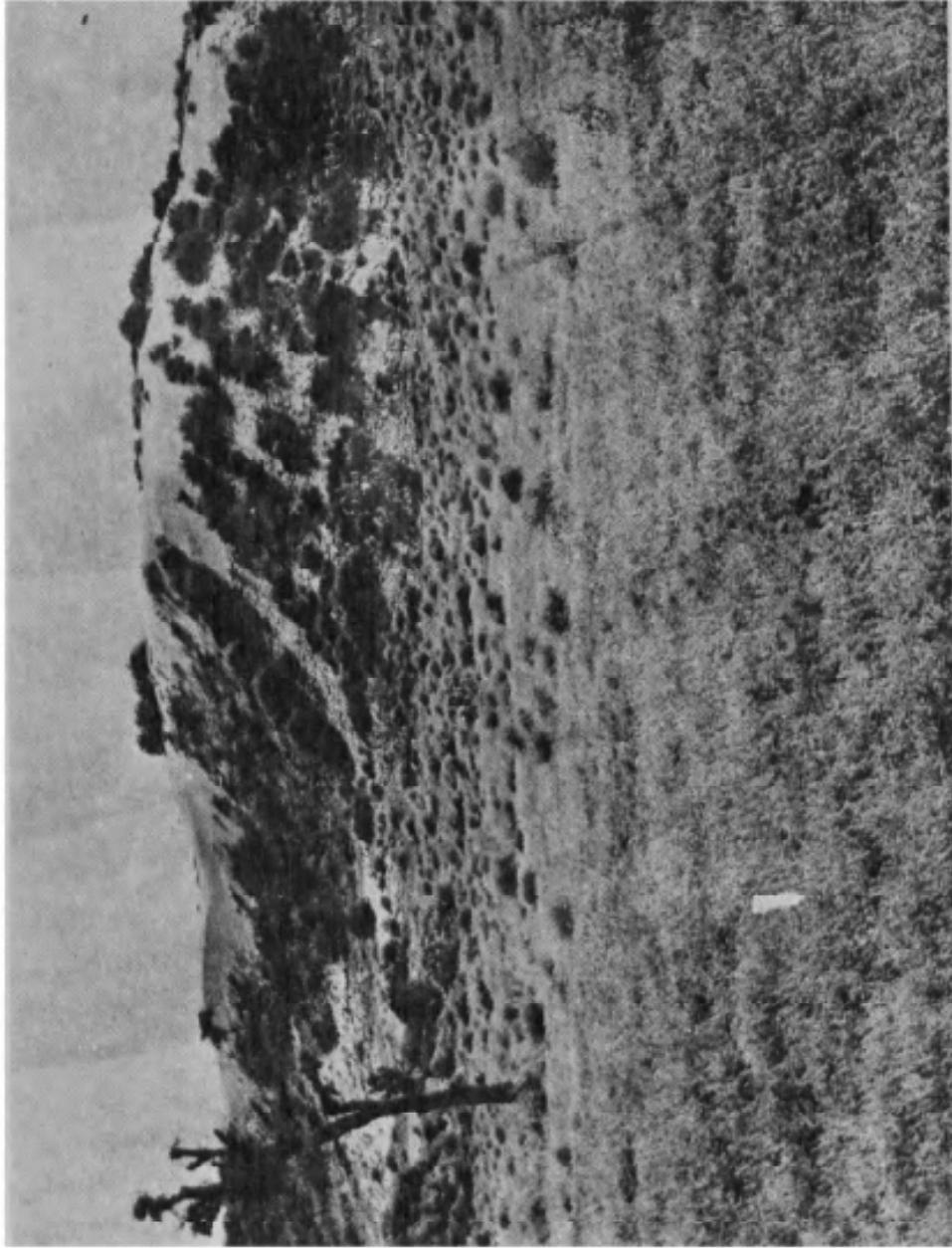


Plate 3. A partially stabilized sand-dune colonized by *Prosopis* (*cineraria*,
Calotropis procera, *Capparis decidua*, *Ziziphus nummularia* etc.



Plate 4. A view of stabilized sand-dune (background), with dense population of *Lasium: hirsutum* on the slopes (foreground).

