MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
(Including Herbarium Methodology and Plant Nomenclature)

-Dr. Devendra Kumar
-Dr. Vijai Malik

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(Including Herbarium Methodology and Plant Nomenclature)

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Dedicated to Late
Professor Y. S. Murty
&
Professor C. M. Govil
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PREFACE

Magnoliophytes of Muzaffarnagar, Uttar Pradesh is designed as a reference book for M.Sc. students, Research scholar, Plant Taxonomist, Ethnobotanist, Herbalists and foresters. A large part of this book is a compilation based on field observation and Ph. D. work. A number of selected references and bibliography are given in the end to support description and interpretation. This book contains 887 species (including subspecies and varieties) under 525 genera and 125 families of Magnoliophytes along with their botanical names, family and vernacular name. Out of the 887 species, 709 species under 429 genera and 103 families belong to Dicotyledons and 178 species under 96 genera and 21 families belong to Monocotyledons. A concise account of diagnostic character of all the species is given, which is followed by field notes including habitat range, abundance, place of collection, flowering & fruiting periods and uses. The general vegetation type of the area has been discussed with information of plants growing in different habitats and topography, geology and soil, climate and biotic factors which influence the vegetation, have also been discussed. The keys to family and to the genera of each family and to the species of each genus are provided for easy identification. The genera in each family and species in each genus are arranged in alphabetical sequence for convenience. The basionyms and important synonyms wherever available, have been given to locate the valid name. References of important floras are invariably cited for authenticity of species. Available local names as followed by people in the area, are also given for the sake of better familiarity. Language of this book is lucid and easily understandable. We hope that this book in the present form will act as reference book to satisfy the needs in different field of plant sciences. Although meticulous efforts have been made to make the book error free, but still there are chances of some mistakes. So, useful suggestions from readers for further improvement of the book are gratefully acknowledged.

Devendra Kumar  
Muzaffarnagar

Vijai Malik  
Saharanpur
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INTRODUCTION

Plant hunt for food, shelter, clothing and medicines is age old. Without plants nothing could live on this earth. This is because plants are the only organisms on our planet that can convert simple substances into complex organic compounds that are needed by all kinds of organisms for their different requirements. In absence of plants there would be no animals, birds, insects or any other form of life including those in the sea. The green vegetation converts carbon-dioxide (breathed out by organisms) into oxygen by the process of Photosynthesis. The energy sources like coal, petroleum, and gases etc are receding without daily increasing energy requirements. Although a number of energy sources like sea, wind, atomic power etc are being tapped today to get more and more energy, but it is only the vegetation which can be a permanent and the cheapest source of energy as it has a capacity to convert the solar energy into chemical energy. With the development of civilization, rapid industrialization and population explosion, every year more and more land which has been under forest cover, is being put under food-crops. Man has become more conscious of its environment and habitat and the risk of losing plant and animal species has naturally been realized. The love and necessity of plants are linked with the survival of mankind. Due to various ecological disturbances natural or artificial, there has been ever-changing floristic composition on our earth. In the recent past, the above danger has been realised and much emphasis is laid on preservation of the valuable vegetation-cover of the earth. Floristic and vegetation studies, because of change in ecosystems, have become necessary for various ecologically disturbed areas. Natural, physical, biotic and man-made disturbances lead to change in the vegetation and floristic composition of and area. Several exotics have been introduced and many of them have acclimatized in the past and present century. Floristic studies are important for making investigations of ecosystem of an area. Thus it is necessary to evaluate and assess the floristic composition from time to time.

Roxburgh (1802) made the first attempt to draw a systematic account and survey of the plants of India. However Hooker (1872-1897) made an extensive survey of the flora of India and gave a vivid account of Indian plants in his 7 volumes of “Flora of British India”. Later several floras were written by different workers who described plants of specific regions. Duthie (1903-1929) described the plants of the Upper Gangetic Plain. Bor (1947) described the common grasses of United Province. All these surveys were made much before independence and population explosion in
the region. The government of India felt the need of enlisting the plants, their local names, economic uses, and precise information about them. In order to explore the natural plant resources of India, the Botanical survey of India organization was entrusted with the task in the year 1954. However the task was difficult and time consuming. Father Santapau (1958) suggested that “our universities can do excellent work in the selected areas in the neighbourhood of their headquarters. In a relatively small area, it is possible to keep the cost down a minimum, since the travelling expenses eat up much of the funds assigned to botanical exploration”. Similar suggestions were made in a summer school in Taxonomy held at Kodaikanal (1962), by Rao (1970), Subramanyam and Sreemadhavan (1970), and Maheshwari (1975) in the Silver Jubilee Volume of Botanica. The data of floristic studies of district Muzaffarnagar would be useful in providing a wide scope for ethnobotanical studies and the allied projects and also for various schemes of Social Forestry and Plantation of the Forest Department, in the planning and implementing schemes of development of agriculture, small scale and cottage industries, pharmaceutical industries to develop drug farms and various other organizations connected with the plant materials of the district and their utilization for the welfare of local people, besides programmes on Eco-development, conservation and utilization of natural resources.

Keeping all this in mind, we study the Magnoliophytes of district Muzaffarnagar situated in the Indo-Gangetic plain of Uttar Pradesh. It is one of the important districts of U.P. because of its rich vegetation and forest products. In recent years fast industrialization of the area has led to great changes in its environment and flora. It thus became necessary to work-out the flora of this district. Therefore, in the present study an effort has been made to provide detailed up-to-date information on the vegetation and the flowering plants of the district, which can be useful for the researchers in various fields. This will also help in the preparation of the recent flora of Uttar Pradesh.

**GEOGRAPHICAL LOCATION & PHYSICAL FEATURES**

The district Muzaffarnagar (including Shamli) lies in the Saharanpur division in the extreme west of Uttar Pradesh in the upper Indo-Gangetic Plain. It is situated between the North latitudes 29° 11' to 29° 43' and East longitudes 77° 04' to 78° 07' the district is about 48 kms wide from north to south and 81 kms long from east to west. According to the “Survey of India report”, the area of the district is 4245 sq. kms. The district is bounded by sacred river Ganga in the east beyond which lies
district Bijnor, in the west river Yamuna (in Shamli region) makes its boundary and separates it from the district Karnal and Panipat of Haryana state. The boundary of the district in the North, is demarcated by Saharanpur and Hardwar district of Uttarakhand, while the district Meerut is situated in its south.

The city of Muzaffarnagar is located at about 240.79 meters altitude above the sea-level in the upper “Doaba” of holy rivers Ganga and Yamuna. The Grand Trunk Road leading from Delhi to Mussoorie passes through the city of Muzaffarnagar. The location of the city on Northern Railway Tract leading from Delhi to Saharanpur via Meerut, is 57 km from Meeut in north and is also at almost equal distance from Saharanpur in south.

From the administrative and developmental points, the district (including Shamali) has been subdivided in 6 Tehshis viz. Muzaffarnagar, Budhana, Kaira, Shamli, Khatauli and Jansath and 14 developmental blocks namely Budhana, Baghra, Charthawal, Jansath, Kaira, Kandhla, Khatauli, Morna, Muzaffarnagar, Oon, Purkaji, Shahpur, Shamli and Thanabhawan.

The district may generally be described as an alluvial plain, consisting of 3 main tracts. The riverian (or Khaddar) of the river Ganga in the extreme east and of the river Yamuna in the extreme west (now under Shamli district). The next region is Bangar zone, which occupies the greater part of the district in between the river Ganga and Yamuna, River Kali, Hindon and Krishna pass through this zone. Third zone is a red sandy Bhood running throughout the width of the district along west of Ganga canal as a 6-8 km wide belt. This canal divides the Bangar Zone into two parts, one on its east and other on its west.

The Ganga Khaddar consists of low-lying land bounded on west by a line of slopy cliffs of sand, which slope down from the level of upland towards Ganga itself. The cliffs are broken at places by flow of seasonal water from upland towards the river. The width of this area is more in the north and towards south it gradually narrows down. The Khaddar of Yamuna (in Shamli district) also consists of low-lying area and in the east is a boundary line made by smaller sandy cliffs. The width of Yamuna Khaddar is almost uniform along the river. The Bangar is uniformally plain and consists of Agricultural land. The Upper Ganga canal and East Yamuna canal pass through the area and a number of irrigation minors have been drawn from these canals. The land near by the rivers Krishna, Hindon and Kali also consists of low-lying pockets of poorly cultivated land owing to flood during rainy season.
Between the Yamuna and the East Yamuna canal area few patches of Dhak Jungle have been observed.

The red-sand bhood zone is occupied at places by sand-hillocks. The zone is being gradually converted into agricultural land due to ample development of means of irrigation (Tube-wells and Minor canals). A number of orchards have been developed in this area. Besides Krishna, Hindon and Kali, two rainy season rivers-Khokar and Katha cover a small region in north west portion of the district (Shamli) and join the Yamuna. The river Solani and Budhi Ganga drain through the north-east part and join the Ganga near the Holy place “Shukartal”. A seasonal river “Nagan” (East Kali river) originates from Jansath area and enters Meerut district. There used to be a very deep Moti Jheel in the west of Muzaffarnagar city, which is almost a dried piece of land now.

CLIMATE

It is well known fact that the type of vegetation depends on climatic, edaphic, topographic and biotic factors. The climate of district Muzaffarnagar is characterised by extremely hot summer, very cold winter and rains of monsoon season. Thus the temperature range, relative humidity and rainfall are widely variable in different months of the year. The climate is basically sub-tropical monsoon type with marked seasonal variations and diurnal difference in temperature. The year may broadly be splitted in three seasons:

- Rainy season (mid-June to mid-October)
- Winter season (mid-October to mid-March)
- Summer season (mid-March to mid-June)

The rainy season is characterized by high rainfall, high relative humidity and high to moderate temperature. In winter season, there is low temperature, low rainfall and high to moderate relative humidity, while the summer season has high temperature, low relative humidity and very low or no rainfall.

Rainfall

Rainfall is the most important climatic factor affecting the vegetation. The 80 - 90% of the total annual rainfall occurs mostly during the monsoon season from mid-June to mid-September. The rest 10-20% of the total rainfall occurs during winter and summer months of the year. The south-west monsoon is responsible for rain during rainy season, when all the rivers, drains and ponds become filled with water. The rivers may become flooded. Generally the period from last week of July to first half of
August is the wettest period of the year. As a result of uncontrolled grazing and deforestation heavy rains cause extensive soil erosion. Depressions and deep ravines have been formed in the river basins by swift flow of rain water.

**Temperature**

The temperature of the district Muzaffarnagar varies from extreme high to very low, in summer and winter respectively. In the months of May and June maximum temperature shoots upto 44°C (average 38.5°C) and falls to a minimum upto 2°C (average 1.7°C) in December and January.

**Relative Humidity**

Relative humidity is minimum in dry summer months from April to mid-June and a maximum during monsoon season during July, August and September. There is a gradual fall in relative humidity from September to November and it rises in the month of December and January and then declines to a minimum in the month of May.

**Wind**

Wind is also an important climatic factor for the district. The monsoon comes with south-west winds during rainy season. In the months of summer very hot and dry winds blow, which is locally known as “Loo”. Dust and sometimes thunder storms may be frequent in the month of April and May.

**Biotic factors**

Men and animals have greatly influenced the vegetation of the district. Constantly increasing population, urbanization and industrialization are affecting the vegetation. Man is directly affecting the natural vegetation by burning and cleaning it for raising crops. The formation of deep, broad and more or less bare ravines take place due to soil erosion. The areas near by the river banks in the district are seriously affected by this problem. Increasing industrialization is not only constantly reducing the vegetation cover of the district but is also influencing the vegetation badly by polluting the environment.
PREVIOUS EXPLORATION & REVIEW OF LITERATURE

With the establishment of Botanical Garden at Saharanpur in 1820 by Hastings an extensive survey of plants of North-west Himalayas and neighbouring plains was made. At that time district Muzaffarnagar used to be a part of Saharanpur district.

J.D. Hooker and T. Thomson (1855) published “Flora Indica” on the basis of their extensive collection from Himalayas and plains of India. Hooker (1872-1897) compiled “The flora of British India” in 7 volumes, where in references about Saharanpur have been made. Kanjilal (1901) published “Forest Flora of Chakrata, Dehradun and Saharanpur Forest Division “Which was revised and enlarged by B.L Gupta (1928). J.F. Duthie (1903-1929) in his 3 volumes of “Flora of Upper Gangetic Plain and of the adjacent Siwalik and Sub-Himalayan Tract” concentrated very much on Saharanpur district and described a number of plants of the area. Families Palmae to Aroideae and Alismaceae were completed by Duthie in 1920 before his death, alongwith these upto Cyperaceae were published by Parker and Turrill (1929).

The grasses of United Province were recorded by Duthie (1883, 1886, 1888); Bor (1941); Raizada (1954); Raizada, Bhardwaj and Jain (1957) and Raizada and Jain (1964).

Singh (1971) published a complete account of 314 species and 14 varieties distributed among 257 genera and 79 families, which include all additions so-far made to the “ Flora of Upper Gangetic Plain” by Raizada (1935, 1936, 1950, 1954, 1958); Raizada and Sharma (1962); Maheshwari (1935); Mukherjee (1953); Srivastava (1935); Bhardwaj et. al., (1956); Jain (1958); Venkatesh (1960, 1962); Kapoor and Srivastava (1960); Murty and Singh (1961a, 1961b, 1964, 1966); Bhattacharyya (1963a, 1963b, 1964); Maheshwari (1966); Malhotra (1966); Raigopal and Panigrahi (1966, 1967); Husain (1962); Panigrahi and Raigopal (1967); Saxena (1967); Dixit and Singh (1968) and Somdeva (1968).


The megadiverse countries are a group of countries that harbor the majority of the Earth's species and are therefore considered extremely biodiverse. Conservation International identified 17 megadiverse countries. The identified Megadiverse
countries are: United States of America, Mexico, Colombia, Ecuador, Peru, Venezuela, Brazil, Democratic Republic of Congo, South Africa, Madagascar, India, Malaysia, Indonesia, Philippines, Papua New Guinea, China, and Australia (Mittermeier et al. 1997). *India* is one of the 17 mega-diversity countries in the world. Our country consists of ca. 19294 flowering plants (Karthikeyan, 2000) out of which ca. 2560 species have been estimated as trees (Rao, 1994).

Irwin and Narasimhan (2011) has reviewed the earlier recorded endemic genera of angiosperms in India and also assessed those present within the political boundaries of India. They concluded that only 49 genera are endemic to India, of which 36 are unispecific.

According to Thorne (2002) and Scotland & Wortley (2003), the number of species of flowering plants is estimated to be in the range of 2,50,000 to 4,00,000. Out of these, about 1,00,000 species are expected as trees. Oldfield et al. (1998) have documented over 7300 tree species as globally threatened.

The recent checklist of Dicotyledons by Khanna et al. (1999) has been compiled before the separation of Uttarakhand from erstwhile Uttar Pradesh and therefore it includes the plants of both provinces in amalgamated form. Similarly Uniyal et al. (1999) compiled the checklist of monocotyledons of Uttar Pradesh before separation of Uttarakhand.

Currently, Srivastava (2004) has presented an overview of floristic diversity of Uttar Pradesh and analysed 2711 angiosperms under 182 families and 1088 genera. As far as endemism is concerned, the province is poorly represented by 10 species of angiosperm (Srivastava, 2004), out of which only 2 species (*i.e.* *Derris kanjilalii* Sahni & H. B. Naithani and *Diospyros holeana* Gupta & Kanjilal) belong to tree.

Kishore et al. (2011) assessed the entire tree species (wild and cultivated) found in the present political boundary of Uttar Pradesh based on literature survey, field visit and herbarium study. Their preliminary studies reveal that Uttar Pradesh comprises ca. 410 tree species belonging to 227 genera and 66 families out of the 2711 angiosperms.

Gupta (1961) worked out the “Flora of District Muzaffarnagar” and reported 341 species. Tayal and Bhasin (1970) published a revised list of plants of Muzaffarnagar, wherein they reported 60 additional species and they also named 28 species missing from the area which were reported earlier by Gupta (1961).
After Duthie (1906), in recent past several district floras and other publications have been brought out by different workers on plant diversity of Uttar Pradesh and other States (Kanjilal 1966, Mathew 1983, Uniyal et al. 1994, Uniyal et al. 1997, Verma & Shukla, 1997; Saini, 2005; Singh & Khanuja, 2006; Srivastava, 2006; Mishra & Pal, 2010; Narain, 2010, & Malik et al. 2010).
METHODOLOGY

Collection and Preservation

Extensive field trips for collecting plants were made from different localities and trips were planned in such a manner so as to cover maximum area during different seasons of the year. All efforts were made to collect the wild species and perennial cultivated plants from different habitats. The cultivated annuals were avoided except those which were found as escapes. During collection all seasonal variations in vegetation were noted. Special attention was paid to the botanically interesting localities such as Shukartal, Morna, Bhokerhedi, Bhopa, Nirgajani, Rahakra, Ramraj, Mirapur, Jansath, Kakroli, Khatauli, Mansoorpur, Jaroda Nara, Vahlna, Budhana, Titavi, Banat, Shamli, Kairana, Gangeru, Kandhla, Ailum, Bhanera, Bhabhisa, Kharar, Lank, Sisoli, Budina, Shahpur, Baghra, Heend, Thanabhawan, Jalalabad, Chitora, Muzaffarnagar, Oon, Chausana, Purkaji, Chhapar, Munjheda Jut, Charthawal, Rohana etc.

During field trips, locations of the plants in vegetative stage, were marked to be collected in subsequent trip. Small herbs were collected along with roots. For tall species, twigs were obtained. Efforts were made to collect the specimens in flowering and fruiting stage and at the same time they were numbered with tags and collected in polythene bags. The habit, habitat, flower colour, flowering time, abundance and other phenological and ecological features were noted during collections. The colour of bark and height especially in case of trees, were observed. For getting the flowering twigs for specimen from tall trees hooked bamboo sticks were used. At the same time efforts were made to note down the local names, local uses of the species with the consultation of local people.

Four to six or even more specimens were collected for each species. Fruits of important plants were also preserved. Specimens were washed in water and pressed in blotting-papers and news papers in the plant press and a change of dry papers was made after every 24 hours, until the specimens were completely dried to avoid fungal and other infections. A light spray of formalin was made to control the already existing infection. Succulent specimens were preserved in 10% formalin.

Well pressed and completely dried specimens for preservation were treated with 2% solution of Mercuric Chloride in rectified spirit. Thus poisoned specimens were mounted on standard size (42 x 26 cms) stiff herbarium sheets. Necessary information like field number, family, name of the plant, place and date of collection,
local name, use and other points of interest were noted on the label and it was pasted on right lower corner of the herbarium sheet. Herbarium sheets so prepared were placed in separate species-cover, genera-cover and family-cover and were arranged according the Bentham and Hooker’s classification.

Identification

During collection and in the laboratory the specimens were observed keenly and were identified with the help of Monographs and available Floras specially Hooker’s “Flora of British India” (1872-1897) Duthie’s Flora of Upper Gangetic Plain and adjacent Siwalik and Sub Himalayan Tract “(1903-1927); Kanjilal’s “Forest Flora of Chakrata, Dehradun and Saharanpur forest Division” (1901); “Supplement to the Flora of Upper Gangetic Plain” by Raizada (1976); Herbaceous Flora of Dehradun” by C.R. Babu (1977); “Flora of Delhi” by J.K. Maheshwari (1963) etc were consulted as and when required. Grasses were identified with the help of “Grasses of Burma, Ceylon, India and Pakistan” Bor (1960); “Grasses of Upper Gangetic Plain” (1957, 1964, 1983) by Raizada et al., and Bailey’s “Manual of Cultivated Plants” (1949) was consulted for cultivated and ornamental plant specimens. The species were confirmed for identification by comparing standard herbarium sheets and also opinion of specialists was also sought for the purpose.

Presentation of Work

In the present work for classification, Banthen and Hooker’s system (1862-1883) has been adopted and families have been arranged accordingly. At places suggestions put forth by Hutchinson (1959) and Airy Shaw (1973) have been followed in splitting the families for the adaptation of latest trends. For convenience the genera in the family and species in each genus have been arranged alphabetically.

Identification keys have been splitted in two parts (a) keys to the genera of each family and (b) key to the species of different genera. Both types of the keys are artificial and meant for easy identification. While preparing keys, attempts have been made to make them dichotomous (i.e. a choice made between two general contrasting characters.) International Code of Nomenclature for algae, fungi and plants (2011) has been followed for latest correct names and every attempt has been made for upto date nomenclature with full reference of author (s). To justify the change in the name, their synonyms and basionyms have been incorporated wherever needed.

Hooker’s “Flora of British India” (1872-1897), Duthie’s “Flora of the Upper Gangetic Plain and adjacent Siwalik and Sub-Himalayan Tracts” (1903-1929) have
been cited throughout. References of the Raizada’s “Supplement to Flora of Upper Gangetic Plain” (1976), Maheshwari’s “Flora of Delhi” (1963), and Babu’s “Herbaceous Flora of Dehradun “ (1977) are also cited frequently. Reference to the latest monographs and taxonomic revisions are cited where a nomenclature change is adopted. For grasses “The Grasses of Burma, Ceylon, India and Pakistan” by Bor (1960) and “Grasses of the Upper Gangetic Plain” by Raizada et. al., (1957, 1964, 1983) are cited throughout.

A concise and diagnostic description of all the species is given. Decimal and metric systems are adopted for measurements. Two dimensions indicate length and width when connected by X. In the end of description abundance, habitat range, place of collection, collection number, flowering and fruiting months are given throughout. Uses and local names are mentioned in most of the cases. The abbreviations are elaborated under the title of abbreviations used. The mounted sheets of all the plants cited in the present work are kept in the herbarium of Botany Department, Institute of Advanced Studies, Ch. Charan Singh University, Meerut.
### ABBREVIATIONS USED

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>auct. pl.</td>
<td>auctorum plurimorum; of most authors.</td>
</tr>
<tr>
<td>auct.mult.</td>
<td>auctorum multorum; of many authors.</td>
</tr>
<tr>
<td>BBSI.</td>
<td>Bulletin of the Botanical Survey of India.</td>
</tr>
<tr>
<td>BCI.</td>
<td>Beautiful Climbers of India, Pal (1972)</td>
</tr>
<tr>
<td>BSD.</td>
<td>Herbarium of Northern Circle, Botanical Survey of India, Dehradun.</td>
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<tr>
<td>Cm</td>
<td>Centimeter</td>
</tr>
<tr>
<td>Comb. nov.</td>
<td>Combinatio nova; new combination of names and epithet.</td>
</tr>
<tr>
<td>Comb. nud.</td>
<td>Combinatio nuda; Combination unaccompanied by a basionym or a reference to it.</td>
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<tr>
<td>etc.</td>
<td>et cetera; and others.</td>
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<tr>
<td>et al.</td>
<td>et alia; and others.</td>
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<tr>
<td>excl.</td>
<td>exclusus’ excluded, excluding</td>
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<tr>
<td>f. (before a plant name)</td>
<td>forma; form</td>
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<td>f. (after a personal name)</td>
<td>filius; son.</td>
</tr>
<tr>
<td>FBI.</td>
<td>Flora of British India, Hooker (1872-1897)</td>
</tr>
<tr>
<td>FD.</td>
<td>Flora of Delhi, Maheshwari (1963).</td>
</tr>
<tr>
<td>FFD.</td>
<td>Forest Flora of Chakrata, Dehradun and Saharanpur Forest Divisions, B.L. Gupta (1928)</td>
</tr>
<tr>
<td>FFI</td>
<td>Fascicles of Flora of India.</td>
</tr>
<tr>
<td>FI.</td>
<td>Flowering period.</td>
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<tr>
<td>FPP.</td>
<td>Flora of Punjab Plains, Nair (1978)</td>
</tr>
<tr>
<td>Fr.</td>
<td>Fruiting period.</td>
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<tr>
<td>FUGP.</td>
<td>Flora of the Upper Gangetic Plain and the Adjacent Siwalik and sub-Himalayan Tracts, Duthie (1903-1929)</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>GBCIP.</td>
<td>Grasses of Burma, Ceylon, India and Pakistan, Bore (1960)</td>
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<tr>
<td>GUGP.</td>
<td>Grasses of Upper Gangetic Plain, Raizada et al. (1957, 1964, 1983)</td>
</tr>
<tr>
<td>Ibid</td>
<td>ibidem; the same, in the same place.</td>
</tr>
<tr>
<td>Incl.</td>
<td>inclusus; included, including</td>
</tr>
<tr>
<td>I.T.</td>
<td>Indian Trees, Brandis (1906)</td>
</tr>
<tr>
<td>loc. cit., I.C.</td>
<td>loco citato ; at the place cited.</td>
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<tr>
<td>LN</td>
<td>Local Name</td>
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<tr>
<td>M</td>
<td>Metre</td>
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<tr>
<td>nom.</td>
<td>nomen; name.</td>
</tr>
<tr>
<td>nom.alt</td>
<td>nomen alternativum; alternative name.</td>
</tr>
<tr>
<td>nom. ambig.</td>
<td>nomen ambiguum; ambiguous name.</td>
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<tr>
<td>nom. cons.</td>
<td>nomen conservandum; name conserved in the International Code of Botanical Nomenclature.</td>
</tr>
<tr>
<td>nom. cons. prop.</td>
<td>nomen conservandum propositum; name proposed for conservation in the International Code of Botanical Nomenclature.</td>
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<tr>
<td>nom. illegit.</td>
<td>nomen illegitimum; illegitimate name.</td>
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<tr>
<td>nom inval.</td>
<td>nomen invalidum; invalidly published name.</td>
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<tr>
<td>nom. nov.</td>
<td>nomen novum; new name.</td>
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<tr>
<td>nom. valid.</td>
<td>nomen validum; validly published name.</td>
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<tr>
<td>op. cit.</td>
<td>opera citato; in the work cited</td>
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<tr>
<td>Pfreich.</td>
<td>Das Pflanzenreich.</td>
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<tr>
<td>pro parte</td>
<td>pro parte; party</td>
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<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>pro syn.</td>
<td>pro synonymon; as far as synonym (s) is concerned</td>
</tr>
<tr>
<td>quoad syn.</td>
<td>quoad synonymon; as far as synonyms (s) is concerned</td>
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<tr>
<td>s.n.</td>
<td>sine numera; without the collectors name</td>
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<tr>
<td>sp.</td>
<td>species</td>
</tr>
<tr>
<td>spp.</td>
<td>species; species (plural)</td>
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<tr>
<td>subsp.</td>
<td>subspecies; subspecies</td>
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<tr>
<td>Suppl. FUGP./SFUGP</td>
<td>Supplement to Duthie’s Flora of the Upper Gangetic Plain and of the Adjacent Siwalik and Sub-Himalayan Tracts, Raizada (1976).</td>
</tr>
<tr>
<td>syn.</td>
<td>synonymon, synonymia; synonym, synonymy</td>
</tr>
<tr>
<td>var.</td>
<td>varietas; variety</td>
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<tr>
<td>viz.</td>
<td>videlicet; namely</td>
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VEGETATION
The study of vegetation is of immense importance because it reveals the relationship between the climate and flora. The vegetation of district Muzaffarnagar (including Shamli district) is basically similar to that of the state U.P. and Upper Gangetic Plain. It is modified somewhat due to its geographical and climatic features. From the point of study, the vegetation of the district can be classified under following heads and sub heads:-

1. TREES

i. Fruit trees
   Aegle marmelos Correa.; Citrus limon (Linn.) Burm. f.; Limonia acidissima Linn.; Ziziphus mauritiana Lamk.; Mangifera indica Linn.; Tamarindus indica Linn.; Eriobotrya japonica (Thunb.) Lindl.; Prunus domestica Linn.; P. persica (Linn.) Stokes; Psidium guajava Linn.; Punica granatum Linn.; Carica papaya Linn.; Anthocepalhus chinesensis (Lamk.) A. Rich.; Morinda tinctoria Roxb.; Achras zapota Linn.; Manikara hexandra (Roxb.) Dub.; Mimusops elengi Linn.; Cordia dichotoma Forst. F.; Artocarpus heterophyllus Lamk.; A. lacucha Buch.–Ham.; Ficus palmata Forsk.; Morus indica Linn.; M. macroura Miq. etc.
ii. Timber yielding trees
   Pterospermum acerifolium Willd.; Toona ciliata M. Roem.; Mangifera indica Linn.; Dalbergia sissoo Roxb.; Acacia nilotica (Linn.) Del.; Eucalyptus paniculata Sm.; E. robusta Smith; E. tereticornis Sm.; Lagerstroemia speciosa (Linn.) Pers.; Gardenia latifolia Ait.; Mitragyna parvifolia (Roxb.) Korth.; Tectona grandis Linn. f.; Holoptelea integrifolia (Roxb.) Planch.; Ficus benghalensis Linn.; Morus macroura Miq.; M. serrata Roxb. etc.
iii. Road-side and Avenue trees
   Polyalthia longifolia Thw.; Tamarix aphylla (Linn.) Lanza.; Pterospermum acerifolium Willd.; Melia azedarach Linn.; Mangifera indica Linn.; Moringa oleifera Lamk.; Dalbergia sissoo Roxb.; Derris indica (Lamk.) Bennet; Erythrina variegata Linn.; Bauhinia purpurea Linn.; B. tomentosa Linn.; B. variegata Linn.; Cassia fistula Linn.; C. siamea Lamk.; Delonix regia (Boj.) Raf.; Parkinsonia aculeata Linn.; Tamarindus indica Linn.; Acacia auriculiformis A. Cunn.; Albizia lebbeck (Linn.) Benth.; Leucaena lastiliqua (Linn.) Gillis.; Pithecellobium dulce (Roxb.) Benth.; Prosopis cineraria (Linn.) Druce.; P. juliflora (Sw.) DC.; Terminalia arjuna (Roxb. ex DC.) Wt. & Arn.; T. bellerica (Gaertn.) Roxb.; T. chebula Retz.;
Eucalyptus paniculata Sm.; E. robusta Smith; E. tereticornis Sm.; Lagerstroemia speciosa (Linn.) Pers.; Lawsonia inermis Linn.; Morinda tinctoria Roxb. Madhuca indica J.F. Gmel.; Minusops elengi Linn.; Alstonia scholaris (Linn.) R. Br.; Cordia dichotoma Forst.; f.; Kigelia africana (Lam.) Benth.; Millingtonia hortensis Linn. f.; Ficus virens Ait. etc.

iv. Ornamental trees


v. Common trees

Bombax ceiba Linn.; Azadirachta indica A. Juss.; Mangifera indica Linn.; Dalbergia sissoo Roxb.; Tamarindus indica Linn.; Albizia lebbeck (Linn.) Benth.; Morus indica Linn. etc.

2. SHRUBS AND CLIMBERS

i. Ornamental shrubs


ii. Wild Shrubs

Melochia corchorifolia Linn.; Carissa carandas Linn.; C. opaca Stapf; Leptadaenia pyrotechnica (Forsk.) Decene. etc.

iii. Woody climbers (Perennials)

Artabotrys hexapetalus (Linn.f.) Bhandari.; Hiptage benghalensis (Linn.) Kurz; Lablab purpureus (Linn.) Sweet.; Lathyris aphaca Linn.; Bauhinia vahlii Wt. & Arn.; Caesalpinia cristata Linn.; Quisqualis indica Linn.; Passiflora suberosa Linn.; Argyreia nervosa (Burm. f.) Boj.; Plectranthus japonicas (Burm.f.) Koidz. etc.

iv. Weak climbers (Annuals)

Actinostemma tenerum Griff.; Citrullus colocynthis (Linn.) Schrad.; C. lanatus (Thunb.) Mansf.; Coccinia grandis (Linn.) Voigt; Cucumis melo Linn.; C. sativus Linn.; Cucurbita maxima Duch.; C. moschata Duch.; C. pepo Linn.; Lagenaria siceraria (Molina) Standley.; Luffa acutangula (Linn.) Roxb.; L. aegyptica Mill.; Momordica charantia Linn.; M. dioica Roxb.; Mukia maderaspatana (Linn.) Roem.; Trichosanthes anguina Linn.; T. cucumerina Linn.; T. dioica Roxb.; Zehneria scabra (Linn.f.) Sond.; Dioscorea bulbifera Linn. etc.

v. Weak climbers (Perennials)

Clematis gouriana Roxb.; C. roylei Rehder, Cissampelos pareira Linn.; Cocculus hirsutus (Linn.) Diels.; Clitoria ternatea Linn.; Desmodium triflorum (Linn.) DC.; Lathyris odoratus Linn.; L. sativus Linn.; Tephrosia purpurea (Linn.) Pers.; Mimosa pudica Linn.; Coccinia grandis (Linn.) Voigt.; Diplocyclos palmatus (Linn.) Jeffrey.; Lagenaria siceraria (Molina) Standley; Zehneria scabra (Linn.f.) Sond.; Jasminum auriculatum Vahl.; Ichneumon frutescens (Linn.) Ait. & Ait. f.; Cryptostegia grandiflora R.Br.; Leptadenia reticulata Wt. & Arn.; Telosma pallida
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

3. HERBS

i. Perennial herbs

Ranunculus cantoniensis DC. Polygala crotalarioides Buch.- Hem.; Fioria vitifolia (Linn.) Mettei.; Sida acuta Burm. f.; Oxalis debilis H.B.K.; Tephrosia purpurea (Linn.) Pers.; Duchesnea indica (Andr.) Focke; Coccinia grandis (Linn.) Voigt.; Zeleya govinda Buch.-Ham.; Centella asiatica (Linn.) Urban; Oenanthe javanica (Bl.) DC.; Artemisia nilagirica (Clarke) Pamp.; Blumea hieracifolia (D. Don) DC.; B. obliqua (Linn.) Druce.; Chromolaena odorata (Linn.) King & Robinson.; Conyza japonica (Thunb.) Less.; Eupatorium riparium Regel.; Launaea aspleniifolia (Willd.) Hook.f.; L. procumbens (Roxb.) Ramayya & Rajgopal; Parthenium hysterophorus Linn.; Soliva anthemifolia (Juss.) R. Br.; Sonchus brachyotus DC.; S. oleraceous Linn.; Vernonia cinerea (Linn.) Less.; Xanthium strumarium Linn.; Asclepias curassavica Linn.; Oxystelma secamone (Linn.) K. Schum.; Pergularia daemia (Forsk.) Blatt. & Mcc.; Heliotropium strigosum Willd.; Ipomoea aquatica Forsk.; Volvolopsis nummularia (Linn.) Roberly; Datura metel Linn.; D. stramonium Linn.; Blepharis maderaspatensis (Linn.) Roth.; Dicliptra roxburghiana Nees; Dipteracanthus prostratus (Poir.) Nees; Elytraria acaulis (Linn. f.) Linden.; Peristrophe bicalyculata (Retz.) Nees; Phyla nodiflora (Linn.) Greene; Verbena officinalis Linn.; Mentha piperita Linn.; Micromeria biflora (Buch.-Ham. ex Don) Benth.; Ocimum sanctum Linn.; Plantago major Linn.; Boerhavia diffusa Linn.; Mirabilis jalapa Linn.; Achyranthes aspera Linn.; A. bidentata Bl.; Alternanthera ficoides (Linn.) R. Br. & ex Roem & Schult.; Amaranthus spinosus Linn.; Gomphrena celosioides Mart.; Chenopodium ambrosioides Linn.; Basella rubra Linn.; Polygonum barbatum Linn.; Croton bonplandianum Baillon; Phyllanthus virgatus Forst.; Gonostegia hirta (Blume) Miquel; (Pouzolzia hirta Hassk.) G. pentandra or P. pentandra (Roxb.) Benn.; Miquel; Pouzolzia zeylanica (Linn.) Benn. Rhoeo spathacea (SW.) Wt. Stern.; Aristida adscensionis Linn.; Arundo donax Linn.; Bothriochloa intermedia (R.Br.) A. Camus.; B. pertusa (Linn.) (L.) A. Camus;
Magnoliophytes of Muzaffarnagar, Uttar Pradesh

Cenchrus ciliaris Linn.; C. pennisetiformis Hochst. & Steud. ex Steud.; Chrysopogon fulvus (Spreng.) Chiov.; Cynodon dactylon (Linn.) Pers.; Hemarthria compressa (Linn. f.) R. Br.; Heteropogon contortus (Linn.) P. Beauv.

ii. Winter season herbs

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Pluchea lanceolata Cl.; Pulicaria angustifolia DC.; Saussurea heteromalla (D. Don) Hand-Mazz Soliva anthemifolia (Juss.) R. Br.; Sonchus asper (Linn.) Hill.; S. oleraceus Linn.; Tridax procumbens Linn.; Vernonia cinerea (Linn.) Less.; Amberboa ramosa (Roxb.) Jafr. or Volutarella ramosa (Roxb.) Santapau; Xanthium strumarium Linn.; Anagallis arvensis Linn.; Primula floribunda Wall.; P. umbellata (Lour.) Bentvelzon.; Centaurea centaurioides (Roxb.) Comb.; C. pulchellum (SW.) Druce.; Hoppea dichotoma Hayne ex Willd.; Phlox drummondii Hook.; Arnebia hispidissima (Lehm.) DC.; Heliotropium eichwaldii Steud. ex DC.; Convolvulus pluricaulis Chois.; Ipomoea batatas (Linn.) Lamk.; I. purpurea (Linn.) Roth; Capsicum annuum Linn.; Petunia axillaris (Lamk.) Britton.; Physalis minima Linn.; Solanum nigrum Linn.; Antirrhinum majus Linn.; A. orontium Linn.; Lindenbergia indica (Linn.) O. Kuntze; Striga euphrasioides (Vahl.) Benth.; Veronica agrestis Linn.; V. anagallis-aquatica Linn.; Orobanche aegyptica Pers.; Rungia pectinata (Linn.) Nees; Hyptis suaveolens (Linn.) Poit.; Leucas aspera (Willd.) Spreng. L. cephalotes (Roth.) Spreng.; L. utricaeifolia R. Br.; Nepeta hindostana (Roth) Haines.; Amaranthus tricolor Linn.; Celosia cristata Linn.; Chenopodium album Linn.; C. murale Linn.; Spinacia oleracea Linn. Suaeda maritima (Linn.) Dumort; Rumex dentatus Linn. Euphorbia helioscopia Linn.; Zeuxine strateumatica (Linn.) Schltr.; Commelina attenuata Koenig. ex Vahl; Avena sterilis Linn.; Lolium temuletum Linn.; Phalaris minor Retz.; Poa annua Linn.; Polypogon monspeliensis (Linn.) Desf. etc.

iii. Rainy season herbs

Apluda mutica Linn.; Brachiaria ramosa (Linn.) Stapf.; Cenchrus biflorus Roxb.; Dactyloctenium aegyptium (Linn.) P. Beauv.; Echinochloa colonum (Linn.) Link.; E. crus-galli (Linn.) P. Beauv.; E. frumentacea Linn.; Eleusine coracana (Linn.) Gaertn.; E. verticillata Roxb.; Eragrostis minor Host.; E. pilosa (Linn.) P. Beauv.; E. tremula Hoehst. ex Steud.; E. proceara (Retz.) C. E. Hubb. etc.

iv. Summer season herbs

Argemone mexicana Linn.; A ochroleuca Sweet.; Portulaca oleracea Linn.; Bergia ammannioides Heyne ex Rooth; Alcea rosea Linn.; Malvastrum coromandelianum (Linn.) Garcke; Lotus corniculata Linn.; Citrulus lanatus (Thunb.) Mansf.; Cucumis melo Linn. C. sativus Linn.; Cucurbita maxima Duch.; C. moschata Duch.; C. pepo Linn.; Diplocyclos palmatus (Linn.) Jeffrey.; Luffa acutangula (Linn.) Roxb.; L. aegyptica Mill.; Momordica charantia Linn.; M. dioica Roxb.; Mukia maderaspatana (Linn.) Roem.; Zehneria scabra (Linn. f.) Sand.; Trianthema triquetra Rottle. & Willd; Gisekia pharmaceoides Linn.; Glinus lotoides Linn.; G. oppositifolius (Linn.) DC.; Bidens bietnata (Lour.) Merr. & Sheriff.; Echinops echinatus Roxb.; Eclipta prostrata (Linn.) Linn.; Galinsoga parviflora Cav.; Grangea maderaspatana (Linn.), Poir; Tridax procumbens Linn.; Vernonia cinerea (Linn.) Less.; Xanthium strumarium Linn.; Ipomoea pes-tigridis Linn.; Capsicum annuum Linn.; Nicotiana plumbaginifolia Viv.; Solanum nigrum Linn.; Commelina attenuata Koenig. ex Vahl etc.

4. HYDROPHYTES

i. Free floating

Trapa natans Linn.; Eichhornia crassipes (Mart.) Solms.; Lemma perpusilla Torrey; Spirodela polyrhiza (Linn.) Schleid.; Wolffia globosa (Roxb.) Hartog. & Plas.; W. microscopica (Girf ex Voigt) Kurz etc.

ii. Submerged

Nymphaea nouchali Burm. f.; Nymphoides cristatum (Roxb.) O. Kuntze.; Ipomoea aquatica Forsk.; Utricularia aurea Lour.; U. inflexa Forsk.; Hygrophila auriculata (Schum.) Heine.; Ceratophyllum demersum Linn.; Hydriella verticillata (Linn. f.) Royle; Ottelia alismoides (Linn.) Pers.; Vallisneria natans (Lour.) Hara.; Monochoria hastata (Linn.) Solms.; Sagittaria guayanensis H. B. & K.; Aponogeton natans (Linn.) Engl. & Krause; Potamogeton crispus Poir.; P. pectinatus Linn. etc.

iii. Attached floating
Nymphaea stellata Willd; Nelumbo nucifera Gaertn.; Ludwigia ascendens (Linn.), Hara.; L. perennis Linn.; Nymphoides cristatum (Roxb.) O. Kuntze etc.

iv. Marshy Plants

Rorippa nasturtium-aquaticum (Linn.) Hayek.; Bergia ammannioides Heyne ex Roth; Aeschynomene indica Linn.; Ammannia salicifolia Monti ex Blume; Rotala indica (Willd.) Koehne; Epilobium hirsutum Linn.; Ludwigia adscendens (Linn.) Hara.; L. prostrata Roxb.’ Cirsium wallichii DC.; Sphenoclea zeylanica Garertn.; Oxystelma secamone (Linn.) K. Schum.; Hydrolea zeylanica (Linn.) Vahl; Ipomoea aquatica Forsk.; Veronica anagallis-aquatica Linn.; Hygrophylla polysperma (Roxb.) T. Anders.; Alternanthera sessilis (Linn.) DC.; Polygonum barbatum Linn.; P. glabrum Willd.; P. hydropiper Linn.; P. plebeium R. Br.; Rumex dentatus Linn.; Monochoria vaginalis (Burman.) Presl; Murdannia nudiflora (Linn.) Brenan.; Tonningia axillaris (Linn.) Kuntze; Juncus bufonius Linn.; Typha angustata Bory & Chaub.; T. elephantina Roxb. Eriocaulon cinereum R. Br.; Cyperus compressus Linn.; C. globosus All.; C. nutans Vahl.; Eleocharis palustris R. Br.; Eriophorum comosum Wall. ex Nees; Fimbristylis bisumbellata (Forsk.) Bub.; F. dichotoma (Linn.) Vahl; F. ovata (Burman.) Kern.; Scirpus affine Roth.; S. littoralis Schrad.; S. mucronatus Linn.; S. roylei (Nees) Parker; S. tuberosus Desf.; Echinochloa colonum (Linn.) Link.; Eragrostis gangetica (Roxb.) Steud.; Hemarthria compressa (Linn.) R. Br.; Hygroryza aristata (Retz.) Nees ex Wt. & Arn.; Leptochloa chinensis (Linn.) Nees; Panicum paludosum Roxb.; Paspalidium punctatum (Burm.) A. Camus.; Paspalum paspalodes (Michx.) Scribrn.; P. scrobiculatum Linn.; Perotis hordeiformis Nees ex Hook. & Arn. etc.

5. XEROPHYTES

i. Succulent

Opuntia stricta (Haw.) Benson.; Trianthema portulacastrum Linn.; T. triquetra Rottlet. & Willd.; Zaleya govindia Buch-Ham.; Pedalium murex Linn.; Agave americana Linn.; A. cantula Roxb.; Yucca gloriosa Linn. etc.;

ii. Spiney and others

Tamarix diocia Roxb.; Crotalaria burhia Buch.-Ham.; Opuntia stricta (Haw.) Benson; Carthamus oxyacantha Bieb.; Carissa carandas Linn.; C. opaca Stapf.; Solanum surattense Burm. f.; Agave americana Linn.; A. cantula Roxb.; Yucca gloriosa Linn.; Asparagus adscendens Roxb.; A. racemosus Willd. etc.

6. PARASITES
Cuscuta reflexa Roxb.; Striga euphrasioides (Vahl) Benth.; Orobanche aegyptiaca Pers.; Dendrophthoe falcate (Linn. f.) Ettingh.

7. KHADDAR PLANTS (RIVERAIN PLANTS)


8. WEEDS

i. Winter weeds

Fumaria indica (Haussk.) Pugsley.; Arabidopsis thaliana (Linn.) Heynh.; Capsella brusa-pestoris (Linn.) Medik.; Coronopus didymus J. E. Smith; Lepidium sativum Linn.; Rorippa indica (Linn.) Hirn.; R. montana Small; Arenaria serpyllifolia Linn.; Cerastium fontanum Baumg.; Silene conoidea Linn.; Spergula fallax (Lowe) Krause; Stellaria media (Linn.) Vill.; Portulaca oleracea Linn.; Lathyrus aphaca Linn.; L. odoratus Linn.; L. sativus Linn.; Medicago lupulina Linn.; Melilotus alba Medik.; M. indica (Linn.) All.; Trigonella cornicularia Linn.; T. fornurn-graeum Linn.; T. polycerata Linn.; Vicia sativa Linn.; Ageratum conyzoides Linn.; Blumea bifoliata DC.; B. eriantha DC.; B lacera Burn. f.; Carthamus oxyacantha Bieb.; Cichorium intybus Linn.; Cirsium arvense (Linn.) Scop.; C. pallichii DC.; Conyza canadensis (Linn.) Crong.; Cotula anthemoides Linn.; Cyathocline purpurea (D. Don) O. Kuntze; Eclipta prostrata (Linn.) Linn.; Grangea maderaspatana (Linn.) Poir.; Pentanema indicum (Linn.) Ling.; Pluchea lanceolata Cl.; Saussurea heteromalla (D. Don) Hand.-Mazz.; Sonchus asper (Linn.) Hill.; Volutarella ramosa (Roxb.) Santapau; Saussurea heteromalla (D. Don) Hand.-Mazz.; Anagalis arvensis Linn.; Convulvulus pluricaulis Chois; Striga euphrasioides (Vahl.) Benth.; Veronica agrestis Linn.; Orobanche aegyptiaca Pers.; Rungia pectinata (Linn.) Nees; Leucas aspera (Willd.) Spreng.; L. cephalotes (Roth.) Spreng.; L. utricaefolia R. Br.; Nepeta hindostana (Roth.) Haines.; Chenopodium album Linn.; Euphorbia prostrata W. Ait.; Bulbosostis barbata (Rottb.) Clarke; Carex fedia Nees; Cyperus alopecuroides Rottb.; Cynodon dactylon (Linn.) Pers.; Lolium temulentum
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Linn.; *Panicum maximum* Jacq.; *Phalaris minor* Retz.; *Poa annua* Linn.; *Polypogon monspeliensis* (Linn.) Desf. etc.

**ii. Summer weeds**

*Portulaca oleracea* Linn.; *Gisekia pharaceoides* Linn.; *Eclipta prostrata* (Linn.) Linn.; *Grangea maderaspatana* (Linn.) Poirs.; *Saussurea heteromalla* (D. Don) Hand-Mazz.; *Nicotiana plumbaginifolia* Viv.; *Euphorbia prostrata* W. Ait.; *Bulbostylis barbata* (Rottb.) Clarke; *Carex fedia* Nees; *Cynodon dactylon* (Linn.) Pers. etc.

**iii. Rainy Weeds**


9. ESCAPES


10. OLD WALL FLORA

*Conyza bonariensis* (Linn.) Cronq.; *C. japonica* (Thunb.) Less.; *Erigeron sublyratus* DC.; *Lindenbergia indica* (Linn.) O. Kuntze; *Verbascum chinese* (Linn.) Santapau; *Euphorbia prostrata* W. Ait.; *Ficus benghalensis* Linn.; *F. palmata* Forsk.; *F. racemosa* Linn.; *F. religiosa* Linn.; *Dactyloctenium aegyptium* (Linn.) P. Beauv.; *Dichanthium annulatum* (Forsk.) Stapf.; *D. caricosum* (Linn.) A. Camus.; *Eragrostis diarrhena* (Schult.) Steud. etc.

11. MEDICINAL PLANTS

*Clematis gouriana* Roxb.; *Cissampelos pareira* Linn.; *Cocculus hirsutus* (Linn.) Diels; *Tinospora sinensis* (Willd.) Miers.; *Nymphaea nouchali* Burm. f.; *Argemone mexicana* Linn.; *Papaver rhoes* Linn.; *Fumaria indica* (Haussk.) Pugsley.; *Lepidium sativum* Linn.; *Raphanus sativus* Linn.; *Cleome gynandra* Linn.; *Capparis decidua* (Forsk.) Edgew.; *Crataeva megna* (Lour.) DC.; *Polycarpacea*
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

ARTIFICIAL KEY TO THE GROUPS AND FAMILIES IN THE MAGNOLIOPHYTES OF DISTRICT MUZAFFARNAGAR

1a. Leaves usually with reticulate venation; vascular bundles of the stem usually arranged in a ring; flowers usually pentamerous or tetramerous; tap root usually present; cotyledons two..............Dicotyledons (Groups I-VIII)

2a. Monocarpellary to multicarpellary, more or less apocarpous:

3a. Gynoecium bi – polycarpellary, apocarpous...............Group – I

3b. Monocarpellary, apocarpous.................................Group – II

2b. Bicarpellary to multicarpellary, more or less syncarpous:

4a. Polycarpellary, syncarpous:

5a. Ovary multilocular with axile placentation:

6a. Woody plants:

7a. Stamens generally more than 10. Group-I

7b. Stamens generally less than 10.... Group-IV

6b. Herbaceous plants.................................Group-V

5b. Ovary generally unilocular with basal, free-central or parietal placementation.................................Group-VI

4b. Bicarpellary, syncarpous:

8a. Flowers generally actinomorphic........Group–VII

8b. Flowers generally zygomorphic........Group–VIII

1b. Leaves without reticulate venation; vascular bundles of the stem scattered; flowers usually trimerous; tap root usually absent; cotyledon.Monocotyledons.(Group–IX)

Groups (I-VIII)
Leaves with reticulate venation; flowers tetra or pentamerous; mono- polycarpellary; seeds with two cotyledons; stem with cambium, vascular bundles in a ring.

**Dicotyledons (Group I-VIII)**

**Group I**

Gynoeclium bicapellary- multicarpellary; more or less apocarpous.

1 a. Submerged floating hydrophytes with large leaves:
   2a. Thalamus dome shaped, and carpels sunk in receptacle; syncarpous ovary, many seeded; leaves submerged......................6. *Nymphaeaceae*
   2b. Carpels sunk in receptacle; leaves free floating; apocarpous ovary.........................................................7. *Nelumbonaceae*

1 b. Mostly terrestrial or if aquatic than leaves not peltate:
   3 a. Flowers generally trimerous with two or more whorls of perianth:
      4a. Usually climbers with broad medullary rays; leaves without stipules.........................................................5. *Menispermaceae*
      4b. Woody shrubs or trees:
         5a. Leaves stipulate................................3. *Magnoliaceae*
         5b. Leaves exstipulate.........................4. *Annonaceae*
   3b. Flowers usually tetramerous or pentamerous with 4-5 perianth; leaves in one or two whorls:
      6a. Perianth uniseriate or biseriate; stamens numerous and spirally arranged..................................................1. *Ranunculaceae*
      6b. Perianth often biseriate:
         7a. Stamens commonly monadelphous with 5, 10 or 15, dithecous anthers; carpels either distinct or united into loculicidal dehiscent capsule.......................22. *Sterculiaceae*
         7b. Stamens numerous, and inner ones recurved; fruit large and enclosed by the enlarged fleshy sepals........2. *Dilleniaceae*

**Group II**

Monocarpellary condition; calyx gamosepalous; thalamus cup shaped.

1a. Leaves pinnately compound; ovules many; marginal placentation; fruit legume:
   2a. Inflorescences various types and flowers irregular; stamens 10:
      3a. Calyx divided nearby to the base; petals in ascending-imbricate; stamens often free and may reduced to staminodes.
39. **Caesalpinaceae**

3b. Calyx gamosepalous; petals free, unequal in descending-imbricate; stamens mono or diadelphous..........................38. **Fabaceae**

2b. Inflorescence generally in spike or head; flowers actinomorphic; stamens numerous..........................................................40. **Mimosaceae**

1b. Leaves not pinnately compound; ovules few; various types of placentation; fruit various, not legume:

4a. Hydrophytes with whorled dissected leaves; flowers unisexual; sepals many; style subulate, persistant.........................103. **Ceratophyllaceae**

4b. Terrestrial plants with simple or compound leaves, generally alternate or opposite; flowers unisexual or bisexual; sepals 2-6:

5a. Flowers epigynous, perigynous and hypogynous; stamens indefinite in many whorls; calyx imbricate:

6a. Aromatic trees or shrubs with alternate, whorled or sometimes opposite exstipulate leaves; flowers solitary or in involucral heads, often dioecious.........................94. **Lauraceae**

6b. Non-aromatic herb, shrub or small trees; leaves alternate, rarely opposite, stipulate; flowers bisexual......41. **Rosaceae**

5b. Flowers hypogynous; stamens definite, generally in one whorl; calyx valvate:

7a. Flowers penta or hexamerous:

8a. Trees; leaves often simple opposite; fruit generally angled or winged; ovules 2-5......43. **Combretaceae**

8b. Trees or shrubs; leaves often alternate, simple or compound; fruit drupe and not winged; ovule one, solitary..........................................................36. **Anacardiaceae**

7b. Flowers tetramerous or pentamerous:

9a. Mostly herbs, sometimes trees or shrubs; perianth uniseriate and commonly of 5 segments and gamotepalous.........................88. **Nyctaginaceae**

9b. Mostly trees or shrubs, rarely herbs; perianth inferior consisting of 4 segments, perianth segments may be recurved to one end.................................

.........................................................95. **Proteaceae**
### Group – III

Polycarpellary, syncarpous; stamens more than 10; axile placentation; ovary bi- or multilocular.

1a. Ovary more or less superior:

2a. Leaves alternate, stipulate, non-aromatic:

3a. Filaments of stamens more or less united to form a staminal tube:

4a. Deciduous trees; leaves digitate; calyx spathaceous; anthers monothecous.............21. **Bombacaceae**

4b. Undershubs or small trees; stem with wooly hairs; epicalyx of bracteoles; leaves not digitate; calyx not spathaceous.

..........................20. **Malvaceae**

3b. Stamens numerous, sometimes in bundles; filaments are free; anther dithecous; ovary as a rule on an elevated androgynophore.

..........................23. **Tiliaceae**

2b. Leaves opposite, stipulate or exstipulate, more or less aromatic:

5a. Herbs, shrubs or trees, not aromatic, stipule minute or absent; fruit a capsule........54. **Lythraceae**

5b. Generally shrubs or trees, strongly aromatic, stipule absent; fruit generally berry, rarely capsule or drupe........30. **Rutaceae**

1b. Ovary more or less inferior:

6a. Trees or shrubs; leaves generally opposite with translucent glands or alternate without glands, exstipulate........44. **Myrtaceae**

6b. Deciduous shrubs or small trees; spinescent branchlets; leaves opposite without translucent glands.........................46. **Punicaceae**

### Group-IV

Polycarpellary, syncarpous, multilocular; axile placentation; plants mostly arborescent; stamens generally less than 10.

1a. Flowers generally biseriate:

2a. Leaves often compound:

3a. Plants mostly climbers; leaves mostly digitately compound.................................34. **Vitaceae**

3b. Plants mostly trees; leaves pinnately compound:
4a. Flowers mostly actinomorphic; stamens united into a tube around the style. ..................................................31. **Meliaceae**

4b. Flowers zygomorphic; stamens not united into a tube around the style, filaments as a rule hairy..................................................35. **Sapindaceae**

2b. Leaves simple:

5a. Stamens opposite to petals, corolla with imbricate aestivation:

6a. Plants without milky juice; flowers dioecious..63. **Ebenaceae**

6b. Plants with milky juice; flowers bisexual..62. **Sapotaceae**

5b. Stamens alternate to petals; calyx lobes imbricate:

7a. Leaves opposite; flowers often zygomorphic; fruit with one or more winged samaras. ......................25. **Malpighiaceae**

7b. Leaves opposite; flowers often actinomorphic; fruit arillate and angular, follicular or capsule........32. **Celastraceae**

1b. Flowers uniseriate, biseriate or aehlamydous:

8a. Herbs, shrubs, often climbing plants; flowers zygomorphic; ovary inferior; stylar column multilobed. ..................................................93. **Aristolochiaceae**

8b. Shrubs, trees, rarely climber; plants with stipular spines; ovary superior or half superior; stylar column simple. .........................33. **Rhamnaceae**

**Group – V**

Polycarpellary, syncarpous; ovary multilocular; Plants herbaceous.

1a. Perianth biseriate with distinct sepals and petals:

2a. Flowers various; ovary superior:

3a. Petals fused; stamen epipetalous..................72. **Polemoniaceae**

3b. Petals free; stamen not epipetalous:

4a. Flowers actinomorphic; sepals not spurred:

5a. Leaves compound or apparently so; polysepalous, imbricate:

6a. Stamens without scales; fruit capsule and not winged; leaflets not dissected...27. **Oxalidaceae**

6b. Stamens with scale; fruit winged; leaflets one to many, entire............26. **Zygophyllaceae**
5b. Leaves simple; poly or gamosepalous, valvate or imbricate:

7a. Leaves opposite; petals small, imbricate......

.................................19.Elatinaceae

7b. Leaves alternate; petals large, contorted......

.................................24.Linaceae

4b. Flowers zygomorphic; sepals produced to spur:

8a. Leaves serrate, pinnately nerved; fruit many seeded.

........................................29.Balsaminaceae

8b. Leaves entire, digitately nerved; fruit 3 seeded.

........................................28.Tropaeolaceae

1b. Perianth uniseriate or biseriate or absent:

9a. Plants with epidermal oil cells and with internal phloem; petals 0-7, white; ovary inferior. .................................................................47.Onagraceae

9b. Plants without epidermal oil cells and internal phloem; petals absent.

.................................................................55.Molluginaceae

**Group –VI**

Polycarpellary, syncarpous; unilocular or trilocular.

1a. Sepals and petals distinct:

2a. Climbers with tendrils:

3a. Flowers unisexual; ovary inferior, polypetalous or gamopetous; stamens 3 or 5 with at least one anther monothecous........................................52.Cucurbitaceae

3b. Flowers bisexual; ovary superior; polypetalous; stamens 8-10 with dithecous anthers........................................50.Passifloraceae

2b. Herbaceous or woody plants:

4a. Generally herbs or undershrubs:

5a. Stamens opposite to petals, generally obdiplostemnous (if in 2 whorls):

6a. Herbs with fleshy leaves; sepals free 2, persistant; placentation free-central or basal..............17.Portulacaceae

6b. Herbs without fleshy leaves; sepals 3-5, rarely free, persistant; placentation basal or free central:
7a. Plants with swollen nodes; leaves opposite, decussate; inflorescence dichasial cyme; flower obdiplostemnous. 16. **Caryophyllaceae**

7b. Plants without swollen nodes; leaves radical or radical and cauline:

8a. Calyx membranous, glandular; ovary with basal placentation; style 5 with stigmatose branches. 60. **Plumbaginaceae**

8b. Calyx herbaceous, eglandular; ovary with free-central placentation; style simple. 61. **Primulaceae**

5b. Stamens generally alternate to petals, not obdiplostemnous:

9a. Plants with latex or color sap; sepals 2 or 3, sometimes 4, caducous; stamens indefinite. 8. **Papavaceae**

9b. Plants without latex or colour sap; sepals 5, persistent; stamens generally 5. 13. **Violaceae**

4b. Generally shrubs or trees:

10a. Fleshy succulent plants, prickly; perianth parts numerous; ovary inferior with hypanthium. 53. **Cactaceae**

10b. Non-fleshy succulent leafy, non-prickly shrubs; petals uniseriate; ovary superior or half inferior:

11a. Leaves compound:

12a. Leaves digitately lobed; stem soft, without wood, milky juice present; flowers dioecious. 51. **Caricaceae**

12b. Leaves pinnately compound with glands at the base of petiole and pinnae; stem soft wooded, without milky juice; flowers monoecious. 37. **Moringaceae**

11b. Leaves simple, alternate generally scale like; seeds winged. 18. **Tamaricaceae**

1b. Perianth uniseriate:

13a. Herbs, shrubs or trees; flowers generally bisexual or unisexual:

14a. Shrubs or small trees or epiphytic parasite; parietal placentation and ovary without true ovule:
15a. Fruit generally drupaceous, one seeded, albumen fleshy; calyx suppressed as a rim, the calyculus...........96.Loranthaceae
15b. Fruit a berry or drupe; seeds one- many, usually with an aril and nature of sepals vary..................14.Flacouriaceae
    (Including 49.Samydaceae)

14b. Mostly herbs; basal placentation:
    16a. Herbaceous succulent vines, with exstipulate leaves; flowers subtended by involucral bracts....91.Basellaceae
    16b. Non-succulent herbs or shrubs, rarely trees or climbers, stipules united and form ochrea; flowers not subtended by involucral bracts.................................92.Polygonaceae

13b. Mostly herbs, in few genera shrubs or trees; flowers unisexual:
    17a. Herbs or woody plants, often with cystolith; inflorescence as a rule in compact heads or clusters; ovary unilocular....99.Urticaceae
    17b. Herbs, shrubs or trees with milky latex, cystolith absent; inflorescence cyathium; ovary trilocular............97.Euphorbiaceae

**GroupVII**

Bicarpellary, syncarpous; flowers generally actinomorphic or zygomorphic.

1a. Floating aquatic herbs; leaves floating; flowers solitary fascicles, axillary heads, panicle or solitary:
   2a. Sepals persistant as hardened horns of fruit; ovary partly inferior, bilocular; fruit one seeded. ........................................48.Trapaceae
   2b. Sepals not as above; ovary superior or partly inferior, unilocular; fruit capsule, one to many seeded.................................70.Menyanthaceae

1b. Plants terrestrial; leaves monomorphic, petiole solid (if present); fruit not spinous:
   3a. Perianth generally biseriate with distinct sepals and petals:
      4a. Ovary superior:
         5a. Generally polypetalous, rarely petals absent:
            6a. Plants without pungent smell; gynophore present:
               7a. Shrubs or trees, sometimes climbing; stamens indefinite; fruit few seeded; seeds reniform.........................12.Capparaceae
7b. Generally herbs; stamens tetradynamous (if six), or 4; fruit many seeded; seeds reniform..........................11. **Cleomaceae**

6b. Plants with pungent smell; gynophore absent; fruit siliqua........................................10. **Brassicaceae**

5b. Generally gamopetalous:

8a. Flowers often tetramerous or pentamerous:

9a. Many ovules in each locule; fruit dehiscent:

10a. Shrubs; axile placentation; seeds winged or margined.................................

........................................68. **Buddlejaceae**

10b. Herbs; parietal placentation; seeds minute...........69. **Gentianaceae**

9b. One or two ovules in each locule; fruit indehiscent:

11a. Unarmed shrubs, trees or sometimes climbing; stamens generally 2, sometimes 4; fruit berry, drupe or capsule.......................64. **Oleaceae**

11b. Herbs; stamens generally 4; fruit circumsicissible capsule or nut.............

........................................87. **Plantaginaceae**

8b. Flowers pentamerous:

12a. Leafless, rootless, stem parasite with watery sap; embryo destitute of cotyledons...............................76. **Cuscutaceae**

12b. Leafy, rooted, shrubby or trees and sometimes climbers with milky sap or latex; plants with normal habit:

13a. Leaves opposite:

14a. stamens 5, epipetalous; axile placentation; gynostegium absent; pollen in pollen sac; anthers sagittate..............
................66. Apocynaceae
14b. Stamens 5, connected with stigma to form gynostegium; pollen in pollinia; marginal placenta...........................

..................67. Asclepiadaceae
13b. Leaves alternate:
15a. Carpels obliquely placed; swollen placenta with many ovules; ovary bilocular, rarely 4-locular..........

..................77. Solanaceae
15b. Carpels not obliquely placed; ovary tetra locular, rarely bilocular; placenta not swollen, 1 or 2 (4) ovules per locule:
16a. Shrubs or trees; fruit drupaceous or baccate, often encircled by persistent calyx.............

..................74. Ehretiaceae
16b. Herbs, Shrubs or climbers; fruit capsular or nutlets, may be encircled by persistent calyx:
17a. Generally herbs, rarely trees; style generally gynobasic; ovary tetralocular; fruits of 4 nutlets, rarely drupe.............

.73. Boraginaceae
17b. Generally climbers or herbs;
4b. Ovary inferior:

18a. Herbs or shrubs, aromatic plants with dissected leaves; flowers in umbels; more or less polypetalous, rarely 0; stylopodium present. ..................................56. *Apiaceae*

18b. Herbs or shrubs or trees, plants with or without sap; entire or dissected leaves; Inflorescence various, head or spike:

19a. Calyx of pappus; syngenecious; ovary unilocular. ..................................................58...*Asteraceae*

19b. Calyx of sepals; anthers free; ovary with more than one locule:

20a. Terrestrial plants; leaves opposite with interpetiolar stipule (except *Galium*)..............

..................................................57. *Rubiaceae*

20b. Amphibian or marshy plants; leaves alternate, stipules absent; fruit enclosed by persistent calyx:

21a. Stamens epipetalous without appendaged stamens; axile placentation........59. *Sphenocleaceae*

21b. Stamens epipetalous with appendaged stamens; parietal placentation........71. *Hydrophyllaceae*

3b. Perianth generally uniseriate or absent:

22a. Woody plants:

23a. Ovary unilocular; placentation parietal or basal; leaves usually alternate, generally stellately hirsute:

24a. Sap-watery; inflorescence racemose; flowers bisexual; fruit samara......................98. *Ulmaceae*
24b. Sap-milky; inflorescence catkin or hypanthodium; flowers unisexual; fruit usually compound.............

..........................................................101. Moraceae

23b. Ovary bilocular; placentation axile; leaves in whorled, reduced to sheath on articulated branches...102. Casuarinaceae

22b. Herbaceous plants:

25a. Carpels bicarpellary to multicarpellary; ovules one to many; placentation parietal, axile or basal; seeds often arillate.

..........................................................54. Aizoaceae

25b. Carpels 1 to many; ovary unilocular; placentation basal; seeds not arillate:

26a. Stem fibrous; leaves simple to palmately lobed or compound, stipulate; flowers unisexual.................

..........................................................100. Cannabinaceae

26b. Stem not fibrous; leaves simple, exstipulate; flowers bisexual:

27a. Flowers with dry scarious bracts and perianth......................89. Amaranthaceae

27b. Perianth sepaloid or green.................................90. Chenopodiaceae

Group VIII

Bicarpellary, syncarpous; flowers zygomorphic.

1a. Heteromorphic, parasitic or insectivorous plants:

2a. Carnivorous, epiphytic or aquatic, trap on rhizome; Stamens 2; placentation free central or basal.................................80. Lentibulariaceae

2b. Parasitic plants without chlorophyll, trap absent; stamens 4 didynamous, placentation parietal, sometimes axile. .....................79. Orobancheaceae

1b. Autotrophic plants:

3a. Petals more or less free; stamens not united with petals; ovary superior; parietal placentation:

4a. Flower with spur; sepals 2, small scale-like, deciduous; stamens 6 in two groups.................................9. Fumariaceae
4b. Flower with spur and unequal petals; sepals 5, outer 3 small, inner 2-large or all 5 nearly equal; stamens 8........15. Polygalaceae

3b. Petals more or less fused; generally epipetalous:

5a. Ovule one or two in each locule:

6a. Usually aromatic plants; stem and branches usually four-angled; gynobasic style.........................86. Lamiaceae

6b. Usually not so aromatic plants; branches and twigs tetragonal, not prominently nodose or articulated; style terminal.................................................................85. Verbenaceae

5b. Ovule one to many in each locule (Except Martynaceae):

7a. Parietal placentation; fruit capsule, one-seeded horned.

.........................................................83. Martyniaceae

7b. Placentation axile; fruit capsule, many seeded:

8a. Trees or shrubs or climbers with compound leaves; seeds winged.................................81. Bignoniaceae

8b. Herbs or shrubs with simple leaf; seeds winged:

9a. Capsule opening elastically; seeds usually on hooked funiculus........84. Acanthaceae

9b. Capsule opening not as above; seeds not on hooked funiculus:

10a. Flowers axillary; corolla ventricose, sub two-lipped........82. Pedaliaceae

10b. Flowers in racemes or spikes; corolla not ventricose, usually two-lipped..................78. Scrophulariaceae

**Group IX**

Leaves with parallel venation; flowers generally di- trimerous; carpels less than 3; seeds with one cotyledon; scattered vascular bundles; stem without cambium.................................................................Monocotyledons (Group IX)

1a. Marshy or aquatic plants; polycarpellary, apocarpous or monocarpellary; unilocular; simple style and stigma:

2a. Polycarpellary, apocarpous; flowers unisexual or bisexual:
3a. Perianth biseriate, with 3 segments in each whorl; bracts 3, rarely 2 per whorl of flowers or branches.............119. Alismataceae

3b. Perianth present or absent (if present then in 1- many series); subtending bracts absent in flowers:

4a. Stamens 6-18; not epitepalous; fruit folicle, 4 seeded; embryo straight..........................120. Aponogetonaceae

4b. Stamens 4; epitepalous; fruit drupaceous, one seeded; embryo curved..........................121. Potamogetonaceae

2b. Monocarpellary; flowers unisexual:

5a. Undershubs and differentiated into leaves and stem; androgynophores in compact spikes; ovary stipitate..116. Typhaceae

5b. Plants reduced to small green bodies called fronds; androgynophore absent; carpel on the surface of frond; ovary bottle shaped.............................................................118. Lemnaceae

1b. Aquatic or terrestrial plants; bicarpellary to tricarpellary, syncarpous, un- multilocular; stigma lobed:

6a. Perianth scarious or reduced or zero and not petaloid:

7a. Flowers (florets) in the axil of glumaceous bracts; leaves linear; spadix absent:

8a. Perianth present; fruit capsule:

9a. Leaves mostly basal, sheath margins fused or overlapping, often two ear like extensions (auricles) at the blade junction; inflorescence of head like clusters or spicate..................................................114. Juncaceae

9b. Leaves mostly many ranked in rosette, sometimes in loose spiral, leaf blade linear to linear triangular, ligulate..............................................................122. Ericaulaceae

8b. Perianth absent or represented by lodicules or bristles or scales; fruit nut or caryopsis:

10a. Leaf phyllotaxis 1/2; leaf sheaths with usually free margins; culms cylindrical; spikelets subtended by a pair of sterile bracts (glumes); each flower enclosed between a membranous bract (lemma) and adaxial
bracteole; perianth reduced to lodicules.

...............................

124. Poaceae

10b. Leaf phyllotaxis 1/3; leaf sheaths closed; culms usually triangular; spikelets usually not subtended by sterile bracts; each flower subtended by a single membranous bract; perianth represented by bristles, hairs, scales, or none.......................123. Cyperaceae

7b. Flowers not in axil of glumaceous bracts; leaves large; spadix present:

11a. Tree, shrub or scramber with large plicate or pinnately divided leaves; flowers nearly sessile; fleshy spike or panicles.................................................115. Arecaceae

11b. Herbs, climbers, floating aquatic halophytes, geophytes; leaves large, alternate, petiolate with sheathing bases, linear simple, sometimes peltate or variously compound or complex and dracontioid; flowers on spadix..............117. Araceae

6b. Perianth well developed, inner whorl may be petaloid:

12a. Flowers zygomorphic; hypogynous or ovary superior:

13a. Epiphyte or saprophyte, terrestrial herbs without pseudostem:

14a. Staminode petal like; stamen and style separate; pollen in pollen sac:

15a. Leaf sheaths generally closed, ligule absent; sepals free; seed aril absent.....108. Cannaceae

15b. Leaf sheaths generally open, ligule present; sepals united; seeds arillate..107. Zingiberaceae

14b. Stamens 5, fertile; stamen and style united to form gynostemium; pollen in pollinia......................

........................................105. Orchidaceae

13b. Tree like herb with pseudostem..........106. Musaceae

12b. Flowers generally actinomorphic; epigynous or hypogynous or ovary inferior:

16a. Arborescent plants:
17a. Polygamous or dioecious dwarf plants; leaves mostly basal, succulent, entire or with a prickly or toothed margin; flowers in scapose panicle, bisexual; placentation axile..........................109.Agavaceae

17b. Tall slender climbing plants with cauline, non-succulent and non-spinous leaves; flowers in axillary spikes, raceme or panicle; unisexual; monochlamydeous.........................110.Dioscoreaceae

16b. Herbaceous plants:

18a. Aquatic plants; flowers unisexual or bisexual enclosed in spathe like or tubular leaf sheaths or subtended by bifid spathe or two opposed spathal bracts:

19a. Style one, stigma capitate or minutely 3-lobed; ovary superior...........................................

.........................112.Pontederiaceae

19b. Styles 2-5, stigma usually bifid; ovary inferior............104.Hydrocharitaceae

18b. Terrestrial plants; flowers mostly bisexual, sometimes enclosed in spathe like bracts:

20a. Leaf bases sheathing; filaments bearded..........

........................................113.Commelinaceae

20b. Leaf bases not sheathing; filaments not bearded.

........................................111.Liliaceae
1. **RANUNCULACEAE**

1a. Climbers with opposite leaves;
   Flowers apetalous, sepals valvate ..........................1. *Clematis*

1b. Herbs with alternate leaves; sepals imbricate:
   2a. Carpels 1-ovuled ........................................ 4. *Ranunculus*
   2b. Carpels more than 1-ovuled:
       3a. Flowers actinomorphic; posterior sepal not spurred; Carpels connate ................. 3. *Nigella*
       3b. Flowers zygomorphic; posterior sepal spurred. Single carpel.................................2. *Consolida*

1. **Clematis** Linn.
   Ca 250 species; 20 species in India; 2 in MZN.
   1a. Flowers smaller sepals spreading from the use ...............1. *C. gouriana*
   1b. Flowers larger, sepals erect, tip recurved .................2. *C. roylei*

   Extensive, slender, glabrous, petiole climbers; young parts pubescent. Leaves opposite, 2-pinnate; leaflets 3-6 cm long, ovate, oblong or lanceolate, cordate, entire, acuminate, glabrous on both surfaces. Flowers greenish-white or yellowish, small, in dense axillary and terminal, crowded panicles, ca 1.4 cm across. Sepals 4 or 5, petaloid white, 0.5-1.0 cm long, oblong, obtuse, hairy outside. Petals absent. Stamens indefinite; filaments glabrous, exerted. Achenes several, lanceolate, hairy, tailed.
   Fl. & Fr.: Aug.-Nov.
   Rarely planted in gardens and common in northern part of district in Khadder and forest area. Collection: 2136; Charthawal.
   The bruised leaves and stem are used as a vesicant. The plant is poisonous.

   FBI. 1: 5; FUGP. 1: 18.
Slender, silky, pubescent, woody petiole climbers. Leaves 3-4 foliate to 2-pinnately decompound, 18-30 cm long; leaflets 2-4 cm long, ovate-lanceolate with round or subcordate base, acute, entire or irregularly 2-3 cm partite, glabrous to villous. Flowers white, in axillary drooping panicles; pedicles 2-3 cm long. Sepals oblong, tomentose outside. Filaments up to 2 cm long. Achenes ovoid-ellipsoid, silky with a small 2 mm long style.

Fl. & Fr.: Nov.-March.

Rare on damp, shady places. Collection: 2020; Thanabhawan.

2. Consolida S. F. Gray

Over 250 species; 15 species in India, 1 in MZN.


Annual erect herbs. Stems simple or branched in upper part. Leaves simple, decompound, alternate, exstipulate; lobes smooth, linear, acuminate. Flowers blue, violet, rose or white, in long racemes, spurred posteriorly, Follicles pubescent, 1-2.5 cm long, abruptly beaked.

Fl. & Fr.: Jan.–March.

Winter ornamental but sometimes found as an escape in wild form. Collection: 2126; Muzaffarnagar City.

2. Nigella Linn.

Ca 20 species; 2 species in India, 1 in MZN.

N. sativa Linn., Sp. Pl. 753. 1753; FUGP. 1: 17; HFD. 42.

Annual, sparsely branched herbs upto 30cm tall. Stems hairy, fistular. Leaves petioled in lower part and sessile above, 2-3 pinnatisect; segments linear, entire, nearly glabrous, 2-2.5 cm long. Flowers solitary, terminal, greenish-white, 1.2-1.5 cm across, pedicellate. Sepals clawed, 1 cm long. Petals 8, obovate or cuneate hairy. Anthers with apical hood. Carpels 3-5, connate. Follicles oblong. Seeds black.

Fl. & Fr.: Feb. – April.

Rarely occurs on waste places and also cultilvated as an ornamental. Collection: 5001; Muzaffarnagar City.

3. Ranunculus Linn.

Ca 400 species; 24 species in India, 2 in MZN.

1a. Hairy herb; flattened achenes with an internarginal rib…….1. R. cantoniensis
1b. Glabrous herbs; turgid achenes, not margined  2. **R. sceleratus**


   Perennial, erect, hirsute upto 50 cm tall herbs. Radical leaves 4 -10 cm long, Petiolate, 3-lobed; segments cuneate, obovate, deeply cut. Flowers long stalked, yellow, 4-8 mm across. Sepals 5, hairy, elliptic-lanceolate, acuminate. Achenes 3mm long, glabrous, flattened, minutely beaked, margined. Receptacles pillose. 

   **Fl. & Fr.**: Aug. – Dec. 

   Wild along Ganga and on damp places. Collection : 100; Bahadurpur.


   Annual, erect, glabrous herbs up to 70 cm tall. Stems branched, succulent, fistular, ribbed. Lower leaves 3-lobed; segments ovate cuneate or variously lobed or notched. Upper leaves sub petiolate, 3-fid; segments narrow, oblong, entire or toothed glabrous. Petioles sheathing. Flowers pale yellow. Calyx reflexed. Petals oblong. Achenes many, in oblong to cylindrical heads faintly rugose, with short obtuse beak, 0.1 cm across. 

   **Fl. & Fr.**: Jan. – May. 

   Abundantly found during winter in muddy places and watersides. Collection : 31.1; Shukartal. 

   Whole plant is acrid and often used as a vesicant. Plat juice is used against rheumatism; seeds are used as tonic and in kindney troubles.

2. **DILLENIACEAE**

   **Dillenia** Linn.

   Ca 55 species; 7 Species in India; 1 in MZN. 

   **D. indica** Linn., Sp. Pl. 535. 1753; FBI. 1: 36 ; FUGP. 1: 21

   Medium sized evergreen trees. Leaves 20-30 cm long, petioled, fascicled at the end of branchlets, coriaceous, oblanceolate, acuminate or acute, sharply serrate, pubescent beneath. Flowers large, solitary, sub-terminal, fragrant, white, 10 -15 cm across. Sepals fleshy thick, ovate, obtuse. 

   **Fl. & Fr.**: May - Aug. 

   Occasionally planted in gardens. Collection : 3502; Muzaffarnagar City.
Flower buds and fleshy sepals are edible.

### 3. MAGNOLIACEAE

1a. Flowers axillary; gynoecium stipitate ..................2. *Michelia*

1b. Flowers terminal; gynoecium sessile ..................1. *Magnolia*

1. *Magnolia* Linn.

Ca 80 species; 10 species in India; 1 in MZN.

*M. grandiflora* Linn., Syst. 1082. 1759; FD. 51; MCP. 416. Vern. *Champa*

Medium sized trees. Leaves large, oblong-ovate, coriaceous, shining green above, rusty tomentose beneath. Flowers large with petaloid sepals, creamish-white colour.

Fl. : Aug- Nov.

Cultivated in gardens. Collection : 5010; Muzaffarnagar City.

2. *Michelia* Linn.

Over 500 species; 12 species in India; 1 in MZN.


Evergreen tall trees. Bark dark grey. Leaves 12-18 x 5-8 cm, ovate or oblong-lanceolate, coriaceous, entire, glabrous, dark green, lateral nerves 7-14 pairs; petioles 2-3.5 cm long. Flowers solitary, axillary, bracteate, pale yellow, sweet-scented; peduncles short, stout; bracts small, deciduous. Sepals and petals 15 -21, in several series, those of inner series narrower. Carpels 1.5-17.5 cm long, subsessile, dark coloured. Fruits 6-8 cm long.

Fl. & Fr. : April- Aug.

Rarely cultivated in lawns and parks. Collection : 5015; Muzaffarnagar City.

### 4. ANNONACEAE

1a. Shrubs or small trees; tepals in two series:

2a. Ripe carpels connate, in a fleshy many seeded fruit. Peduncles not hooked.................................................................1. *Annona*

2b. Ripe carpels 6 -10, free. Peduncles hooked ...............2. *Artabotrys*

1b. Large trees; tepals in 3 series........................................3. *Polyalthia*

1. *Annona* Linn.

Ca 120 species; 3 species in India; 1 in MZN.

Shrubs or small trees. Leaves simple, 5-8 x 2-2.5 cm oblong or oblong-lanceolate, obtuse or acuminate, base acute, glabrous beneath, petioles 1.2-2 cm long. Flowers solitary, yellowish green, pubescent, drooping; pedicels 1.5 cm long. Sepals triangular, acute, united at base. Outer petals fleshy, upto 2.5 cm long, third series of petals minute or absent. Fruits 5-8 cm across, fleshy, tuberculated.

Fl. & Fr. : July - Sept.

Planted in gardens. Collection : 3793; Muzaffarnagar City.

Root is purgative. Seeds, fruits, and leaves are used as insecticide, also to remove lice in head, fruits are edible.

2. *Artabotrys* R. Br.

Over 100 species; 6 species in India; 1 in MZN.


Large, scandent, glabrous shrubs climbing by recurved hooks. Leaves shining above, 5-12 cm long, oblong-lanceolate, acute base, short petioled, Flowers yellowish-green solitary or in pairs, panicled, sweet scented.

Fl. & Fr. : April - Sept.

Cultivated for the fragrant flowers. Collection : 4245; Shukartal.

Flowers yield essential oil used in perfumery.


Ca 120 species; 12 species in India; 1 in MZN


Handsome, straight, evergreen tree with a close crown. Leaves 20-30 x 3.5-5 cm oblong- lanceolate, acuminate, shining, margins undulate; petioles upto 0.5 cm long. Flowers yellowish-green, in umbellate cymes. Sepals 3. Petals 6 in 3 series, narrow-linear. Fruits ovoid drupe, 1.5 cm across.

Fl. & Fr. : May – July.

Planted as avenue trees in gardens. Collection : 3504; Muzaffarnagar City.

*P. longifolia* var. *pendulosa*-The drooping- branched form of this tree is also quite common in gardens.

5. MENISPERMACEAE
1a. Carpels solitary...........................................................................................................1. Cissampelos
1b. Carpels 3 or more:
   2b. Leaves ovate or ovate-cordate, glabrous, green.
       Seeds oblong or subglobose .........................3. Tinospora

1. Cissampelos Linn.

     Over 30 species; 1 species in India; 1 in MZN.
     
     Vern. Harjori, Nirbasi.

     Perennial, twining, tomentose or softly pubescent shrubs. Leaves broadly ovate or orbicular, peltate or cordate, 2.5-7 x 3-8 cm petiolate. Plants dioecious. Male flowers in cymes, peduncled, small, pale-green, densely tomentose. Female flowers 1-2, axillary, with large orbicular bracts. Carpels solitary. Drupes 3-5 mm subglobose, hirsute, scarlet.

     Fl. & Fr. : May – Oct.

     Common along hedges, creeping on ground or twining around trees and shrubs.

     Collection : 515; Sherpur.

     Used as bitter tonic for dyspepsia, cough and urinary troubles.

2. Cocculus DC. nom. cons.

     Ca 20 species; 6 species in India, 1 in MZN


     Climbing, hairy undershrubs. Leaves 2-3 x 4-5 cm, ovate-oblong, dark-green above, obtuse, mucronate, subcordate or truncate at the base, under surface hairy. Male flowers in short axillary panicles. Female flowers in axillary cluster of 2-3, sessile or shortly pedicelled. Carpels 2 or more. Fruits 4-7 mm in diam. subglobose, dark-purple.

     Fl. & Fr. : Feb. – March

     Common on trees and shrubs. Collection : 321; Shukartal.

     Juice of ripe fruits makes a blue purple ink. Roots used in chronic rheumatism and venereal diseases.
3. **Tinospora** Miers.

Ca 40 species; 3 species in India; 1 in MZN


Large climbers, stem smooth, branches and young parts pubescent. Leaves 10-20 cm across, broadly ovate or orbicular, pubescent above, tomentose beneath, deeply cordate, 7-nerved from base; petioles 5-15 cm long, twisted at base. Flowers in 8-15 cm long racemes from old branches, pedicel solitary in female; clustered in male. Sepals 6, in 2 series; outer smaller, ovate- oblong; inner larger, sub- orbicular. Petals 6. Stamens 6; filaments free. Female flowers: staminodes 6, ovaries 3. Drupes 1-3, ovoid smooth.

Fl. & Fr. : March- June; Nov.-Jan.

Common in shady localities. Collection : 5020; Muzaffarnagar City.

Roots and stems are used in medicines. Stem juice is used in fever by villagers. Paste of stems and leaves rubbed on painful organs.

6. **NYMPHAEACEAE**

*Nymphaea* Linn. *nom. cons.*

Ca 50 species; 4 species in India; 1 in MZN

1a. Anthers without appendages. Leaves sinuate-toothed ..........1. *N. nouchali*

1b. Anthers with long appendages. Leaves entire ................. 2. *N. stellata*


Aquatic herbs with creeping rhizome. Leaves 12-18 cm across, petioles 40 cm or more long, submerged, orbicular, cordate at base, sharply sinuate- toothed, glabrous above, pubescent beneath, many nerved from the base. Flowers 5-8 cm across, white. Sepals 4, obtuse, ribbed, 5-7 cm long, glabrous outside; Petals in many series, oblong, obtuse, equal or slightly longer that the sepals. Anthers with out appendages; filaments dilated at base. Fruits spongy berry, 2-3 cm across.

Fl. & Fr. : July- Sept

Common in ponds and stagnant water. Collection : 5033; Morna.

Rhizomes are eaten raw or cocked. Powdered roots used for piles, dysentery and dyspepsia.

Aquatic herbs with rhizomes underwater and floating leaves. Leaves variable in size, 7-12 cm across, orbicular, entire, glabrous on both sides. Flowers white, blue or purple on long axillary pedicels, emerging over the surface of water. Sepals 4, up to 5.5 cm across, acute or obtuse, not ribbed, streaked with purple lines. Petals many, linear to narrowly oblong, acute. Stamens many, filaments not dilated at base, anthers with oblong appendages. Carpels many. Fruits spongy berry. Seeds many in a sac like structure.

Fl. & Fr.: Aug- Nov
Common in the area in ponds. Collection: 588; Khatauli.
Rhizomes and seeds are edible.

7. **NELUMBONACEAE**

*Nelumbo* Adans.

2 species; 1 species in India; 1 in MZN


Large aquatic herbs with creeping rhizome. Leaves peltate, orbiculate, 38-80 cm across, with upturned margins; upper surface dark- green; lower surface brown, glabrescent. Flowers solitary, pinkish red, 10-25 cm across; pedicels 50-80 cm long with small scattered prickles. Sepals 4 or 5, caducous. Petals many seriate, caducous, elliptic or obovate, 10-15 cm long. Stamens many seriate; anthers appended. Carpels many, embedded in spongy torus; stigma peltate. Ripe carpels nut like, smooth.

Fl. & Fr.: Aug.- Sept.
Rhizomes, flowers, stalks, and seeds are eaten.

8. **PAPAVERACEAE**

1a. Plants prickly, sap yellow. Capsules oblong and prickly………………..**1. Argemone**
1b. Plants glabrous or hispid, sap milky. Capsules globose, smooth ………**2. Papaver**
1. Argemone Linn.

Ca 10 species; 3 species in India; 2 in MZN.
1a. Petals prickly, sap yellow; capsules oblong and prickly..............1. A. mexicana
1b. Petals glabrous or hispid, sap milky, capsules globose, smooth..2. A. ochroleuca


Robust herbs, 15-45 cm tall, erect, branched, glaucous, prickly; stems with yellow sap. Lower leaves in rosette, petioled; uppers petiole 7-16 cm long, semi-amplexicaul base, sinuate-pinnatifid, spinose-dentate, prickly both sides, especially on nerves. Flowers solitary, terminal with short pedicels; bracts leafy. Sepals 3, oblong, prickly outside. Petals 6, obovate, variable in length, pale-yellow, caducous. Stamens many. Carpels oblong, ellipsoid, prickly with erectopatent spines. Stigma subsessile. Fl. & Fr.: Feb.–May.
Common winter weed, along roads, river beds. Collection: 827; Bahadurpur. Seeds and oil are used as adultrent. Oil also used in painting and medicines.


Erect, white- tomentose, upto 60 cm tall, prickly herbs. Stems with yellow sap, branched. Leaves sessile, 10-20 cm long, half amplexicaul, sinuate pinnatifid, glaucous, prickly on nerves. Flowers sessile, white or light yellowish-white. Sepals 3, 1.2 cm long, with spines. Petals 6, obovate. Stamens upto 1 cm long, many. Carpels covered with erecto-patent spines. Stigma 5-lobed. Capsules ovate- lanceolate, covered with erecto- patent spines.
Fl. & Fr.: March- Aug.

2. Papaver Linn.

Ca 100 species; 7 species in India; 1 in MZN.

Erect, simple or branched, hispid herbs upto 45 cm tall. Leaves irregularly pinnatifid; basal ones petiolate; uppers sessile. Flowers solitary, terminal, long
peduncled, 5 cm across, dark red. Sepals 2, upto 1.5 cm long. Petals obovate, subobicular, 2-3 cm long. Capsules campanulate, porous, and smooth.

Fl. & Fr. : Jan. – April

Ornamental in gardens. Often met with as an escape. Collection : 2701 ; Charthwal. Plant is useful as medicines.  
*P. somniferum* L. is also found under cultivation in gardens as ornamental. Commercial opium is obtained from the latex of immature fruit, used to induce sleep, relieve pain and relax spasms.

9. FUMARIACEAE

**Fumaria** Linn.

Over 50 species; 2 species in India; 1 in MZN


Diffuse, slender, glaucous, annual herbs, 10-40 cm tall. Stems decumbent below, ascending upwards. Leaves 2 or 3 pinnatisect; segments linear-oblanceolate, entire. Recemes leaf opposed, 2.5-4.5 cm long, 18-20 flowered; bracts lanceolate, acuminate. Sepals ovate, acute, dissected, 0.1 cm long. Petals erect, two outer dissimilar; posterior gibbous or spurred at base, pinkish-purple, 0.5 cm long. Fruits sub-globose, with small tubercle, depressed on either side.

Fl. & Fr. : Jan.-March

Common in cultivated fields & waste places. Collection : 195; Muzaffarnagar City. Plants are used for remedy of fever, and decoction of the plant is said to be used for blood purification.

10. BRASSICACEAE

1a. Pods about as long as broad:

2a. Pods indehiscent……………………………………4. *Coronopus*

2b. Pods dehiscent:

3a. Petals unequal…………………………………….6. *Iberis*

3b. Petals equal:

4a. Pods triangular ..............................3. *Capsella*

4b. Pods orbicular .................................7. *Lepidium*
1b. Pods many times longer than broad:
   5a. Flowers yellow or yellowish white:
      6a. Seeds 1- serriate:
         7a. Siliqua beaked  ............................ 2. *Brassica*
         7b. Siliqua not beaked  ...................... 1. *Arabidopsis*
      6b. Seeds 2- serriate:
         8a. Pods with compressed beak ............... 5. *Eruca*
         8b. Pods not beaked  ....................... 9. *Rorippa*
   5b. Flowers pink or white; pods indehiscent, divided
      into 1- seeded compartments .................... 8. *Raphanus*


Ca 12 species; 8 species in India; 1 in MZN.

*A. thaliana* (Linn.) Heynh. in Holl & Heynh. Fl. Sachs. 1: 538. 1842; HFD. 53.


Erect, less branched, 15-25 cm tall, annual hispid herbs. Basal leaves in rosette, obovate-oblong, subsessile, spathulate, entire or dentate, 0.8-1.4 x 0.3 0.5 cm;
cauline leaves sessile, lanceolate-oblong, cuneate, smaller; all leaves hairy on margins. Flowers in racemes; pedicels 1-1.5 cm long, slender. Sepals 4, lanceolate, 0.2 cm long. Petals 4, white, 0.4 cm long, oblong-obovate. Stamens 4. Pods linear, 1.2-2.5 cm long, glabrous; valves 1-nerved. Seeds flat, brown, small.

Fl. & Fr. : Feb.- April

Growing on moist places, lawns, gardens and on road sides. Collection : 1095; Muzaffarnagar City.

2. *Brassica* Linn.

Ca 150 species; 11 species in India; 5 in MZN

1a. Leaves lyrate or pinnatifid or lyrate lobed:
   2a. Roots fleshy, napiform........................................ 5. *B. rapa*
   2b. Roots not fleshy:
      3a. Stem leaves tapering to base, not amplexicaul.........2.*B. juncea*
      3b. Stem leaves broad based, the upper ones amplexicaul.1.*B. campestris* var. sarson

1b. Leaves entire or slightly lobed:
   4a. Plants with a terminal bud of overlapping leaves..........4. *B. oleracea*
4. B. oleracea var. capitata Linn., Sp. Pl. 667. 1753; Blatt. in JBNHS. 34: 297 1930; FD. 60; HFD. 55. Vern. Band Gobhi or Pat Gobhi

Low, stout, short stemmed, annual herbs with dense terminal head. Leaves large, oblong- obovate, closely packed into a large bud or head.
Fl. & Fr. : March – April.
Cultivated for vegetable. Collection : 5050; Bhopa.
Leafy head is cooked as vegetable and as salad.

*B. oleracea* var. **caulorapa** DC. LN. Ganth Gobhi is cultivated extensively in winter season as vegetable crop.

5. **B. rapa** Linn., Sp. Pl. 666. 1753; MCP. 436; FD. 60. Vern. **Shalgam**.

Erect, tall, branching annual herbs with napiform fleshy, purple or white roots. Stems often tinged with purple, especially at nodes. Leaves lyrate or pinnatifid, decreasing in size from base to top; upper leaves with sagittate base. Flowers pale yellow, pedicelled. Pods slender, narrow.

Fl. & Fr. : Dec. - March
Cultivated during winter. Collection : 5065; Kandhla.
Roots are cooked as vegetable and pickle.

*B. nigra* (Linn.) K. Koch LN. Kali Sarson is extensively cultivated in the area as oil seed crop.

3. **Capsella** Medik., *nom. cons*.
Ca 100 species; 1 species in India; 1 in MZN


Erect, branched, annual, glabrous or hairy herbs, upto 25 cm tall. Basal leaves in rosette, petioled, entire or pinnatipartite; segments alternate, unequal, entire to sinuate- dentate; upper leaves sessile with a hastate base. 2.5–3.5 x 0.4-0.6 cm. Flowers white, pedicellte; small, corymbose at first, elongating to racemes, 5-20 cm long. Sepals 4, oblong 0.1 cm long. Petals 4, obovate, white, 0.15 cm long. Pods 0.5-0.6 x 0.5-0.6 cm, notched at apex, compressed. Seeds oblong-ellipsoid.

Fl. & Fr. : Nov. - April.
Occasionally growing in cultivated fields during winter. Collection : 2677; Gordhanpur.

4. **Coronopus** Linn. *nom. cons*.
10 species; 1 species in India; 1 in MZN

Prostrate or decumbent-ascending, much branched from base, annual hairy herbs, upto 15 cm tall. Leaves often forming a rosette, 4-10 cm long, pinnatifid-pinnatipartite; segments lanceolate, entire, upto 0.5 cm long. Flowers pale-green, arranged in lateral racemes, 1-2 mm in dia. Sepals 4, ovate, sub-erect. Petals 4, very short or none. Stamens 2. Pods notched, orbicular, 0.15 x 0.22 cm, reticulate.

Fl. & Fr.: Jan-May.

Common weed of winter crops, on road-sides and waste places. Collection: 3549; Muzaffarnagar.

5. **Eruca** Mill.

6 species; 1 species in India; 1 in MZN


Erect, annual, branched herbs, upto 50 cm tall. Stems glabrous upward, hairy below. Lower leaves 5-10 cm long, lyrate-pinnatifid, with oblong or oblong-lanceolate lobes, 1-1.5 cm long petiole; upper leaves nearly sessile, lyrate-pinnatifid; entire, 3.5 cm long. Flowers in long racemes; pedicels 0.1-0.15 cm long. Sepals 4, 1 cm long, oblong-lanceolate, acute. Petals 4, 1.8-2 cm long, yellow, obovate, long clawed, with dark purple veins. Fruits 2-2.5 cm long, oblong, smooth, beak flat. Seeds many, compressed.

Fl. & Fr.: Dec.-Feb.

Cultivated as winter crop. Collection: 222; Shamli.

Oil is extracted from seeds. Seeds are used as medicines for mulching cattle.

6. **Iberis** Linn.

Ca 30 species; 1 in MZN


Erect or often ascending, annual herbs upto 60 cm tall. Stems corymosely branched in upper part. Lower leaves petiolate, pinnatifid with linear-lanceolate to oblong-oblancoolate, subacute-obtuse segments; upper ones sessile, cuneate at base, dentate with a few obtuse teeth at the top. Flowers 0.18–0.2 cm long. Pods rounded, ellipsoidal silicula. Seeds reddish-brown, narrowly margined, 0.2 x 0.1 cm, Cultivated as ornamental.

Fl. & Fr.: Feb.-May
7. **Lepidium** Linn.


Vern. *Alsa, Halim*.

Erect, annual, branched, glabrous, 15-50 cm tall herbs. Radical leaves long-petioled, divided; caulines sessile, entire or toothed, lanceolate-oblong, glabrous, 1.5-2.5 cm long. Flowers white, small in axillary and terminal racemes; pedicels 0.25-0.3 cm long. Sepals 4, oblong, obtuse, 0.5 cm long, minutely pubescent. Petals 4, white, 0.2-0.25 cm long, clawed, obovate. Pods upto 0.5 cm long, oblong, orbicular, notched, wings narrow, 2-seeded, Seeds brown.

Fl. & Fr. : Feb.-May.

Common winter season weed. Collection : 5066; Kandhla.

Plants are used as fodder and seeds used as medicines.

8. **Raphanus** Linn.

*R. sativus* Linn., Sp. Pl. 669. 1753; FBI. 1: 166; FUGP. 1: 48; FD. 57; HFD. 60.

Vern. *Mooli*.

Erect, glabrous, annual herbs, branched with fleshy, fusiform, white or reddish-white roots. Lower leaves petioled, lyrate-pinnatifid-partite with sinuate-dentate lobes; upper ones sessile, decreasing in size, lanceolate to ovate-obovate, entire or dentate, glabrous, acute to acuminate. Flowers in 8-20 cm long racemes; pedicels upto 0.5 cm long. Sepals 4, 0.6 cm long, oblong or obovate, acute. Petals 4, white, obovate, 1.2 cm long, clawed strongly veined. Fruits terete, 3-10 cm long, indehiscent, divided into 1-seeded compartments, pointed conical beak. Seeds embedded in whitish spongy tissue.

Fl. & Fr. : Dec.—March

Cultivated in winter season. Collection : 4216; Chitora.

Roots and leaves are used as vegetable and salad. Dried root powder is used as churan.

9. **Rorippa** Scop.

Ca 70 species; 4 species in India; 3 in MZN.

1a. Flowers yellow; leaves simple, lyrate-pinnatifid:

2a. Lobes of leaves toothed; pods 1-2.5 cm long.………..1. **R. indica**
2b. Lobes of leaves entire; pods 2-4 cm long …………2. R. montana
1b. Flowers white; leaves deeply pinnatisect…………………3. R. nasturitium-aquaticum


Erect glabrous, annual herbs upto 50 cm tall. Lower leaves petioled, entire, shortly lyrate-pinnatifid, 2-4x1-15 cm; upper leaves sessile, lyrate, base amplexicaul, 1.5-2.5x 0.5-1cm. Racemes 3.5 – 5 cm long, lax. Flowers small, yellow; pedicels upto 0.5 cm long. Sepals 4, 0.25 cm long, oblong. Petals 4, 0.25 cm long, oblanceolate. Pods 2.5 cm long, narrow, cylindrical. Seeds brown, many.
Fl. & Fr.: Feb.-May.
Commonly found in moist and shady places, crop fields. Collection : 728; Muzaffarnagar City.


Glabrous, much branched, creeping or floating, annual herbs. Leaves upto 15 cm long, pinnatifid in upper part with 3-7 orbicular, oblong lobes. Flowers in 3-10 cm long racemes; pedicels upto 0.5 cm. long during anthesis, upto 1 cm long in fruiting. Sepals 4, 0.2 cm long, oblong. Petals 4, longer than the sepals, oblong-obovate, shortly clawed. Pods erecto-patent, spreading or bent upewards. Seeds small, pitted in two rows, brown.
Fl. & Fr.: Feb.- May.
Amphibous, common in marshy and sandy river banks, in swampy localities. Collection : 272; Rampur.
Leaves are used as vegetable.


Annual erect, branched herbs, upto 25 cm tall. Stems villous. Lower leaves sinuate-pinnatifid; lobes entire. Flowers yellow. Sepals 3-4 mm long, slightly villous.
Petals equaling the sepals. Pods 2-4 cm long, narrow, cylindrical, obscurely angled. Seeds oblong, compressed.
Fl & Fr. : Feb- May.
Common in moist places, crop fields. Collection : 5025; Muzaffarnagar City.

11. CLEOMACEAE

1. Cleome Linn.

Over 150 species; 14 species in India; 2 In MZN
1a. Flowers white; stamens 6; andro- gynophores long………1. C. gynandra
1b. Flowers yellow; stamens 11 -20, andro-gynophore ……….2. C. viscosa


Erect, much branched, 30- 60 cm tall, glandular pubescent, unpleasantly smelling herbs. Leaves 5- foliate, long petioled; leaflets 2.5 – 4.5 x 1.2 – 2.5 cm, nearly sessile, elliptic or obovate, obtuse or acute, minutely serrulate. Flowers in corymbose, white, solitary, in axils of leafy bract. Pedicels 1.5–2.0 cm long, viscid. Sepals 4, lanceolate, acute, 0.3–0.35 cm long, gland pubescent. Petals 4, 1.2-1.4 cm long, obliquely obovate, with long claws, white. Androgynophores 1.5-1.8 cm long. Stamens 6; anthers versatile; filaments pinkish. Capsules 4 -10 cm long, glandular, viscid pubescent. Seeds rugose, dark brown, 0.12 cm in diameter.
Fl. & Fr. : July-Sept.
Common rainy season weed of waste and crop lands. Collection : 5093 ; Shamli.
Leaves are used for skin infections and seeds for cough.


Erect, glandular- pubescent, annual herbs. Stems simple or branched upto 1 m tall. Leaves digitately 3-5 foliate; petiole 1.5 – 2.5 cm long. Leaflets sessile, ovate to obovate, acute, entire nearly glabrous. Flowers yellow, solitary, axillary or in leaf-bearing terminal racemes. Pedicels 0.5-0.8 cm long during anthesis, 1.2-2.0 cm during fruiting, glands pubescent. Androgynophore absent. Sepals 4, obovate. Petals 4, 1.0-1.2 cm long, yellow, obovate. Stamens 12-20; filaments long, variable in size. Capsules cylindrical, striate, gland-pubescent. Seeds reddish-brown, wrinkled.
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Fl. & Fr. : July- Sept.
Frequent on rail and road sides. Collection : 702; Rampur.

12. CAPPARACEAE

1a. Leaves simple………………………………………………………1. Capparis
1b. Leaves 3-5 foliate …………………………………………………2. Crateva

1. Capparis Linn.
Ca 250 species; 26 species in India; 4 in MZN.
1a. Small trees with white flowers…………………………………....1. C. grandis
1b. Climbing shrubs with white yellowish or pinkish flowers:
   2a. Stipular thorns straight………………………………………..…1. C. decidua
   2b. Stipular thorns recurved:
      3a. Flowers greenish yellow in terminal and lateral umbels…3. C. sepiaria
      3b. Flowers white or pink, solitary…………………………..…..4. C. zeylanica


   Leafless, diffuse, much-branched, glabrous, spinous bushy shrubs. Branches green, straggling, twining, having leaves when young only. Stipules thorny, in pairs, straight, short. Flowers reddish brown, about 2.5 cm in diam, in 2-8 flowered terminal corymbose racemes. Sepals petaloid, pubescent outside. Petals with a beak like nectary at the base. Fruits berry, 7-15 cm in diam, ovoid or subglobose.
Fl. & Fr. : Dec. –June.
Rare, growing on waste on waste land. Collection : 4115; Banat.
Young shoots and leaves are used on boils and swelling. Fruits are pickled


   Small trees, branched, pubescent. Leaves 3-5 cm long, broadly ovate or obovate, acute, obtuse or retuse, silky beneath. buds pubescent. flowers 1.5-2.5 cm in diam, white, in terminal corymb or recemes. Petals narrowly obovate. Fruits subglobose, purple smooth, 2-6 seeded.
Fl. & Fr. : Sept.- Nov.
Occasionally found along road sides. Collection : 2995; Kakroli

Perennial, diffused, much branched, spiny shrubs. Young parts tomentose, spines in pairs, recurved. Leaves ovate oblong, subacute, nearly glabrous above, tomentose beneath, upto 2.5 cm long. Flowers yellowish green, in many flowered umbels; pedicels upto 1.5 cm long. Sepals 4, in two series, ovate, glabrous. Petals 4, unequal, narrow, oblong, Gynophore 4-6 mm long. Stamens exerted many. Ovary ovoid, glabrous. Berries 7-8 mm in diam, 1-seeded, black when ripe.

Fl. & Fr. : May- July.

Common in waste lands. Collection : 877; Kairana.


Climbing shrubs, stipular spines in pairs, recurved; young branches reddish brown, tomentose. Leaves 3-10 cm long, ovate, obovate, obtuse, acute- mucronate or acuminate; young leaves brownish–red, tomentose; petioles upto 6 mm long. Flowers white, turning pink, 2 cm in diam, fragrant, solitary, pedicels upto 1 cm long, densely tomentose. Sepals 4, 1-1.2 cm long, broad ovate. Petals 4, pink, 1.5 cm long, tomentose inside, oblong, acute. Stamens more than 30; filaments pink. Gynophores 0.4 cm long. Fruit a berry, subglobose, orange red when ripe, many seeded, upto 2.5 cm in diam.

Fl. & Fr.: Feb.- Sept.

Common along road sides. Collection : 2926; Jhinjhana

Fruits are used in pickles.

2. Crateva Linn.

Ca 8 species; 4 species in India; 1 in MZN


Medium size deciduous trees; bark grey, smooth. Stems branched. Leaves 3-foliolate; common petiole 6-8 cm long. Leaflets 4-5 x 5-7 cm, ovate, lanceolate, lax terminal umbels; pedicels upto 3 cm long. Sepals 4, ovate oblong, acuminate, upto 0.7 cm long. Petals obtuse, long clawed, light pink or white. Stamens violet, longer than petals. Ovary on 4-5 cm long gynophore. Stigma sessile. Fruits 2.5-4.0 cm in diam, ovoid, orange.

Fl. & Fr. : March- May.

Rarely planted or met in wild conditions. Collection : 447; Muzaffarnagar City.
Leaves are used as fodder. Leaves and fruits are used in medicines.

13. VIOLACEAE

1a. Wild herbs; sepals not spurred; petals unequal in size........1. *Hybanthus*

1b. Cultivated ornamental herbs; sepals spurred at the base; petals equal in size

........................................................

2. *Viola*

1. *Hybanthus* Jacq.

Ca 150 species.; 2 species in India; 1 in MZN


Erect, annual, branched, glabrous or minutely pubescent herbs with thick woody base, upto 20 cm tall. Leaves variable in shape and size, 0.4-1.8 x 0.15-1.2 cm, oblanceolate-oblong to ovate, serrate; stipules linear-lanceolate, acuminate, scarious, 0.1 cm long. Flowers axillary; pedicels 0.5-1.0 cm; bracts linear- lanceolate, 0.1 cm long, acuminate above the middle. Sepals 5, lanceolate, acuminate, scarious on margins. Petals 5, variable, 4 oblong, mucronate, fifth with long claw and limb. Stamens 5, filament shorter than the petal. Capsule 3- valved, sub-globose.

Fl. & Fr.: July- Nov.

Common in sandy soil. Collection : 2289; Mirapur.

2. *Viola* Linn.

Ca 500 species; 15 species in India; 1 in MZN


Annual much branched herbs. Basal leaves round-cordate; upper ones ovate-oblong to lanceolate, crenate-dentate, 2.0-4.5 cm long. Stipules large, pinnately parted towards base. Flowers 2.5-3.5 cm across, yellow or blue. Spur short. Capsules 0.8-1.2 long.

Fl. & Fr.: Jan. - April.

Cultivated for the attractive flowers during winter. Collection : 2002; Shamli.

14. FLACOURTIACEAE

*Flacourtia* Commers.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (64)
Ca 15 species; 3 species in India; 2 in MZN.

1a. Leaves obtuse or rounded. Spines simple ................................................1. *F. indica*
1b. Leaves acuminate, Spines compound...........................................2.*F. jangom*


*Gmelina indica* Burm. f., FL. Ind. 132. T. 39, f. 5. 1768. *Flacourtia sepiaria* Roxb.,

Small deciduous, moderate- sized trees; dark grey; young parts tomentose;
spines sharp, 1.5-3.5 cm long. Leaves alternate, sub-orbicular or obovate, obtuse, serrat or crenate, upto 4 cm long, glabrous; petioles 0.5-0.7 cm long, tomentose.

Flowers dioecious, small, in short branched axillary and terminal racemes. Sepals 4 or 5, rusty hairy, broadly ovate, obtuse. Ovary 1-celled; stigmas 5-11, free or connate.

Fruits globose berries 0.7-1.2 cm across, dark purple when ripe; seeds 8 -16.

Fl. & Fr. : April- Dec.

Common on Ganga bank. Collection : 323; Shukartal.

Wood is used for agriculture implements. Fruits are eaten and leaves are used as fodder.


Small trees with long compound spines and smooth bark. Leaves ovate or ovate-lanceolate, 7-12 cm long, acuminate, crenate-serrate, glabrous; petioles upto 0.5 cm long, flowers in racemes. Sepals 4 or 5. Petals O. Ovary 1- celled; stigmas 4-6, capitates. Fruit a globose berry, upto 2.5 cm across.

Fl. & Fr. : July- Nov.

Rare in the forest area of Shukartal. Collection : 5047; Shukartal.

Fruits are eaten and wood is used for agriculture implements.

15. POLYGALACEAE

*Polygala* Linn.

Ca 600 species; 20 species in India; 3 in MZN.

1a. Wings herbaceous; strophiolae 3-lobed............................1. *P. arvensis*
1b. Wings petaloid:

2a. Perennials; racemes dense,

many flowered Strophiolae 2- lobed.................................2. *P. crotalariaeoides*

2b. Annuals; racemes few flowered;

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
strophiole without appendages.......................3. *P. erioptera*


   Erect or diffused, pubescent, annual herbs upto 20 cm tall. Leaves sessile, obovate, linear- oblong, mucronate, pubescent, 1-2.5 cm long. Flowers yellow, in dense axillary racemes. Calyx persistent; outer sepals ovate, acuminate; wings ovate-elliptic, acuminate. Petals 3, obovate, upto 0.5 cm long, keeled with a bearded crest. Stamens 8. Style 4- fid. Capsules oblong-orbicular, notched at apex, winged, ciliate, 0.4 x 0.4 cm. Seeds black, patently hairy. Strophiole 3- lobed.

   Fl. & Fr. : July- Nov

   Common rainy season as garden weed and on waste places. Collection : 4176; Ramraj. Plants are eaten by poor people.


   Erect, perennial, small herbs upto 20 cm tall. Stems villous, decumbent below, ascending or sub-erect above. Leaves upto 5 cm long, linear- oblong, obtuse or subacute, ciliate. Flowers upto 1 cm across, arranged in short dense racemes, rarely terminal- bracts minute; pedicels upto 2 cm long. Sepals obovate-oblong, glandular-pubescent on back. Petals obcordate, deeply emerginate or 2-lobed. Capsules broader than length, notched, strongly ciliate, hairy, ovoid-ellipsoid. Strophiole with 2 ovate appendages.

   Fl. & Fr. : Aug- Oct.

   Occasionally growing found in the area. Collection : 644; Budhana.


   Erect or decumbent, annual herbs upto 25 cm tall. Stem pubescent. Leaves variable, lanceolate elliptic to oblong-lanceolate, entire, obtuse, upto 2 cm long, nearly glabrous; petioles minute. Flower 1 or 2 in lateral or leaf- opposed racemes; pedicels 0.1-0.15 cm long. Bracts minute, subulate, persistent. Calyx segments lanceolate, acute, pubescent upto 0.2 cm long; wings elliptic- oblong with green mid-rib, petaloid, longer than capsule. Petals 3, obovate, yellow. Stamens 8. Capsules oblong- obcordate, pubescent, 0.35 across. Strophiole without appendage.


   Common in grassy fields river and canal banks. Collection : 634; Dungar.
16. CARYOPHYLLACEAE

1a. Sepals united. Petals long clawed, inserted together with the stamens on short gynophores:
   2a. Styles 2:
      3a. Epicalyx present. Calyx tube cylindric .................. 3. *Dianthus*
   2b. Styles 3 ................................................................. 6. *Silene*

1b. Sepals free or united at the base only:

4a. Stipules present, scarious:
   5a. Style 1, 3-partite:
      6b. Petals entire often absent. Leaves in pseudo-whorls .................. 5. *Polycarpaceae*
   5b. Style 3 or 5, free to the base .................. 7. *Spergula*

4b. Stipules absent:
   7a. Styles usually 3; capsules ovoid-ellipsoid to oblong:
      8a. Petals 2-partite or 2-lobed, rarely 0.
         Capsules dehiscent into valves upto the base or to the middle .................. 8. *Stellaria*
      8b. Petals entire. Capsules dehiscent into valves at the apex or to middle .......... 1. *Arenaria*
   7b. Styles usually 3-5. Capsules cylindrical .................. 2. *Cerastium*

1. *Arenaria* Linn.
   Ca 250 species; 22 species in India; 1 in MZN.
   **A. serpyllifolia** Linn., Sp. Pl. 423. 1753; FBI. 1: 239; FUGP. 1: 66; FD. 69; HFD. 69.

   Annual, erect or decumbent, much branched from base, upto 20 cm tall herbs. Stems rooting from lower nodes. Leaves sessile or subsessile, ovate- lanceolate, acute, mucronate, entire, 3-nerved from base, glabrous or hairy, upto 0.5 cm long. Flowers axillary, solitary; pedicel upto 2 cm long. Sepals 5, lanceolate, sharply acute, scarious on margins, upto 0.35 cm long. Petals 5, 0.15 cm, white. Stamens 10. Styles 3. Capsules ovoid, as long as or longer than sepals, 6-valved, upto 0.4 cm long. Seeds black, tubercled.
Fl. & Fr. : March- May.
Common weed of winter crops and on river banks, road sides. Collection : 2381; Kairana.

2. **Cerastium** Linn.

Ca 600 species; 7 species in India; 1 in MZN.


Annual, pubescent, viscid, herbs. Leaves 1.0-1.5 cm long, obovate- lanceolate, pubescent. Flowers white. Petals shoter or as long as sepals, sortly lobed. Styles 5. Capsules upto 0.8 cm long. Seeds tuberculate. Fl. & Fr. : Feb – May.
Growing rarely in waste places and crop fields. Collection : 2622; Gordhanpur.

3. **Dianthus** Linn.

Over 300 species; 10 species in India; 2 in MZN.

1a. Leaf margin serrate- ciliate. Flowers clustered……… **1. D. barbatus**

1b. Leaf margin entire. Flowers solitary…………………**2. D. chinensis**


Annual, erect herbs. Leaves serrate- ciliate; densely clustered inflorescence. Flowers usually red, spotted with white. Petals barbulate.
Fl. & Fr. : Jan.- March
Winter season ornamental herb. Collection : 364; Muzaffarnagar City.


Erect, glabrous, annual herbs. Leaves linear- lanceolate, opposite- decussate, entire, upto 8cm long. Flowers 3.5–4.0 cm across; white, pink or variously coloured. Epicalyx of bracts 4, upto 2 cm long. Sepals ciliate. Petals upto 4 cm long; limb dentate-laciniate, 1.2 cm across. Capsules upto 2.2 cm long. Seeds smooth.
Fl. & Fr. : Jan.- April.
Planted in gardens as winter ornamental herbs. Collection : 364a; Muzaffarnagar City.

4. **Drymaria** Willd.ex Roem. & Schult.

Ca 50 species; 2 species in India; 1 in MZN.


Decumbent or prostrate, minutely glandular pubescent, annual herbs. Stems rooting at nodes. Leaves broadly ovate, rounded at base, entire, apiculate; stipules lacerate; petioles upto 0.6 cm long. Flowers in lax glandular, repeatedly forked cymes; pedicels upto 0.5 cm long. Sepals 5, oblong, with pubescent keel, scarious on margins, apiculate tips. Petals 5, white, deeply 2-fid; lobes oblong, upto 0.25 cm long. Stamens 3. Style 2-3-fid. Capsules ovoid, trigonous, 0.25-0.3 cm long.

Fl. & Fr. : Dec.–March.

Occasionally found on moist and shady places. Collection : 1808; Kairana.


Ca 50 species; 3 species in India; 1 in MZN.


Erect, annual, dichotomously branched herbs, upto 25 cm tall. Leaves linear, sessile, mucronate, entire, 3-nerved on lower side, glabrous; stipules lanceolate to ovate-lanceolate, long tipped, upto 0.25 cm long, scarious. Flowers silvery white, crowded on much branched dichasial cymes, forming large flat heads. Bracts scarious; bristle pointed. Sepals 5, linear-lanceolate, scarious upto 0.25 cm long, acute. Petals 5, much shorter than sepals. Capsules 3-valved, brown; seeds obovoid; light brown.

Fl. & Fr. : Aug. - Nov.

Common in sandy–clayey soils fallow fields and on Ganga bank. Collection : 1017; Shukartal.

Plants are used in fever.


Over 500 species; 25 species in India; 1 in MZN


Erect, branched, glandular- hairy herbs upto 45 cm tall. Leaves lanceolate-oblong, acute, glandular hairy, upto 7 cm long. Flowers pinkish, in dichotomous leafy cymes; pedicels upto 2.5 cm long. Sepals hairy, upto 2 cm long. Petals small clawed, obovate limb, with two basal scales. Ovary incompletely 3-celled; styles 3. Capsules 1-2 cm long, ovoid, contracted above, crustaceous; seeds tubercled.
Fl. & Fr.: Jan. – April.

Common weed of rabi crop fields. Collection: 2419; Kandhla.

7. Spergula Linn.

5 species; 3 species in India; 2 in MZN.

1a. Capsules 5 valved; seeds granulate or papillose………………..1. S. arvensis

1b. Capsules 3 valved; seeds glaucous, smooth………………............2. S. fallax


Fl. & Fr.: Dec. - March.

Common winter season weed. Collection: 2076; Thanabhawan.


Erect, annual herbs branching from the base. Leaves linear, flat, obtuse, 1.5-3.0 cm long, in false whorls. Flowers white, in few to many flowered loose terminal cymes; pedicels upto 1.5 cm long. Sepals ovate, subobtuse, with scarious margins. Petals subobtuse. Capsules ca 0.5 across, margins winged, granulate or papillose, black.

Fl. & Fr.: Dec.- March.

Common weed of winter crops and on moist places. Collection: 2296; Jansath.

8. Stellaria Linn.

Ca 120 species; 20 species in India; 1 in MZN.


Diffused, glabrous, much branched, annual herbs. Leaves elliptic to oblong; uppers sessile; lower leaves long petioled. Flowers in leafy cymes; pedicels upto 2 cm long. Sepals 5, oblong, obtuse, acute, ciliate along margins, upto 0.5 cm long. Petals 5, white, bifid, upto 0.4 cm long. Stamens 3-10. Ovary 1-celled; styles 3. Capsules ovoid, 0.5 cm long, minutely longer than calyx; seeds brown, tubercled.
Fl. & Fr.: Dec. - April.
Abundant within the area along road sides, in crop, waste fields and moist localities.
Collection: 4541; Muzaffarnagar City.

Ca 5 species; 1 species in India; 1 in MZN.


Erect, stout, glabrous, annual, branching herbs. Leaves 2.0-8.0 cm long, ovate-lanceolate, acute or short acuminate, connate at base, sessile. Flowers in corymbose panicles; pedicels upto 5.5 cm long; bracts foliaceous. Calyx tabular; segments 5, upto 1.5 cm long with broad nerves. Petals 5, obovate clawed upto 1.7 cm long, pink. Stamens 10, alternate; filaments short. Styles 2, bearded above the middle. Capsules ovoid, globose, included within the calyx; seeds black, granulate.

Fl. & Fr.: Feb. - April.
Common weed of winter season crops. Collection: 2462; Budhana.

17. PORTULACACEAE

*Portulaca* Linn.
Ca 200 species; 7 species in India; 2 in MZN.

1a. Stem nodes without hairs..........................................................1. *P. oleracea*
1b. Stem nodes with short haris..........................................................2. *P. quadrifida*

Vern. *Nunka*

Erect or prostrate ascending, more or less succulent, annual herbs. Stem branched, reddish purple. Leaves oblong- obovate, linear or spatulate. Flowers solitary or in clusters of 2-6, sessile, subtended by 3-4 leaves. Sepals 2, acute, persistent, glabrous outside, upto 0.3 cm long. Petals 5, yellow, obovate, upto 0.4 cm long, falling soon. Stamens 8-12. Seeds many, reniform, mucronate, black.

Fl. & Fr.: Throughout the year.
Commonly growing in waste-places, gardens and crop fields. Collection: 20; Muzaffarnagar City.
Various parts of the plant are used in medicines.
2. **P. quadrifida** Linn., Mant. 1: 73. 1767; Roxb. Fl. Ind. 2: 464; FBI. 1: 247; FUGP. 1: 70; FD. 70. Vern. *Lonia*.

Prostrate, succulent, diffused annual herbs, with many filiform branches rooting at nodes. Leaves subsessile, opposite, ovate to ovate-lanceolate, acute, entire, glabrous, fleshy. Nodal hairs white, upto 0.5 cm long, in a ring. Flowers terminal, solitary, surrounded by 4–5 leaves and long silky hairs. Calyx half inferior, upto 0.2 cm long. Petals 4, yellow, oblong-ovate. Stamens 8. Style 4-fid. Seeds black, tubercled, upto 0.1 cm across.

**Fl. & Fr.**: July–Nov.

Common in moist, waste places and agriculture fields. Collection: 2078; Thanabhawan.

Plants are used as vegetable by poor classes.

18. **TAMARICACEAE**

*Tamarix* Linn.

Ca 90 species; 7 species in India; 3 in MZN.

1a. Leaf sheaths completely encircling the nodes:

2a. Trees; flowers bisexual in lax, racemose panicles ……………1. **T. aphylla**

2b. Shrubs; flowers unisexual, in dense cylindrical spikes………2. **T. dioica**

1b. Leaf-sheaths not completely encircling the nodes; flowers bisexual.3. **T. troupii**


Large shrubs or moderate-sized trees upto 6 m tall. Branches articulate at the base of sheath with punctuate gland. Leaves reduced to triangular teeth, sheathing. Flowers pink, hermaphrodite, in slender spikes, arranged in loose panicles. Bracts shorter than the flowers. Stamens 5, inserted in the alternate notches of 10-lobed disc. Capsules trigonous, rounded at tip.

**Fl. & Fr.**: Dec.-April.

Growing or planted on road sides. Collection: 2073; Thanabhawan.


Moderate-sized shrubs with long drooping branches upto 2 m tall. Leaves scaly, minute, closely appressed, greyish-green, persistent, obliquely deltoid apex.
Flowers dioecious, in compact cylindrical panicled spikes; bracts equalling the flowers, triangular, with white margins. Sepals 5, ovate, obtuse. Petals 5, oblong, pinkish–red, emerginate. Male flower: stamens 5; filaments inserted into disc. Female flower: ovary 1-celled; styles 3. Capsules globose or ovoid, 0.2 cm long.

Fl. & Fr. : July–Oct.

Branches are used for basket making.

3. **T. troupii** Hole. in Ind. For. 45: 248. 1919; FD, 71. *T. gallica* (non. Linn)


Fl. & Fr. : Aug.–Sept.
Common in sandy and saline soils along river banks. Collection : 894; Kairana.

19. **ELATINACEAE**

**Bergia** Linn.

Ca 30 species; 5-6 species in India; 1 in MZN.


Annual, erect or decumbent, hairy herbs. Leaves subsessile, lanceolate- elliptic to oblong, subacute to obtuse, serrate. Flowers minute, reddish, in dense axillary fascicles. Sepals 5, lanceolate, denticulate. Stamens 5. Capsules ovoid, 0.2 cm across. Seeds many, ovoid.

Fl. & Fr. : Nov–May.
Growing on river banks, marshy places grassy localities. Collection : 2602; Gordhanpur.

20. **MALVACEAE**

1a. Styles as many as the carpels:

2a. Carpels 2 or more seeded, bracteole 0 ............2. *Abutilon*

2b. Carpels 1- seeded :

3a. Stigma linear:
4a. Bracteoles 6 - 9 …………………………….3. Alcea
4b. Bracteoles 3………………………………..7. Malva

3b. Stigma capitate:

5a. Bracteole 3……………………………….8. Malvastrum
5b. Bracteole 0………………………………..10. Sida

1b. Styles twice as many as the carpels:

6a. Fruits indehiscent, separating into 1 –seeded mericarps:

7a. Flowers solitary or in clusters of 2-3 in axil of upper leaves……………………..12. Urena
7b. Flowers in racemose leafless clusters…………9. Pavonia

6b. Fruits dehiscent, capsular:

8a. Stigmas connate:

9a. Seeds densely clothed with woolly hairs..5. Gossypium
9b. Seeds not hairy………………………11 Thespesia

8b. Stigmas spreading:

10a. Calyx caducous……………………..1. Abelmoschus
10b. Calyx persistent:

11a. Flowers drooping…………4. Fioria

1. Abelmoschus Medik.

15 species; 6 species in India; 3 in MZN.

1a. Capsules sparsely hairy and 10-20 cm long………………1. A. esculentus
1a. Capsules coarsely or bristly hairy and 4-7 cm long

2a. Stem retrorsely hairy, hispid to prickly……………………2. A. moschatus
2b. Stem with strigose hair……………………………………..3. A. tuberculatus


Erect, coarsely hairy annual, branched herbs upto 1.5 m tall. Leaves ovate-cordate, variously dissected, usually 5-7 lobed. Flowers large, yellow with crimsom centre, axillary and solitary. Pedicles elongated when fruiting. Capsules fusiform, upto 20 cm long, ribbed; locules with densely bristly hairy margins. Seeds round, white, black when mature.

Fl. & Fr.: March- Oct.

Cultivated vegetable crop. Collection: 3174; Jaroda.
Capsules are used as vegetable & seeds in medicines.


Annual, much-branched, hispidly hairy, under-shrubs. Leaves long petioled, 4-5 lobed, cordate; lobes lanceolate-oblong or linear, toothed margins. Flowers yellowish white with reddish centre, axillary, solitary. Capsules upto 5 cm long, ovoid or globose. Seeds musky, glabrous.

Fl. & Fr. : Nov. - Feb.

Occasionally cultivated for its stems used in Gur preparation. Collection : 173; Muzaffarnagar City.

The stems and branches are used in Gur industry.


Annual herbs upto 1.75 m tall with strigose hair on stem. Leaves palmate-partite, 5-7 lobed, 10-15 cm long; lobes broadly ovate margins crenulate. Flowers yellow with a basal purple eye, arranged in long racemes. Epicalyx of 6-12 subequal bracteoles. Sepals 5, spathaceous, caducous. Petals with an irregular purple spot in the centre. Stigma scarlet. Fruits 4-7 cm long, oblong with blunt apex, 5- ridged, covered with bristly tuberculate hair. Seeds round, black.

Fl. & Fr. : June - Oct.

Rarely growing in wild conditions. Collection : 2347; Oon.

2. **Abutilon** Mill.

Ca 150 species; 11 species in India; 3 in MZN.

1a. Carpels with awns ........................................... 2. **A. indicum**

1b. Carpels without awns:

2a. Carpels 8 – 10........................................... 3. **A. ramosum**

2b. Carpels 20 – 25........................................... 1. **A. hirtum**


Perennial undershrubs with glandular pubescent hairy branches. Leaves upto 7.5 cm long, orbicular-cordate, acuminate or palmately lobed. Petiole almost equalling the blade. Stipules linear- falcate. Flowers orange with a dark centre. Sepals 0.8-1.0 cm long, acuminate, densely pubescent. Carpels 20-25, rounded, hairy upward.
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Fl. & Fr. : July- Oct.
Rarely found in jungle and waste lands. Collection : 1519; Jaroda.


Robust, tomentose shrubs, branched, upto 1.5m tall. Leaves cordate, ovate, acuminate, coarsely toothed, upto 10 cm long, minutely pubescent on both surfaces; petioles equalling the blade; stipules lanceolate, subulate, reflexed. Flowers orange-yellow, on long pedicels. Calyx lobes ovate apiculate, pubescent. Carpels 12-20, much longer than calyx, with short spreading awns. Seeds dark brown to black.

Fl. & Fr. : Major part of the year.
Common along road sides, waste places. Collection : 1651; Khatauli

Fibres are obtained from stems and branches. Seeds are used medicinally.


Small shrubs with drooping brances and dull whitish bark. Leaves ovate-cordate, acuminate, crenate-serrate, hairy on both sides upto 8 cm long. Petioles upto 5 cm long. Flowers yellow, small in axillary and terminal cymes. Pedicels jointed near the apex. Calyx cup-shaped, viscous-pubescent; lobes acuminate, upto 0.8 cm long. Carpels 8-10, pubescent. Fruits upto 1 cm long. Seeds 2-3 in each carpel, 0.2 cm across, rugose, papillose.

Fl. & Fr. : Aug- Oct.
Occuring in wild conditions near railway lines. Collection : 5085; Shamli

3. **Alcea** Linn.

Ca 20 species; 3 species in India; 1 in MZN.

**A. rosea** Linn., Sp. Pl. 687, 1753. *Althea rosea* (Linn.) Cav., Diss. 2: 91. t. 28. f,1. 1786; FBI.1: 319; FUGP. 1: 78; HFD. 84. Vern. **Holyhock.**

Erect, branched, hairy, annual herbs. Lower leaves long petioled, sub-orbicular-rounded or ovate, crenate serrate; upper ones short petioled. Flowers pink, red or white, 4-10 cm across, solitary or axillary. bracteole 6-9. calyx 1-2 cm long, pubescent. corolla often double. Capsules 1.5-2.0 cm across, hairy, mericarps orbicular.

Fl. & Fr. : March- June.
Planted as ornamental and also met as an escape. Collection: 127; Muzaffarnagar City.

4. Fioria Linn.


Erect, much branched, hispidly hairy perennial herbs. Leaves 3-5 cm long, cordate, palmately 3-5 lobed, tomentose on both sides; lobes oblong- lanceolate, serrate. Petiols 4-6 cm long. Flowers yellow with purple centre, drooping, solitary, axillary. Bracteoles 5-8, setaceous, linear, shorter than calyx. Sepals lanceolate, connate below the middle, acute, pubescent. Corolla yellow with a purple centre. Capsules 5-winged, beaked, hairy, shorter than the enlarged spreading calyx. Seeds tubercled.

Fl. & Fr.: Sept.- Nov.

Found on roadsides, gardens, and other waste places. Collection: 3152; Jaroda.

Bark yields a strong silvery fibre.

5. Gossypium Linn.

Over 20 species; 3 species in India; 3 in MZN.

1a. Bracteoles united, not pectinate:

2a. Flowers purple……………………………………1. **G. arboreum**

2b. Flowers yellow with purple claw……………………2. **G. herbaceum**

1b. Bracteoles quite free, pectinate; leaves hirsute………..… 3. **G. hirsutum**


Erect, annual, branched, shrubs up to 1.5 m tall, stellate hairy. Leaves palmate-partite, 3-5 segmented; segments acuminated, entire, cordate, glabrous, gland dotted, up to 8.5 cm long. Petioles up to 2.0 cm long. Stipules linear lanceolate, acuminate, glabrous, up to 1 cm long. Flowers axillary, solitary, 2.5 cm across. Pedicels up to 3 cm long, hairy; bracteoles up to 2.5 cm long, ovate, remotely serrate. Calyx cupular with 5 small segments. Corolla light yellow with purple centre. Capsules globular, 3-4 locules. Seeds fuzzy with white coarse lint.

Fl. & Fr.: July- Nov.

Cultivated field crop and also met as an escape. Collection: 5043; Bhopa.

Capsule yields high quality of cotton.

Erect, annual, hairy shrubs with woody stems. Leaves 5-7 lobed; stipules falcate. Bracteoles-epicalyx with 6-8 serrated teeth on the margin, broadly triangular, cordate. Flowers large, yellow with purple centre. Calyx with black glandular dots. Capsules round or ovate, pointed 3-4 locular. Seeds fuzzy with white lint.

Fl. & Fr. : Aug. - Nov.

Cultivated as kharif crop. Collection : 3114; Titavi.

Capsules yield high quality of cotton and seeds are used as cattle feed and oil also extracted.


Erect, much branched, coarse bushy herbs. Leaves simple to 5-lobed, 6-10 cm long, acuminate, entire, cordate; lobes triangular-ovate. Petals upto 10 cm long, hairy. Stipules upto 1.2 cm long, lanceolate-ovate, acuminate, hairy. Flowers axillary, solitary, pale-yellow, 3.5 cm long. Pedicels upto 2 cm long; bracteoles 7-9, ovate, cordate at base, upto 3 cm long with 7-9 linear-lanceolate, acuminate segments, hairy outside, many nerved. Calyx lobes small, obtuse. Petals upto 4 cm long. obovate. Staminal column upto 1.5 cm long. Capsules ovoid, glandular, beaked.

Fl. & Fr. : July- Oct.

Cultivated as field crop. Collection : 5062; Kandhla.

High quality cotton and oily seeds are obtained from capsules.

6. **Hibiscus** Linn. nom. cons. prop

Ca 300 species; 30 species in India, 5 in MZN.

1a. Plants wild:

2a. Bracteole absent..................................................2 **H. lobatus**

2b. Bracteoles present...............................................3 **H. ovalifolius**

1b. Plants cultivated:

3a. Staminal tube much exerted:

4a. Petals entire......................................................4 **H. rosa-sinensis**

4b. Petals laciniate...................................................5 **H. schizopetalous**

3b. Staminal tube not exerted.................................1 **H. cannabinus**

Erect, annual simple or branched herbs up to 2.5 m tall. Leaves broad, ovate, 3-5 lobed to compound with linear, lanceolate, acuminate, serrate segments; petioles prickly, equaling the leaves. Flowers solitary, axillary, 5-6 cm across; pedicel 0.5 cm long; epicalyx 8-10, linear, up to 1.0 cm long. Calyx 2-2.5 cm long, white tomentose outside; segments linear, setaceous. Corolla up to 4.0 cm long, yellow, violet at base; petals obovate. Capsules globose, pointed, bristly, 1-2 cm long.

Fl. & Fr. : Sept. – Nov.

Cultivated usually as mixed crop. Collection : 186; Muzaffarnagar City.

Fibre is obtained from stems. Various parts of the plant are used medicinally.


Erect, simple or branched, annual, pubescent, up to 50 cm tall herbs. Leaves ovate, cordate, long petioled up to 6.0 cm long acute or acuminate, serrate, stellate-hairy; lower ones 3-partite, up to 6 cm long; upper ones smaller, entire. Petioles up to 7.5 cm long. Flowers solitary, axillary, white, up to 1.5 cm long. Pedicel up to 1 cm during anthesis, up to 3 cm long later on. Bracteole 0. Calyx 0.5 cm long, divided halfway down, pubescent. Petals 5, obovate, 1.5 cm long, yellow. Capsules oblong, hairy at tip, 1.2 cm long. Seeds brown, 0.2 cm across, tubercled.

Fl. & Fr. : Sept. - Nov.

Common on moist places, sandy river banks and waste lands. Collection : 5077; Shamli.


Erect, perennial, branched or often unbranched up to 3 m tall shrubs. Leaves up to 2.5 cm long, ovate-oblong, serrate or entire. Petiole very short. Flowers white, axillary. Peduncles often longer than leaves. Bracteoles 7–8, linear-filiform. Capsules globose, up to 1 cm in diam. Seeds covered with cottony hairs.

Fl. & Fr. : July- Oct.

Common on river banks, amongst bushes. Collection : 2346; Chausana.

Fruit is edible.

Perennial, evergreen, branched, upto 3 m tall shrubs. Leaves glabrous, 5-10 cm long, ovate- acuminate, coarsely serrate, 3-nerved at the base. Stipules linear. Flowers red, solitary, from the upper axils. Bracteoles 7-9, linear, shorter than the calyx. Petals 5, crimson with a dark eye, obovate, obtuse. Staminal tube red, exceeding the corolla. Ovary conical, obtuse. Fruits ovoid, beaked.

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

Planted in gardens. Collection: 608; Bhopa.

H. rosa-sinensis Linn. var. schizopetalus Mast. in Gard. Chron. 282. 1879.

Large, glabrous shrubs with drooping branches. Leaves 5-10 cm long, ovate, Elliptic, acute or acuminate, dentate. Flowers red or reddish-purple. Pendulous on long peduncles. Calyx tubular. Petals recurved, deeply laciniate. Staminal column long, exerted.

Fl. & Fr.: Aug.-Nov.

Planted in gardens. Collection: 2752; Muzaffarnagar City.

7. Malva Linn.

Ca 40 species; 5 species in India; 1 in MZN.


Erect, glabrous, much branched, annual upto 1 m tall herbs. Leaves cordate, rounded, 5-7 lobed, obtuse, crenate; petioles upto 7 cm long; stipules ovate, acuminate, 0.5 cm long. Flowers in axillary fascicles, white or purplish white, 3 cm across. Pedicels 0.5 cm long. Petals longer than sepals, notched at apex. Carpels 10-12. Capsules 0.6 cm across; mericarps reticulate.

Fl. & Fr.: Jan.-Oct.

Common on waste places, fields, road sides. Collection: 3526; Ailum.


Ca 12 species; 2-3 species in India; 1 in MZN.

M. coromandelianum (Linn.) Gracke, Bonplandia 5: 295. 1857; FD. 77; HFD. 89.

Erect, suberect or ascending, branched, appressed hairy herbs upto 60 cm tall. Leaves ovate to ovate-lanceolate, crenate-serrate, acute, hairy, upto 5 cm long. Flowers yellow, solitary or 2-3 together in leaf-axils. Bracteoles 3. Calyx lobes
triangular, divided half way down, 5 lobed. Petals obcordate, upto 1.0 cm long, yellow. Carpels 10-12. Capsules upto 0.8 cm across.

Fl. & Fr. : Major part of the year.
Common along road- sides, waste lands and fields. Collection : 3119; Bhopa.

Ca 200 species; 7 species in India; 1 in MZN.
P. repanda (J. E. Sm.) Sprang., Syst. 3: 98. 1826. Urena repanda Roxb. (Hort. Beng. 51. 1814, nom. nud.) ex Sm. in Rees, Cyclop. 37. n. 6. 1819; FBI. 1: 330; FUGP.1: 85; HFD. 93.

Erect, branched, hairy undershrubs. Leaves upto 10 cm long, round- cordate, 5-7 palmati-lobed, rough above, glandular at the base, repand serrate. Flowers in racemose leafless cluster, pink with a dark centre. Bracteoles 5 upto 0.8 cm long, connate below into a ribbed cup. Mericarps unarmed, smooth. Seeds smooth.

Fl. & Fr. : July- Nov.
Rarely occurs on waste lands and sandy soils. Collection : 5012; Muzaffarnagar City.

10. Sida Linn.
Ca 200 species; 9 species in India; 6 in MZN.

1a. Petioles with two recurved spines at the base…………… 2. S. alba

1b. Petioles not spiny:
2a. Procumbent trailing herbs………………………….. 3. S. cordata
2b. Erect small shrubs:
3a. Awns half the length of calyx:
4a. Leaves narrowly elliptic-
lanceolate, glabrous on
both surfaces, serrate……………. 1. S. acuta

4b. Leaves broadly ovate or orbicular:
5a. Leaves toothed pubescent
beneath.........................6. S. rhombifolia

5b. Leaves hairy on both sides…..5. S. ovata

3b. Awns as long as or exceeding the calyx……..4. S. cordifolia

Erect, perennial, much branched, hairy herbs or undershrubs. Leaves 2-6 cm long, lanceolate to elliptic-lanceolate, round or acute base, serrate-dentate, glabrous or appressed hairy; petioles upto 0.4 cm long; stipules two; one linear-lanceolate and other linear-filiform, upto 0.8 cm long. Flowers axillary, solitary, 1.2 cm across; pedicel 0.3 cm or more. Calyx 5 lobed, angular, divided half way down; lobes triangular, acute to acuminate, ciliate. Petals 0.5 cm across, rugose-2-awned.

Common on road sides, waste places and gardens. Collection: 3107; Baghra.


Erect, pubescent, branched, perennial undershrubs. Stems rough with hairs, spines at the nodes below the petioles. Leaves upto 3 cm long, broadly ovate or obovate, obtuse, serrate-crenate, glabrous above, pubescent beneath; petioles upto 1.5 cm long. Flowers 1.7 cm across, white, long jointed pedicels, usually in axillary fascicles. Calyx hairy, cup-shaped. Fruits of 5 carpels topped by rough erect beaks. Seeds black, glabrous.
Fl. & Fr.: Sept.-Dec.

Rarely found on waste places, road-sides. Collection: 2896; Lachheda.


Prostrate, decumbent-ascending, densely stellate-pubescent, annual herbs. Leaves 2-3 cm long, ovate-cordate, acuminate, serrate, alternate; petiole upto 3 cm. Flowers solitary, axillary, 1.5 cm across; pedicel upto 3 cm long, jointed above, villous. Calyx divided half way down, triangular, acuminate, 3.5 cm long, white hairy. Petals upto 0.8 cm long, obcordate, orange yellow. Capsules subglobose, 0.3 cm across, smooth. Seeds black, glaucous.
Fl. & Fr.: June-Oct.

Common along road-sides, waste places in gardens. Collection: 4102; Bharsi.

Erect, robust, stellate-tomentose, perennial, branched, herbs, upto 80 cm tall. Leaves ovate-oblong, cordate, obtuse or acute, crenate-serrate, hairy on both sides. Petioles upto 3 cm long, hairy; stipules linear. Flowers axillary, solitary in fascicles; peduncles upto 2 cm long, jointed above the middle, hairy. Calyx grey, pubescent, upto 0.7 cm long. Corolla yellow, upto 0.8 cm long. Capsules 0.7-0.8 across. Mericarps 10, glabrous, rugose, two awned.

**Fl. & Fr. : Sept - Nov.**

Common on waste places, road sides. Collection : 4037; Ailum. Fibre is obtained and the seeds are used in leucorrhoea, spermatorrhoea and gonorrhoea.


Erect, branched, stellate hairy, perennial undershrubs. Leaves upto 3.5 cm long, oblong-ovate, obtuse, crenate, hairy on both sides. Petioles upto 1.5 cm long. Flowers solitary on peduncles, jointed just below the calyx. Calyx campanulate, 5-lobed; lobes subacute, upto 0.6 cm long. Petals yellow, obliquely obovate. Fruits with 5-8 laterally reticulate, nearly glabrous mericarps with 2 linear, short awns.

**Fl. & Fr. : Sept- Jan.**

Occasionally found on waste lands, road sides. Collection : 2284; Mirapur.


Erect, branched, hairy under shrubs. Leaves 3-5 cm long, broadly ovate or nearly orbicular, variable in shape and size, acute or acuminate or obtuse, rounded or cuneate base, hairy above. Petioles upto 1.0 cm long. Flowers solitary in axils of leaves or clustered at the ends of branches. Peduncles upto 1.5 cm long, joined near the middle. Calyx upto 0.8 cm long, 10-nerved; lobes ovate-triangular, acute-sub acuminate. Petals glabrous within, hairy outside. Carpels 5-10, pubescent, with short awns.

**Fl. & Fr. : Oct. - Jan.**

Common on road sides, waste places. Collection : 1408; Bahadurpur.


Ca 15 species, 1 species in India; 1 in MZN.

Perennial, branched, small, trees with dense top. Leaves 5-12 cm long, cordate, entire, ovate acuminate, long pétioled. Flowers yellow to purple, axillary. Carpels upto 2.0 cm across, depressed, glabrous.

Fl. & Fr. : March- June.

Occasionally cultivated in gardens. Collection : 4083; Kandhla.

**12. Urena Linn.**

Ca 6 species; 2 species in India; 1 in MZN.


Erect, branched, stellate hairy. Undershubs upto 1.5 m tall. Leaves variable in shape and size, broader than length, ovate-suborbicular, subcordate, serrate-entire, 3- nerves prominent beneath from base, white tomentose beneath. Flowers solitary or in clusters of 2-3, in the axils of upper leaves. Epicalyx lanceolate. Calyx lobes ovate, acute. Corolla upto 1.8 cm long, pink. Carpels 5, armed with hooked bristles.

Fl. & Fr. : June- Jan.

Common on moist and shady places, along canal banks, railways lines. Collection : 237; Mansoorpuri.

Stem fibre used for rope and coarse fibres.

**21. BOMBACACEAE**

**Bombax** Linn.

8 species; 2 species in India; 1 in MZN.


Large, deciduous trees upto 15 m tall with spreading branches, covered with conical prickles. Leaves digitate; common petiole upto 10 cm long; leaflets 5-7, lanceolate, acuminate, entire, upto 16 cm long. Flowers axillary, solitary, 8-10 cm across, fleshy. Calyx cup- shaped, thick, silky inside. Corolla crimson-orange. Capsules oblong- ovoid, 5- angled, 10-12 cm across. Seeds obovate, surrounded by long white silky hairs.

Fl. & Fr. : Feb.-May.
Planted in parks, gardens and on road sides. Collection : 3503; Muzaffarnagar City. The wood is used for various purposes. The silk around the seeds produce cotton. Seeds are given to cattles as food. The calyx is used as vegetables.

B. *insigne* Wall. Unarmed tree is also planted in parks for its ornamental pink flowers.

### 22. STERCULIACEAE

1a. Flowers polygamous. Petals 0 ……………………

1b. Flowers bi-sexual. Petals 5 :

2a. Anthers 5; capsule 5 valved ……………………

2b. Anthers more than 5:

3a. Petals deciduous:

4a. Fruit a woody capsule;

seeds winged ………………… 5. *Pterospermum*

4b. Fruit of spirally twisted

follicles; seeds not winged……2. *Helicteres*

3b. Petals persistent:

5a. Leaves hastate- lanceolate;

style spirally twisted ……………4. *Pentapetes*

5b. Leaves cordate, angled or

lobed; style not spirally twisted …………………1. *Dombeya*

1. *Dombeya* Cav. nom. cons.

Over 300 species; few species cultivated in India; 2 in MZN.

1a. Leaves cordate; flowers pink……………………………1. *D. cayeuxii*

1b. Leaves orbicular- cordate; flowers………………………2. *D. mastersii*

1. *D. cayeuxii* Hort., MCP. 669; FD. 86.

Branched, perennial shrubs. Leaves cordate upto 18 cm long dentate, densely tomentose beneath. Flowers pink on hairy pendulous, many flowered umbels, subtended by large ovate bracts.

Fl. & Fr. : March - May.

Planted for ornamental flowers in gardens. Collection : 3576; Bhopa.

2. *D. mastersii* Hook. f. in Bot. Mag. 93, t. 5639. 1867; FD. 86.

Large, perennial, branched shrubs. Leaves orbicular- cordarte, upto 13 cm long, serrate,usually 3-lobed, acuminate, slightly hairy above, densely tomentose
beneath; petiole upto 7cm long. Flowers white, many in axillary umbels; peduncles villous. Ovary densely villous. Seeds 0.2 cm long, truncate at the ends.

Fl. & Fr. : Feb- May.

Cultivated in gardens for beautiful flowers. Collection : 2343; Oon. Fiberes extracted from its bast.

2. *Helicteres* Linn.

Ca 60 species; 4 species in India; 1 in MZN.


Erect, branched, shrubs upto 2 m tall, young parts brown pubescent. Leaves 4-10 cm long, orbicular, acuminate, base cordate, serrate; petiole upto 5 cm long; stipules equalling the petiole, subulate, 2-4 toothed. Flowers scarlet, solitary or in few flowered cymes. Calyx 1.6 cm long, two lipped, brown hairy outside. Petals 5, scarlet, unequal, long clawed. Fruits 4-6 cm long, cylindrical, pubescent; carpels twisted.

Fl. & Fr. : May- Nov.

Common in Shukartal forest. Collection : 616, Shukartal.

The fruits and leaves are used in medicines, the bark also yields a strong fibre.


Ca 73 species; 2 species in India; 1 in MZN.


Erect, branched, annual herbs upto 80 cm tall. Stem nearly glabrous. Leaves variable in size and shape upto 6 cm long, 5- nerved from base. Flowers pinkish white, in dense terminal or axillary clusters with several bracteoles. Capsules globose, hispid, 0.5 cm in diam; seeds angular.

Fl. & Fr. : Aug.- Dec.

Common along ponds, ditches, and canal banks in the shade of bushes. Collection : 110; Muzaffarnagar City.


A monotypic genus.


Erect, branched, annual herbs upto 1.5 m tall. Leaves upto 10 cm long, haste-lanceolate, strongly crenate-serrate, glabrous above, thinly hairy beneath; petiole upto 2.5 cm long; stipule equalling the petiole, linear. Flowers axillary or terminal, 1-2
flowerd, jointed near the top. Sepals 5, lanceolate, acute. Petals 5, obovate, red. Capsules sub-orbicular, 1.3 cm across, with persistant calyx, bristly. 
Fl. & Fr. : Dec- April.
Sometimes cultivated in gardens for showy flowers. Collection : 2257; Jansath.

5. Pterospermum Schreb. nom. cons. 
Ca 40 species; 12 species in India; 1 in MZN.
Medium-sized trees with grey bark and young parts tomentose. Leaves large, oblong or round upto 18cm long, lobed, entire, cordate or peltate, obtuse or acuminate, glabrous above; petiole upto 6 cm long; stipules caducous. Flowers axillary, solitary or in 2- flowered cymes, 8-11 cm long; pedicel 0.5-0.8 cm long; bracts many, linear-lanceolate. Calyx 5, deeply lobed, linear upto 10 cm long. Petals deciduous. linear. Capsules 1-10 cm long, woody, 5- angled; seeds with membranous wings. 
Fl.: March- July; Fr. : July- Sept.
Planted in gardens and along road sides. Collection : 2242; Mirapur.
The calyx is considered useful in swellings. Leaves used for packing, wood used for packing cases, planks, turnery articles & plywood.

6. Sterculia Linn. 
Ca 20 species; 12 species in India; 1 in MZN.
Medium- sized, deciduous trees; branches marked with large scars and grey bark. Leaves at the end of branches, large, 20-40 cm across, 5-7 lobed; lobes ovate-oblong, acuminate; petioles 30-50 cm long, hollow. Flowers in drooping panicles at the end of leafless branches, yellow. Calyx campanulate, pinkish within, downy outside. Fruit of about 5 follicles; follicle sessile, spreading, coriaceous, rusty- villous, red within; seeds smooth, black. 
Fl. & Fr. : March- July. 
Rare in jungle area. Collection : 2299; Jansath.

23. TILIACEAE

1a. Trees or shrubs; fruits drupaceous …………………. 2. Grewia
1b. Herbs or undershrubs; fruits capsular:

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
2a. Fruits smooth, not prickly ..........................1. Corchorus
2b. Fruits stellette hairy, prickly ........................3. Triumfetta

1. Corchorus Linn.

Ca 100 species; 10 species in India; 5 in MZN.

1a. Capsules depressed- globose ..........................2. C. capsularis
1b. Capsules longer than broad, cylindical:

2a. Capsules stout, winged.................................1. C. aestuans
2b. Capsules slender, not winged:

3a. Capsule beak – 3 fid, spreading ..............4. C. tridens
3b. Capsule beak straight, not divided:

4a. Capsules 10- ribbed, beak
   long............................................. 3. C. olitorius
4b. Capsules 3-4 angled, beak
   short ...........................................5. C. trilocularis


Prostrate or suberect, annual, branched, hairy herbs upto 35-40 cm tall. Leaves ovate-lanceolate, acuminate, rounded at base, serrate; petioles 1-1.5 cm long, pilose, grooved. Flowers yellow 2-3 in short, leaf- opposed cymes; 0.6-0.5 cm across, pedicel short, elongated in fruit. Capsules short, 6- angled, cylindic, erect, 2-5 cm long; beak 3- fid, spreading, toothed; seeds truncate, dark brown.

Fl. & Fr. : July- Oct.

Common near water resources, gardens and crop fields. Collection : 2071; Jhinjhana. A coarse fibre is obtained from the plant.


Erect, much-branched, glabrous, annual herbs. Leaves ovate-lanceolate, 5-9 cm long, acuminate, serrate, rounded at base; petioles 0.5-2.2 cm long. Stipules linear, acuminate. Flowers axillary, 1-3 together, 0.6-0.8 cm across; pedicel short upto 0.15 cm long. Petals yellow, obovate, 0.4 cm long. Capsules globose, depressed at the apex, upto 1 cm in diam, tidged, muricate, 5- celled. Seeds wedge-shaped, smooth.

Fl. & Fr.: July- Nov.

Occurs in moist and swampy places, road sides. Collection : 2674; Gordhanpur.
The plants yield a high quality fibre. The leaves are used medicinally.

3. **C. olitorius** Linn., Sp. Pl. 520. 1753; FBI. 1: 367; FUGP. 1: 120; FD. 88; HFD. 96.

   Erect, stout, much- branched, annual herb upto 70 cm tall. Leaves elleptic-lanceolate, 6-13 cm long, acuminate, or acute, closely serrate, nearly glabrous. Flowers yellow 1 or 2 together, subsessile, axillary or leaf-opposed. Capsules 3-6 cm long, 3-6 valved longitudinally; beak upto 0.5 cm long, 5 dentate.

   Fl. & Fr. : Aug- Nov.

   Common on waste places and road- side. Collection : 2688; Podawali.


   Erect or suberect, branched, glabrous, annual herbs. Leaves lanceolate-oblong, rounded at base, serrate, acute, 2-8 cm long; petioles upto 1.2 cm long. Flowers 1-4 together, axillary or in leaf-opposed cymes, yellow; pedicel short. Capsules 2-3.5 cm long, slightly curved, glabrous, terminating into a 3-bifid, spreading or deflexed horns.

   Fl. & Fr. : Aug- Oct.

   Common in cultivated fields on waste places and moist soils. Collection : 2899; Lachheda.

5. **C. trilocularis** Linn., Mart. 77. 1767; FBI. 1: 397; FUGP.1: 120; FD. 89. Vern. *Kag- tori*.

   Diffused, hairy, under-shrubs, branching from near the ground. Leaves upto 6 cm long, elliptic- oblong to lanceolate, crenate-serrate with or without basal lobes; petiole short upto 0.5 cm long. Flowers yellow, leaf opposed; peduncles very short. Capsules straight or curved, 2.5- 7 cm long, 3-4 angled; beak short, erect; seeds obliquely truncate at the ends.

   Fl. & Fr. : Aug- Oct.

   Common in rainy season in moist, shady places and a weed in cultivated fields. Collection : 3618; Sherpur.

2. **Grewia** Linn.

   Ca 150 species; 42 species in India; 1 in MZN.

**G. asiatica** Linn., Mant. 1:122. 1767; Roxb. Fl. Ind. 2: 586; FBI. 1: 386; FUGP. 1: 113; FD. 87. Vern. *Phalsa*.

Medium- sized trees, bark grey. Inflorescence grey or yellow tomentose. Leaves obliquely ovate, 8-13 cm across, cordate, acuminate; petiole 0.5-1 cm long. Flowers
axillary clusters 1.4 cm across, 2-3 together. Drupes subglobose, obscurely 4- lobed, black when ripe, sweet and acidic.

Fl. & Fr.: April- Aug.

Common in forest area and also planted in gardens. Collection : 994; Jaroda.

The fruits are eaten. The wood is used variously.

3. **Triumfetta** Linn.

Ca 150 species; 8 species in India; 2 in MZN.

1a. Perennials Fruits larger; spines long, hispid on their lower edges..1. *T. pilosa*

1b. Annuals Fruits smaller; spines short, glabrous.........................2. *T. rhomboidea*


Erect, annual-perennial, densely stellate hairy, herbs or shrubs. Leaves: lower ones 3-lobed, hairy on both sides; upper ones ovate or ovate-lanceolate, 3- 8 cm long, toothed, villous; petiole 0.6-0.8 cm long. Flowers yellow, in cymes at the nodes. Sepals linear, apiculate. Petals oblong-spathulate, equalling the sepals, hairy at the base. Capsules globose, 0.5-0.6 cm across (excl. prickles) 4- celled, 8 seeded; spines long, sharply hooked.

Fl. & Fr. : Aug- Oct.

Not uncommon in jungles among bushes. Collection : 36; Muzaffarnagar City.


Erect, coarse herbs or under shrubs, branching from the base. Leaves variable in shape, ovate- rhomboid or cordate, 3-7 nerved, apex acute or 3 lobed, serrate. Flowers yellow in dense cymes at the nodes. Petals hairy at the base. Fruits 0.4-0.6 cm across, globose, tomentose between the hooked prickles.

Fl. & Fr. : Aug- Nov.

Occuring during rainy season under shade of trees and shrubs. Collection : 3764; Muzaffarnagar City.

Stem yields a soft glossy fibre.

24. **LINACEAE.**

*Linum* Linn.
Over 200 species; 4 species in India; 1 in MZN.


Erect, annual herbs up to 45 cm tall. Leaves lanceolate, linear to oblong, 5 cm long, entire, glabrous. Flowers solitary, leaf-opposed, combined into leafy corymbs, up to 1.2 cm across, blue; pedicel up to 2.8 cm long. Sepals 5, ovate, acuminate. Petals 5, purple, entire. Capsules compressed-globose, brownish, 5-ribbed; seeds compressed, slimy when moistened.

Fl. & Fr.: Jan.-March

Cultivated crop of winter season and also met as an escape. Collection: 1273; Shahpur.

Oil is extracted from seeds and fibre from bark. Also cultivated as garden ornamental.

### 25. MALPIGHIACEAE

1a. Leaves eglandular; calyx with a large gland …………………2. *Hiptage*

1b. Leaves 2- glandular at base; calyx usually glandless ……………1. *Galphimia*

1. **Galphimia** Cav.

Ca 12 species including that of *Thrgallis* Linn.; 1 in India; 1 in MZN.

**G. gracilis** Bartl. in Linnaea 13. 552. 1839; Bor. & Raiz. 188, Pl. 69, 70; FD. 91.

Erect, perennial, dwarf undershrubs with more or less brittle branches. Leaves glandular, oblong or ovate- lanceolate, 2-4.5 cm long, glabrous on both sides. Flowers yellow in many flowered panicles; filaments yellow turning red. Capsules 3-lobed, dehiscing into 3- parts.

Fl. & Fr.: July-Oct.

Cultivated in gardens. Collection: 2667; Ramraj.

2. **Hiptage** Gaertn.

Ca 20 species; 3 species in India; 1 in MZN.


Much-branched, evergreen, climbing perennial shrubs. Leaves ovate or elliptic- lanceolate, up to 20 cm long, entire, acuminate, coriaceous, glabrous, main lateral nerves 4-6 pairs; petioles 0.5-1.2 cm long. Flowers fragrant on terminal and axillary panicles. Calyx with a gland outside, segments oblong, 0.5 cm long, unequal, 3.
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Fl. & Fr. : Feb.- June
Culivated in gardens and also met in jungle area. Collection : 866; Muzaffarnagar City.

26. ZYGOPHYLLACEAE

Tribulus Linn.

Ca 25 species; 3 species in India; 1 in MZN


Vern. Gokharu.

Procumbent, ascending or suberect, annual or biennial herbs covered with silky hairs. Leaves pinnate, 3.0-5.5 cm long, 3-7 pairs of leaflets, mucronate. Flowers yellow, pseudo-axillary. Fruits schizocarpic, breaking into 4-6 cocci; cocci with 2 long and 2 short stout, sharp spines.

Fl. & Fr. : July- Dec.
Common through out the area in sandy soils. Collection : 158 ; Muzaffarnagar City.
Fruits are reported as cooling, diuretic tonic and aphrodisiac; used in urinary discharges, importency, gout and kidney diseases.

27. OXALIDACEAE

1a. Trees; fruit a berry.................................................................1. Averrhoa

1b. Herbs; fruit a capsule:

2a. Leaves pinnate; leaflets 6 -15 pairs.................................2. Biophytum

2b. Leaves 3- foliolate.................................................................3. Oxalis

1. Averrhoa Linn.

2 species; 1 in MZN.


Medium- sized, evergreen trees with drooping branches. Leaves alternate, imparipinnate; leaflets 5- 11, 3.5 cm long, ovate to elliptic, acuminate, entire, base oblique. Flowers pinkish, in short racemes, axillary. Stamens 10. Berries 4-10 cm long, ellipsoid, with 4-5 deep ribs, yellow when ripe, pulpy, fragrant; seeds arillate.

Fl. & Fr. : June- Oct.
Cultivated in gardens for fruits. Collection : 525; Muzaffarnagar City.
The fruits are eaten raw, cooked or pickled.
2. Biophytum DC.

Ca 70 species; 9 species in India; 1 in MZN.


Erect, simple annual hairy herbs, upto 10 cm tall. Leaves crowded at the top of stem, even-pinnate, upto 2.6 cm long; leaflets 6-8 pairs, sessile, opposite; lower ones oblique-ovate; upper ones longer, obliquely oblong, obtuse, mucronate; rachis hairy. Flowers yellow in pseudo-umbellate clusters; peduncle 1.2 – 3.5 cm long, hairy. Capsules ovoid, 0.3 cm long; seeds transversely tubercled.

Fl. & Fr. : Aug – Nov.


Used for chest complaints and its ash for stomach ache.

3. O. Linn.

Over 800 species; 63 in MZN.

1a. Flowers yellow; leaflets obtuse........................................1. **O. corniculata**

1b. Flowers bluish – purple or purple-violet:

2a. Leaflets 3; obtuse, round on sides.........................2. **O. debilis**

2b. Leaflets 3; broadly and distinctly triangular...............3. **O. richardiana**


Procumbent, slender, pubescent or appressedly hairy herbs with creeping subterranean stem, rooting at nodes. Leaves digitately 3-foliolate on 2-8 cm long petiole; leaflets cuneate 2.5-3.5 cm long, subsessile, obturate. Flowers yellow in umbellate few-flowered clusters on 3-12 cm long peduncles. Sepals hairy outside, persistant. Capsules 1-2 cm long, angular, tomentose; seeds rugose, dark-brown.

Fl. & Fr. : Sept. – Jan.

Common in gardens, on waste moist and shady places. Collection : 536, Muzaffarnagar City.

Used as a cure for scurvy; leaves & seed edible.

Erect or diffused. 15-20 cm long perennial herbs. Stems scaly bulbous below. Leaves on 12-20 cm long, glabrous petioles, digitately 3-lobed; leaflets obcordate, acute at base, hairy below. Flowers violet, 1.2-1.4 cm long, in umbellate 6-8 flowered cymes; peduncle directly from bulbs, 15-18 cm long, hairy. Petals 1.5 cm long, with purple streaks. Capsules oblong, 1.2-1.5 cm long, narrowed to the apex, pubescent.