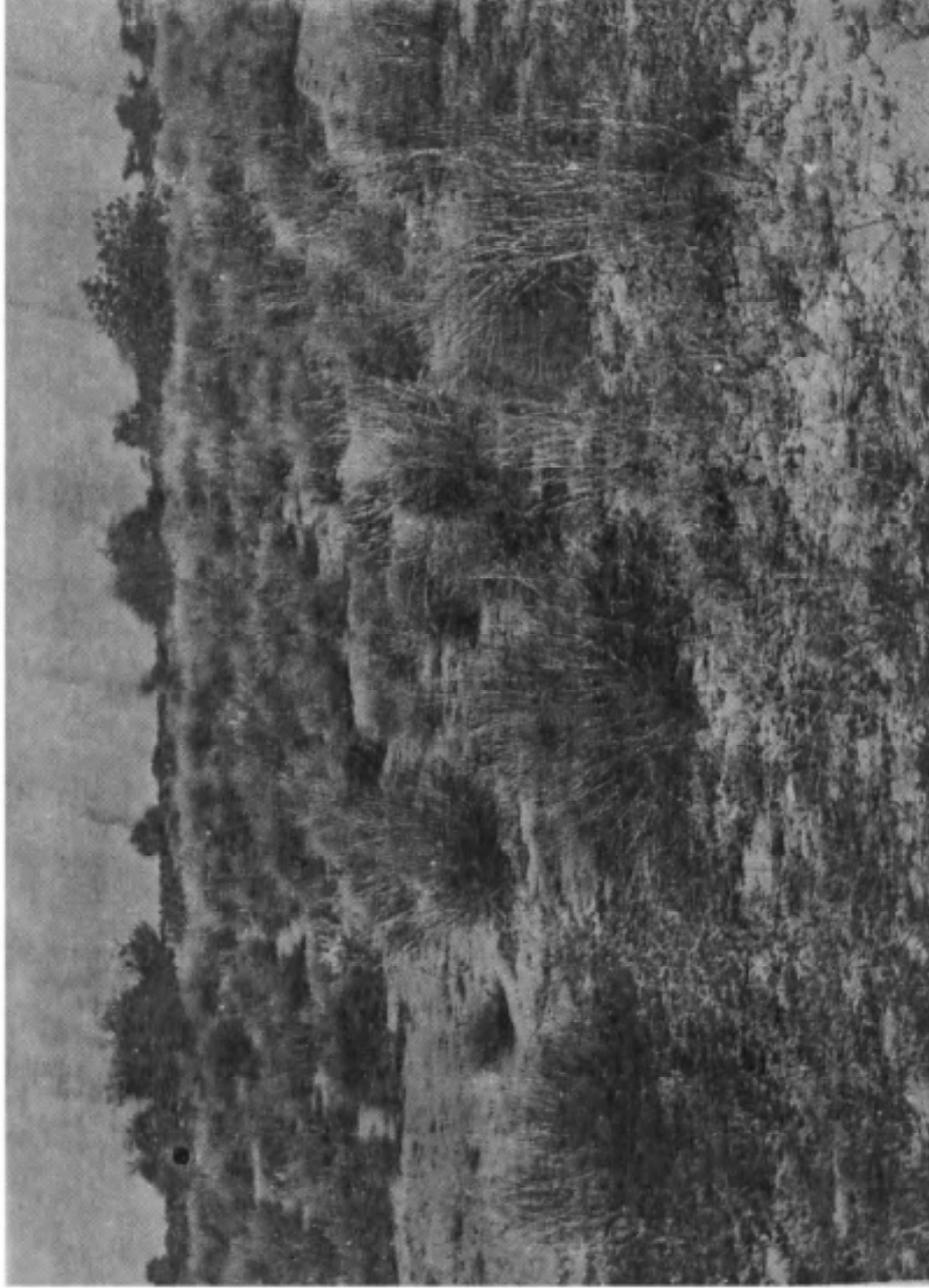


Plate 5. A hummocky plain showing association of *Calotropis procera*, *Capparis decidua*, *Calligonum polygonooides* etc

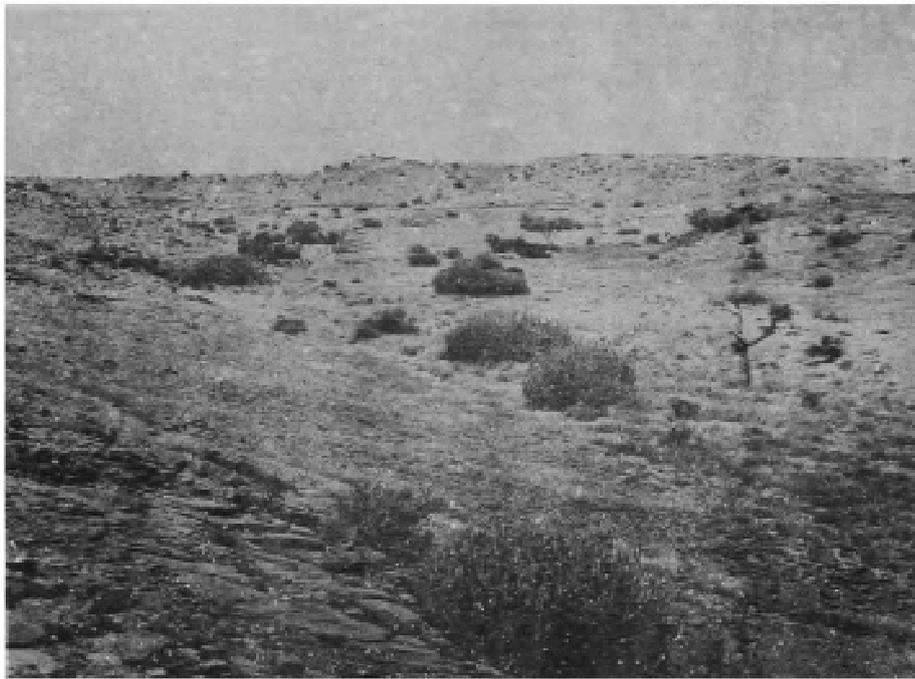


Plate 6. Rock outcrop dominated by *Euphorbia calycifolia*; other associates include *Atriplex pendula*, *Prosopis cineraria*, *Moupinus emarginatus* etc.

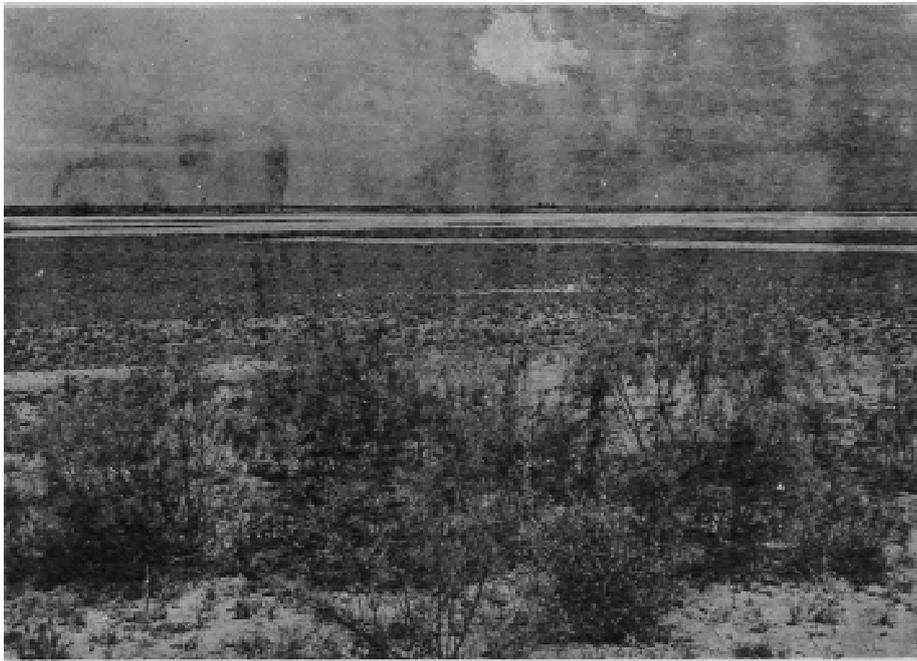


Plate 7. Rann near Ramgarh (Jaissalmer) supporting *Tamarix troupii*, *Haloxylon salicornicum*, *Suaeda frutescens*, *Achiropter lagopoides*, *Zygophyllum simplex* etc.



Plate 8. A view of Aakal Fossil wood Park (Jaisalmer) showing fossilised tree trunk (gymnosperm) of lower Jurassic age.



Plate 9. A typical association of *Capparis decidua* and *Aerva javanica* in desert ecosystem.