Fl. & Fr. : Nov. – May
Common on moist shady places, in garden. Collection : 290; Muzaffarnagar City.


Perennial, acaulescent, pubescent herbs with a bulbous root stock. Leaves on 10-15 cm long petioles; leaflets subbilobed (incised halfway), 1-1.5x3-3.5 cm. Flowers violet, 0.8 cm across, in 6-8 flowered umbellate cymes; peduncles 24-28 cm long, glabrous. Sepals oblong, obtuse, glabrous. Petals 0.8-0.9 cm long, violet.

Fl. & Fr. : Oct. – April.
Common on moist shady place; fruit orchards and waste moist – places. Collection : 92; Muzaffarnagar City.

28. **TROPAEOLACEAE**

*Tropaeolum* Linn.

Ca 90 species; 2 species in India; 1 in MZN.

**T. majus** Linn., Sp. Pl. 345. 1753; MCP. ed. 2. 662. 1949; HFD. 105.

Suberect, climbing or trailing, decumbent, annual, glabrous herbs. Leaves 4-8 cm across, orbicular or somewhat reniform; petioles upto 10 cm. Flowers axillary, solitary on 6-15 cm long pedicels, yellow, orange or red, 4-6 cm across. Sepals upto 3.0 cm long; spur upto 5 cm long. Petals rounded, dentate at apex. Fruits of 3 indehiscent cocci.

Fl. & Fr. : Jan.- April.
Cultivated in lawns and gardens for ornamentation or met with as an escape. Collection : 356, Muzaffarnagar City.

29. **BALSAMINACEAE**

*Impatiens* Linn.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
Over 600 species; Ca 175 species in India; 1 in MZN.


Erect, glabrous or minutely hairy, branched, upto 50 cm tall annual herbs with roots from lower nodes. Leaves alternate, lanceolate-oblong to oblanceolate, obtuse to sub acuminate, or white, 1-2 in leafy axils, spurred. Capsules 1.2- 2.3 cm long, ovoid-ellipsoid, acuminate, pubescent.

Fl. & Fr. : Aug.- Nov.

Cultivated in garden as an ornamental one. Collection : 1852; Ramraj.

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**30. RUTACEAE**

1a. Leaves unifoliolate……………………………………………………………………………………………………………………2. *Citrus*

1b. Leaves multifoliolate:

   2a. Plants unarmed

   2b. Plants armed with spines: ……………………………………………..4. *Murraya*

       3a. leaflets 3; stamens many ………………………………1. *Aegle*

       3b. Leaflets 5 or 7; stamens 10-12 ……………………3. *Limonia*

   1. **Aegle** Correa nom. cons.

Ca 3 species; 1 species in India ; 1 in MZN.

**A. marmelos** (Linn.) Correa., Trans. Linn. Soc. 5: 223; FBI. 1: 516; FUGP.1:143;FD.95: Vern. *Bel, Belpattuhar.*

Medium-sized, deciduous trees armed with 2-2.5 cm long axillary spines. Leaves alternate, 3–foliate, common petiole 1.5- 2.5 cm long. leaflets ovate-lanceolate, crenate; lateral ones opposite, nearly sessile, terminal long stalked. Flowers greenish – white, 4-5 merous, in short lateral panicles with a fine honey scent. Fruits large, glabrous, or ovate, upto 15 cm across. Grey when ripe, hard; pulp orange and sweet; seeds many, oblong, white.

Fl. & Fr. : March- May


Frutis and root bark are used as cooling, laxative, digestive, stomachic purpose in diarrhea, dysentery and intermittent fever.

2. **Citrus** Linn.

Ca 15 species; 11 species in India; 5 in MZN.
1a. Petioles mostly broadly winged; fruits large-sized over 12 cm across…………………………5. C. maxima

1b. Petioles with no or up to 1 cm wide wings; Fruits medium or small sized; rarely more than 12 cm across:
    2a. Petals more or less pink or purplish outside; rind of fruits thick and soft:
        3a. Leaves highly scented; petiole short, not winged……3. C. limon
        3b. Leaves not highly scented; petiole short, not winged.4. C. medica
    2b. Petals pure white, rind of fruits thin:
        4a. Rind orange or scarlet orange, bright…………2. C.aurantium
        4b. Rind green or yellow when ripe ……………1. C.aurantifolia


    Much-branched, thorny, evergreen shrubs. Leaves elliptic-oblong to ovate, margins slightly indented, 3-10 cm long, blunt or round at apex. Petioles narrowly winged. Flowers white, few in axils. Fruits small, globose or ovoid, yellow when ripe, smooth; rind thin; pulp acidic.
    Fl. & Fr. : May- Nov.
    Cultivated for fruits. Collection : 640; Kandhla.


    Shrubs or small trees, armed with alternate spines; young shoots glabrous. Leaves 7-10 cm long, elliptic or ovate, sinuate, shortly acuminate, glabrous; petiole not winged. Flowers white or greenish white, many in axils, fragrant. Fruits globose, orange when ripe; rind aromatic, bitter, pulp sour, sacs rather small.
    Fl. & Fr. : Major part of the year
    Cultivated for its fruits. Collection:3786; Mirapur.


    Small, thorny, evergreen trees or large shrubs. Leaves ovate, 3-7 cm long; petioles slightly winged or not. Flowers and buds pinkish-purple outside, axillary in clusters or solitary. Fruits oblong or ovoid with a blunt projected apex, bright yellow when ripe, medium sized, rind smooth, pulp acidic, juice-sacs long and pointed.
    Fl. & Fr. : Major part of the year
    Cultivated in garden for fruits. Collection : 3852; Mirapur.

Small trees or large shrubs with sharp thorny branches. Leaves oblong, serrate or crenate; petiole not winged, marginate. Flowers purplish outside in axillary clusters. Fruits large, oblong or obovoid, rind thick, rough, yellow when ripe, pulp pale-yellow.

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

Cultivated in the area. Collection : 3739; Ramraj


Small trees armed with thorns, young shoots pubescent. Leaves broadly-ovate-oblong, 5-11 cm long, often emerginate; petiole broadly winged, nearly triangular. Flowers white, large. Fruits globose, 12-16 cm across, with thick rind.

Fl. & Fr. : Nov.- March

Cultivated for fruits. Collection : 2418; Kairana.

The fruits of *Citrus* spp. are variously used in the area. Cold drink is prepared, or pickled, or juice is used as such with meal. The juice is also used as preservative.

3. **Limonia** Linn.

Monotypic genus.


Deciduous trees, armed with straight, axillary, 2-6 cm long spines. Bark grayish-brown. Leaves alternate, imperipinnate, 6-9 cm long; leaflets 3-7, obovate, crenate at apex, 1.5-2.5 cm long; petioles and rachis often winged. Flowers in large, much-branched panicles, pale-green, 1.5 cm across. Anthers dark-red. Fruits large, globose; rind woody.

Fl. & Fr. : Feb.- April

Rare on road sides and in jungles. Collection : 875; Kairana.

The bark yields a valuable gum. The pulp of the fruit is eaten and used medicinally.

4. **Murraya** Linn.
Ca 15 species; 2 species in India; 2 in MZN.


1b. Leaves not aromatic. Young leaflets not pubescent. Berries red...2. M. paniculata


Pubescent, deciduous shrubs or small trees, strongly scented. Bark grey. Leaves crowded at the top of branches, 15-20 cm long, rachis pubescent; leaflets 9-25, 2.5-5 cm long, ovate-lanceolae, pubescent, gland-dotted, obscurely crenulate. Flowers white, on short axillary and terminal corymbose panicles. Berries sub globose, 1.2 x 0.7 cm, glabrous, black.

Fl. & Fr. : Feb. - June
Rarely planted in gardens or met with as an escape. Collection : 456; Muzaffarnagar City.
The leaves are used for flavouring curries. The roots and bark are used in medicines.


Evergreen, large shrubs with ash- coloured bark. Leaves 10-12 cm long. 3- 9 foliate; rachis pubescent; leaflets ovate, acute, oblique at base, entire, shining above; petiolules upto 0.2 cm long. Flowers 2 cm long, white, in axillary and terminal corymb or solitary; pedicel 0.4 cm long. Berries 2- seeded, ovoid, bright red or orange when ripe.

Fl. & Fr. : March- Oct.
Cultivated as hedge plant. Collection : 2406; Kandhla.
The twigs are used as tooth brushes.

31. MELIACEAE

1a. Fruit a small, indehiscent drupe:

2a. Leaves once pinnate; ovary 3- celled.................................1. Azadirachta

2b. Leaves bipinnate; ovary 5- celled.................................2. Melia

1b. Fruit a capsule:

3a. Stamens free..................................................4. Toona

3b. Stamens united into tube.........................................3. Swietenia

1. Azadirachta A. Juss.
2 species; 1 in MZN.


Large, deciduous trees with grey bark. Leaves alternate, odd pinnate, 18-20 cm long; leaflets 9 – 15, opposite, obliquely lanceolate, acuminate, serrate, shining above. Flowers white, scented in lax panicles or corymbs. Staminal tube glabrous with 10- anthers inserted inside. Stigma 3- toothed. Drupes glabrous, 1-celled, ovoid, yellow when ripe, 1-seeded.

Fl. & Fr. : Feb. – July.

Cultivated as common shade tree on road sides and of villages. Collection :396; Nirana.

Wood is used in construction variously. The bark, leaves and fruits are used in medicines. Oil extracted from seeds, is used in small-pox, sores, and burning.

**2. Melia** Linn.

Ca 15 species; 2 species in India; 1 in MZN.


Medium- sized, deciduous trees with grey bark. Leaves crowded near the ends of branches, bipinnate, 18-30 cm long; rachis soft, pubescent; leaflets opposites, 2.5 - 6.0 cm long, ovate or lanceolate, serrate, acuminate, base oblique. Flowers bluish-white, sweet scented in axillary long peduncled panicles. Calyx 5 lobed. Petals 5, linear- oblanceolate; staminal tube purple, cylindrical. Drupes globose, yellow when ripe and wrinkled on drying. Stone 5 celled, 5 seeded.

Fl. & Fr. : Feb.- July.

Collection : 2757; Budhana.

Root, bark, flowers, fruits and leaves are used in medicines. The leaves are also used as fodder for goats.

**3. Swietenia** Jacq.

Ca 10 species; 1 in MZN.


Fl. : April- May. Fr. : May- July.
Planted in Kamla Nehru Vatika Muzaffarnagar City. Collection : 5002; Muzaffarnagar City.
The bark is an astringent and used medicinally.

4. Toona Roem.
   Ca 15 species; 4 species in India; 1 in MZN.
   Large deciduous trees with dull grey bark and dense leafy crown. Leaves paripinnate; leaflets 10-20 usually opposite, entire obliquely ovate or lanceolate, glabrous. Flowers cream- coloured in drooping panicles. Calyx short; lobes obtuse, or acute, ciliate. Petals oblong, or ovate, ciliate. Capsules oblong. Seeds winged at both ends.
   Fl. & Fr. : March- July.
   Collection : 4120; Khandaroli.
   Wood is used for furniture, door-pannels, carving, bark in medicines, as astringent- tonic in dysentery and for ulcer.

32. CELASTRACEAE
   Celastrus Linn.
   Ca 30 species; 4 species in India; 1 in MZN.
   Large, deciduous climbers, perennial, with pendulous branches. Leaves alternate, 6-10 cm long, ovate or orbicular, glabrous, toothed, abruptly pointed.
   Flowers pale- yellow-green, in terminal pendulous pubescent panicles. Capsules globose, bright yellow, upto 1 cm across 3, -celled, 3-6 seeded; seeds enclosed in red aril.
   Fl. & Fr. : April- June.
   Rare on river banks among bushes. Collection : 996; Shukartal.
The seeds and leaves are used in medicines for rheumatism, paralysis, leprosy, fever and as laxative.
33. Rhamnaceae

1a. Fruits dehiscent; ovary inferior; tendrils present………………….1. Helinus

1b. Fruits indehiscent; ovary not inferior; tendrils absent;
   2a. Fruit a berry with 2-4 stones; ovary superior……………….2. Sageretia
   2b. Fruit a fleshy drupe, stone 1–4 celled; ovary semisuperior.3. Ziziphus


6 species; 1 species in India; 1 in MZN.

H. lanceolatus Wall ex Brand. For. Fl. 574. 1874; FBI. I: 664; FUGP. I: 169, HFD. 107.

   Evergreen, unarmed, glabrous, climbing or scandent shrubs. Branchlets angular, normally ending in a tendril. Leaves alternate ovate or ovate-lanceolate, short petioled, entire, acute, rounded or subcordate base, 5-10 cm long. Flowers greenish yellow, in small umbellate clusters at the end of long axillary peduncles. Calyx superior, cup shaped. Petals 5. Frutis globose, 3-celled, 3-seeded.
Fl. & Fr. : Nov.-April.
Very rare in the area, occurs on canal and river bank among bushes. Collection : 741; Barla.

2. Sageretia Brongn.

Ca 35 species; 4 species in India, 1 in MZN.


Large, climbing shrubs, tomentose branches when young, often armed with short, stiff, thorny branches. Leaves 5-10 cm long opposite, ovate-lanceolate, acute or acuminate, serrate, lateral nerves 4-8 pairs; petiole upto 1-2 cm long. Flowers small, greenish-yellow in long terminal and axillary, tomentose panicles. Bracts leaf like. Drupes upto 1 cm long, obovoid, black when mature, not lobed, edible.
Fl. & Fr. : July-Oct.
Not common, occurs on canal banks and among bushes on road sides. Collection : 1841; Ramraj.
The fruits are edible.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Ca 100 species; 17 species in India; 3 in MZN.

1a. Erect bushes, shrubs or small trees:
   2a. Leaves tomentose beneath; drupes globose or ovoid- oblong more than 1.5 cm in diam.  
   1. *Z. mauritiana* Lamk., Encycl. 3: 319. 1789; Santapau in JBNHS. 51: 802. 1953; 
   FD. 101.  
   *Z. jujuba* Lamk., Encycl. 3: 318. 1789 (non Mill. 1768); FBI. 1: 632; FUGP. 1: 163. 
   Vern. *Ber, Pondi-ber.*  
   Medium-sized trees with spreading crown. Spines usually in pairs, one straight 
   and one curved. Leaves variable, 2-5.5 cm long, ovate, oblong- elliptic, gradually 
   acuminate, serrate; base oblique, 3- nerved. Flowers pale, in axillary, few flowered 
   fascicles. Calyx lobes triangular-acute. Drupes oblong- globose or ovoid, yellow, red 
   or orange when ripe, fleshy; stone 1-2 celled. 
   Cultivated for fruits or occurs as wild. Collection : 132, Muzaffarnagar City. 
   The leaves and roots are used medicinally. Fruits are edible.

   *Rhamnus nummularia* Brum. f., Fl. Ind. 61. 1768.  
   Thorny tomentose bushes with densely hairy or pubescent branches armed with 
   stipular prickles. Leaves 1.5-2.0 cm long, nearly orbicular or ovate, serrate, dark- 
   green, densely tomentose on both sides, short petaled. Flowers pale yellow, in 
   axillary, sessile, pubescent cymes. Sepals pubescent outsides. Fruit a drupe, 1-1.5 cm 
   across, globose, red when mature. 
   Fl. & Fr. : May- Dec.  
   Common on dry and waste places along railways line. Collection : 599; Bhopa. 
   The fruits are eaten and leaves are grazed by goats.

   Straggling or climbing large thorny shrubs. Young parts rusty- tomentose. 
   Leaves 3-4 cm long, obliquely ovate- lanceolate, acute or acuminate, entire, serrate, 
   glabrous above, rusty tomentose below. Flowers in short axillary, dichotomous
densely pubescent cymes. Drupes 0.5-0.8 cm across, globose or obovoid, black when mature.

Fl. & Fr. : April- May

Common or road sides, along railway line on waste places. Collection : 2190; Heend.

34. VITACEAE

1a. Leaves trifoliolate; flowers hermaphrodite; petals 4 …………………1. *Cayratia*

1b. Leaves simple; flowers polygamous, dioecious; petals 5………………2. *Vitis*


Ca 50 species; 7 species in India; 1 in MZN.


Slender, herbaceous climbers with much branched angular, hairy stem. Leaves alternate, 3- foliate, 6-14 cm long; petiole upto 4.5 cm long; leaflets elliptic-ovate, rounded at base, serrate, hairy. Tendrils 2 or 3 times divided. Flowers in leaf-opposed corymbose-cymes. Berries globose, 3-4 seeded; seeds trigonous, rugose.

Fl. & Fr. : July- Feb.

Common, climbing on bushes and trees. Collection : 1080; Shahpur.

The leaves are used in poultice for boils.

2. *Vitis* Linn.

Over 60 species; 5 species in India; 1 in MZN.


Large, woody, deciduous climbers with bifid tendrils. Leaves thin, sub-orbicular, cordate, more or less deeply 3-5 lobed, acutely toothed, glabrous above. Flowers greenish on slender pedicels arranged in umbel like cymes. Bracts caducous. Fruits pulpy with one or no seed.

Fl. & Fr. : Feb. – June

Cultivated for fruits. Collection : 2119; Muzaffarnagar City.

The fruits are edible and variously used.

35. SAPINDACEAE

1a. Climbing herbs; flowers petalous …………………1. *Cardiospermum*
1b. Erect shrubs or trees; apetalous:
   2a. Shrubs; leaves simple..............................2. Dodonaea
   2b. Trees; leaves compound...........................3. Litchi

1. Cardiospermum Linn.

Ca 15 species; 2 species in India; 1 in MZN.


Climbing, annual, minutely hairy herbs, stem and branches wiry. Leaves 3-8 cm long, 3-foliate; leaflets 3.5-5.5 cm long, oblong-lanceolate, decurrent on petioles, obtuse, mucronate, pinnate-lobed, 1.4-2.5 cm long; petiole 1–1.8 cm long. Flowers 0.2 cm across, in cymes, white, polygamo-dioecious. Sepals 4, unequal. Petals 4, obovate, pubescent at base. Capsules 1.5 cm across, depressed pyriform, 3-gonous, winged at angles; seeds globose, black, aril heart shaped, white.

Fl. & Fr.: Sept.-Nov.
Common on river bank, in jungles climbing on bushes. Collection: 3000; Ramraj. Various parts of the plant are used in medicines and leaves also cooked as vegetable.

2. Dodonaea Linn.

Ca 50 species; 1 species in India, 1 in MZN.


Evergreen shrubs or small trees with brown, thin bark and glabrous branches. Leaves simple, alternate, oblanceolate, tapering base, entire, apex retuse or subapiculate, glabrous. Flowers in terminal panicles; greenish-yellow petals. Capsules 2-4 valved, winged, yellowish with black seeds.

Fl. & Fr.: Sept.-Jan.
Cultivated as hedge plant. Collection: 2153; Charthawal.

3. Litchi Sonn.

2 species; 1 species in India; 1 in MZN.


Evergreen, small trees with
a dense crown. Leaves alternate, paripinnate, upto 10 cm long; leaflets sub-opposite, oblong- lanceolate, obtuse or acuminate, entire, glabous. Flowers small, in large, terminal, brown-tomentose panicles, polygamous, 0.3 cm across. Petals 0. Stamens 6. Capsules globose, 2.5-3.5 cm across, red or pinkish when ripe; pericarp tubercled. Seed aril large, fleshy.
Fl. & Fr. : Feb.- June
Cultivated in fruit orchards. Collection : 836; Muzaffarnagar City.
The tree is valued chiefly for its delicious fruits.

36. ANACARDIACEAE

1a. Leaves simple..........................1. Mangifera
1b. Leaves compound:
   2a. Leaves trifoliate......................2. Rhus
   2b. Leaves pinnately compound; imparipinnate ..........3. Spondias

1. Mangifera Linn.
   Ca 40 species; 4 species in India; 1 in MZN.
   Large, evergreen trees, glabrous except the inflorescence. Leaves simple, oblong- lanceolate, entire, 15-25 cm long, crowded at the ends of branches. Flowers yellowish- green in terminal panicles, polygamous. Calyx 0.2 cm long, 4 lobed hairy outside. Petals 4, ovate, yellow. Drupes much variable in shape and size.
Fl. & Fr. : March- July
Extensively cultivated in fruit orchards. Collection : 3148; Jaroda.
Fruits edible when ripe. Green fruits are cooked or pickled. Wood is also used for different purpose. Leaves and bark are also used medicinally.

2. Rhus Linn.
   Ca 250 species; 13 species in India; 1 in MZN.
R. parviflora Roxb., Fl. Ind. 2: 100; FBI. 2: 9; FUGP. 1: 186.
   Unarmed, hairy shrubs. Leaves palmately 3- foliolate, petiole upto 4 cm long; leaflets 3 -8 cm long, sessile, elliptic- oblong- obovate, irregularly crenate above the middle, coriaceous, nerves spreading parallel. Flowers small, arranged in panicles; bracts linear. Sepals ovate, hairy outside. Petals twice as long as broad, oblong, Drupes upto 0.3 cm across, ovoid, compressed, red-brown, shining.
Fl. & Fr. : May-Sept.
Rare on canal banks, river banks and in jungles. Collection : 2628; Gordhanpur. The leaves are used medicinally.

3. **Spondias** Linn.

Ca 12 species; 4 species in India; 1 in MZN.


Small or medium sized, deciduous trees with aromatic grey bark. Leaves alternate, imparipinnate, 30-40 cm long; leaflets 4-6 pairs, 7-20 cm long, oblong-elliptic, acuminate, entire, membranous, glabrous; lateral nerves 10-30 pairs, parallel. Flowers 0.5 cm across, greenish-white, polygamous on 30-40 cm long terminal panicles. Drupes ovoid, smooth, 4-4.5 cm across, fleshy, yellowish when ripe.

Fl. : March-May; Fr. : Nov.-Jan.

Rarely planted in gardens. Collection : 852; Muzaffarnagar City.

Green fruits are made into curries and pickles. The ripe ones edible. Various parts of plant are also used in medicines.

37. **MORINGACEAE**

*Moringa* Adans

Over 10 species; 2 species in India; 1 MZN.


Medium-sized, deciduous, weak trees with corky bark. Leaves 30-70 cm long, usually 3-pinnate; leaflets obovate or elliptic; petiole sheathing at the base. Flowers pale-white, fragrant, in axillary panicles. Sepals reflexed. Petals spatulate. Pods long 20-40 cm, pendulous, 1-ribbed, slightly constricted between the seeds.

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

Cultivated in gardens as an avenue tree. Collection : 784; Rohana.

The leaves, flowers and fruits are used as vegetable. The roots are used in medicines.

38. **FABACEAE**

**Tribes and Key to the Genera of Fabaceae**

**Tribe I.**
Genisteae- Leaves simple or digitately 3–foliate; stamens monadelphous; pod dehiscent, not jointed, pod turgid...............................................................11. *Crotalaria*

**Tribe II.**

Trifoliae—Leaves pinnately 3–foliate, leaflets toothed or not toothed; stamens diadelphous.

1a. Raceme long.................................................................23. *Melilotus*

1b. Raceme short:

2a. Pod dehiscent:

3a. Pod spirally twisted, spinous........................................22. *Medicago*

3b. Pod linear, not spinous. .................................................33. *Trigonella*

2b. Pod indehiscent.............................................................32. *Trifolium*

**Tribe III.**

Phaseoleae—Trees, climbers, rarely erect shrubs or herbs; leaves simple trifoliate, rarely imparipinnate leaves.

1a. Leaves trifoliate with gland dotted beneath:

2a. Ovules 3 to many:

3a. Seed strophiolate. ......................................................6. *Atylosia*

3b. Seeds not strophiolate. .................................................8. *Cajanus*

2b. Ovule 1 to 2, funiculus almost central on hilum........28. *Rhynchosia*

1b. Leaves not gland dotted beneath:

4a. Style bearded:

5a. Keel obtuse or beaked; stigma oblique...............36. *Vigna*

5b. Keel beaked; stigma capitate. .................................18. *Lablab*

4b. Style not bearded (Except in *Clitoria*):

6a. Rachis of inflorescence not swollen at the node:

7a. Stamens monadelphous; stipules and bracts persistent; anthers all fertile.................................................................10. *Clitoria*

7b. Stamens monadelphous; stipules and bracts caducous; alternate anthers abortive..................................................31. *Teramnus*

6b. Rachis of inflorescence swollen at the node:

8a. Petals very unequal:

9a. Anthers dimorphic; keels exceeding wings and standard…

.................................................................25. *Mucuna*

9b. Anthers uniform; standard exceeding keels and wings..
16. *Erythrina*

8b. Petals about equal; flowers large in raceme.

7. *Butea*

**Tribe IV.**

Galegeae-Leaves imperipinnate, rarely peripinnate; stamens usually diadelphous; pod dehiscent, not jointed.

1a. Anthers muticous, hairs basifixed:

2a. Raceme axillary.................................29. *Sesbania*

2b. Raceme terminal or leaf opposed or paniculate at end of branches:

3a. Herb or undershrub; stamens diadelphous.............30. *Tephrosia*

3b. A large woody climber; stamens monadelphous.......24. *Millettia*

1b. Anther with an apiculate or gland tipped connective, hairs fixed by the centre:

4a. Stamens monadelphous. ......................................12. *Cyamopsis*

4b. Stamens diadelphous. ......................................17. *Indigofera*

**Tribe V.**

Vicieae-Leaves peripinnate, petiole ending in a tendril or bristle.

1a. Stamens 10, diadelphous:

2a. Wings free from the keels, leaflets toothed. ...............9. *Cicer*

2b. Wings attached to keels:

3a. Staminal tube with oblique mouth:

4a. Style longitudinally bearded with minute hairs on inner face......20. *Lens*

4b. Apex of style dorsally bearded by a bunch of hairs, or pillose all around.

.........................................................................................35. *Vicia*

3b. Staminal tube truncate at the mouth:

5a. Style flattened at the apex; leaflets entire...............19. *Lathyrus*

5b. Style dilated from the base, upwards; leaflets obscurely dentate......

.........................................................................................26. *Pisum*

1b. Tenth stamen absent; climbers with bright polished seeds.......1. *Abrus*

**Tribe VI.**

Dalbergieae-Trees or shrubs; leaves imperipinnate; pod not jointed, indehiscent.

1a. Leaves alternate. ..................................................13. *Dalbergia*

1b. Leaves opposite:

2a. Pod almost woody, not winged. ..............................27. *Pongamia*

2b. Pod thin, winged. ................................................14. *Derris*

**Tribe VII.**
Hadysareae – Herbs; leaves odd – pinnate, except (Zornia); pod breaking into one seeded indehiscent segments or if dehiscent (Dasmodium) opening along lower suture.

1a. Stamens monadelphous; anthers dimorphous; leaflets in one or two opposite pairs……………………………………37. Zornia

1b. Stamens diadelphous; anthers uniform; leaves simple or pinnate:

2a. Stamens in 2 bundles of 5 each. .....................2. Aeschynomene

2b. Stamens in bundles of 9 + 1:

3a. Joints of pods flattened. .........................15. Desmodium

3b. Joints of Pods turgid:

4a. Leaves simple:

5a. Spinous shrubs or under shrubs. ..............3. Alhagi

5b. Unarmed shrubs........................................4. Alysicarpus

4b. Leaves compound:

6a. Fruits aerial............................................34. Uraria

6b. Fruits geocarpic. ..................................5. Arachis

Tribe VIII.

Loteae - Small herbs; leaves odd – pinnate, leaflets 5, fleshy, terminal sessile; flowers subtended by reduced trifoliate leaves at the end of long peduncle…21. Lotus

1. Abrus Adans

Over 10 species; 2 species in India: 1 in MZN.


Slender, glabrous or hairy, deciduous, twining herbs. Leaves 5-10 cm long. paripinnate with 8-14 pairs; leaflets oblong, obtuse, entire, glabrous, Flowers in upto 10 cm long axillary racemes, pinkish. Pods 4-5 cm long, oblong, flat, appressed hairy, 3-5 seeded; seeds sub-globose, bright red with black blotch. 0.5 cm across.


Common along canal sides, in forests among bushes. Collection : 570; Chitora.
The seeds are used as weights by goldsmiths and the roots are used in medicines.

2. Aeschynomene Linn.

Ca 150 species; 3 species in India; 1 in MZN.

Erect, annual, marshy herbs up to 1m tall with globose, fistular stem. Leaves pinnately compound, up to 8 cm long; rachis warty. Leaflets up to 35 pairs, 1 cm long, oblong, glabrous, obtuse, mucronate, base oblique. Flowers yellow, 0.6 cm across in axillary 1-4 cm long racemes. Pods 2.5 - 4 cm long, usually straight, shallowly incised along lower suture, 6 - 10 jointed, black dotted.

Fl. & Fr. : Aug. - Nov.

Common along stagnant water, ponds, rice fields and canal banks. Collection : 96 Muzaffarnagar City.

3. **Alhagi** Desv.

Ca 5 species; 1 species in India; 1 in MZN.

**A. pseudalhagi** (Bieb.) Desv. Jour. de Bot. 1: 120. 1813; FD. 122; FID. 105.-


Erect, deep-rooted, bushy, armed with spines, annual under-shrubs or herbs. Spines sharp, axillary. Leaves simple, 0.5-1.2 cm long, obovate, oblong, obtuse, mucronate, cuneate, glabrous. Flowers red, axillary. Pods 2-3.5 cm long, usually falcate, irregularly constricted between the seeds; seeds subreniform, smooth.

Fl. & Fr. : April - July

Common with in the area in sandy soils near river and canal banks and fellow fields. Collection : 684; Kairana.

The plant is used for making Tatties in summer and also used as fodder.

4. **Alysicarpus** Desv., nom cons.

Ca 26 species; 1.5 species in India; 6 in MZN

1a. Calyx about as long as the first joint of pod :

2a. Pods moniliform............................................... 4. **A. monilifer**

2b. Pods not moniliform :

3a. Leaves uniform.......................... 6. **A. vaginalis**

3b. Leaves polymorphic............................. 2. **A. heterophyllus**

1b. Calyx much longer than the first joint of pod :

4a. Flower usually in pairs on spike-like lax racemes; pods usually exerted.................. 1. **A. bupleurifolius**

4b. Flowers in spike – like, rather dense racemes; pods included or slightly exerted :
5a. Joints of pods finely reticulate –
veined……………………………………… 3. A. longifolius

5b. Joints of pods transversely and deeply
plicate…………………………………5. A. rugosus


Decumbent- ascending, glabrous annual herbs upto 80 cm tall. Leaves simple, 3-8 cm long, glabrous, linear - lanceolate, acute; petioles short upto 0.2 cm long. Flower bluish pink, usually in pairs on spike like lax racemes. Calyx 0.5- 0.6 cm long; segments lanceolate, long acuminate, ciliate. Corolla pink. Pods 3 or.4 jointed, upto 1.2 cm long, slightly moniliform, glabrous. 
Fl. & Fr. : Aug. - Nov. 
Common along canal banks and in grassy fields. Collection : 2554; Bhokarhedi.


Var. differs from A. vaginalis DC. in having polymophic leaves. Lower leaves oblong, 3-5.5 cm long, cordate at the base; upper ones 4-5.5 cm long, lanceolate, simple to trifoliolate or intermixid. Racemes elongated. 
Fl. & Fr. : Aug. - Nov. 
Common in open grassy-fields, moist and shady places. Collection : 4175; Ailum.

3. A. longifolius Wt. & Arn., Prodr. 233. 1834; FBI. 2: 159; FUGP. 1: 278; FD. 125; HFD. 117.

Erect, ascending, glabrous herbs. Leaves 2 - 3.5 cm long, oblong or lanceolate, hairy on nerves beneath; base subcordate. Stipules lanceolate. Flowers pinkish - white in long dense racemes. Bracts ovate, cuspidate. Calyx pubescent; teeth ciliate. Pods 1.5 - 2.0 cm long, glabrous, stalked, apiculate; joints 4 - 6. 
Fl. & Fr. : July - Oct. 
Occurs along canal and river banks among grasses. Collection : 586; Muzaffarnagar City.


Diffused or procumbent - ascending, annual much branched, hairy deep rooted herbs. Leaves 1 - 1.5 cm long, oblong, obtuse, slightly mucronate, subcordate at base, entire, glabrous; petiole 0.3 - 0.5 cm long; stipule scarious, triangular, acuminate, 0.6
cm long. Flowers pink, 0.4 - 0.5 cm long, axillary, solitary or 2-6 in racemes. Calyx persistent. Corolla pinkish-violet, equalling the calyx. Pods upto 2 cm long, moniliform, 4-8 jointed, densely clothed with hooked hairs.

Fl. & Fr. : Sept. - Nov.

Common on waste places, road sides and grassy fields. Collection : 674; Muzaffarnagar City.


Erect or decumbent - ascending annual herbs, glabous or with a line of hairs on stem. Leaves 4 - 5 cm long, lanceolate - oblong to obovate, rounded - cordate base, obtuse or acute apex, ciliate glabrous above, hairy beneath; petiole short about 0.5 cm long. Flowers purplish - blue, in dense racemes of 3 -6 cm long; pedicle 0.3 cm long. Calyx upto 1 cm long. Corolla purplish - blue or yellowish - purple. Pods 4 - 5 jointed, upto 1.2 cm long, glabrous.

Fl. & Fr. : Sept. - Nov.

Common in grassy localities, waste places. Collection : 2994; Ramraj.


Erect or prostrate herbs upto 50 cm tall. Leaves much variable in size and shape, suborbicular or broad oblong to oblong and oblanceolate. Flowers small, pale -purple, in axillary racemes. Pods subterete, 6 - 8 jointed, rather crowded at the end of branches, glabrous.

Fr. & Fr. : Aug. - Dec.

Common in grassy fields and waste-places. Collection : 2550; Bhokarhedi.

5. **Arachis** Linn.

Ca 15 species; 1 in MZN.

**A. hypogaea** Linn., Sp. Pl. 741. 1753; MCP. 554; FBI. 2: 161; FD. 125. Vern. **Mungphali**.

Prostrate or erect-diffuse annual, hairy herbs upto 50 cm tall. Leaves bipinnate; rachis 3 - 5 cm long; stipules long acuminate, ovate, 2-3 cm long. Leaflets
2-pairs, oval to oblong-ovate, ciliate, obtuse. Flowers yellow, solitary, axillary, showy; pedicel 2.5 - 4.0 cm long. Pods 1-3 seeded, indehiscent, geocarpic with a thick reticulate pericarp, constricted between the seeds. Seeds oily.


Cultivated for oily seeds. Collection : 3706; Ramraj.

The seeds contain oil which is largely used for cooking. Rosted seeds are eaten and variously used in kitchen.

6. **Atylosia** Wt. & Arn.

Ca. 25 species; 16species in India; 2 in MZN.

1a. Leaves exstipulate. Corolla caducous .......... 1. **A. scarabaeoides**

1b. Leaves stipulate. Corolla persistent .......... 2. **A. volubilis**


   Slender, twining prostrate, hairy - pubescent herbs. Leaves 3 - foliolate; leaflets 1.5-3 cm long, obovate, obtuse or rounded at apex, rounded at base, pubescent, short axillary peduncles. Pods 2 - 2.5 cm long, 2 - 6 seeded, hairy, small.


   Common in grassy fields, road sides and waste places. Collection : 1007; Bhopa.


   Stout, twining herbs; young branches densely hairy. Leaves 4 - 9 cm long, pinnately 3 - foliolate; leaflets 3 - 5 cm long, cuneate at base, acuminate at apex, ovate- elliptic, glabrous or hairy above, densely hairy below. Flowers yellow, up to 2 cm long, in short hairy racemes or in panicles of 2 - 8 cm long. Bracts acute. Calyx grey downy. Corolla yellow, 1 – 1.5 cm long. Pods oblong, 3 - 4 cm long, rounded at the ends, pubescent, greenish - brown, transversely depressed, 3-6 seeded.

   Fl. & Fr : Dec.-May.

   Occasionally growing in jungle area near river banks and canal sides. Collection : 4195; Shukartal.


   30 species; 3 species in India; 1 in MZN.


Small or medium-sized, deciduous trees with young parts silky pubescent. Leaflets 3, 8-25 cm long, terminal largest, rhomboid; laterals smaller, glabrous above, broadly obovate, cuneate or deltoid base. Flowers bright orange - red, 5-8 cm long, appearing before the leaves in rigid axillary and terminal racemes. Petals equal. Rachis, pedicels, bracteoles and calyx outside dark brown, velvety. Pods 10 - 15 cm long, pendulous, tomentose, flat.

Fl. & Fr. : March - June
Collection : 4168; Khatauli.
The leaves are used for serving food and for wrapping up edibles. The dye “Tesu” is obtained from the flowers. The poultice of the leaves is used locally in pimples and swellings.


3 species; 2 species in India; 1 in MZN.

Erect, annual, hairy shrubs upto 2.5 m tall. Leaves 3 - foliolate; leaflets ovate, longer than broad, mucronate, acute or sub-acuminate, hairy, entire. Flowers yellow, upto 9 cm long, few flowered axillary or corymbose racemes or panicles. Pods 3-5 cm long, sessile, 3-5 seeded, with reddish-brown, obliquely transverse streaks.

Fl. & Fr. : Aug. - Nov.
Cultivated as main or mixed crop. Collection : 1060; Bhokerhadi
The pulse is very nutritious and used as “DAL”. The leaves are used as fodder and stem as fuel.

9. Cicer Linn.

Ca. 20 species; 2 species in India; 1 in MZN.

Fl. & Fr. : Jan. - April
Cultivated as winter crop or met with as an escape. Collection : 5082; Shamli.
Fresh and roasted pods are eaten. Soaked, boiled roasted and grinded seeds are variously used. Seed flour, “Besan” is used variously.

10. Clitoria Linn.
Ca 40 species; 3 species in India; 1 in MZN.

Slender, climbing, appressed hairy herbs. Leaves upto 10 cm long, stipulate. Leaflets 5-7, ovate-oblong or sub-orbicular, retuse, entire, glabrous, upto 2-4 cm long. Flowers bright blue with orange centre, solitary axillary; bract lanceolate; pedicel 0.5 cm long. Calyx 1 - 2 cm long; teeth lanceolate. Corolla 4-5 cm long. Pods 5-8 cm long, flat, hairy, 5 - 8 seeded.
Fl. & Fr. : July - Nov.
Cultivated in gardens. Collection : 3767; Jansath.
A dye is obtained from flowers and seeds and parts of the plant are used in medicines.

11. Crotalaria Linn.
Over 550 species; 86 species in India; 5 in MZN.

1a. Flowers blue........................................... 5. C. sessiliflora
1b. Flowers yellow :
   2a. Leaves digitately 3- foliate...................... 3. C. medicaginea
   2b. Leaves simple :
      3a. Stipules absent.................................... 1. C. burhia
      3b. Stipules Present :
         4a. Pods glabrous; branches slender, density silky....................... 4. C. mysorensis
         4b. Pods hairy; branches terete, clothed with persistgant silky hairs..................................... 2. C. juncea

Erect, diffused, much - branched, xerophytic herbs or under shrubs. Leaves simple, 4 - 7 cm long, subsessile, obovate or lanceolate, obtuse or subacute pubescent.
Stipule 0: Flowers yellow with reddish veins, in terminal racemes. Calyx densely silky. Pods upto 1 cm long, oblong, villous, slightly longer than calyx.
Fl. & Fr. : Aug. - Dec.
Common on dry sandy soils, along road sides and waste places. Collection : 176; Muzaffarnagar City.


Erect, simple or branched, hairy, annual herbs upto 1.5 m tall. Leaves lanceolate, or linear - lanceolate, 5-8 cm long, entire, acute or obtuse. Flowers yellow in erect, terminal or lateral lax racemes. Bracts small, caducous. Pods 2.5 3.5 cm long, sessile, hairy.
Cultivated as rainy season crop. Collection : 2304; Shamli.
Fibre is obtained from the stem and plants are used in paper manufacturing and also for green manure.


Erect or prostrate, annual herbs with hairy branches. Leaves 3 - foliate, variable in shape, larger than petioles, oblanceolate or obovate, truncate apex, emarginate or obtuse. Flowers yellow in terminal and leaf opposed racemes. Pods obliquily subglobose, 2 - seeded; seeds compressed, polished.
Common weed of rainy season.
Two common variety are
(i) var. **luxurians** Baker in FBI. 2: 81; FUGP. 1: 207; FD. 112.

Erect upto 60 cm tall herbs. Stem and branches much pubescent. Leaflets 2 - 3.5 cm long. Racemes 3 - 12 flowered.
Collection : 4057; Ailum.
The plant is used as fodder.
(ii) var. **neglecta** Wt. & Arn., FBI. 2: 81; FUGP . 1: 207.

Prostrate or ascending annual herbs. Leaflets 1.5 - 2.0 cm long, obovate or oval, emarginate or truncate. Pods subglobose, 2 - seeded.
Common in rains in sandy soils.
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Collection : 569; Muzaffarnagar City.

4. **C. mysorensis** Roth., Nov. Pl. Sp. 338. 1821; FBl. 2: 70; FUGP. 1: 204; FD. 113; HFD. 128.

   Erect, branched, hairy herbs upto 50 cm tall. Leaves shortly petioled, 3-7 cm long, linear-oblong, obtuse, rounded at both ends; stipules small, linear, persistant. Flowers in 15 - 20 cm long terminal and lateral racemes. Bracts lanceolate, leafy. Calyx densely silky, upto 1 cm long; upper teeth lanceolate; lower linear. Corolla linear, not exerted. Pods nearly sessile, twice as long as the calyx, oblong, glabrous, 20 - 30 seeded.

Fl. & Fr. : Aug. - Dec.

Common on waste places, roadsides.

Collection : 3857; Shamli.


   Erect or ascending branched, annual herbs, covered with soft hairs. Leaves simple, linear-lanceolate, 4-8 cm long, acute at both ends, mucronate, glabrous above, stipulate. Flowers blue, in 2-8 cm long, 4-8, crowded at the top in lax racemes. Pods sessile, oblong, glabrous 10-12 seeded, upto 1.2 cm long.

Fl. & Fr. : Sept. - Nov.

Rare along river banks and canal sides. Collection : 2671; Gordhanpur.

12. **Cyamopsis** DC.

   3 species; 1 species in India; 1 in MZN.


   Erect, annual herbs with tetra-angular stem and branches. Leaflets 3, 3-6.5 cm long, ovate-elliptic, acute, coarsely toothed. Flowers pinkish-purple in axillary racemes. Pods 4-10 cm long, erect, flat, hairy, 8-10 seeded.

Fl. & Fr. : Aug. - Nov.

Cultivated as mixed crop. Collection : 3718; Ramraj.

Green pods are cooked as vegetables. The whole plants is used as fodder. Mature seeds are also cooked.

13. **Dalbergia** Linn. f. *nom. cons.*

   Ca 300 species; 25 species in India; 1 in MZN.
D. *sissoo* Roxb., Hart. Beng. 1814; *nom. nud.* & Fl. Ind. 3: 223. 1832; FBl. 2: 231; FUGP 1: 264; FD. 135. Vern. *Shisham*.

Large, deciduous woody trees. Leaves 7.5 - 13.0 cm long; leaflets 11 2.5-4.5 cm long, oblong - elliptic, acute, thick, glabrous, petiole short. Flower yellowish-white, unilateral, on long axillary and terminal paincles. Pods 4-6 cm long, indehiscent, strap shaped flat, obtuse, narrowed at both ends, 1-3 seeded.

**Fl. :** March - May; **Fr. :** Nov. - Feb.

Common along railway lines and road sides. **Collection :** 373; Muzaffarnagar City. Wood is used as a good quality timber for various articles.


Ca 80 species; 25 species in India 1 in MZN.


Medium-sized, soft greyish-barked, glabrous, deciduous trees. Leaves odd-pinnate, 10-20 cm long; leaflets 5-7 variable ovate–oblong, obtuse or short acuminate, entire 3.5-5.0x2.0-2.5 cm, subcoriaceous; midrib and lateral nerves prominent beneath. Flowers white tinged with violet or pink in pedulous axillary racemes; pedicel 0.7-1.0 cm long; 2 bracteoles at the base and 2 at the apex. Calyx minute, campanulate; segments 5. Corolla white-blue, 1.0-1.2 cm. standard orbicular, hairy outside. Stamens 1-adelphous. Ovary pubescent; style curved glabrous. Pods ovate with decurved point woody, 3.5-5.0 cm long, glabrous, 1-needed.

**Fl. & Fr. :** April-Oct.

Planted in gardens and on road sides. **Collection :** 874; Muzaffarnagar City. Leaves are used as fooder. Roots and leaves are used in medicines are seeds yields an oil, which is used in ayurvedic medicines.


Ca 450 species; 42 species in India 3 in MZN.

1a. Leaves 3 – foliolate

2a. Herbs.................................................. 3. *D. triflorum*

2b. Shrubs or undershrubs............................ 2. *D. pulchellum*

1b. Leaves 1 – foliatate................................. 1 *D. gangeticum*
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH


Suberect, much branched, wiry trailing herbs upto 1 m tall, rooting at lower sides. Leaves simple, 6 - 12 cm long, ovate - elliptic to ovate-oblong, acute, base round, entire, hairy beneath. Flowers pinkish-blue or white, in axillary or terminal racemes. Pods 1.5-2.5 cm falcate; joints 6-8 indehiscent, clothed with hooked hairs.

Fl. & Fr. : May-Feb.

Common in fruit orchards. Collection : 1775; Barla

Roots are used in asthma, snake bite and scorpion sting.


Erect, much branched, bushy undershrubs upto 2 m tall. Leaves 3- foliolate on 1-1.5 cm petioles, leaflet 6-14 cm long, oblong - lanceolate or elliptic, obtuse, rounded at base, glabrescent above, hairy beneath. Lateral smaller. Flowers white, subtended and enclosed by persistent leaf like bracts, in 2-6 flowered umbels. Pods 1-2 jointed, upto 1 cm long, shallowly incised along both surfaces, glabrous.

Fl. & Fr. : Aug. – Nov.

Common on damp, shady places among bushes. Collection : 601; Shukartal.


Much branched, creeping, wiry herbs, rooting at nodes. Leaves 0.8 - 1.3 cm long,3 foliolate; leaflets upto 1 cm long. obtuse, obcordate; glabrous above, hairy beneath. Flowers pink or purplish, 1-3 together in the axils of leaves. Pods 1-1.5 cm long, curved, flat, 3-5 jointed, clothed with hooked hairs.

Fl. & Fr. : Aug. – Nov.

Common in the waste places and grassy fields. Collection : 500, Muzaffarnagar

16. Erythrina Linn.

Ca 100 species; 8 species in India; 2 in MZN

1a. Medium sized trees. Flowers appearing before the leaves.......................................................... 2. E. variegata
1b. Small or medium–sized trees. Flowers appearing with the leaves……………………………………

1. E. suberosa


Medium - sized, deciduous, grey barked, branched shrub, branches straight with conical prickles. Leaves, young parts and inflorescence covered with soft, brown tomentose hairs. Leaves pinnately 3-foliate, leaflets 5.5-14. cm long, rhomboid, glabrous above, entire, acute; lateral ones obliquae. Flowers showy upto 15 cm long, in 2 - 3 dense racemes; pedicel 0.5 cm long. Calyx campanulate, nearly 2- lipped, 0.7-1.1 cm long, nearly glabrous. Corolla 4.0 cm long, dark scarlet; stamens 2-adelphous. Ovary stalked; style uncurved; stigma capitulate. Pods stalked, 7.5- 10.0 x0.7 cm, tapering on both ends, 4 -6 seeded.

Fl. & Fr. : March – July
Rarely planted in gardens, on roadsides. Collection : 2709; Rampur.
The wood is used in making sieve frames.


Medium - sized, branched, deciduous trees. Trunk armed with numerous prickles. Leaflets broad mate to rhombic-ovate, nearly as long as broad. Flowers bright scarlet, showy, numerous. Calyx spathaceous.

Fl. : Feb. - April.
Planted in gardens and bungalows. Collection : 2235; Shamli.

17. Indogofera Linn.

Ca 700 species; Ca 50 species in India; 7 in MZN

1a. Leaves simple :

2a. Pods globose, 1 – seeded…………………………. 5. I. linifolia

2b. Pods oblong, 1-2 seeded…………………………. 2. I. cordifolia

1b. Leaves compound, imparipinnate :

3a. Flowers an axillary short peduncled heads.

4a. Leaves 3 – foliolate…………………………. 4. I. glandulosa

4b. Leaves 5- 9 foliolate…………………………. 6. I. linnaei
3b. Flowers in axillary racemes:

5a. Racemes laxly 3-4 flowered; leaflets

5b. Racemes more then 12-flowered:

6a. Pods tetragonous, hirsute......... 1. I. astragalina

6b. Pods cylindrical, glabrous......... 7. I. tinctoria


Annual, erect, 20 - 30 cm tall herbs covered with copper-brown hairs. Stem four-angular. Leaves 8.0-12.5 cm long, opposite, odd-pinnate. Leaflets 7-9, obovate-oblung, obtuse or retuse or mucronate at apex, acute at base, 0.8-3.5 x 0.4-1.4 cm; petiole upto 0.15 cm long; stipule linear, 1.0 - 1.3 cm long. Flowers small, brown-hairy, in dense, 8.0-17 cm long axillary racemes; pedicel 0.1 cm long; bract linear, 0.3 cm long. Calyx upto 0.35 cm long; segments linear. Corolla pink, exceeding the calyx. Pods 1-2 cm long, 4 angular, 4 - 6 seeded, straight, densely hairy tipped with base of persistent style; seeds black, 0.25 x 0.12 cm.

Fl. & Fr. : Sept-Nov.

Rarely found on sandy soils. Collection : 155; Oon.

Babu (1977) has given a comment in HFD for uniting I. hirsuta Linn and I. astragalina DC. to treat former as synonym of the later as single polymorphic species.


Annual, diffuse branched herbs clothed with long white hairs. Leaves simple, 0.6-0.8 cm long, hairy, sub-sessile, cordate, obtuse, mucronate. Flowers red, 4-8 flowered, small, sessil heads. Calyx 0.6-1.5 cm long, with a short tube of setaceous hairy teath. Corolla bright red, not exerted. Pods 0.3-0.5 cm. long, oblong, terete, 2-seeded, beaked. Seeds ovate, truncated at one end, Yellow.

Fl. & Fr. : Aug. – Nov.

Common on river and canal banks and shady places. Collection : 2725; Gordanpur.


Ascending, much - branched, annual herbs, generally glabrous. Leaves upto 1.5 cm long with petiole and stipule, lanceolate. Leaflets 5, opposite, 0.6 - 1 cm long,
oblong, oblanceolate, rounded at base, obtusely retuse, mucronate, membranous, hairy. Flowers on 2 - 4 flowered axillary racemes; pedicels minute. Corolla red, 0.3 cm long. Pods upto 2 cm long, straight, turgid, glabrous; seed 8 - 12. Fl. & Fr. : Aug. - Nov.

Common on dry sandy places, railway tracts and waste-lands. Collection : 695; Joroda.


   Erect or slender, annual-perennial hairy herbs. Leaves 3 -foliolate; stipules minute. Leaflets 1-3 cm long, membranous, green above, glaucous and black-dotted beneath. Flowers in dense sessile or shortly peduncled axillary racemes. Corolla reddish. Pods small up to 0.5 cm long, oblong, finely pubescent, angled, 1-2 seeded with winged sutures; wings often toothed.

   Fl. & Fr. : July–Nov.

   Rare in grassy and agriculture fields. Collection : 1004; Shukratal.


   Prostrate or decumbent – ascending, much branched, silvery pubescent herbs upto 30 cm tall. Leaves simple, linear – lanceolate or oblong, obtuse, mucronate rounded at base 1.2-2.0 x 0.25-0.4 cm; petiole small; stipule subulate 0.2 cm long. Flowers red, 0.3 cm across. 4-8 in 0.5-1.5 cm long racemes; bracts lanceolate, 0.15 cm long; pedicel 0.05 cm long. Calyx 0.25-0.3 cm long, hairy out side; segments acuminate. Corolla 0.3 cm long, exceeding the calyx. Pods ovoid, glabrous, appressed hairy,0.2 cm across, 1-seeded.


   Common in sandy places, waste la.f1ds, river and canal banks. Collection : 271; Rohana.


   Annual-perennial, prostrate or decumbent-ascending herbs with much branched, appressed hairy stem. Leaves 2.1-4.2 cm long, 5-9 foliate, subsessile alternate. Leaflets oblanceolate, obovate, retuse, mucronate; entire, hairy; 0.5 - 1.2 x 0.3 cm; petiole 0.5 cm long. Flowers pinkish - red, 0.25 cm across in dense upto 1.0 cm long axillary racemes; bracts ovate, acuminate, 0.3 cm long. Calyx 0.35 cm long;
segments linear. Corolla upto 0.5 cm long, slightly exerted. Pods cylindrical, appressed hairy, 2 - seeded, 0.3 - 0.4 x 0.1 - 0.2 cm.

Fl. & Fr. : March - Nov.

Common in grassy fields, sandy soils, rivers beds, and on road sides. Collection : 2766; Sujaru.


**Vern. Neel.**

Erect, much branched, appressed hairy, perennial, herbs or under shrubs with angular, tough, zigzag branches upto 1.5 m tall. Leaves 4.0 - 8.5 cm long; stipules minute. Leaflets 9-13, oblong - lanceolate, obtuse, mucronate, cuneate at base, entire appressed hairy, 0.5 - 2.0 x 0.3 - 0.8 cm; petiole 1.0 cm long. Flowers pink in many flowered upto 3.5 cm long lax axillary racemes; bract subulate, 0.1 cm long, pedical 0.1 cm long. Calyx small, hairy. Corolla exerted; standard greenish yellow; wings pink. Pods 2.5 - 3.0 x 0.3 cm straight, cylindrical, nearly glabrous. 8-10 seeded.

Fl. : July-Nov.; Fr. : Nov.-Feb.

Common in waste sandy places, canal sides, and river banks. Collection : 5071; Shamli.

18. *Lablab* Sweet.

Probably monotypic


Twining, glabrous, annual – perennial with lanceolate basifixid stipules. Leaflets 3, as broad as its length, 6-12 cm across, broadly ovate elliptic, acuminate; terminal one deltoid. Flowers pink or white blue standard, solitary, axillary. Style inflated. Pods stipulate, flat, beaked. oblong with persistant style base.

Fl. & Fr. : Major Part of the year.

Cultivated for pods. Collection : 1811; Ramraj.

Green pods are cooked as vegetable.


Over 125 species; 9 species in India; 3 in MZN.

1a. Stipules fooliaceous. Leaves without leaflets, ending in
an unbranched, coiled tendril

1b. Stipules not foliaceous. Leaves with a pair of leaflets, ending in branched tendril.


3. *L. sativus*


Plants climbing or twining


Annual, suberect or prostrate-trailing, branched glabrous herbs. Stem and branches angular. Leaves without leaflets up to 3.5 long, ending into coiled tendrils; stipules foliaceous, ovate-round, mucronate, hastate at base, 0.5-2.0x0.4-1.2 cm. Flowers yellow, 1.0 cm long peduncles. Bracts minute. Pedicels 0.3 cm long. Calyx 0.5-0.8 cm long, divided half way down; segments lanceolate. Corolla 0.85-1.0 cm long, yellow; standard shallowly notched. Pods oblong, glabrous, 5-seeded, 3.0-3.5 cm.

Fl. & Fr.: Feb.-May

Common weed of winter crops. Collection: 2133; Charthawal.

The plant is used as fooder.


Annual, glaucous, hairy, climbing herbs with branched, winged stem. Leaflets elliptic ovate-oblong, glabrous, 4.0-7.0x2.0-4.5 cm; petiole 2.5-4.0 cm long, ending into tendrils. Stipules falcate, semi-sagittate at base, 1.0-1.5 long. Flowers purple, on 1.5-4.5 cm long peduncles, solitary. Pedicle 0.6 cm long. Calyx 1.5 cm long, cleft half way down. Corolla up to 3.0 cm long. Pods oblong, pubescent, slightly curved at the top, 4-6 seeded.

Fl. & Fr.: Dec.–March

Cultivated in gardens. Collection: 2828; Jaroda.


Annual, much-branched, sub erect, diffused-climbing herbs. Leaflets linear lanceolate-sharply acute, glabrous, 4.0-6.5x0.5-0.7 cm. Leaves ending into terminal 3-fid tendrils, petiole 1.5 cm long, entire, acuminate, semi-sagittate at base. Flowers
0.6-0.7 cm across, blue, 1.0-1.5 cm long, solitary, axillary. Peduncle upto 1.5 cm long; bract minute; pedicle 0.3 cm long. Calyx 0.6 cm long, glabrous; segments lanceolate. Corolla upto 1.5 cm long, glabrous; standard blue. Pods 4-5 seeded, 3-5 cm long, winged along the dorsal suture, flat, compressed. Seeds 0.2-0.4 cm across, compressed, brown.

Fl. & Fr. : Jan. - March

Common weed of winter agriculture crops and on waste places. Collection : 206; Muzaffarnagar City.
The plant is used as fodder.

20. **Lens** Mill. *nom. cons.*

Ca 10 species; 1 in MZN


Annual, thinly hairy, erect or diffuse, branched herbs. Leaves sessile, upto 2.5 cm long, terminating into a short bristle; stipules 0.3 cm long. Leaflets 3 - 7 pairs. linear - oblong, retuse, mucronate at apex, entire. hairy, 0.5-0.7 x 0.1 cm. subsessile. Flowers pale purple, 1.0 - 1.5 cm long, 1-4 axillary racemes; peduncle; upto 2.5 cm long; pedicel 0.2 cm long. Calyx 0.4 cm long, hairy; segments unequal, lanceolae. Corolla pale-blue, 0.5 cm long, wings adhering to keels. Staminal tube with oblique mouth. Ovary sessile; style bearded longitudinally. Pods 1.0 - 1.2 x 0.3-0.4 cm, compressed, glabrous, 2 - seeded with persistent style base.

Fl. & Fr. : Feb. - April

Cultivated as mixed or main crop. Collection : 2193; Heend.

Seeds are used as very nutritious pulse and branches and leaves as fodder.

21. **Lotus** Linn.

Ca 100 species; 3 species in India; 1 in MZN.


Annual, branched, small herbs. Stem Slender, glabrous or slightly hairy. Leaves oddpinnate, leaflets 5, fleshy; terminal one sessile; laterals 4.0-6.0 cm long. Flowers red, solitary, subtended by a reduced trifoliate leaf at the end of long peduncle. Pods 1.5-2.0 cm long, cylindrical, straight. dehiscent.
Fl. & Fr. : April – Aug.

Rare in sandy soils, canal and river banks. Collection : 3621; Muzaffarnagar City.

### 22. Medicago Linn.

Ca 100 species; 10 species in India; 3 in MZN

1a. Pods not spirally coiled; subglobose reniform……… *1. M. lupulina*

1b. Pods spirally coiled :

2a. Plants wild; flowers yellow……………………… *2. M. polymorpha*

2b. Plants cultivated flowers purple…………………. *3. M. sativa*

1. **M. lupulina** Linn., Sp. pl. 779. 1953; FBI. 2:90; FUGP. 1: 210; HFD. 151.

Annual, prostrate or decumbent – ascending, glabrous, herbs with branches patent-hairy. Leaves pinnately 3- foliate; stipules lanceolate, acuminate, toothed 0.25 cm long; petiole 0.5 – 1.0 cm long; leaflets obovate or cuneate – obcordate, shallowly notchched or mucronate at apex, toothed, bse deltoid, glabrous, subsessile; terminal one on 0.1-0.2 cm long stalk. Flowers 0.1-0.2 cm across, yellow, in dense, capitate peduncled axillary racemes; peduncles 0.5-2.0 cm long. Calyx 0.1 cm long. Corolla yellow, exerted. Pod. subglobose, 0.5 cm across, indehiscent, linear, sickle – shaped, 1-seeded.

Fl. & Fr. : Dec.- March.

Common weed of winter agriculture crops, on waste places, road sides. Collection : 773; Muzaffarnagar

The plant is used sometimes as fodder.


Annual, prostrate or decumbent – ascending, herbs with branched, glabrous stem. Leaves 1.2-2.5 cm long; stipule 0.25 cm long, segmented. Leaflets 0.5-1.0 x 0.2-0.6 cm, obovate – cuneate, notched, mucronate, cuneate at base, dentate in upper part, glabrous, sub – sessile, terminal one on 0.1 -0.2 cm long stalk. Flower yellow , 0.1 cm across, 2-6 flowered, short peduncles, axillary racemes; peduncle upto 1.2 cm long; bracts minute, subulate; pedicle 0.05 cm. Calyx 0.1 cm long. Corolla yellow, 0.2 cm long. Pods 0.5 – 0.6 cm across, coiled, hooked spines on outer margins, 3-4 seeded.

Fl. & Fr. : Dec. – March.
Common agriculture crop weed. Collection : 2212; Heend
The plant is used as fodder.


   Erect, hairy, branched, perennial, grown as annual, 0.5-1.2 m tall herbs. Leaves 3-foliate. Leaflets 2.0 - 3.1 cm long, obovate-oblanceolate. Flowers in axillary racemes. Pods with 2 - 3 spirals.

   Fl. & Fr. : Dec. - April
   Cultivated as green fodder crop during wimer. Collection : 2459; Karoda.
   The plant is used as fodder and the crop gives 5-7 cuttings.

23. **Melilotus** Mill.

Ca 25 species; 3 species in India; 2 in MZN.

1a. Flowers white…………………………………… 1. **M. alba**

1b. Flowers yellow…………………………………… 2. **M. indica**


   Erect, annual, glabrous, upto 50 cm tall branched herbs. Leaves 2.0 - 6.0 cm long.; stipules linear, 0.5 - 0.7 cm long. Leaflets obovate or elliptic - oblong to spatulate, serrate - dentate, obtuse, slightly retuse, macronate, glabrous, 1.0 - 2.5 x 0.4 - 0.7 cm; petiole 0.2 - 0.4 cm long. Flowers on slender peduncle, 4 - 6 cm long, in axillary racemes. Peduncle 20 - 2.5 cm long; bracts subulate, 0.2 cm long. Calyx 0.3 cm long. Corolla 0.5 - 0.6 cm long, white, standard retuse, longer than the wings. Pods glabrous 0.5 - 0.7 cm long, narrowed towards the base, 1- 2 seeded.

Fl. & Fr. L : Dec. – April.
Common weed of winter crops and occurs along canal banks and waste places. Collection : 2511; Budhana
Used as cattle feed.


   Annual, erect, ascending herbs upto 30 cm tall with branched glabrous stem. Leaves 1.5-3.5 cm long; stipule lanceolate, 0.3 cm long. Leaflets obovate-oblanceolate, cuneate, denticulate, notched, entire towards the base, glabrous, 0.7 -3.0
x 0.3 - 0.7 cm, laterals on short petiolules; terminal on 0.3 - 0.5 cm long stalk. Flowers 0.1 cm across, upto 4.5 cm long, dense, axillary, peduncled racemes; pedicels minute; bracts minute. Calyx 0.15 cm long, glabrous; segments lanceolate. Corolla yellow, 0.2 cm long. Pods ovoid - ellipsoid, reticulate, 0.2 - 0.3 cm long, 1- seeded glabrous.

Fl. & Fr. : Jan. - April.
Common winter weed in waste places and fields. Collection : 2514; Mohammadpur. Used as cattle fodder.

Ca 200 species; 12 species in India; 1 in MZN.

M. ovalifolia Kurz. in JASB. 42 (2): 68. 1873. (excl. syn. Wt. & Arn.); FBI. 2: 107; FD. 122; Benthall. Trees Calc. 145.

Medium sized, grey barked evergreen tree. Leaves 10-17 cm long, imparipinnate: leaflets 7, opposite, ovate-elliptic, acute, glaucous, 1.2- 1.5 x 0.8 cm; petiole 0.3 - 0.4 cm long. Flowers in fascicled pandulous racemes; pedicel 0.4 - 0.5 cm long. Calyx campanulate, 0.25 cm long, segments minute. Corolla liliac, 0.7 -0.8 cm long; petals clawed. Stamens 1-adelphous; filaments filiform. Ovary linear; style filiform. incurved; stigma capitate. Pod 6.0 - 8.5 x 1.3-1. 7 cm, 2-3 seeded, lanceolate-oblong, narrowed at base. Seeds 0.7-0.8 cm in diam, compressed, brown.

Fl & Fr. : April – Aug.
Planted on road sides. Collection : 937; Muzaffarnagar City.

25. Mucuna Adans. nom. cons.
Ca 125 species; 15 species in India; 1 in MZN.


Annual, herbaceous, climbing herbs. Leaves 3 - foliate. Leaflets 12.0 - 15.0 x 5.0. 7.0 cm, ovate-oblong or ovate - rhomboid, round or subtruncate at base, retuse. mucronate at apex, appressed hairy; petiole 10-15 cm long; stipules subulate, 0.2- 0.4 cm long. Flowers dark - purple in pairs on upto 8.0 cm long drooping racemes; silky rachis; bracts boat - shaped, 0.8 cm long; pedicel small. Calyx 0.7–0.8 cm long, densely white - silky hairy; segments acute, 2 upper ones connate. Corolla 3.0 - 3.5 cm long, dark violet; keels exceeding the standard. Stamens- 2 adelphous; ovary sessile; style incurved, beardless; stigma capitate. Pods 6.0-7.5 x 1.2-1.5 cm hard, 4-6
seeded, S-shaped, densely clothed with brown, irritating bristles, abruptly hooked at tip. Seeds with an oblong, white, funicular hilum.

Fl. & Fr. : Sept. - Feb.

Rare in jungles & river banks among bushes. Collection : 3654; Shukartal.
The roots & seeds are used in medicines.

26. **Pisum L.**

Ca 6 species; 2 in MZN.

1a. Seeds angled, mottled…………………………………… 1. **P. arvense**

1b. Seeds round, uniformly coloured………………………… 2. **P. sativum**


Annual, smooth, glabrous, twining, branched herbs. Stipules large ovate, toothed irregularly. Leaflets 4-6 oval to oblong, rachis ending in a branched tendril. Flowers 1.2 - 1.5 cm across, on upto 8.5 cm long peduncles, variously coloured. Pods broad straight, slightly curved, reticulate, 4-6 seeded. Seeds angled greenish, yellow, mottled.

Fl. & Fr. : Jan – March

Cultivated in winter season. Collection : 5042, Bhopa. Seeds are eaten by the natives as “dal”. The straw is much valued for fodder.


Annual, suberect, climbing, branched herbs. Stem 4 - gonous, fistular. Leaflets upto 20 cm long, terminating into branched tendril; stipules foliaceous, rounded, dentate at outer margin, upto 3.5 cm across. Leaflets 2-3 pairs, ovate-elliptic-oblong, short-petioled, obtuse or truncate, mucronate, entire or dentate in upper part. Flowers 1.2-1.4 cm across, 1-2 on upto 9.5 cm long axillary peduncles; pedicel 0.5 cm long. Calyx 0.8-1.1 cm long, glabrous; segments acuminate. Corolla 2.5 cm long, white. Style truncate, tapering towards apex. Pods 4.5-8.5 x 1.0-1.2 cm, 4-7 seeded, smooth. Seeds globose, whitish green in colour.

Fl. & Fr. : Jan. - March

Cultivated field crop. Collection : 196; Muzaffarnagar City.

The green seeds are used as vegetables and pickle. The whole plant is used as fodder.


Probably Monotypic genus

Tree, with imparipinnate leaves, rachis 5-15 cm long, leaflets 5-9, 5-10 cm long, acuminate, entire, glabrous; stipules small, caducous. Raceme shorter than the leaf, flower pinkish white. Pedicel c. 7-10 mm long. Bract c. 2.5 mm long. Calyx c. 3.5-4.0 mm long, pubescent, obscurely toothed. Pod obliquely oblong, woody, indehiscent, beaked, and usually 1-seeded.

Fl. & Fr.: Jan-Oct.

Widely grown through the area. Collection: 2646; Jaroda & MZN

Cultivated as avenue plant

**28. Rhynchosia** Lour., nom. cons.

Ca 300 species; 22 species in India; 3 in MZN.

1a. Twining herbs; seeds not arillus:

2a. Peduncles 3-4 cm long………………………... 2. *R. minima*

2b. Peduncles long upto 14 cm……………………... 3. *R. minima* var. minima

1b  Trailering herbs; seeds arillus………………………... 1. *R. capitata*


Annual, trailering, branched, clothed with white spreading hairs herbs. Leaves 5.0 - 10.5 cm long, with 3.5 - 6.5 cm long petiole, 3 - foliate. Leaflets rhomboid-ovoid, obtuse or acute apex, entire, cuneate at base, 2.2 - 3.5 x 1.2 - 2.5 cm petioalule of lateral ones small 0.1 cm long, and upto 1.5 cm long in terminal one. Flowers yellow, upto 1.1 cm axillary, in few to many flowered close racemes; bract ovate, acuminate 0.2 cm long; pedicel 0.2 - 0.5 cm long. Calyx upto 0.75 cm long, hairy, segments acuminate, divided half way down. Corolla 0.8-1.2 cm long. Pods orbicular 0.8 -1.2 cm long, 0.8-1.3 cm across, closely transversely veined, with persistent hooked style, 2-seeded, compressed, hairy. Seeds 2, arillus, oblong, compressed.

Fl. & Fr.: July – Nov.

Common in sandy areas. Collection: 2900; Kakroli.

The plants are used as fodder.

Annual, slender, twining, glabrous branched herbs. Leaves 1.5 - 3.5 cm long; stipule ovate, 0-1.5 cm long, common petiole 0.5-2.0 cm long. Leaflets obovate - rhomboid, deltoid at base, entire, obtuse, 0.5 - 1.5 x 0.5 - 1.2 cm, golden brown, gland dotted beneath; petiolule small 0.05 cm long in lateral ones, 0.5 cm in terminals. Flowers 0.5 - 0.6 cm long, axillary in 2.2-3.5 cm long lax racemes; pedicel 0.5 cm long. Calyx 0.44 - 0.5 cm long, glabrous; segments divided more than halfway down. Corolla yellow, upto 0.6 cm long. Pods oblong, recurved, turgid, 0.8-1.2 x 0.35 cm, 2- seeded, with persistent style base. Seeds without strophiole.

Fl. & Fr. : May. - Nov.

Common in waste places, railway sides. Collection :1582; Khatauli.

The leaves are used as abortifacient.


Annual, twining, branched, herbs. Branches angular, hairy at angles. Leaves 3.0-7.0 cm long; common petiole 1.0 - 3.5 cm long. Leaflets rhomboid, ovate, acute at both ends, 2.2-5.0 x 1.0-3.5 cm, entire, glabrous, petioles small upto 0.1 cm in lateral ones and 1.2 cm long in terminal one; stipule linear, 0.8 cm long. Flowers 0.5 cm long, yellow, axillary, on lax 2.5 - 7.5 cm long racemes; bracts upto 0.1 cm long. Calyx upto 0.6 cm long, segments linear - lanceolate. Corolla about 0.5 cm long, standard hairy outside. Ovary hairy. Pods 1.2 - 2.1 X 0.4 cm, oblong, slightly recurved, short beaked, 2 - seeded, minutely hairy.

Fl. & Fr. : July – Oct.

Occur in sandy localities and river banks. Collection : 634; Badhiwala.

**29. Sesbania** Adans. corr. Scop., *nom cons*

Ca 50 species; 6 species in India; 4 in MZN.

1a. Branches and rachis prickly…………………………. 1. **S. bispinosa**
1b. Branches and rachis prickly
   2a. Flowers yellow…………………………………….. 2. **S. sesban**
   2b. Flowers dark maroon or purple

3a. Flowers dark maroon or violet………… 3. **S. sesban var. bicolor**
3b. Flowers yellow dotted with purple……. 4. *S. sesban* var. *picta*


   Annual, erect, upto 2m tall herbs with minute prickles scattered on stem, branches and rachis. Leaves even-pinnate, 8.5-12.5 cm long; stipule 0.35 cm long. Leaflets 18-30 pairs, oblong lanceolate or linear-oblong, glabrous, obtuse, mucronate, 0.3-1.2 X 0.1-0.2 cm; petiolule minute. Flowers 0.4 cm across, yellow, in 1-4 flowered upto 7.3 cm long solitary axillary recemes; bracts 0.3 cm long. Pedicel 0.4-0.7 cm long. Calyx 0.5 cm long, glabrous, teeth short acute. Corolla 0.7-1.0 cm long. Pods 15-20 X 0.5-1.0 cm, narrowly linear, beacked subterete, many seeded.

   Fl. & Fr.  : Aug. - Nov.

   Grown around agriculture fields, and also found as an escape in waste places. Collection : 4201; Patti-Khedi.

   The stem gives a fibre, leaves are used as fodder and the plant is also used as fuel.


   Erect, soft-woody, large shrubs upto 3.5 m tall, stem branched, glabrous. Leaves even-pinnate, 5.0 -18.5 cm long; stipules deciduous. Leaflets 7 or more pairs lanceolate - oblong, obtuse, obliquely rounded at base, glabrous, 0.5 - 1.2 x 0.2-0.3 cm; petiolule minute. Flowers yellow, 1.5 cm across, on many flowered, in upto 8.5 cm long axillary racemes. Bracts subulate, ovate, 0.2 - 0.3 cm long. Calyx upto 0.5 cm long, glabrous; segments minute, triangular. Corolla 1.5 - 1.8 cm long. Pods 15 - 20 cm long, torulose, twisted, many seeded, septate between the seeds.

   Fl. & Fr.  : Aug. - April

   Planted as hedge, and on road sides. Collection : 79; Muzaffarnagar City.

   Leaves are used as fodder and stem and branches as fuel.
Large shrubs with dark maroon or violet coloured flowers.
Fl. & Fr. : Aug. - Feb.
Along road sides. Collection : 3575; Bhadurpur.

Shrubs with yellow flowers, dotted with purple.
Fl. & Fr. : Aug. - Feb.
Along road sides, field borders. Collection : 5095; Shamli

**30. Tephrosia** Pers., *nom. cons.*
Ca 300 species ; 25 species in India; 3 in MZN

1a. Leaves simple ……………………………………….. 3. **T. strigosa**

1b. Leaves oddpinnate :
   2a. Leaflets 7-13; pods glabrescent………………. 2. **T.purpurea**
   2b. Leaflets 9-11; pods finely dewny…………… 1. **T. pumila**


   Perennial, diffused, decumbent - ascending or erect hairy herbs upto 20 cm tall. Leaves odd-pinnate, 4.5-8.0 cm long; leaflets 9-15, oblanceolate, obtuse, mucronate, glabrous above, hairy beneath, 1.4-1.7 x 0.4-0.5 cm, short petioled: stipules linear, upto 0.3 cm long. Flowers pinkish-violet, about 0.2 cm across, in 2.0-3.0 cm long, axillary, 2-4 flowered leaf opposed racemes; pedicel 0.1 cm long, hairy. Bract linear, 0.25 cm long. Calyx 0.3 cm long, hairy; segments longer than tube, linear, acute. Standard appresed hairy outside. Pods oblong, 2.5-3.2 cm long, slightly curved, hairy with thick margins.

Fl. & Fr. : Aug. - Nov
Common on moist, shady localities. Collection : 2555; Bhokarheri.

Erect, much-branched, perennial, appressed hairy. 30-45 cm tall herbs. Leaves 6.0-7.5 cm long; leaflet 7-15, oblanceolate-obovate, 0.8-1.3x0.3-0.5 cm, nearly entire, glabrous above, silky beneath; petiolule 0.1-0.2 cm long; stipule lanceolate, subulate, upto 0.5 cm long. Flowers pinkish–purple, 0.3-0.5 cm across, on axillary, many flowered, 5-10 cm long racemes; pedicel 0.2-0.3 cm long, bract linear, 0.2 cm long. Calyx 0.3-0.4 cm long, hairy; segments longer than the tube, acute. Standard minutely pubescent outside. Style glabrous; stigma penicellate. Pods 2.5-3.5 cm long, 4-8 seeded, slightly recurved, glabrescent, minutely hairy. Seeds 0.2-0.3 cm across. Fl. & Fr.: June–Nov. Common along road sides, waste places and moist sandy localities. Collection: 3109; Titavi.

The plant is used in medicines.


31. **Teramnus Sw.**


Wide-spreading, creeping or twining herbs clothed with appressed hairs. Leaves 3.0-4.5 cm long, 3-foliate. Stipules small, lanceolate, deciduous. Leaflets 3.0-7.2 cm long, obovate–oblong or elliptic oblong, entire, sub-coriaceous, pubescent
beneath. Flowers pink, in lax axillary elongated racemes; panicles solitary below, fascicled upwards; bracts narrowly lanceolate, caducous; bracteoles minute, subulate. Calyx teeth subequal, about as long as teeth. Corolla pinkish. Pods 3.0-7.2 cm long linear, suppressed hairy, flattened, recurved, 8-12 seeded.
Fl. & Fr. : Aug.–Nov.
Common on canal banks among bushes, in gardens & forest. Collection : 1807; Ramraj.

32. Trifolium Linn.
Over 325 species; Ca 10 species in India; 3 in MZN.

1a. Flowers greenish – yellow ……………………………..1. T. alexandrinum

1b. Flowers pink:
   2a. Peduncle much longer than the subtending leaf. Inflated part of calyx with exserted, divergent upper teeth…………………………3. T. resupinatum
   2b. Peduncle shorter than the subtending leaf. Inflated part of the calyx with inwardly recurved upper teeth…………………………2. T. tomentosum

   Annual, ascending, erect, 30-60 cm tall herbs. Leaves 3-foliate, digitate. Leaflets elliptic or oblong, obtuse, 3.0-.40x1.0-1.5 cm, faintly serrate at apex, appressed hairy; petiole 2.5-3.5 cm long, stipule 1.0-1.5 cm long. Flowers yellowish white or creamish yellow, in dense, globular or oblong-ovate heads; peduncle 2.0-4.5 cm long. Bracts forming involucres at base. Calyx 0.5 cm long, segments long-subulate, 1-3 nerved. Corolla 1.0-1.2 cm long; petals united at the base into a long tube. Pods slightly exerted.
Fl. & Fr. : Feb.- May.
Cultivated winter green fodder crop, also met with as an escape in waste places. Collection : 198; Muzaffarnagar City.
The crop gives several cuttings in the season and widely used as fodder.

   Erect or decumbent-ascending, glabrous herbs. Leaves digitately 3-foliate; leaflets rhomboid- lanceolate or arrowly obovate, rounded- truncate at apex; serrate,
cuneate at base, 1.5-2.0x 1.0-1.5 cm, glabrous; petiole 2.5-6.0 cm long; stipules 1.0-1.5 cm long. Flowers in dense axillary globose racemes; pinkish in colour; peduncle 0.6-2.5 cm long, longer than subtended leaf. Calyx 0.3 cm long, hairy outside; segments subulate, inflated in fruit. Corolla pink, 0.5 cm long; wings longer than keel. Pods small, 1-5 seeded, enclosed in pyriform densely hairy calyx.

Fl. & Fr. : Feb. – March.
Cultivated and also met with as an escape in agriculture field and river beds. Collection : 502; Nirana.
Used as fodder.

3. **T. tomentosum** Linn., Sp. Pl. 771. 1753; SFUGP. 60; HFD. 166; Babu in Ind. For. 95(2): 102.

Prostrate or decumbent-ascending, glabrous annual herbs. Leaves digitately 3-foliate; petiole 0.2-0.8 cm long; leaflets obovate, 2.0x1.0-1.5 cm, rounded truncate at base, retuse at apex, dentate; stipules 1.0-1.5 cm long, ovate- lanceolate, acuminate. Flowers in axillary, globose heads; peduncle 0.8-1.0 cm long, shorter than subtending leaves. Calyx 0.2-0.3 cm long, inflated on upper two segments connate at base; lower three lanceolate, hairy outside. Corolla purple 0.4-0.5 cm long; standard obovate. Pods ovoid, 2-seeded, included within the fruiting calyx; globose, densely hairy, membranous.

Fl. & Fr. : Nov – March.
Occasionally found in grassy localities, waste lands and on road sides. Collection : 381; Muzaffarnagar City.

33. **Trigonella** Linn.
Ca. 135 species; 7 in India; 3 in MZN

1a. Pod narrow, linear falcate .................................1. **T. corniculata**
1b. Pod long, turgid, usually curved:
    2a. Pod long beaked.......................................2. **T. foenum-graecum**
    2b. Pod not beaked........................................3. **T. polycerata**

1. **T. corniculata** Linn., Syst. Nat. ed. 10. 1180. 1759; FBI. 2: 88; FUGP. 1: 210; FD. 115; HFD. 167.

Erect or sub-erect, glabrous, annual herbs upto 30 cm tall. Stem fistular; branches glabrous. Leaves 2.0-5.2 cm long; stipules 1.0 cm long, toothed; leafless obovate, obtuse dentate, cuneate at base, glabrous, 1.2-2.6x 0.6-2.0 cm ; petiole 0.1 cm on long; terminal one on upto 2.6 cm long petiolule. Flowers 6.0-12.2 cm long,
axillary racemes; bracts minute; pedicel 0.4-0.5 cm long. Calyx 0.3-0.35 cm, upper segment longest, acuminate. Corolla 0.6-0.8 cm long, yellow. Pods 1.7-2.8 x 0.25 cm, sickle shaped, compressed, 6-8 seeded.

F1. & Fr. : March – May
Common in crop fields and waste places. Collection : 5088; Shamli.


   Erect, branched, annual hispid herbs. Stem hairy. Leaves 3-foliate; leafless obovate, dentate-serrate at the top, 0.8-3.0 x 0.5-1.5 cm, globose; petiole 0.6 cm long; stipule lanceolate, entire, 3.0 cm long. Flowers pale-yellow in dense racemes; pedicel minute or absent. Calyx 0.35 cm long, hairy; segments subulate, ciliate. Corolla 1.0-1.5 cm long, yellow, 1.0-1.5 cm long; standard and wings narrow. Stamens diadelphous. Pods straight or slightly curved, long beaked, hairy, 5.0-8.2 cm long, 10-20 seeded.

F1. & Fr. : Jan. – March
Cultivated as winter fodder crop, also met with as an escape. Collection : 3128; Titawi.

Common fodder crop. Leaves are used as vegetable and seeds as condiment.