Plate 10. *Calligonum polygonoides* — a typical desert indicator being cut for fuel-wood.

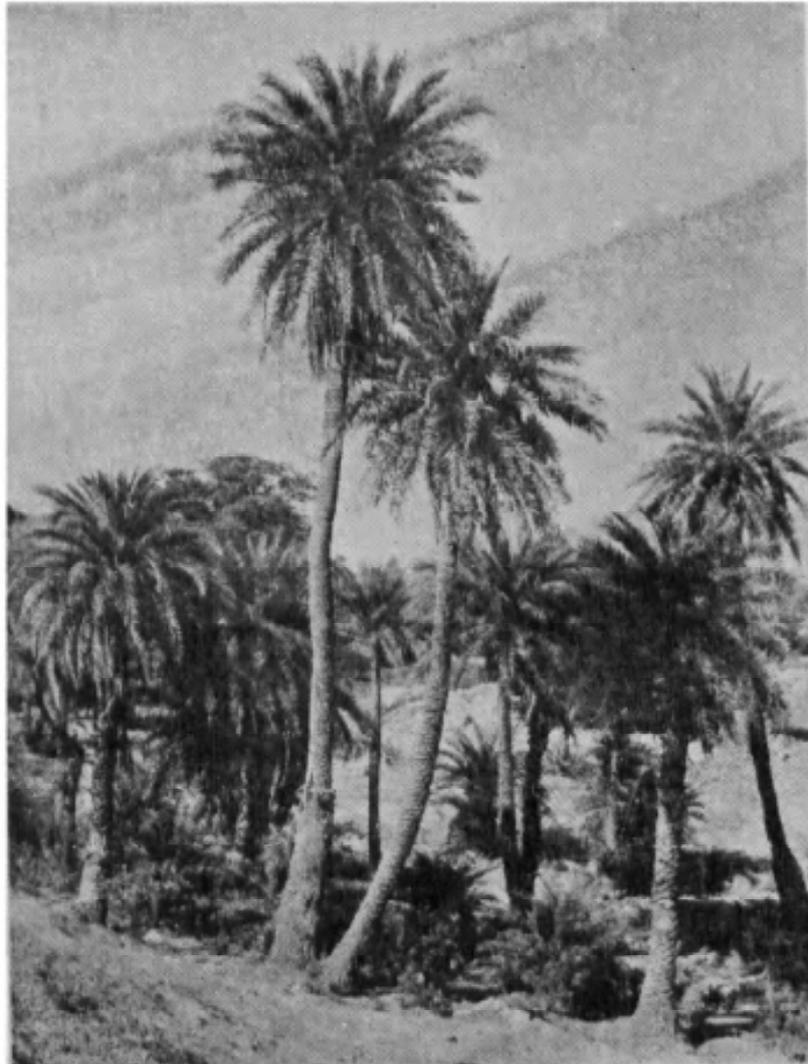


Plate 11. *Phoenix sylvestris* forms pure stands in low-lands in the east of Aravalli.



Plate 12. An aquatic habitat in the east of Aravalli supporting thick growth of *Typha angustata* and species of *Cyperus* and *Scirpus*.

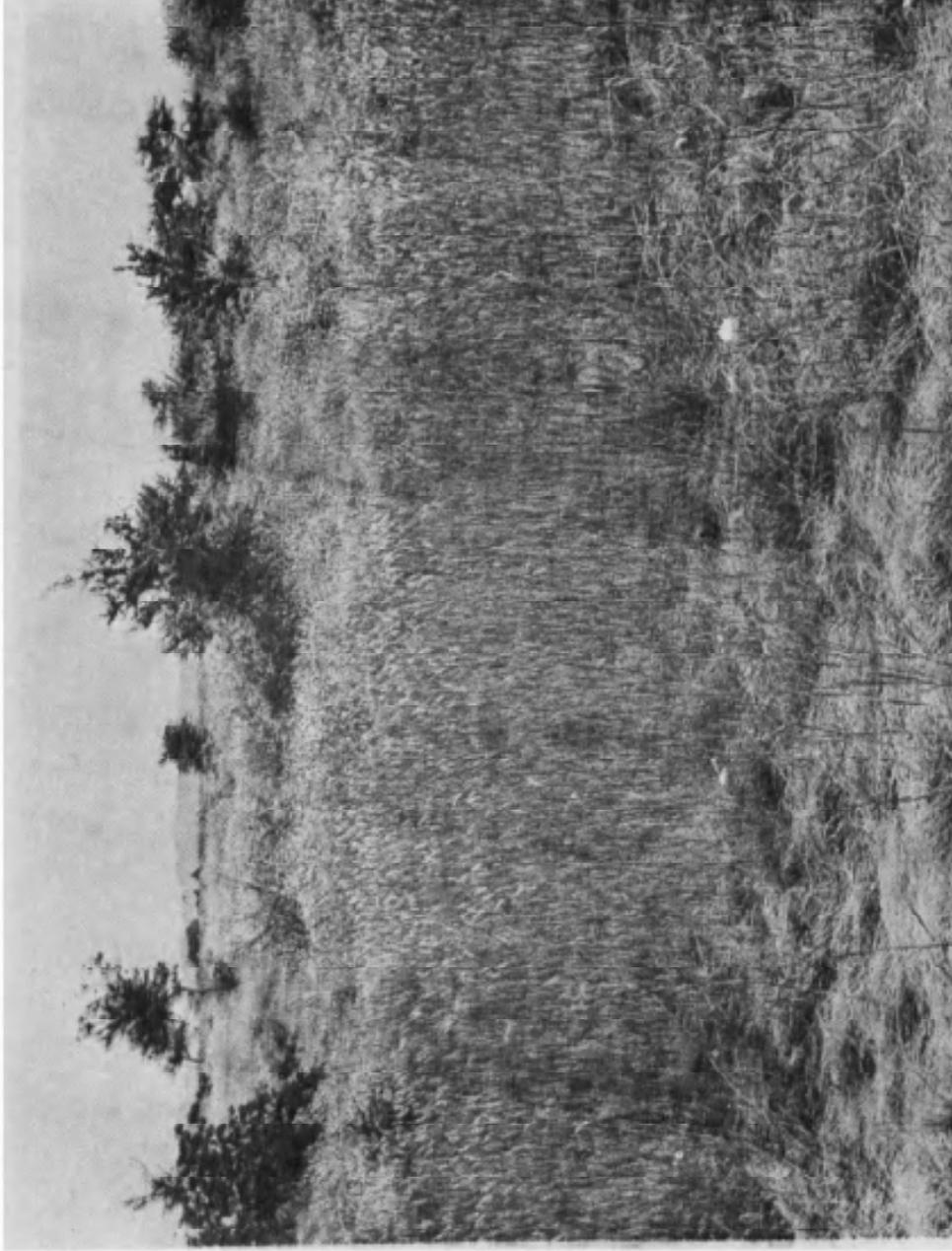


Plate 13. *Imperata cylindrica*—a troublesome grass in low-lands in the east of Aravalli.

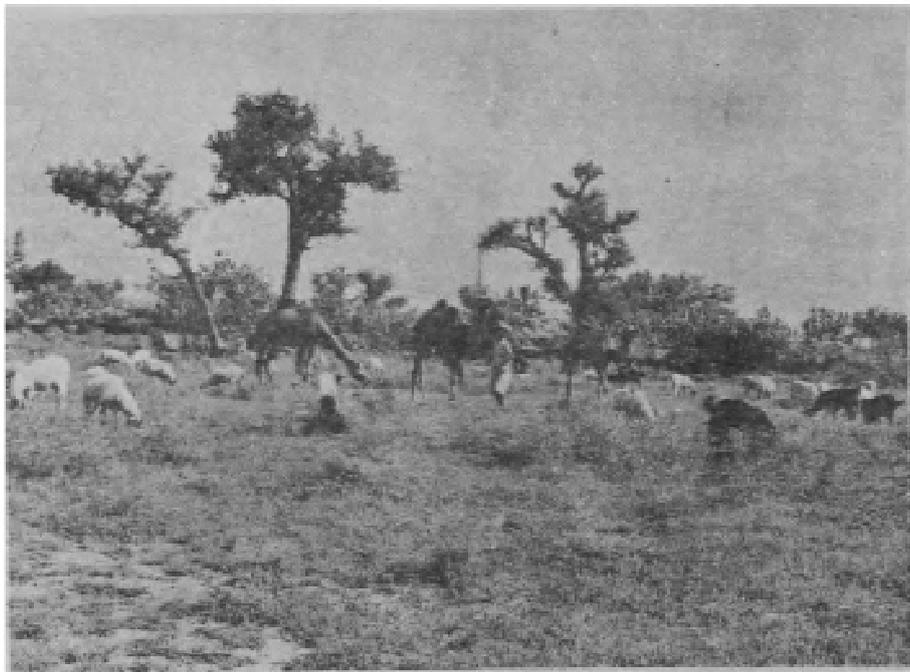


Plate 14. A view of biotic pressure on vegetation in whole Rajasthan.