   Porstrate or sub-erect, diffuse much-branched, annual herbs. Stem appressed hairy. Leaves 3-foliate; petiole 0.5-1.0 cm long; leaflets obovate-rhomboid, sharply serrate in upper half, appressed hairy, 0.5 x 0.35 cm; stipule 0.5 cm long, semisagittate, subulate. Flowers 1-4, on axillary or terminal peduncle; bracts subulate, minute. Calyx 0.5 cm long, divided half way down; segments subulate. Corolla yellow, 0.6-0.7 cm long; standard and wings narrow. Stamens diadelphous. Pods sickle-shaped, turgid, transversely reticulate, not beaked, 3.5 x 0.2 cm, 12-20 seeded.

F1. & Fr. : Jan. – April.
Common weed of winter crops and also met with in gardens and waste places. Collection : 3121; Jaroda.

The plant is often used as fodder.

34. **Uraria** Desv.
   Ca 25 species; 10 species in India; 1 in MZN.

Erect, pubescent upto 0.75 m tall undershrubs. Stem branched, finely tomentose. Leaves 6.0-16.0 cm long; upper ones 5-foliate; lower ones 3-foliate; stipules ovate-acuminate, upto 1.5 cm long; common petiole upto 4.5 cm long. Leaflets lanceolate-oblong, 5.0-6.5 x 1.7-2.5 cm, rounded at base, acute, entire, glabrous above, minutely hairy beneath; petiolule 0.1-0.5 cm; stipule subulate 0.3 cm long. Flowers 0.35 cm across, on upto 2.5 cm long terminal racemes; bracts deciduous pedicel 0.7-0.8 cm long, densely hairy. Calyx 0.4-0.5 cm long, hairy; segments unequal; tube short. Corolla 0.8 cm long, purple. Pods 3-6 jointed, whitish, glabrous.

The plant parts are used in medicines.

35. Vicia Linn.
Ca 150 species; 13 species in India; 3 in MZN.

1a Rachis not ending in a tendril................. 1. V. faba

1b Rachis ending in a bifid tendril:

2a Pods 2-seeded................................... 2. V. hirsuta

2b Pods 6-8 seeded............................... 3. V. sativa


Erect, glabrous, 30-50 cm tall annual herbs with quadrangular stem. Leaves 4.5-9.0 cm long; leaflets 4-6, 2.5-5.8 x 1.0-2.7 cm, obovate or oblong, obtuse, mucronate, entire, membranous, glabrous, sub-sessile; stipules subovate, with dentate auricle. Flowers 1.5-2.2 cm long, sub-sessile, 2-3 in axillary, short racemes. Calyx upto 0.8 cm long, glabrous; segments divided less than half way down, acuminate. Corolla white, 2.0-2.5 cm long. Pods linear-oblong, 6.0-8.2 cm long, glabrous.

F1. & Fr. : Feb.–May
Cultivated in the fields. Collection : 173; Muzaffarnagar City.
The young fruits are used as vegetable.

Climbing, annual, much branched herbs. Stem angular, nearly hairy. Leaves 3-5 cm long; rachis ending into a long bifid tendril; leaflets 6-10 pairs, linear-oblong, truncate, mucronate, entire, base acute, glabrous, subsessile. Flowers white, 2 or more in axillary 1.8-2.5 cm long racemes; pedicel small. Pods upto 1.2 cm long, obliquely oblong, 2-seeded, short hairy.

F1. & Fr. : Jan. – March

Common in moist and waste places. Collection : 3123; Titawi.


Suberect or prostrate, branched, minutely hairy herbs with angular stem. Leaves 2.5-6.0 cm long, with 1-3 fidi terminal tendril. Leaflets 3-6 pairs, oblanceolate or oblong, entire, acute at apex, upto 1.8 cm long, glabrous, subsessile; stipule ovate, acuminate. Flowers reddish-blue, solitary, axillary; pedicel upto 0.15 cm long. Pods 3-4.5 cm long, oblong, glabrous, 8-10 seeded, beaked.

F1. & Fr. : Dec. – March

Common weed of winter crops. Collection : 2154; Charthawal.

36. Vigna Savi.

Ca 100 species; 9 species in India; 4 in MZN.

1a Stipules falcate – lanceolate – linear ………….. 1. V. mungo

1b Stipules broadly ovate-oblong-lanceolate :

2a Pods bristly ……………………………….. 1. V. angularis

2b Pods glabrous;

3a Pods 3-4 cm long …………………… 3. V. trilobata

3b Pods 10-15 cm long ……………………….. 4. V. unguiculata


Erect or decumbent-ascending, annual hairy herbs. Leaflets broadly ovate, acute-acuminate, rounded-truncate at base, oblique, hairy, entire, 5-9 cm long; petiole 8-25 cm long; stipule broad-ovate. Flowers in axillary racemes; pedicel upto 10 cm long. Corolla yellow 0.6-0.8 cm long. Pods cylindrical, 6-9 cm long, densely covered with strong hairs; seeds 12-14, greenish.
F1. & Fr. : Aug. – Nov.

Cultivated throughout within the area. Collection : 1749; Basera.

Seeds are very nutritious and are much used in the form of “Dal”. Leaves and straw are used as fodder. Flour of seeds is an excellent substitute for soap.


Suberect or trailing, annual herbs with all parts densely erecto-patently brown hairs. Petiole 6-13 cm long; stipule oblong-lanceolate, upto 1.5 cm long. Leaflets lanceolate-oblong or ovate, acute, rounded at base, entire, 4.5-10 cm long. Flowers in axillary racemes; rachis short; bracts boat shaped, 0.5 cm long. Corolla yellow, 1.2 cm long. Pods 3-4 cm long, hairy, 4-5 seeded; seeds dark black brown.

F1. & Fr. : July – Nov.

Cultivated widely within the area.

Collection : 1063; Mohammadpur.

Seeds are used as “Dal” due to its high nutritious value. Leaves and straw are used as fodder.


Trailing, glabrous or hairy, annual herbs. Stipules ovate, 0.5-0.6 cm long. Leaflets 3-5 cm long, shallowly or deeply 3-lobed, rounded at base. Flowers yellow in capitate racemes. Pods 3-4 cm long, subcylindrical, slightly curved, 8-12 seeded.

F1. & Fr. : Sept. - March

Occasionally cultivated crop. Collection : 3797; Mirapur.


A twining annual, herb. Stem branched, tubercled, glabrous. Leaves 3-foliate, petiole variable; stipule ovate-lanceolate, 0.5-2 cm long; leaflets ovate, acuminate, 5-6 cm long, obliquely at base, entire. Flowers yellow or blue, in axillary racemes; pedicle
0.3 cm long. Corolla long-exserted, 2.5-3.0 cm long. Pods linear-oblong, turgid, 1.5-4.0 cm long, glabrous many seeded.

F1. & Fr. : June – Oct.

Cultivated. Collection : 5036; Morna.

The green pods are used as vegetable. The stalk and leaves are used as fodder, and dry seeds as pulse.

37. **Zornia** J.F. Gmel.

Ca 75 species; 2 species in India; 1 in MZN.


Prostrate-decumbent or suberect, grass-like annual herbs. Stem glabrous or hairy. Leaflets 2, entire, short petioluled, lanceolate, acute, oblique-rounded at base, ovate-lanceolate, ciliate. Pods 2-5 jointed, 0.5-1.2 cm long, exceeding the bracts, with joints easily separable, muriculate with hooked bristles.

F1. & Fr. : Aug. – Nov.

Common in sandy soils and river banks. Collection : 2958; Ramraj.

39. **CAESALPINIACEAE**

1a Leaves simple shallowly or deeply cleft ……… **1. Bauhinia**

1b Leaves compound :

2a Plants armed with prickles or spines:

3a Pods not moniliform ……………… **2. Caesalpinia**

3b Pods moniliform……………………**5. Parkinsonia**

2b Plants unarmed :

4a Leaves 1- pinnate:

5a Petals 0; calyx petpaloid…………… **7. Saraca**

5b Petals present, calyx sepaloid:

6a Fertile stamens 3,

monadelphous …………. **8. Tamarindus**

6b Fertile stamens 5-10, free… **3. Cassia**

4b Leaves 2- pinnate :

7a Sepals valvate; stamens
1. Bauhinia Linn.

Ca 100 species; 8 species in India; 4 in MZN.

1a. Shrubs or climbers:

2a. Large woody climbers; flowers white or dull yellow

3. B. vahlii

2b. Shrubs; flowers yellow

4. B. tomentosa

1b. Trees:

3a. Calyx spathaceous

4. B. variegata

3b. Calyx splitting into 2, nearly equal, reflexed parts

5. B. purpurea


Medium sized deciduous trees. Younger parts pubescent. Leaves 8-15 cm long, longer than broad, usually 11 nerved, cordate, glabrous; lobes subacute, reaching cleft upto the middle. Flowers rose-pink in terminal and axillary corymbose raceme; bracts small, deltoid; calyx tube silky, splitting into 2, narrow, nearly usually reflexed toothed parts; stamens 3 or 4. Pods 15-20 cm long or more, flat, decurved, greenish-purple.


Planted in gardens, road sides.

Collection : 229; Mansoorpur.

The bark and leaves are used in medicines. The buds are used as vegetable. The bark is also used for dyeing and tanning.


Small branched, shrubs. Leaves 3-5 cm long, nearly as long as broad, lobes obtuse. Flowers cream or pale yellow coloured; 1-3 axillary; calyx spathaceous. Stamens 10. Pods 8-12 cm long, flat, finely pubescent, dehiscent with a long persistent style.

F1. & Fr. : July – Oct.
Planted in gardens and lawns. Collection : 4033; Basera. Young buds are used as vegetable and buds and other parts of the plants are used in medicines


Larged leaved climber with young parts, petioles, inflorescences grey or rusty pubescent. Leaves vary in size, upto 30 cm long and equally broad, deeply cordate or auriculate; lobes obtuse. Flowers witish yellow in corymb or corymbose receme. Pods 15-30 cm long, flat, rusty tomentose.

Fl. & Fr. : May-July

Planted in gardens. Collection : 4480; Basera

Young buds are used as vegetables.


Medium sized deciduous tree. Young parts with brown pubescence. Leaves 10-15 cm long, broader than length, 8-10 nerved, deeply cordate. Flower pink to purple, fragrant, arranged in lateral corymbs, pedicel short or lacking. Calyx spathaceous, hairy outside. Fertile stamen 5. Pods 10-15 cm long, flat glabrous, slightly curved with long stripe.

Fl. & Fr. : Seb- Oct

Planted on road side and gardens. Collection : 2535; Karoda

Buds are cooked as vegetable and medicinally in diarrhea. Leaves are used as fodder and bark for dyeing and tanning.

2. **Caesalpinia** Linn.

Over 100 species; 9 species in India; 1 in MZN.


Evergreen scandent or straggling or climbing, prickly shrubs. Prickles hooked, hard. Leaves 30-35 cm long, pinnate, 6-8 pairs; stipules foliaceous. Leaflets 1.5-2.5 cm long, oblong, ovate, obtuse mucronate. Flowers yellow, in 15-30 cm long, axillary or terminal racemes. Pods 6-8 cm long, 3-4 cm broad, dehiscent, prickly. Seeds 2, shining.

Fl. & Fr. : July – Feb.

Commonly growing along the garden borders. Collection : 2581; Bhopa.
The roots, leaves and seeds are used in medicines. Bitter cotyledones are considered to be a substitute of quinine.

3. **Cassia** Linn.

Over 500 species; 24 species in India; 11 in MZN.

1a. Herbs, undershrubs or shrubs:

   2a. Fertile stamens 5………………………………………6. **C. pumila**

   2b. Fertile stamens 6-7:

      3a. Leaves with 1 gland just above the base
          of the petiole and not in between leaflets:
          4a. Leaflets 3-5 pairs, ovate acuminate;
              pods flat………………………………5. **C. occidentalis**

      4b. Leaflets 4-8 pairs, oblong lanceolate;
          pods more or less turgid:
          5a. Branches green; leaflets
              2-5 cm long ………………….8. **C. sophera**

          5b. Branches reddish-purple;
              leaflets 1.5-2.0 cm long…………9. **C. sophera**
              subsp. purpurea.

   3b. Leaves with 1-several glands between
       the leaflets:

      6a. Glands between the lowest
          pair of leaflets………………4. **C. obtusifolia**

      6b. Glands between each of
          the 2 lowest pairs of leaflets……11. **C. tora**

1b. Trees:

   7a. Flowers red or pink; anther filaments with
       globose swelling:
       8a. Leaflets pointed, glabrous………………3. **C. nodosa**

       8b. Leaflets round, hairy beneath………………2. **C. javanica**

   7b. Flowers yellow; anther filaments without
       globose swellings:

       9a. Stamens 10, all fertile:

       10a. Stemens nearly equal in
            length; pods dehiscent……………10. **C. surattensis**
10b. Stamens unequal; pods
  indehiscent ..........................*1. C. fistula*

9b. Stamens 10, 6-7 fertile..................7. *C. siamea*


   Medium-sized, deciduous trees with whitish or greenish bark. Leaflet 4-8 pairs, 10-15 cm long, ovate, acuminate, entire, cuneate at the base, pubescent when young. Flowers bright yellow in long drooping lax racemes. Stamens unequal. Pods indehiscent, cylindrical, pendulous, 25-60 cm long, smooth, hard, dark brown, transversely divided into numerous 1-seeded segments. Seeds flat, embedded in pulp.

   F1. : July; Fr. : Nov. – Feb.

   Planted in gardens and met in jungles. Collection : 411; Nirana.

   Fruits are used as laxative.


   Medium-size trees. Leaves with 6-14 leaflets, 2-4 cm long, bluntly rounded hairy beneath. Stipules linear, caduceus. Flowers and leaves pink fading to white, in dense racemes. Stamens 10, 3 with glabrous swellings. Pods cylindrical, pendulous, indehiscent.

   F1. & Fr. : July – Oct.

   Planted in gardens. Collection : 2573; Bhopa.


   Planted in gardens. Collection : 2783; Muzaffarnagar City.


   Annual, branched herbs upto 1 m tall. Leaves 5-10 cm long, with a conical gland between the lowest pair of leaflets. Stipules linear, caduceus. Leaflets 3.5-4.5 cm long, obovate-oblong, deltoid at apex. Flowers axillary, usually in pairs. Perfect
stamens 7. Pods 10-20 cm long, subterete, obliquely septate, upto 20 cm long; seeds shining, brown.
F1. & Fr. : July – Nov.
Common weed of rainy season, on road sides, and fields. Collection : 1552; Jaroda.
The seeds are used in medicines.
Vern. *Bada Panwar; Kusunda.*
Erect, under-shrubs upto 1.5 m tall. Leaves with an ovoid gland at the base of the petiole. Leaflets 3-5 pairs, 3-10 cm long, opposite, ovate oblong or ob lanceolate, acuminate, glabrous. Flowers yellow, in few flowered, axillary racemes. Perfect stamens 7. Pods 9-11 cm long, flattened, recurred, transversely septate. Seeds 20-25 flat, brown.
F1. & Fr. : Aug. – Nov.
Common on road-sides, waste places. Collection : 19; Muzaffarnagar City.
6. **C. pumila** Lamk., Encyl. 1: 651. 1785; FBI. 2: 266; FUGP. 1: 295; FD. 141.
Prostrate or ascending, deep rooted, stout herbs. Stems and branches reddish brown. Leaflets 8-12 pairs, close, 0.5-0.8 cm long, linear-oblong, strongly veined, mucronate, a gland present below the lowest pairs of leaflets. Flowers yellow, usually solitary, on very short pedicels. Fertile stamens 7, 3 uppers reduced to staminodes. Pods 2-4 cm long, straight flat, linear, stout, obliquely septate between the seeds. Seed 6-8.
F1. & Fr. : Aug. – Nov.
Common rainy season weed, in fields, on road sides and waste lands. Collection : 2560; Bhopa.
7. **C. siamea** Lamk., Encyl. 1: 648. 1785; FBI. 2: 264; MCP. 586; FD. 143.
Large or medium-sized trees. Leaves 10-30 cm long. Leaflets 6-12 pairs, 4-6 cm long, elliptic – oblong, obtuse, glabrous. Flowers yellow in corymbose racemes, clustered at the end of branches. Stamens 10, 6-7 fertile. Pods flat, 20-30 cm long, thickened at the sutures.
F1. & Fr. : Aug. – May
Planted in gardens and also on road sides. Collection : 230; Mansoorpur.
The leaves contain toxin an poisonous substances.
Erect, diffused undershrubs. Rachis grooved, with a single conical gland at the base. Leaflets 4-6 pairs, 2-5 cm long, oblong-lanceolate, acute, cuneate at base. Flowers yellow, axillary corymbose racemes. Pods 5-10 cm long, slightly curved, transversely septate, dehiscent. Seeds upto 40, dark brown.

F1. & Fr. : July – Feb.
Planted in gardens and met with in wild conditions also. Collection : 80; Muzaffarnagar City.

Seeds are used in adultration in coffee.


Erect, diffused undershrubs with reddish-purple branches and petioles. Leaves 4-8 cm long; leaflets 6-8 pairs, 1.5-2.0 cm long. Leaves and leaflets are smaller than *C. sophera*. Pods 6-8 cm long, more or less turgid, thickened and marked with broad yellow lines along the sutures.

F1. & Fr. : Aug. – Nov.
Occuring on waste places. Collection : 1613; Mansoorpur.

Various parts of the plant are used for the remedy of ring worm diseases.


Small trees with rachis chanelled above and a long conical gland between 2-3 leaflet-pairs. Leaflets 5-6 pairs, 4-8 cm long, ovate, obtuse, cuneate at base. Flowers yellow in axillary, peduncled corymbs. Stamens 10, all fertile. Pods 10-20 cm long. Stalked, straight, flat, thin, flexible, 20-30 seeded, dehiscent. Seeds dark brown, in two rows.

F1. & Fr. : Sept. – Nov.
Planted in gardens and also met with in wild conditions. Collection : 2802; Sujaru.


Erect, annual, small herbs. Rachis with a conical gland between each of the two lowest pairs of leaflets. Leaflets 3 pairs, 2-4 cm long, obovate, oblong. Flowers yellow, axillary in pairs on short peduncles. Fertile stamens 7. Pods 12-20 cm long, stout, obliquely septate, stalk of pod 1.2 – 1.6 cm long.
F1. & Fr. : Aug. – Nov.
Common in rainy season on waste places and fellow fields. Collection : 15; Muzaffarnagar City. 
The leaves are used as fodder and seeds are used in medicines.

4. Delonix Raf.

3 species; 2 species in India; 1 in MZN.


Medium sized, weak, fast growing trees with an umbrella crown. Leaves bipinnate, stout petiole, 10-20 pairs of pinnae each with 20-40 pairs of leaflets. Leaflets 1-1.5 cm long, oblong, stipules absent. Flowers red or orange-red in long racemes. Sepals green outside and red within. Petals clawed, 5 cm long; limbs broad, crisped, odd petal distinct, often yellow. Pods 30-60 cm long, flat. Seeds many, oblong.

F1. : April. – Sept.; Fr. : Nov. - April
Commonly planted or road sides, gardens. Collection : 3749; Muzaffarnagar City.

5. Parkinsonia Linn.

2 species; 1 in MZN.


Diffused shrubs or small trees; armed with woody spines. Leaves bipinnate with 2-6 pinnae, crowded on dwarf axillary shoots. Pinnae 15-20 cm long; rachis flattened; leaflets 20-30 pairs, 4-5 cm long, oblanceolate. Flowers yellow, in lax axillary racemes, 7-10 cm long. Stamens 10, free, filaments flattened villous at base. Pods 4-10 cm long, twisted, slender, moniliform, finally dehiscent.

F1. : Nov. – Feb.; Fr. : March – June
Planted in gardens and on road sides. Collection : 224; Kandhla.
Charcoal is prepared from wood.

6. Poinciana Linn.

Species included under Gen. Caesalpinia Linn.


Glabrous shrubs upto 4 m tall. Leaves 20-30 cm long; rachis smooth; pinnae 8-16. Leaflets 6-9 pairs, 1.5-2.0 cm long, obtuse oblique-oblong. Flowers red or
orange coloured, with long pedicels, arranged in loose, terminal or axillary racemes. Sepals imbricate. Stamens 10; filaments bright red, exerted. Pods thin, flat, broadly linear.
F1. & Fr. : April. – Nov.
Planted in gardens and lawns. Collection : 2399; Kandhla.

7. Saraca Linn.
Ca 20 species; 2 species in India; 1 in MZN.

F1. & Fr. : March - April
Planted in gardens. Collection : 821; Muzaffarnagar City.

8. Tamarindus Linn.
 Probably monotypic genus.

Large or medium sized trees with a dense crown. Leaves 6-15 cm long, paripinnate; leaflets 10-15 pairs, opposite, 1.5-2.0 cm long, linear-oblong, obtuse. Flowers yellow, striped with red, in few-flowered terminal racemes. Bracts enclosing the buds. Calyx sepaloid, tube turbinate. Perfect stamens 3. Pods 5-10 cm long, narrowed at both ends, usually falcate, pulpy inside, 4-5 seeded. Seeds shining, dark-brown.
F1. : July. – Aug.; Fr. : Oct. – Nov.
Planted in gardens and on road sides. Collection : 2172; Heend.
Fruits pulp is edible and used variously, roasted seeds are also eaten.

40. MIMOSACEAE
1a. Anthers gland tipped; stamens 10…………………………6. Prosopis
1b. Anthers not gland tipped:
    2a. Stamens 4-10 :
        3a. Valves of pods segmented…………………………4. Mimosa
3b. Valves of pods continuous

2b. Stamens more than 10:

4a. Stamens free

1. Acacia

4b. Stamens monadelphous:

5a. Plants armed; pods spirally twisted

5. Pithecelobium

5b. Plants unarmed, pods flat, straight

2. Albizia

1. Acacia Willd.

Over 700; Ca 25 species in India; 3 in MZN.

1a. Leaves reduced to phyllodes

1. A. auriculiformis

1b. Leaves not reduced to phyllodes:

2a. Heads axillary, fascicled

3. A. nilotica

2b. Heads in terminal panicles

2. A. leucophloea


Medium sized trees. Phyllodes falcate, oblong, 10-18 cm long, narrowed at both ends with 4-6 subparallel nerves. Flowers yellow, in cylindrical, lax spikes. Pods moniliform, brown, coiled at maturity, dehiscent. Seeds black with long coiled yellow funicle.


Planted in gardens for its beautiful phyllodes and flowers. Collection : 2775; Sujaru. The wood is used in paper industry.


Medium sized, deciduous trees armed with short, straight spines. Pinnae 5-12 pairs; rachis hairy. Leaflets 30-40 pairs, 0.6-0.8 cm long, linear. Flowers heads pale-yellow, sweet scented, in large terminal, leafless, densely tomentose branched panicles. Pods 8-10 cm long, narrow, falcate, tomentose, 8-12 seeded.

F1. & Fr. : Sept. – Feb.

Rarely occurs on waste lands and in forest area, on canal banks. Collection : 041; Morna.
The bark yields an important gum which is used in medicines and leaves and bark in dyeing.


Large or medium-sized trees, armed with paired spines upto 4 cm long or small, straight, white. Leaves 4-8 cm long. Pinnae 3-7 pairs, upto 4.5 cm long. Leaflets 10-20 pairs, upto 0.8 cm long, sessile, linear. Flowers yellow in globose pedunculate heads. Pods 6-15 cm long, flat, moniliform, compressed, 8-10 seeded.

F1.: Aug. – Sept.; Fr.: Jan. – April.

Planted and occurs in wild conditions. Collection: 1634; Titavi.

Leaves and young pods are used as fodder. The twings are chewed and used as toothbrush. Wood is also used for agriculture implements. Gum is used medicinally and bark is used in tannery.

2. **Albizia** Durazz.

Ca 100 species; 14 species in India; 1 in MZN.


Large, deciduous trees, Leaves paripinnate, bipinnate; rachis 7-20 cm long with a large sessile gland near the base. Pinnae 2-4 pairs, 8-15 cm long. Leaflets 4-9 pairs, sub sessile, 2.5-4.0 cm long, obliquely elliptic-oblong, or obovate-oblong obtuse, glabrous. Flowers pale yellow, in globose umbellate heads, fragrant, shortly pedicellate. Pods 10-30 cm long, linear, oblong, flat with pale brown patches.

F1.: July. – Aug.; Fr.: Sept. – Oct.

Planted along road sides, canal banks. Collection: 4162; Ailum.

The wood is used for making sugarcane-crushers, oil mills and furniture. The leaves and twings are used as fodder.

3. **Leucaena** Benth.

Ca 50 species; 1 in MZN.

Large shrubs or small trees. Rachis 5-15 cm long, ending in a soft – bristle. Pinnae 4-6 pairs, 4-8 cm long. Leaflets 10-15 pairs, 1.0-1.3 cm long, linear, acute, membranous. Flowers white, in dense globular heads. Pods 10-15 cm long, 1.0-1.5 cm broad, clustered, straight, flat, shortly beaked, shining. Seeds 15-20, obliquely placed.

F1.& Fr. : July – Sept.

Planted along park boundaries and road sides. Collection : 2343; Heend.

4. **Mimosa** Linn.

Ca 450 species; 8 species in India; 2 in MZN.

1a. Stamens 4; pinnae digitately arranged……………….2. **M. pudica**

1b. Stamens 8-10; pinnae pinnately arranged …………………..1. **M. himalayana**


Erect or straggling, throughout prickly shrubs. Branches ribbed. Prickles recurved. Pinnae 8-12 pairs. Leaflets 8-15 pairs, upto 0.6 cm long, obtuse, mucronate. Flowers pink, fading to white, in solitary or fascicled heads. Pods oblong-linear, curved, glabrous, 7-8 cm long, with 5-10 joints, prickly at the edge and on the stalk.

F1.& Fr. : June – Sept.

Common along river banks and moist sandy places. Collection : 1705; Rampur.


Much branched, spreading, prickly herbs; stem and branches hairy. Leaves very sensitive to touch. Pinnae 4. Leaflets 12-20 pairs, small upto 1.0 cm long. Flowers purplish in spherical heads. Pods flat, 3-5 jointed, 1-1.5 cm long, margins spinose bristly with long hooked bristles.

F1.& Fr. : Aug. – Nov.

Common in waste places, sandy areas and also planted in pots. Collection : 336; Morna.

The leaves and roots are used in medicines.

5. **Pithecellobium** Mart. *nom. cons.*

Ca 200 species; 5 species in India; 1 in MZN.

Large, thorny shrubs or trees; bark grey-white, or slate-coloured. Leaves with one pairs of pinnules. Leaflets 2, obovate or oblong, 2.5-4.0 cm long, obtuse, oblique. Flowers greenish white, in globose axillary heads. Pods flat, spirally twisted, 10-15 cm long, reddish-brown when ripe. Seeds flat; funicle dilated at the apex into a fleshy aril.

F1. : April – July; Fr. : June – Sept.

Planted as hedge tree and growing in wild conditions. Collection : 2226; Heend

The wood is used for fuel and the aril of the seeds is eaten.

6. Prosopis Linn.

Ca 40 species; 3 species in India; 2 in MZN.

1a. Pods cylindriical, torulose………………………………..1.P. cineraria

1b. Pods compressed ………………………………………….2.P. juliflora


Medium sized trees with short, scattered, broad, conical, straight prickles. Rachis 1.5-2.5 cm long. Pinnae 1-2 pairs, 3-8 cm long. Leaflets 7-13 pairs, 0.7-1.5 cm long, sessile, obliquely oblong, mucronate, base rounded, 3-nerved. Flowers yellow, subsessile, in glandular spikes, 4-6 cm, long in short axillary panicles. Pods 8-14 cm long, pendulous, cylindrical, turgid, torulose, narrowed into a short stalk.

F1. : May - June; Fr. : June – July

Common on road sides and field edges. Collection : 3607; Muzaffarnagar City.


Medium-sized trees with drooping branches. Rachis upto 2.5 cm long with gland between each pair of pinnae. Pinnae 4, 2.5-8.0 cm long; leaflets 15-20 pairs, sessile, obliquely oblong, minutely mucronate. Stipules spiny. Flowers cream or pale, in axillary spikes, 8-12 cm long. Pods 12-18 cm long, 1.5 cm broad, pendulous, compressed, beaked at the apex, curved, constricted between the seeds.


Common on road sides and Ganga canal Banks. Collection : 5094; Shamli.

The sweet pods are largely used as a food and fodder for cattle.

41. ROSACEAE

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
1a. Leaves simple:
   2a. Ovary superior :
      3a. Shrubs or trees; carpel one...................4. Prunus.
      3b. Small shrubs; carpel 4 or more.............7. Spiraea
   2b. Ovary inferior :
      4a. Flowers in umbel.............................5. Pyrus
      4b. Flowers in terminal panicles................2. Eriobotrya

1b. Leaves compound :
   5a. Shrubs with spines..................................6. Rosa
   5b. Herbs, no spines :
      6a. Leaflets 3.....................................1. Duchesnea
      6b. Leaflets 3-9...................................3. Potentilla

1. Duchesnea J. E. Smith
   6 species; 1 species in India; 1 in MZN.


   Perennial prostrate, more or less hairy herbs. Leaves 2-12 cm long, stipulate; leafless usually 3, stalked or sessile, 2-3 cm long, obovate, serrate, crenate or toothed, membranous. Peduncles axillary, solitary; 1-flowered, equaling the petioles. Flowers 1.0-2.5 cm in diam yellow. Calyx lobes ovate or lanceolate. Petals obovate. Fruits globose or oblong, bright red, spongy.
   F1.& Fr. : Nov. - March
   Rarely growing in moist and shady places. Collection : 4143; Rampur.
   The ripe fruits are eaten.

2. Eriobotrya Lindl.
   Ca 30 species; 9 species in India; 1 in MZN.


   Small evergreen trees with rusty, tomentose branchlets. Leaves upto 30 cm long, obovate, elliptic-oblong, acute or acuminate, tapering at the ends, wooly beneath. Flowers dull-white creamy yellow, fragrant, in terminal panicles; styles free. Pomes pyriform upto 4 cm long, yellow when ripe.
   F1.& Fr. : Dec.; Fr. : March – April
Cultivated for edible fruits. Collection : 86; Muzaffarnagar City.

3. Potentilla Linn.
   Ca 500 species; 40 species in India; 1 in MZN.


Annual, prostrate, much branched, leafy herbs. Leaves pinnately 3-9 foliate, 1.5-4.0 cm long; leaflets opposite or alternate, lobulate or serrate. Flowers yellow, solitary, on slender axillary panicles. Receptacles globose, villous. Achenes minute, smooth.

Fl. & Fr. : Jan. – April.

Common near the ponds, shady places, grassy localities and along road sides. Collection : 3860; Ramraj.

4. Prunus Linn.
   Ca 40 species; 19 species in India; 2 in MZN.

1a. Flowers white; drupes glabrous.........................1. *P. domestica*

   **Subsp. insititia**

1b. Flowers pink; drupes pubescent.........................2. *P. persica*

   Hook. f., FBI. 2: 315; FUGP. 1: 324. Vern. *Alu – Bukhara, Alucha, Phulum*

   Large deciduous shrubs or small trees. Leaves 2.5-6.5 cm long, ovate to oblong-lanceolate, sharply serrate, glabrous above, pubescent beneath with petiolar and marginal glands; petioles upto 1.5 cm long. Flowers 1 or 2 together, axillary; pedicels upto 0.7 cm long; flowers appearing with or before leaves. Calyx segments upto 0.35 cm long, triangular, acute. Petals 5, upto1 cm long, oblong, clawed, white.

Fl. : March - April; Fr. : May - June

Drupe globose or ovoid, yellow or dark red; stones hard.

Cultivated in fruits orchards. Collection : 2748; Jaroda.

The fruits are edible.


   Small, much branched, deciduous trees. Leaves 6-10 cm long, oblong-lanceolate, acuminate, finely sharp serrate, glabrous; petioles upto 1.5 cm long, with glandless; stipules linear. Flowers solitary, axillary, sessile in advance of leaves.
Calyx segments 5, up to 1 cm long, oblong obtuse. Petals 5, pink, obovate – oblong, obtuse, 1-1.2 cm long. Stamens many, inserted in the mouth of calyx tube. Drupes variable greenish-yellow, 3.5-4 x 2.5-3 cm; stones hard, pitted.

F1. : Feb. - March; Fr. : May - June
Cultivated in fruits orchards. Collection : 3523; Muzaffarnagar City.

Fruits are edible and leaves are used medicinally.

*P. amygdalus* Batsch.  LN. Badam: It is also cultivated in fruits orchards. It was found in fruiting in Titavi.

5. **Pyrus** Linn.

Ca 30 species; probably 5 species in India; 1 in MZN.


Small deciduous trees. Leaves 5-10 cm long, long petioled, broad ovate to elliptic or oblong-orbicular, narrowly acuminate. Flowers in umbels with or before foliage, white with pink tinge. Pomes variable, mostly pyriform or subglobose, yellowish green when ripe.

F1. : March - May; Fr. : July – Sept.
Cultivated in fruit orchards for edible fruits. Collection : 2737; Rohana.

6. **Rosa** Linn.

Ca 250 species; probably 10 species in India; 1 in MZN.


Erect, prickly shrubs; stipules adnate to the petioles up to 1 cm long. Leaves oddpinnate, 6-10 cm long; rachis prickly. Leaflets 5-7, ovate, acuminate, sharply serrate, glabrous. Flowers solitary, terminal; bracts lanceolate, up to 0.8 cm long; pedicel up to 5 cm long. Calyx tube pitcher shaped, up to 3.5 cm long; segments 5, acuminate, pubescent. Petals in several rows, many, large, dark red or variously coloured. Stamens many, inserted on the disc. Carpels many, included in calyx tube, ovule 1.

F1. : Major part of the year.
Largely cultivated in gardens. Collection : 837; Muzaffarnagar City.

Rose water is extracted from flowers. Scent also obtained. Planted for ornamental as well as different medicinal uses.
Several other types of *Rosa* Linn. are also cultivated in public and private gardens, which are as:

*R. banksiae* R. Br.—climber
*R. indica* Linn.
*R. multiflora* Thunb. etc.

7. *Spiraea* Linn.

Ca 100 species; 10 species in India; 1 in MZN.


Small, evergreen, shrubs with reddish–brown branches. Leaves 2-4.5 cm long, obliquely lanceolate, serrate, acute, bluish-green. Flowers white, in dense glabrous umbel like corymbs, with the leaves. Petals longer than stamens. Carpels 5.

F1. : March–April.

Grown as ornamental in gardens. Collection : 3592; Muzaffarnagar City.

42. **CRASSULACEAE**

1a. Calyx tubular, 4 toothed..................................1. *Bryophyllum*
1b. Clayx 4 lobed nearly to the base.........................2. *Kalanchoe*

1. **Bryophyllum** Salisb.

Species have been included under genus *Kalanchoe*; 1 in MZN.


Erect, glabrous, perennial herbs, upto 1 m tall. Leaves usually simple or with 3 leaflets; opposite, fleshy, stalked, ovate or oblong, crenate, obtuse. Flowers pendulous, upto 3 cm long, in large terminal panicles. Calyx tubular, inflated, greenish red, 4-toothed. Corolla twice as long as the calyx, red, spreading, acute. Follicles 4, many seeded, enclosed in persistent papery calyx and corolla.

F1. : April – June.

Common in waste places and also planted in gardens. Collection : 5075; Shamli.

Leaves are used in medicines.

2. **Kalanchoe** Adans.

Ca 200 species; 10 species in India; 1 in MZN.

Erect glabrous, perennial herbs. Leaves fleshy, opposite, crenate or nearly entire; lower ones crowded, stalked, obong-spathulate; uppers distant, nearly sessile, oblong. Flowers yellow, 2-2.5 cm long, in large terminal corymbs. Calyx 4-lobed nearly to the base, triangular, acute. Corolla tubular; tube inflated, lobes 4, spreading. Follicles 4, many seeded, enclosed in the dry persistent calyx and corolla. F1. & Fr. : Sept. – Nov. Planted in gardens and met in wild dry conditions also. Collection : 2865; Muzaffarnagar City. Leaves are used medicinally.

### 43. COMBRETACEAE

1a. Climbers or scandent shrubs; petals 4-5……………..**1. Quisqualis**

1b. Erect trees; petals O……………………………………………………………..**2. Terminalia**

**1. Quisqualis** Linn.

17 species; 2 species in India; 1 in MZN.


Large climbing or scandent shrubs; young parts densely tomentose. Leaves opposite, ovate-oblong, rounded at base, acuminate, entire, 6-12 cm long. Petioles 0.5 cm long. Flowers in long terminal spikes; bracts elliptic, foliaceous. Calyx tube narrow, upto 6 cm long; segments 5. Petals 5, pink, obovate, obtuse upto 1.2 cm long. Stamens 5; filaments unequal; ovary 1-celled. F1. & Fr. : April. – Dec. Cultivated in gardens as an ornamental climber. Collection : 2672; Charthawal.

**2. Terminalia** Linn. *nom.cons.*

Ca 250 species; 12 species in India; 3 in MZN.

1a. Fruits with 4-6 hard wings……………………………………….**1. T. arjuna**

1b. Fruits without wings :

2a. Petioles less than 2.5 cm long……………………………..**3. T. chebula**

2b. Petioles more than 2.5 cm long……………………………..**2. T. bellirica**

Large sized trees with bark peeling off in large flakes; young parts rusty pubescent. Leaves subopposite or opposite, oblong or elliptic, obtuse or shortly acute; petiole upto 1 cm long. Flowers sessile, greenish yellow, in axillary spikes or terminal panicles. Fruits 2.0-5.0 cm long, drupaceous, ovoid or obovoid-oblong, fiberous, woody, brown with 5-6 thick hard wings.


Planted in gardens, on road sides and canal banks Collection : 4001; Khandraoli. The bark is used in medicines for blood pressure.


Large or medium sized trees, deciduous, with bark grey bark. Leaves 6-12 cm long, alternate, clustered at the end of branchlets, elliptic or acuminate. Petioles upto 1 cm long. Flowers pale-greenish in 8-10 cm long, axillary spikes. Calyx lobes wooly in side. Drupes ovoid, globose, tomentose, upto 2 cm long, brown or dark blue, angled when ripe, not winged.

F1. : April – June; Fr. : Jan. – Feb.

Planted in gardens and on canal banks. Collection : 825; Muzaffarnagar City. The bark and the fruits used for different medicinal purpose.


Large or medium-sized deciduous trees with bark brown dark and rusty pubescent young parts. Leaves sub-opposite alternate, broadly elliptic-oblong or ovate, entire, acute or acuminate, glabrous when mature, upto 5-9 cm long, 6-12 lateral nerves. Petiole 1.5-2.0 cm long with two glands on the upper side. Flowers dull white, in axillary and terminal paniced spikes, sessile; bracts exceeding the flower buds, deciduous. Fruits obovoid, ellipsoidal or ovoid, glabrous, more or less distinctly ribbed, 2-4 cm long.

F1. : June-July; Fr. : Jan – March.

Planted in gardens and also met within forest area. Collection : 5069; Shukartal. The fruits are used in medicines.

44. **MYRTACEAE**

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
1a. Flowers crimson; in terminal spikes..................2. Callistemon

1b. Flowers pink, white, yellow or greenish; solitary,
    clustered in panicles or corymbs:

    2a. Leaves opposite:
        3a. Ovary 2-3 celled; semi-superior or superior:
            4a. Flowers white, axillary, solitary ..............4. Myrtus
            4b. Flowers greenish white, in terminal
                or lateral panicles ................................6. Syzygium

    3b. Ovary inferior:
        5a. Ovary 2-4 celled................................1. Barringtonia
        5b. Ovary 4 or 5 celled..................5. Psidium

2b. Leaves alternate or scattered.........................3. Eucalyptus

1. Barringtonia Forst.

    Over 100 species; 5 species in India; 1 in MZN.


    Medium-sized or small glabrous trees. Leaves shortly stalked, 10-20 cm long, obovate-oblong or cuneate-elliptic, rounded or subacute at the broad apex, minutely denticulate or crenate, glabrous, pale beneath, with 10-13 pairs of main lateral nerves. Flowers deep-pink, in long, slender pendulous racemes; bracts oblong, caducous. Calyx with a short tube and 4-rounded imbricate, ciliate lobes. Petals small. Filaments longer than petals, red. Ovary 2-celled.
    Fl. & Fr. : June – Oct.
    Rarely planted in gardens. Collection : 921; Muzaffarnagar City.
    Wood used for making boat

2. Callistemon R. Br.

    Over 20 species; 1 in MZN.


    Medium-sized, evergreen trees, with long drooping branches. Leaves alternate, linear-lanceolate, narrowed at both ends, upto 7.5 cm long, gland-dotted. Lateral nerves prominent. Flowers crimson, in dense terminal spikes. Calyx conpanulate, pubescent; lobes 5. Petals 5, dark crimson. Stamens many, long exerted, upto 2.5 cm
long, red or crimson. Ovary 3 or 4 celled. Fruit a woody capsule, upto 0.4 cm across, with truncate apex, ovoid.

F1. : Sept. – Feb.; Fr. : March - June
Commonly planted in gardens. Collection : 2526; Kurmali.

3. **Eucalyptus** L’ Herit.

Ca 500 species; 3 in MZN.

Some species of *Eucalyptus* L’ Harit, have been successfully introduced in the district in lawns, road & canal sides and boundary of agriculture farms and gardens.

1a. Inflorescence a many flowered panicle…………….*1.E. paniculata*

1b. Inflorescence a stalked umbel;

2a. Lids as long as the calyx tubes………………...**2.E. robusta**

2b. Lids 2-3 times longer than the calyx tubes…………...**3.E. tereticornis**

1. **E. paniculata** Sm. in TLS. 3: 287. 1797; Parker, For. F1. 248; FD. 159.Vern *Safeda.*

Medium sized trees with whitish bark, peeling off in patches. Leaves alternate, narrowly lanceolate, curved, 10-20 cm long, entire, truncate at apex, narrowed at base, coriaceous; petioles upto 1.5 cm long. Flowers white, in axillary panicles; pedicels woody, upto 0.6 cm long. Calyx tube campanulate, 0.5 cm long, truncate. Lids hemispherical, much shorter than the calyx tube. Stamens numerous, exerted. Fruits globular.

Planted on road sides. Collection : 1803; Jaroda.
Leaves are used as flavouring agents and also have insecticidal properties. Wood is used in paper industry and match-sticks.


Large straight trees with dark – green bark. Leaves alternate, lanceolate, entire, long, coriaceous; petioles upto 1.5 cm long. Flowers white or pale in 4-12 flowered umbels, upto 1 cm across; peduncles 1 cm long; pedicel minute. Calyx tube campanulate, truncate, 0.2-0.3 cm long. Lids acuminate, as long as calyx tube. Stamens many, long, exerted. Fruits globular, 1 cm across.

Planted along road sides and on boundary of agriculture fields and gardens. Collection : 5537; Muzaffarnagar City.
Wood is used as fuel and as timber also.
3. **E. tereticornis** Sm., Bot. N. Holl. 41. 1793; Parker, For. F1. 251; Bailey *op. cit.* 728; FD. 159. Vern. *Safeda.*

Large trees, bark grey peeling off in thin layers. Leaves alternate, lanceolate, curved, 20-25 cm long, coriaceous, acuminate, cuneate at base; petioels upto 1.5 cm long. Flowers white, 1.0-1.5 cm across, in axillary, 4-8 flowerd umbels; peduncles upto 1.5 cm long; pedicel minute. Calyx tube campanulate, upto 0.4 cm long, nearly truncate. Lid membranous, 2-4 times longer than the calyx tube, acute. Stamens memerous, long, exerted. Fruits obovoid.

F1. & Fr. : Sept.–Dec.

Planted along canal banks, road sides. Collection : 84; Muzaffarnagar City.

Uses similar to the other species.

4. **Myrtus** Linn.

Ca 100 species; 1 in MZN.


Evergreen shrubs. Leaves 3.0-4.5 cm long, opposite, ovate to lanceolate acute, smooth, shining, entire. Flowers white, 1.5 cm across, solitary in axils. Berries bluish black, globose or ovoid, crowned by persistent calyx.

F1. & Fr. : March - June

Planted in gardens. Collection : 2627; Muzaffarnagar City.

Green and dried flowers are used as a condiment. Essential oil is obtained from the leaves, used in perfumery.

5. **Psidium** Linn.

Ca 140 species; 3 species in India; 2 in MZN.


Small, branched trees with scaly brownish bark. Young branches 4-angled. Leaves 5-15 cm long, oblong-elliptic, pubescent below. Flowers white up to 2.5 cm across, solitary or 2-3 together axillary, peduncled; peduncles 1 cm long, densely pubescent; pedicels upto 0.3 cm long. Fruits ovoid or globose or pyriform with white or deep pink pulp; seeds numerous.


Grown in fruit orchards. Collection : 301; Rampur.

Fruits are edible and also used for preparing jams & jellies. Bark and leaves used for tanning.
**P. cattleianum** Sabine—a bushy shrub and with smaller fruits is also growing in nurseries and lawns.

Vern. *Japani Amrood.*

F1. & Fr. : July – Sept.

6. **Syzygium** Gaertn. *nom. cons.*

Ca 500 species; over 30 species in India; 3 in MZN.

1a. Petals united into calypters or cup :

2a. Berries ovoid-oblung .......................... 1. *S. cumini*

2b. Berries globose, smaller.......................... 2. *S. cumini* var. *microcarpa*

1b. Petals free.................................................. 3. *S. jambos*


Medium size or large trees. Leaves opposite, ovate-oblung or oblong-lanceolate, 7-12 cm long, acuminate, coriaceous, smooth, shining above; petioles upto 2 cm long, channeled. Flowers in groups of 3, in lateral or terminal trichotomous panicles; bracts minute, deciduous. Berries ovoid or oblung; juicy, dark purple, 1-seeded.

F1. : March - April; Fr. : June - July

Planted or road sides and in gardens. Collection : 3594; Muzaffarnagar City.

Fruits are edible. Wood is used for fuel and some other purpose. Bark is used for dyeing, tanning, and in medicines.


F1.& Fr. : June – Sept.

Common in area, planted on boundary of gardens. Collection : 2274; Jansath.

The fruits and bark are used in diabiotic medicines.

Medium-size evergreen trees; stems and branches glabrous. Leaves opposite, 10-16 cm long, broad, lanceolate or elliptic, acuminate, alternate, attenuated towards the base, coriaceous; petioles upto 0.5 cm long. Flowers in short, axillary racemes, 2.5 cm across, whitish-green, fragrant. Calyx turbinate, upto 1.5 cm long; segments 4, obtuse, recurved. Ovary 2-celled. Berries 3-4 cm across, globose or obovoid, pulpy, dark purple or black when ripe.

F1. & Fr. : April - July

Planted in gardens. Collection : 3594; Muzaffarnagar City.
The fruits, seeds and the bark of tree are used medicinally for diabetic patients.

45. LYTHRACEAE

1a. Herbs, usually aquatic:
   2a. Capsules 2-5 valved; capsules wall thin, densely and finely cross-striate…………………..4. Rotala
   2b. Capsules operculate or irregularly dehiscent, capsule-wall not finely cross-striate…………1. Ammannia

1b. Shrubs or trees :
   3a. Flowers 6-merous; stamens indefinite…………..2. Lagerstroemia
   3b. Flowers 4- merous; stamens 8 …………………3. Lawsonia

1. Ammannia Linn.
   Ca 30 species; 18 species in India; 2 in MZN,

1a. Leaves narrowed at the base……………………1. A. baccifera
1b. Leaves rounded or cordate at the base………………2. A. salicifolia


   Erect, much- branched annual marshy herbs upto 20 cm tall. Stems and branches angular, purplish. Leaves opposite, sessile, lanceolate-oblong, narrowed at base. Flowers in dense axillary clusters, bracteoles minute. Calyx small 0.15 cm across, obpyramidal or sub globose; segments 4, triangular, minute. Petale 0. Stamens 4. Style minute. Capsules depressed, globose, upto 0.2 cm across, glabrous; seeds minute, numerous, sub semi-spherical, black.

F1. & Fr. : July – Oct

Common in moist shady places. Collection : 22; Muzaffarnagar City.

Fresh leaves are used for skin – diseases as a rubefaciency.

Erect, much branched, robust herbs, upto 60 cm tall. Leaves opposite; cauline upto 4 cm long; others upto 1.2 cm long, sessile, lanceolate, acute or obtuse at apex, round at base. Flowers densely clustered in axils; pedicel minute. Calyx in fruit hemispheric, 0.2 cm long; segments 4, triangular, shorter than capsules; accessory segments minute. Petal 0. Capsules globose, depressed, reddish, upto 0.2 cm across; seeds many, half-ovoid, one much smaller.

F1. & Fr. : Aug. – Nov.

Common in marshy places. Collection : 340; Muzaffarnagar City.

2. **Lagerstroemia** Linn.

Ca 50 species; 10 species in India; 2 in MZN.

1a. Calyx puberulous, not tomentose……………………………………..1. L. indica

1b. Calyx with falvous or brown red tomentum……………………………2. L. speciosa

1. **L. indica** Linn., Syst. ed. 10: 1076. 1759; FBI. 2: 575; FD. 162.

Glabrous, deciduous, shrubs or small trees upto 3 m tall, with brown smooth bark. Leaves 3-6 cm long, oblong, elliptic, acute or obtuse at apex, glabrous. Flowers pink, white in terminal panicles; peduncles upto 1.5 cm long, pedicel upto 0.5 cm long; bracts minute, 0.2 cm long. Calyx upto 1 cm long; segments 6, triangular-obovate, shorter than the tube. Petals 6, white, pink or purple, obovate, clawed, dissected, upto 0.7 cm long. Stamens numerous. Capsules woody, 1.2 x 1.0 cm.

F1. & Fr. : March – Sept.

Cultivated in gardens for beautiful flowers. Collection : 340; Muzaffarnagar City.


Medium sized trees. Leaves upto 30 cm long, ovate-lanceolate or elliptic, coriaceous, acute apex, glabrous; petioles upto 0.5 cm long. Flowers in 20-30 cm long terminal panicles; pedicel upto 1.3 cm long, bracts 0.3 cm long. Calyx tube funnel-shaped, ribbed, clawed, upto 1.8 cm long. Stamens numerous. Capsules globose.


Planted in gardens and on road sides. Collection : 4018; Kandhla.

Wood used for structural work, and interior fittings.

3. **Lawsonia** Linn.
A monotypic genus.


Large shrubs with grey bark. Leaves opposite, elliptic, acute at both ends, tapering into a short petiole, coriaceous. Flowers creamish white, in large corymbose terminal panicles; pedicel upto 0.4 cm long. Calyx 0.3 cm long, glabrous; tube short; segments 4, much longer than the tube, oblong, acuminate. Petals 4, white, wrinkled. Stamens 8, inserted in pairs in between the petals. Ovary 4-celled, style long; stigma minute. Capsules globose, 0.4 cm across, glabrous, irregularly beaking up, ultimately 1-celled. Seeds angular.

F1.& Fr. : Jan. – Oct.

Planted as hedge plant. Collection : 991; Shukartal.

Leaves are much used to dye skin, nails, and hairs and medicinally also.

4. Rotala Linn.

Ca 50 species; 14 species in India; 1 in MZN.


Annual, erect or decumbent herbs upto 30 cm tall. Leaves opposite, upto 2 cm long, elliptic or obovate, midrib and nerves prominent beneath. Flowers on short axillary branches, sessile solitary in axils of reduced leaves; bracts in pairs, minute, filiform. Calyx tube elongate-campanulate, with 4-acute triangular teeth at its mouth. Petals 4, minute or absent. Capsules 2-valved, ellipsoid. Seeds narrowly oblong, subfalcate, angular.

F1.& Fr. : Aug. – Nov.

Common or waste places, crop fields, gardens and moist places. Collection : 3862; Mirapur.

46 PUNICACEAE

Punica Linn.

Porbably Monotypic

Shrubs or small trees; bark grey branchlets often with spines. Leaves opposite or clus-tered, up to 6 cm long, oblong-ovate or oblanceolate, obtuse, narrowed into a short petiole, glabrous. Flowers solitary or in 3 flowered terminal cymes. Calyx tube adnate to ovary below; segments 5-7, acute. Petals 5-7 up to 2 cm long, oblanceolate, membranous, wrinkled red. Stamens numerous, inserted in the calyx tube. Ovary inferior, many celled; style long; stigma capitates. Fruits globose with reddish – brown coriaceous ring, up to 5-8 cm across; seeds many, 0.5 cm long, with a reddish-yellow aril, filled with sweet juice.

F1. : April - May; Fr. : July – Sept.

Planted in fruit orchards. Collection : 2391; Shamli.

Juicy seeds are edible, flowers and bark are used in dyeing and tanning and various parts are used in medicines.

47. ONAGRACEAE

1a. Calyx tube distinctly produced beyond the ovary:
   2a. Stigma combined..............................1. *Epilobium*
   2b. Stigma 4-cleft....................................3. *Oenothera*

1b. Calyx tube not produced above the ovary................2. *Ludwigia*

1. *Epilobium* Linn.

Over 200 species; 30 species in India; 1 in MZN.


Erect, glandular-pubescent, annual herbs up to 60 cm tall. Leaves alternate or opposite, 3-5 cm long, sessile, semi-amplexicaul, acute, serrate-dentate, pubescent on both sides. Flowers axillary, solitary; pedicels up to 1.2 cm long, pubescent. Sepals 4, oblong acute. Petals 4, rose-purple, obovate-oblong, 0.6-0.7 cm long. Ovary inferior, 4-celled; stigmas 4, distinct, spreading. Capsules 4-angled, pubescent, up to 5 cm long. Seeds many, obovoid, not papillose with fulvous white coma.


Common along canal sides and in marshy places. Collection : 3612; Muzaffarnagar City.

2. *Ludwigia*

75 species; 6 species in India; 3 in MZN.
1a. Stamens twice as many as calyx lobes.....................1. L. adscendens
1b. Stamens as many as calyx lobes:
   2a. Seeds many-seriate in each cell of the capsule ..........2. L. perennis
   2b. Seeds uni-seriate in each cell of the capsule.............3. L. prostrata


Floating or creeping aquatic annual herbs. Stems erecto-ascending from creeping base, with spongy white pneumatophores at the nodes. Leaves alternate, obovate or oblanceolate, obtuse, entire, glabrous. Flowers axillary, solitary; bracts 2, minute. Calyx tube linear, scarcely produced above the ovary; segments 5, triangular, acuminate. Petals 5. Stamens 10. Ovary inferior, 5-celled; style minute; stigma 5 lobed. Capsules woody upto 3 cm long, linear-cylindric, nearly glabrous; seeds quadrate.

F1. & Fr. : Sept. – Oct.
Common in ponds and marshy places. Collection : 2536; Banat.


Erect, glabrous, annual herbs with angular, reddish pale stem. Leaves 3-5 cm long, lanceolate, glabrous, base cuneate. Flowers small yellow or greenish, solitary, axillary, 4-merous; pedicel minute. Ovary inferior, inflated, membranous, upto 1 cm long, 4-angled, smooth. Seeds in many rows in each cell, brown.


Prostrate or decumbent –ascending annual herbs upto 40 cm long. Leaves linear- lanceolate or lanceolate, acute at apex, cuneate at base, upto 7 cm long, glabrous; petiole upto 1.5 cm long. Flowers axillary 1 or 2, sessile. Petals longer than the calyx, 4, yellow, lanceolate; stamens 4. Ovary inferior, style simple; stigma capitate. Capsules 4-angled, 1-2 cm long, filiform, crowned by calyx segments. Seeds in one row in each cell, minute.

F1. & Fr. : Aug. – Nov.
Occurs in rice fields and marshy places. Collection : 2114; Thanabhawan.

3. Oenothera Linn.
Ca 200 species; 2 in MZN.
1a. Flowers yellow; capsules narrow, cylindric, angled……1. O. drummondii
1b. Flowers purple or rose; capsules club shaped, angled,
   wings in the upper part……………………………2. O. rosea

1. O. drummondii Hook., MCP. 738; HFD. 189.
   Annual, decumbent, densely pubescent herbs. Leaves oblong, ovate, tapering
to a short petiole, slightly toothed. Flowers bright yellow. Capsules narrow, cylindric.
F1. & Fr. : Feb.-May
Planted in gardens as an ornamental. Collection : 2481; Budhana.

   Decumbent or erect annual herbs. Stems much branched, tinged with red,
hairy. Leaves alternate, upto 2.5 cm long, ovate- lanceolate, acute apex, narrowed to
petiole, entire or remotely denticulate. Flowers axillary, solitary; pedicel 0.5 cm long.
Calyx tube linear, 1.0 cm long above the ovary, pubescent; segments 4, lanceolate.
Petals 4, pink or red. Capsules clavate, 4-angular, 1.5 cm long, hairy. Seeds
numerous, minute.
F1. & Fr. : Jan. - May
Rare, occurs in Ganga Khadar. Collection : 3606; Muzaffarnagar City.

48. TRAPACEAE

Trapa Linn.
Ca 30 species; 1 in MZN.

T. natans Linn. var. bispinosa (Roxb.) Makino in Linnaea, Somoku-Dzusetsu ed. 3, 1: 137. 1907. T. bispinosa Roxb., Cor. Pl. 234; W. & A. Prod. 337; FBI. 2: 590;

Aquatic annual herbs, ascending in water. Floating leaves arranged in rosette
or alternate, rhomboidal, obscurely 3-lobed, glabrous above, villous beneath; upto 6.0
cm long; stipules linear, caducous. Flowers axillary; pedicel utpo 10 cm long in fruits.
Calyx tube short; segments 4, 2 of which spinecent in fruits. Petals 4, white, small.
Stamens 4. Ovary semi-inferior, 2-celled. Fruits on seeded, angled, shortly beaked at
the apex with sharp, spiny horn on either sides.
Cultivated in ponds in the area. Collection : 3569; Khatauli.  
Fruits are largely eaten either raw or cooked.

49. SAMYDACEAE

Casearia Jacq.

Ca 160 species; 10 species in India; 1 in MZN.


Small, tomentose, deciduous trees with light grey bark. Leaves upto 10 cm long, alternate, shortly petioled, simple, ovate-lanceolate, tomentose, sub-coriaceous. Flowers small, in axillary fascicles; pedicel upto 0.8 cm long, hairy. Calyx persistent; segments 4 or 5; obtuse, hairy. Petals 0. Stamens 8. Fruits fleshy, obovoid, upto 1.8 cm long, 3-valved. Seeds embedded in scarlet pulp.  
F1. : March – May; Fr. : June -July  
Common on canal banks and in forest area. Collection : 4078; Khandraoli.  
Wood is used sometimes in making combs.

50. PASSIFLORACEAE

Passiflora Linn.

Ca 500 species; 23 species in India; 2 in MZN.

1a. Corolla present, bluish white……………………………………..1. P. caerulea
1b. Corolla absent……………………………………………………..2. P. suberosa


Annual, glabrous slender herbs with angled-stems. Leaves 5-8.5 cm long, deeply divided into 3-5 lanceolate sharp pointed lobes. Petioles with 2-3 glands. Flowers bluish-white, 6cm across, fragrant. Sepals white with a short horn at the back, near-apex. Petals bluish-pink or whitish. Crown white, purple at base.  
F1. & Fr. : Aug. – Nov.  
Planted in gardens as an ornamental herbs. Collection : 1200; Nairana.


Perennial twinning or climbing shrubs. Tendrils axillary, simple. Leaves upto 6 cm long, broadly ovate, sub-orbicular, entire, 3-lobed; lobes lanceolate, acute ciliate on margins; petiole upto 1.5 cm long, jointed at the middle. Calyx upto 1.3 cm long, hairy; segments 5 lanceolate. Corolla 0. Corona 3-seriate, outer ones 5, longer, 0.4 cm
long; inners shorter. Gynophore 0.4 cm long. Stamens 5. Ovary 1-celled; styles 3. Fruits globose ellipsoid, upto 1.0 cm across. Seeds many, reticulate.
F1. & Fr. : April - June.
Occasionally planted in gardens and also met on road sides. Collection : 2826; Jaroda.

51. CARICACEAE

Carica Linn.
Ca 40 species; 4 species in India; 1 in MZN.

F1. & Fr. : Major part of the year.
Cultivated in fruit orchards, kitchen gardens or met as an escape also. Collection : 200; Muzaffarnagar City.
Fruits are edible when ripe, green cooked as vegetable. Latex is used in medicines.

52. CUCURBITACEAE

1a. Stamens 5………………………………………………1. Actinostemma
1b. Stamen 3 (excl. Luffa aegyptiaca Mill.)
   2a. Tendrils unbranched :
   3a. Anthers free:
      4a. Stamens inserted near the base of
         Calyx tube:
         5a. Anther cells some what curved; style with no disc at the base………………..6. Diplocyclos
      5b. Anther cells straight; style with an annular disc at the base:
         6a. Male flowers in clusters;
seeds rough..........................10. Mukia
6b. Male flowers in corymbs;
seeds smooth ......................12. Zehneria
4b. Stamens inserted near the mouth of
calyx tube:
7a. Calyx tube without scales……1. Cucumis
7b. Calyx tube with scales at
the base..............................9. Momordica
3b. Anthers coherent at the base..................3. Coccinia
2b. Tendrils branched :
8a. Flowers white:
9a. Petals laciniate into filiform
fibrate segments......................11. Trichosanthes
9b. Petals entire........................7. Lagenaria
8b. Flowers yellow :
10a. Anthers free, curved or
triplicate (S-shaped) ...............8. Luffa
10b. Anthers connate :
11a. Corolla rotate, divided more
than half way down; stigma
3, simple.............................2. Citrullus
11b. Corolla campanulate, divided
less than half way down;
stigma 2-fid.........................5. Cucurbita

1. Actinostemma Griff.
Probably monotypic genus.
Annual climbers or twining herbs. Tendrils simple bifid. Leaves upto 8 cm
long, deeply cordate or hastate or sagittately 3-lobed, acute or acuminate, serrate or
denticulate, nearly glabrous; petioles small, upto 0.2 cm long. Flowers monoecious, in
lax, axillary panicles. Male panicles hairy upto 12 cm long. Stamens 5. Female
flowers solitary or clustered. Fruits ovate-elliptic; operculum conical. Seeds slightly
rugulose.
F1. & Fr. : June . – Sept.
Common in marshy places climbing on bushes. Collection : 3024; Ramraj.

2. **Citrullus** Schrad, *nom. cons.*

Ca 3 species; 2 species in India; 2 in MZN.

1a. Fruits globose, not exceeding 7 cm across…………………1. **C. colocynthis**

1b. Fruits sub-globose or ellipsoid, more then 7 cm across:

2a. Fruits not depressed at any end, smooth, more than 10 cm across………………2. **C. lanatus**

2b. Fruits depressed at both ends, hispid, upto 10 cm across…3. **C. lanatus**

var. fistulosus


A trailing, scabrous annual herb. Leaves deeply 3-lobed; lobes sinuately pinnatatifid. Flowers yellow. Fruits globose, upto 7.0 cm across, striped with dark grey and white, hard; pulp spongy and bitter.

F1. & Fr. : May – Sept.

Commonly occurring in waste places and sandy soils. Collection : 2979; Bhopa. The fruits are used medicinally as strong purgative and in stomach troubles.


Annual, much branched, climbers; branches angular, villous. Leaves upto 15 cm long, cordate at base, palmately divided; petioles upto 10 cm long, villous. Tendrils bi-fid. Plants monoecious. Bracts boat-shaped, upto 2 cm long. Male flowers: axillary, solitary, yellow, pilose. Female flower: staminodes 3, short. Ovary ovoid; stigmas 3, sub-trilobed. Fruits globose or oblong upto 30 cm across, with sweet red or yellowish pulp; seeds many, black or brown.

F1. & Fr. : April – July

Cultivated in sandy soils on river banks. Collection : 5091; Shamli.

Fruits are eaten.

Var. differs from the main type by its fistulous stem and petioles, 3-4 fidi
tendrils, less divided leaves. Fruits depressed, hard, smaller.
F1. & Fr. : April. – Aug.
Commonly cultivated in Khadar of rivers. Collection : 5003; Muzaffarnagar City.

3. Coccinia Wt. & Arn.
Ca 30 species; 1 species in India; 1 in MZN.
*C. grandis* (Linn.) Voigt., Hort. Suburb. Calc. 59. 1845; HFD. 194. *Bryonia grandis*

Scandent, annual-perennial herbs. Roots tuberous. Stems glabrous. Leaves
ovate, deeply cordate at base, 5-lobed, 5-8 cm in diam, shining. Tendrils simple,
slender. Male flowers 1-3 in axils of leaves; peduncles 2-4 cm long. Female flowers
solitary, peduncles 1-3 cm long. Staminodes 3. Ovary ovoid-oblong; stigma tri-lobed.
Fruits ellipsoid-oblong, with rounded ends, sub-glabrous.
F1. & Fr. : March – Oct.
Common along road sides and in waste places. Collection : 3025; Ramraj.
The green and ripe fruits are eaten by poor people sometimes and also used medicinally.

4. *Cucumis* Linn.
Ca 30 species; 7 species in India; 2 in MZN.
1a. Fruits tubercled……………………………………4.C. sativus
1b. Fruits not tubercled :
   2b. Fruits spherical………………………………1.C. melo
   2b. Fruits cylindric or oblong:
      3a. Fruits smooth, not ribbed, oblong….2.C. melo var.
          *momordica*
      3b. Fruits ribbed; cylindric…………3.C. melo var.
          *utilissimus*

Annual, creeping, hispid herbs. Leaves orbicular or reniform, palmately 5-7
lobed, cordate at base, denticulate, upto 15 cm across; petiole upto 6.0 cm long.
Denticulate, upto 15 cm across, petiole upto 6.0 cm long. Male flowers in axillary fascicles; corolla yellow. Fruits variable, spherical or ovoid, glabrous.

**F1. & Fr. :** March – June

Cultivated along river banks. Collection : 3787; Ramraj.

Fruits are tasty & edible. Seeds are used in Medicines.


   It differs in the shape and nature of fruits, which are cylindrical, smooth, yellow mottled with dark green, bursting spontaneously.

**F1. & Fr. :** June – Sept.

Cultivated for edible fruits and met as an escape also. Collection : 5055, Kandhla.

Fruits are cooked as vegetable and ripe are eaten.


   It differs in shape and nature of the fruits, which are cylindrical to elongate, straight or curved, ribbed.

**F1. & Fr. :** May – Sept.

Cultivated on river banks in sandy soils. Collection : 443; Sujaru.

Fruits are edible when green also used as salad.


   Slender, densely hispid, annual trailing or climbing herbs. Leaves 3-5 lobed, cordate or triangular, ovate, hispid, 5-7 nerved from base, denticulate, upto 10 cm across, petioles upto 6 cm long. Flowers yellow, axillary or solitary fascicled. Fruits ovate to oblong, elongated and tubercled. Seeds white, flat.

**F1. & Fr. :** May – Sept.

Cultivated in river beds. Collection : 880; Kairana.

The fruits are much eaten during summer as salad.

5. **Cucurbita** Linn.

   Ca 20 species; 3 species in India; 3 in MZN.

1a. Calyx-lobes spathulate, foliaceous. ..........................................................2. **C. moschata**

1b. Calyx-lobes linear-subulate, not foliaceous:

   2a. Hairs rigid, pungent. Leaves lobed half way down.............3. **C. pepo**

   2b. Hairs either rigid, nor pungent. Leaves lobed less than half way down...

Large, trailing, spreading annual climbers. Stems cylindric, grooved. Leaves 5-lobed, dentate, nearly circular, up to 16 cm across, hairy; petioles up to 10 cm long. Flowers large, yellow solitary. Calyx lobes spathulate. Fruits of variable shape, ovoid, cylindric, subglobose with a glaucous bloom when ripe.

Fl. & Fr.: Feb. - May

Cultivated for fruits. Collection: 5014; Muzaffarnagar City.

Fruits are cooked as vegetable.


Large, trailing spreading annuals. Leaves 5-7 lobed, denticulate, pilose, glandular beneath. Flowers large, yellow, solitary. Fruits varies in shape, size and colour.

Fl. & Fr.: May – June

Cultivated for fruits. Collection: 5101; Banat.

Fruits are cooked as vegetable.


Hispid hairy annuals. Leaves usually prominently lobed. Flowers yellow. Peduncles angled, expanded at the top. Fruits large furrowed.

Fl. & Fr.: Feb. – Oct.

Cultivated for fruits. Collection: 5073; Shamli.

Fruits are cooked as vegetable.


4 species; 1 species in India; 1 in MZN.


Climbers, with slender, angular, glabrous stems; tendrils 2-fid. Leaves broadly ovate, usually deeply 5-7 palmatifid, 9-15 cm across, acuminate, pilose above.
Male flowers on a pedicel 0.5-1.5 cm long. Female flowers with shorter calyx tube, glabrous, teeth subulate. Fruits sessile, often 2-3 together, globose red-white striped, upto 1-5 cm across.

F1. & Fr. : March – Nov.
Occurring on the river bank among bushes. Collection : 3856; Ramraj.

7. Lagenaria Seringe

6 species; 1 species in India; 1 in MZN.


Annual, softly pubescent, climbing or trailing herbs with 5-angled stems and branches. Tendrils branched. Leaves cordate –ovate to reniform, upto 18 cm across, 5-angular or 5-lobbed hairy on both surfaces. Flowers large, white, solitary. Petals entire. Fruits variable in shape and size.

F1. & Fr. : Major part of the year.
Cultivated widely. Collection : 5074; Shamli.

Fruits are cooked as vegetable.

8. Luffa Mill.

6 species; 5 species in India; 2 in MZN.

1a. Stamens 3; fruits strongly angled…………………1. L. acutangula

1b. Stamens 5; fruits not angled………………………2. L. aegyptiaca


Annual, trailing climbing herbs. Tendrils 3-fid. Leaves usually 5-lobed, cordate at base, 10-20 cm across, denticulate, acuminate; petioles upto 10 cm long. Flowers large, yellow. Male flowers in erect, axillary racemes. Stamens 3. Female flowers solitary. Fruits clevate, upto 25 cm long or more, strongly ridged.

F1. & Fr. : July – Nov.
Cultivated for fruits and also met as an escape. Collection : 5006; Muzaffarnagar City. Young fruits are much used as vegetable.


Annual climbing or trailing scabrous herbs. Leaves upto 10-25 cm across, 5-7 palmately lobed or angled, dentate, punctate on both surfaces; petioles upto 8 cm long. Tendrils 3-fid. Flowers large yellow, male in axillary racemes; females solitary in the same axil. Stamens 5. Ovary cylindric, stigmas 3, bilobed. Fruits ovoid ellipsoid to cylindrical, upto 25 cm long, smooth; seeds numerous, smooth or slightly tubercled.


Cultivated for fruits or met as an escape. Collection : 5078; Shamli.

Fruits are cooked as vegetable.

9. Momordica Linn.

Ca 50 species; 7 species in India; 2 in MZN.

1a. Flowers monoecious. Bracts of male flowers attached to the middle of the peduncle..............................................1. M. charantia

1b. Flowers dioecious. Bracts attached to the apex of the peduncle......2. M. dioica


Climbing or trailing annual branched herbs. Leaves suborbicular or reniform, 4-7 cm across, glabrous 5-7 lobed, cordate, acuminate; petiole 3-10 cm long. Tendrils simple. Flowers monoecious, yellow. Fruits oblong-fusiform, irregularly warty, 8-10 ribbed, upto 10 or more cm long.

F1. & Fr. : May – Sept.

Cultivated and also met as an escape. Collection : 2836; Vahelna.

Fruits are cooked and also used in medicines for diabtes.


Perennials with a tuberous root stock, climbing or spreading; branches angular, glabrous. Leaves usually 3-5 lobed, cordate at base, upto 8 cm long, entire or minutely denticulate; segments elliptic-lanceolate, acute or acuminate. Tendrils simple. Male flowers solitary; peduncles upto 8 cm long; bracts sessile, sub-glabrous, cordate at base. Female flowers solitary; peduncles 4-8 cm long. Staminode 0. Ovary ovoid-oblong; stigmas 3. Fruits ovoid, narrowed towards both ends, upto 6 cm long, muricate, yellow at maturity. Seeds embedded in red pulp.
F1. & Fr. : April. – Oct.
Commonly found in wild conditions. Collection : 626; Basera.
Tubers and roots are used in medicines and fruits are cooked as vegetable.

10. Mukia Arn.
4 species; 2 species in India; 1 in MZN.

Annual climbing herbs. Leaves broadly ovate-reniform entire, 3-5 angled or lobed, cordate, acute or acuminate, denticulate, scabrous above, glabrous beneath, 6-8 cm across; petioles 3-6 cm long. Male flowers yellow, capitates or umbellate at the apex of the common peduncles. Female flowers solitary or sub-umbellate. Fruits globose, small upto 1 cm across. Seeds 1-4, ovoid-oblong.
F1. & Fr. : June – Oct.
Occuring or road sides, waste-lands. Collection : 2944; Kakroli.
Roots masticated to relieve toothache.

11. Trichosanthes Linn.
Ca 50 species; 24 species in India; 3 in MZN.

1b Male flowers in racemes:
2a. Male racemes bracteates..................... 1. T. anguina
2b. Male racemes ebracteate..................... 2. T. cucumerina
1b Male flowers solitary.......................... 3. T. dioica

Extensively, climbing or trailing annual herbs. Leaves broad ovate to triangular- obovate, 5-7 lobed, cordate, distantly denticulate, 8-12 cm across; petioles upto 10 cm long. Tendrils 3-fid. Flowers monoecious, white; peduncles 1 cm long, axillary solitary. Fruits 30-60 cm long, linear-cylindric, twisted, smooth with 7 or 8 white spripes along the length; seeds many, oblong.
F1. & Fr. : July. – Oct.
Cultivated, often met as an escape. Collection : 4550, Rampur.

Climbing or spreading, scabrous glandular annual, hairy herbs. Leaves 5-9 cm long, 5-7 angular or lobed, denticulate, petioles upto 5 cm long. Tendrils slender, 3-fid. Flowers white, with fimbriate petals. Male peduncles paired. Female flowers solitary. Fruits upto 5 cm long, ovoid, green and white streaked, yellow and ultimately red when ripe.

F1. & Fr. : July – Oct.

Common on road sides and waste places. Collection : 525; Muzaffarnagar City.

The fruits are cooked as vegetable and various parts are used in medicines.


Long climbing or twining annual herbs with slender and scabrous stems. Leaves 5-6 cm long, broad-ovate to ovate-oblong, cordate at base, sinuate-dentate, glabrous. Tendrils 2-4 fid. Flowers white, dioecious. Male flowers solitary. Female flowers axillary or solitary. Fruits 4-8 cm long, elliptic oblong, glabrous, orange-red when ripe, pointed at both ends.

F1. & Fr. : March. – Sept.

Occurs on waste places, along railway lines and road sides, Collection : 627; Purkaji. Fruits are cooked as vegetable. The roots, leaves and juice for fruits are used in medicines.

12. **Zehneria** Endl.

Ca 30 species; 5 species in India; 1 in MZN.


Perennial climbing herbs with slender stem. Leaves ovate, cordate base, entire, 3-5 angled or lobed, denticulate, scabrous above, glabrous beneath. Flowers pale yellow; male on peduncle, umbellate cymes; females solitary. Fruits globose, finely reticulate. Seeds compressed, smooth, narrowly margined.

F1. & Fr. : April – Sept.

Rare in forest area. Collection : 984; Shukartal.
53. CACTACEAE

Opuntia Mill

Ca 300 species; 2 in MZN.

1b Flowers pale-sulphur yellow; areoles with 5-6 yellow spines, some curved

2. O. stricta

1b Flowers lemon yellow, changing to yellow pink; Areoles with 2-6 brown or black spines all straight

1. O. elatior


Tall much branched, succulent, perennial shrubs upto 1.5 m tall; branchlets 20-30 x 6-10 cm or more, oblong-oblanceolate, marked with lines joining the with 2-5 straight spines. Flowers yellow soon turning to rose-pink, bisexual, regular, Perianth rotate; lobes numberous, unequal. Stamens many, long exerted. Ovary inferior. Berries red when ripe, marked with areoles but spines and bristles deciduous.

F1. & Fr. : April. – June.

Common along hedges, railway lines. Collection : 5019; Muzaffarnagar City.


Flashy and thorny xerophytic bush upto 1.5 m tall; branchlets flat, jointed more or less obovate, undulate, 25-30 x 12-18 cm, with 4-6 pale yellow spines and dense tuft or hairs. Flowers on upper edge of the joints, bisexual, regular; perienath rotate; lobes numerous; outer ovate, obtuse and inner obovate, yellow. Stamens numerous. Berries purple, pear-shaped, truncate.

F1. & Fr. : March – May.

Common along road sides and waste places. Collection : 5007; Muzaffarnagar City.

54. AIZOACEAE

1b Styles 1-2; flowers in pouch......................... 1. Trianthema

1b Styles 2-3; flowers glomerulate..................... 2. Zaleya

1. Trianthema Linn.

Ca 20 species; 3 (?) in India; 2 in MZN.
1b Flowers pinkish white; stamens 10 or more

1b Styles 2-3; flowers glomerulate

1. T. portulacastrum

2. T. triquetra


Annual, prostrate or procumbent succulent herbs upto 20 cm tall; branches minutely hairy. Leaves succulent, opposite, unequal, obovate, entire, upto 2.0 cm long, obtuse or retuse at apex; cuneate at base, glabrous. Flowers pinkish, solitary, axillary, sessile. Calyx tube short, scarious; segments 5, obtuse. Stamens 10-20, inserted near the top of the calyx tube. Capsules enclosed in a petiolar sheath upto 0.5 cm in length. Seeds 6-8 black, marked with raised lines.

F1. & Fr. : June – Dec.
Common weed of rainy season. Collection : 2734; Ruhana.
Leaves and stems are used as vegetable and root are used in medicines.


Prostrate, mat-forming, glabrous, annual succulent herbs. Leaves opposite, narrowly oblanceolate or elliptic, 2-3 cm long, grayish-green. Flowers solitary or in pairs in axils of leaves or in fork of branchlets, sessile. Perianth ribbed; segments recurved, triangular. Stamens 5, inserted near to the top of calyx tube. Ovary 1-celled; style 1. Capsules 0.2-0.3 cm long, ovoid, 2-seeded; seeds discoid, black with raised lines.

F1. & Fr. : July. – Dec.
Common in sandy areas, road sides. Collection : 637; Purkaji,
In nature it is a good sand binder.

2. Zaleya Burn. f.

Ca 5 species; 3 species in India; 1 in MZN.


Prostrate, deep-rooted, glabrous, perennial herbs with many branches from a common base. Leaves upto 3 cm long, subsucculent, oblong or elliptic. Flowers rosy-pink in subsessile axillary clusters. Stamens 5. Styles 2. Stigmas recurved. Capsules small, 0.5 cm in dia, 2-seeded. Seeds discoid, black.
F1. & Fr. : May – Sept.
Common in waste places and weed of rainy season. Collection : 1844; Ramraj.

55. MOLLUNGINACEAE

1a Carpels apocarpous............................... 1. Gisekia

1b Carpels syncarpous :


2b Flowers in terminal cymes. Seeds slightly appendaged or not.................. 3. Mollugo

1. Gisekia Linn.
Ca 5 species; 1 species in India; 1 in MZN.

G. pharnaceoides Linn, Mant. 562. 1771; FBI. 2 : 664; FUGP.1: 388; FD. 173.
Diffused, hairy, branched, prostrate or ascending annual herbs upto 25 cm tall; stems fistular. Leaves in whorls of 3-5 or opposite, obovate, spatulate upto 1.5 cm long, pubescent, entire, apex round or obtuse. Flowers small, yellowish in dense axillary cymes; pedicels glandular hairy. Sepals oblong-ovate. Petal 0. Stamens 5; filaments dilated below. Fruits of 5 distinct, indehiscent 1-seeded carpels, tubercled; seeds round on the back.
F1. & Fr. : July – Sept.
Occurs on dry hard clayey soils, along ditches and canals. Collection : 2643; Godhanpur.
The plants possess anthelmintic properties. Leaves eaten as a vegetable by poor people.

2. Glinus Linn.
Ca 10 species; 2 species in India; 2 in MZN.

1a Plant densely stellate hairy....................... 1.G. lotoides

1b Plant glabrous.......................... 2.G. oppositifolius

Prostrate, densely-hairy, annual herbs. Stems spreading in all sides. Leaves upto 2.5 cm long, opposite or in false whorls, orbicular-ovobate, obtuse, hairy on both surface. Flowers greenish-white, in axillary clusters or sublateral fascicles, usually 6 at each node. Sepals 5, oblong or elliptic, acute, hairy outside. Stamens 5-10. Ovary 3-
5 celled. Capsules oblong, with enlarged sepals, 0.4 cm across. Seeds dark brown, tubercled, with scaly appendage.
F1. & Fr. : April - July
Common in dry ditches and ponds. Collection : 2698; Gordhanpur.
The dried plants are used in medicines.


Trailing or diffused much branched annual herbs with glabrous stems. Leaves usually whorled, elliptic or spathulate-lanceolate, sessile or sub-sessile. Flowers in axillary clusters; pedicels upto 0.8 cm, slender. Sepals 5, oblong, sub-acute with membranous margins. Petals 0. Stamens 3. 3-celled; stigmas 3, minute. Capsules oblong-ovoid, shorter then sepals. Seeds many, dark brown, tuberculate, with a small white scale.
F1. & Fr. : July – Sept.
Common in moist fallow fields. Collection : 5029; Muzaffarnagar City.

3. **Mollugo** Linn.

Ca 20 species; 4 species in India; 3 in MZN.

1b Leaves all radical, if cauline than opposite…….. **2. M. nudicaulis**

1b Leaves cauline, in whorls at the nodes :
2a Leaves lanceolate to obovate; seeds tubercled ………………….……………….. **3. M. pentaphylla**

2b Leaves linear-spathulate; seeds nearly smooth ………………………………….. **1. M. cerviana**

1. **M. cerviana** (Linn.) Ser. in DC. Prodr. 1:392, 1824; FBI. 2: 663; FUGP. 1: 387; FD. 174.

Erect, slender, much branched, glabrous, annual herbs upto 15 cm tall. Stems pale to orange, filiform; branches umbellate. Leaves in whorls of 4-8, oblancolate-spathulate, nearly sessile, upto 1.5 cm long, pubescent. Flowers in terminal trichotomous cymes or axillary; pedicels short. Sepals 5, elliptic, scarious along margins. Stamens 5. Ovary 5-celled; style minute. Capsules 0.2 cm across, equalling the sepals, globose. Seeds many minute, yellowish, reticulate.
F1. & Fr. : July – Sept.