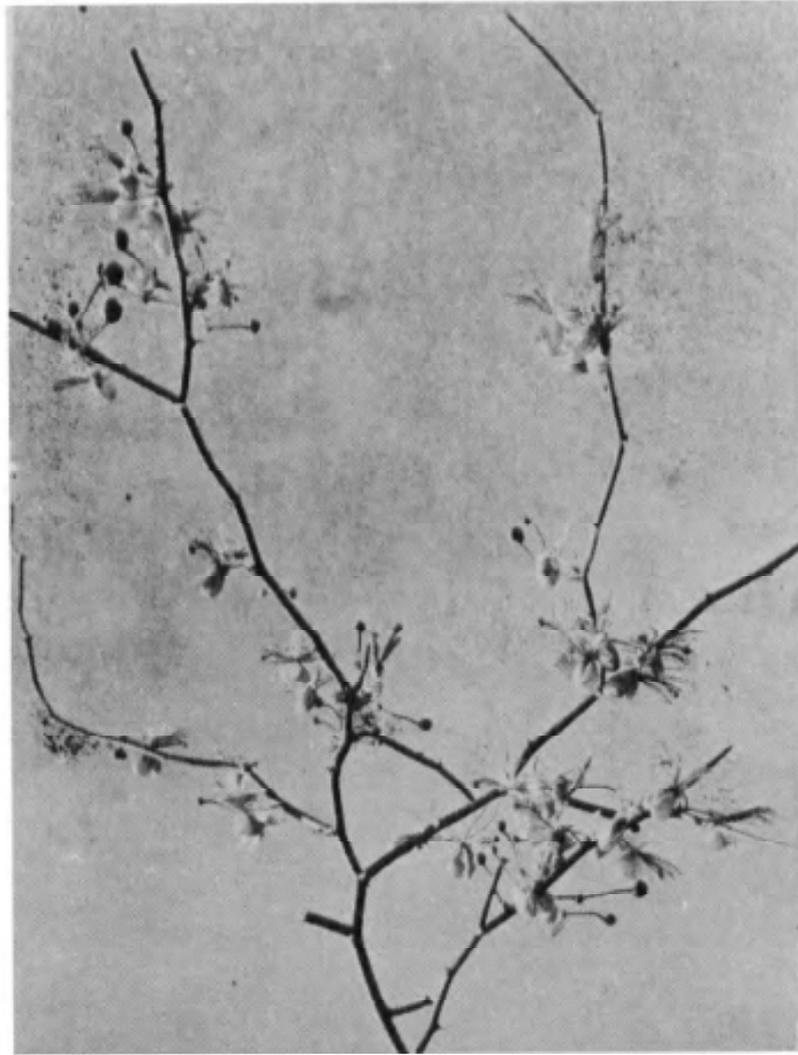


Plate 15. *Capparis decidua* - a typical desert plant, often attaining height of a tree.