Annual, glabrous, herbs upto 12 cm tall. Stem leafless, raising from a tuft of radical leaves or rarely 1 or 2 pairs or opposite leaves. Leaves 3.5 cm long, oblong-spathulate, tapering towards the base, obtuse, membranous; petioles minute. Flowers dull-white, in di or trichotomous cymes. Capsules brown, globose, glabrous, 0.2 cm long. Seeds many, minute, black, closely reticulate, minutely appendaged at the hilum.

F1. & Fr. : July – Oct.

Rarely occurring in the area near railway lines or waste-moist places. Collection : 2611; Rohana.


Erect or prostrate or decumbent, glabrous, simple or much-branched annual herbs. Stems 4- angular, leafy with dichotomous branches. Leaves in whorls of 3-5 or opposite, upto 5 cm long, nearly sessile, lanceolate, narrowed at base, acute, 1-nerved. Flowers minute, greenish- white, in terminal compound cymes; bracts persistent, scarious; pedicels upto 0.5 cm long, filiform. Capsules globose, ellipsoid, 3-gonous, 0.2 cm long, many seeded; seeds tuberculate.

F1. & Fr. : Aug. – Nov.

Occasionally found in grassy localities, gardens, canal sides. Collection : 1018; Shukartal.

Plants are used in medicines and the leaves are eaten.

56. **APIACEAE**

1b Leaves and umbels simple....................... 2. **Centella**

1b Leaves and umbels compound :

2a Ovary and fruit hairy or bristly :

3a Primary ridges of fruit conspicuous…. 4. **Daucus**

3b Primary ridges of fruit not conspicuous, fruit laterally compressed. .............................. 7. **Trachyspermum**

2b Ovary and fruit glabrous :
4a Mericarps with winged marginal ribs... 1. *Anethum*
4b Mericarps with exalate marginal ribs :
   5a Calyx teeth well developed :
      6a Annuals; flowers purplish white......................... 3. *Coriandrum*
      6b Perennial; flowers white .... 6. *Oenanthe*
   5b. Calyx teeth absent ....................... 5. *Foeniculum*

1. *Anethum* Linn.

Ca 4 species; 2 species in India; 1 in MZN.


Erect or decumbent, glabrous annual herbs. Stems covered with whitish bloom. Leaves finely dissected; segments filiform; lower petioled; upper and leaf opposed compound umbels, yellow; peduncles 4-12 cm long; secondary umbels 6-20 flowered. Ovary glabrous, inferior, 1-celled. Fruits narrowly winged with distinct dorsal intermediate ridges.

F1. & Fr. : Jan.-March
Cultivated in winter season and also met as an escape. Collection : 743; Muzaffarnagar City.
Fruits are used as flavouring ingredient and in medicines.

2. *Centella* Linn.

Ca 100 species; 4 species in India; 1 in MZN.


Prostrate, creeping annual or perennial herbs, rooting at nodes. Leaves simple, several at each node, reniform or orbicular, crenate, glabrous; petiole upto 1 cm long. Flowers small, pink in clusters of umbels, 3-6 in each head, sessile. Fruits 2-seeded, upto 0.5 cm long, laterally compressed, indehiscent. Seeds brown, oblong.

F1. & Fr. : Dec. - March.
Common on river and canal banks. Collection : 2642; Gordhanpur.
Whole plant is used in medicines as a diuretic, blood purifier and nerve- tonic.

3. *Coriandrum* Linn.
2 species; 1 in MZN.


Erect, glabrous, strongly smelling annual herbs. Leaves palmatilobed or partite with ovate-lanceolate segments. Flowers purplish or white, in compound umbels, axillary and terminal; peduncles 4-8 cm long. Outer flowers zygomorphic. Calyx teeth well developed. Fruits globose, ribbed.

F1. & Fr. : Dec. – April
Cultivated in winter season. Collection : 4243; Ailum.
Green leaves are added in vegetables and fruits are used as spices and in medicines.

**4. Daucus** Linn.

Ca 60 species; 1 in MZN.


Hispid, much branched, erect herbs with thick fleshy tap root. Leaves bipinnate; pinnatified; long petiole expanded at the base; segments narrow-lanceolate or nearly linear and acute. Flowers white, numerous, in compound umbels, the outer flowers with large unequal petals. Bracteoles many, 3-fid and simple. Fruits oblong, 0.3-0.5 cm long, bristly along the secondary ribs.

F1. & Fr. : Jan. – April
Cultivated as winter season crop. Collection : 4132; Bharsi.
Fleshy roots are cooked as vegetables, and also used in preparation of Gajar paak, murabba, pickles or eaten fresh.

**5. Foeniculum** Mill.

Over 5 species; 1 in MZN.


Erect, tall, glabrous annual herbs with a sweet smell and taste. Stems fistular in the lower part. Leaves divided into filiform segments upto 20 cm long; sheath white margined. Flowers in compound umbel, terminal yellow. Bracts and bracteoles absent. Calyx minute. Ovary inferior, 2-celled. Fruits upto 0.7 cm long, oblong, with unequal conspicuous ridges.

F1. & Fr. : Jan. – April
Cultivated in winter season. Collection : 743; Muzaffarnagar City.
Young leaves are used as a vegetable. Fruits are used as spice and condiment, also used as carminatives and stimulant.


Over 40 species; 1 species in India; 1 in MZN.


Perennial herbs with stoloniferous, glabrous, fistular stems upto 70 cm tall, rooting from lower nodes. Leaves 1 or 2 pinnate; leaflets pinnatifoliated, or shallowly serrate; petioles upto 8 cm long. Flowers white in terminal or leaf opposed umbels; peduncles upto 8 cm long. Fruits glabrous, sub-quadrilateral-ellipsoid, dorsal and intermediate ridges prominent.

F1. & Fr. : April - June

Common in moist-waste places and gardens. Collection : 1028; Shukartal.

Young shoots used as a condiment.

7. *Trachyspermum* Link. nom. con.

Ca 20 species; 3 species in India; 1 in MZN.


Erect or decumbent, glabrous, much branched herbs upto 70 cm tall. Leaves 2 or 3 pinnate, with ultimate segments linear-lanceolate, 1.5 cm long. Flowers white, in terminal or leaf-opposed compound umbels; peduncles upto 10 cm long. Fruits ovoid, 0.2 cm long, muricate, carpels dorsall compressed, with distinct primary ridges.

F1. & Fr. : Nov. - March.

Cultivated for fruits or met as an escape. Collection : 2685; Gordhndandpur.

Fruits are used as spices and in medicines.

GAMOPETALAE

57. RUBIACEAE

1a Arborescent :

2a Flowers in dense globose heads :
3a Heads light yellow, 2-2.5 cm in diam

8. Mitragyna

3b Heads orange, 3-3.5 cm in diam

1. Anthocephalos

2b Flowers in axillary or terminal, panicled cyme or umbellate heads.

4a Fruit capsular

13. Wendlandia

4b Fruit drupeceatum

9. Morinda

1b Non-arborescent:

5a Shrub

6a One calyx lobe expanded into a coloured leaf like structure

10. Mussaenda

6b Calyx lobe not expanded:

7a Leaves in whorls of 3; corolla tubular

5. Hamelia

7b Leaves opposite; corolla not tubular:

8a Flowers in dense corymbs

7. Ixora

8b Flowers usually solitary, axillary

4. Gardenia

5b Erect or prostrate herbs:

9a Ovules many in each cell:

10a Flowers in axillary clusters or whorls

2. Borreria

10b Flowers in axillary and terminal paniculate cymes:

11a Stems sharply angeld; capsules broadly didymous
11. Oldenlandia

11b Stems terete or obscurely 4-angled; capsules minute…

6. Hedyotis

9b Ovules solitary in each cell:

12a Flowers in terminal trichotomously branched panicles; pink or white ……

12. Spermacoecytion

12b Flowers in few flowered cymes, in large leafy panicles; greenish white……

3. Galium


3 species; 1 species in India; 1 in MZN.


Medium sized or large deciduous trees with horizontal branches. Leaves opposite, elliptic-oblong or ovate, upto 22 cm long, acute or shortly acuminate, glabrous shining above, pubescent beneath; petioles 2-5 cm long. Flowers in terminal globose heads, 4-6 cm in diam, scented. Calyx limb tubular; segments 5. Corolla tube long, funnel shaped; lobes 5. Ovary 2-celled. Fruits globose yellow pseudocarp upto 4 cm across.


Planted in gardens. Collection : 5009; Muzaffarnagar City.
Fruits is edible & wood is used for construction of boxes.


Ca 150 species; 7 species in India; 2 in MZN.

1a Flowers pale –blue, clusters few flowered, without floral tube. …………………………… 1.B. articularis

1b Flowers white, clusters many flowered, with exerted floral tube. …………………………… 2.B. pusilla

Procumbent, hispid, deep rooted, much branched herbs. Stems 4-angular. Leaves 1.5-3.0 cm long, opposite, lanceolate-oblong, narrowed in a short petiole, acute or acuminate, entire, scabrid on both surface. Flowers pale-violet or pale-blue, 4-merous, in axillary clusters, 4-6 together, sessile. Corolla hairy outside, whitish or pinkish. Fruits obovoid, hispid, 0.4x0.5 cm, crowned with calyx tube; seeds 2, oblong.

Common during rainy season along road sides and sandy soils. Collection : 1753; Shahpur.

The roots are used in medicines.


Erect, simple or rarely branched at top, annual upto 40 cm tall herbs. Stems angular, scabrid on angles. Leaves opposite, 2-3.5 cm long, linear-lanceolate or oblong, glabrous or scabrid, acute or acuminate; stipules connate. Flowers in dense terminal clusters or axillary with exerted floral bracts. Calyx lobes linear, mucronate. Corolla lobes 3 or 4, ovate, 2-seeded, crowned with persistent calyx segments.

Commonly growing on river banks, sandy soils and road sides. Collection : 2241; Hennd.


Annual, much branched, climbing herbs with 4-angled stems. Leaves sessile, upto 4.5 cm long, spatulate-oblong, obtuse, mucronate, glabrous except prickly midrib and margins. Flowers in few flowered cymes combined into a large, leafy panicle, Calyx teeth absent. Corolla rotate, greenish-white; lobes ovate-triangular. Stamens 3-4. Fruits didymous, densely clothed with patent, hooked bristles, upto 0.4 cm across.

Commonly growing on river banks, sandy soils and road sides. Collection : 2241; Hennd.
Growing on road sides, waste places and grassy fields. Collection : 2305; Oon.

4. **Gardenia** Ellis. nom. cons.

Ca 250 species; 7 species in India; 1 in MZN.


Small unarmed trees with stout branches; branchlets resinous. Leaves opposite or in whorls of 3, subsessile, upto 12 cm long, broadly elliptic or orbicular, shortly acuminate, bright green above, pale beneath, glabrous; stipules connate. Flowers large, whitish-yellow, fragment, solitary or in pairs. Calyx upto 8 cm long, recurved. Corolla tube pubescent, 2-3 cm long. Fruits 2-4 cm in diam, globose, smooth, beaked by the calyx limb; seeds many.

F1. & Fr. : April - July.

Planted in gardens. Collection : 920; Muzaffarnagar City.

Wood in used in tannery.

5. **Hamelia** Jacq.

Ca 40 species; 1 in MZN.


Evergreen, handsome, woody shrubs. Young parts pubescent. Leaves in whorls of 3; upto 15 cm long, elliptic-ovate to oblong-acute or acuminate. Stipules inter-petioler. Flowers scarlet-orange or reddish yellow in corymbose heads on terminal cymes. Corolla tubular. Berries ovoid or globose.


Commonly planted in gardens. Collection : 135; Muzaffarnagar City.

6. **Hedyotis** Linn.

Ca 150 species; Ca 35 species in India; 2 in MZN.

1a Peduncles 5 from the lowers or from all the axils

1-4 flowered ........................................

2. **H. corymbosa**

1b Peduncles axillary and in open terminal penicled cymes........................................


Annual, glabrous or sparsely hairy erect herbs. Leaves 3-6 cm long, linear lanceolate, acute, upper surface subscabrous. Flowers minute, on long hairy
peduncles, rarely solitary, white. Calyx teeth subulate, much shorter than the slender corolla-tube, distinct in fruit. Capsules very small, globose, crown not produced; seeds 6.

F1. & Fr. : Sept. – Nov.

Rare in the area in waste lands. Collection : 4191; Bharsi.


Small, prostrate, straggling or ascending herbs with woody base. Stems 4-angular, glabrous or scabrid. Leaves sessile, linear-lanceolate to oblong, acute, revolute on margins, upto 3 cm long. Flowers white in 2-5 flowered peduncled cymes; pedicels upto 0.5 cm long; tetramerous. Calyx lobes ovate-triangular. Capsular didymous, with truncate mouth, 0.2 cm across, glabrous; seeds numerous minute.

F1. & Fr. : July – Dec.

Abudant in waste open places, grassy localities and road sides. Collection : 2267; Mirapur.

7. **Ixora** Linn.

Ca 400 species; 30 species in India; 2 in MZN.

1a Flowers white, 1.0-1.5 cm long .......................... 1. **I. arborea**

1b Flowers red, 2.5-3.5 cm long .......................... 2. **I. coccinea**


Erect, evergreen small trees or shrubs. Leaves opposite, upto 15 cm long, oblong-elliptic, obtuse; rounded at base, entire, glabrous. Flowers white, upto 1.5 cm long, in 3-chotomous corymbose cymes, 4-merous. Ovary 2-celled; stigma exerted, 2-fid, hairy. Berries globose, 0.5 cm across, depressed, shining black.

F1. & Fr. : March – Sept.

Planted in gardens. Collection : 4088; Kandhla.

Branches are made into torches.

2. **I. coccinea** Linn. Sp. Pl. 110. 1753, MCP. 929; FD. 183.

Evergreen shrubs. Leaves upto 12 cm long, oval, cordate or amplexicaul base. Flowers red, 2.5-3.5 cm long, in corymb. Berries hard, globose.

F1. & Fr. : April – Aug.
Planted in gardens for its flowers. Collection : 4093; Kandhla.

8. **Mitragyna** Korth. *nom. cons.*

Ca 15 species; 3 species in India; 1 in MZN.


Large deciduous trees with grey or brownish bark. Leaves opposite, upto 10 cm long, elliptic or obovate, acute or bluntly acuminate, rounded or subcordate at base, glabrous or pubescent beneath, entire; petiole upto 2.5 cm long. Stipules large and caducous. Flowers in dense globose heads, white or light yellow, 2-2.5 cm in diam, pentameric. Ovary 2-celled, style filiform, much exerted; stigma cylindrical. Capsules upto 0.3 cm long of 2 dehiscent cocci; seeds many, winged.


Rarely planted in gardens. Collection : 584; Muzaffarnagar City.

Leaves are used as fodder and wood is also useful for different works.

9. **Morinda** Linn.

Ca 80 species; 8 species in India; 1 in MZN.


Medium-sized trees with 4-angled, tomentose branches. Leaves upto 15 cm long, elliptic, acute at both the ends, tomentose on both sides. Stipules bifid. Flowers white, panicled or umbellate heads in leaf-opposed peduncles. Corolla tube upto 2.5 cm long, hairy outside. Fruits globose upto 2.5 cm in diam, composed of many coalescent drupes.

F1. & Fr. : March – Nov.

Rarely planted along road sides and in gardens. Collection : 2037; Shamli.

Drupes are edible; roots yield a red dye for colouring linen and woolen goods.

10. **Mussaenda** Linn.

Ca 200 species; 14 species in India; 1 in MZN.

**M. luteola** Delile, Cent. P1. Meroe 65, t. 62. 1826; Bor & Raizada 80, f. 50, P1. 25; FD. 181.

Erect, much-branched, woody shrubs, upto 50 cm, tall. Leaves opposite, ovate or elliptic, upto 5 cm long, acute, entire, glabrous; stipules interpetiolar, in pairs, linear. Flowers in terminal cymes; bracts linear; pedicels upto 0.5 cm long. Calyx
segments 4; 2 of them yellow, leafy, enlarged, persistent, broadly ovate or elliptic acuminate. Berries subglobose or obovoid.

F1. & Fr. : July – Jan.
Planted in gardens.
Collection : 4072; Kairana.

11. Oldenlandia Linn.

Over 100 species; ca 10 species in India; 1 in MZN.


Erect, annual, glabrous herbs upto 20 cm tall. Stems 4-angular. Leaves opposite, linear, upto 2.5 cm long, minutely revolute, nearly sessile; stipules minute. Flowers in axillary, 1-flowered peduncled and in dichotomous terminal cymes. Calyx segments 4, minute. Corolla white, tube short. Ovary 2-celled; stigma 2. Capsules didymous, upto 0.5 cm across.

Common on moist shady places. Collection : 1616; Mansoorpur.

12. Spermadictyon Roxb.

Ca 5 species; 1 species in India; 1 in MZN.


Deciduous, shrubs upto 2 m tall, branches spreading, glabrous. Leaves opposite, oblong or ovate, upto 15 cm long, acute, entire, glabrous above, pubescent beneath, rough; petioles upto 2.5 cm long. Flowers bluish or pinkish, scented, numerous in terminal trichotomous lax panicles, 5-merous. Calyx minute. Corolla tube 1 cm long; segments 4 or 5, pubescent. Capsules ellipsoid, upto 0.4 cm long, 1-celled; seeds 5, triquetrous.

Planted in gardens and also met in wild conditions. Collection : 2296; Ramraj.


Ca 70 species; 20 species in India; 1 in MZN.

Small, deciduous trees with rough brown bark. Leaves opposite, ovate-lanceolate, acute or acuminate, entire, upto 20 cm long, upper surface glabrous, lower pubescent; petiole upto 2.5 cm long. Stipules ovate, acute, recurved, persistent. Flowers subseismatic, white, small, fragrant, arranged in sessile pyramidal panicles. Calyx hairy; lobes or subulate, persistent. Corolla tube shorter. Stamens exerted. Capsules small, white tomentose. Seeds small, black, rugose.

F1. & Fr. : Sept. – Nov.
Sometimes occurs on canal and river banks. Collection : 501; Muzaffarnagar City. Leaves used as fodder.

58. ASTERACEAE

KEY TO TRIBES UNDER SERIES OF ASTERACEAE

Series I.
Flowers all tubular, or the outer only ligulate; juice watery.........Tubuliflorae.
1a. Head homogamous:

2a. All flowers bisexual, never yellow; anthers cleft at the base; style armed, subulate, hairy; leaves alternate. .........................Vernonieae.-Tribe I.

2b. All flowers bisexual, tubular, never yellow; anthers sub-entire at the base; style armed, obtuse, minutely hairy; leaves opposite. ........Eupatorieae.-Tribe II.

1b. Head homogamous or heterogamous:

3a. Anther not tailed or sub entire at the base:

4a. Style arms flattened, all or those of the disk flowers terminated by a cone.
.................................................................Asteroideae. –Tribe III.

4b. Style arms linear, obtuse, all or those of the disk flowers not terminated by a cone:

5a. Receptacles with chaffy bracts.Helanthoideae......Inuleae -Tribe IV.
5b. Receptacles naked:

6a.Involucral bracts two to many seriate; pappus 0.........
.................................................................Anthemideae.-Tribe V.

6b.Involucral bracts one–seriate; pappus of fine hairs.......
.................................................................Senecionideae.-Tribe VI.

3b. Anthers tailed:
7a. Style arms obtuse or linear or style of sterile flowers undivided........
........................................................................................................
Inuloideae.-Tribe VII.

7b. Style sub–entire or with short hairy arms….Cynaroideae.-Tribe VIII.

Series- II Flowers all ligulate; plants usually with milky juice.
Heads homogamous; corolla 5 -toothed; anther bases sagittate, rarely tailed;
style arm slender; leaves radical or alternate..........Cichorideae.-Tribe IX.

KEY TO GENUS UNDER TRIBES OF ASTERACEAE

TRIBE I. Vernonieae. Heads homogamous. All flowers bisexual,
ever yellow. Anthers cleft at base. Style arms subulate,
hairy. Leaves usually alternate :
1. Heads distinct, many flowered, Pappus long,
usually with an outer row of short hairs. .....

TRIBE II. Eupatoriieae. Heads homogamous. Flowers all bisexual
and tubular, never yellow. Anthers subentire at base.
Style arms obtuse, minutely papillose. Leaves usually
opposite.
1a Pappus plaeeaceous........................... 1. Ageratum
1b Pappus of slender hair :
2a Involucral bracts 3-5 seriate. Achenes
glabrous........................... 8. Chromolaena
2b Involucral bracts 1-2 seriate. Achenes hairy
on ribs........................... 18. Eupatorium

TRIBE III. Asterieae. Heads heterogamous, rayed or discoid or
homogamous and rayless. Anthers subentire at the base.
Style arms flattened. Dise flowers yellow.

1a Heads golden-yellow, in unilateral racemes
forming panicles........................... 30. Solidago

1b Heads not as above :
2a Outer flowers of head female, not longer
than disc :
3a Pappus 0. Flowers rose purple.......... 13. Cyathocline

3b Pappus cup like. Flowers yellow......... 21. Grangea
2b Heads with distinct ray-flowers :
   4a Corolla of ray-flowers with short ligule. Flowers all yellow……………….. *17. Erigeron*
   4a Corolla of ray-flowers slender, tubular, or with short ligule. Flowers not Yellow…………………………….. *11. Conyza*

**TRIBE IV. Inuleae.** Heads with the flowers all similar and tubular
(Except in *Inula*). Anther cells tailed, undivided. Flowers all yellow. Leaves alternate :
1a Heads homogamous ………………….. *6. Caesulia*
1b Heads heterogamous :
   2a Heads not rayed :
      3a Style arms of 2-sexual flower truncate.. *20. Gnaphalium*
      3b Style arms of 2-sexual flowers not truncate :
         4a. Heads in dense clusters………….. *33. Sphaeranthus*
         4b. Heads corymbose or panicked, not in dense clusters :
            5a Involucral bract broad. Shrubs or undershrubs…… *7. Pluchea*
            5b Involucral bracts narrow. Herbs :
               6a Anther cells tailed….. *5. Blumea*
               6b Anthers cells not tailed………………….. *23. Laggera*

   2b Heads rayed :
      7a Pappus in a single row……………….. *26. Pentanema*
      7b Pappus with an outer row of short scales………………………………….. *28. Puliceria*

**TRIBE V. Heliantheae.** Heads heterogamous, usually rayed or homogamous and rayless. Ray flowers female. Disc flower 2 sexual. Style branched, each with a crown of hair below the stigma. Receptacle with chaffy bracts :
1a Heads monoecious. Achenes 2 to each head ........ 37. Xanthium

1b Heads not as above. Achenes many to each head:

2a Leaves simple:

3a Paleas flat, not embracing flowers or achenes:

4a Pappus of ciliate scales ............... 19. Galinsoga

4b Pappus of long plumose hair ...... 34. Tridax

3b Paleas concave, embracing flowers or achenes:

5a Marginal flowers numerous many seriate.......................... 15. Eclipta

5b Marginal flowers usually 5-few, 1-seriate ...................... 4. Blainvillea

2b Leaves 3-foliate or pinnati-partite:

6a. Disc flowers only male.............. 25. Parthenium

6b. Disc flowers 2-sexual............... 3. Bidens

TRIBE VI. Anthemideae. Heads heterogamous, usually rayed of homogamous and rayless. Ray flowers female. Disc flowers 2-sexual. Involucral bracts 2-many seriate, dry or with scarios tips. Receptacle naked. Pappus 0:

1a Erect or diffuse herbs or shrubs. Heads stalked:

2a Heads solitary on slender, long peduncles.

Small herbs.................................. 12. Cotula

2b Heads in panicles. Large herbs or shrubs ...... 2. Artemesia

1b Prostrate herbs. Heads sessile.................. 31. Soliva

TRIBE VII. Senecionideae. Heads heterogamous rayed or discoid or homogamous and rayless. Involucral bracts usually 1-seriate. Receptacle naked. Anther cells obtuse at base, rarely tailed. Pappus of fine hair.


TRIBE VIII. Cynareae. Flowers all tubular. Involucral bracts many seriate, often with spinous tips or leafy appendage. Receptacle bristly or paleaceous. Corolla-limb deeply
5-fid. Anther-cells tailed. Style sub-entire or with short hairy arms. Pappus of paleas of bristles, rarely 0.

Leaves alternate, spinous;

1a Heads I-flowered, crowded into involucrate balls.
   Achenes villous ........................................ 14. Echinops

1b Heads many flowered, separate. Achenes glabrous:
   2a Heads yellow or orange-yellow; pappus ...... 7. Carthamus
   2b Heads purplish, violet or blue :
      3a Achenes with an oblique or lateral areole................................. 36. Volutarella
      3b Achenes with a horizontal areole:
         4a Leaves and involucral-bract spinous. Pappus hair plumose. 10. Cirsium
         4b Leaves and involucral-bracts not spinous. Pappus 1 or 2 seriate; inner plumose................. 29. Saussurea

TRIBE IX. Cichorideae. Heads homogamous; corolla 5-toothed; anther bases sagittate, rarely tailed; style arm slender; leaves radical or alternate.

   1a Pappus extremely short, of reddish or greenish scales. Corolla blue................................. 9. Cichorium
   1b Pappus of hair or bristles. Corolla yellow or pink, rarely blue :
      2a Achenes beaked................................. 22. Lactuca
      2b Achenes not beaked :
         3a Achenes columnar, truncate at both ends. Involucres cylindrical........... 24. Launaea
         3b Achenes compressed, ovoid or obovoid.
            Involucres ovoid or campanulate......... 32. Sonchus

1. Ageratum Linn.

Ca 60 species; 2 species in India; 1 in MZN.


Erect or decumbent, hairy annual herbs. Stem branched, hairy when young, rooting at base. Leaves opposite, ovate or rhomboid-ovate, upto 8.0 cm long, sub-
cordate or truncate at base, acute or obtuse, serrate margin, hairy; petiole upto 2.5 cm long. Heads homogamous, violet arranged in dense terminal corymb, 0.5 cm across; peduncle upto 1 cm long. Involucral bracts 2 or 3 seriate, linear, acuminate, ribbed. Receptacle flat. Corolla tubular. Achenes upto 0.15 cm long, 5 angled, black. Pappus scales 5, connate below, awn-tipped.

F1. & Fr. : Jan. – June.

Common in cultivated fields and on waste lands. Collection : 2364; Oon.

2. Artemisia Linn.

Ca 400 species; 34 species in India; 2 in MZN.

1a Leaves densely white tomentose beneath. Disc-flowers fertile…………………………………… 2.A. nilagirica

1b Leaves glabrous or pubescent, not white tomentose Beneath. Disc flowers sterile……………………… 1A. capillaris


Erect, annual or biennial, branched herbs upto 80 cm tall. Stem slender, grooved, tinged with purple, glabrous. Young parts hairy. Radical leaves long petioled upto 7 cm long, 1-3 pinnatisect and shortly mucronate, glabrous or hairy beneath. Heads minute, green, axillary, subsessile, combined into a paniculate inflorescence. Involucral bracts ovate-elliptic. Achenes glabrous, minute. Pappus 0.

F1. & Fr. : Sept. – Nov.

Common in sandy soils and wastelands. Collection : 3633; Nirana.


Erect or ascending, aromatic, perennial herbs or undershrubs. Leaves sessile, pinnatipartite to 2-pinnate, 5-10 cm long; segments lanceolate – oblong, entire, glabrate or thinly hairy above, densely white tomentose beneath. Heads heterogamous, ovoid or subglobose, axillary, solitary, combined into paniced racemes. Disc flowers fertile. Involucral bracts ovate-oblong, obtuse. Achenes glabrous, minute. Pappus 0.


Rarely found on waste places, road sides. Collection : 5074; Shamli.

Plants are used for making brooms.
3. **Bidens** Linn.

Over 230 species; 6 species in India; 2 in MZN.

1a Leaves 2-3 pinnatipartite........................................... **1. B. bipinnata**

1b Leaves simple, 1-pinnate........................................... **2. B. biternata**


Erect, simple or branched annual herbs, up to 1.5 cm tall. Stem 4-gonous, glabrous. Leaves opposite, uppers may alternate, 2-3 pinnatipartite; segments ovate-lanceolate, acute or acuminate, incised-serrate to lobulate, thinly hairy. Flowers heads yellow, ebracteate, on 2-8 cm long peduncles, up to 1 cm across. Disc flowers bisexual; corolla tubular. Achenes 4-angular, tapering towards apex, glabrous or shortly hispid; pappus- setae 2-4, retrolessly bristly.

F1. & Fr. : May – Oct.

Common on waste places, road sides and in cultivated fields. Collection : 29; Muzaffarnagar City.


Erect, pubescent or glabrous annual herbs up to 1 m tall. Stem 4-angled, thickened at nodes. Leaves variable simple or 3-foliolate to bipinnate; the terminal segments ovate, acute, serrate, base cuneate. Flowers heterogamous, white or yellow, in corymbose panicles. Ray florets ligulate. Disc florets tubular. Achenes 4-angular, glabrous, ribbed, black. Pappus 2-awned, spreading.

F1. & Fr. : March – Dec.

Common in gardens, on road sides. Collection : 2333; Oon.

4. **Blainvillea** Cass.

Ca 10 species; 1 species in India; 1 in MZN.


Erect dichotomously branched, hispidly hairy, annual herbs up to 1 m tall. Stem and branches terete, clothed with hair. Leaves opposite, up to 8 cm long, ovate or
ovate-lanceolate, acute or acuminate, crenate-serrate, base cuneate, hispid on both surfaces; people upto 1.5 cm long. Heads white, arranged in dichotomously terminal cymes. Ray floret ligulate, 1-seriate. Disc floret tubular. Achenes of disc flowers obovoid, transversly rugose; those of ray triquetrous, curvrd, hispid, pappus 2-5, upto 1 cm long.

Fl. & Fr. : Aug.–Oct.

Commonly occurring in ravines and gardens. Collection : 2104; Thanabhavan.

5. *Blumea* DC., nom. cons.

Ca. 75 species; 30 species in India; 8 in MZN

1a Heads solitary, few, peduncled at the end of branches :

2a Heads soliatary :

3a Leaves serrate; pappus white .............. 1. *B. bifoliata*

3b Leaves toothed; pappus pink :

4a Heads 12-16 mm in diam .............. 7. *B. obliqua var. pubiflora*

4b Heads 8-10 mm in diam .............. 6. *B. obliqua*

2b Heads axillary and in terminal coryms :

5a Plants villous; leaves spinulosely toothed............................... 8. *B. oxyodonta*

5b Plants pubescent or tomentose, leaves toothed............................... 2. *B. eriantha*

1b Heads many :

6a Achenes ribbed 3. *B. hieracifolia*

6b Achenes not ribbed :

7a Heads yellow............................... 4. *B. lacera*

7b Heads purple ............................... 5. *B. mollis*


Erect, bushy hairy herbs upto 50 cm tall. Stem branching from the base, erect or decumbent. Leaves sessile, upto 8 cm long, obovate-oblong or acute serrate. Heads small, solitary on long peduncles. Involucral- bracts more or less villous, acute. Flowers yellow. Achenes narrowly oblong, 4-5 angled, not ribbed. Pappus white.

F1. & Fr. : March – May
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

Occurs on waste places and crop fields. Collection: 2312; Oon.

2. **B. eriantha** DC. in Wight. Contrib. 15. 1834; FBI. 3: 266; FUGP. 1: 452.

   Erect, pubescent, dichotomously branched up to 35 cm or more tall. Leaves alternate, 3-6 cm long, softly pubescent; lower petioled, ovate or oblanceolate, acute or acuminate; upper smaller, acute, often entire. Heads few, up to 1.0 cm in diam, in axillary and terminal dichotomous cymes. Receptacle glabrous. Achenes minute; faintly angled, silky.

   F1. & Fr.: Jan. - March

   Sometimes found on road sides, river banks and canal sides. Collection: 762; Muzaffarnagar City.


   Erect woody herbs up to 50 cm tall. Stem simple, tomentose-woolly. Leaves mostly basal, variable in shape, elliptic or obovate, dentate or serrate, silky. Heads yellow, up to 1 cm in diam, intermixed with globose in long leafy spikes. Receptacles glabrous. Involucral bracts straw-coloured. Achenes oblong, brown, ribbed, villous. Pappus white, up to 0.5 cm long.

   F1. & Fr.: March - June

   Occurs in Khadar area. Collection: 2957; Ramraj.


   Erect, aromatic, viscid, annual-biennial herbs. Leaves obovate-oblong or elliptic-oblong, obtuse or acute, entire or dentate, hairy on both sides. Heads yellow, up to 0.7 cm in diam, in short axillary cymes or terminal panicles. Invol-bracts glandular hairy. Achenes hairy, not ribbed, minute. Pappus hair up to 0.4 cm long.

   F1. & Fr.: Feb. - June

   Occurs in shady places, agricultural fields, grassy localities. Collection: 2839; Lachheda.


   Erect, villous, leafy, strongly aromatic annual-biennial herbs. Leaves ovate-obovate, round or obtuse, acute, dentate; petioles short. Heads 0.3-0.4 cm across,
purple, arranged in terminal or axillary spike like cymes or panicles. Invol-bracts linear, acute, densely hairy. Achenes hairy, terete or angular. Pappus hair present.


Common on moist waste places. Collection : 896; Muzaffarnagar City.


Decumbent, woody, deep rooted herbs upto 30 cm tall. Leaves sessile, alternate, oblong or obovate, obtuse or acute, dentate or entire. Heads on long slender peduncles, solitary. Invol-bracts slender, pubescent, Receptacle glabrous. Flowers yellow. Achenes minute, oblong. Pappus pink.

F1. & Fr. : Feb. - May

Common in the area, especially in sandy soils. Collection : 4164; Ailum.


A stout, villous herb. Leaves densely villous. Flowers pink. Heads larger than in the type.

F1. & Fr. : March – April

Occurring in sandy soils. Collection : 945; Jaroda.


Decumbent-ascending or prostrate, annual-biennial, glandular-villous, simple or branched herbs. Leaves obovate, lanceolate, lanceolate-obleng, spinulose-toothed, narrowed into a short petiole, hairy, upto 6 cm long. Heads light yellow or creamy, upto 0.6 cm across, combined into a lax leafy panicle. Stamens in disc flowers usually wanting. Invol-bracts linear, acute, villous, upto 0.7 cm long. Achenes thinly hairy, ribbed.

F1. & Fr. : Feb. - May

Occuring in waste lands and cultivated fields. Collection : 5024; Muzaffarnagar City.

6. Caesulia Roxb.

Monotypic genus.

C. axillaris Roxb, P1. Cor. 1: 64.t. 93. 1798; FBI. 3: 291; FUGP. 1: 462; FD. 192; HFD. 248.
Erect or decumbent-ascending, glabrous, semi-aquatic herbs. Leaves sessile, upto 15 cm long, narrowly lanceolate, acuminate, tapering to the auricled base. Flower heads homogamous, axillary, sessile, purplish, bisexual. Invol-bracts 2-3, crenulate. Achenes flat, upto 0.3 cm long, ribbed, winged dark brown, short hairy at top. Pappus scales 2, apiculate.

F1. & Fr. : Sept. - April

Common weed of rice fields and rainy season crops. Collection : 1659; Rohana.

7. **Carthamus** Linn.

Ca 15 species; 3 species in India; 1 in MZN.


Annual, spiny, herbs. Stem and branches white, minutely pubescent. Leaves alternate, oblong or oblong-lanceolate, coriaceous, spinescent, amplexicaul base, nerves conspicuous, spinulose-toothed. Flowers yellow, bisexual, whitish yellow. Invol-bracts exceeding the heads. Achenes obovoid, 4-angled, smooth, white, shining, upto 0.5 cm long. Pappus 0.

F1. & Fr. : Feb. – May

Occurring in cultivated fields. Khaddar area and on road-sides. Collection : 2977; Ailum.

8. **Chromolaena** Linn.

Monotypic genus.


Erect, much-branched, perennial, softly hairy herbs. Leaves upto 8 cm long, petiole 2 cm long, ovate-lanceolate or triangular, acute or acuminate, narrowed at base, entire or serrate-dentate, nearly glabrous. Heads blue, in terminal corymbs, upto 0.4 cm across, 1 cm long. Invol-bracts ovate lanceolate, 3-4 seriate. Achenes 5-angled, glabrous, upto 0.4 cm long. Pappus hairs white.


Cultivated; rarely met as an escape. Collection : 2246; Jansath.

9. **Cichorium** Linn.

9 species; 3 species in India; 1 in MZN.
C. intybus Linn., Sp. P1. 813. 1753; FBI. 3: 391; SFUGP. 107; FD. 188; HFD. 253.

Vern. Kasani.

Erect or decumbent, hispid annual herbs with white latex. Leaves oblanceolate or oblong-lanceolate; lower leaves usually pinnately divided, obtuse, dentate or lobed, nearly glabrous, short petaled; upper ones with a semi amplexicaul base, undivided or lobed, short, nearly sessile. Heads blue, homogamous, axillary, sessile. Invol-bracts 2-seriate, lanceolate-oblong, acute. Achenes turbinate, 5-angled, up to 0.3 cm long. Pappus scally, very short or wanting.

F1. & Fr. : Feb. - May
Growing mixed with winter fodder crop of Trifolium alexandrinum Linn. Collection : 5053; Khandhala.

10. Circium Mill.

Ca 150 species; 7 species in India; 2 in MZN.

1a Heads unisexual; flowers deep pink to pale purple; solitary.............................................................. 1. C. arvense

1b Heads bisexual; flowers yellow, in dense fascicles................................................................. 2. C. wallichii


Erect, annual, simple or branched, cottony herbs with subterranean stolons. Leaves sessile, pinnati-lobed or fid to partite, glabroscent or cottony above, woolly beneath; segments 4-8 cm long, dentate. Heads solitary, up to 2 cm across, subsessile. Invol-bracts 4-5 seriate; outer ovate, shortly aciculate, cottony; inner ones lanceolate, glabrous. Achenes oblong, glabrous. Pappus hair plumose, dirty white, connate at base, deciduous.

F1. & Fr. : Feb. - June
Commonly occurs in cultivated fields. Collection : 3517; Nirana.

Used as tonic and diaphoretic.


Erect, annual or perennial, simple or branched, cottony or glabrescent herbs. Basal leaves pinnatifid of 2 pinnate; upper ones lanceolate, pinnatifid-fid, woolly
on lower surface. Heads up to 4 cm across, terminal, sessile or on short peduncles, in dense fascicles; outer invol-bract ovate; inner ones lanceolate. Pappus hair brown.

F1. & Fr.: Feb. - March

Rare in the area in marshy places and cultivated fields. Collection: 4152; Ailum


Ca 60 species; 10 species in India; 3 in MZN.

1a Corolla of ray flowers slender tubular or with short ligule; flowers all yellow ...................... 3. C. japonica

1b Corolla of ray flowers ligulate; never yellow:

2a Invol-bracts glabrous; heads less than 0.4 cm across. .................................................. 2. C. canadensis

2b Invol-bracts hairy; heads more than 0.4 cm across .................................................. 1. C. bonariensis


Erect, stout, deep-rooted, hirsute, annual-biennial herbs up to 1 m tall. Stem ribbed. Leaves linear-lanceolate or oblanceolate, up to 5 cm long, narrow base, entire or serrate-incised, hairy. Heads heterogamous up to 1 cm across, axillary, in corymbose panicles. Invol-bracts 2 or 3 seriate, linear, scarious margins. Ray flowers white. Corolla of disc flowers pale-yellow. Achene oblong, thinly hairy, brown. Pappus dirty white.

F1. & Fr.: Feb. - July.

Common on road sides, shady places and old walls. Collection: 279; Muzaffarnagar City.


Erect, much branched, hairy annual herbs up to 1 m tall. Stem ribbed. Leaves 2-5 cm long, linear-lanceolate, acute, entire, glabrous or hairy. Heads heterogamous, yellow, 0.2 cm across axillary, combined into large leafy panicles; peduncle up to 0.8
cm long. Invol-bracts 2 or 3 seriate, linear, glabrous. Corolla of marginal flowers filiform, white. Achenes thinly hairy. Pappus dirty white, 0.2 cm long.

F1. & Fr. : May – Sept.
Abundant within the area in cultivated fields, on road-sides and waste places. Collection : 573; Chitora.


Erect, hairy, perennial herbs with ribbed and patently villous stem upto 35 cm tall. Leaves oblong-spathulate, entire; lower ones narrowed into petiole; uppers with a semi-amplexicaul base. Heads upto 0.6 cm across in few-headed compact corymbs. Invol-bracts 2 or 3 seriate, linear-lanceolate. Achenes thinly hairy. Pappus hair white, upto 0.3 cm long.

F1. & Fr. : Sept. – Feb.
Common on old walls, river banks and field borders. Collection : 5115; Shamli.

12. **Cotula** Linn.
Ca 75 species ; 4 species in India; 1 in MZN.

**C. anthemoides** Linn., Sp. Pl. 891. 1753; FBI. 3: 316; FUGP. 1: 476; HFD. 258.

Prostrate or decumbent-ascending, multicauine, annual herbs. Stems glabrous. Leaves 1 or 2 pinnate partite, semi-amplexicaul, 1.5-2.0 cm long; segments linear-lanceolate, acute, entire, glabrous. Heads heterogamous, disciform, yellow, leaf-opposed, solitary 0.3 cm across; peduncles upto 0.8 cm long. Involucral bracts 2-seriate, oblong, obtuse, with prominent mid-rib, upto 0.15 cm long. Ray-flowers: female; corolla absent. Disc-flowers: 2-sexual, corolla yellow with 4 fdl limb. Achenes compressed 0.1 cm long; of outer flowers winged and of disc flowers not winged.

F1. & Fr. : Nov. - May
The flowers heated with oil are used as an external remedy for rheumatism.

13. **Cyathocline** Cass.
3 species in India; 1 in MZN.

Erect, aromatic, glandular-hairy, annual-biennial herbs. Stem usually tinged with reddish-purple, branched from base, hairy. Leaves sessile, 1-2 pinnatipartite, up to 14 cm long; upper ones smaller; segments dentate to lobed, hairy. Heads 0.5 cm across, in terminal corymbose panicles. Invol-bracts 2-seriate, pilose, linear-lanceolate, acute. Achenes minute. Pappus 0.

F1. & Fr.: Sept. – Dec.

Occuring on river banks and in rice fields. Collection: 2286; Jansath.

14. Echinops Linn.

Over 100 species; 4 species in India; 1 in MZN.


Erect or diffuse, much-branched, white woolly annual herbs. Leaves sessile, up to 15 cm long, pinnatifid, segments ending in long rigid narrow spines, glabrous above, white woolly beneath. Heads dioecious, solitary, fascicled or corymbose up to 0.4 cm in diam. Flowers deep pink to bluish. Involucre of heads surrounded by white, pappus like bristles. Achenes minute silky.

F1. & Fr.: April. - June

Commonly growing in dry waste lands. Collection: 4092; Kanyan.

15. Eclipta Linn. nom. cons.

Ca 5 species; 1 species in India; 1 in MZN.


Erect or prostrate, rough annals, with stem often creeping and rooting at base. Leaves subsessile, up to 7 cm long, ovate-lanceolate, elliptic-oblong, acute or obtuse, narrowed at base, entire. Heads axillary and terminal on 5-7 cm long peduncles. Invol-bracts 2-seriate, ovate-lanceolate, acute, pubescent. Flowers white. Achenes turbinate, tuberculate, with thick margin, 0.3 cm long.

F1. & Fr.: Through out the year.

Common near ditches, in agriculture fields and waste places. Collection: 2228; Jansath.

The plant is used in medicines and hair oil.
16. **Emilia** Cass.

Ca 30 species; 4 species in India; 1 in MZN.


Erect or decumbent-ascending, glabrous, annual herbs. Leaves alternate; lower ones petioled, lyrate-pinnatifid or obovate, entire or sinuate, upto 10 cm long; upper ones sessile, sagittate, acute with rounded base, glabrous. Heads homogamous combined into corymbs; peduncles upto 5 cm long. Invol-bracts 1-seriate. Receptacle naked. Achenes upto 0.3 cm long, 5-ribbed; pappus hairs white silky.

Fl. & Fr. : Sept. – Jan.
Growing on moist and shady places. Collection : 1774; Baria.

17. **Erigeron** Linn.

Over 200 species; 10 species in India; 1 in MZN.


Fl. & Fr. : Dec. - July
Growing on road-sides, old walls. Collection : 2946; Kakroli.

18. **Eupatorium** Linn.

Ca 1200 species; 7 species in India; 1 in MZN.

1. **E. riparium** Regel., Garten-flora. 15: 324. t. 525. 1866; HFD. 265.

Perennial herbs erect or decumbent-ascending, branched with subterranean stolons, rooting at base. Leaves on upto 1.5 cm long petiole, elliptic-lanceolate, narrowed base, acuminate, serrate-dentate, 1-3 nerved, glabous, 4-6 cm long. Heads upto 0.5 cm across, upto 20- flowered, in lax panced corymbs, short peduncled. Invol-bracts 1-2 seriate, linear- lanceolate, subacute, 2-nerved, hairy. Achenes black, hairy on ribs. Pappus whitish.

Fl. & Fr. : Feb. - May
Common or road-sides, shady places, water sides. Collection : 3193; Jaroda.

4 or 5 species; 2 species in India; 1 in MZN.


Erect, flaccid, simple or branched annual herbs with stems often decumbent below. Leaves opposite, ovate, up to 4 cm long, membranous, acute at apex, cuneate at base, serrate, glabrous; petioles up to 1 cm long. Heads heterogamous, 0.5 cm across, on up to 3.0 cm long, peduncles, combined into terminal corymbiform panicles. Involucral bracts 2-seriate, 4-8 ovate, obtuse. Achenes black, viscid, hairy, 0.2 cm long. Pappus-scales oblong, ciliate, up to 0.2 cm long. Paleas oblong spathulate, mostly with 2 lateral, acute lobes.

F1. & Fr.: Major part of the year. Rare along river and canal banks. Collection: 5037; Shukartal.

20. **Gnaphalium** Linn.

Ca 200 species; 8 species in India; 5 in MZN.

1a Heads in leafy spikes:
   2a Pappus hairs connate at base into a ring .......... 3. **G. pensylvanicum**
   2b Pappus hairs free........................................ 4. **G. polycaulon**

1b Heads in leafy or leafless clusters:
   3a Erect herbs, leaves sessile; heads in
      Corymbose leafless clusters:
      4a Heads golden-yellow.................. 1. **G. luteo-album**
         subsp. affine
      4b Heads pale-brown...................... 2. **G. luteo-album**
         Subsp. pallidum
   3b Prostrate herbs, leaves shortly petioate, heads
      in leafy clusters.................................. 5. **G. pulvinatum**

   Hook. f., FBI. 3: 288; FUGP. 1: 461.

Prostrate or ascending, white woolly herbs. Leaves sessile, up to 2.5 cm long, oblanceolate, obtuse, woolly on both sides; upper ones lanceolate, half amplexicaul. Heads up to 0.5 cm across, golden-yellow, heterogamous, in dense leafless corymbose, shining clusters. Achenes brown, oblong-ellipsoid, papillose.

F1. & Fr.: Jan. - April
Common on river banks and canal sides. Collection : 3557, Muzaffarnagar City.

2. **G. luteo–album** Linn. var. **pallidum** Buch.-Ham. (Sp.) FBI. 3: 288; FUGP 1: 461.

Erect, annual, wooll herbs. Leaves sessile, upto 5 cm long, oblong, spathulate, obtuse; upper ones lanceolate, half amplexicaul. Heads brownish- yellow, in dense corymbose leafless clusters. Invol-bracts hyaline except near the base. Achenes papillose.

F1. & Fr. : Feb.- May

Common in sandy and waste lands. Collection : 385; Muzaffarnagar City.


Erect, annual, cottony, branched herbs upto 40 cm tall. Leaves alternate, spathulate- obovate, narrowed at base, obtuse or apiculate apex, upto 8 cm long, cottony above, densely white woolly beneath. Heads heterogamous, in clusters of 1-5. Invol-bracts 2 or 3 seriate, brown, lanceolate, acuminate, 0.3 cm long. Achenes upto 0.4 cm long, minutely papillose. Pappus upto 0.3 cm long, cohering at base.

F1. & Fr. : Dec. - May

Common in the waste places, road sides, river banks. Collection : 297; Muzaffarnagar City.


Decumbent –ascending or prostrate, multicauline, densely woolly annual herbs. Stem branched from base. Leaves alternate upto 3.5 cm long, linear- obovate or spathulate, apiculate, narrow semiamplexicaul base, cottony above, woolly beneath. Heads in simple or branched, leafy spikes or ovoid cluster, 2.0-2.5 cm long. Invol-bracts pale, reddish-brown, 2-3 seriate, lanceolate. Achenes ovoid, minutely papillose. Pappus hair not coherent at the base.

F1. & Fr. : Dec. - April

Common on road-sides, ditches, rivers and canal banks. Collection : 771; Muzaffarnagar City.

5. **G. pulvinatum** Delile, F1. Egypt. 266. t. 44; FBI. 3: 289; FUGP. 2: 462.
Erect or prostrate small, woolly, annual herbs, branching from base. Leaves small, spatulate, narrowed into a short petiole. Heads arranged in leafy, axillary or terminal globose clusters, hidden by the crowded terminal leaves. Invol-bracts linear, recurved with acute and hyaline tips. Corolla yellow. Achenes slender, minutely papilose.

F1. & Fr.: Feb.- April
Occasionally found in association with G. polycaulon Pers. in moist places. Collection : 893; Kairana.


6 species; 1 species in India; 1 in MZN.

Erect or prostrate, pubescent or villous annual herbs. Branches forming circular pathes. Leaves sessile, oblong or oblanceolate, sinuately pinnatifid; lobes coarsely toothed, pubescent on both surface. Heads yellow, rayless, upto 0.8 cm across, solitary, leaf-opposed; peduncle minute, heterogamous. Invol- bracts elliptic, obtuse. Achenes glandular. Pappus short, cupular.

F1. & Fr. : Major part of the year.
Common weed of crop fields and also found in dry soils. Collection : 2194; Heend.

22. Lactuca Linn.

Over 100 species; 20 species in India; 1 in MZN.

Erect annual, leafy herbs. Radical leaves variable upto 30 cm long, thin, oblong to orbicular, narrowed towards base; cauline ones auriculate. Heads yellow, in long irregular panicles. Achenes lenticular-oblong.

F1. & Fr. : Feb. – May.
Grown for edible radical leaves. Collection : 4073; Shamli.
Leaves used as vegetable.

23. Laggera Sch. – Bip.

Ca 20 species; 4 species in India; 2 in MZN.

1a Flowers pink; leaves shortly decurrent ............... 1. L. aurita
1b Flowers yellow; leaves not decurrent ............... 2. L. flava

1. L. aurita Sch.- Bip. ex C1., Comp. Ind. 94. 1876; FBI. 3: 271; FUGP. 1: 457; FD. 196.
Perennial, pubescent or villous, erect herbs upto 50 cm tall. Leaves sessile or short petioled, upto 8.0 cm long, ovate or oblanceolate, subacute, toothed or sub pinnatifid; upper ones small. Heads heterogamous upto 1.0 cm across, in terminal paniced corymbs; peduncle short. Invol- bracts many seriate, slender, linear, acute, softly villous; outer ones smaller. Receptacles glabrous. Outer flowers female. Disc floweres 2-sexual, pink. Achenes small, sub-terete, hairy dark red. Pappus white, 1-seriate.

F1. & Fr. : June – Aug.
Plants strongly scented, the odour of turpentine; leaves used to stop bleeding from cuts.


Erect or slender glabrous herbs upto 50 cm tall, simple or branched. Leaves upto 6.0 cm long, lower ones petioled; cauline ones half aplexicaul, ovate- lanceolate or obovate, sharply dentate or incised or entire, membranous, glabrous. Heads upto 1 cm in diam; few in the slender branches of loose paniced cymes. Outer invol-bracts ovate, acute; inner longer, lanceolate, acuminate, all glabrous. Receptacles glabrous. Flowers golden yellow. Achenes minute, glabrous. Pappus white.

F1. & Fr. : Jan. - April
Sometimes occurring on river banks and canal sides. Collection : 4155; Ailum.

Ca 40 species; 7 species in India; 3 in MZN.

1a Achenes with a truncate apex, not contracted at the top. Leaves lyrate-pinnatifid:

2a Perennials with yellow latex. Leaf-segment closely denticulate.......................... 3. L. procumbens

2b Annuals or biennials, with milky latex. Leaf Segments remotely denticulate............... 2. L. aspleniiifolia

1b Achenes with a contracted top. Leaves entire or Remotely denticuute.......................... 1. L. acaulis

Erect, simple or branched, glabrous, perennial herbs with milky juice. Radical leaves in rosette, linear- lanceolate or narrowly oblong, narrow at base, acute, entire, glabrous upto 10 cm long. Heads 10-12 flowered on 1.5 cm long peduncle, in terminal panicles. Invol-bracts 3-seriate, outer ones ovate; inners lanceolate, acute. Achenes ellipsoid, ribbed, contracted at top, narrowed at both ends. Pappus-hair white.

F1. & Fr. : Feb. - May

Occuring in grassy fields and on road sides. Collection : 4041; Shamli.


Erect or decumbent-ascending, branched herbs with milky juice and upto 25 cm tall. Leaves in a basal rosette, sessile or shortly petioled, narrowly obovate, sinuate-lobed or pinnatifid; lobes minutely toothed, glabrous. Heads 1.0–1.5 cm long, in terminal panicles. Invol-bracts 2-seriate; outer ones ovate, acute; inner ones lanceolate, acute. Achenes columnar, angled and ribbed. Pappus hair white.

F1. & Fr. : Sept. – March.

Occuring in sandy, grassy and waste fields. Collection : 4036; Shukartal.


Perennial, multicauline herbs with yellow juice. Stem simple or branched, erect or scandent or trailing. Leaves in basal rosette, oblong-oblanceolate with a narrowed base, obtuse, pinnately lobed, upto 20 cm long. Head yellow, 1.5 cm long, solitary or in clusters, combined into a terminal, subracemose inflorescence. Invol-bracts 3-seriate, outer ones ovate; inner ones lanceolate. Achenes rugulose, ribbed. Pappus-hair white, upto 0.8 cm long.

F1. & Fr. : Sept. - March.


25. Parthenium Linn.
Ca 15 species; 1 in MZN


Erect, profusely branched, annual-biennial herbs upto 1 m tall with angular stem. Leaves alternate, upto 8.0 cm long, pinnately or bipinnately dissected; sements entire, oblong, obtuse; upper ones small, entire or with 1 or 2 minute lateral lobes. Heads heterogamous upto 0.4 cm across, in axillary or terminal leafy corymbose cymes; peduncle upto 1.0 cm long. Invol- bracts 2-seriate; outer ones ovate, acute, hairy. Ray flowers male and female. Disc flowers all male. Achenes obovate, upto 0.2 cm long, black.

F1. & Fr. : Major part of the year.
Abundant within the area in waste-places, fields and on road sides. Collection : 2335; Oon.

26. **Pentanema** Cass.

12 species; 3 species in India; 2 in MZN.

1a Plants hispidly hairy, Invol-bracts glabrous...............  **1. P. indicum**

1b Plants white-villous to tomentose. Invol-bracts Hairy..................................................  **2. P. vestitum**


Erect, branched, rigid, hairy herbs upto 40 cm tall. Leaves sessile, upto 5 cm long, lanceolate or oblong-lanceolate, base auricled, acuminate, entire or serrulate scabrous on both surfaces, sessile. Heads bright-yellow, upto 1.2 cm in diam, solitary in large corymbose, loose terminal panicles. Invol-bracts glabrous, 3-4 seriate, linear-lanceolate. Ray flowers female. Disc flower 2-sexual. Achenes small, terete, sparsely hairy. Pappus upto 0.5 cm long, white.

F1. & Fr. : Oct. – March
Common in the district in agricultural fields. Collection : 1482; Jansath.


Erect, branched, woolly, faintly scented herbs upto 50 cm tall. Stem reddish, hairy. Leaves sessile, upto 10 cm long; oblong or linear-oblong, broadly auriculate, hairy, subobtuse. Heads yellow, heterogamous, solitary, corymbose, upto 1.5 cm across. Peduncles upto 2.0 cm long. Invol-bracts 4-seriate, filiform, villous with recurved tips. Achenes minute, oblong-cylindric, sparsely hairy. Pappus white, few. F1. & Fr. : March. - June

Common in waste fields and as weed of winter crops. Collection : 4045; Ailum.

27. **Pluchea** Cass.

Ca 50 species; 7 species in India; 1 in MZN.

**P. lanceolata** C1., Comp. Ind. 94. 1876; FBI. 3: 272; FUGP. 1: 458; FD. 196. Vern. *Rukhri*.

Erect, branched, hairy-pubescent under-shrubs upto 1 m tall. Leaves alternate, sessile, oblanceolate or oblong, narrowed towards base, rounded or acute at apex, distantly toothed, upto 5.0 cm long, minutely hairy. Heads pinkish-purple, upto 0.8 cm long, heterogamous in compound corymbs; peduncle short. Invol-bracts many-seriate; outer obtuse, short, tinged with purple; inner linear, sub-acute. Outer flowers female. Disc flowers 2-sexual. Achenes minute, angled. Pappus 1-seriate, connate at base, brown.

Collection : 2872; Jaroda.


Plants are used as fodder.

28. **Pulicaria** Gaertn.

Ca 50 species, 10 species in India; 1 in MZN.

**P. angustifolia** DC., Prodr. 5: 479. 1834; FBI. 3: 299; FUGP. 1: 465; FD. 193.

Erect, annual, pubescent herbs. Leaves upto 2.5 cm long, sessile, linear-lanceolate to oblong, entire or serrulate, narrowed at base. Heads yellow, upto 1.0 cm across. Ray flowers ligulate; ligules equalling or exceeding the bracts. Pappus as long as the glabrate achenes.

F1. & Fr. : Feb. – Aug.

Rare, occurs on river banks. Collection : 633; Oon.

29. **Saussurea** DC. *nom. cons.*

Ca 400 species; 46 species in India; 1 in MZN

Erect, cottony woolly, annual herbs upto 1.5 m tall, simple or often branching near the top. Radical leaves oblong or obovate, narrowed into a short petiole, entire or sinuate, pinnately lobed near the base, white tomentose beneath; upper ones lanceolate, oblong, entire or dentate, woolly beneath, sessile, smaller. Heads long stalked, purple in corymbiform panicles. Invol-bracts 3 – 5 seriate, cottony. Achenes 4-angular, muricate, upto 0.4 cm long. Pappus hair white, feathery, slender.

F1. & Fr. : March - May

Not common, occurs in agriculture fields, and waste places. Collection : 4237; Kandhla.

30. Solidago Linn.

Over 100 species; 2 species in India; 1 in MZN.


Erect, woody, perennial shrubs with long creeping rhizome. Stems simple, soft-pubescent. Leaves sessile, lanceolate-oblong, alternate, base acute, remotely serrate, lower ones petioled. Heads small upto 0.5 cm long, in one sided spreading or recurved racemes forming large panicles. Invol-bracts 2-seriate, lanceolate. Pappus hair white.


Sometimes planted in gardens as an ornamental. Collection : 2017; Thanabhawan.

31. Soliva Ruiz & Pav.

Ca 8 species; 1 in MZN.


Annual-biennial, creeping herbs with short stem. Leaves radical, petiolate, upto 10 cm long, finely dissected, hairy, lanceolate-oblong, acute-apiculate with a sheathing base. Heads sessile, greenish yellow, many-together, enclosed within leaf-bases, villous hairy. Receptacles flat, without scales, villous within. Achenes minute upto 0.2 cm long, cuneate or truncate, winged, rugose. Pappus 0.

F1. & Fr. : Feb. - May
Not common. Sometimes occur on river banks, canal sides. Collection: 2867; Jaroda.

32. Sonchus Linn.

Ca 50 species; 4 species in India; 3 in MZN

1a. Annuals, Involucral bracts without gland-bristles:
   2a. Basal auricles of leaves rounded. Achenes smooth with winged margins………………. 1. S. asper
   2b. Basal auricles of leaves acuate. Achenes Transversely rugose, with slightly thickened margins……………………………………. 3. S. oleraceus

1b. Perennials. Outer invol-bracts densely covered with gland bristles……………………………………. 2. S. brachyotus


   Erect, glabrous or sharply hairy annual herbs upto 50 cm tall. Basal leaves in rosette, petioled; cauline ones upto 15 cm long, lanceolate or elliptic-oblong, pinnatifid or pinnati-lobed, half amplexicaul at base; auricles rounded, appressed, margins undulate and spinose-dentate. Heads orange-yellow, crowded in umbel like cymes, homogamous. Invol-bracts glabrous. Achenes compressed with a winged margin.
   F1. & Fr. : Dec. - March
   Common in gardens, waste places, and cultivated fields. Collection: 50; Muzaffarnagar City.


   Erect, branched, perennial herbs upto 1.0 m tall. Stem hollow, umbellately branched, hairy above. Radical leaves pinnatifid, spinous, toothed; cauline ones lanceolate, small, entire. Heads bright yellow, upto 1.5 cm long, homogamous, combined into terminal branched corymbs; peduncle upto 5.0 cm long. Invol-bracts 3 or 4 seriate, densely white. Flowers ligulate. Achenes compressed, ribbed on each face. Pappus many seriate, upto 1 cm long, white.
   F1. & Fr. : Dec. – March
   Common in the district along road sides and river banks. Collection: 2858; Barla.

Erect, glabrous, annual-perennial, herbs upto 60 cm tall. Stem subumbellately branched above. Leaves upto 18 cm long; basal ones in rosette, lyrate-pinnati-lobed, with a semiamplexicaul base; upper ones elliptic oblong, pinnatifid with terminal lobes large toothed. Heads upto 2.0 cm diam, arranged in umbellate-cymes. Invol-bracts 2-3 seriate, lanceolate, acute. Achenes 3-ribbed, transversely rugose. Pappus hair white, many seriate, upto 1 cm long.

Common on waste-places, road sides, canal banks and in gardens. Collection : 3637; Ramraj.

33. Sphaeranthus Linn.
Ca 40 species; 3 species in India; 1 in MZN.
S. senegalensis DC., Prodr. 5: 370. 1836; HFD. 383. S. indicus acut. pl. (non Linn. 1753); FBI. 3: 275, pro parte; FUGP. 1: 459.

Prostrate or decumbent–ascending, branched, spreading, glandular hairy herbs. Stem winged with dentate bases of decurrent leaves. Leaves sessile, upto 3 cm long, oblong-lanceolate, semi-amplexicaul bae, obtuse, mucronate, serrate-dentate with pointed teeth, glandular hairy. Heads upto 1.0 cm across, in terminal, globose clusters on 2-4 cm long glandular pubescent peduncle. Invol-bracts oblanceolate, apiculate, 0.3 cm long, tips purple tinged. Outer flowers female, 5-10, fertile. Disc flowers 2-4, with 0.4 cm long pinkish-purple corolla. Achenes glabrous, glandular.

F1. & Fr. : Sept. - March
Common in rainy season in rice fields, on road sides and waste places. Collection : 4166; Kanyan.

34. Tridax Linn.
Ca 25 species; 1 species in India; 1 in MZN.

Erect or procumbent, hispid annual herbs upto 40 cm tall. Stem creeping at base, suberect. Leaves pinnatisect, segments ovate or lanceolate, dentate, acute at apex, hairy on both surfaces; petiole upto 1 cm long. Heads heterogamous, rayed, solitary on long hairy peduncles. Invol-bracts 2 or 3 seriate, lanceolate, hairy, long. Ray flowers female, fertile 5 or 6. Disc flowers 2- sexual, yellow, 5-fed. Achenes 0.2 cm long, brown, hairy. Pappus of 15-20, unequal, feathery bristles. Paleas upto 1 cm long, membranous.
F1. & Fr. : Major part of the year.
Abundant within the area. Collection : 2707; Rohana.

35. **Vernonia** Schreb. *nom. cons.*

Ca 1000 species; 45 species in India; 1 in MZ


Erect or decumbent-ascending, pubescent, upto 40 cm tall herbs. Leaves nearly sessile, ovate or lanceolate, obtuse or acute, obscurely or deeply crenate or serrate, hairy on both sides. Heads purple, upto 0.6 cm across, in rounded or open and flat-topped corymbs. Invol-bracts narrowly lanceolate, mucronate or awned, silky outside. Achenes terete, not ribbed, appressed hairy. Pappus white or dirty white.
F1. & Fr. : Major part of the year.
Common on road-sides, waste places and in gardens. Collection : 2321; Oon.

36. **Volutarella** Cass.

Ca 5 species; 1 species in India; 1 in MZN.


Erect, straggling, stiff, dichotomously branched annual herbs. Stem white-tomentose, rough. Leaves sessile, upto 5 cm long, variable in shape, oblong or obovate, entire, toothed or pinnatifid. Heads homogamous, 2.5 cm long; peduncles long. Invol-bracts many-seriate, spinescent at tip. Achenes 0.5 cm long, angled, grooved, narrowed at base. Pappus many, unequal, silvery brown.
F1. : Dec. – May; Fr. : Jan. - July.
Common in waste lands, sandy soils and on river banks. Collection : 1042; Shukartal.

37. **Xanthium** Linn.

Ca 30 species; 2 species in India; 1 in MZN


Erect, scabrous, unarmed, annual perennial herbs upto 1.5 m tall. Stem ribbed, pubescent. Leaves alternate, ovate-triangular, palmately 3-5 lobed or angled, 4.5-8.0x 3.5-8.5 cm, acute or acuminate at apex, cuneate at base; petiole upto 15 cm long. Heads dull white, in terminal and axillary racemes, monoecious. Invol-bracts 2-3
seriate, linear, ciliate, acute. Fruiting involucres with hooked prickles. Achenes short. Pappus 0.

F1. & Fr. : June – Nov.

Abundent on waste places, road sides and grassy fields. Collection : 2626; Gordhanapur. Fruits are used in medicines.

Horticultural forms of following are also found under cultivation as garden ornamentals.

1. **Centaurea** Linn.
   Over 500 species; 5 species in India; 1 in MZN.
   **C. cyanus** Linn., Sp. P1. 911. 1753; MCP. 1027; HFD. 250.

2. **Chrysanthemum** Linn.
   Over 200 species; 9 species in India; 1 in MZN.
   **C. coronarium** Linn., Sp. P1. 90. 1753; HFD. 252. LN. Guledaudi.

3. **Cosmos** Cav.
   Over 25 species; 1 in MZN
   **C. bipinnatus** Cav., MCP. 999.

4. **Dahelia** Cav.
   Ca 30 species; 3 in MZN.
   1. **D. pinnata** Cav.
   2. **D. rosea** Cav.
   3. **D. viriabilis** Cav.

5. **Helianthus** Linn.
   Ca 100 species; 1 in MZN.
   **H. annuus** Linn., Sp. P1. 904. 1753.

6. **Tagetes** Linn.
   Ca 50 species; 2 in MZN.

7. **Viguieria** H. B. & K.
   150 species; 1 in MZN.

8. **Zinnia** Linn.
   Ca 20 species; 1 in MZN.
   **Z. elegans** Jacq., MCP. 1001.
59. SPHENOCLEACEAE

_Sphenoclea_ Gaertn.

Probably monotypic.

**S. zeylanica** Gaertn., Fruct. _1_: 113. t. 24. 1788; FBI. _3_: 438; FUGP. _1_: 499; FD. 203. Vern. _Mirchi_; _Phulan ghas._

Erect, stout, amphibious annual herbs upto 80 cm tall with fistular stem. Leaves shortly petioled, lanceolate, entire, glabrous, upto 7.5 cm long. Flowers greenish-yellow or greenish-white in dense terminal spikes. Peduncles upto 4 cm long. Capsules wedge-shaped, 0.5 cm across, enclosed by persistent calyx. Seeds brown, minute.

_F1. & Fr. : Aug. – Nov._

Occurs in rice fields, swampy and marshy localities. Collection: 2964; Gordhanpur.

60. PLUMBAGINACEAE

_Plumbago_ Linn.

Ca 10 species; 3 species in India; 2 in _MZN._

1a Flowers blue…………………………………………..  _1. P. auriculata_

1b Flowers white…………………………………………..  _2. P. zeylanica_


Erect or straggling perennial undershrubs with glabrous stem. Leaves whorled, upto 6.0 cm long, oblong-lanceolate, obtuse or minutely mucronate apex, rounded or tapering base, glabrous; petiole upto 1.0 cm long. Flowers pale-blue 4-5 cm long, in spikes combined into leafy corymbs. Calyx glandular-pubescent. Corolla pale-blue, with 2.5-3.0 cm across limb. Style base glabrous.

_F1. & Fr. : Sept. - April_

Planted in gardens. Collection : 3157; Jaroda.

**2. P. zeylanica** Linn., Sp. P1. _151. 1753; FBI. _3_: 480; FUGP. _2_: 2; FD. 203; HFD. 296. Vern. _Chitra._

Erect or straggling, perennial undershrubs. Leaves upto 10 cm long, ovate or ovate-lanceolate with rounded base, acute apex, glabrous; petiole upto 1.0 cm long with 2 basal, caducous stipuled auricles. Flowers white, in terminal and axillary, upto 30 cm long racemes combined into leafy panicles. Calyx 1 cm long, gland- hairy;
lobes linear-subulate. Corolla white; lobes oblong. Style glabrous. Fruits oblong, acute, furrowed with a patent recurved calyx.

F1. & Fr. : Sept. - March
Common on road-sides, hedges and among bushes. Collection: 2854; Lachheda.

61. PRIMULACEAE

1a Flowers white, in superposed whorls. Corolla with distinct tube…………………………………… 2. Primula

1b Flowers blue, not in whorls. Corolla divided near to the base……………………………………… 1. Anagallis

1. Anagallis Linn.
Ca 30 species; 3 species in India; 1 in MZN.
Vern. Buchbucha, Neelambrum.

Erect or procumbent, glabrous, annual branched herbs upto 18 cm tall. Stem much branched from base, glabrous, narrowly winged, 4-angled. Leaves opposite, sessile, upto 2 cm long, ovate or lanceolate, gland dotted, entire, obtuse rounded at base. Flowers bright blue, solitary; pedicel upto 2.5 cm long. Calyx segments narrowly lanceolate 5, acuminate. Corolla blue; lobes 5, rotate. Capsules globose, upto 0.5 cm across, glabrous, brusting irregularly; seeds many on free central placenta.

F1. & Fr. : Dec. – April.

2. Primula Linn.
Ca 500 species; Ca 140 species in India; 2 in MZN.

1a Flowers white. Corolla tube short…………………. 2.P. umbellata

1b Flowers yellow. Corolla tube well developed…….. 1.P. floribunda

1.P. floribunda Wall., Tent. F1. Nepal, 43. t. 33. 1836; FBI. 3: 495; FUGP. 2: 4; HFD. 300.

Perennial, scapigerous herbs upto 30 cm tall. Leaves in a basal rosette upto 15 cm long, obovate, narrow decurrent base, obtuse or rounded apex, serrate – dentate, hairy; petiole 3.5 cm long, winged. Flowers in 1-4 whorls. Bracts 4, ovate-lanceolate, acute, serrate, hairy. Pedicel filiform; glands hairy. Calyx 0.6 cm long; segments
lanceolate, acute, entire-serrate. Corolla yellow; lobes obovate, limbs 1.3 cm across, notched. Capsules 0.2 cm long.

F1. & Fr. : Nov. - May

Occuring in moist, shady localities. Collection : 2249; Ramraj


Annual, erect, small upto 1 cm tall herbs. Leaves in basal rosette, orbicular, ovate or suborbicular, 1.5 cm across, cordate, crenate-dentate; petiole upto 1.4 cm long, minutely winged, hairy. Flowers in 2-5 flowered umbels, white or pinkish. Capsules globose, whitish, upto 0.3 cm across; seeds pitted, many, angular.

F1. & Fr. : Jan. - March


62. SAPOTACEAE

1a Calyx lobes 6-8; staminodes present :
   2a Petals 6; berries 4.5-5.0 cm across, with thin, rusty-brown scurfy skin...................... 1. Achras
   2b Petals 18-24; berries upto 1.5 cm across, yellow or reddish-yellow when ripe :
      3a Flowers normally trimerous.................. 3. Manilkara
      3b Flowers normally tetramerous .............. 4. Mimusops
   1b Calyx-lobes 4-5; staminodes absent.................. 2. Madhuca

1. Achras Linn.

1 species in MZN.


Medium-sized, evergreen trees upto 4 m tall. Leaves crowded at the end of branchlets, oblong lanceolate or elliptic-oblong, upto 12 cm long, entire, coriaceous, rounded at base, obtuse or shortly acuminate at apex, woolly beneath when young. Flowers cream coloured on long, rusty-tomentose pedicles, clustered at the end of branches. Calyx lobes 6-8 in two whorls, hairy outside. Corolla white, lobes 6, 0.6-1.0 cm across. Stamens 6. Ovary villous, 10-12 celled. Fruits globose, 4-6 cm across, with thin rusty-brown epicarp; flesh yellowish – brown. Seeds large, shining black.

*Madhuca* Ca 80 species; 4 species in India; 1 in MZN.


Large or medium-sized, deciduous trees with dull-black bark, young parts pubescent. Leaves clustered at the end of branches, 10-20 cm long, elliptic or oblong-elliptic, rounded or acute at base, obtuse or shortly acuminate at apex; petiole upto 3.5 cm long. Flowers cream-coloured at the end of branches. Calyx lobes 4-5. Berries fleshy, ovoid, greenish, upto 4 cm across.

F1. & Fr. : March - July.

Planted in gardens and elsewhere. Collection : 962; Jaroda.

The fragrant fleshy petals are eaten either raw or cooked or made into sweet preparations. Oil extracted from seeds, used in soap-making and burning.


*Manilkara* Ca 70 species; 4 species in India; 1 in MZN


Large or medium-sized, evergreen trees with whitish dull greyish bark and forming a dense crown. Leaves upto 10 cm long, obovate or oblong or elliptic, rounded or emerginate at apex, shining above. Flowers solitary or fascicled. Berries ovoid, 1-seeded, upto 1.5 cm in daim.

F1. : Oct. – Dec.; Fr. : Jan. - March

Rarely planted in gardens. Collection : 2156; Thanabhawan.

Ripe fruits are sweet and edible.


*Mimusops* Ca 50 species; 2 species in India; 1 in MZN.

Large or medium – sized, evergreen trees with dark grey bark. Leaves upto 11 cm long, variable oblong, oblanceolate, elliptic or elliptic-obovate, coriaceous; petiole upto 3 cm long, entire, obtuse or rounded at both ends. Flowers fragrant, dull white, upto 1.5 cm across, star-shaped, axillary, solitary or in clusters; pedicel upto 1 cm long, pubescent. Calyx lobes 8, ovate in 2 series. Corolla tube very short, lobes 24. Stamens 8; filaments minute. Ovary hairy. Berries globose, or ovoid, upto 1.2 cm across, yellow when ripe.

F1. : May – June; Fr. : Jan. – Feb.

Planted in gardens. Collection : 2101; Thanabhawan.

Ripe fruits are edible.

63. EBENACEAE

Diospyros Linn.

Ca 500 species; 44 species in India; 3 in MZN.

1a Leaves glabrescent; fruits glabrous :

2a Leaves 4-6 cm long; male flowers in threes……………………………………… 1. D. cordifolia

2b Leaves 6-10 cm long; male flowers in small few flowered panicles………………… 2. D. montana

1b Leaves glabrous; fruits covered with a dense, rusty scurf……………………………………………… 3. D. peregrina


Small or medium sized trees. Leaves 4-8 cm long, elliptic or ovate-oblong, acuminate, rounded at the base, subacuminate, tomentose when young, glabrous when matures. Flowers pale-white, unisexual. Male flowers in few flowered cyomes. Female axillary, solitary. Fruits globose, 2.0-2.5 cm in diam supported by enlarged reflexed calyx. Seeds compressed.

F1. & Fr. : March- May.

Occurs in wild conditions. Collection : 2135; Charthawal.

The fruits are used during rainy season for skin treatment.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (228)

Shrubs or small trees with ashy grey bark, smooth. Leaves alternate, elliptic or ovate-oblong, up to 12 cm long, rounded at base, subacuminate. Flowers dioecious. Male flowers in 3-5 flowered short axillary cymes; pedicles 0.15 cm long. Female flowers solitary, axillary; peduncle up to 0.5 cm long. Calyx of female flowers persistent, enlarged in fruits, reflexed. Fruits pendulous, globose, about 2.5 cm across. F1. : April - May; Fr. : Dec. - March

Common in wild conditions. Collection : 143; Charthawal.


Small, evergreen trees forming a compact, shady crown near the ground. Young leaves reddish. Leaves up to 24 cm long, ovate-oblong to oblong, coriaceous. Flowers unisexual, cream-coloured; female ones solitary, drooping. Calyx accrescent. Fruits 3-5 cm across, almost globose, rust-coloured, yellow when ripe. F1.& Fr. : May - July

Rarely planted in gardens. Collection : 2163; Heend.

64. **OLEACEAE**

**Jasminum** Linn.

Ca 300 species; 40 species in India; 5 in MZN.

1a Flowers yellow…………………………………… 3. **J. humile**

1b Flowers white :

2a Leaves unifoliate :

3a Plants hairy; clayx lobes short……….. 5. **J. sambac**

3b Plants densely hairy, calyx lobes very long…………………………………… 4. **J. multiflorum**

2b Leaves 3-more foliate :

4a Leaves with the two lower leaflets very short and frequently absent……….. 1. **J. auriculatum**

4b Leaves distinctly compound……….. 2. **J. grandiflorum**


MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (229)
Perennial, climbing scandent shrubs with young parts densely soft pubescent. Leaves opposite, simple or with a pair of minute leaflets; terminal one ovate, acute or apiculate, entire 3-5 x 1.5-2.5 cm, minutely pubescent beneath; petiole upto 0.5 cm long. Flowers in axillary and terminal pubescent compound cymes; peduncles upto 1 cm long; bracts linear. Calyx upto 0.5 long, grey-pubescent, ribbed; segments 5, minute. Corolla tube narrow, cylindric, upto 1 cm long; lobes 6, elliptic, obtuse. Stamens 2, included in the tube. Ripe carpels 0.4-0.8 cm across, globose, black.

Fl. & Fr.: June–Sept.
Planted in gardens for fragrant flowers. Collection: 4049; Oon.


Perennial, much branched shrubs with drooping branches. Rachis winged or flattened. Leaves opposite imparipinnate, 4-8 cm long; leaflets 7-11, nearly sessile; ovate, entire, subacute-apiculate or acuminate. Flowers in lax terminal cymes; pedicel upto 2 cm long, glabrous; Corolla white with faint pink streaks outside; segments 5, linear-lanceolate; tube upto 1.2 cm long; narrowly cylindric stamens. Berries of 2 carpels, ellipsoid.

Fl.: May – Sept; Fr.: Oct. – Nov.
Planted in gardens for flowers. Collection: 331; Muzaffarnagar City.


Erect or diffused, evergreen, much-branched shrubs, with glabrous angled branches. Leaves alternate; leaflets 3-7, variable in shape, ovate to linear, obtuse or acute. Flowers bright yellow, 1-2 cm across, fragrant, in 10-20 flowered cymes. Calyx teeth triangular. Corolla lobes reflexed, shorter than tube.

Fl.: July – Sept.
Planted in gardens and bungalows. Collection: 4134; Kandhla.


Scandent or diffused, densely pubescent shrubs. Leaves opposite, simple, ovate, upto 10 cm long, acuminate, cordate at base, entire, glabrous above; petiole upto 1 cm long. Flowers white, scented, subsessile, in compact axillary cymes; peduncle small 0.2 cm long. Bracts lanceolate. Calyx tube 0.2 cm long; segments 7-9,
linear, hairy. Corolla white; tube upto 1.5 cm long, lobes 7-9, oblong-lanceolate, acuminate. Stamens 2, included. Ovary 2-celled; stigmas 2. Fruits globose or ellipsoid, surrounded by calyx segments.

F1. : Dec. – April; Fr. : Jan. - May

Cultivated in gardens for flowers. Collection : 2914; Bhopa.


Erect or scandent shrubs with angubcular pubescent branches. Leaves 4-7 cm long, elliptic or broadly ovate, rounded or cuneate, glabrous, shining above. Flowers white, single or double, fragrant, 1.5-2.5 cm across in 3-many flowered clusters. Calyx teeth linear upto 0.6 cm long, hirsute on edges. Corolla lobes about the length of the tube.

F1. : April- June.

Planted in gardens and lawns for fragrant flowers. Collection : 117; Muzaffarnagar City.

Oil is obtained from flowers is used in perfumery.

65. NYCTANTHACEAE

Nyctanthes Linn.

This genus probably monotypic, so far regarded as a member of the oleaceae, has been transfered by H.K. Airy Shaw (in Kew Bull. 273-276,1952) to the family Verbenaceae under a new subfamily Nyctanthoideae Airy Shaw. Agardh J.G. Kept Nyctanthes Linn. in an independent family of its own, the Nyctanthaceae. (Flora of Bhopal. 236, 1977.)


Large shrubs or small deciduous trees; bark grey; branches 4-angular, rough with stiff hairs. Leaves opposite, ovate, 8-12 x 6-8 cm acute, acuminate, entire rounded at base, upper surface scabrous with bulbous based hairs; lower surface with soft white hairs; petiole upto 1.2 cm long. Flowers sessile, 3-5 together in peduncled heads, arranged in 3-chotomous cymes; peduncles upto 3 cm long. Calyx segments 4 or 5, minute, pubescent. Corolla tube cylindrical, upto 1.2 cm long, orange coloured; limbs white, 5-8 lobes. Anthers 2, subsessile. Ovary 2-celled, style 2-fid. Capsules orbicular, compressed, upto 1.0 cm across, scabrous; seeds 2.
F1: July – Oct.; Fr.: Nov. – Feb.

Planted in gardens and also met in wild conditions. Collection: 5026; Muzaffarnagar City.

The rough leaves are used for polishing the wood and in medicines. An orange-coloured dye, obtained from flowers, used for colouring silk and cotton.

66. APOCYNACEAE

1a Fruits indehiscent, drupes or berries:
   2a Plants armed with spines………………… 2. Carissa
   2b Plants unarmed:
      3a Leaves alternate…………………… 10. Thevetia
      3b Leaves apposite…………………… 8. Rauvolfia

1b Fruits dehiscent, follicles:
   4a Erect herbs………………………….. 3. Catharanthus
   4b Erect of diffuse shrubs or trees:
      5a Leaves alternate…………………… 7. Plumeria
      5b Leaves opposite or whorled:
         6a Leaves opposite:
            7a Flowers very small, greenish, follicles slender………… 5. Ichnocarpus
            7b Flowers larger, white; follicles stout:
               8a Follicles baccate, coriaceous……………… 9. Tabernaemontana
               8b Follicles narrow, linear………………… 4. Holarrhena
         6a Leaves whorled:
            9a Corolla mouth with 5 scales……………… 6. Nerium
            9b Corolla mouth with a ring of hair……………… 1. Alstonia

1. Alstonia R. Br. nom. cons.

Ca 50 species; 6 species in India; 1 in MZN

Large or medium-sized trees; bark grey. Branches whorled. Leaves in whorls of 4-7, oblong-lanceolate, obovate, obtuse, upto 15 cm long; petiole short. Flowers greenish-white in umbellately branched cymes. Calyx lobes 5, ovate-obtuse. Stamens 5, included. Ovary of 2 distinct carpels. Follicles more than 30 cm long, terete, pendulous, in clusters. Seeds upto 0.8 cm long, flattened, with a tuft of long hairs.

F1. : Dec. - March; Fr. : March - June
Planted along road sides and in gardens. Collection : 420; Muzaffarnagar City.

2. Carissa Linn. nom. cons.

Over 30 species; 12 species in India; 2 in MZN.

1a Leaves 3-8 cm long. Berries upto 1.3 cm across...... 1.C. carandus

1b Leaves 3-4 cm long. Berries upto 0.7 cm across...... 2.C. opaca


Perennial, evergreen, diffused spiny shrubs. Spines paired, upto 2 cm long, straight. Leaves upto 8 cm long, broadly elliptic-oblong, obtuse, cuneate at base. Flowers pinkish or white, in few flowered corymbose cymes at the end of branches; pedicel upto 0.2 cm long. Calyx 0.2 cm long; segments 5, lanceolate, ciliate. Corolla tube 1.2 cm long, cylindrical; lobes 5, elliptic, lanceolate. Berries ellipsoid, smooth, green, purple on maturity.

F1. & Fr. : Feb.- July
Cultivated in garden and lawns. Collection : 2801; Sujaru.
Fruits are used for pickles, jams etc.


Diffused, evergreen, bushy-shrubs with straight simple or forked thorns upto 4.5 cm long. Leaves 2-4 cm long, broad ovate, elliptic or suborbicular, acute or mucronate, cuneate at the base. Flowers white, scented, in terminal or axillary corymbose cymes. Calyx 0.2 cm long; segment 5, divided upto base. Corolla tube white, 0.9-1.2 cm long, cylindrical; lobes 5. Berries ellipsoid, upto 0.7 cm across, dark purple at maturity; seeds 2.

F1. : April - June; Fr. : Nov.- Jan
Common on waste lands. Collection : 374; Muzaffarnagar City.

3. Catharanthus G. Don

6 species; 2 species in India; 2 in MZN

1a Leaves oblong-obovate, obtuse, appiculate, perennial shrubs..............................

2. C. roseus


Commonly occurs in cultivated and fellow fields. Collection : 2359 Oon.


Erect, glabrous, perennial herbs; stem widely branched. Leaves opposite, 3-8 cm long, obovate, oblong, entire, obtuse or rounded at base; petiole 2-4 cm long. Flowers axillary, on small 0.2 cm long pedicels, pink. Follicles 2-3 cm long, patent-hairy, narrowly cylindric.
F1.& Fr. : Major part of the year.
Planted in gardens or met as an escape. Collection : 2285; Jansath.
Leaves are used as medicines in diabetes.


Ca 20 species; 1 species in India; 1 in MZN.


Small or medium-sized deciduous trees, leaves opposite, nearly sessile, ovate, elliptic or elliptic oblong, acute or acuminate, glabrous or pubescent, upto 18 cm long.
Flowers white or creamy, in many flowered, terminal, sessile, corymbose cymes. Follicles 2, distinct, glabrous, slender, terete, upto 35 cm long. Seeds numerous, with tuft of hairs.
F1.& Fr. : May – Dec.
Growing in wild conditions. Collection : 3737; Mirapur.
Bark and seeds are used in medicines as antidysenteric, anthelmintic in dysentery and other alimentary ailments.

5. Ichnocarpus R. Br. nom. cons.
Ca 15 species; 3 species India; 1 in MZN.


Evergreen, much branched, climbing shrubs with young shoots rusty-pubescent. Leaves opposite, variable upto 7 cm long, elliptic, oblong or ovate-lanceolate. Flowers white, scented in axillary and terminal cymose panicles; pedicel upto 0.5 cm long. Calyx segment 5, 0.15 cm long, pubescent. Corolla white, 0.5 cm across, tube short, swollen round the included anthers. Fruits of two distinct slender cylindrical follicles, upto 12 cm long. Seeds with 1 cm long coma.
F1. : Aug. – Nov.; Fr. : Feb. - April
Common in Ganga bank forest climbing on trees and bushes. Collection : 320; Shukartal.

6. Nerium Linn.
3 species; 1 in MZN.


Large, evergreen, garden shrubs. Leaves upto 25 cm long, ternate, linear-lanceolate, coriaceous, acuminate, dark green shining above. Flowers in terminal racemose cymes; pedicel 0.5 cm long, white or rosy-red.
F1.& Fr. : April – Aug.
Planted in gardens and lawns. Collection : 2185; Shamli.
Bark used for skin-diseases.

7. Plumeria Linn.
Ca 10 species; 1 in MZN.

Small, weak, trees branching dichotomously. Leaves alternate, 20-30 cm long, obovate or oblong-obovate, apiculate, entire, coriaceous, main lateral nerves many; petiole 2.5-4.0 cm long. Flowers in terminal corymbose cymes; pedicel upto 1 cm long. Calyx segments 5, minute. Corolla white with yellow centre, 3-3.5 cm long; tube narrow, shorter than the lobes. Fruits of two follicles.

Fl. & Fr.: May – Oct.

Planted in gardens.

Collection: 115; Muzaffarnagar City.

P. rubra Linn. form acutifolia (Pair) Woodson. is also planted in gardens.

8. Rauvolfia Linn.

Ca 100 species; 5 species in India; 1 in MZN.


Erect, glabrous, perennial, small shrubs branching from base upto 75 cm tall. Leaves whorl, 5-15 cm long, elliptic-lanceolate, acute or acuminate, narrowed into a short petiole. Flowers white or pinkish in terminal or axillary peduncled corymbose cymes; peduncles stout, 5-8 cm long. Calyx red; lobes 5, acute. Corolla tube upto 1 cm long. Drupes globose, 0.5 cm across, single or two, purple-black when mature.


Rarely occurring in moist and shady places.

Collection: 3616; Shukartal.

Various parts of plant are used in medicines. The juice of roots is given internally as an antidote for snake-bite. The leaves are used in typhoid and malaria fevers.

9. Tabernaemontana Linn.

Over 100 species; 5 species in India; 1 in MZN.


Evergreen, perennial, much branched shrubs upto 2.5 cm tall. Leaves 8-15 cm long, oblong to lanceolate, acuminate, shinig dark green above. Stipules cup-like. Flowers white, in few flowered cymes. Calyx 0.3 cm long. Corolla tube 2.0 -2.5 cm
long, thinly hairy within. Follicles upto 5 cm long with recurved beaks. Seeds embedded in red, pulpy aril.


Planted in gardens for flowers. Collection : 963; Sanjhak.

**10. Thevetia** Linn. *nom. cons.*

Ca 10 species; 1 in MZN.


Evergreen shrubs or small trees upto 2.5 m tall. Leaves alternate, 8-15 cm long, revolute, linear-lanceolate, narrowed at both ends. Flowers yellow or orange, fragrant, in a few flowered, terminal cymes; pedicel upto 2 cm long. Calyx segments 5, narrow, acute, persistent, spreading in flowers, reflexed in mature fruits. Corolla tubular at the base, broad upwards. Drups angular, sub-globose, green.

F1. & Fr. : Major part of the year.

Planted in public gardens and along road sides. Collection : 931; Muzaffarnagar City.

Plants parts are poisonous. Seeds yield an oil, used in medicines.

### 67. ASCLEPIADACEAE

1a Plants erect :

2a Corona scales hood-shaped, leaves not cordate at base…………………………….. 1. *Asclepias*

2b Corona scales laterally compressed, not hood-shaped; leaves base cordate………… 2. *Calotropis*

1b Plants twining or climbing :

3a Filaments free; pollinia granular…………….. 3. *Cryptostegia*

3b Filaments connate into tube; pollinia waxy :

4a Anthers without a membranous tip…. 4. *Leptadaenia*

4b Anthers with membranous appendage:

5a Follicles echinate……………….. 6. *Pergularia*

5b Follicles not echinate

6a Leaves narrow; flowers white or pink, veined with
purple..........................  5. Oxystelma

6b  Leaves broad; flowers
pale-yellow....................  7. Telosma

1. Asclepias Linn.

Ca 120 species; 2 species in India; 1 in MZN.


Erect, perennial, herbs up to 1 m tall. Leaves opposite, lanceolate, 7-12 cm long, acute or acuminate, narrowed into a short petiole. Flowers orange-red, in extraxillary, umbellate cymes. Corolla lobes reflexed in flowers, valvate in bud. Corona scales hood-shaped, yellow. Follicles solitary, erect, 7-8 cm long, lanceolate, beaked. Seeds ovoid, dark brown, thickened margin.

F1. & Fr. : Major part of the year.

Common along road sides, water-courses, and in waste places. Collection : 2999; Ramraj.

2. Calotropis R. Br.

6 species; 3 species in India; 1 in MZN.


Evergreen, erect or decumbent perennial undershrubs, stem white tomentose. Young leaves hairy. Leaves opposite, thick, ovate-obleng or elliptic, subamplexicaul, 10-17 cm long. Flowers purplish-red, pale-silvery outside, in terminal and axillary corymbose cymes; peduncles 8-12 cm long. Corona scales acute, hairy, adanate to staminal coloumn. Follicles 6-10 cm long, recurved, smooth. Seeds ovate, 0.5 cm across, flat, tomentose coma silky, white.

F1. & Fr. : March- Nov.

Abundant within the area in waste places and road sides. Collection : 67; Muzaffarnagar City.

Plant parts are used medicinally.

3. Cryptostegia R. Br.

Ca 3 species; 2 species in India; 1 in MZN.

Straggling or climbing perennial shrubs with glossy foliage. Leaves 5-10 cm long, elliptic or oblong. Flowers large pale-purple or rosy in terminal trichotomous cymes. Calyx leafy. Follicles woolly, 2-winged, upto 10 cm long.
F1. & Fr. : June – Sept.
Planted in gardens and also met as an escape. Collection : 2021; Shamli.

4. Leptadenia R. Br.
Ca 5 species ; 2 species in India; 2 in MZN.
1a Erect shrubs; almost leafless........................... 1. L. pyrotechnica
1b Twining shrubs; leafy................................. 2. L. reticulata


Erect or weak, often leafless shrubs, much branched, glabrous upto 1.5 m tall. Leaves few, often unequal, usually on young shoots only, 3-6 cm long, subsessile, linear, acute or acuminate, thick, glabrous. Flowers yellowish in lateral umbellate cymes. Follicles upto 10 cm long, terete, tapering into a long straight beak. Seeds 6-9 cm long; coma 2.5 cm long.
F1. : Aug. – Dec.; Fr. : Nov. – March.
Common in Khadar and various areas. Collection : 2840; Lachhada.
The fruits and young twigs are used as food.

2. L. reticulata Wt. & Arn. in Wt. Contrib. 47. 1834; FBI. 4: 63; FUGP. 2: 63; FD. 221.

Diffused, much branched, robust climbers with young parts pubescent. Leaves opposite, 5.0-7.5 cm long, ovate, cordate, coriaceous, entire; petiole upto 1.8 cm long. Flowers yellowish, in sub-axillary, umbellate-cymes; peduncle upto 0.8 cm long. Calyx small; segments 5, lanceolate, acute. Corolla whitish, lobes 1.5 cm long. Stamens 5, inserted at corolla tube base. Follicles glabrous, 5-6 cm long, ovoid-lanceolate, tapering into a curved beak. Seeds many, 0.6-0.8 cm long; coma 1.5-1.8 cm long.
F1. : Sept. – Dec.; Fr. : March. - May
Occurs in hedges and bushes on river bankes. Collection : 5051; Kandhla.
The milky juice and roots are used in medicines.

5. Oxystelma R. Br.
4 species; 1 species in India; 1 in MZN.

Twining, annual-perennial, glabrous herbs, much branched. Leaves opposite, thin, 2-5 cm long, lanceolate, acute or acuminate; petiole slender, 1-1.2 cm long. Flowers white-purple, solitary or in lax racemes or umbelliform cymes, drooping up to 2.0 cm in diam. Corolla saucer-shaped; lobes ciliate. Follicles glabrous, lanceolate, pointed, 5-6 cm long. Seeds many 0.6-0.8 cm long; coma 1.5-1.8 cm long.

F1. & Fr.: July – Nov.

Common on marshy places and sandy soils. Collection: 790; Rohana. Fresh roots believed to be a cure for jaundice, fruits eaten as vegetable, cooked or raw.

**6. Pergularia** Linn.

Ca 5 species; 2 species in India; 1 in MZN.


Perennial, twining, bad-smelling, hispid herbs. Leaves subsucculent, 5-7 cm long, broad ovate, acuminate, deep cordate. Flowers yellowish-green tinged with pink at base, racemose. Follicles 5-8 cm long, curved backwards, softly spiny, beaked.

F1. & Fr.: May – Nov.

Common in bushes on road sides in rainy season. Collection: 4097; Kanyan. The leaves and juice are used medicinally. A fibre is obtained from stem.

**7. Telosma** Coville.

Probably 10 species; 2 species in India; 1 in MZN.


Twining, nearly glabrous or pubescent shrubs. Leaves opposite, petiolate, ovate, acuminate or acute, cordate, entire, 3-6 cm long. Flowers yellowish, in axillary, umbelliform cymes. Corolla salver-shaped, much longer than the calyx. Follicles usually solitary, 7-11 cm long, straight, tapering to a point. Seeds flat, ovate, broadly margined.
F1. & Fr. : July – Sept.
Not common, occurs in waste places and in gardens. Collection : 4098; Kanyan.

68. BUDDLEJACEAE (LOGANIACEAE)

Buddleja Linn.
Ca 100 species; 11 in India; 2 in MZN.

1a Leaves lanceolate. Flowers white………………… 1. B. asiatica
1b Leaves ovate-oblong. Flowers orange ……………… 2. B. madagascariensis


Perennial, evergreen, large shrubs with grey bark. Young branches densely tomentose. Leaves opposite, 9-15 cm long, lanceolate, serrulate, acute or acuminate, glabrous and dark green above, grey or white tomentose beneath; petiole minute. Flowers white, fragrant, sessile, in dense spikes arranged in large leafy panicles. Calyx lobes 4, triangular. Corolla white, upto 0.8 cm long. Capsules ellipsoid or ovoid, glabrous. Seeds many, minute.

F1. & Fr. : Feb. – June.

Planted in gardens and also met in jungles. Collection : 2125; Charthawal.

2. B. madagascariensis Lamk., Encycl. 1: 513. 1785; MCP. 804; FD. 222.

Perennial, straggling, evergreen shrubs with densely tomentose branches. Leaves ovate-oblong, 8-13 cm long, acuminate, rounded at base, entire or serrulate, glabrous above, densely clothed beneath with white or orange-yellow tomentum. Flowers orange in large terminal-panicles. Corolla lobes 4, orange, tomentose outside. Stamens 4, included. Ovary 2-celled; style simple; stigma bifid.

F1. : Jan. - April

Planted in public gardens for flowers. Collection : 2029; Shamli.

69. GENTIANACEAE

1a Corolla regular ……………………………………… 1. Centaurium
1b Corolla irregular…………………………………… 2. Hoppea

1. Centaurium Hill.

Over 40 species; 5 species in India; 2 in MZN.

1a Calyx lobes much shorter than the corolla tube
1. C. centaurioides

Calyx lobes nearly equalling the corolla tube

2. C. pulchellum


Erect, herbs, branching from base, upto 15 cm tall. Radical leaves in rosette, obovate or oblong, obtuse; cauline ones lanceolate-linear, acute, glabrous, pale beneath, 1-1.5 cm long; upper most smaller. Flowers pink or dull white, 1 cm long, in axillary or terminal dichotomous cymes forming a lax head. Capsules narrowly oblong, upto 1 cm long.

F1.& Fr. : Feb. – May.

Occurs on river and canal banks. Collection : 4205; Kandhla.


Erect, annual, glabrous herbs upto 10 cm tall. Leaves basal in a rosette, ovate-oblong; cauline opposite decussate, ascending, 1-2.5 cm long, variable in shape. Flowers rosy pink, in leafy cymose panicles. Calyx lobes nearly equalling the corolla tube. Capsules as long as the calyx, oblong. Seeds many, minute.

F1.& Fr. : Feb. – May.

Common on sandy places, canal sides and river banks. Collection : 2029; Jhinjhana.

2. Hoppea Willd.

2 India species; 1 in MZN.


Erect, annual, branched herbs upto 12 cm tall. Stem and branches 4-angular, slightly winged, glabrous. Leaves opposite, 4-8 cm long, sessile, ovate, acute; upper most smaller and bractiform. Flowers in leafy paniculate, dichasial cymes, greenish-
yellow. Calyx 1.5-2.0 cm long, campanulate, membranous, over topping the corolla. Capsules subglobose or ellipsoid. Seeds many, black, obscurely reticulate.


Occurs in grassy fields, canal sides and river banks. Collection : 2130; Charthawal.

70. MENYANTHACEAE

Nymphoides Hill.


Aquatic, creeping herbs with floating leaves, spreading by runners. Leaves 4-8 cm across, suborbicular, deep cordate, purple beneath, petiole upto 1.5 cm long. Flowers white, in short racemes at the base of the petioles; pedicel upto 3 cm long. Calyx segments 5, lanceolate, obtuse. Corolla lobes glabrous, crested in the middle. Capsules upto 1 cm long, ellipsoid. Seeds many, muriculate.

F1. & Fr. : Sept. – Nov.

Sometimes occurs in ponds, ditches and rice fields. Collection : 328; Muzaffarnagar City.

71. HYDROPHYLLACEAE

Hydrolea. Linn. nom. cons.


Erect or decumbent upto 40 cm tall annual herbs. Stems succulent, often rooting at lower nodes. Leaves alternate, lanceolate or oblong-lanceolate, upto 6 cm long, narrowed towards both ends, entire, glabrous. Flowers blue in short terminal racemes; pedicel 0.4-0.8 cm long. Calyx 0.5-0.7 cm long, gland pubescent, segments 5, lanceolate, acuminate. Corolla blue; lobes 5, ovate. Stamens 5, exerted. Capsules 0.4 cm long, ovoid-oblong, enclosed in a enlarge persistent calyx with many minute seeds.

F1. & Fr. : Sept. – Nov.
Common in rice fields and marshy places. Collection: 3778; Kairana.
The leaves possess antiseptic properties.

72. POLEMONIACEAE

Phlox. Linn.
Ca 70 species; 2 species; 1 in MZN.
Erect simple or branching, hairy annual herbs. Leaves sessile; lower ones opposite; upper ones alternate with an amplexicaul base; all leaves ovate-lanceolate, acute, glabrous. Flowers red, pink or white, in corymbose cymes; pedicel 0.5 cm long. F1. & Fr.: March – May
Cultivated as ornamental plant in garden. Collection: 4101; Muzaffarnagar City.

73. BORAGINACEAE

1. Arnebia Forsk.
Ca 30 species; 5 species in India; 1 in MZN.
Prostrate or diffused, hispid, annual-biennial herbs up to 15 cm tall. Stem branching from the base. Leaves alternate, linear-lanceolate, 1.5-2.0 cm long, sobotuse, hairy on both surfaces. Flowers yellow, in compact secund hirsute spikes; bracts leafy, 0.5 cm long, foliaceous, linear. Corolla pubescent outside. Nutlets ovoid-conic, acute, tuberculate. Dimorphic with long and short-styled flowers. F1. & Fr.: Oct. - April
Common on sandy soils, river beds and waste places. Collection: 1000; Shukartal.
Red dye obtained from roots used for colouring hair oils.

2. **Cynoglossum** Linn.

Ca 60 species; 13 species in India; 1 in MZN.


Erect, hispid, annual, herbs upto 60 cm tall. Leaves 10-14 cm long, short petioled, obovate; upper ones sessile, elliptic oblong to lanceolate, acute at both ends; all leaves dentate, hairy. Flowers in lax, panicked racemes, terminal or axillary, with curved tips. Nutlets shortly globose, ovate, 0.2 cm across, densely glochidiate.

F1.& Fr. : June - Nov
Abundant in the area on road-sides, grassy localities and waste lands. Collection : 1545; Yarpur.

3. **Heliotropium** Linn.

Over 250 species; 18 species in India; 3 in MZN.

1a Leaves upto 10 cm long; fruits 4-beaked, separating into 2 nutlets...................... 2. **H. indicum**

1b Leaves not exceeding 5 cm; fruits not beaked, separating into 2 or 4 nutlets :

2a Erect herbs; leaves elliptic-oblong or obovate……………………………………. 1. **H. eichwaldi**

2b Prostrate herbs; leaves linear .............. 3. **H. strigosum**


Erect, rough, woolly-tomentose, annual herbs upto 50 cm tall. Leaves alternate, elliptic-oblong or obovate, obtuse at base, 2-5 cm long; petiole upto 2 cm long. Flowers white, in short, paired or terete spikes, helicoid when young, ebracteate. Calyx segments 0.3 cm long, enlarging in fruits. Corolla lobes 5, short, rounded, cripsed at margins. Nutlets 4, ellipsoid, 0.2 cm long, obtuse at both ends, pubescent.

F1.& Fr. : March- June
Common on fellow fields, river banks, gardens and waste places in dry, sandy and sandy clay soils. Collection : 3173; Jaroda.

Diffused, annual hairy herbs upto 60 cm tall. Leaves alternate or sub-opposite, upto 10 cm long, ovate or ovate-lanceolate, obtuse or subacute, serrate, base round or decurrent into the petiole. Flowers in extra-axillary, simple or forked spikes; upto 5-12 cm long, ebracteate, pale-violet, sessile. Calyx segments 5, unequal, small, narrowly lanceolate, acute. Corolla funnel shaped, hairy outside. Fruits deeply 2-lobed, with 4-beaks, I-seeded, seeds white, subquadrate.

**F1. & Fr.:** Sept. - Nov.

**Collection:** 940; Muzaffarnagar City.


Prostrate, small, branched, appressed white hairy, perennial herbs. Leaves alternate, upto 2 cm long, nearly sessile, linear-lanceolate, entire, acute; upper ones smaller. Flowers pale blue or white, in terminal, bracteate spikes. corolla tube cylindric, lobes spreading. Fruits globose, 4 minute, more or less united, glabrous or slightly hairy nutlets.

**F1. & Fr.:** Aug. – Nov.

Common in grassy fields, sandy soils and road sides. **Collection:** 4110; Bhabhisa.

### 4. **Trichodesma** R. Br. nom. cons.

Ca 40 species; 6 species in India; 1 in MZN


Erect or diffused, annual, herbs upto 60 cm tall, rough with bulbous-based hairs. Leaves opposite, ovate-oblong or lanceolate and semiamplexicaul at base. Flowers axillary, solitary, leaf-opposed or in few-flowered cymes. Calyx upto 1 cm long; segments 5, acute, lanceolate. Corolla light blue, limb oblique, funnel shaped; lobes 5, ovate. Fruits minutely 4-ribbed; nutlets 4, slightly margined.

**F1. & Fr.:** Aug. – Dec.

Common along road sides, canal-banks and waste places. **Collection:** 2637; Gordhanpur.

### 74. **Ehretiaceae**

1a Styles twice forked. Fruits usually 1-seeded ...... **1. Cordia**

1b Style bifid. Fruits 1-4 seeded....................... **2. Ehretia**

**1. Cordia** Linn.
Over 250 species; 10 species in India; 2 in MZN.

1a Leaves broad ovate, glabrescent, calyx not ribbed.......................... **1. C. dichotoma**

1b Leaves orbicular-elliptic, scabrous above, tomentose beneath. Calyx ribbed.............. **2. C. rothii**


Medium-sized, deciduous trees; bark brownish-grey. Leaves alternate, 6-12 cm long, variable, broadly ovate, crenate or wavy at the margins, acuminate at apex, rounded at base, lateral nerves 5-6 pairs; petiole 2.0-4.5 cm long. Flowers white in large, lax-terminal and axillary peduncle cymes. Calyx not ribbed, campanulate. Drupes globose-ovoid, usually 1-seeded, yellow when ripe, filled with viscid pulp.

F1.& Fr. : March- July

Common on canal bank, road sides or planted in gardens. Collection : 2365; Kandhla. The fruits are eaten. A fibre is obtained from bark. The leaves are used in medicines.


Large shrubs or small trees, deciduous, with grey bark. Leaves 7-9 cm long, orbicular or broadly elliptic, acuminate lateral nerves 3-5 pairs; petiole 2-3 cm long. Flowers white, in dense compound cymes, polygamous; pedicel 0.5 cm long. Calyx ribbed; segments 4 or 5. Corolla tube 0.5-0.6 cm long; lobes 4 or 5, equalling the tube. Drupes ovoid, 1.7 cm across, supported by the accrescent calyx, orange when ripe, filled with pulp.

F1.& Fr. : March – Nov.

Planted in gardens or met in forest area. Collection : 418; Sherpur.

2. **Ehretia** Linn.

**E. aspera** Willd., Phytogr. 4, t. 2, f. 1. 1794; FUGP. 2: 87; FD. 229.

Shrubs with short terete glabrous branches, downy when young. Bark greenish or grey-white. Leaves variable, elliptic, obovate or spathulate, scabrous and shortly hairy above, persistently hairy beneath. Flowers white in dense, corymbose cymes becoming paniculately lax later.

F1.& Fr. : June – Aug.

Occurs in the ravines of Ganga. Collection : 3795; Ramraj.
75. CONVOLVULACEAE

1a Style solitary, undivided :
   2a Fruits indehiscent; crustaceous ............ 1. Argyreia
   2b Fruits dehiscent; not crustaceous :
      3a Pollen grains not spinulose :
         4a Stigmas 1-2, oblong-linear ...... 2. Convolvulus
         4b Stigmas 2, globose :
            5a Leaves digitate or palmetely lobed............. 5. Merremia
            5b Leaves simple, cordate-ovate.................. 6. Porana
      3b Pollen grains spinulose .................. 4. Ipomaea

1b Styles 2 or 2-fid :
   6a Leaves lanceolate............................. 3. Evolvulus
   6b Leaves orbicular or suborbicular.......... 7. Valvulopsis

1. Argyreia Lour.

Ca 90 species; 40 species in India; 1 in MZN.


Large, woody climber with stout, white tomentose stem. Leaves 10-25 cm long, ovate, acute, glabrous above, white tomentose beneath, cordate base. Flowers white-rosy in subspikelet cymes; bracts large, foliar, 3-4 cm long, ovate- lanceolate, deciduous. Calyx 1-1.5 cm across, apiculate, hard berry.

F1.& Fr.: Sept. – Jan.


2. Convolvulus Linn.

Over 250 species; 10 species in India; 2 in MZN.

1a Twining or Trailing herbs. Leaves auriculate or hastate at base. Flowers pedicellate. ............... 1.C. arvensis

1b Suberect or prostrate herbs. Leaves ovate lanceolate or linear. Flowers sessile............. 2.C. pluricaulis

Creeping or twining, slender, perennial glabrous shrubs spreading on the ground. Leaves ovate-lanceolate to oblong, with a hastate base, obtuse upto 7 cm long; petiole upto 3 cm long. Flowers white or pink, solitary axillary 1-3 flowered cymes, peduncles upto 3 cm long, funnel shaped. Capsules globose or ovoid, upto 0.5 cm long, glabrous.

F1. & Fr. : July – Oct.

Common in gardens, cultivated fields, fallow land and on road sides. Collection : 1051; Shukartal.

2. **C. pluricaulis** Chois., Convol. Or. 95. 1833; FBI. 4: 218; FUGP. 2: 1058; FD. 239.

Vern. *Shankh - pushpi.*

Diffused, much branched from base, densely appressed hairy annual herbs; branches terete, prostrate or suberect. Leaves oblanceolate or oblong upto 2.5 cm long, obtuse, subsessile, mucronate, hairy on both sides. Flowers white or pinkish, solitary or 1-3 together axillary; bract linear upto 0.35 cm long. Calyx upto 0.7 cm long, thinly hairy, divided nearly to the base; segments subequal. Corolla lobes pink-pale, funnel shaped, globose. Capsules globose, 0.3 cm across. Seed 4.

F1. & Fr. : Dec. – May.

Common in cultivated fields, waste fields, road sides and sandy areas. Collection : 3116; Baghra.

3. **Evolvulus** Linn.

Ca 100 species; 2 species in India; 1 in MZN


Prostrate, much branched, diffused, spreading annual herbs with milky juice. Stem glabrous. Leaves variable, upto 2 cm long, lanceolate to ovate, obtuse, mucronate, entire, rounded at base, hairy on both surfaces; petiole small. Flowers axillary, in 1-3 flowered cymes; peduncles upto 2 cm long. Calyx divided nearly to the base; segment 5, lanceolate, acute. Corolla blue upto 0.5 cm across, glabrous. Capsules globose with persistent calyx. Seeds 4, brown.

F1. & Fr. : July – Nov
Abundent within the area in grassy fields, waste places and along railway lines. Collection: 4038; Bharssi.

4. *Ipomoea* Linn.

Over 500 species; 60 species in India; 14 in MZN.

1a Leaves lobed or compound (excl. *I. pes-tigridis* var. *capitellata*):  

2a Prostrate, glabrous herbs; leaves digitate; flowers white------------------------------- 5. *I. coptica*

2b Twining herbs:

3a Flowers sessile, clustered in axillary heads:

4a Leaves deeply palmate, 5-7 lobed--------------------------------------------- 10. *I. pas-tigridis*

4b Leaves undivided or slightly lobed-------------------------------------------- 11. *I. pes-tigridis* var. *capitellata*

3b Flowers pedicellate, solitary or in cymes:

5a Sepal 2-2.5 cm long------------- 9. *I. nil*

5b Sepal not more than 1.5 cm long:

6a Leaves pinnately parted into many filiform segments------------------------ 13. *I. quamoclit*

6b Leaves digitately or palmately 3-7 lobed or variously toothed:

7a Roots fleshy tuber, edible------------------------------------------ 2. *I. batatas*

7b Roots not fleshy:

8a Flowers red; leaves 3-lobed or variously
1b Leaves entire:

9a Struggling or diffused shrubs.............. **4. I. carnea**

9b Hebaceous or woody climbers, twinner or creeper:

10a Aquatic floating herbs; rooting at nodes............................. **1. I. aquatica**

10b Terrestrial plants, not rooting at nodes:

11a Flowers in sessile or sub sessile heads:

12a Flowers pink; capsules hairy.............. **7. I. eriocarpa**

12b Flowers white; capsules glabrous............. **14. I. sindica**

11b Flowers in pedunculate 1-several flowered cymes:

13a Leaves white, tomentose beneath...... **6. I. dichroa**

13b Leaves glabrous or pubescent............. **12. I. purpurea**

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Aquatic, amphibious, trailing herbs, rooting at nodes. Stem fistular, glabrous. Leaves variable, elliptic or ovate-oblong, cordate or hastate, acute, 6-10 cm long, glabrous; petiole upto 8 cm long. Flowers pale-pink, solitary or 1-5 flowered cymes;

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**8. I. hederifolia**

8b Flowers purple; leaves palmately 3-7 lobed .............. **3. I. cairica**
peduncle 3-5 cm long; bracts glabrous, 0.2 cm long. Corolla upto 4.5 cm long, funnel shaped, glabrous. Filaments unequal, woolly below. Capsules ovoid, 0.6 cm across, glabrous, seeds hairy.

F1. & Fr. : Sept. – Feb.

Common in ponds, ditches and marshy places. Collection : 2699; Gordhanpur.


Prostrate or diffused, spreading, glabrous, tuberous annual herbs, rooting at nodes. Tubers white or red. Leaves upto 12 cm long, ovate, cordate, lobed irregularly, petiole long. Flowers purple, 2-many on long axillary peduncles.

F1. & Fr. : Dec. - Jan

Cultivated in sandy soils. Collection : 5031; Bhopa.

Tubers are sweet and edible.


Perennial, glabrous, large, climbing shrubs. Stem glabrous, terete. Leaves palmately 5-7 partite or deeply lobed; segments ovate-lanceolate to elliptic, acute, entire, glabrous; petiole 2.5-6.5 cm long. Flowers purple, in 1-3 flowered axillary cymes. Calyx segments oblong, obtuse. Corolla funnel shaped, upto 5.5 cm long. Capsules sub-globose or ovoid, 2-celled, 2-4 valved, 4 seeded.

F1. & Fr. : Oct. - May

Cultivated as an ornamental and also met as an escape along road-sides & railway line; Collection : 3017; Kandhla.


Erect-ascending or scandent, perennial shrubs with milky juice. Stem fistular, glabrous. Leaves upto 13 cm long or more, ovate or ovate-triangular, acuminate;
petiole long up to 12 cm long. Flowers in many flowered axillary and terminal cymes; peduncles long up to 15 cm long. Calyx segments subequal, ovate-rounded, obtuse, hairy outside, 0.6-0.7 cm long. Corolla large, 6.5-8.0 cm long, blue-purple. Capsules ovoid, up to 1.5 cm long, silky pubescent.

F1. & Fr. : Major part of the year.

Abundant within the area along road sides and waste-places. Cultivated as hedge plant also. Collection : 463; Muzaffarnagar City.

Leaves are used medicinally.

5. I. coptica (Linn.) Roth, apud Roem. & Schult. Syst. 4: 208. 1819. FD. 237. 

Prostrate or twining, glabrous annual herbs. Leaves digitate, 3-7 lobed, 3-4 cm across; lobes linear-cuneate, toothed or deeply serrate; petiole up to 1.2 cm long. Flowers white, 1.5 cm long, solitary; peduncles 1.4-2.5 cm long. Capsules subglobose 0.5 cm in diam, glabous, 5-6 seeded.

F1. & Fr. : Aug - Nov

Common in grassy and cultivated fields. Collection : 3757; Ramraj.


Twining, annual, hairy herbs with hirsute stem. Leaves up to 9 cm long, broadly ovate, acuminate, entire, hairy above, woolly below, base cordate; petiole up to 8 cm long. Flowers pinkish-white, in axillary lax cymes; peduncle 3-6 cm long. Calyx up to 1.3 cm long, hairy outside. Capsules globose, 6-8 cm across, hairy, apiculate.


Occasionally met on road sides, river banks climbing on bushes. Collection : 706; Bamanhedi.

7. I. eriocarpa R. Br., Prodr. 484. 1810; FBI. 4: 204; FD. 235; HFD. 324. I hispida (Vahl.) Roem. & Schult., Syst. 4: 238. 1819 (non Zucc. 1809); FUGP. 2: 113. 
Prostrate or twining annual villous herbs. Leaves 3-7 cm long, narrowly ovate-oblong, acute or acuminate, cordate at base, entire, hairy on margins and both surfaces; petiole upto 3.5 cm long. Flowers pinkish-purple in sessile or subsessile, 1-many flowered axillary clusters; bracts linear, 0.4-0.6 cm long, hirsute. Capsules globose, 0.6-0.8 cm across, hairy, apiculate; seeds glabrous.

F1. & Fr. : March – Nov.

Common on waste-places, gardens and grassy sandy places. Collection : 705; Bamanhedi.


Large herbaceous, annual-perennial twiners with stem and branches angular, glabrous or minutely pubescent. Leaves 5-8 cm long, ovate, deeply cordate, long acuminate, entire, 3-5 angular or lobed, glabrous; petiole 4-7 cm long. Flowers in many flowered cymes; peduncles upto 15 cm long. Calyx 0.3-0.4 cm long, glabrous, segments oblong, obtuse, awned. Corolla red, 3.0-3.5 cm long; tube narrow, limb lobed. Capsules globose, 0.6-0.8 cm across, glabrous, 3-celled. Seeds upto 0.4 cm long black, pubescent.

F1. & Fr. : Aug. – Nov.

Occurs on road sides, railway line and canal banks. Collection : 1814; Mirapur.


Slender, annual-perennial, twining herbs with watery juice. Leaves 6-12 cm long, ovate-cordate, entire, deeply 3-lobed, acuminate, hairy; petiole upto 11 cm long. Flower deep blue, tinged with pink, in 1-5 flowered axillary cymes; peduncles upto 5.5 cm long. Calyx 5-6 cm long, narrowly funnel shaped, pale-orange coloured below, glabrous. Capsules globose; 0.8-1.0 cm across, glabrous, 3-celled, 6 seeded. Seed black, glabrous.

F1. & Fr. : March – Oct.

Common along road sides, railway lines and waste places. Collection : 2342; Oon.

Twining, hispid, annual herbs. Leaves deep-palmately 5-7 lobed; segments elliptic or elliptic-oblong, entire, hairy. Flowers pinkish-white, in 3-7 flowered sessile axillary cymes; bracts foliaceous, ovate-lanceolate, up to 2.5 cm acrossed, densely hairy. Capsules ovoid, glabrous; up to 2.5 cm enclosed in calyx; seeds 4, silky.

F1.& Fr. : Sept. – Dec.
Common in grassy and cultivated fields. Collection : 2074; Thanabhawan.


It differs from the type only in having ovate, acuminate cordate, undivided or irregularly lobed leaves.

F1.& Fr. : Aug. – Nov
Common in grassy and cultivated fields and along railway-lines. Collection : 2012; Jhinjhana.


Tall, hairy, twining herbs. Leaves 4-10 cm long, broadly cordate-ovate, shortly acuminate, entire, pubescent. Flowers varying in colours from white to pale-blue or purple, in 1-5 or more axillary or solitary clusters. Corolla tube short. Ovary 3-celled. Capsules 5-8 cm in diam, subglobose, 3-celled; seeds glabrous.

F1.& Fr. : Dec. - March.
Cultivated as an ornamental or met as an escape. Collection : 651; Muzaffarnagar City.


Slender, glabrous, twining, annual herbs. Leaves shortly petioled or sessile, pinnately divided into filiform segments. Flowers red, on 1-few flowered peduncles. Corolla red, 3.0-3.5 cm long, tube narrow. Capsules ovoid, beaked, with a persistent style base, glabrous. Seeds 4, tubercled.

F1.& Fr. : Aug. – Dec.
Cultivated in gardens for beautiful flowers and leaves and also met as an escape. Collection : 3194; Jaroda.

Leaves are used medicinally & powdered leaves are applied to bleeding piles.

Slender, twining, annual, hispid herbs. Leaves upto 5.5 cm long, triangular-hastate, acute or acuminate, softly hairy, cordate base; petiole 2-3 cm long, hairy. Flowers white, solitary or in few-flowered heads; bracts hispid. Calyx 0.5-0.7 long, hispid. Fruits glabrous, globose, 0.5-0.7 cm across.

F1.& Fr. : Aug. – Oct.

Common within the district twining, around the herbs and shrubs. Collection : 191; Muzaffarnagar City.


Ca 80 species; over 15 species in India; 2 in MZN.

1a Outer calyx segments hirsute with long brown hirsute leaf segments entire

1. *M. aegyptia*

1b Calyx nearly glabrous. Leaf-segments toothed pinnati-fid

2. *M. dissecta*


Twining, hirsute, annual herbs with yellowish, brown hairy stem. Leaves digitate; leaflets 5, elliptic or broadly lanceolate, subsessile, oblique, acuminate apex, acute base, entire, upto 8 cm long; petiole 5 cm long. Flowers white, on long laxy, dichotomous, 3-9 cm long peduncles; pedicels 5 cm long. Calyx lobes 5, large elliptic, densely hirsute, enlarged in fruits. Corolla funnel shaped, glabrous. Capsules ovoid, upto 1.2 cm across, papery, 4-celled, 4-valved. Seeds 4, glabrous.

F1.& Fr. : Sept. – Dec.

Occasionally found on road sides, and in grassy fields climbing on bushes. Collection : 2660; Bhopa.


Large, climbing, hairy annual herbs. Stem and branches covered with long spreading yellow or brown hairs. Leaves 5-7 palmately partite or deeply lobed; segments elliptic or lanceolate, acute, mucronate, serrate, 2.5-4.0 cm long, glabrous; petiole upto 4.5 cm long, hairy. Flowers white or pinkish with rose-purple throat, axillary, 1-2 flowered cymes; peduncle 3-7 cm long, glabrous. Calyx segments
lanceolate, short acuminate. Corolla upto 4.0 cm long, pinkish-white, campanulate. Capsules sub-globose, 1.5-1.7 cm across, 2-celled; seeds black, nearly glabrous.  
F1. & Fr. : Sept. – Nov.  
Occuring along railway lines climbing on bushes. Collection : 742; Muzaffarnagar City.

6. **Porana** Burm. f.  
Over 20 species; 6 species in India; 1 in MZN.  
Large, climbing, perennial shrubs. Stem, branches inflorescence and lower surface of leaves covered with soft grey tomentum. Leaves alternate, ovate, upto 13 cm long, acuminate, cordate at base, entire, 5-7 nerved from the base; petiole upto 3 cm long. Flowers in axillary and terminal drooping panicles; bracts minute. Calyx lobes linear, oblong. Corolla upto 0.5 cm long, white, funnel shaped. Capsules globose, 0.5 cm across, membranous, hairy, I-seeded; seeds glabrous.  
F1. & Fr. : Nov.- April.  
Cultivated in gardens and also met as an escape. Collection : 141; Muzaffarnagar City.  
The twigs are used in making baskets.

7. **Volvulopsis** Roberty.  
Prostrate or decumbent-ascending, much branched, hairy perennial herbs, rooting at nodes. Leaves alternate, orbicular or suborbicular, upto 1.4 cm across, obtuse or rounded at apex, cordate at base; petiole upto 0.4 cm long. Flowers 1-2 in axillary short peduncled or nearly sessile cymes; pedicel upto 0.6 cm long, elongating and recurved in fruits. Calyx 0.3 cm long, divided nearly to the base; segment 5, lanceolate, obtuse. Corolla white, 0.3 cm long funnel shaped, hairy on margins. Capsules globose-ovoid, 0.3-0.5 cm across, glabrous, 2-4 valved, 1-4 seeded.  
Common on road sides, grassy fields, railway lines. Collection : 1727; Rampur.
76. CUSCUTACEAE

Cuscuta Roxb.

Ca 170 species; 12 species in India; 1 in MZN.


Twining, leafless, stem parasite. Branches greenish-yellow, glabrous, forming dense masses on trees and shrubs. Flowers pale-white, solitary or on upto 5 cm long racemes, sessile or very shortly pedicelled. Calyx fleshy, cupulate, ovate with membranous margins. Corolla white; lobes reflexed, tubular, 0.5-0.7 cm long. Fruits globose-subglobose, depressed, conical at apex, 0.6 cm across.


Abundant within the area as a stem parasite on many plants. Collection : 2873; Jaroda. Stem is used for inflammations.

77. SOLANACEAE

1a Fruit a berry :

2a Berries enclosed in the inflated calyx :

3a Flowers in axillary fascicles, greenish yellow; corolla lobes valvate in bud......................... 10. Withania

3b Flowers solitary, yellowish; corolla lobes contorted in bud ............... 8. Physalis

2b Berries not enclosed in the inflated calyx :

4a Flowers in axillary or extra-axillary cymes or panicles :

5a Corolla tubular...................... 2. Cestrum

5b Corolla rotate :

6a Anthers opening by apical pores.................... 9. Solanum

6b Anthers opening by longitudinal slits....... 5. Lycopersicon

4b Flowers solitary or in 2 or 3 axillary :
7a Spineless herbs or under shrubs; cultigens.............. 1. Capsicum
7b Spinous shrubs; plants wild ....  4. Lycium

1b Fruit a capsule :
8a Capsules tubercled or echinate .............. 3. Datura
8b Capsules glabrous :
9a Flowers solitary......................... 7. Petunia
9b Flowers in cymose panicles or corymbss...................... 6. Nicotiana

1. Capsicum Linn.

Ca 50 species; 5 species in India; 1 in MZN.


Erect, branched, annual, shrubby herbs upto 80 cm tall. Stems and branches glabrous. Leaves variable ovate, elliptic to narrow-lanceolate, entire, upto 4.5 cm long, glabrous. Flowers white drooping, solitary in 2 or 3 axillary; petiole upto 1 cm long. Calyx short, nearly truncate, glabrous. Corolla white, rotate, lobes 5. Berries elongated much variable in sized and shape, erect, tapering at apex, green when young, red when mature, seeds many, white flat.

F1. & Fr. : Major part of the year.
Cultivated crop. Collection : 2319; Oon.
The fruits are used variously such as pickled, as an ingredient in curries and other food preparations.

2. Cestrum Linn.

Ca 150 species; 8 species in India; 2 in MZN.

1a Leaves thick. Corolla lobes reflexed .............. 1. C. diurnum
1b Leaves membranous. Corolla lobes erect ........ 2. C. nocturnum


Large, much branched, upto 1.5 m tall, shrubs. Stems and branches glabrous, terete. Leaves lanceolate or lanceolate oblong, thick, acute, cuneate, 5-10 cm long; petiole upto 0.8 cm long. Flowers in axillary 3-4 cm long umbelliform racemes; pedicel upto 1 cm long. Calyx 0.3 cm long, campanulate, glabrous; segments shorter
than tube, obtuse. Corolla pale-yellow upto 1.5 cm long, glabrous; segments oblong-obtuse, reflexed. Berries ovoid, 0.5 cm across.

F1. & Fr.: March - July.

Planted in gardens for fragrant flowers and also met as an escape. Collection: 2365; Shamli.


Large, diffused, shrubs upto 2 m tall. Stem and branches glabrous. Leaves 6-10 cm long, oblong-ovate to elliptic, entire; petiole upto 2 cm long. Flowers greenish-yellow in axillary or terminal, umbelliform racemes. Corolla 1.8-2.3 cm long, tube narrow; lobes 5, erect, obtuse. Berries globose, blackish.

F1. & Fr.: June – Sept.

Planted in gardens for fragrant flower and also met as an escape. Collection: 332, Muzaffarnagar City.


Ca 15 species; 10 species in India; 2 in MZN.

1a Fruit deflexed, globose, armed with short conical 0.2-0.4 cm long prickles, dehiscing irregularly Calyx subterete.............................................. 1. *D. metel*

1b Fruit erect, oblong, armed with densely beset strong 0.4-1.0 cm long prickles, dehiscing by 4-valves. Calyx angular..................................... 2. *D. stramonium*


Erect, branched, perennial, undershrubs upto 1 m tall. Stem and branches tinged with purple, glabrous or minutely hairy. Leaves ovate to elliptic-ovate, obliquely rounded at base, acute or acuminate, upto 14 cm long; petiole 3-8 cm long. Flowers axillary, solitary; pedicel 0.5-0.8 cm long. Calyx 4-8 cm long, terete, tubular, segments upto 0.8 cm long, triangular, acuminate. Corolla purple, 12-14.5 cm long, pubescent; lobes 5. Fruits globose, minutely pubescent or glabrous with 0.2-0.4 long, conical, thick prickles, 3-4 cm across.

F1. & Fr.: Nov. – April.
Common in waste-places, along road sides, railway lines and fellow fields. Collection: 2315; Oon.
The seeds are poisonous and are used in medicines.


Erect, branched, perennial, herbs upto 1 m tall. Stem and branches densely pubescent when young. Leaves ovate-oblong to triangular, with unequal sided or cuneate base, acute, entire, 5-9 cm long, soft pubescent; petiole 1.0-2.3 cm long. Flowers solitary, axillary; pedicel upto 0.8 cm long. Calyx minutely hairy, 5-angular, upto 4 cm long. Corolla white or purple; lobes with a short acumen. Fruits erect, oblong, 4-6 cm across, densely covered with long prickles.

F1. & Fr. : March – Nov.

Occurs on waste-places, road sides, river banks. Collection : 131, Muzaffarnagar City. The seeds are poisonous and used in medicines.

**D. tatula** Linn. and **D. inermis** Jacq. are sometimes considered as varities of **D. stramonium** Linn. or as distinct species. **D. innoxia** Mill. (**D. metel acut. pl.** – (non Linn. 1753); FBI. 4: 243; FUGP. 2: 131) may occur under cultivation in gardens.

4. **Lycium** Linn.

Ca 100 species; 3 species in India; 1 in MZN.


Bent or erect, thorny, bushy shrubs. Young parts pubescent. Stem white and branches ending in spines. Leaves variable in shape, 1.5-3.0 cm long, linear-oblong to oblanceolate. Flowers white or pale purple, 1 cm long, solitary, on slender pedicel. Calyx 0.5 cm across, sub-globose, yellow or red when mature; seeds many

F1. & Fr. : July – Nov.

Rare on canal banks, road sides. Collection : 2102; Thanabhawan.

5. **Lycopersicon** Mill.

Ca 100 species; 1 in MZN.

Erect, decumbent-ascending, strong aromatic, glandular hairy annual herbs. Leaves irregularly odd pinnate, 12-20 cm long; segments entire or lyrate, ovate-oblong, acuminate. Flower yellow, in 3-many flowered cymes; pedicels jointed at or just above the middle, upto 2 cm long. Calyx upto 1 cm long, hairy. Segments lanceolate, acute. Corolla yellow, 1.5-2.5 cm across; segments lanceolate, acuminate. Fruits red, orange red, smooth or grooved, glabrous, variable in size and shape, with persistent calyx.

F1. & Fr. : Major part of the year.

Widely cultivated for fruits and also met as an escape. Collection : 1466; Jansath.

The fruits are used as vegetable and in various ways.

6. Nicotiana Linn.

Ca 65 species; 3 in MZN.

1a Corolla broadly campanulate, 1-1.4 cm long.
   Calyx-lobes obtuse…………………………… 2. N. rustica

1b Corolla salver form; 3.0-4.5 cm long. Calyx-lobes acuminate :
   2a Corolla tube narrow below, ventricose
       above…………………………………….. 3. N. tabacum
   2b Corolla tube narrow-throughout, not
       ventricose above………………………… 1. N. plumbaginifolia

Vern. Jangali Tambakhu.

Erect, weak, annual, branched herbs upto 1 m tall, pubescent throughout. Basal leaves forming a rosette, 5-8 cm long, obovate-spathulate, petiolate; cauline ones sessile, elliptic-obovate, base semi-amplexicaul, obtuse or acute. Flowers greenish-white, in cymose leafy panicles; pedicel 0.4-0.5 cm long, elongated in fruit. Calyx 10-ribbed, tube narrow 1-1.5 cm long. Corolla 2.5-3.2 cm long, tube narrow; lobes 5, ovate, obtuse. Fruits upto 1 cm long. Seeds rugose, small.

F1. & Fr. : March – Oct.

Common in waste-places, roadsides, gardens, and cultivated fields. Collection : 157; Muzaffarnagar City.

Erect, vicid, pubescent, branched, herbs upto 1 m tall. Leaves petiolate; lower ones large, broad ovate or suborbicular obtuse, short hairy; upper ones smaller and narrower. Flowers greenish-yellow in dense, glandular-pubescent, cymose panicles; pedicels 0.4-0.6 cm long. Calyx glandular-pubescent, divided halfway down, 1 cm long; lobes obtuse or subacute. Corolla yellow, hairy outside; lobes orbicular, obtuse or subacute. Fruits 1-1.3 cm across, globose-ovoid.

**F1. & Fr. :** Nov. - April
Cultivated for leaves to smoke. Collection : 879; Kairana.
Leaves are used for smoking, medicinally.


Large, erect, vicid annual herbs upto 1 m tall. Lower leaves large, oblong or ovate-lanceolate; upper ones smaller, amplexicaul, obovate. Flowers rosy, reddish, in terminal panicles. Capsule ovate.

**F1. & Fr. :** Nov. - March
Leaves are used for smoking, chewing and in medicines.

**7. Petunia** Juss.
Ca 40 species; 1 in MZN.

**P. axillaris** (Lamk.) Britton, Stern & poggenb. MCP. 879; HFD. 336.
Erect, annual, weak hairy herbs. Leaves ovate-oblong, upper ones sessile. Flowers solitary, dull white to variously coloured. Capsules 2-celled.

**F1. & Fr. :** Feb. - April
Cultivated in the gardens for beautiful flowers. Collection : 358; Muzaffarnagar City.
Some other species of *Petunia* Juss. Such as *P. integrifolia* (Lodd.) Sching & Thell., and hybrids of these are also cultivated in gardens.

**8. Physalis** Linn.
Ca 100 species; 3 species in India; 1 in MZN.


Erect or prostrate, much-branched annual herbs upto 50 cm tall. Stem and branches ribbed, glabrous. Leaves ovate or ovate-oblong, 3-8 cm long, sinuate-dentate, obliquely-round or sub-cordate, acute, minutely hairy; petiole 1.0-3.5 cm long. Flowers solitary on long deflexed pedicels 0.5-0.8 cm long. Calyx 0.3-0.4 cm
long, truncate at base, ciliate; segments triangular, acute, ciliate. Corolla yellow, 0.6 cm long. Berries completely enclosed within the enlarged 5-10 ribbed calyx-lobes, yellowish when mature. Seeds discoid.
F1. & Fr. : Sept. – Feb.
Common within the area on waste-places, along road sides, and in fellow fields. Collection : 3562; Nairana.
Ripe fruits are eaten by poor people.

9. Solanum Linn.
Ca 1500 species; 40 species in India; 6 in MZN.

1a Plants armed :

2a Flowers violet or blue :

3a Prickles hooked or short compressed:

4a Berries 0.8 cm across; prickles hooked…………………………… 1.S. indicum

4b Berries more than 0.8 cm across; Prickles short; compressed…………………………… 2.S. melongena

3b Prickles erect…………………………… 4. S. surattense

2b Flowers white …………. 5.S. torvum

1b Plants unarmed :

5a Leaves simple…………………………… 3.S. nigrum

5b Leaves pinnate…………………………… 6.S. tuberosum


Erect, perennial, undershrubs, stellate tomentose, armed, upto 1.5 m tall. Leaves 6-10 cm long, ovate-oblong or sinuate-pinnatifid, acute or sub-obtuse apex, rounded base; petiole 2.5 cm long. Flowers blue, in lateral cymose corymbs; pedicles short, armed. Calyx 0.5 cm long, hairy; lobes ovate, acute. Corolla 2.0-2.5 cm across; lobes elliptic-oblong, obtuse. Fruits orange-yellow, upto 0.8 cm across; seeds smooth. F1. & Fr. : July – Nov.
Occasionally found on waste places. Collection : 2242; Heend.
The seeds are said to be poisonous. The roots & fruits are used medicinally.

Erect or diffuse undershrubs, prickly or not. Leaves upto 15x9 cm, ovate sinuate or lobed, pale beneath, grey tomentose. Flowers violet or bluish, in extra axillary cymes. Berries variable, round, oval, or elongate-cylindric, deep purple. F1. & Fr. : Major part of the year.

Cultivated widely for its fruits for vegetable. Collection : 1014; Shuakartal. The fruits are cooked as vegetable & various other preprations, also used medicinally.


Erect, much branched, weak glabrous annual herbs, upto 50 cm tall. Leaves 3-8 cm long, ovate-oblong, entire, sinuate, sub-acute or acuminate, tapering into petiole; petiole upto 3 cm long. Flowers white, in extra-axillary umbelliform cymes. Berries globose, purplish-black or red or yellow-when ripe, 0.5 cm across. Seeds minutely pitted. F1. & Fr. : Major part of the year. Very common weed and in shady places of garden, fellow fields, along road sides. Collection : 1038; Shuakartal.


Prostrate or decumbent-ascending, much branched, annual or perennial, much prickly herbs. Leaves oblong elliptic-pinnatifid, unequal sided at base, covered with stellate hairs, 5-8 cm long; midrib and main lateral nerves armed with yellow upto 1.5 cm long, straight spines; petiole 1.4-2.5 cm long. Flowers solitary or in few flowered extra-axillary cymes; peduncles upto 3 cm long. Calyx 0.5-0.6 cm long, hairy; segments ovate, acuminate. Corolla bluish-purple, upto 3 cm across; tube short; segments hairy. Berries yellow, streaked with green, globose, upto 1.5 cm across. Seeds small, many. F1. & Fr. : Dec. - March

Common in the area in dry sandy soils, along rivers and railway line. Collection : 2291; Jansath. Various parts of the plant are used in medicines.


Erect, branched armed or unarmed, upto 1.5 m tall, perennial shrubs, densely covered with grey stellate-tomentum. Leaves oblong-ovate, pinnati-lobed, cordate base, acute, upto 15 cm long; petiole 2-5 cm long. Flowers white in many flowered extra-axillary corymbose cymes; peduncle upto 1.5 cm long; minutely hairy. Calyx lobes lanceolate, acuminate, glandular hairy, 0.5-0.6 cm long. Corolla white, hairy outside, lobes lanceolate, subacute. Berries globose, upto 1.4 cm across. Seeds brown. F1. & Fr. : Dec. - June

Occasionally found in moist, shady places and in fruit orchards. Collection : 4124; Ailum.


Weak, branched, annual herbs with sub terranean stolons bearing under ground tubers of various size and shape. Leaves 10-18 cm long, odd-pinnate; Leaflets 3-4 pairs, unequal, ovate; petiole upto 3 cm long. Flowers in 7-15 flowered terminal and lateral cymose corymbs; pedicels upto 3 cm long. Corolla white or purple. Fruits globose.

F1. & Fr. : Jan. – April.

Extensively cultivated in sandy soils and also met as an escape. Collection : 2173; Heend.

Tubers are used as vegetable and or various other edible preprations.


Ca 10 species; 2 species in India; 1 in MZN.


Erect, much-branched, perennial undedrshrub with stem and young parts stellate- hairy. Leaves elliptic-oblong, or ovate-rounded, acute- decurrent base, acute or obtuse apex, upto 14 cm long; petiole upto 3 cm long. Flowers in 3-5 flowered axillary fascicles; pedicel upto 0.3 cm long. Calyx 0.4 cm long, hairy; lobes ovate-tringular, acute. Corolla greenish, upto 0.6 cm across; lobes ovate- triangular, acute. Fruits a berry, red when ripe, enclosed in the bladder like inflated calyx. Seeds subreniform, pale brown, polished, wrinkled.
F1. & Fr. : Jan. - June.
Common on waste places, on dry soils, near gardens and road sides. Collection : 905; Kairana.
An alkaloid “Somniferin” is extracted from the roots, medicinally useful.

78. SCROPHULARIACEAE

1a. Corolla tubular, rotate or funnel shaped :
   2a. Stamens 2……………………………………………………12. Veronica
   2b. Stamens 4 :
      3a. Corolla 4- merous; leaves in whorls of 3 ………8. Scoparia
      3b. Corolla 5- merous; leaves alternate ………11. Verbascum

1b. Corolla bilabiate or personate :
   4a. Capsules opening by pores or pores and
      valves both ………………………………………1. Antirrhinum
   4b. Capsules opening by valves only :
      5a. Fertile stamens 2:
         6a. Anther cells parallel………………3. Dopatrium
         6b. Anther cells divergent………………5. Lindernia
      5b. Fertile stamens 4:
         7a. Anther cells contiguous,
            Distinct, parallel……………………2. Bacopa
         7b. Anther cells separate, stipitate:
            8a. Capsules septicidal :
               9a.Calyx distinctly ribbed…………9. Striga
               9b.Calyx not ribbed :
                  10a.Shrubs; corolla tube long, Narrow;
                     flowers red…………………7. Russelia
                  10b. Herbs; corolla tube short, Broad;
                     flowers blue…………………10. Torenia
            8b. Capsule loculical
               11a. Calyx without bracteole; Corolla with 2-gibbous throat …………6. Mazus
               11b. Calyx bracteole; Corolla without gibbous throat………4. Lindenbergia
1. **Antirrhinum** Linn.

Ca 20 species; 2 species in India; 2 in MZN.

1a. Leaves ovate-lanceolate to oblong; calyx lobes not foliaceous, corolla 3-4.5 cm long. ..............................1. *A. mazus*

1b. Leaves linear, calyx lobes foliaceous; corolla less than 1 cm long. ..........................2. *A. orontium*

1. **A. majus** Linn., Sp. P1. 617. 1753; MCP. 895; HFD. 345.

Erect, annual, glabrous herbs. Stem terete, glabrous downwards, gland-hairy upwards. Leaves sessile or short petioled, ovate-elliptic to oblong, narrowed towards both ends, glandular. Flowers in many flowered, glandular hairy terminal racemes; pedicel upto 1 cm long. Corolla white or red or variegated, hairy outside. Capsules obliquely-ovoid.

F1. & Fr.: Jan.–March.

Cultivated in gardens. Collection: 365; Muzaffarnagar City.


Erect, ascending, simple or branched, herbs, glandular hairy above. Leaves sessile, linear, with a narrow base, obtuse or subacute, glabrous, 1-5 cm long, with a revolute margin. Flowers in lax, leafy spiciform racemes. Bracts foliaceous. Corolla white, purplish-streaked. Capsules obliquely ovoid; seeds black, compressed.

F1. & Fr.: Feb.–April.

Common weed of cultivated fields and gardens. Collection: 2036; Shamli.

2. **Bacopa** Aublet nom. cons.

Ca 100 species; 4 species in India; 1 in MZN.


Prostrate herbs with spreading or ascending branches, rooting at nodes. Leaves sessile, decussate 1-2 cm long, obovate-oblong or spathulate, entire, gland dotted beneath. Flowers bluish-purple in axillary or racemose; pedicel upto 3.5 cm long.
Bracteoles at the top of pedicel. Corolla 1-1.5 cm long, white tinged with purple, lobes subequal, entire, retuse. Capsules upto 0.6 cm long, grooved, ovoid, glabrous.
Common in river beds and marshy places. Collection : 630; Purkaji.
Used in skin treatment including lapprosy.

3. **Dopatrium** Buch.- Ham. ex Benth.

Ca 20 species; 3 species in India; 1 in MZN.


Erect, branched, spongy, glabrous annual herbs upto 20 cm tall. Leaves sessile, 1-1.5 cm long, ovate-lanceolate, obtuse, entire, parallel-narrowed; higher ones smaller, passing into bracts. Flowers pinkish-violet in opposite distant pairs, sessile terminal racemes; lower one sessile; pedicel 1.5 cm long. Anther cells parallel. Capsules ovoid-subglobose, apiculate, with a persistent style base, upto 0.3 cm long, seeds minute, ellipsoid.

4. **Lindenbergia** Lehm.

Ca 15 species; 7 species in India; 1 in MZN.


Erect or decumbent-ascending, simple or branched annual herbs. Leaves long petioled 2-3 cm long, ovate-elliptic, crenate-serrate. Villous on both surface round or acute at base, obtuse or sub-acute at apex. Flowers axillary or solitary in paris, on upto 0.3 cm long hairy pedicel. Corolla yellow. Fruits hairy at top, upto 0.5 cm long, oblong.
F1. & Fr. : Jan. – April
Plant juice is applied for skin- eruptions.

5. **Lindernia** All.
Ca 10 species; 27 species in India; 3 in MZN.

1a. Upper two stamens perfect, the lower two reduced to staminodes:
   2a. Leaves parallel – nerved; staminodes bilobed; Capsules ovate or shortly oblong ..............3. *L. parviflora*

2b. Leaves penni-nerved; staminodes entire; capsules linear- oblong ..................................1. *L. ciliata*

1b. Stamens 4 with perfect anthers.................................2. *L. crustacea*


   *Bonnaya brachiata* Link & Otto, Ic. P1. 25. t.11. 1820; FBI. 4: 284; FUGP. 2: 151.

   Erect, simple or branched from the base, annual herbs upto 20 cm tall. Stems 4- angular, glabrous, rooting at base. Leaves sessile, 1-3 cm long, oblong or obovate, obtuse, rounded at base, nearly glabrous, acute, serrate with bristle-tipped teeth. Flowers white, in terminal racemes; bracts 0.3-0.5 cm long. Calyx ciliate. Corolla white with red streaks and dots. Capsules cylindric upto 1 cm long.

   F1. & Fr. : Sept. – Nov.

   Common weed of rice fields and found on damp moist grassy areas. Collection : 3002; Jaroda.


   Diffused branched, annual glabrous, herbs upto 40 cm tall. Stems angular. Leaves opposite, short-petioled, ovate, sub-acute, coarsely toothed, upto 1 cm long. Flowers purplish, axillary and subracemose at the end of branches; pedicel 1-2 cm long. Calyx glabrous, ribs not keeled. Stamens 4. Capsules upto 0.4 cm long, ellipsoid-oblong apiculate.


   Common in moist places, lawns and grassy and agriculture fields. Collection : 3037; Kandhala.

Hysanthes parviflora (Roxb.) Benth. in DC. Prodr. 10: 419. 1846; FBI. 4: 283; FUGP. 2: 151.

Erect or decumbent-ascending, diffusely, branched, glabrous annual herbs upto 13 cm tall. Stem 4-angled. Leaves sessile, 0.5-1.0 cm long, oblong-lanceolate, entire, glabrous. Flowers white, axillary, solitary in leafy racemes. Corolla much longer than calyx. Capsules ovoid-oblong or ellipsoid, unusually exceeding the calyx, apiculate.


Common in grassy fields, moist places and as weed of rice fields. Collection : 1617; Mansoorpur.

6. Mazus Lour.

Ca 20 species; 8 species in India; 1 in MZN.


Erect, glabrous or hairy, diffusely branched herbs. Leaves 1-3 cm long, obovate-lanceolate, crenate-toothed, glabrous or pubescent; basal ones in rosette; upper ones sessile. Flowers whitesh-purple, in lax, terminal racemes; pedicel upto 1.5 cm long. Calyx divided half-way down. Corolla whitish-purple, upto 1 cm long, hairy outside, 2-lipped, upper lip 2-fid; lower large, 3 lobed. Capsules globose, 0.35 cm across, pubescent; seeds minute, pale yellow.

F1. & Fr. : Sept. – Nov.

Common on moist shady places, rice fields and gardens. Collection : 4127; Ailum.

7. Russelia Jacq.

Ca 40 species; 1 in MZN.


Erect or drooping, whorled branched; branches slender, ribbed, shrubs. Leaves small, whorled, linear or ovate; upper ones reduced to scales. Flowers red or scarlat, on 1-3 flowered peduncles on drooping branches. Corolla tubular. Stamens 4. Fruit a capsule.

F1. & Fr. : Major part of the year.
Commonly planted in gardens. Collection: 8414; Muzaffarnagar City.

8. Scoparia Linn.

Ca 20 species; 1 in MZN.


Erect or ascending, annual-perennial, undershrubs up to 70 cm tall. Stem and branches angular, glabrous. Leaves 1-2.5 cm long, opposite or whorled in threes, obovate or oblanceolate, obtuse or subacute, tapering at base, crenate-serrate in upper half. Flowers white axillary, 1-3 together often forming leafy racemes. Corolla 0.5-0.7 cm long, white, tube short; lobes 4, oblong, obtuse; throat densely hairy. Stamens 4, subequal. Capsules subglobose, 0.2-0.3 cm across; seeds obovoid, angled.

F1. & Fr.: Major part of the year.

Common on roadside, waste places. Collection: 2471; Budhana.

9. Striga Lour.

Ca 40 species; 7 species in India; 2 in MZN.

1a. Calyx 10 ribbed. Flowers yellow. *J. S. asiatica*

1b. Calyx 15 ribbed. Flowers white. **2. S. euphrasioides**


Erect, simple or branched, annual herbs up to 50 cm tall. Stem ribbed, hairy. Leaves sessile, 1-2 cm long, linear, sub acute or obtuse; higher ones smaller, passing into bracts. Flowers in lax, leafy terminal spikes. Bracteoles linear. Calyx 0.6 cm long, hairy; lobes linear-subulate. Corolla yellowish 1-1.5 cm long, glabrous; tube shortly hairy. Capsules 0.35 cm long.

F1. & Fr.: Sept. – Dec.

Common on grassy places, canal banks. Collection: 3769; Mirapur.


Erect, simple or branched, annual partial root parasites, up to 35 cm tall herbs, stem and branches hispid, hairy, ribbed. Leaves linear, 1-4 cm long, sessile, subacute at apex, entire, densely covered with tubercled based hair. Flowers white, sessile, axillary, solitary forming lax terminal spikes; bracts foliaceous. Calyx 15 ribbed, segments 5. Corolla white up to 1.5 cm long, glabrous, cylindrical; limb 2- lipped;
upper erect, 2-lobed, short; lower lip spreading, 3-lobed, long. Capsules oblong, glabrous, black, upto 0.6 cm long.

F1. & Fr. : Dec. - March

Common weed of sugarcane and winter crops, also found in fellow fields and canal banks. Collection : 3016; Ramraj.

10. **Torenia** Linn.

Ca 50 species; 12 species in India; 1 in MZN.


Erect, simple or branched, sparsely hairy herbs, upto 25 cm tall, with 4-angled branches. Leaves 2-3.5 cm long, petiolate, opposite, ovate, sharply toothed, glabrous, acute, base cuneate. Flowers blue-purple, solitary or fascicled in the axils towards the ends of the branches. Corolla tube curved, longer than calyx; limb spreading, 4-lobed. Stamens 4, in unequal pairs. Capsules oblong, acute enclosed in the persistent calyx.


Common on west places, road sides. Collection : 2495; Budhana.

11. **Verbascum** Linn.

Ca 300 species; 6 species in India; 2 in MZN.

1a. Pubescent herbs; stamens 4...............................1. *V. chinense*

1b. Woolly tomentose herbs; stamens 5........................2. *V. thapsus*


Erect, simple or branched, annual pubescent herbs upto 90 cm tall. Redical leaves in rosette, long, lyrate-pinnatifid; cauline ones smaller, oblong-ovate, cordate, toothed, hairy, passing into foliar bracts. Flowers yellow in simple or branched terminal racemes. Bracts ovate. Calyx segments serrulate. Corolla lobes 5, spreading. Capsules 0.5-0.6 cm long, sub-globose, glabrous; seeds truncate, minute.

F1. & Fr. : Major part of the year.

Common on river and canal banks, waste places, and on old walls. Collection : 2151; Thanabhawan.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH  (273)

Erect, woolly, tomentose, generally unbranched herbs upto 70 cm tall. Stem winged with prolonged leaf bases. Radical leaves longer upto 20 cm long, petioled, ovate; upper ones sessile, oblanceolate, acute or acuminate. Flowers yellow, nearly sessile, crowded in terminal, simple, densely woolly spikes. Bracts longer than flowers. Calyx and woolly outside. Stamens 5. Capsules ovoid, tomentose, as long a calyx.

F1. & Fr. : Feb. – June.

Common on river and canal banks, damp shady places. Collection: 4228; Bahadurpur. Plant is used in medicines for treatment of asthma and pulmonary complaints. Leaves warmed and rubbed with oil are used as an application to inflamed parts.


Ca 300 species; 32 species in India; 2 in MZN.

1a. Erect herbs; leaves linear-oblong or oblong. flowers in axillary racemes……………………………………………………………………………………………………2. *V. anagallis-aquatica*

1b. Prostrate herbs; leaves cordate-ovate or orbicular. Flowers solitary, axillary…………………………………………………………………………………………………………………………………………………………………………………………1. *V. agrestis*


Prostrate or decumbent- ascending, annual, pubescent herbs, branching from base. Leaves shortly petioled, upto 1.5 cm long, cordate, ovate or orbicular, toothed, obtuse, hairy. Flowers blue or white or pink, solitary, axillary on slender, drooping fascicles forming terminal racemes. Sepale 0.4-0.5 cm long, ciliate. Capsules small upto 0.5 cm long, reniform, bilobed; seeds grey.

F1. & Fr. : Feb. – June

Common in agriculture fields, canal banks and river sides. Collection : 3566; Bahadurpur.


Erect, glabrous, annual, simple or branched herbs. Stem hollow, hairy above, glabrous below. Leaves sessile, 4-12 cm long, oblong-lanceolate or linear oblong, entire or serrate, base usually cordate. Flowers white or pale-purple in lax –axillary racemes. Capsules compressed, 0.3-0.4 cm long, oblong-orbicular, emarginated, notched.
Fl. & Fr. : Feb-June.
Common in marshy localities, ponds and ditches. Collection : 3566, Bahadurpur

79. OROBANCHACEAE

Orobanche Linn.

Ca 140 species; 10 species in India; 1 in MZN.


Scapigerous, pale-brown, erect, complete annual root parasites upto 30 cm tall, branching from base. Scales few lanceolate, minutely hairy. Flowers nearly sessile, forming a lax spike; bracts ovate or lanceolate, acuminate, pubescent. Bracteoles filiform. Corolla 1.5-2.0 cm long, bilipped. Capsules oblong, acuminate.

Fl. & Fr. : Jan. – May
Common in the field on the roots of various plants, more common on members of Brassicaceae. Collection : 4261; Muzaffarnagar City.

80. LENTIBULARIACEAE

Utricularia Linn.

Ca 130 species; 28 species in India; 2 in MZN.

1a. Peduncle without a whorl of floats .............................................. 1. U. aurea

1b. Peduncle with a whorl of spongy floats ...................................... 2. U. inflexa

var. stellaris


Aquatic, submerged except the flowers, rootless, free-floating herbs. Leaves whorled, filiform , simple or pinnately divided into fine segment; each segments with a subglobose blader at base. Flowers in 3-8 flowered erect racemes arising above the water surface; peduncles upto 15 cm long, without whorl of floats. Bracts small, ovate. Calyx lobes unequal, ovate, obtuse. Corolla spurred. Capsules globose upto 0.4 cm long.


Common in the area in ponds and ditches. Collection : 2027; Jhinjhana.

Rootless, freefloating, aquatic, submerged, herbs. Leaves whorled, 4 in each, pinnatifid; segments capillary, each pinna provided with a globular, ovoid bladder with truncate mouth. Flowers yellow, peduncles with a whorl of spongy floats below the inflorescence, in racemes. Pedicels deflexed in fruits. Capsules globose. Seeds discoid, narrowly winged.

F1. & Fr. : Aug. – Nov.
Rarely, occurs in ponds and ditches in rainy season. Collection : 3768; Ramraj.

### 81. BIGNONIACEAE

1a. Erect trees or shrubs:
   2a. Leaves simple........................................8. **Tecomella**
   2b. Leaves compound:
   3a. Leaves unipinnate:
      4a. Fruits indehiscent, large, woody........5. **Kigelia**
      4b. Fruits dehiscent, not as above:
         5a. Large shrubs; leaflets
            toothed capsules linear........7. **Tecoma**
         5b. Trees; leaflets entire. Capsules
            large, cylindric, curved ..........3. **Haplophragma**
   3b. Leaves 2-3 pinnate:
      6a. Leaflets ovate to ovate- lanceolate,
         large; staminode 0; flowers white
         with long slender tube..........6. **Millingtonia**
      6b. Leaflets oblong, smaller; staminode
         very long; flowers Mauve- blue.....4. **Jacaranda**

1b. Climbers:
   7a. Climbing by tendrils...............................1. **Bignonia**
   7b. Climbing by aerial rootlets.......................2. **Campsis**

**1. Bignonia** Linn.
Probably monotypic.
**B. unguis-cati** Linn., Sp. P1. 623, 1753; FD. 260; SFUGP. 199; Bor. & Raizada in Beau. Ind Climb. & Shrubs. 32. 1954.

Large shrubs, climbing by 3-fid claw–like tendrils. Stem and branches glabrous. Leaves palmately compound; rachis upto 1.5 cm long; leaflets 2, elliptic of elliptic lanceolate, acuminate at apex, narrowed towards the base, 1.5-3.0 cm long. Flowers bright yellow, axillary in pairs, peduncles slender, up to 1.5 cm long, Calyx bowl-shaped, membranous; veined segments 5, minute. Corolla yellow, 5-8 cm long; tube short, narrow; limb broad with 5 spreading lobes. Stamens 4, didynamous, included. Fruits narrowly linear.

F1. & Fr. : Jan. - June

Common in wild in garden. Collection : 5021; Muzaffarnagar City.

**2. Campsis Lour. nom. cons. prop**

2 species; 1 in MZN


Climbing, deciduous, shrubs. Leaflets 7-9, ovate to ovate-lanceolate, serrate, 3-6 cm long, glabrous. Flowers orange in drooping clusters in terminal panicles. Calyx. companulate, divided almost up to the middle; lobes 5, acute. Caorlla upto 5 cm long; lobes 5 spreading. Stamens 4; didynamous, included. Fruits capsule, not beaked.


Widely cultivated in gardens. Collection : 3144, Muzaffarnagar City.

**3. Haplophragma** P. Dop

4 species; 1 species in India; 1 in MZN.


Medium-sized trees with dense crown; bark rough, pale brown; young branches soft pubescent. Leaves large, unipinnate. Leaflets 3-7, large upto 30 cm long, unequal, broadly ovate or obovate, entire, acute at apex, subcordate base, nearly sessile and hairy, especially on nerves beneath. Flowers yellowish-brown, rusty-
woolly tomentose in terminal panicles. Capsules upto 80 cm long, cylindric, usually curved or coiled; seeds winged.

Fl. : Sept. – Dec.; Fr. : Nov. – Feb.

Planted as an avenue tree. Collection : 2108; Kandhla.

4. **Jacaranda** Juss.

Ca 50 species; 1 in MZN.


Medium- sized trees with grey-whitite bark. Leaves bipinnate, 15-30 cm long; rachis grooved; pinnae 6-20 pairs, opposite, 3-5 cm long. Leaflets 8-26 pairs, except the terminal ones, oblong or oblong- lanceolate, acuminata at apex, narrowed towards base, upto 1 cm long, sessile, glabrous. Flowers blue in loose, pyramidal panicles; pedicel upto 2 cm long. Calyx segments 5, lanceolate, acuminata. Corolla mauve-blue, 2-2.5 cm long, tube curved; throat wide; limb 2- lipped; lobes 5, nearly equal, oblong, obtuse. Stamens 4, included, staminodes long, thickened and hairy at top. Capsules ovate- orbicular, 5-7 cm long, compressed, longitudinally dehiscent; seeds winged.

Fl. : March. - May; Fr. : June. – Aug.

Planted in gardens and on road sides. Collection : 429; Muzaffarnagar City.

5. **Kigelia** DC.

Probably Monotypic.

**Kigelia africana** (Lam.) Bth. in Hook., Nigir. Fl. 463. 1849. **K. pinnata** DC., Prodr. 9: 247. 1845; FUGP. 2: 175; FD. 258; MCP. 904.

Medium-sized or large trees with spreading branches; bark grey-brown. Leaves ternate, imparipinnate, upto 30 cm long; leaflets 7-9, opposite, oblong or obovate, rounded or obtuse at apex, entire, thick, glabrous, 7-15 cm long. Flowers scarlet, in lax hanging upto 60 cm long racemes; pedicel 3.5-4.5 cm long, crured-pubescent. Calyx tubular, thick, 1.5-2.0 cm long; segment 5, ovate, acute, unequal. Corolla dark maroon, 5-8 cm long. Fruits 30-40 cm long, woody, gourd-like, hanging on cord like long stalks.


Planted in gardens and on road sides. Collection : 464; Muzaffarnagar City.

6. **Millingtonia** Linn. f.
A monotypic genus.


Large trees branching from high above the ground; bark corky, greyish-black. Leaves 2 or 3 pinnate, 50-60 cm long, leaflets ovate-lanceolate, acuminate, sinuate or crenate, 2-5 cm long, deep green above, glabrous; petiole upto 0.5 cm long. Flowers in long terminal pendulous panicles, white, numerous, fragrant. Corolla with long slender tube.

F1. : Nov. – Dec.; Fr. : Dec. - March

Rare, planted in garden, on road sides. Collection : 5032; Shukartal.


Large shrubs or small trees. Leaves imparipinnate, 15-30 cm long; leaflets ovate or lanceolate, acuminate, sharply serrate, 3-6 cm long, sessile except the terminal one. Flowers bright yellow, in terminal panicles; pedical 0.5 cm long. Calyx tubular, glabrous; segments 5. Corolla bright yellow, 4-5 cm long, tube narrowed at base; lobes 5, unequal. Stamens 4, Staminode 1, included. Capsules 12-20 cm long; seeds thin, winged.


Planted in gardens for beautiful flowers. Collection : 3137; Shamli.

**8. Tecomella** Seem.

Probably monotypic.


Large shrubs upto 2.5 m tall with long drooping glabrous branches. Leaves simple, narrowly oblong, obtuse or acute at apex, narrowed towards base, 5-12 cm long, undulate on margins, glabrous. Flowers orange-yellow, in corymbose-racemes from short lateral branches; pedicel upto 1 cm long. Calyx upto 1 cm long, tubular; segments 5, stamens 4, exerted; filaments glabrous. Capsules 15-20 cm long, slightly curved, glabrous.

F1. & Fr. : March. - June
Planted on road sides and in gardens. Collection: 3743; Muzaffarnagar City.

82. PEDALIACEAE

1a. Fruit a drupe, with 4 spines, Flowers yellow..............................1. Pedalium

1b. Fruit and elongated capsule, not spinous, Flowers pinkish-white...2. Sesamum

1. Pedalium. Linn.

Probably monotypic


Diffused, much-branched, spreading or ascending, upto 40 cm tall, succulent annual herbs. Stem fistular, angular, nearly glabrous. Leaves opposite, 2.5-4.0 cm long, elliptic-obovate, obtuse or truncate at the apex, crenate, serrate, glabrous above, lower surface with minute shining scales. Flowers pale-yellow, solitary, axillary; pedicel upto 0.3 cm long; with a pair of glands at the base. Corolla lobes unequal. Fruits 4-sided, upto 1.8 cm long, abruptly narrowed towards base, with short, sharp, conical, horizontal spines; seeds 2 in each cell.


Common in sandy areas, river banks and grassy fields. Collection: 611; Bhopa. Flowers used in medicines.

2. Sesamum Linn.

Ca 30 species; 4 species in India; 1 in MZN.