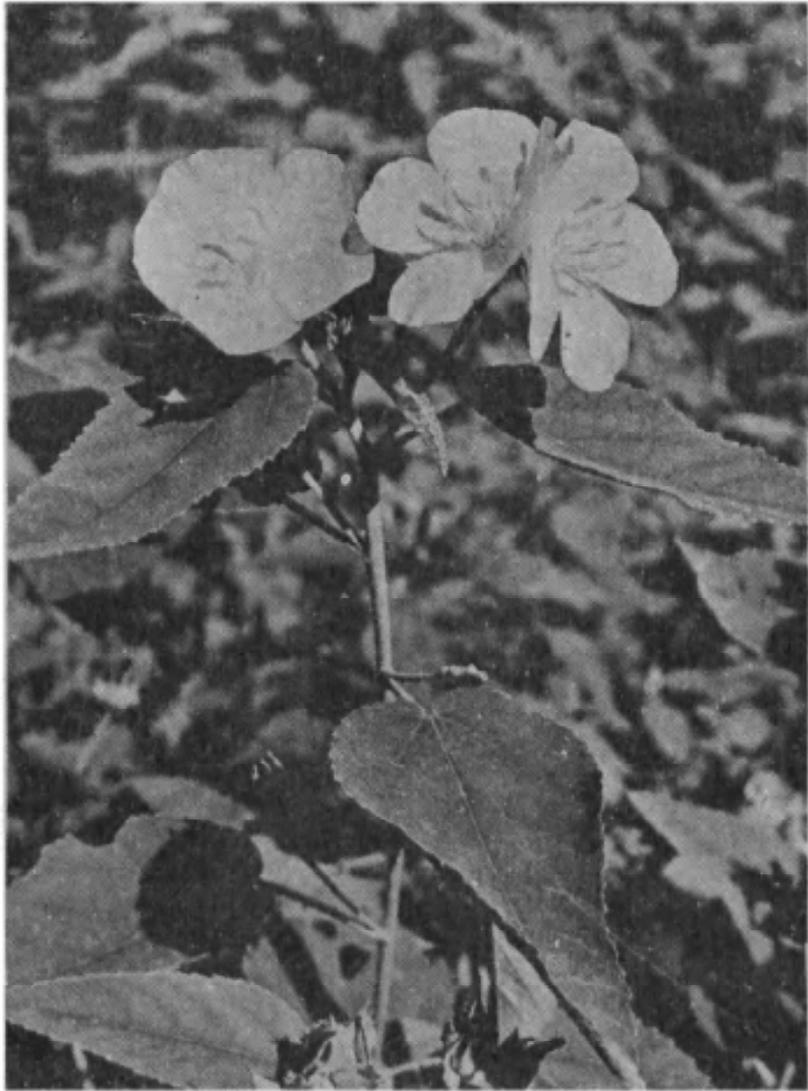


Plate 16. *Melhania futteyporensis* var. *major* - endemic in Rajasthan.

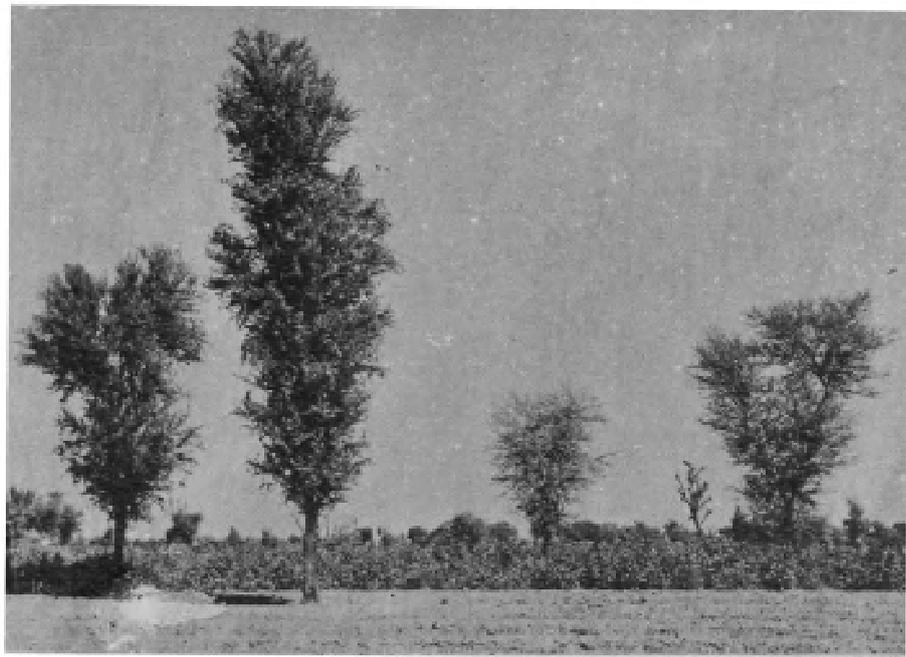


Plate 17. *Acacia nilotica* subsp. *indica* (short trees) and subsp. *cypressiformis* (longer one) growing side by side.



Plate 18. *Acacia senegal* - a chief source of gum-arabic in the desert.