Erect, much-branched, annual hairy, upto 1.5 tall herbs. Leaves heteromorphic, very variable in shape and size, lower ones opposite, 3-lobed palmately partite; petiole upto 2.5 cm long; upper ones linear-lanceolate, 6-13 cm long; all leaves acute or acuminate, entire, pubescent when young, glandular. Flowers solitary, axillary; pedicel 0.4 cm long, with 2 glands in the axil of bract. Calyx segments 5, unequal, lanceolate-oblong, acuminate. Corolla 2.5-3.6 cm long, pinkish white or tinged with purple, densely pubescent, oblique; limbs 2-lipped; lobes 5. Stamens 4, didynamous; anthers 2 celled. Capsules 2-2.5 cm long, erect, beak short, hispid, becoming 4-celled by formation of false septa, 4 angled. Seeds black or white, compressed, smooth.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (280)
Cultivated oil seed crop and also met as an escape. Collection : 596; Bhopana.
Oil is extracted from seeds. Seeds are used in various preparation & medicines.

83. MARTYNIACEAE

Martynia Linn.
A monotypic genus.


Erect, much-branched, rough annual undershrubs upto 70 cm tall with deep yellow roots, Stem and branches fistular, hairy. Leaves ovate- orbicular, cordate, sub-petiolate, acute or subobtuse, dentate, 8-13 cm long; petiole upto 3 cm long, hairy; fistular. Flowers in axillary upto 6 cm long racemes; bract spathulate, rounded, pinkish, deciduous. Calyx yellowish-white, divided near to the base; segments 4, hairy, unequal. Corolla 4.5-5.5 cm long, pinkish outside, broadly rounded. Fruits hard, green, ovoid, shortly beaked, glandular-pubescent.

Common on waste places and road sides. Collection : 1645; Rohana.
Leaves are given in epilepsy, applied to tuberculous gland of the neck, leaf juice is used as gargle for throat.

84. ACANTHACEAE

1a. Fertile stamens 4:
   2a. Seeds not supported on retinacula......................17. Thunbergia
   2b. Seeds supported on retinacula:
      3a. Anthers 1-celled. Corolla with a
          minute upper lip..................................4. Blepharis
      3b. Anthers 2-celled. Corolla with a well
          developed upper lip:
      4a. Corolla lobes contorted in bud:
         5a. Cells of the capsule 1 or 2 seeded ..........13. Perilepta
         5b. Cells of the capsule 3-seeded:
            6a. Corolla distinctly 2-lipped....................11. Hygrophila
            6b. Corolla distinctly 2- lipped,
equally or sub-equally 5- lobed :

7a. Capsules fusiform, not clavate...........10. Hemigraphis
7b. Capsules clavate, with a sterile
solid stalk like base :

8a. Flowers 1-3 in the axiles of leaves…..6. Dipteracanthus
8b. Flowers in axillary peduncled cymes…..15. Ruellia

4b. Corolla lobes imbricate in bud :

9a. Anterior 2 stamens perfect, exerted,
the other one minute often reduced to
staminode. Corolla 4-8 cm long.................3. Barleria
9b. All stamens perfect, included. Corolla
less than 2 cm long..................................12. Lepidagathis

1b. Fertile stamens 2:

10a. Seeds without retinacula..............................7. Elytraria
10b. Seeds with retinacula :

11a. Anther cells not equally placed.
12b. Cells of the capsules 6-10 seeded.......2. Andrographis

11b. Anther cells unequally placed :

13a. Anther cells without a basal spur :

14a. Placentae separating elastically from
the base of the capsule..............................5. Dicliptera
14b. Placentae remaining attached

to the valves of capsule.........................14. Peristrophe

13b. Both or one of the anther cells with a basal spur :

15a. Inflorescence axillary.........................1. Adhatoda
15b. Inflorescence terminal :

16a. Both cells of the anther with basal
16b. Only one cell of the anther
with a basal spur. Bract broadly

1. Adhatoda Mill.

Ca 20 species; 3 species in India; 1 in MZN.

Diffused, branched, evergreen, shrubs with short internodes upto 1.5 m tall. Stem and branches appressed pubescent in young parts. Leaves petiolate, 10-20 cm long, ovate or elliptic-lanceolate, acuminate, entire; petiole upto 2 cm long. Flowers white with pink or purple stripes in dense axillary peduncled spikes at the end of branches. Bracts leaf like, ovate-elliptic, upto 2 cm long, bracteoles narrowly lanceolate. Capsules 2.5 cm long, clavate; seeds sub-orbicular, rugose.

F1.& Fr. : Nov. - June.
Common on waste places, road sides, along railway line. Collection : 1012; Shukartal.

Roots, leaves and flowers are used in acute bronchitis and cough.

2. Andrographis Wall.

Over 20 species; 18 species in India; 1 in MZN.


Erect, branched or unbranched, annual herbs upto 45 cm tall. Stem and branches sharply 4- angular, ribbed, densely white hairy. Leaves opposite-decussate, sessile, 3-8 cm long, oblong or linear-oblong or obovate, tapering towards the base, obtuse, entire, minutely hairy on nerves. Flowers white, purple-spotted, unilateral in axillary spreading or recurved racemes; rachis gland hairy. Bracts lanceolate. Bracteoles smaller than bracts. Calyx gland-hairy, 0.5-0.7 cm long, elliptic-lanceolate. Corolla 1.2-1.4 cm long, whitish-pink, tube narrow, segments 5. Capsules hairy, elliptic- obovate, short tipped, compressed upto 1.2 cm long; seeds 6-12 glabrous, pitted.

F1.& Fr. : Aug. – Nov.
Common in gardens, road sides, railway sides and waste places. Collection : 602; Morna.

3. Barleria Linn.

Ca 250 species; 26 species in India; 2 in MZN.
1a. Plants unarmed. Flowers blue-purple or pinkish……1. B. cristata
1b. Plants armed. Flowers orange yellow…………2. B. prionitis

Erect or suberect, perennial herbs or undershrubs upto 45 cm tall. Stem much branched from the base, dense appressed hairy, 4- angular. Leaves 6-10 cm long, elliptic-oblong, acute apex, narrowed at base, entire; petiole upto 0.7 cm long. Flowers in axillary and terminal racemes. Bracteoles linear-lanceolate upto 1.2 cm long, acute, margin with distinct teeth. Calyx segments 4, outer pair lanceolate, spinous- toothed, mucronate; inner narrow, acute. Corolla pubescent outside; 3-4 cm long, purple; lobes 5, subequal. Capsules ellipsoid, upto 1.7 cm long, 4- seeded; seeds silky hairy, upto 1.7 cm long.

F1.& Fr. : Oct. – Dec.

Common on river banks, canal sides. Collection : 1917; Ramraj.

Roots and leaves are used to reduce swellings and infusion is given in cough. Seeds are regarded as an antidote for snake bite.


Erect, much-branched, bushy-undershrubs upto 1 m tall; stem grey white, nearly glabrous, armed with 0.4-1.4 cm long spines in groups of 3 or 4 or more at nodes. Leaves 6-9 cm long, elliptic-ovate, acute or acuminate, spine tipped, entire, minutely hairy; petiole upto 0.5 cm long. Flowers orange-yellow in terminal lax, spikes. Bracts leaf-like ending in a bristle. Calyx 1.0-1.5 cm long, spine tipped, 1.2-1.4 cm long; segments 5. Corolla orange-yellow, 2-lipped, funnel-shaped. Capsules 1.6-2.0 cm long with prominent beak, 2-seeded.

F1.& Fr. : Oct. – Feb.

Wild, common on road sides and waste places, also cultivated in gardens. Collection : 2556; Bhokarhedi.

The plant extract and ash of leaves are used in the cure of whooping cough and tuberculosis.

4. **Blepharis** Juss.

Ca 100 species; 5 species in India; 2 in MZN.

1a. Leave petioled, thin, acute……………………………1. **B. maderaspatensis**

1b. Leave subsessile, fleshy, obtuse…………………..2. **B. molluginifolia**

Erect or prostrate or spreading, much-branched, perennial, pubescent herbs. Stem 4-angled. Leaves in whorls of 4, unequal, 3-5 cm long, ovate to elliptic-ovate, tapering towards the base, entire or with distinct teeth, hairy beneath; petiole upto 0.3 cm long. Flowers solitary axillary, 1-4 together, sessile. Bracteoles 8 in opposite pairs, broadly spatulate, upper margins with stiff bristles. Calyx segments 4, unequal, in opposite pairs, lanceolate, acute. Corolla bluish to pinkish – purple, tube cylindrical; limb 2-lipped; lower lip 3-lobed. Stamens didynamous; filaments short, thick. Capsules ellipsoid, upto 1.4 cm long, 2-seeded.

**F1. & Fr.: Sept. – Nov.**

Common in dry localities and waste lands. Collection : 4173; Ailum.


Prostrate, more or less hispid, branched, xerophytic herbs. Leaves sessile or nearly so, in whorls of 4, unequal, fleshy, oblong to obovate, obtuse, mucronate, hairy, pale beneath, 1.0-2.5 cm long. Flowers blue, usually 1-flowered solitary. Bracteoles 10, in opposite pairs. Calyx segments linear-lanceolate, acute, margins membranous. Corolla blue, Capsules included, 0.3-0.4 cm long, ellipsoid, 2-seeded.

**F1. & Fr.: Sept. – Nov.**

Common in dry localities in waste places. Collection : 1856; Ramraj.

**5. Dicliptera** Juss., nom. cons.

Ca 150 species; 8 species in India; 1 in MZN.


Erect, much-branched, herbs upto 40 cm tall. Stem nearly glabrous, angular, rooting below. Leaves 2-6 cm long, elliptic-ovate, rounded or cuneate at base, acute or acuminate, minutely apiculate, subentire, pubescent; petiole 0.5-3.0 cm long. Flowers in terminal and axillary usually sessile clusters; peduncle 0.5-4.5 cm long; bracts upto 1 cm long, obovate or cuneate-elliptic, apiculate, pubescent in unequal pairs, forming a flat margin. Bracteoles lanceolate, hairy, upto 0.7 cm long. Calyx segments 5, unequal, linear-lanceolate, upto 0.5 cm long. Corolla 1.6-1.8 cm long,
pinkish-violet, hairy out side. Stamens 2; anthers 2-celled. Capsules cylindrical, clavate, hairy outside, 0.6 cm long, narrowed into a short stalk; seeds verrucose.


Common in waste places, road sides, along railway lines. Collection : 4153; Ailum.

Very variable in habit, hairiness, size and shape of leaves and bracts and size of corolla.

*D. bupleuroides* Nees is often treated as a distinct species. It is distinguished from this by larger, ovate leaves, linear-lanceolate to oblong, acuminate or cuspidate bracts, and shorter, hairy, eglandular calyx.

6. **Dipteracanthus** Nees *emend* Bremek.

Ca 10 species ; 7 species in India; 1 in MZN.

*D. prostratus* (Poir.) Nees in wall. Pl. As. Rar. 3: 81. 1832; FD. 273; HFD. 381.


Prostrate to decumbent –ascending, stout herbs with woody base upto 50 cm tall. Stem multicauline, 4- angular, hairy when young. Leaves 3-8 cm long, ovate, elliptic, subcordate, entire, deep green above, pale below; petiole 2-3 cm long.

Flowers sub-sessile, solitary, axillary, few together. Bracteoles similar to the leaves but smaller. Calyx 1 cm long, segments 5, lanceolate, ciliate. Corolla pale-purple, hairy on outside, 2.0-2.5 cm long; lobes rounded- suborbicular. Capsules clavate, pointed, pubescent, upto 2 cm long; seeds 16-20.

F1. & Fr. : June. – Dec.

Occurs in dry shady localities, hedges and among bushes. Collection : 2922; Bhopa.

7. **Elytraria** Michx. *nom. cons.*

7 species; 1 species in India ; 1 in MZN.


Erect or decumbent- ascending, perennial, herbs. Rooting below with a somewhat woody base. Stem almost none or upto 4 cm tall. Leaves 8-20 cm long, whorled, obovate, undulate, tapering into a hairy petiole; petiole acuminate 3-4 cm long. Flowers axillary, in 2-4 flowered simple or branched spikes. Bracts ovate, spine-tipped, hairy outside, margin ciliate. Calyx 0.6-0.7 cm long; segments unequal, linear,
ciliate. Corolla purplish or lilac or white, 1.5-2 cm long. Capsules clavate, pubescent, 0.5-0.6 cm long.

F1. & Fr.: March - June.

Common in moist shady places, gardens and canal banks. Collection: 3780; Ramraj. Variable in shape, size of leaves and size of flowers.

8. Eranthemum Linn.

Ca 30 species; 10 species in India; 1 in MZN.


Erect, pubescent, stout, shrubs upto 1.5 cm tall. Leaves shortly petioled, ovate to elliptic, 10-18 cm long, acuminate, margins crenate-dentate, tapering towards base, entire. Flowers blue, in axillary and terminal spikes- forming panicles; peduncles upto 2.5 cm long, 4 angled, glabrous. Bracts ovate with rounded base, acute, dark green veins, nearly glabrous, 1.5-2.0 cm long. Calyx upto 1 cm long divided half way down; segments 5, unequal, lanceolate. Corolla blue, 2-3 cm long; tube narrow; lobes 0.6-0.8 cm long, subequal, rounded-ovate. Stamens 2, inserted in the corolla tube. Capsules upto 5.0 cm long, elliptic, 2-seeded, glabrous.

F1. & Fr.: Nov. - April.

Cultivated in gardens or met as an escape. Collection: 2676; Gordhanpur.

9. Gendarussa. Nees

2 species, 1 in MZN.


Erect, much-branched, perennial, undershrubs or shrubs upto 70 cm tall. Stem and branches angular, glabrous, thickened on green or purple nodes. Leaves 3-8 cm long, lanceolate or linear- lanceolate, narrowed towards base, acuminate, sub-entire, glabrous; petiole upto 0.8 cm long. Flowers in lax axillary and terminal upto 4 cm long hairy spikes; bracts narrow, linear. Calyx 5- partite, 0.5 cm long, hairy; segments 4. Corolla creamy-white tinged with violet, 2-lipped, upto 1.3 cm long. Stamens 2; anthers 2 celled; lower on spurred. Capsules oblong, glabrous.

F1. & Fr.: Jan. - May
Cultivated in gardens as hedge plant or met as one escape also. Collection : 2477; Budhana.

10. Hemigraphis. Nees

Over 25 species; 4 species in India; 1 in MZN.


Prostrate or decumbent- ascending, much-branched, densely hairy, 10-30 cm tall annual herbs. Leaves 1.3-1.8 cm long, broadly-ovate oblong to sub-orbicular, obtuse or subacute at apex, rounded at base, crenate; petiole short 0.1-0.2 cm long. Flowers in few-flowered heads. Bracts upto 1 cm long, elliptic. Calyx 1.2 cm long, green, spathulate. Corolla tubular, 1.2-1.4 cm long, bluish-yellow; lobes 5, obtuse. Stamens 4, didynamous. Capsules upto 1 cm long, linear-oblong, pubescent, 10-12 seeded.

F1.& Fr. : Feb. - June

Common on waste places, along road sides and in gardens.

Collection : 901; Kakroli.


Ca 75 species; 11 species in India; 2 in MZN.

1a. Plants armed. Calyx segment 4, Seeds 4-8..................1. *H. auriculata*

1b. Plants unarmed. Calyx segments 5. Seeds 16 or more........2 *H. polysperma*


Erect, much-branched, upto 1 m tall, perennial herbs. Stem and branches densely hispid. Leaves in whorls of 6; the 2 outer 10-15 cm long; other 4 are 4-5 cm long, all lanceolate-oblong, subacute, entire, spathulate, densely white long hairy, subsessile or with 0.5 cm long petiole; each whorl is subtended by 1.2-3.0 cm long, straight spines. Flowers in many flowered axillary whorls; bracts involucrate, sub 2-seriate, lanceolate, acute, hispid hairy, 1.5-3.0 cm long. Calyx segment 4, unequal,
long ciliate. Corolla upto 3 cm long, pale-purple, 2-lobed, tube 0.8-1.2 cm long, abruptly dilated above. Capsules oblong, glabrous, upto 1.2 cm long, 4-8 seeded.

F1.& Fr. : Sept. – Dec.

Common in the area in ditches, ponds and other waste places along road sides.

Collection : 682; Muzaffarnagar City.


Small, procumbent, herbs. Stems much- branched, creeping and rooting at base, 4-angular, hairy above. Leaves opposite, 1.5-2.5 cm long, sub-sessile, narrowly oblong to ovate, entire, acute or obtuse at apex, higher ones smaller, passing into bracts; petiole short 0.1 cm long. Flowers in interrupted terminal spikes; bracts leafy, ovate hairy; bracteoles linear, hairy. Calyx upto 0.4 cm long; segments 5, linear. Corolla white or purple-pale, upto 0.4 cm long, pubescent, 2-lipped. Fertile stamens 2. Capsules oblong compressed, 4-angular, upto 0.5 cm long, nearly glabrous. Seeds 18 or more.

F1.& Fr. : March – May.

Common in marshy places and river banks. Collection : 83; Muzaffarnagar City.

12. Lepidagathis Willd.

Ca 100 species; 25 species in India; 1 in MZN.

L. hamiltoniana Wall., P1. As. Rar. 3: 96. 1832; FBI. 4: 516; Watt. ED. (under L. cristata var. rupestris) ; FUGP. 2: 203.

Erect, perennial, branched herbs upto 40 cm tall. Stem and branches 4-angular, minutely hairy when young. Leaves 5-8 cm long, linear or narrowly oblong, nearly glabrous, acute at apex, entire, sessile, minutely hairy on nerves beneath. Flowers in dense spikes in glabrous heads arising directly from the base of stem; bracts lanceolate, acuminate spine tipped upto 1 cm long. Calyx 1 cm long, divided near to the base, soft pubescent; segments 5, unequal, oblong, acuminate, 2 anterior ones connate, forming the calyx almost 4-partite. Corolla pinkish white upto 1 cm, hairy outside. Capsules nearly conical, 2-seeded, scarious on back, thin and irregularly rupturing. Seeds covered with long hairs.

F1.& Fr. : Aug. –Dec.
Growing on moist sandy soils. Collection: 3196; Bhopa.

13. **Perilepta** Bremek.

8 species; 2-3 species in India; 1 in MZN.

Often considered as congeneric with *Strobilanthes* Blume


Erect, branched, shrubs upto 2 m tall; branches spreading, 4-angled, glabrous or more or less hairy when young. Leaves sessile, elliptic-lanceolate or ovate-oblong 0.5-2.5 cm long, acuminate, serrulate, often very unequal, pubescent on both surfaces, base auricled. Flowers solitary or terminal, in 8-15 cm long spikes. Calyx segments upto 1 cm long, linear, obtuse, closely hairy. Corolla 2.5 cm long, curved, pale-blue, slightly hairy; lower tubular part 1 cm long, limbs somewhat 2-lipped. Capsules 1 cm long, glabrous, 4-seeded.

F1.& Fr.: July – Nov.

Rare, occurs in waste-shady places. Collection: 2945; Kakroli.

14. **Peristrophe** Nees

Ca 30 species; 8 species in India; 1 in MZN.


Erect, much branched, hairy herbs with 6 angled branches. Leaves 2-8 cm long, ovate, acute or acuminate, rounded at base, entire, hairy on both surfaces; petiole upto 2.5 cm long. Flowers in clusters of 2-8 panicked due to reduction of leaves; bracts in pairs, unequal. Calyx upto 0.6 cm long; segments 5, equal, linear-lanceolate, acuminate. Corolla 1.8-2.0 cm long, pink with purple dotted throat, tube narrow; 2-lipped; upper one entire, oblong; lower lip with 3 minute lobes. Stamens 2. Capsules upto 0.8 cm long, beaked, hairy, narrowed into a stalk.

F1.& Fr.: Sept. – Dec.

Abundant with in the area in waste places, along road sides and gardens. Collection: 3079; Morna.

The plants is regarded as remedy of snake bites.

15. **Ruellia** Linn. *emend*. Bremek.
5 species; 1 species in India; 1 in MZN.

**R. tuberosa** Linn., Sp. P1. 635. 1753; HFD. 392; SFUGP. 209.

Erect, annual, herbs upto 40 cm tall with tuberous roots. Stem and branches angular, nearly glabrous. Leaves 4-8 cm long, elliptic-ovate, subacute, often undulate-crenate, decurrent into a short petiole. Flowers in 1-many flowered axillary or terminal cymes; pedicel 1.5 cm long; bracts linear- spatulate, 0.5 cm long; bracteole 0. Calyx 1.5-2.0 cm long; segments 5, linear, ciliate. Corolla pinkish-violet, upto 5 cm long, hairy outside; lobes 5, rounded, subentire. Capsules 1.8-2.5 cm long, cylindric, oblong, stalked, glabrous with a short beak. Seeds compressed brown.

F1.& Fr. : Aug. – Oct.

Common on road sides, waste lands and in gardens.

Collection : 868, Goharpur.

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**16. Rungia** Nees

Ca 50 species; 13 species in India; 2 in MZN.

1a. Bracts dimorphic. Corolla white with blue lines; upper lip entire....1. **R. pectinata**

1b. Bracts uniform. Corolla violet with purple; upper lip emarginate......2. **R. repens**


Prostrate or procumbent-ascending, annual, much-branched herbs; stem often rooting from base. Lower nodes glabrous or hairy. Leaves upto 3.5 cm long, elliptic or oblong-lanceolate, subacute or obtuse at apex, acute at base, entire, appressed hairy, petiole upto 2 cm long. Flowers in 0.5-1.8 cm long spikes, often 2.3 together at the end of branches; bracts dimorphic, barren one lanceolate, acuminate, with scarious margins; fertile ones orbicular or ovate, acuminate, ciliate. Corolla 0.3 cm long, bluish-violet, 2-lipped; upper lip entire; lower lip 3-lobed. Stamens 2. Capsules upto 0.3 cm long, ovoid, acute, compressed, hairy at apex.

F1.& Fr. : Nov. – Feb.

Common in grassy localities, crop fields and waste lands. Collection : 2829; Jaroda.


Decumbent-ascending, much branched, annual, herbs rooting at nodes upto 30 cm tall. Stem and branches angular, pubescent. Leaves 3-4 cm long, lanceolate to oblong-elliptic, acute at apex, cuneate towards base, entire, nearly glabrous, nearly
sessile. Flowers violet or pinkish in erect, 1.5-6.0 cm long, dense, terminal spikes; bracts broadly elliptic, cuspidate; margins scarious; bracteole linear- lanceolate. Calyx divided near to the base, linear-lanceolate, acuminate. Corolla upto 1 cm long, violet with purple spot, hairy outside. Stamens 2; anthers 2-celled with a white appendage at the base. Capsules 0.5-0.7 cm long, oblong, pubescent. Seeds rugose.

F1. & Fr.: Sept. – Feb.

Common on moist and shady places. Collection: 581; Muzaffarnagar City.

17. Thunbergia Retz. nom. cons.

Ca 200 species; 10 species in India; 1 in MZN.

T. erecta (Benth.) T. Anders. in JLS. 7: 18. 1864; Bor. & Raiz. 107, f. 68, P1. 38, 39; FD. 265; MCP. 919. Meyenia erecta Benth. in Hook. Nigar F1. 476. 1849.

Suberect or scandent, much-branched, upto 1 m tall perennial undershrubs stem and branches angular, glabrous. Leaves 4-6 cm long, ovate or ovate lanceolate, entire, acuminate, rounded-cuneate at base, nearly glabrous, petiole short 0.2-0.5 cm long. Flowers axillary, solitary; pedicels 1.0-1.5 cm long; bracts foliaceous, ovate, acute, 0.8-1.2 cm long, enclosing the calyx. Calyx 0.5-0.8 cm long; limb blue-purple, with yellowish-white curved tube; lobes 5, unequal, rounded. Stamens 4, didynamous, included. Capsules 2.0-2.5 cm long, with large flat beak.

F1. & Fr.: Nov. – Feb.

Cultivated in gardens for flowers. Collection: 3088; Kandhla.

85. VERBENACEAE

1a. Leaves digitate..........................................................11. Vitex

1b. Leaves not digitate:

2a. Flowers sessile, in spikes:

3a. Stamens 2..............................................................8. Stachytarpheta

3b. Stamens 4, didynamous:

4a. Ovaries 2-celled:

5a. Fruits hard, dry; creeping herbs..................7. Phyla

5b. Fruits succulent; shrubs or undershrubs.......5. Lantana

4b. Ovaries 4-celled..................................................10. Verbena

2b. Flowers pedicellate, in racemes, cymes or panicles:

6a. Trees, stamens 5, all equal.................................9. Tectona

6b. Shrubs or undershrubs. Stamens 4, equal or didynamous:
7a. Overies 2- celled........................................................................ 6. Petrea
7b. Overies 4 or 8- celled :

8a. Flowers in panicled cymes. Ovaries 4- celled:

9a. Fruit a drupe with 4- pyrenes or drupets :

10a. Corolla tube slender; durpe exerted, usually succulent............................2. Clerodendrum

10b. Corolla tube widned upwards; drupe dry, included in red coloured calyx..............4. Holmskioldia

9b. Fruit a capsule.....................................................1. Caryopteris

8b. Flowers in racemes; ovaries 4 or 8 celled…3. Duranta

1. Caryopteris Bunge
Ca 15 species; 3 species in India; 1 in MZN.


Erect, aromatic, perennial, undershrubs. Stem and branches densely brown-pubescent when young, 4- angular. Leaves opposite, 5-10 cm long, simple, lanceolate-elliptic with a cuneate or acute base, acuminate, crenate-serrate in the upper part, shortly hairy; petioles upto 1.5 cm long. Flowers in dense cymes combined into terminal leafy panicles; peduncles upto 0.8 cm long, hairy. Calyx 0.4-0.5 cm long, rusty pubescent; stamens shorter than calyx tube, acute, ribbed in fruit. Corolla bluish pink, 2- lipped; tube 0.5 cm long, middle lobe of lower lip longest. Stamens 4, didynamous, long exerted. Capsules globose, hairy, 0.4 cm across, bluish, dehiscent into 4- parts, one pyrene with each.

F1.& Fr. : April. – June
Cultivated in gardens and also met as a wild plant in jungle area. Collection : 720; Muzaffarnagar City.

2. Clerodendrum Linn.
Ca 400 species; 18 species in India; 6 in MZN.

1a. Corolla tube less than 5 cm long :

2a. Calyx much enlarged in fruit and turning red……… 6. C. viscosum

2b. Calyx not or slightly enlarged in fruit, not turning
red:

3a. Flowers in white dichotomous cymes forming a rounded panicle:

4a. Flowers in dichotomous cymes forming a rounded panicle............ 4. C. phlomidis

4b. Flowers in axillary 3-flowered cymes ............................. 3. C. inerme

3b. Flowers not white; Cymes terminal

5a. A climbing shrub. Flowers crimson .................................. 5. C. splendens

5b. An erect shrub. Flowers pink, fragrant............................... 1. C. fragrans

1b Corolla tube more than 5 cm long ......................... 2. C. indicum


Erect, perennial, undershrubs up to 2 m tall with angular, soft pubescent branches. Leaves opposite, 10-15 cm long, broadly ovate, truncate or cordate at the base, acute, coarsely toothed; petiole 4-8 cm long. Flowers pinkish-white in terminal compact corymbs, 4-8 cm across; bracts linear-lanceolate. Calyx 1.0-1.2 cm long, red tinged, glabrous; segments 5, lanceolate, acuminate. Corolla pinkish-white, tube equaling the calyx, narrow; limb 1 cm across; lobes 5, lanceolate, acute. Stamens 4, didynamous, exerted.

F1. & Fr. : Aug. – Nov.

Cultivated in gardens as an ornamental. Collection : 2279; Jansath.


Erect, perennial, glabrous, up to 2 m tall shrubs. Stem and branches ribbed, fistular. Leaves in whorls of 3-5, 10-15 cm long, narrowly lanceolate, tapering at the base, entire, sessile. Flowers in lax up to 10 cm long, terminal panicles; bracts up to 0.7 cm long, linear-lanceolate. Calyx up to 1 cm long, glabrous; segments 5, ovate, acute. Corolla white; tube cylindrical, curved, up to 8 cm long; limb 2 cm across; lobes 5, obovate. Drupes ovoid, blue up to 1 cm long, supported by the enlarged red calyx.

F1. & Fr. : Sept. – Nov.
Common on river bank, jungles, road sides and in gardens. Collection : 524; Muzaffarnagar City.

3. **C. inerme** (Linn.) Gaertn. Fruct. 1: 271. 1788; FBI. 4: 589; SFUGP. 212; FD. 283; HFD. 397.

   Erect, drooping or straggling, perennial undershrubs. Leaves opposite, 2-5 cm long, ovate- elliptic to oblong, obtuse at apex, acute at base, glabrous ; petiole upto 1 cm long. Flowers white axillary, in 1-3 flowered cymes; bracts linear, subulate, glabrous; peduncles 3-5 cm. Calyx companulate, 0.5 cm long, minutely hairy. Corolla white, tube 3.0-3.5 cm long, narrow; limb 1.2-1.4 cm long across; lobes 5, ovate, acute. Stamens 4, didynamous. Drupes pyriform, subtended at the base by accrescent calyx.

F1.& Fr. : July. – Dec.

Cultivated as hedges along gardens. Collection : 1695; Khatauli.


   Large shrubs upto 3 m tall; young parts densely white pubescent. Leaves opposite, 2-4 cm long, ovate, acute or short acuminate at apex, entire or crenate, minutely pubescent petiole 1.0-2.5 cm long. Flowers in terminal, axillary dichotomous cymes, forming terminal panicles; bracts foliaceous, obovate-lanceolate 0.4-0.5 cm long; pedicle slender, 0.6-0.9 cm long. Calyx upto 1.2 cm long, segments 5, triangular, acuminate, Corolla pinkish-white; tube upto 2.3 cm long, pubescent outside; limb upto 1.3 cm across; lobes 5, elliptic, veined. Stamens 4, didynamous. Drupes upto 0.8 cm long, broadly obovoid, black, wrinkled when dry.

F1.& Fr. : Aug. – Feb.

Common on waste places among bushes, hedges. Collection : 719; Muzaffarnagar City.

The roots are used in medicines.


   Large, woody climbing shrubs with 4- angular, glabrous branches. Leaves opposite 10-12 cm long, ovate- oblong – orbicular, acuminate at apex, cordate at base, entire; petiole upto 0.5 cm long. Flowers in dense terminal showy cymes; bracts minute; pedicel 0.8-1.2 cm long. Calyx 0.5 cm long, companulate, purple-red;
segments 5, ovate, acuminate. Corolla crimson, tube narrow, long; lobes 5. Stamens 4, didynamous. Ovary 4-celled, with one ovule in each cell. Drupes black.

F1.& Fr. : Dec. - April

Cultivated in gardens for its gregarious blossoms. Collection : 850; Muzaffarnagar City.


Erect, perennial undershrubs upto 2 m tall with 4- angular stem and branches, densely brown hairy towards apex. Leaves 8-15 cm long, broadly ovate, acuminate at apex, rounded or sub- cordate at base, crenate-dentate, densely brown hairy beneath; petiole upto 4 cm long. Flowers in upto 30 cm long terminal, hairy panicles; bract, lanceolate, 0.3 cm long hairy. Calyx 0.6-0.8 cm long, hairy, enlarged and reddening in fruits; segments 5 obtuse. Corolla white, tinged with red; tube cylindrical, 0.6-0.8 cm long, densely hairy outside; limb upto 1.5 cm across; lobes 5, elliptic, acute. Stamens 4, didynamous exerted. Drupes 4, angular, depressed, tetragonal, enclosed in accrescent calyx. Bluish black when ripe.

F1. : Jan. - April; Fr. : July – Sept.

Common in waste places along road sides, grassy fields among bushes. Collection : 1622; Mansoorpur.
The bark & leaves are used in medicines.

3. Duranta Linn.

Ca 35 species ; 1 in MZN.


Erect, much-branched, bushy shrubs upto 1.5 m tall with spinose branches. Stem and branches nearly glabrous. Leaves in whorls, obovate, elliptic or lanceolate, obtuse or acute at apex, cuneate at base, glabrous, upto 5.2 cm long. Flowers in axillary and terminal upto 8 cm long racemes, nearly sessile; bracts subulate, hairy. Calyx tubular, hairy; segments minute, linear-lanceolate. Corolla blue, 1.0-1.2 cm long; limb with unequal obtuse lobes. Stamens 4, didynamous, included. Berries globose, upto 0.4 cm across, orange when ripe, with 4 pyrenes.

F1.& Fr. : Majore part of the year.
Cultivated as a hedge plant in gardens. Collection: 1800; Mirapur.


Ca 10 species; 1 speceis in India; 1 in MZN.


Large, straggling perennial shrubs upto 3-5 m tall, stem and branches obscurely 4-angled, minutely-hairy. Leaves opposite, 8-12 cm long, ovate, obtuse or acuminate at apex, crenate, subcordate at base, hairy; petiole 1.5-2.0 cm long. Flowers reddish-orange, in axillary or terminal pediceled cymes; pedicel upto 0.6 cm long. Calyx obconical, upto 1 cm long, pubescent; segments minute, red-orange, obtuse. Corolla 2.0-2.2 cm long, cylindric, 2-lipped; tube curved, bright red; limb 5-lobed; lobes unequal. Drupes obovoid, 4 lobed at the apex, 0.6-0.7 cm long. Seeds 1-4, oblong.

F1. & Fr. : Nov. - April

Cultivated in gardens or rarely met as an escape among bushes. Collection: 2553; Bhopa

5. Lantana Linn.

Ca 150 species; 8 species in India; 2 in MZN.

1b Flowers orange, yellow or red. Plants armed with recurved prickles……………………………………. 1. L. camara

1b Flowers white. Plants unarmed. …………………. 2. L. indica


Erect or straggling upto 1.5 m tall, aromatic shrubs with minute prickles on branches. Stem 4- gonous. Leaves opposite, ovate, 3-7 cm long, acuminate at apex, rounded at base, crenate-dentate, glandular hairy especially on nerves beneath; petiole upto 3.5 cm long. Flowers vary in colour in long peduncled capitates spikes; bracts hairy, exceeding the calyx. Calyx small, truncate, hairy outside. Corolla tube 0.6-0.8 cm long, slender; limb 0.4 cm across, 4-lobed; lobes rounded. Stamens 4, didynamous, included. Drupes globose, 0.2-0.3 cm across, with 2-seeded pyrenes.


Common within the area in waste places, road-sides or cultivated as hedge plant. Collection: 316; Bhopa.

Erect or scandent, 1.5-2.5 m tall, much branched, woody shrubs. Stem and branches 4-angular, hairy. Leaves 3-7 cm long, broadly ovate, acute or short acuminate, crenate-serrate, minutely hairy, especially on nerves beneath; petiole upto 1 cm long. Flowers in axillary, peduncled, 1-2 cm long spikes or close heads, enlarging in fruits; peduncle 3-8 cm long, usually in opposite axils, 4-angled; bracts ovate, long acuminate, hairy. Calyx membranous, nearly truncate, hairy. Corolla limb 0.8 cm across, purple-orange, tube 0.5 cm long; lobes 4, obtuse. Drupes enclosed in thin transparent calyx, subglobose, small, with 2 one seeded pyrenes.


Common in the area in scrub forests. Collection : 2327, Oon.


Ca 30 species ; 1 in MZN.

**P. volubilis** Linn., Sp. P1. 626. 1753; FUGP. 2: 229; FD. 277.

Large, much branched, woody climbers. Stem bark ash-coloured, lenticellate. Leaves 5-15 cm long, opposite, scabrous, entire. Flowers bluish-pale or pale-violet, star-shaped, in terminal, long racemes. Calyx large, petaloid, 5-lobed.

F1. & Fr. : Oct. - April

Cultivated in gardens along walls and poles. Collection : 838; Muzaffarnagar City.


Ca 10 species; 1 species in India; 1 in MZN.


Creeping perennials, much-branched, rooting at nodes, stem and branches obscurely 4-angular, appressed hairy. Leaves 1-3 cm long, obovate-spathulate, decurrent at base, obtuse at apex, sharply dentate-serrate in upper half, minutely hairy; petiole short. Flowers pale-pink, small, sessile, numerous in dense globose, long peduncled axillary heads; bract ovate, long acuminate, membranous, 2-lobed, hairy outside. Corolla pale-pink or white, 0.2-0.3 cm long, 2-lipped; upper lip 2-fid; lower lip 3 lobed. Drupes small, 0.2 cm across, separating into 2, one seeded pyrenes; seeds plano-convex, brown.

F1. & Fr. : April – Aug.
Abundant within the area in moist and grassy localities. Collection : 897; Kairana. The whole plant is used in indigenous medicines as cooling diuretic, febrifuge, stoppage of bowels, pain in knee joints and boils.

8. **Stachytarpheta** Vahl. *nom. cons.*

Ca 100 species; 3 species in India; 1 in MZN.


Erect, glabrous, upto 1 m tall shrubs or undershrubs, Branches 4-angular suberec, nearly glabrous. Leaves opposite, ovate or elliptic-ovate, acute at apex attenuate towards, the base into long petiole, serrate-dentate, membranous, glabrous. Flowers in upto 25 cm long. Calyx tubular, upto 0.5 cm long; segments 5, minute, unequal. Corolla dark-blue, upto 1 cm long, tube narrow; limb 0.6 cm across; lobes 4, obovate-rounded, spreading. Stamens 4, didynamous. Drupes oblong, glabrous.

F1. & Fr. : July – Nov.

Cultivated in gardens for its beautiful flowers. Collection : 2188; Heend.

9. **Tectona** Linn. *f. nom. cons.*

Probably 3 species; 1 species in India; 1 in MZN.


Large, woody, deciduous, trees upto 40 m tall; bark light brown; branch- lets 4-angular, tomentose. Leaves opposite 30-50 x 25-30 cm , gradually being smaller and terminating into bracts, ovate- obovate, entire cuneate at base, acute or acuminate, coriaceous, glabrous above, soft tomentose beneath; petiole 3-5 cm long; flattened. Flowers creamy-white in large d i or tri-chotomously branched terminal paincles. Calyx enlarging and covering the fruit; segments 0.2 cm long, subequal. Corolla white, limb of 6 equal lobes. Stamens 6, adanate to corolla base. Drupes subglobose, upto 1.4 cm across, hairy, 4-celled, 1-4 seeded, densely hairy.

F1. : Aug.–Oct.; Fr. : Nov. - March

Cultivated in the area. Collection : 660; Muzaffarnagar City.

The wood is largely used in furniture.

10. **Verbena** Linn.

Ca 250 species; 2 in MZN.
1b Prostrate herbs. Leaves dissected into filiform-linear segments. Flowers lilac-purple ............ 1. *V. bipinnatifida*

1b Erect or decumbent herbs. Leaves pinnate partite.
Flowers pale-pink........................................ 2. *V. officinalis*

1. *V. bipinnatifida* Schau. in DC. Prodr. 11. 553. 1847; MCP. 840; FD. 278; SFUGP. 215.

Prostrate or decumbent-ascending, much-branched annual herbs. Stem and branches 4-angular, minutely pubescent. Leaves 2-4.5 cm long, pinnati-partite-fid; segments linear-lanceolate, acute; petiole upto 0.8 cm long. Flowers in upto 15 cm long terminal spikes; bracts linear-lanceolate, upto 0.5 cm long. Calyx 0.8 cm long, tubular; segments 5, linear. Corolla upto 2 cm long, blue; limbs 5 lobed, spreading. Fruits of 4, oblong, 0.2 cm long pyrenes.
Cultivated in gardens for beautifying landscapes. Collection: 93; Muzaffarnagar City.


Erect or ascending, upto 50 cm tall, more or less pubescent annual-perennial herbs; stem and branches 4 angular. Leaves subsessile, ovate or obovate-oblong or pinnate-partite upto 3.5 cm long; segments oblong-lanceolate, serrate, hairy on nerves beneath. Flowers in dense, upto 2.5 cm long terminal spikes, combined into panicles; bracts small, ovate, acute, hairy. Calyx tubular, pubescent; segments 5, minute. Corolla white or lilac, upto 0.4 cm long; limb 2-lipped; lobes 5, spreading. Fruits included in calyx, upto 0.2 cm long, separating into 4, oblong pyrenes.
F1. & Fr. : July–Dec.
Common along road sides and waste places, canal banks. Collection: 835; Muzaffarnagar City.

11. Vitex. Linn.

Ca 250 species; 13 species in India; 1 in MZN.


Erect, perennial, upto 2.5 m tall shrubs. Stem and branched 4-angular, densely white tomentose. Leaves pinnately compound, 3-foliate, rachis upto 5 cm. long, tomentose; leaflets lanceolate, acuminate, acute at base, entire, glabrous, above, densely grey tomentose beneath, 4-cm long; lateral ones smaller and nearly sessile;
terminal one largest. Flowers in terminal, compound, upto 15 cm long panicles. Calyx segments 5 upto 0.3 cm long, covered with grey tomentose. Corolla upto 0.4 cm long, bluish-white; limb spreading, 2 lipped, 5-lobed; middle lobe of lower lip longest. Drupes nearly globose, 0.25 cm across, glabrous, black on maturity.

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

Common with in the area along waste places and also planted in gardens. Collection: 2607; Gordhanpur.

The leaves are used in joint inflamations.

Following species are also cultivated as ornamentals.

1. *Callicarpa macrophylla* Vahl.

86. **LAMIACEAE**

1a. Calyx 5-partite................................................................. 2. *Colebrookea*
1b. Calyx not 5-partite:

2a. Calyx equally dentate or lobed:

3a. Corolla sub 2 lipped or 4 lobed:

4a. Staminal filaments glabrous. Anthers 1-celled..........................

7. *Mentha*

4b. Staminal filaments patently hairy. Anthers 2-celled..................

13. *Pogostemon*

3b. Corolla distinctly 2-lipped:

5a. Calyx-lobes filiform-subulate............ 4. *Hyptis*

5b. Calyx-lobes otherwise:

6a. Flowers in 1-3 flowered verticillasters. Leaves less than 1 cm long................

8. *Micromeria*

6b. Flowers in few to many-flowered verticillasters.

Leaves more than 1 cm long:

7a. Calyx-lobes obovate-oblong. Upper lip of corolla hooded:
8a. Calyx 8 to 10 toothed;
   Teeth spinescent............  5. Leonotis
8b. Calyx 5-lobed;
   Segments obovate-oblong....................  14. Raylea
7b. Calyx lobes linear-
   Lanceolate. Upper lip of corolla not hooded.....  1. Anisomeles

2b. Calyx unequally denate or 2-lipped:

9a. Calyx lobes usually 6-10 ....................  6. Leucas
9b. Calyx lobes 5 or rarely less than 5:

10a. Fertile stamens 2 ....................  15. Salvia
10b. Fertile stamens 4:

11a. Lower lip of corolla 3-lobed.

   Stamens suberect or ascending:

12a. Calyx with entire lips;
   upper lip with a dorsal,
   concave scale like appendage.............  16. Scutellaria
12b. Calyx with lobed or dentate lips; upper lip without a dorsal appendage..............  9. Nepeta

11b. Lower lip of corolla entire

   Stamens Declinate:

13a. Lower lip of corolla concave, navicular:

14a. Filaments free….  12. Plactranthus
14b. Filaments connate at base...........  3. Coleus

13b. Lower lip of corolla flat:

15a. Stigma 2-fid…..  10. Ocimum
15b. Stigma entire… **11. Orthosiphon**

**1. Anisomeles** R.Br.

7 species; 3 species in India; 1 in MZN.


Erect, branched, densely pubescent, shrubs upto 1.5 m tall. Stem 4-angular. Leaves 4-10 cm long, ovate, acute, crenate-serrate, hairy; petiole upto 6 cm long hairy. Verticillasters few-many flowered, forming a dense combined spike. Bracts linear-spathulate, upto 1 cm long. Calyx hairy, gland-dotted, 1cm long. Corolla bluish-purple 1.5-2.0 cm long; upper lip 0.6 cm long, oblong; lower one much longer, deeply 2-fid. Nutlets 4, ovoid, polished, shining black when mature.


Common on waste-places, road sides, railway sides. Collection : 2653; Gordhdanpur. Species is variable in size and shape of leaves, hairiness and numbers of flowers per verticillaster.

**2. Colebrookea** Smith

A monotypic genus.


Erect, aromatic, much-branched, pubescent-villous, perennial shrubs upto 2 m tall. Stem and branches, 4-angular, grooved, pubescent. Leaves crowded towards the ends of branches, opposite or in whorles of 3, elliptic-oblong or ovate, crenate-serrate, softly hairy on both sides, 8-18 cm long, acuminate at apex, acute at base; petiole upto 2.5 m long, tomentose. Flowers small, whitish in dense, many flowered, verticillasters combined into tomentose panicles. Bracts linear-subulate, ciliate. Calyx densely tomentose; teeth minute; segments 5. Corolla white; tube minute; lobes rounded. Nutlet usually 1, obovoid, hairy at top.

F1. & Fr. : Jan. – May.

Common grows along railway-lines and road sides. Collection : 2046; Shamli. The wood is used for gun-powder charcoal and the leaves are applied on wounds.

**3. Coleus** Lour.
Ca 150 species; 8 species in India; 1 in MZN.

**C. blumei** Benth. in Wall. P1. As. Rar. 2: 15. 1831, Bailey, MCP. 864.

Erect, annual, branched, upto 50 cm tall herbs. Stem and branches soft pubescent, 4-angular. Leaves variable in size, narrowed or broad at base, ovate, acuminate at apex, serrate, variously coloured, membranous, pubescent on nerves beneath; petiole 3 cm long, pubescent. Verticillaster many-flowered, arranged in long panicles; bracts foliaceous, ovate, acuminate, 0.7 cm long. Calyx campanulate, minute, 2-lobed. Corolla whitish-blue, longer than the calyx. Upper lip 3 or 4 fid lower lip entire. Stamens 4, didynamous, slightly exerted; filaments connate at the base. Nutlets ovoid of ovoid-oblong.

F1. & Fr. : Major part of the year.

Collection : 2150; Heend.

**4. Hyptis** Jacq. *nom. cons.*

Ca 400 species; 4 species in India; 1 in MZN.


Erect, aromatic, upto 1.25 m tall annual herbs, densely hairy. Stem and branches 4-angular. Leaves 3-10 cm long, ovate or ovate-lanceolate, obtuse or acute at apex, cordate at base, serrate to dentate, hairy on both sides; petiole upto 2 cm long. Flowers in 1-5 flowered verticillaster; peduncles upto 1 cm long, hairy; bracts 0.2-0.3 cm long. Calyx prominently 10 ribbed; teeth 5 linear. Corolla blue, upto 0.5 cm long, distinctly 2-lipped. Stamens 4, didynamous. Nutlets generally 2-4, notched at the apex, compressed, ovoid, oblong.

F1. & Fr. : April – Dec.

Common on canal banks, river banks and in gardens Collection : 4130; Oon.

Plants are used in parasitical cutaneous diseases.

**5. Leonotis** R.Br.

Ca 40 species; 2 species in India; 1 in MZN.


Erect, annual, upto 2 m tall herbs with 4-angled, stout, puberulous stem. Leaves 3-8 cm long, ovate, acute at apex, cuneate-truncate at base, serrate,
membranous, puberulous on both surfaces; petiole 2-6 cm long, winged above. Flowers arranged in axillary, dense globose whorls; bracts 1-1.5 cm long, deflexed, spine-pointed. Calyx 1.5-1.8 cm long, ribbed, villous, mouth oblique. Corolla blue; tube 1.0-1.2 cm long, hairy in upper part; upper lip 1-1.2 cm long, woolly; lower lip 0.4 cm long. Nutlets 4, 0.4 cm long, obliquely truncate.

F1. & Fr. : July. – Oct.

Common on river banks, road sides and among bushes. Collection : 690; Jaroda.


Ca 110 species; Ca 40 species India; 3 in MZN.

1a. Mouth of calyx splits above; lower lip much prolonged......................................... 3. L. urticaefolia

1b. Mouth of calyx projecting forward above :

2a. Flowers in large, subglobose, terminal Whorls; mouth of calyx hairy within.................. 2. L. cephalotes

2b. Flowers in both axillary and terminal whorls; mouth of calyx glabrous within............... 1. L. aspera


Erect or diffused, much-branched annual herbs upto 40 cm tall. Stem and branches 4-angular, spercely pubescent. Leaves subsessile 2-6 cm long, linear-oblong, obtuse at apex, entire or crenate, tapering towards base, minutely pubescent; petiole only upto 0.5 cm long. Verticillaster terminal and axillary, of many sessile flowers, 1.0-1.5 cm across; bracts linear-lanceolate, bristles tipped, long ciliate on lower part. Calyx bristle tipped, 10 nerved, nearly glabrous in lower part; tube curved; mouth oblique. Corolla white upto 1 cm long; tube hairy above, annulate within; upper lip 0.3 cm long, densely white woolly; lower one longer than upper. Nutlets oblong, smooth, brown.

F1. & Fr. : Aug. – Feb.

Common weed of cultivated fields, gardens and in shady pleces. Collection : 1593; Mansoorpur.

Erect, rough-hairy, annual herbs upto 70 cm tall. Stem and branches obtusely angular. Leaves lanceolate-oblong, or ovate-lanceolate, subobtuse at apex crenate-serrate, tapering at base, hairy; petiole short upto 0.5 cm long. Verticillasters dense, globose, 3-5 cm across, terminal; bracts involucrate, foliaceous, acuminate, ciliate. Calyx tubular, slightly curved, 1.0-1.2 cm long, 10-ribbed, hairy in upper part, oblique at mouth; teeth 10, sub-equal, narrowly triangular-subulate. Corolla 1.5-1.8 cm long, tube annulate within, upper lip 0.4 cm long, white woolly; lower lip longer, 3-lobed. Nutlets obovoid-oblong, 0.3 cm long, smooth, brown.


Common in the area in cultivated and fellow-fields, Collection : 2107; Thanabhawan. The plants are used in indigenous medicines.


Erect, diffused, hairy annual herbs. Leaves 2-5 cm long, ovate, acute, serrate, rounded at the base; petiole upto 2.5 cm long. Flowers in dense, globose, up to 2.5 cm across, in whorls. Bracts shortly stalked, upto 2 cm long, narrowly lanceolate, ciliate. Calyx 2.0-2.5 cm long, cylindric, mouth very oblique, 10 toothed, membranous. Corolla white, tube 0.5 cm long; upper lip villous outside. Nutlets obovoid-oblong, 3-gonous, obliquely truncate and glandular at apex, smooth, brown.

F1. & Fr. : Nov. – Feb.

Common in and along cultivated fields, in sandy soils. Collection : 3631; Titawi.

7. **Mentha** Linn.

Ca 25 species; 6 species in India; 2 in MZN.

1a. Flowers pale-purple, in lax-interrupted spikes..... **1. M. piperita**

1b. Flowers white, in dense interrupted spike........ **2. M. spicata**


Erect, ascending with subterraneous stolons, strongly aromatic perennial herbs. Leaves 2-5 cm long, ovate-lanceolate, acute at apex, rounded at base, serrate, glabrous, gland-dotted; petiole 0.5-0.8 cm long. Flowers pale-purple, in many-flowered verticillaster combind into 10-20 cm long terminal interrupted
inflorescence; pedicel short upto 0.2 cm long. Calyx glabrous, 13-nerved, teeth 5. Corolla pinkish-purple, 0.4 cm long, lobes, lobes 4, gland-punctate. Stamens 4, didynamous. Stigma 2-fid. Nutlets minute.

F1. & Fr. : June – Oct.
Rare on Ganga canal banks. Collection : 556; Chitora.
Peppermint oil is obtained, used extensively for flavouring, in pharmacy and in medicines.


Ascending, aromatic, perennial, glabrous herbs, perenating by leafy stotons. Leaves subsessile, 4-5 cm long, ovate-lanceolate, sharply serrate. Flowers white in narrow, dense interrupted 5-7 cm long spikes.
F1. & Fr. : April. – June.
Cultivated in the area in kitchen gardens for its aromatic leaves. Collection : 2763; Muzaffarnagar City.
The leaves are used for culinary and medicinal purpose.


Over 100 species; 3 species in India; 1 in MZN.


Erect-ascending, pubescent, aromatic, perennial herbs. Stems several from base, simple or branched, short hairy. Leaves 0.5-1.0 cm long, ovate-lanceolate, rounded, subcordate base, subacute apex, margins thick, glabrous. Flowers pinkish in verticillaster; bracts subulate; pedicel small 0.3 cm long. Calyx 0.5 cm long, short-hairy, 13-ribbed, teeth subulate, ciliate. Corolla pinkish, hairy outside 1-1.3 cm long. Stamens exerted. Nutlets reddish-brown, smooth, glabrous, small.
F1. & Fr. : Sept. – March.
Occasionally found on river and canal banks among bushes. Collection : 2089; Thanabhawan.

9. Nepeta Linn.

Over 250 species; 35 species in India; 2 in MZN.
1a. Verticillasters few-flowered, combined into a lax panicle.................................................. 1. N. graciliflora

1b. Verticillasters many-flowered, combined into an interrupted, racemes-like inflorescence .......... 2. N. hindostana


Erect, annual, glabrous or pubescent, herbs. Leaves long-petioled, ovate or ovate-cordate, acute, 2-4 cm long, coarsely crenate or serrate; petiole 2.0-2.5 cm long. Flowers pale-lilac, verticillasters few-flowered, often drooping panicles with very slender branches; bracts setaceous. Upper calyx teeth triangular-lanceolate, awned; lower ones setaceous. Corolla pale-lilac or rose coloured. Nutlets mintue, oblong, granulate.

F1. & Fr. : Feb. – April.

Rarely occurs in the area on river and canal banks in grassy and bushy patches. Collection : 2981; Ramraj.


Erect or ascending, pubescent annual herbs upto 40 cm tall. Leaves 2.0-4.5 cm long, ovate or orbicular, cordate, crenate, obtuse; petiole upto 3 cm long. Flowers bluish-purple, in axillary, dense, many-flowered cymes forming interrupted spike like racemes; bracts linear. Calyx sub-2-lipped, villous, 15- nerved. Corolla bluish or pinkish with a purple-dotted throat, hairy outside, 0.7-0.8 cm long. Nutlets brown, granulate, oblong.

F1. & Fr. : Oct. - June

Abundant in grassy, crop fields, shady places, road sides, railway line sides and canal banks. Collection : 1863; Jansath.

10. Ocimum Linn.

Ca 150 species; 6 species in India; 4 in MZN.

1a. Pedicel shorter than calyx :

2a. Bracts stalked, shorter than the calyx. The two lower calyx teeth longer than the upper lip :

3a. Corolla 0.4-0.5 cm long...................... 2. O. canum
1. O. basilicum

2b. Corolla 0.7-0.8 cm long .................. 1. O. basilicum

2b. Bracts sessile, longer than the calyx. The two lower calyx teeth minute.................... 3. O. gratissimum

2b. Pedicel as long as or longer than the calyx ..... 4. O. sanctum


Erect, much branched, strongly aromatic, herbs upto 70 cm tall. Stem and branches purple. Leaves 3-7 cm long, ovate-lanceolate, entire, base cuneate, acute apex. Flowers whitish-pink or purplish in whorls on simple or branched racemes; bracts stalked, shorter than the calyx. Calyx 0.4 cm long first, afterwards 0.5-0.8 cm long, hairy outside, glabrous inside; upper lip ovate-rounded, lower one 4-dentate. Corolla white or pale purple; tube 0.3 cm long. Nutlets oblong-ellipsoid, dark-brown. F1. & Fr.: Major part of the year.

Cultivated in gardens and also met as an escape also. Collection: 170; Muzaffarnagar City.

The plant in strongly aromatic and is used as an flavouring ingredient. The seeds are used in medicines.


Erect, much-branched, glandular-pubescent, annual herbs; upto 30 tall. Leaves 2.5-4.5 cm long, elliptic-oblong to elliptic-lanceolate or rhomboid, entire, or serrate, acute at apex, rounded-cuneate at base; petiole 0.8-1.5 cm long. Flowers pale-violet or purplish-white, in interrupted whorls on an erect, 5-15 cm long, lax inflorescence; bracts stalked, elliptic-lanceolate, ciliate. Calyx 0.3 cm long, pubescent; upper lip rounded, flat, mucronate; lower lip with two central awned teeth longer than the two lateral ones. Corolla white, 0.5 cm long; upper lip broadly oblong, 4-toothed; lower lip entire, obtuse. Fruiting calyx upto 3 cm long. Nutlets ellipsoid, black. F1. & Fr.: July – Nov.

Common in open grassy localitites, waste places, river, road and canal sides. Collection : 595; Khatauli.

Erect, much-branched up to 1.5 m tall perennial shrubs. Stem and branches 4-angular, pubescent. Leaves 5-10 cm long, elliptic-ovate or elliptic-lanceolate, acute or acuminate at apex, cuneate at base, coarsely crenate or serrate in upper part, pubescent and gland dotted on both sides; petiole up to 5 cm long. Verticillasters few-flowered, combined into 8-12 cm long terminal racemes; bracts sessile, longer than calyx, ovate, acuminate. Calyx elongating in fruit, pubescent; upper lip longer than lower one, rounded or curved upwards in fruits; lower lip strongly nerved. Corolla greenish-yellow, 0.4 cm long, hairy outside; upper lip 0.3 cm broad, with 4-rounded teeth; lower lip lower and narrower. Nutlets subglobose, brown, rugose.

F1. & Fr.: Sept.–Dec.

Cultivated in gardens and also met along road sides, and in waste-places. Collection: 3721; Ramraj.

The leaves and seeds are used in medicines for cough and cold.


Erect, branched, up to 50 cm tall, strongly aromatic annual-perennial herbs. Stem subterete, clothed with soft spreading hairs. Leaves 3-5 cm long, oblong or elliptic-oblong, entire or sub serrate, subrounded at base, hairy on both sides; petiole up to 2 cm long. Flowers 5 or 6 in verticillasters arranged in 10-18 cm long racemes; pedicel longer than the calyx; bracts broadly ovate or cordate ovate, acuminate, ciliate. Calyx up to 0.4 cm long, elongating in fruit; upper lip much reflexed, broadly obovate, apiculate; lower are exceeding the upper, with 4-teeth. Corolla purplish-pink, 0.4 cm long; upper lip hairy on the back. Nutlets broadly ellipsoid, smooth, yellow, dotted with black.

F1. & Fr.: Nov.–Feb.

Cultivated in gardens, also met as an escape. Collection: 2932; Bhopa.

Used in bronchitis and gastric disorders of children.

11. *Orthosiphon* Benth.

Ca 50 species; 10 species in India; 1 in MZN.


Erect, diffused, low herbs. Leaves petioled, 1.5-2.5 cm long, ovate, coarsely serrate or crenate, glabrous, cuneate base, peltolate. Flowers white, verticillaster...
arranged in erect lax racemes, whorls distinct, 6-flowered. Calyx 0.3-0.4 cm long, enlarging and deflexed in fruit. Style entire. Nutlets subglobose, smooth, brown.

F1. & Fr. : July–Sept.

Rare within the area in sandy soils. Collection : 2619; Podawali.


Ca 250. Species; 30 species in India; 1 in MZN.


Suberect or climbing, strongly aromatic, perennial, undershrubs upto 1.5 cm tall. Stem 4-angular, pubescent hairy. Leaves opposite, 2-10 cm long, ovate or ovate-lanceolate, crenate or sharply toothed, acute, softly pubescent above, white tomentose beneath, tapering at base. Flowers bluish, in many short cymes arranged in long axillary and terminal pubescent panicled racemes; bracts subulate. Corolla hairy outside; tube decurved; upper lip obscurely lobed, lower on large, boat-shaped. Nutlets broadly ellipsoid or suborbicular, smooth, yellow.


Common on river bank jungles and waste lands among bushes. Collection : 2925; Lachhera.

13. Pogostemon Desf.

Ca 40 species; 26 species in India; 1 in MZN.


Erect, aromatic, branched undershrubs upto 1.3m tall. Stem tinged with purple, densely grey-tomentose when yound. Leaves 5-10 cm long, ovate-lanceolate, cuneate or acute base, doubly serrate, glabrous except slightly pubescent beneath; petiole 2-5 cm long. Flowers in dense verticillaster, crowded in 3-8 cm long cylindrical spikes forming large terminal panicles; bracts floiaceous, 0.6-0.8 cm long; ovate, acute, soft, hairy; bracteole purple, linear-lanceolate. Calyx glandular-pubescent; teeth 5, nearly equal. Corolla 0.7 cm long, white, tinged with pinked; tube
0.2 cm long, curved; limb 2-lipped; upper lip longer than lower, 3 lobed; lower short, obtuse, entire. Nutlets minute, ellipsoid, smooth, dark-brown, shining.

F1. & Fr.: Feb. – May.

Common along revines, railway lines and road-sides. Collection: 3593; Bahadurpur.


Probably monotypic genus.


Erect, much branched herbs with grey bark, upto 1.2 m tall, branches glandular, terete, pale-brown, finely tomentose. Leaves, ovate-elliptic to rhomboid, acute or acuminate at apex, deeply crenate or lobed, finely tomentose beneath, base cuneate; petiole 3-5 cm long. Flowers in verticillasters, combined into axillary and terminal 15-18 cm long pubescent racemes; bracts lanceolate 0.5-0.6 cm long; pedicel 0.2-0.3 cm long glandular pubescent. Calyx 0.4-0.5 cm long, hairy outside, ribbed; limb 2-lipped. Corolla white, 0.4 cm long, hairy outside. Nutlets ovoid, reddish-brown, glabrous.

F1. & Fr.: July – Nov.

Rare on canal and river banks. Collection: 2295; Jansath.

15. *Salvia* Linn.

Ca 700 species; 24 species in India; 2 in MZN.

1a. Corolla crimson or red, 3-4 cm long. Stems patently long – hairy and appressedly short hairy ............

1b. Corolla white, 0.4-0.5 cm long. Stems retrorsely scabridly hairy........................................


Erect, often branched from base, strongly aromatic, annual herbs. Stem sulcate, often purple-tinged, clothed with patent hairs. Leaves ovate-triangular, crenate, serrate, densely pubescent beneath; petiole 2-5 cm long. Verticillasters 4-15 flowered, forming interrupted racemes; bracts ovate-lanceolate, upto 1.5 cm long. Calyx green, 13-nerved, short hairy. Corolla bright crimson or red, hairy outside, 3-4 cm long. Nutlets ovoid-oblong, smooth, glabrous, 0.3 cm long.
F1. & Fr. : Major part of the year.
Cultivated in gardens and also met in wild conditions among bushes. Collection : 253; Muzaffarnagar City.


  Erect, roughly pubescent, annual-biennial herbs. Stem and branches 4-angular, grooved. Leaves 3-6 cm long, oblong-lanceolate, obtuse or subacute, creante, glabrous or slightly hairy, base acute or often decurrent. Verticillaster 4-6 flowered, combined into racemes forming panicles; bracts ovate-lanceolate. Calyx 2-lipped, glandular hairy; upper lip shortly 3-dentate. Corolla 0.4-0.5 cm long; upper lip retuse. Nutlets minute, ovoid, smooth, glabrous.
F1. & Fr. : Major part of the year.
Common on sandy localities, river and canal banks. Collection : 2856; Jaroda.

16. **Scutellaria** Linn.

Ca 300 species; 17 species in India; 1 in MZN.

**S. repens** Buch.–Ham. ex D. Don, Prodr. 110, 1825; FBI. 4: 669; FUGP. 2: 246; HFD. 420.

  Erect or diffused, pubescent or tomentose herbs with 4-angular stem and branches. Branches crowded, ascending. Leaves petioled, ovate, acute or truncate base, lower ones usually crenate-serrate; uppers entire, 2.5 cm long; petiole 1.3 cm long. Flowers upto 2 cm long, arranged in, glandular hairy racemes. Corolla dull yellow, usually tinged with purple, sharply recurved. Nutlets faintly subgranulate.
F1. & Fr. : July. – Oct.
Rare on cannal banks among bushes. Collection : 4067; Shamli.

87. **PLANTAGINACEAE**

**Plantago** Linn.

Ca 265 species; 10 species in India; 1 in MZN.

**P. major** Linn., Sp. Pl. 112. 1753; FBI. 4: 705; FUGP. 2: 261; FD. 291; HFD. 422. *P. ispaghula* Roxb., F1. Ind. 1: 404, 1832.

  Erect, nearly glabrous, perennial herbs with a short stout rhizome. Leaves in basal rosette, oblong-ovate or elliptic, obtuse or acute at apex, tapering and decurrent towards base, subentire, toothed, glabrous, 6-14 cm long; petiole winged with a sheathing base, 5-7 cm long. Flowers in 8-15 cm long, cylindrical terete spikes; bracts
ovate, acuminate, scarious margin, equaling or shorter than the clayx. Calyx 0.3 cm long, glabrous, divided near to the base, segments 4, ovate-belong, obtuse, keeled on the back. Corolla 0.4 cm long, pale-white, glabrous; lobes 4, ovate acute, reflexed. Capsules 2 celled, 0.3-0.4 cm long, ovate, glabrous, splitting transversely near to the base. Seeds 8-16, minute, angled, dull black.

F1. & Fr. : July, – Nov.

Common along water sides and gardens. Collection : 1409; Kairana.

The seeds are used in medicines as a substitute for *Plantago ovata*, an auravedic medicine.

88. NYCTAGINACEAE

1a. Scendent or struggling, thorny shrubs. Bracts large, Coloured………………………………………………………… 2. *Bougainvillea*

1b. Erect or diffused herbs. Bracts not coloured :

2a. Flowers small in heads of umbels. Bract minute……………………………………………………………………………… 1. *Boerhavia*

2b. Flowers showy in a calyx-like involucres ...... 3. *Mirabilis*

1. *Boerhavia* Linn.

Ca 50 species; 8 species in India; 2 in MZN.

1a. Leaves in unequal pairs. Flowers subcaspitate ………………………………………………… 1 *B. diffusa*

1b. Leaves in nearly equal pairs. Flowers in umbela ...... 2. *B. repanda*


Erect or decumbent ascending perennial herbs upto 6.0 cm tall. Leaves 15-3.5 cm long, arranged in unequal pairs, broad-ovate to sub-orbicular, glabrous; petiole upto 1.5 cm long. Flowers pink, sub-capitate, 4-8 together in axillary and terminal panicles; peduncles 1-4 cm long; bracts minute, ovate, acuminate. Perianth pinkish-purple, 0.3 cm long, constricted below the middle, gland hairy below; limb 0.2 cm across; lobes 5. Fruits 0.3-0.5 cm long, club-shaped, with rounded apex, viscid-pubescent, with 5 smooth ribs.

F1. & Fr. : Major part of the year.
Abundant within the area in waste-places, road-sides, open-fields, and old walls. Collection: 2414; Kairana. The whole plant is used in jaundice, gonorrhoea and as diuretic. The roots are used for cure of skin inflammation and the leaves are eaten by poor people as pot-hurb.


   Diffused, subscandent, glabrous or pubescent annual herbs upto 60 cm tall. Leaves opposite, in nearly equal pairs, triangular-ovate, acute or acuminate at apex, subcordate or truncate at base, 1.5-3.5 cm long, glabrous above, minutely pubescent beneath; upper ones smaller; petiole 1.0-2.5 cm long. Flowers in axillary, 3-6 flowered umbel; peduncle slender 3-10 cm long; bracts minute, lanceolate, acute. Perianth pinkish upto 1 cm long; tube narrow at base, widening upwards; limb 0.6-0.8 cm across; lobes 5, notched. Fruits 0.5-0.6 cm long, clavate, obscurely ribbed, rough with glandular projections.

F1. & Fr. : June. – Nov.

Common along road sides and waste places, especially in hedges and among bushes. Collection: 635; Purkaji.

2. **Bougainvillea** Comm. ex Juss. cons. Spach. nom. cons.

   Ca 15 species; 2 in MZN.

1a. Perianth tube more or less pubescent; leaves and stem subglabrous………………………………………………... 1. **B. glabra**

1b. Perianth tube densely pubescent; leaves and stems pubescent……………………………………………………… 2. **B. spectabilis**

1. **B. glabra** Choisy in DC. Prodr. 13(2): 437. 1849; MCP. 358; FUGP. 3: 4; FD. 292.

   Scandent or straggling, glabrous or thinly hairy, much branched shrubs with straight spines. Leaves 4-7 cm long, oblong-lanceolate or ovate-oblong to broad-ovate, acuminate at apex, entire, rounded at base with 3-4 cm long petiole. Flowers scattered on long leafy branches; bracts large, bright purple or variously coloured. Perianth tube glabrous or slightly pubescent.

F1. & Fr. : Through-out the year.

Cultivated in gardens or on road sides. Collection: 49; Muzaffarnagar City.


   Woody, scandent or straggling large shrubs. Stem and branches soft pubescent, terete. Spines upto 0.5 cm long. Leaves alternate, oblong- lanceolate or
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

oblong-ovate, acute at apex, rounded or cuneate at base, entire, thick, 2-6 cm long; petiole 0.5-0.8 cm long. Flowers in clusters at the end of branches, yellow or variously coloured, bracts 3, large showy, coloured, exceeding the flowers. Perianth tube densely pubescent, 0.5-0.8 cm long.

F1. & Fr. : Major part of the year.
Planted in gardens and on road sides. Collection : 3232; Banat.

3. Mirabilis Linn.

Ca 70 species; 4 species in India ; 1 in MZN.

M. jalapa Linn., Sp. P1. 177; 1753; FUGP. 3; MCP. 358; FD. 292; HFD. 424.
Vern. Gulbansh.

Erect of diffused, much branched, upto 1 m tall herbs. Stem and branches minutely hairy, swollen at nodes. Roots tuberous. Leaves opposite, ovate, acute at apex, subcordate at base, 2-8 cm long, entire, glabrous; petiole upto 3.5 cm long. Flowers solitary in a calyx like involucre, variously coloured, white, red or yellow; tube 2.5-4 cm long; limb spreading; lobes 5. Stamens 5, exerted; filaments unequal, united at base; style filiform; stigma capitate. Fruits leathery, ribbed.

F1. & Fr. : March – Oct.
Cultivated in gardens as an ornamental and also met on waste places along railway lines. Collection : 595; Purkaji.

MONOCHLAMYDEAE

89. AMARANTHACEAE

1a. Leaves opposite :

2a. Anthers I-celled :

3a. Flowers in axillary clustered heads........... 3. Alternanthera

3b. Flowers in ovoid terminal heads ............. 7. Gomphrena

2b. Anthers 2-celled :

4a. Staminode absent....................................... 8. Pupalia

4b. Stamens with interposed staminodes ...... 1. Achyranthes

1b. Leaves alternate :

5a. Staminodes present................................. 2. Aerva

5b. Staminode absent :
6a. Filaments united below in membranous cup...............................5. *Celosia*

6b. Filaments free, hypogynous:

7a. Flowers bisexual, pink..................6. *Digera*

7b. Flowers unisexual or polygamous not pink ..................................4. *Amaranthus*

1. **Achyranthes** Linn.

Ca 100 species; 4 species in India; 2 in MZN.

1a. Leaves thick, leathery, not long pointed; spikes robust, upto 50 cm long...............................1. *A. aspera*

1b. Leaves thin membranous, narrowed and long slender pointed; spikes slender, rarerly more than 12.5 cm long...............................2. *A. bidentata*

1. **A. aspera** Linn., Sp. P1. 204. 1753; FBI. 4: 730; FUGP. 3: 19; FD. 299; HFD. 426.

Vern. *Chirchita, Latjira.*

Erect, simple or branched, stiff, annual-perennial herbs. Stem often-tinged with reddish purple, ribbed, pubescent. Leaves variable, 3-9 cm long, opposite, elliptic- obovate or suborbicular, acute or acuminate at apex, cuneate or rounded at base, glabrous to pubescent; petiole upto 2 cm long. Flowers greenish-white or with pinkish ting, sharply deflexed against the pubescent axis, in terminal spikes, rachis hairy. Bracts and bracteoles subequal, ovate, spinosecent. Tepals 5, unequal, greenish, ovate-lanceolate, sharp acute. Utricles oblong-cylindric.

F1. & Fr. : Major part of the year.

Common on waste places, gardens, road sides. Collection: 1; Muzaffarnagar City.
The plant is considered to be an antidote for the poison of snakes and scorpions.

2. **A. bidentata** Bl., Bijdr. 545. 1825; FBI. 4: 730; SFUGP. 230; HFD. 426.

Erect, ascending, slender, annual-perennial herbs. Stem 4-angular, somewhat flaccid; glabrous or appressed or patently hairy. Leaves 6-14 cm long, elliptic-oblong or ovate-lanceolate, rounded or cuneate at base, acuminate at apex, subentire, thinly hairy; petiole 1-4 cm long. Spikes axillary and terminal, 5-30 cm long; rachis hairy; bracts ovate, acuminate; bracteoles 0.3-0.4 cm long. Tepals subequal, lanceolate, shortly acute. Pseudo- staminodes truncate, sharply dentate. Utricles upto 0.2-0.3 cm long.

Rarely occurring in shady, sandy places. Collection: 1815; Ramraj.


Ca 20 species; 7 species in India; 3 in MZN.

1a. Stigma entire, capitate, not bifid ................. 2. A. sanguinolenta

1b. Stigma bifid:

2a. Flowers unisexual.............................. 3. A. tomentosa

2b. Flowers bisexual.............................. 1. A. lanata


Erect or diffused or prostrate herbs or undershrubs up to 45 cm tall. Branches many from stout woody base, soft pubescent. Leaves alternate, 1.3 cm long, elliptic obovate, obtuse or acute at apex, entire, dense pubescent beneath; petiole short. Flowers 1 or 2 sexual, in small, dense, axillary spikes, crowded into clusters, sessile greenish-white; bracteoles ovate, apiculate, hairy. Tepals 5, oblong, obtuse, apiculate, hairy on back. Stamens 5. Utricles ovoid, acute; seeds black, shining.

F1. & Fr. : June – Dec.

Common among bushes and road sides, waste places and canal banks. Collection: 3712; Mirapur.


Erect or straggling herbs or undershrubs. Stem terete, hairy towards the apex. Leaves alternate, or opposite, 2-6 cm long, elliptic-ovate to lanceolate, acute or mucronate at apex, narrowed towards the base, appressed hairy; petiole up to 1 cm long. Flowers silvery white, bisexual, in dense axillary spikes; spikes densely tomentose, solitary fascicled, combined into a lax panicles, 1-3 cm long; bracts and bracteoles ovate, mucronate, hairy outside, minute. Stamens 5. Utricles broadly ovate, acute, 0.1 cm long. Seeds black, minute, shining.

F1. & Fr. : Nov. – April

Common in sandy areas and near canal and river banks. Collection: 322; Shukartal.

Erect, densely wooly tomentose somewhat woody undershrubs. Leaves 5-7 cm long, sessile or subsessile, linear-lanceolate, acute or obtuse apex, atenulated at base, densely tomentose on both subface. Flowers 1-sexual, sessile, white in leafless cylindridcal spikes forming, 1.5-5 cm long panicles; bracteoles broadly ovate, acute, white. Perianth 5-lobed, lobes elliptic, oblong, subobtuse. Fruits orbicular-ovoid utricle.

F1. & Fr. : Oct. - June

Common in khaddar area, on canal banks and among bushes. Collection : 3580; Bahadurpur.

3. Alternanthera Forsk.

Ca 200 species; 6 species in India; 3 in MZN.

1a Leaves suborbicular; tepals spine tipped stamens 5...

1b Leaves linear-oblong or spathulate; tepals not spine tipped. Stamen 3:

2a. Tepals with cuspidate hairs at the base ............

2b. Tepals with out hairs at base......................

1. A. ficoides (Linn.) R. Br. ex Roem & Schult., Syst. 5: 555. 1819; SFUGP. 230; HFD. 427 (excl. syn. Gomphrena polygonoides Linn. and A. polygonoides R. Br.);


Erect, prostrate or decumbent, perennial herbs upto 30 cm tall, rooting at lower nodes. Leaves opposite, in subequal pairs, 1-4 cm long, oblong-ovate, acute or obtuse at apex, nearly glabrous. Flowers in dense axillary spikes, 2-5 flowers together; bracts and bracteoles unequal, ovate, acuminate. Tepals 5, unequal, ovate-lanceolate, nearly glabrous, 0.3-0.4 cm long, 3-nerved. Utricles winged, obcordate, included in perianth.

F1. & Fr. : Throughout the year.

Common on waste places among bushes, canal banks, river banks, road sides. Collection : 909; Kairana.


Illecebrum achyranthes Linn. Sp. Pl. (ed. 2) 299. 1762. Alternanthera repens (Linn.)


Prostrate, spreading herbs, rooting at lower nodes, upto 40 cm tall, hairy. Leaves opposite, 1.5-3.5 cm long, elliptic-obovate or sub-orbicular, mucronate
narrowed towards base into a short petiole, minutely hairy beneath. Flowers in axillary heads, sessile, much compressed; bracts and bracteoles scarious with spinous awns. Perianth becoming spiny in fruits, tepals 5, unequal. Stamens 5, minute, united at base. Utricles enclosed by perianth, truncate; seeds minute, round brown.

F1. & Fr. : June – Dec.

Common within the area on dry localities, waste-places and road sides. Collection : 2892; Jaroda.


Prostrate, spreading or decumbent-ascending, glabrous herbs, rooting at nodes, much branched from base, thickened and hairy at nodes. Leaves opposite in equal-pairs, 2-4 cm long, lanceolate-oblong to linear oblong, tapering towards the base, obtuse at apex, subentire; petiole upto 0.5 cm long. Flowers white, in axillary, 2-4 flowered, globose, or oblong heads; bracts and bracteoles subequal, ovate, acuminate, tinged with purple. Utricles obcordate, notched at apex, thickened on margins, small; seeds suborbicular, reddish-brown.

F1. & Fr. : June - Nov

Common within the area in marshy and swampy places. Collection : 1535; Jaroda.

The whole plant in used in medicines for as febrifuge and lactagogue.

4. **Amaranthus** Linn.

Ca 60 species; Ca 20 species in India; 5 in MZN.

1a. Utricles indehiscent or bursting irregularly. Tepals

3. Bracts shorter than tepals ..............................

5. **A. viridis**

1b. Utricles corrugated. Tepals mostly 5 or rarely 3.

Bracts as long as or longer than the tepals :

2a. Tepals 3, awned (long-acuminate) .................

4. **A. tricolor**

2b. Tepals 5, not prominently awned, mucronate :

3a. Flower-clusters mostly axillary. Bracts

not longer than tepals .................................

3.A. **spinosus**

3b. Flowers-clusters combined into terminal

or axillary spikes or panicles. Bracts
longer than the tepals:

4a. Panicles erect or nodding only in their upper halves. Bracts considerably longer than the tepals…………………2. A. cruentus

4b. Panicles drooping from the base. Bracts slightly longer than the tepals………………………..1. A. caudatus


Erect, simple or branched in upper part, annual herbs. Stem obtuse angular, tinged with purple, glabrous or thinly hairy towards apex. Leaves 5-20 cm long, ovate to ovate-oblong, obtuse or rounded at the apex, attenuate at base; petiole 3-15 cm long. Flower clusters in drooping, terminal and axillary spikes or panicles. Bracts acicular, slightly longer than the obovate, mucronate tepals. Utricles circumsessile.


Common on road sides, gardens, grassy fields. Collection : 4111; Bharsi.

Grains are used as food.


Tall, robust, branched annual herbs. Leaves 4-12 cm long, ovate or ovate-oblong to ovate-lanceolate, acute apex, cuneate at base, subentire, tinged with purple; petiole upto 6 cm long. Flowers reddish-green or yellowish in clustered terminal or axillary dense spikes forming panicles with the central spike longest; bracts ovate acuminate, 0.2-0.3 cm long. Male flowers : tepals 5, red ; stamens 5. Female flowers : perianth as in the male, stigma 3. Utricle small, 0.2-0.3 cm long, ovoid, narrowed at the apex.

F1. & Fr. : Oct. – Nov.

Cultivated for seeds with rainy season crops and also met as an escape. Collection : 2352; Shamli.

The seeds are used vairbusly in the kitchen.

Erect or ascending, much-branched, spinous, annual-perennial herbs. Stem terete, glabrous; spines straight, divaricate, 1.0-2.5 cm long. Leaves alternate, 3 -6 cm long, ovate- lanceolate to oblong, obtuse or retuse, mucronate, acute and decurrent at base, glabrous; petiole 2-8 cm long. Flowers in dense clusters, axillary to terminal, interrupted spikes; bracts and bracteoles mucronate from a broad base. Male flowers in lower part and female in upper part. Male flowers : tepals 5, equal, lanceolate-oblong, mucronate, stamens 5, rarely 3. Female flowers : tepals minute, stigma 2 or 3. Utricles ovoid, rugose, compressed, with 3- lobed apex; seeds minutely reticulate, black, shining.

F1. & Fr. : June – Nov.

Abundant within the area on waste places, road sides, and cultivated fields. Collection : 2901; Kakroli.


Erect, diffused, branched, glabrous annual herbs upto 40 cm tall. Leaves 3-8 cm long, variable in shape, and size, alternate, ovate rhomboid to elliptic-ovate, obtuse or acute at apex, cuneate with decurrent base; petiole 1-3 cm long. Flowers in dense; lower ones axillary; higher ones in spikes; bracts and tepals acute, or awned. Utriles ovoid, rugose, circumsessile. Seeds lenticular, black, biconvex, shining.

F1. & Fr. : Sept. – Feb.

Occurring on waste places and fields. Collection : 2330; Oon.


Erect, much-branched, glabrous annual herbs upto 0.5 m tall. Leaves alternate, 2-8 cm long, ovate to deltoid-ovate or rhomboid-oblong, with round-cuneate base, acute or obtuse apex, subentire, glabrous; petiole 2-5 cm long. Flowers in axillary clusters, forming dense spikes or panicles; bracts ovate, acute, membranous. Tepal 3,
F1. & Fr. : June. – Nov.
Cultivated within the area in gardens and also met as an escape on waste-places. Collection : 163; Muzaffarnagar City.

5. **Celosia** Linn.

Ca 60 species; 4 species in India; 2 in MZN.