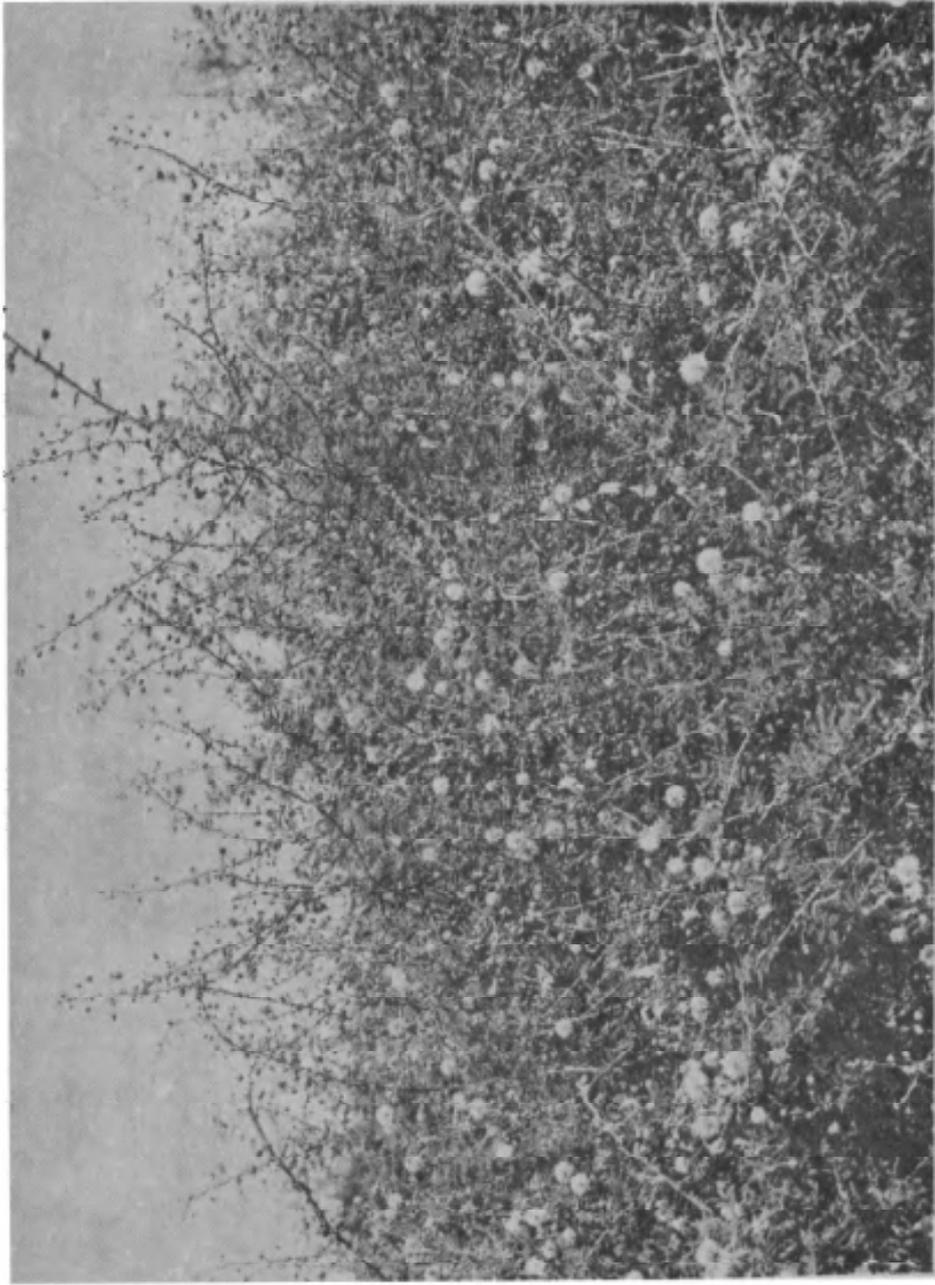


Plate 19. *Mimosa hamata* - abundant in wastelands and open forests.



Plate 20. *Citrullus colocynthis* - a typical creeper in desert; the seeds are source of non-edible oil.

ABOUT THE EDITORS

Born in October, 1931 Shri B.V. Shetty has been working in the Department since 1959 in various capacities and has many scientific papers to his credit. He was last Deputy Director, Southern Circle of Botanical Survey of India at Coimbatore and now working as a Liaison Officer at Kew Herbarium (U.K.). He was the first author for the Flora of Tonk District chiefly covering arid zone species. He was also awarded merit promotion by the department.

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