- 1a. Spikes unbranched, pale-pink, dense.......................... **1. C. argentea**
- 1b. Spikes branched, forming a cock’s comb, red or yellow.................................................. **2. C. cristata**


Erect, glabrous, annual, much-branched herbs upto 1 m tall. Leaves alternate, 3-9 cm long, linear to ovate-lanceolate, tapering at ends. Flowers pinkish or white, in terminal, dense, conical to oblong, 3-10 cm long, spikes; peduncle 4-10 cm long; bracts and bracteoles subequal, ovate-lanceolate, mucronate, 0.3-0.6 cm long. Tepals 5, nearly equal, ovate- lanceolate, upto 1 cm long, pink or white. Stamens 5. Utricles obovoid, 0.4 cm long; seeds black, shining, minute.
F1. & Fr. : Sept. – Nov.
Common on waste-places, gardens, crop fields. Collection : 2019; Shamli.
Stem and twigs are used as vegetable by poor people and seeds are used in medicines.


Erect, much branched, glabrous, annual herbs upto 80 cm tall. Leaves linear to ovate-lanceolate. Inflorescence of usually fascinated and crest-like divisions of the branched spikes forming cock’s comb, pink, crimson or yellow. Stigma bifid.
F1. & Fr. : Nov. – March.
Commonly cultivated for ornamental purpose in gardens and also met as on escape on waste-places near gardens. Collection : 118; Muzaffarnagar City.

6. **Digera** Forsk.

2 species; 1 species in India; 1 in MZN.


Erect-ascending, branched from the base, upto 40 cm tall, annual herbs. Stem ribbed, nearly glabrous. Leaves variable, alternate, 2-6 cm long, ovate or elliptic or lanceolate, base cuneate or rounded, apex acute, entire, glabrous; petiole very short. Flowers pink, bisexual, in axillary, ascending 3-20 cm long in many flowered racemes; bracts ovate-oblong, acute. Tepals 5, upto 0.5 cm long, pink, subequal; outer free, 5-7 nerved; inner 1-2 nerved. Fruits compressed, globose, with 2-dentate apex, upto 0.2 cm long, muricate.

F1. & Fr. : Aug. – Nov.

Common weed of rainy crops and on waste places. Collection : 647; Purkaji.

**7. Gomphrena** Linn.

Over 100 species; 3 species in India; 1 in MZN.


Erect or prostrate or decumbent or porocumbent annual-perennial herbs, upto 30 cm tall. Stems and branches densely covered with spreading long hairs. Leaves opposite, 2.0-4.5 cm long, sessile or subsessile, spatulate or oblong-lanceolate, acute at apex, hairy on both sides. Flowers white, in sessile ovoid, head like terminal spikes upto 3 cm long; rachis woolly hairy; bracts ovate, acute. Tepals 5, lanceolate, mucronate, upto 0.5 cm long, outer 3 white woolly in lower part; inner 2 greenish woolly. Staminal tube 5-fid. Utricles enclosed in hardened parianth. Seeds compressed, reddish-brown.

F1. & Fr. : March – Oct.

Common on dry and waste-places. Collection : 2966; Ramraj.


Ca 10 species, 3 species in India; 1 in MZN.


Erect, branched, woolly, undershrubs upto 60 cm tall. Stem and branches suberect, thickened at nodes. Leaves alternate, 4-8 cm long, ovate to oblong-lanceolate, acute or acuminate at apex, rounded at base, entire, hairy on both surfaces;
petiole up to 2.5 cm long. Flowers in axillary and terminal long spikes, 6-20 cm long, with 2 or 3 female flowers and several sterile ones, at maturity the flowers reduced to hooded awns. Bracts ovate, acuminate, villous. Tepals 5, up to 0.5 cm long, slightly connate below, lanceolate-acuminate, 3-nerved, white-woolly. Utricles membranous, oblong, narrowed towards the apex. Seeds black, minute, ellipsoid compressed.
F1. & Fr.: Aug. – Nov.
Common on road sides, river banks and among hedges and bushes. Collection: 1572; Khatauli.

90. CHENOPODIACEAE

1a. Utricles enclosed in a capsule like bracted body........... 2. Spinacia
1b Utricles not enclosed:
   2a. Leaves flat, not fleshy........................................... 1. Chenopodium
   2b. Leaves half-terete, fleshy......................................... 3. Suaeda

1. Chenopodium Linn.
Ca 150 species; 7 species in India; 3 in MZN.

1a. Plants strongly smelling, ovaries, fruits and undersurfaces of leaves glandular............ 2. C. ambrosioides
1b. Plants not smelling, ovaries, fruits and leaves not glandular:
   2a. Seeds smooth, shining........................................... 1. C. album
   2b. Seeds rugose, dull black................................. 3. C. murale


Erect, up to 40 cm tall, annual, white pubescent branched herbs. Stem angular. Leaves alternate, variable in shape and size, 1-8 cm long, oblong, lanceolate, toothed or lobed, rounded at apex, cuneate or decurrent at base, membranous; petiole equal or longer than blade. Flowers greenish in terminal and axillary cluster forming compact, panicled spikes. Tepals 5, connate at base, oblong, lanceolate. Fruits depressed, globose, seeds smooth, shining.
F1. & Fr.: Nov.-March
Common weed of winter season crops and on waste-places. Collection: 2557; Bhopa.
The leaves and young twigs are used as vegetable and various others preparations.

Erect, much-branched, strongly aromatic, upto 1.5 m tall annual-perennial woolly pubescent herbs. Leaves alternate, 4-10 cm long, lanceolate-oblong or elliptic, subacute or obtuse at apex, narrowed into a short petiole at base, serrate-dentate, minutely hairy, higher ones smaller passing into bracts. Flower in axillary clusters, forming interrupted spikes of leafy panicles. Tepals 5, greenish, connate at base, ovate-rounded, acute or subobtuse, gland-dotted and hairy outside. Stamens 3-5. Fruits closely surrounded with tepals, membranous. Seeds smooth, shining, brownish-black.

F1. & Fr. : April. – Sept.
Common in waste places, undisturbed moist sides near gardens and canal banks. Collection : 1878; Thanabhwan.


Erect, glabrous, annual, branched herbs upto 45 cm tall. Stem and branches ribbed. Leaves alternate, 3-8 cm long, rhomboid or deltoid-ovate, obtuse or acute at apex, cuneate at base, irregularly toothed or lobed; petiole upto 1.5 cm long. Flowers greenish, clustered in dense or lax terminal leafless racemes or panicles. Tepals 5, oblong, green, minutely keeled, closing over the utricle. Stamens 5. Stigma 2. Seeds orbicular, compressed, reddish-brown.

F1. & Fr. : Dec. – March.
Common on waste-places, road sides, sides of canal and stream. Collection : 1911; Mirapur.

2. **Spinacia** Linn.

3 species; 1 in India; 1 in MZN.


Erect, glabrous, annual simple or branched herbs. Stem angular, ribbed, glabrous. Leaves lower and basal long petioled, narrow-oblong or ovate-oblong, obtuse or acute at apex, entire, soft; higher ones smaller, becoming lanceolate in inflorescence. Flowers unisexual. Male in leafless spikes or panicles; females in clusters in the axils. Tepals 5, ovate, obtuse. Stames 5. Utricles enclosed in tubercled capsule like body.

F1. & Fr. : March- June.
Cultivated in gardens and fields for its leaves. Collection: 2541; Shamli.
Leaves are cooked as vegetable.


Ca 100 species; 4 species in India; 1 in MZN.


Erect, annual, branched herbs up to 40 cm tall. Branches slender. Leaves 1-3 cm long, linear-oblong, fleshy, subacute at apex. Floral leaves very small. Flowers in subglobose clusters forming slender lax long spikes; bracteoles membranous, ovate, entire. Perianth minute; segments 5, rounded, covering the utricles. Stigma 2, slender.

Seeds ovoid or suborbicular, black, shining.

F1. & Fr.: March – June.

Common on river and canal banks. Collection: 3758; Ramraj.

Other cultivated species:

*Beta vulgaris* Linn. LN. Chukander. Also cultivated for its fleshy roots in the area.

*Kochia scoparia* Schrad. Cultivated as pot herb in gardens and lawns in summer season.

91. **BASELLACEAE**

**Basella** Linn.

6 species; 3 species in India; 1 in MZN.


Large, climbing, fleshy, much-branched, perennial herbs. Stem and branches tinged with red, glabrous. Leaves broadly ovate or suborbicular, acute or acuminate at apex, 1.5-3.5 cm long, cordate at base, thick, entire, glabrous; petiole 2.0-5.0 cm long. Flowers sessile, in lax axillary peduncled 2-10 cm long spikes. Bracts apiculate; bracteole oblong, obtuse, longer than perianth. Tepals 5, white or red, connate in lower half, remaining closed. Utricles black, 0.3 cm across.

F1. & Fr.: Sept. – Feb.

Cultivated in gardens. Collection: 1850; Mirapur.

Whole plant used as vegetable.

92. **POLYGONACEAE**
1a. Climbing Shrubs…………………………………… 1. Antigonon

1b Herbs or shrubs, not climbers :
   
   2a. Perianth 4-5 merous; segments not toothed ;
       stigma capitellate………………………………… 2. Polygonum

   2b. Perianth whorls 2; each 3-merous; inner
       segments enlarged and toothed or comb-shaped; stigmas fimbriate………………… 3. Rumex

1. Antigonon Endl.

8 species; 1 in MZN.


Climbing, large, perennial shrubs. Branches angular. Leaves variable in size 2.5-8.0 cm long, alternate, hastate-ovate to triangular-ovate, cordate base, subacute; petiole upto 3 cm long, upper ones much smaller. Flowers bright-pink in axillary racemes terminating into simple or 3-fid tendrils. Perianth lobes 5, petaloid, enlarging in fruit; outer 3 ovate, acute; inner two oblong, lanceolate, stamens 8. Achenes conical, 3-angled, upto 1 cm long.

F1. & Fr. : Nov. – March.

Cultivated in gardens along poles and walls. Collection : 85; Muzaffarnagar City.

2. Polygonum Linn.

Ca 300 species; 80 species in India; 7 in MZN.

1a. Flowers 1-5 in axillary clusters :

   2a. Internodes long………………………………… 6. P. plebeium

   2b. Internodes short………………………………… 7. P. plebeium var. griffithii

1b. Flowers in terminal racemes, spikelets of capitates or elongated racemes :

   3a. Nutlets biconvex………………………………… 3. P. glabrum

   3b. Nutlets 3- gonous :

      4a. Racemes filiform; braacts distinct :

         5a. Ochrcea short ciliate or eciliate.

         Stems eglandular. ....................... 4. P. hydropiper

         5b. Ochrcea long ciliate. Stems
glandular………………………….. 5. *P. hydropiper*

subsp. microcarpum

4b.  Racemes stout; bracts closely imbricate :

6a  Leaf-base usually rounded or
subcordate………………………… 2. *P. barbatum*

subsp. gracile

6b  Leaf-base acute, narrowed. .......... 1. *P. barbatum*

subsp. barbatum

1. **P. barbatum** Linn., Sp. P1. 362. 1753; FBI. 5: 37; FUGP. 3: 36. subsp. **barbatum**


Erect, annual perennial, herbs upto 60 cm tall. Stem glabrous downwards, appressed hairy upwards, thickened at nodes. Leaves alternate, 7-15 cm long, lanceolate-oblong, acute or acuminate at apex, acute at base, minutely hairy above, densely appressed long hairy beneath, entire-ciliate margins; petiole short 0.2 cm long; ochreae 1-2.5 cm long, densely hairy. Flowers in dense spikes forming terminal panicles; peduncles 2-3.5 cm long; bracts closely imbricate, glabrous. Perianth white, 0.3 cm long, divided more than half-way down; tepals 4, oblong-rounded. Stamens 5-8, minutely exerted. Nuts ovoid-ellipsoid 0.2 cm across, sharply 3-4 gonous, brown.

F1. & Fr. : Aug. - April

Abundant within the area in moist and shady places. Collection : 1030; Shukartal.


Creeping-ascending, annual perennial glabrous herbs upto 60 cm tall. Leaves lanceolate-oblong, acute or acuminate at apex, rounded at base, entire, glabrous except on nerves-beneath, ciliate on margins, 3-15 cm long on short upto 0.2 cm long petiole; ochreae upto 1.5 cm long, appressed hairy with 1-2 cm long cilia. Flowers in terminal dense spikes combined into terminal panicles; peduncle 1.5-4.0 cm long, glabrous; bracts closely imbricate, glabrous, ciliate at apex. Perianth upto 0.3 cm long, white, divided near to the base; tepals obovate-rounded, glabrous. Stamens 5-8, styles 3, connate below. Nutlets dark-brown, granulate, 3-4 gonous.
Common on marshy places, near ponds, ditches, canal and river banks. Collection : 956; Jaroda.
Vern. *Nali*.
Erect, glabrous, stout annual herbs. Stem procumbent below, red tinged. Leaves 7-15 cm long, lanceolate, acuminate, glandular-punctate, tapering at the base, glabrous; petiole upto 1 cm long. Stipules 2.5-3.5 cm long, embracing the stem, eciliate. Flowers pinkish in erect, slender racemes forming a terminal panicle. Bracts glabrous, eciliate, ovate, obtuse. Perianth 0.3-0.5 cm long, pink, eglandular; segments ovate-oblong, obtuse. Stamens 5-8. Styles 2 rarely 3, connate below. Nutlets 0.3 cm across, sub-orbicular, biconvex, brown.
F1. & Fr. : Sept. – April
Very common within the area near canal, river banks and marshy places. Collection : 244; Rampur.
Erect or decumbent, annual herbs. Stem tinged with pink, rooting at lower nodes. Leaves sessile or subsessile, 5-10 cm long, lanceolate or oblong lanceolate, glabrous, acuminate at base. Stipules 1-1.5 cm long, eglandular, shortly ciliate. Flowers pink, in decurved, filform racemes. Bracts glabrous or shortly ciliate. Perianth very glandular. Nutlets trigonous, opaque, shining.
F1. & Fr. : Sept. – March.
Common on pond banks, moist and shady places, ditches and canal sides. Collection : 52; Muzaffarnagar City.
Erect-ascending, with creeping base, annual herbs. Stem glabrous, gland-dotted. Leaves 3-8 cm long, ovate-lanceolate or oblong, acuminate at apex, narrowed towards the base, glabrous except hairy on midrib beneath, gland-dotted, nearly sessile; ochreae 1.0-1.5 cm long, glabrous, truncate mouth and 0.2 cm long cilia at mouth. Flowers in pseudo-spikes, decurved in upper part; bracts glabrous, glandular.
Perianth very glandular, pinkish-white, 0.3 cm long; segments ovate-rounded. Stamens 8. Nutlets 3-gonous, granulate, minutely rugose.

F1. & Fr. : Aug. – March.

Common within the area in ditches and ponds. Collection : 1665; Rohana.


Prostrate, diffusely branched glabrous, herbs, often with a woody rootstock. Leaves 10-20 cm long, oblong, linear or obovate, obtuse or rounded at the apex, narrowed towards the base, entire, nearly sessile; ochreae membranous, irregularly lacerate to the middle, fimbriate, with obscure nerves, up to 0.3 cm long. Flowers pink axillary, 1-3; pedicel minute or none. Perianth pink, up to 0.3 cm long, divided near to the base, tepals 4, broad, rounded. Nutlets 3-gonous, shining black.

F1. & Fr. : Aug. – April.

A very variable species, abundant within the area in waste moist places, ravine and canal banks, pond sides and grassy fields. Collection : 802; Muzaffarnagar City.


It differs from the type in having very short internodes, excessively branched in all directions from a woody rootstock. Internodes almost hidden by the crowded leaves and stipules giving a white villous look. Flowers sessile, nearly concealed by stipules.

F1. & Fr. : July. – Feb.

Common in the moist, shady localitites, waste places, road sides and along canal banks. Collection : 2751; Sujaru.

3. **Rumex** Linn.

Ca 200 species; 15 species in India; 2 in MZN.


Inner fruiting tepals ovate-triangular, dentate, green. .................................................. **1. R. dentatus**

1b. Perennial herbs. Flowers polygamous. Leaves not hastate. Inner fruiting tepals orbicular, entire, pink. ................................................................. **2. R. hastatus**


Erect, much-branched, annual herbs upto 50 cm tall, glabrous with grooved, fistuler, red-tinged stem. Leaves alternate; lower 2-10 cm long, long petioled, oblong, cordate-truncate at base, obtuse or rounded at apex; upper ones short petioled, smaller lanceolate-oblong, cuneate-rounded at base; stipules hyaline; ochreae 0.3-0.6 cm long. Flowers in short, dense whorls arranged into leafy panicles; pedicel upto 0.5 cm long. Perianth biseriate, 3 in each whorls, much enlarged in fruit, prominently dentate with numerous straight teeth. Stamens 6. Styles 3. Nutlet 3-gonous, brown.

F1. & Fr. : Jan. – June.
Common within the area long water bodies and marshy places. Collection : 2271; Jansath.
The roots yield a dye.

2. *R. hastatus* D. Don, Prodr. 74. 1825; FBI. 5: 60; FUGP. 3: 42; HFD. 446. Vern. *Chulmora.*

Erect, much-branched, glabrous herbs with woody base, upto 60 cm tall. Stem and branches angular. Leaves alternate, 2-5 cm long, triangular-hastate, acute at apex, more or less fleshy, punctate; higher ones linear-lanceolate to oblong. Flowers polygamous, pink, in whorls combined into panicles. Perianth in 2- whorls, each of 3 tepals; outer obovate-rounded; inner rounded-orbicular, pink entire, 0.4 cm across. Stamens 6. Styles 3. Nutlets 3-quetrous, narrowly winged, 0.2 cm long.

F1. & Fr. : Jan. – June.
Occurs on moist and damp, shady places. Collection : 2670; Gordhanpur.
Other cultivated plants.

*Muehlenbeckia platyclada* (Muell.) Meissn. MCP. 351.

A glabrous branched shrub. Planted in gardens.

F1. : Aug. – Nov.
Collection : 2723; Mirapur.


Erect, annual glabrous herbs. Rarely planted in gardens for ornamental purpose and leaves are cooked as vegetable.

F1. & Fr. : Dec. - March
Collection : 717; Muzaffarnagar City.
93. ARISTOLOCHIACEAE

Aristolochia Linn.

Ca 350 species; 15 species in India; 1 in MZN.


Slender, glabrous, climbing shrubs. Leaves 4-10 cm across, long petioled 3-8 cm long broadly ovate-cordate, reniform, obtuse or rounded apex, basal lobes round; stipules falcately reniform or orbicular. Flowers violet-brown, spotted, solitary on pendulous branches. Perianth tube elongated upto 3 cm long. Fruits beaked; beak 0.5-1.0 cm long.

Cultivated in gardens. Collection : 2122; Charthwal.

94. LAURACEAE

Cinnamomum Schaeffer.

Over 250 species; 6 species in India; 1 in MZN.


Small evergreen trees or large shrubs. Leaves 5-10 cm long, glabrous, ovate or ovate-lanceolate, obtuse, opposite or so, often alternate on the same branch 3-nerved. Flowers yellowish-white in loose, tomentose, axillary and terminal, panicles. Perianth 6-parted. Fruits drupe, ovoid, 2-3 cm across, black.

Fl. & Fr. : Feb. – April.
Occasionally on canal and river banks, among bushes. Collection : 870; Muzaffarnagar City.

95. PROTEACEAE

Grevillea R. Br. nom. cons.

Ca 200 species; 1 in MZN.


Large, robust trees with rusty-tomentose young branches. Leaves alternate, 2-3 pinnate; pinnae 10-30 cm long, pinnatifid or entire; ultimate segments lanceolate, curved on margins, glabrous above, silky beneath. Flowers in 5-15 cm long racemes
96. LORANTHACEAE.

Dendrophthoe Mart.

Ca 45 species; 7 species in India; 1 in MZN.


Loranthus falcatus Linn. f., Suppl. 211. 1781.


Much-branched, stout, glabrous, leafy, partial parasite. Leaves opposite or alternate, ovate-elliptic to oblong-ovate, 7-15 cm long, coriaceous, entire, brittle when young; petiole upto 1.5 cm long. Flowers deep orange, upto 3.5 cm long, in axillary or supra-axillary, unilateral racemes; bract ovate, subacute; calyx upto 1 cm long, tubular, tomentose; limb cylindrical. Corolla upto 2 cm long, glabrous, swollen near the middle, orange-red; segments 5, linear-oblong, reflexed, shorter than the tube. Fruits upto 1 cm long, ovoid-oblong, crowned by calyx, black when ripe.


Common within the area on different trees as semiparasite. Collection : 713; Mukandpur.

97. EUPHORBIACEAE

1a. Flowers monoecious, aggregate in heads resembling a single flower with a calyx like involucres (cyathium)

.......................................................... 5. Euphorbia

1b. Flowers monoecious or dioecious, not arranged in cyathia:

2a Cells of ovary 2-ovuled; juice very rarely milky:

3a. Style arms much dilated; fruit an
3b. Style and style arms slender:

4a. Male flowers with a large, 2 or 3-fid pistillode

........................

4. Drypetes

14. Securinega

4b. Poistilode absent in males:

5a. Disc none in either sex, combined with the Calyx lobes; Shrubs or small trees

........................

9. Melanthesa

5b. Disc present in the female and often in the male flowers; herbs, shrubs or trees:

6a. Herbs; fruits dry capsules:

7a. Cultivated ……

7b. Wild; fruits dry capsules……

10. Pedilanthus

6b. Shrubs or trees; fruit a berry:

8a. Shrubs; fruits small, fleshy, dark purple

......................

7. Kirganelia

8b. Trees; fruits large, fleshy, pale yellow

......................

3. Emblica

2b. Cells of the ovary 1-ovuled; juice sometimes milky:

9a. Petals present at least in male flowers:

10a. Flowers in 2 or 3 chotomous cymes or axillary racemes, Leaves
10b. Flowers in spikes or racemes. Leaves not palmately lobed .......... **2. Croton**

9b. Petals absent in either sex:

11a. Filaments connate in bundles and repeatedly branched ....................... **12. Ricinus**

11b. Filaments free:

12a. Stamens many. Styles plumose or papillose:

13a. Leaves opposite. Flowers dioecious, large. Style Papillose fruit a drupe............ **15. Trewia**


12b. Stamens few, styles long, lacinate:

14a. Erect herbs or shrubs; leaves eglandular at base...................... **1. Acalypha**

14b. Trees; leaves 2-glandular at base........ **13. Sapium**

1. **Acalypha** Linn.

Over 400 species; Ca 10 species in India; 3 in MZN.

1a. Herbs, Leaves not mottled:

2a. Bract of female flowers 1-2 flowered .............. **1. A brachystachya**

2b. Bract of female flowers 3-5 flowered .............. **2. A. indica**

1b. Shrubs. Leaves variously mottled with red and purple.................................................. **3. A. wilkesiana**

1. **A. brachystachya** Hornem., Hort. Hafn. 1909. 1815; FBI. 5: 416; HFD. 453.

Erect or weak, much-branched, flaccid, annual herbs upto 30 cm tall with sulcate, thinly hairy stem. Leaves 2-4 cm long, ovate, subcordate base, acute-
acuminate at apex, crenate, thinly hairy; petiole 2-6 cm long. Flowers unisexual, in short axillary, 1-2 cm long finally spikes. Male flowers few, terminal minute; female bracts few, 2-3 flowered, crowded at the base of the spikes, very large, cut into 3 linear, 1-nerved, obtuse spreading lobes. Capsules depressed, hispid, globose. Seeds smooth, subglobose.

Common in moist and shady localities. Collection : 2326; Oon.


Erect, annual, herbaceous plants 30-70 cm tall, with many spreading or ascending branches. Leaves membranous, 30-70 cm tall, ovate or rhomboid-ovate, crenate-serrate, cuneate at base, obtuse to sub-acute at apex, 3-nerved from base; petiole slender, 3-5 cm long. Flowers green, minute in lax, axillary spikes; male clustered at the apex; female in clusters of 3-5, subtended by a shortly-denate bracts, 0.5-0.5 cm across. Capsules hispid, concealed by persistent bracts. Seeds ovoid, smooth.

F1. Fr. : Aug. – Nov.
Common on waste places, road sides. Collection : 3644; Muzaffarnagar City.


Erect, perennial shrubs upto 1.5 m tall with pendulous leaves. Stem and branches 4-anular, glandular-pubescent. Leaves 10-18 cm long, shortly acuminate, rounded at apex, rounded-cuneate at base, thin, variously mottled with red and purple; obtusely crenate, glabrous; petiole 2-8 cm long, pubescent. Flowers in axillary, slender, 8-20 cm long pubescent spikes; bracts triangular, predominantly toothed. Flowers small, bright red.

F1. Fr. : Major part of the year.

2. Croton Linn.

Over 700 species; 14 species in India; 1 in MZN.

Erect or much branched, annual-perennial herbs, with stellate hairy stem. Leaves 4-6 cm long, crowded at the top of the branches, ovate-lanceolate, toothed, sparsely hairy beneath, with 2 glands at base. Plants monoecious. Flowers pale-white in terminal, erect, androgy nous spikes; female flowers with 2- extra floral glands at the base of pedicels; male flowers fascicled in the axils of minute bracts. Capsules 3-angled, stellate hairy. Seeds shining, 3-gonous, stellate hairy, oblong, strophiolate.

F1. Fr. : Major part of the year.
Common in the area on waste places. Collection : 900; Kairana.

3. **Emblica** Gaertn.

4 species; 2 species in India; 1 in MZN.


Medium-sized deciduous trees with grey bark, branchlets finely pubescent. Leaves distichously arranged along the branchlets, linear-oblong, acute or mucronate at apex, rounded at the base, nearly glabrous, nearly sessile; stipule ovate, minute, acute. Flowers monoecious arranged in axillary fascicles on the leaf bearing branchlets or nacked portion below the leaves. Male flowers : numerous, shortly pedicelled; bracts minute. Sepals 6, arranged in 2-series, oblong, obtuse. Female flowers; few, subsessile; ovary 3- celled; styles 3, connate at base, twice 2-fid. Fruits pale-yellow, 1-2 cm across, globose, 6-lobed, breaking into 3, 2 seeded cocci. Seeds 6, trigonous.

F1. : Feb. – May; Fr. : Dec. – Feb.
Cultivated in gardens for its fruits. Collection : 124; Muzaffarnagar City.

4. **Drypetes** Vahl.

Ca 200 species; 15 species in India; 1 in MZN.


Medium sized evergreen trees with drooping branches; branches pubescent; bark grey, smooth. Leaves alternate, 5-8 cm long, elliptic-oblong, acute or acuminate at apex, rounded or cuneate at base, entire or serrulate, glabrous; main lateral nerves 8-10 pairs; petiole upto 0.8 cm long; stipules small, triangular, acute, deciduous. Male flowers in dense axillary clusters often spicate; pedicel minute. Calyx 3-5 clift; segments oblong, obtuse stems 3. Female flowers : 2 or 3 axillary or solitary. Calyx
segments 5 or 6, elliptic-obtuse. Ovary 3-celled, tomentose. Drupes obovoid-globos, 1-1.3 cm across, tomentose, pointed at top.


Rarely planted in gardens and met in forests. Collection : 3747; Mirapur.

The wood is used for tools and turnary. The nuts are tied round the neck of children to keep them in good health.

5. Euphorbia Linn.

Ca 200 species; 60 species in India; 8 in MZN.

1a. Plants armed with stipular spines...................... 5. E. milii

1b. Plants unarmed :

2a. Perennial, erect shrubs, with scarlet. Bracteal leaves ........................................................... 8. E. pulcherrima

2b. Annual, erect or prostrate shrubs :

3a. Involucres gland one...................... 2. E. geniculanta

3b. Involucres glands more than one :

4a. Leaves alternate below and opposite above or all except floral leaves alternate :

5a. Leaves linear, lanceolate, entire.......................... 1. E. dracunculoides

5b. Leaves obovate or spatulate, tip finely toothed .................... 3. E. helioscopea

4b. Leaves all opposite :

6a. Involucres glands with conspicuous petaloid limb :

7a. Leaves serrulate, capsules hairy through out.......... 6. E. parviflora

7b. Leaves minutely serrulate at the apex, capsules hairy only on the keels 7. E. prostrata
6b. Involucral glands with a narrow wing or wings:

8a. Erect herbs; hispid, leaves 1-4 cm long ...  **4. *E. hirta***

8b. Prostrate herbs; leaves less than 1 cm long ..................  **8. *E. thymifolia***


Erect, diffused, dichotomously branched, glabrous, deep rooted annual herbs. Leaves linear- lanceolate, subacute at apex, narrowed towards base, 1.5-2.5 cm long, entire, glabrous, nearly sessile; floral leaves short, broad at base. Involucres solitary, sessile or in the fork of branchlets 0.2 cm across, lobes ciliolate, glabrous outside, hairy within. Male flowers: filaments pubescent; female flowers: ovary pedicelled, 3-celled; style 3, free from base; stigma 2-fid. Capsules of 3, 2-celled cocci, smooth, globose, 0.3 cm across. Seeds upto 0.3 cm long, ellipsoid, rounded at back.

F1. Fr.: April. – Aug.

Common in sandy fields and waste places. Collection: 1902; Shamli.


Erect, or ascending, stout, annual herbs with fistular, ribbed stem. Leaves variable, 3-12 cm long, alternate below, opposite above, ovate-elliptic, elliptic-oblong to elliptic, whitish hairy beneath, entire; petiole 1-3 cm long. Involucre upto 0.5 cm long, with one lateral gland; lobes 5, ovate, fimbriate, orbicularly, excavated apex. Fruit a capsule, glabrous, 3-celled, rarely 2-celled.

F1. Fr.: Nov.-March

Common in grassy areas, gardens and waste places. Collection: 3701; Jansath.


Erect, multicauline or unbranched, foetid, upto 30 cm tall annual herbs. Stem glabrous downwards, long hairy above, fistular. Stem leaves alternate, subsessile, obovate or spatulate, obtuse or rounded at apex, cuneate towards the base, 1-2.5 cm long, finely toothed in upper half, glabrous; lower ones smaller. Inflorescence with 3-5, 4-5 cm long, umbellate on forked branches; rays 2 or 3; bracts foliaceous, upto 1
cm long, orbicular-ovate. Involucre subcampanulate, upto 0.5 cm long, lobes 4, ovate, laciniate; glands subsessile, yellow, entire, reniform. Ovary 3-celled; styles 3, free. Capsules depressed-globose, smooth, upto 0.4 cm across, with three 2 valved cocci. Seeds reticulately pitted, rounded-obovoid.

F1. Fr. : Dec. – May.

Common in grassy-sandy areas, on canal banks. Collection : 392; Muzaffarnagar City.


Erect-ascending or prostrate, upto 40 cm tall, branched from woody base, annual hispid herbs. Leaves 2-4 cm long, opposite, elliptic-oblong or ovate-oblong, acute at apex, oblique at base, reddish tinged above, white villous beneath; petiole short upto 0.3 cm long; stipule subulate. Cythia axillary and terminal, clustered in dense, crowded, cymes, on 0.5-0.8 cm long hairy stalk; lobes ovate-triangular; gland minute, globose. Ovary 3-celled; styles 3, nearly free. Capsules depressed globose, appressed hairy with three, 2-valved cocci. Seeds ovoid, 3-gonous, brown, minutely rugose.

F1. Fr. : Major part of the year.

Abundant within area in grassy localities, waste-places, road sides, fields canal banks. Collection : 2; Muzaffarnagar City.

The leaves and seeds are astringent, and the juice acts as a violent purgative.


Small, much-branched, erect or somewhat climbing, spiny shrubs becoming upto 1 m tall, armed with needle like spines. Leaves borne all round the stem, fascicled, 3-5 cm long, spathulate or obovate. Flowers showy, crimson, in long peduncled, dichotomous cymes. Cythia subtended with 2 lip shaped, hemispheric, cuspidate, bright-red attractive bracts.

F1. Fr. : Major part of the year.

Commonly planted in pots or rockeries in gardens and in hedges. Collection : 5008; Muzaffarnagar City.


Erect or decumbent, glabrous annual herbs upto 50 cm tall, with a somewhat woody base. Stem and branches often purplish. Leaves opposite, very variable in and size, upto 1.8 cm long, linear-oblong to elliptic-ovate, oblique and rounded-subcordate base, obtuse or subacute at apex, minutely serrate, glabrous above, minutely appressed pubescent beneath; petiole short 0.2 cm long. Flowers in dense, axillary second cymes; peduncle 0.1-0.5 cm long. Involucres cup shaped, nearly glabrous; 0.2 cm long; segments 5, ovate, ciliate, glands 4, red with orbicular or elliptic, entire appendage. Ovary 3-celled; styles 3, short, deeply 2-fid. Capsule depressed, globose, glabrous, with three, 2-velved cocci, 0.2 cm long. Seeds ellipsoid, 4-angled, minutely transversely rugose.

F1. Fr. : May – Oct.
Common in grassy fields, lawns, along canal banks, on moist sandy soils. Collection : 5089; Shamli.


Prostrate or ascending, slender, annual herbs, with minutely hairy branches, often purplish. Leaves upto 1 cm long, opposite, obliquely oblong, minutely serrate towards the tip, glabrous. Inflorescence on short, axillary, leafy raceme like branchlets. Involucre with 5 lobes, glands 4, each with a minute petaloid limb. Capsules usually bent, long stalked, subglobose, hairy only on ribs. Seeds red-brown with 5-7 transverse ribs.

F1. Fr. : Major part of the year.
Common on road sides, old walls, waste-moist places and agriculture fields. Collection : 1692; Khatauli.


Erect or diffused, glabrous, perennial shrubs upto 2 m tall. Leaves alternate, ovate-elliptic to lanceolate, 6-20 cm long, acute at apex, rounded at base, entire, glabrous, main lateral nerves many, nearly horizontal; petiole 2-4 cm long. Involucre in terminal cymes; bracteal leaves rayed, bright vermilion- red or crimson-scarlet;
pedicel 0.3-0.5 cm long. Involucre 0.6-0.8 cm long, with a large yellow gland on one side.
F1. : Sept. – March.
Cultivated in gardens for beautiful inflorescence and also met as an escape. Collection : 2447; Budhana.


Prostrate-creeping, hispid, annual herbs, tinged purple-red. Stem flattened on the ground. Leaves opposite, upto 0.8 cm long, oblong-orbicular, obtuse or rounded at both ends, obscurely crenate, glabrous above, minutely pubescent beneath; petiole upto 0.4 cm long; stipule fimbriate. Involucre axillary, solitary or 2 or 3 together, subsessile, campanulate; lobes 5, lanceolate. Capsules shortly stalked, 0.2 cm across, obtusely keeled, pubescent throughout, with three, 2-valved cocci. Seeds small, transversely furrowed.
Common on road sides, grassy fields and fellow fields. Collection : 1873; Ramraj.

6. **Jatropha** Linn.

Ca 200 species; 10 species in India, 1 in MZN.


Erect, branched, perennial shrubs. Leaves upto 10 cm long, penduriform, distantly dentate below, abruptly acuminate, cordate at base, dark green on upper side, purplish tinge below; petiole 3-4 cm long. Stipules small, subulate. Inflorescence a small terminal cyme; peduncle slender, purplish green. Plants unisexual. Male flowers: calyx small, cup-shaped, 5-lobed, purplish, 2-5 cm long; petals spathulate, scarlet; stamens 8, often 4 long, 4 short. Female flowers: calyx longer; ovary ovoid, glabrous, style 3, bifid. Fruit a capsule, purplish-green.
F1. Fr. : July – Dec.
Cultivated in gardens for ornamental purpose. Collection : 936; Muzaffarnagar City.

7. **Kirganelia** Juss.

3 species; 2 species in India; 1 in MZN.

Large, diffused, glabrous shrubs with drooping branched. Leaves 2-4 cm long, oblong, elliptic or rotundate, glabrous, obtuse at apex, rounded at base, entire; petiole short upto 0.2 cm long; stipules ovate, acute. Flowers monoecious. Male flowers : in axillary fascicles with minute pedicel. Calyx 1.5 cm long; segments oblong-obtuse. Stamens 5, three inner connate; 2-outer free, short. Female flowers: axillary, solitary with 0.5-0.7 cm long pedicel. Ovary 5-10 celled; styles 3, minute, 2-fid. Berreis globose, upto 0.4 cm across, smooth, shining purple, when ripe; seeds trigonous.
F1. Fr. : April. – Oct.
Rare on Ganga and other river bank jungles and on canal banks and on waste lands.
Collection : 168; Muzaffarnagar City.
Roots yields red dye and leaves used medicinally.

8. Mallotus Lour.
Ca 150 species; Ca 40 species in India; 1 in MZN.


Medium- sized, evergreen, much-branched trees, young parts and inflorescence rusty tomentose. Leaves alternate, 6-15 cm long. Variable in shape, ovate, ovate-oblong or lanceolate, entire, rounded at base, glabrous, 3- nerved from the base; petiole 1.5-6.0 cm long. Flowers dioecious. Male flowers : sessile, in 8-18 cm long, erect, terminal spikes. Sepals 4, lanceolate, acute. Petals and disc absent. Stamens many; filaments free. Female flowers: sessile in short spikes. Sepals 3 or 4, ovary 3-celled; styles 3. Capsules 3-lobed, 0.7-1.3 cm across, densely covered with bright, red powder, red powder; seeds subglobose, black, smooth.
Occurs on canal and river banks and road sides. Collection : 2213; Heend.
Flowers yield an orange dye. The bark is used for tanning and the red resinous powder “Kamela” from ripe fruits is used for dying silk and in medicines.

Ca 15 species; 2 species in India; 1 in MZN.


Large shrubs or small glabrous trees. Branches many, horizontal. Branchlets flexuous, ascending, spreading. Leaves 2-4 cm long, distichous, elliptic, glabrous
beneath, turning black when dry; petiole base easily detachable. Stipules subulate. Flowers greenish-yellow, very small. Male flowers usually on short pedicels. Female flowers solitary. Fruits globose, 0.6 cm across, dull red or purple, fleshy, smooth.

F1. : June-Dec.

Planted in gardens. Collection : 3664; Muzaffarnagar City.


Ca 15 species; 1 in MZN.


Erect, succulent, dark green undershrubs with many stems. Leaves alternate, numerous, elliptic, ovate or ovate-lanceolate, acute at apex, subsessile, somewhat fleshy. Flowers scarlet or orange slipper-shaped involucres in dichotomous cymes with caducous bracts.

F1. : Jan.–July.

Planted in gardens and lawns as hedge. Collection : 5072; Shamli.

11. Phyllanthus Linn.

Over 600 species; 40 species in India; 4 in MZN.

1a. Fruits densely warty. Stem tinged with red ........... 3. P. urinaria

1b. Fruits smooth. Stem not red tinged :

2a. Stipules peltate :

3a. Anthers horizontally dehiscent. Disc of female flowers shortly cup shaped. ........... 4. P. virgatus

3b. Anthers vertically dehiscent. Disc of female flowers consist of free glands.

..........................

2. P. maderaspatensis


Erect, glabrous, annual herbs upto 50 cm tall. Branches spreading from the base, suberect. Leaves 0.8-1.3 cm long, simple, upper to be compound, oblong, distichous, often overlapping, entire, obtuse or rounded at the ends; petiole 0.5 cm long; stipule lanceolate-subulate. Flowers yellow, axillary, hanging down below the branchlets. Male flowers : 1-3 together, axillary; bracts subulate. Perianth upto 0.8 cm
long, divided near to the base; segment 5, elliptic, glandular. Female flowers; axillary, solitary; perianth segments oblong-spathulate. Style free, minute, 2-fid. Capsules compressed, smooth. Seeds 3 gonous, rounded on the back, pale-brown, longitudinally ribbed.

**F1. Fr.**: June – Oct.


The plants are often used medicinally.


Erect, glabrous herbs with stem often decumbent below, and angular apex. Leaves oblong-obovate, with an acute apex, base rounded to subacute, often mucronate, cuneate, rhombic, thin. Flowers axillary. Male flowers: subsessile, fascicled; perianth lobes ovate-oblong, green. Female flowers: axillary and solitary, pedicelled, whitish; perianth lobes obovate-spathulate. Style-arms slightly or not divericate. Capsules globose, 3-lobed, glabrous, with persistent sepals. Seeds trigonous.

**F1. & Fr.**: July – Nov.

Rare, in sandy soils. Collection: 2207; Heend.


**F1. & Fr.**: July – Oct.

Common on moist-shady places and fields. Collection: 2711; Rohana.


Erect, prostrate or ascending, deep-rooted perennial herbs with a woody base. Branchlets spreading from the base, narrowly margined. Leaves distichous, 1-2 cm long, linear-oblong or elliptic-lanceolate, subobtuse at apex, rounded at base, nearly
glabrous; petiole short; stipule peltate, ovate-triangular. Male flowers: axillary, solitary. Perianth segments 5 or 6, oblong, obtuse; stamens 3; filaments free. Female flowers: axillary, solitary. Style short, 2-3-fid with recurved arms. Capsules globose, upto 0.3 cm across, obscurely lobed, minutely warty. Seeds brown, warty, trigonous, rounded on the back.

F1.& Fr.: July – Oct.

Rare in crop fields, moist and shady places. Collection: 5092; Shamli.

12. Ricinus Linn.

Probably monotypic


Erect, evergreen, weak, small trees with fistular, branched stem. Leaves 15-30 cm across, membranous, palmately lobed, alternate, peltate; lobes coarsely serrate, glaucous beneath; petiole long nearly equal to the blade; stipule caducous. Flowers monoecious, in terminal racemes forming panicles; upper ones female; lower ones male. Male flowers: calyx membranous; petals 0; stamens numerous; filaments connate, repeatedly branched. Female flowers: calyx spathaceous, caducous. Ovary 3-celled; style 2-fid, spreading, feathery. Capsules globose 1-2.5 cm across, prominently echinate, breaking into three, 2-valved cocci; seeds oblong, smooth.

F1.& Fr.: Major part of the year.

Occurs on waste places near villages. Collection: 314; Shukartal.

Many parts of the plant are used in medicines. A well known oil “Caster Oil” is extracted from seeds largely used for burning, as a lubricant and in medicines. The oil cake is used as manure.

13. Sapium P. Browne

Ca 120 species; 4 species in India; 1 in MZN.


F1. & Fr.: June – Sept.
Rare in the area in gardens and also met in wild conditions. Collection: 2192; Heend.
Fat is obtained from the seeds, used for candles and soaps.

14. **Securinega** Comm. ex Juss., nom. cons.

Ca 25 species, 4 species in India; 1 in MZN.

**S. virosa** (Roxb. ex Willd.) Baillon in Adansonia 6: 334. 1866; FD. 318; HFD. 464.


Erect, glabrous, evergreen, deciduous unarmed shrubs. Leaves alternate in two rows, 3-7 cm long, elliptic or obovate, acute or cuneate at base, obtuse or acute at apex, entire, green above, glaucous beneath: short petioled, stipule scarious, ovate-lanceolate, acute. Flowers minute, dioecious, apetalous, yellow-green, in axillary fascicles. Pistilode 2-lobed, large in males. Disc present in both. Fruits globose, depressed, of two sizes, moistly small and dry, with a few larger ones, white and fleshy. Seeds 3-6, punctate.

F1. & Fr.: April – Nov.
Rare in forests, on canal and river banks. Collection: 5040; Shukartal.

Roots are reported to be used for curing gonorrhea. The branches are used for making walking sticks.

15. **Trewia** Linn.

Probably 5 species: 2 species in India; 1 in MZN.


Medium-sized, deciduous, trees with smooth grey young parts, inflorescence, and under surface of leaves densely cottony or tomentose. Leaves 7-15 cm long, 3-5 nerved from base; petiole 5-8 cm long; stipule minute, acute, caducous. Male flowers yellow 3-4 in fascicles, each supported by a minute bract in solitary or 2 or 3 together, long pedicelled. Calyx segments 3-5. Ovary cottony, 3 or 4 celled; style connate below. Berries globose, 2-3.5 cm across, depressed; seeds dark-brown, smooth.

F1.: Feb. – April; Fr.: Nov. – Jan.
Rare on canal banks and in forests on river banks. Collection: 5035; Shukartal.
The fruit is edible. Wood is used for making match-boxes.
98. ULMACEAE

1a. Fruit a samara ................................................. 1. Holoptelea

1b. Fruit a drupe.................................................... 2. Trema

1. Holoptelea Planch.

2 species; 1 species in India; 1 in MZN.


Large or medium-sized, spreading, almost glabrous, deciduous trees with greyish, scaly bark. Leaves alternate, 6-12 cm long, ovate, subcordate at base, acuminate at apex, coriaceous, entire, glabrous or minutely pubescent beneath; main lateral nerves 5-8 pairs; petiole upto 0.7 cm long; stipule ovate, membranous. Flowers greenish-yellow, in dense lateral racemes arranged in fascicles, from the leaf scars of last years shoots. Tepals 4-8, imbricate. Stamens 4-7, anthers pubescent. Fruit samara broadly oblong, deeply notched at apex, 1.5-2.5 cm across, winged.

F1. : Jan. - March; Fr. : March – Aug.

Occurs in jungles on canal and river banks. Collection : 2396; Kandhla.

Fruits are edible. Slender branches are used for preparing baskets. The wood is used for making carts and as fuels.

2. Trema Lour.

Ca 35 species; 4 Species in India; 1 in MZN.


Erect, small, sparingly branched, evergreen trees with a short trunk and stout-branchlets. Leaves bifarious, 5-12 cm long, oblong or ovate-lanceolate, acuminate, serrulate, very scabrous on both surface, dark green and usually shining above, pale beneath, base nearly equal, rounded or cordate, 3 nerved; petiole 0.5 cm long; stipules exceeding the petioles. Flowers in compact cymes, usually monoecious. Drupes globose, seated on the persistent perianth, reddish brown, globose.

F1. & Fr. : July. –Nov.

Common on river and canal banks. Collection : 2831; Jaroda.

99. URTICACEAE

1a. Plants with stinging hairs…………………………….. 2. Laportea
1b. Plants without stinging hairs:

2a. Fruiting perianth more or less fleshy ............... 1. *Debregeasia*

2b. Fruiting perianth dry, membranous ............... 3. *Pouzolzia*

1. *Debregeasia* Gaud.

6 species; 5 species in India; 1 in MZN.


Large shrubs, with thin grey bark, branches and leaves beneath clothed with snow-white wool. Leaves 5-7 cm long, lanceolate or oblong-lanceolate, acuminate, serrulate, scabrid with minute rounded elevated white dots on upper surface, base rounded or acute, main nerves 3-from the base; petiole 1-2.5 cm long; stipules 2-fid. Flowers usually dioecious, arranged in round sessile or subsessile axillary heads. Male flowers; sepals 4, shorter than bracteoles, white tomentose outside. Stamens 4. Female flowers; with tubular perianth, narrowed to a minute 4-toothed mouth.

F1. & Fr.: June–Aug.

Rare in the area on canal and road sides. Collection: 3206; Banat.


Ca 25 species; 5 species in India; 1 in MZN.


Erect or decumbent-ascending, 15-30 cm tall, annual herbs. Stem flexuous, terete, with stinging hairs. Leaves 4-12 cm long, broadly ovate, long acuminate, subcordate-rounded at base, coarsely serrate with in conspicuous cystoliths, thinly hairy, 3 nerved from base; petiole upto 10 cm long; stipule 2-fid, 0.5 cm long. Flowers monoecious, in distant paniculate cymose clusters. Male flowers: pedicel upto 1 cm long; perianth segments 4 or 5, ovate, acute; stamens 4 or 5. Female flowers: pedicel minute; perianth segments 4, unequal; ovary compressed. Achenes obliquely ovoid, compressed.

F1. & Fr.: Aug.–Nov.

Common weed in gardens and jungles. Collection: 3703; Miranpur.


Ca 60 species; 12 species in India; 3 in MZN.
1a. Leaves not in distant pairs; fruits not ribbed:
   2a. Lobes of male perianth 5, abruptly inflexed above the middle; stamens 5 .......................  2. P. pentandra
   2b. Lobes of male perianth usually 4, convex or gibbous on the back; stamens 4, rarely 5 ........  3. P. zeylanica

1b. Leaves in distant pairs; fruits ribbed .................  1. P. hirta


Decumbent or suberect herbs upto 1 m tall. Leaves 4-12 cm long, opposite in distant pairs, sessile or subsessile, lanceolate, base rounded or cordate, 3-nerved. Flowers unisexual, pinkish or orange, in small axillary clusters. Male flowers 5-parted. Fruits 3- winged, ribbed.

F1. & Fr. : July – Oct.

Rare in jungles among bushes on canal banks and road sides. Collection : 1722; Barla.


Erect, glabrous, perennial herbs. Stem diffusely branched, terete below, angular above. Leaves 2-6 cm long, sessile, lowers larger, opposite, obong-lanceolate, acute or acuminate, strongly 3-nerved; upper smaller alternate; linear-oblong. Flowers arranged on an erect spike in the axil of the floral leaves. Male flowers stalked, truncate in bud, perianth 5-partite. Fruits with 2 to 3 broad lateral wings.

F1. & Fr. : July. – Nov.

Frequently found along Ganga canal and river banks. Collection : 1061; Shukaral.


Erect, perennial herbs, variable in size and habit, glabrous, hairy or pubescent. Leaves 2-4 cm long, opposite or alternate, ovate to lanceolate, obtuse, acute or acuminate, entire, hairy, base acute or rounded. Flowers strigose with simple or hooked hairs. Male flowers : sepals 4, dorsally rounded, acute; stamens 4; pistillode small, clavate. Female flowers : perianth tubuler, persitent, ribbed, 2-fid at the apex, closely inserting the achenes. Achenes small, broadly ovoid, shining.

F1. & Fr. : July. – Nov.
Common in moist grassy localities, near water bodies. Collection: 3620; Muzaffarnagar City.

100. CANNABINACEAE.

Cannabis Linn.

Monotypic genus.


Erect, aromatic, suffruticose, dioecious herbs up to 1.5 m tall, branches ribbed. Leaves alternate, lower opposite, variable, 5-7 partite; upper ones 1-3 partite; segments lanceolate, acute, serrate, glandular pubescent; petiole 2-8 cm long; stipule subulate, filiform. Male flowers: in short cymes, forming terminal panicles; pedicel up to 0.5 cm long. Female flowers: solitary axillary forming leafy spikes. Nuts ovoid, yellowish, smooth; seed 1.

F1. & Fr.: Sept. – March

Common on waste places, road sides. Collection: 2161; Gadhi.

Bhang and ganja, narcotics, obtained from female plant are used in gonorrhea, dyspepsia and as intoxication. Fibre is also obtained from stem.

101. MORACEAE

1a. Stamens straight in bud, with erect anthers:

2a. Flowers crowded outside the globose receptacles................................. 1. Artocarpus

2b. Flowers attached to the inner wall of a closed receptacle.......................... 2. Ficus

1b. Stamens inflexed in bud, with reversed anthers:

3a. Fruit syncarpium formed from a whole Inflorescence.............................. 3. Morus

3b. Fruit formed from one flower only ...................... 4. Streblus


Ca 50 species; 18 species in India; 2 in MZN

1a. Fruits tubercled, large, 30-60 cm long................. 1. A. heterophyllus

1b. Fruits smooth, small, 5-8 cm in dain................. 2. A. lacucha

Large, evergreen trees. Leaves 8-20 cm long, thickly coriaceous, glabrous, ovate or orbicular-ovate to elliptic, entire, shining above. Staminate spikes cymic or clavate, terminal or axillary. Pistillate spikes cylindric or oblong, directly arising from the trunk and main branches, maturing into a large tubercled, syncarps, 30-60 cm long or more.

Fl. : March. – June.; Fr. : July – Sept.

Planted in gardens. Collection : 5011; Muzaffarnagar City.

The fruits know as “Jack-fruit”, are cooked as vegetable and wood is used in making furniture and heart wood yield a yellow dye.


Fl. : March. – June.; Fr. : Sept. – Nov.

Planted in gardens.

Collection : 421; Muzaffarnagar City.

Fruits are edible, used either raw or cooked or pickled.

2. Ficus Linn.

Ca 1000 species; 70 species in India; 8 in MZN.

1a. Leaves cupuliform…………………………………… 4. F. krishnae

1b. Leaves not cupuliform, but broad-ovate, Lanceolate to ovate :

2a. All lateral nerves of leaves nearly Parallel…………………………………… 3. F. elastica

2b. Lateral nerves of leaves not as above :

3a. Receptacles sessile :

4a. Leaves obtuse, tomentose or pubescent beneath…………… 1. F. benghalensis
4b Leaves caudate- acuminate, glabrous.......................... 7. F. religiosa

3b Receptacles stalked :
5a. Receptacles in clusters, on short special branches................. 6. F. racemosa

5b. Receptacles solitary or paired :
6a. Small or large trees. Leaves ovate-oblong; Receptacles white tinged red and dotted...................... 8. F. virens

6b. Shrubs or small trees. Leaves orbicular-ovate; Receptacles yellow or Yellowish- purple when ripe :
7a. Leaves generally lobed..................... 2. F. carica

7b. Leaves entire or rarely lobed......... 5. F. palmata


Large, evergreen trees with aerial roots from the branches. Leaves alternate, 10-20 cm long, thick, long petioled, orbicular-ovate to elliptic, obtuse, entire, pubescent beneath; stipules 1.5 cm long, sheathing. Receptacles 1-2 cm in diam, in axillary pairs, sessile, globose, puberulus, red when ripe. Male and female flowers in the same receptacle.

F1. : June. - March

Commonly planted in & near the temples and growing in crevies of old walls. Collection : 2923 ; Bhopa.

The wood is used for well-curbs, leaves are used as fodder. The latex in used in medicines.

Large shrubs or small trees, branching from the base. Leaves 6-13 cm long, thick, long petioled, broad-ovate to orbicular, rough above, pubescent beneath, margins toothed or serrulate. Receptacles 1-2 cm in diam, solitary or paired, axillary and subterminal, pear-shaped, red when mature.

Common on road sides, gardens, waste places. Collection: 4064; Ailum

The fruits are edible and also used in medicines.


Large, glabrous evergreen trees. Leaves 10-25 cm long, very thick, deep glossy-green, with many fine parallel side nerves, oblong or elliptic, sharp pointed, rounded base; petiole upto 3 cm. Stipules large, about half to the leaves.

F1.: Not obtained
Rarely planted in gardens. Collection: 858; Muzaffarnagar City.

4. **F. krishnae** DC. in Bot. Meg. t. 8092. 1906; FD. 324. Vern. **Shri Krishna Ka dona.**

Small or medium-sized trees, much branched. Bark dull white. Leaves cupuliform, long petioled, green above, pale yellowish beneath, prominently nerved. Receptacles small, about 1.5 cm in diam, nearly globose.

F1.: April – June.
Rarely planted in the area in gardens. Collection: 3733; Mirapur.

5. **F. palmata** Forsk, F1. Aegypt –Arab. 179, 1775; FBI. 5: 530; FUGP, 3: 158; FD. 327. *F. caricoides* Roxb., F1. Ind. 3: 529. 1832. *F. virigata* Roxb., op. cit. 530; Brandis For. F1. 419. Vern. **Anjeer; Fig.**

Erect, woody shrubs or small trees. Young parts tomentose. Leaves 10-15 cm long, orbicular or broad, ovate, usually dentate or serrate; 3–nerved. Receptacles axillary, solitary, pubescent, about 1.7 cm in diam, subglobose or pyriform, yellowish-red when ripe.

Receptacles: Feb. – July
Commonly growing in wild conditions along canal banks and grown in gardens also. Collection: 2871; Jaroda.

The fruits are eaten and also used in medicines. The leaves are used as fodder.

Medium sized or large, deciduous trees. Leaves 10-15 cm long, alternate, ovate-oblong to elliptic- lanceolate, glabrous, prominently nerved beneath; stipules scarious, ovate – lanceolate. Receptacles clustered, on short- leafless branchlets, 2.5 cm in diam, nearly globular, reddish when ripe, full of insects. Male flowers sessile near the mouth.

Receptacles: April–July
Growing on road sides, villages. Collection: 664; Muzaffarnagar City.
The fruits are used in medicines.


Large, glabrous trees with greyish bark. Leaves 10-15 cm long, ovate-round, entire, coriaceous, shining, apex long tailed, 5-7 nerved, base rounded or cordate, long petioled. Receptacles globose, supported by 3 basal bracts.

Receptacles: April – June.
Common in the area on road sides, near temples, wells and in crevices of old walls. Collection: 446; Muzaffarnagar City.
The leaves and branches are used as fodder. The wood is used for making packing-cases and brunt for charcoal. The leaves, bark and wood are used in medicines. It is a sacred tree for Hindus. It causes lot of damage to forest trees due to epiphytic growth and also to building on which it grows.


Medium sized or large, deciduous spreading, quick-growing trees. Leaves 7-12 cm long, ovate or oblong - ovate, acuminate, entire, rounded at base, 3 – nerved.

Receptacles axillary, in pairs, pedunculate, sessile, globose, 6-7 mm in diam, reddish white.

Planted on road sides and villages. Collection: 454; Muzaffarnagar City.

3. **Morus** Linn.

Ca 10 species; 5 species in India; 5 in MZN.

1a. Fruits greenish or yellowish white......................

1b. Fruits greenish red or black on maturity:

2a. Leaves sharply serrate..............................
2b. Leaves not sharply serrate:

3a. Fruits black at maturity..................

3b. Fruits remain green or red at maturity:

4a. Leaves acute; style short, free, slightly hairy. Fruits 2-3 cm long.........................

1. M. alba.

4b. Leaves long acuminate; style long, hairy, connate below. Fruits 1-2 cm long....................

3. M. indica


Medium sized, deciduous trees. Leaves usually 5-8 cm long, ovate, acute or shortly acuminate, dentate or often lobed, base cordate. Flowers greenish on short ovoid spikes, monoecious. Male spikes catkin-like, elongated. Female spikes short, ovoid. Fruits white or dark purple, turning black when ripe, sweet in taste.

F1. : Feb. – March; Fr. : May – June.

Cultivated in gardens, lawns for its edible fruits. Collection : 388 ; Muzaffarnagar City.

The leaves are used as fodder. The fruits are edible. The leaves are also used for feeding silk worms.


Large or small deciduous trees. Leaves 5-10 cm long, frequently lobed, dentate, base cordate, petiole 2-3 cm long. Flowers monoecious. Fruits cylindric, 4-8 cm long, dark purple.

F1. : April – June.

Planted in gardens. Collection : 3577; Bahadurpur.

Fruits are eaten. Leaves are used as fodder and to feed silkworms.


Medium-sized, deciduous trees; bark brown. Leaves 4-12 cm long ovate, cordate-acuminate at apex, rounded subcordate at base, coarsely and unequally serrate, pubescent or scabrous when old; petiole short; stipule lateral, deciduous. Flowers monoecious. Male flowers : spikes lax, on upto 1cm long slender peduncle.
Sepals 4. Stamens 4, exerted. Female spikes stout, ovoid, Sepals 4; the 2 linner flat or concave; the outer 2 keeled; style long, 2-fid. Fruits dark-purple when ripe.

Cultivated in orchards and road sides. Collection : 5081; Shamli.
The fruits are sweet in taste and eaten raw.


Large, deciduous trees. Leaves 7-11 cm long, ovate or ovate cordate, usually caudate-acuminate, finely serrate, scabrous, base cordate, often oblique. Spikes long peduncles villous. Fruits 3-5.5 cm long, greenish when unripe and buring yellowish white.

F1. : Feb. – May.
The fruits are eaten. The leaves are used as fodder and to feed silk-warms. The wood in also used for agriculture implements.


Large or medium sized deciduous trees, Young parts tomentose. Leaves 10-20 cm long, broadly ovate-cordate, acuminate, serrate, velvety tomentose; petioles 4-8 cm long, pubescent. Stipules upto 1.5 cm long, broadly lanceolate. Fruits short cylindric, purple and sweet when ripe.

Rare, planted in gardens. Collection : 3570 ; Bhadu rpur.
The wood, which seasons well and take a fine polish, is valued for cabinet work and is also used for making agricultural implements and tennis bats. The young branches and leaver are used as fodder.

4. **Streblus** Lour.

Ca 25 species; 4 species in India ; 1 in MZN.


Small, evergreen trees upto 5 m, but very frequently a shrub. Bark thick, soft, grey or greenish-white or brown, rough when old. Branchlets many rigid and often much interwoven, pubescent. Leaves 4-10 cm long, elliptic or rhomboid or obovate, acute or acuminate, margins more or less toothed towards the apex, rough on both sides with minute raised dots, main lateral nerves 4-6 pairs; petiole very small; stipules obliquely lancedolate. Flowers usually dioecious. Male flowers: in shortly
stalked, globose heads. Perianth companulate. Sepals hairy outside. Female flowers; solitary, on slender axillary usually fascicled; pedicles 0.5 cm long. Fruits 1–sedded, subglobose berry, upto 1 cm in diam, yellow when ripe.

F1. : Jan. - March; Fr. : May - July

Common on canal and river banks in Jungles. Collection : 402; Muzaffarnagar City.
The fruits are edible; rough leaves are used polishing ivory and wood.

102. CASUARINACEAE

Casuarina Linn.

Over 40 species; 3 species in India; 1 in MZN.


Tall, leafless, weak tree or bush with drooping, jointed, deciduous branches, which perform the function of leaves. Branchlets slender jointed with whorls of 6-8 scales, alternating with ribs of next, similar to twigs of Equisetum. Male spikes cylindrical, upto 1 cm long, many at the end of branches. Female flowers cone like globose or ovoid. Nules winged.

F1. : March – May; Fr. : June. – Aug.

Planted in gardens, lawns. Collection : 2708; Rohana.

103. CERATOPHYLLACEAE

Ceratophyllum Linn.

10 species; 2 species in India; 1 in MZN.


A slender, rootless, submerged, much branched aquatic herb. Leaves whorled, divided into filiform brittle, serrate segments. Male and female flowers solitary. Perianth segments 10-12 , slightly connate at base. Nutlets ovoid or ellipsoid coriaceous, small, persistent- subulate style. Subtended by a short, basal spine on either side.


Common in still water of ponds, ditches. Collection : 798; Rohana.
MONOCOTYLEDONS

104. HYDROCHARITACEAE

1a. Stem leafy, branched; stolons absent………………….. 1. Hydrilla

1b. Stem absent; stolons present. Leaves radical:

2a. Leaves petioled, suborbicular …………………….. 2. Ottelia

2b. Leaves sessile, linear…………………………….. 3. Vallisneria

I. Hydrilla Richard

Monotypic genus.


Submerged, freshwater, weak herbs. Leaves opposite or 3-8 in a whorl, sessile, linear to lanceolate, entire or toothed. Flowers unisexual. Sepals 3; linear. Petals 3, narrow. Male flowers shortly pedicellate, solitary, enclosed in muricate spathe. Stamens 3. Female flowers sessile. 1 or 2 in tubular 2-toothed spathe. Overy 1-celled. Fruit muricate.

F1. & Fr. : Sept. – Nov.

Common in fresh water ponds, tanks etc. Collection : 883; Muzaffarnagar City.

2. Ottelia Pers.

Ca 40 species; 1 species in India; 1 in MZN.


Submerged or partially floating aquatic herbs. Submerged leaves 5-7 cm long, short, petioled, oblong or narrow; tapering at the base. Floating leaves orbicular, cordate or rounded at the base, 7-11 nerved, margins undulate. Petioles trigonous. Spathe 2.5-5.0 cm long, 1–flowered, 5-6 winged, mouth 5-6. toothed. Flowers white, sessile. Sepals oblong, green. Petals 2-3 cm long, white with yellow base. Fruits upto 4 cm long, ellipsoid, crowned by the persistent calyx.


Rarely occurs in shallow and muddied water. Collection : 620; Purkaji.

3. Vallisneria Linn.

Ca 10 species; 2 species in India; 1 in MZN.

Submerged, tufted, stemless, stoloniferous herbs with fibrous roots. Leaves up to 30 cm long, redical, linear, ribbon shaped, entire, obtuse apex; veins 3-6, parallel. Flowers dioecious. Male flowers solitary, within 3 toothed spathe and born on a long spiral stalk; styles 3, split into broad stigmatic lobes.

F1. & Fr. : Jan. – May.
Common on the banks and bottom of ponds, lackes and rivers. Collection : 258; Rampur.

105. ORCHIDACEAE
Zeuxine Lindl., nom. cons.
Ca 75 species; 14 species in India; 1 in MZN.

Erect, small, terrestrial, glabrous herbs. Stem leafy upwards. Leaves 2-3 cm long linear, acuminate, sessile, margins recurved. Flowers white or pale-bluish in terminal spikes; bracts 5-8 mm long, lanceolate, acuminate, hyaline, 1-nerved. Sepals unequal. Petals falcate-lanceolate to oblong. Lip shallowly notched. Stamens covered by two memberous lateral wings. Capsule 1cm long, ovoid, ribbed.

F1. & Fr. : Jan. - March
Common- growing on the grassy banks of canals. Collection : 4246; Nala

106. MUSACEAE
Musa Linn.
Ca 50 species; 14 species in India; 1 in MZN.

Erect stoloniferous, large herbs up to 3.5 m tall with a pseudostem. Leaves large, oblong, erect or ascending, 1.0-1.5 m long. Racemes drooping with red-brown bracts, deciduous. Flowers 4-6 cm long. Fruits in a bunch, yellowish – green, oblong. Seeds generally absent and if present brownish black.

F1. : April. – June; Fr. : July. – Sept.
Planted in gardens. Collection : 1075; Shahpur.
The ripe fruits are eaten raw or used as vegetable when green.

107. ZINGIBERACEAE

1a. Lateral staminodes large and petal-like .................

1b. Lateral staminodes not petal-like or absent or small
or narrow and adnate to lip:

2a. Filaments elongated; inflorescence not Cone-
like .......................... 1. Catimbiium

2b. Filaments of fertile anthers short or wanting;
Inflorescence cone- like ..................... 3. Zingiber


Ca 25 species; over 15 species in India; 1 in MZN.


Erect, diffused, leafy shrubs. Leaves large 30 -75 cm long, oblong- lanceolate, entire, glabrous, shining. Flowers rosy or purplish white, fragrant, in 20-35 cm long drooping, terminal racemes. Bracts large white. Calyx cylindric, 3- toothed. Stamen1, white, 2 staminodes. Ovaries embedded in densely hairy torus.

F1. & Fr. : March. - May

Planted in gardens. Collection : 1624; Titawi.

The seeds are used in spices, sweets and medicines.

2. Curcuma Linn.

Ca 50 species; 18 species in India; 1 in MZN.


Erect, tall annual herbs with ovoid, orange or yellow coloured root- stockes. Leaves large upto 1 m long in tufts, 30-80 cm long, petioled, oblong-lanceolate, tapering to base, glabrous. Flowers 10-15 cm long spikes; peduncles 15 cm long or more concealed by the sheathing petiole; flowering bract pale- green; bract of coma tinged with pink. Calyx cylindrical, minutely toothed. Corolla funnel-shaped. Stamen 1, perfect; anther cells spurred at base, Ovary 3- celled; stigma 2-lipped. Fruit a 4-valved capsule.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (362)
Occasionally cultivated in the area. Collection: 1076; Shahpur. The tubers are used as a condiment and give a yellow dye.


Ca 80 species; 14 species in India; 1 in MZN.

*Z. officinale* Rosc. in TLS. 8: 358. 1807; FBI. 5: 246; FUGP. 3: 235; MCP. 288; FD. 333; HFD. 504. Vern. *Adrakh*

Erect, annual-perennial herbs with creeping tuberous rhizome. Stem leafy, 30-80 cm tall. Leaves 10-30 cm long, Linear-lanceolate, sessile with sheathing base.

F1.: Not observed

Rarely-cultivated in kitchen gardens for rhizome. Collection: 5090; Banat. Rhizomes used as spice & condiment, also used in medicines as a carminative and digestive-stimulant.

108. CANNACEAE

*Canna* Linn.

Over 60 species; 1 in MZN.


Erect, glabrous, slender, perennial herbs with creeping, subterranean, tuberous rhizoms. Leaves sub-sessile, 15-50 cm long, oblong or elliptic-lanceolate. Flowers bright red or yellow in lax, simple or branched racemes. Flowers sessile; bracts rounded suborbicular, upto 2 cm long; bracteoles oblong-ovate, 1.2 cm long. Calyx segments subequal, lanceolate-oblong, red. Corolla segments nearly equal, oblong-acute, 3.0-3.5 cm long. Staminodes 5; upper 3 bright red, 3-3.5 cm long. Lip entire. Anthers 1-celled. Capsules 3-gonous, mucronate. F1.: Major part of the year. Cultivated in gardens or also met as an escape on damp and marshy places. Collection: 122; Muzaffarnagar city.

109. AGAVACEAE

1a. Leaves usually spine-edged ........................................ 1. *Agave*

1b. Leaves mostly entire...................................................... 2. *Yucca*

1. *Agave* Linn.

Over 300 species; 6 species in India; 3 in MZN.
1a. Leaves with distinct, coarse marginal spines……… 1. A americana

1b. Spines of leaf-margins erecto-patent, with tips curved towards the leaf-apex :

2a. Tepals connate in lower part. Leaves 1.5-2.0 m long……………………………………… 3. A. wightii

2b. Tepals free near to the base or Conrate at base only. Leaves not more than 1 m long.
………………………………………………………………………………………………………………… 2. A. cantala


Stemless, perennial hard xerophyte. Leaves erectropatent with strong widely patent or recurved marginal spines, glaucous, often with longitudinal, white or yellow streaks or bands. Perianth funnel-shaped; segments oblong, yellowish-green. Capsules oblong-clavate, beaked.
F1. : July. – Oct.
Cultivated on boundary or met as an escape. Collection : Rohana


Perennial, stout, scapigerous, spiny xerophyte. Leaves in rosette, pale- green, glaucous, recurved in the upper part, with a sharp, apicula spiny tip. Flowers greenish in panicles; pedicles jointed, upto 1 cm long. Tepals lanceolate with obtuse, ligulate tips; inner ones smaller, narrower than outers. Stamens exerted.
F1. : July. – Sept.
Common on waste places, road sides, often planted along- hedges and borders of fields.
Fibre is obtained from leaves.

3. A. wightii Dr. & Prain. in Agric. Ledger. 13 (7): 91 1906; FUGP. 2: 317; FD. 334; HFD. 513.

Perennial, some what stout, conspicuous herbs. Leaves 30-80 cm long, linear, in a globose rosette, marginal prickles spreading, erect, weak, with a small brown cushion, sharply recurved, parallel to the leaf edge; terminal spins 1 cm long, pale, decurrent. Scape 4-5 cm high, scaly. Flowers in terminal panicles. Pedicels 1.5- 2.0 cm long. Tepals lanceolate, obtuse. Stamens 6; filaments sub- equal, linear, 5-6 cm long, exerted. Anthers 2 cm long. Style 5 cm long. Stigma 3- lobed, Bulbils present.
F1. : Jan. - June
Common on waste places, road sides, and planted along boundaries of fields. Collection : 1069; Muzaffarnagar
The fibre is obtained from leaves.

2. **Yucca** Linn.

Ca 40 species; 3 species in India; 1 in MZN.

**Y. gloriosa** Linn., Sp. P1. 319, 1753; MCP. 241; FD. 334; HFD. 514.

Erect, short trunked or stemless perennial herbs. Leaves 30-60 cm long, entire, toothed, mostly clustered in rosette at the ground surface, flat with margins raised; apex needle pointed, red or black. Inflorescence an erect, long panicule with alternate branches. Flowers greenish-white, bell-shaped, drooping, hermaphrodite. Perianth lobes waxy in texture. Stamens 6. Styles connate forming a canal; stigmas 3.

F1. : March – May.

Planted in gardens. Cultivated Species.

**Dianella ensifolia** (Linn.) in Reodoute, Liliac. 1:t. 1. 1802; Hook. f. FBI. 6: 337.


Planted in gardens, pots for foliage ornamentation.

“A highly adaptable species ............ Despite its variability. I doubt that even with intensive field work distinct subspecific taxa can be derived” ............Jessop

110. **Dioscoreaceae**

**Dioscorea** Linn.

Over 600 species; 50 species in India ; 2 in MZN.

1a. Stem twining to the right................................. 1. **D. alata**

1b. Stem twining to the left.......................................... 2. **D. bulbifera**


Climbing or trailing perennial shrubs with acutely angled or winged bulbiferous stem. Leaves variable in size upto 15 cm long, usually opposite, broadly ovate-cordate, acuminate, cuspidate or caudate, 7-9 costate, deeply cordate at base. Bulbils globose, ovoid or obpyriform, sometimes much elongated or flattened. Tubers variable, lobed in various ways.
F1. : Not observed.
Rarely cultivated or met as an escape. Collection: 2132; Charthawal.
Tubers are used in medicines and are cooked as vegetable.


Annual herbaceous, climbing herbs. Bulbils axillary, globose, tubercled. Leaves up to 22 cm long, alternate, ovate, cordate, acuminate, 7-9 nerved at the base. Flowers dioecious. Male spikes almost 2.5-8.0 cm long, axillary, panicked, flowers greenish-purple, crowded or scattered. Stamens 6, anthers didynamous. Female spikes 10-18 cm long, pendulous. Capsules up to 2.5 cm long, membranous. Seeds with a broad basal wing.

F1. : Aug. – Nov.
Growing in wild conditions climbing on trees. Collection: 2221, Charthawal.
Tubers are used in medicines and are cooked as vegetable.

### 111. LILIACEAE

1a. Branchlets modified into needle-like cladodes.

   Leaves absent or reduced to scales .................... 3. **Asparagus**

1b. Branchlets not modified into cladodes. Leaves normal:

2a. Leaves with spiny margins...................... 2. **Aloe**

2b. Leaves with entire margins:

3a. Flowers in heads or umbels............. 1. **Allium**

3b. Flowers in racemes......................... 4. **Asphodelus**

1. **Allium** Linn.

Ca 500 species; over 30 species in India; 2 in MZN.

1a. Leaves cylindric and fistular. Bulbs simple……… 1. **A. cepa**

1b. Leaves plane, flat not hallow. Bulbs compound… 2. **A. sativum**

Vern. **Piyaj**

Annual, herbs with large bulb. Leaves radical, subdistichous, fistular, terete. Flowers many, white in dense umbels and bulbils subtended by 2 or 3 reflexed bracts. Stamens exerted, inner often 2 toothed at the base.
F1. : Dec. - May
Widely cultivated for bulbs. Collection: 952; Jaroda.

Bulbs are used as condiments, cooked as vegetable when young. Leaves are also cooked as vegetable, also used in medicines.


Annual cultivated herbs with short compound compressed bulbs. Leaves long, linear, fleshy, flat. Flowers white in lax umbels, often displaced by bulbils on long terete scape exceeding the leaves. Anthers and style exerted. Sepals lanceolate, acuminate, inner filaments 3 toothed at apex; central tooth with anther.

F1.: March - May

The bulbs are used as condiments and for flavouring and also in medicines.

2. Aloe Linn.

Ca 300 species; 1 in MZN.


Stoloniferous, acaulescent herbs. Leaves arising in rosette from the ground, erect, fleshy, long-acuminate, thorn edged. Scape simple or branched, 30-60 cm long. Flowers orange red or dull red, 2-4 cm long. Perianth segments equalling the tube and stamens. Style exerted.

F1.: Dec. - June

Planted in garden beds or pots.

Juice of leaves used locally in bronchitis and for other medicinal uses.

3. Asparagus Linn.

Ca 300 species; 20 species in India; 2 in MZN

1a. Suberect shrub......................................................... 1. A. adscendens

1b. Tall climbing much branched undershrubs.......... 2. A. racemosus

1. A. adscendens Roxb., F1. Ind. 2: 153. 1832; FBI. 6: 317; FUGP. 3: 259; HFD. 517.

Sub-erect prickly shrubs, with white tuberous roots. Stem tall, slout, suberect, terete, smooth, white, much branched; branchlets ascending, ashy white, grooved, angled, armed with 0.5-2 cm long, stout, straight spines; cladodes in dense tufts of 6-20, 1-2.5 cm long, slender, filiform, terete, soft, suberect or curved. Racemes 2-5 cm long, many-fid; pedicles jointed above or below the middle; bracts minute. Flowers 2
cm in diam. Parianth segments spreading. Ovules many in each cell. Berries 3-5 mm in diam, 1 seeded.
F1. : July – Dec.
Planted in gardens and also met as an escape. Collection : 1055; Shukartal.
Roots are used a demulcent, also in diarrhea and dysentery.

Perennial, climbing herbs with tuberous rootstock. Stem triquetrous with patent or recurved spines. Cladodes 2-3, arranged in a tuft, falcate, acuminate. Flowers white, in racemes, solitary or in fascicles, 2-3 cm long. Anthers purplish. Berries 4-5 mm in diam, globose, scarlet.
F1. : July. – Dec.
Planted in gardens and pots. Collection : 405; Jansath.
Roots are used in medicines and also cooked as vegetable.

4. **Asphodelus** Linn.

Ca 15 species; 3 species in India; 1 in MZN.


Annual, stemless herbs. Leaves 15-35 cm long, terete, hollow. Scapes many, 15-70 cm long or more, terete, simple or branched. Flowering stems several, erect, solid, branched in upper part, scabrid in lower part, glabrous upwards, upto 50 cm long. Flowers white in 8-20 cm long lax recemes. Pedicels erect, jointed below the middle, dilated upwards upto 0-4 cm long. Tepals whitish, lanceolate oblong, obtuse with a brownish keel upto 0.5 cm long. Anthers brown. Capsules globose, 4-5 mm in diam, transversely wrinkled. Seeds rugose, trigonous, black.
F1. : Jan. - April
Common weed of wheat and other winter crops, in gardens. Collection : 2307; Oon. Lives and seeds are used medicinally.

112. **PONTEDERIACEAE**

1a. Perianth tubular below. Flowers sessile………
1b. Perianth segments nearly free. Flowers pedicellate.

------------------------------------------
1. **Eichhornia** Kunth. *nom. cons.*
7 species; 1 species in India; 1 in MZN.

**E. crassipes** (Mort.) Solms. in DC. Mon. Phan. 4: 527. 1882; MCP. 199; FD. 338.  

Floating, profusely rooting at the nodes, aquatic smooth spongy herbs. Leaves rosette forming, 4-15 cm in diam, ovate to orbicular, glabrous, long spongy petiole, much inflated at base. Flowers violet on a simple scape, sessile, with a conspicuous sheath near middle. Spikes 8-20 flowered, many fid. Bracts 2, lower foliaceous with a tubular sheath; upper apriculate. Perianth 5-6 cm long, 6-lobed; upper lobe larger. Fruit oblong capsule. Seeds minute, many ribbed.

F1. : Major part of the year.

Common in the area in ponds, lacks, and rivers. Collection : 100; Muzaffarnagar City.

**2. Monochoria** Presl.

Ca 5 species; 2 species in India; 2 in MZN.

1a. Root-stock very long. Leaves with hastate or sagittate base with acuminate basal lobes…………………………………………………………… 1. *M. hastata*

1b. Root-stock short. Leaves with rounded-cordate base…………………………………………………………… 2. *M. vaginalis*


Aquatic, herbs with short, spongy, creeping root stock. Leaves 10-22 cm long; radicals triangular-ovate, with a segittate or hastate base. Flowers purplish blue, in racemes, subumbellate or crowded. Pedicles 2-3 cm long. Filaments spurred. Large anther blue and other yellow. Capsules 8 mm in diam, ellipsoid enclosed in persistent twisted perianth.

F1. : July.- Nov.

Rarely found in marshy and muddy places. Collection : 593; Chitora.


Annual or perennial amphibious herbs. Leaves 7-10 cm long, ovate to ovate-lanceolate, acuminate, sub- cordate-truncate to rounded at base, glabrous. Flowers
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

white, in dense racemens emerging from the sheaths of the upper leaves. Pedicels 1-1.5 mm long. Fruits 1 cm long, glandular outside. Seeds rounded, many ribbed.


Common in ponds and ditches, on road sides. Collection : 3179; Jaroda, 1569 Khatauli.

113. COMMELINACEAE

1a. Perfect stamens less than 6:
   2a. Perfect stamens 3........................................ 1. Commelina
   2b. Perfect Stamens 2........................................ 3. Murdannia

1b. Perfect stamens 6:
   3a. Petals free:
      4a. Flower white.......................... 4. Rhoeo
      4b. Flowers blue on pinkish-blue:
         5a. Capsules oblong, 3- gonous
             ........................................ 2. Cyanotis
         5b. Capsules oblong-ellipsoid.
   3b. Petals producted into a tube............. 6. Zebrina

1. Commelina Linn.

Ca 225 species; 23 species in India; 7 in MZN

1a. Ovary cells 1- ovuled:
   2a. Capsules 2-valved. Seeds adnate to the cell.
      ......................................................... 4. C. erecta
   2b. Capsules 3-valved. Seeds free in the cell................................. 7. C. paludosa

1b. 2 anterior ovary cells 2- ovuled; posterior one 1- ovuled:
   3a. Capsules 3-celled; 2 lateral ones 2- seeded, and median one deciduous, 1- seeded:
      4a. Leaves elliptic- ovate; spathe turbinate
          .......................................................... 2. C. benghalensis
      4b. Leaves lanceolate; spathe complicate:
         5a. Seeds reticulate, cylindric ........ 3. C. diffusa
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

5b Seed smooth, truncate at one end:
   6a Spathes ovate- lanceolate.
      Capsules usually 5 seeded;
      posterior cell keeled ....... 6. C. hasskarlii
   6b Spathes broad- ovate.
      Capsules usually 3-seeded;
      posterior cell not keeled .... 5. C. forsskalaei

3b Capsules 1- celled with 2 superposed seeds

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<tr>
<td>Annual, branched, glabrous or sparsely hairy herbs. Leaves 3-7 cm long, linear or linear lanceolate, acute or subobtuse. Sheaths cylindric, mouth ciliate. Spathes 3-5 cm long narrowly ovate- lanceolate or caudate- acuminate. Flowers bluish. Capsules 5-6 mm long. 1-celled, with 2 superposed seeds. Seeds truncate and appendiculate at both sides.</td>
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<td>F1. &amp; Fr. : Oct. – Nov.</td>
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<td>Common in grassy areas, and river banks. Collection : 5553; Purkaji.</td>
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<tr>
<td>Branched, decumbent-ascending, annual herbs. Leaves 3-5 cm long, ovate or elliptic- ovate, obtuse, sessile, rounded, cuneate or cordate at base, sheaths loose, pubescent, striate, ciliate. Spathes 1-3 in the axils, obliquely funnel shaped or tubrinate, pubescent or hirsute. Flowers blue or bluish-violet. Cymes with 1-flowered lower branch and 2 or 3 flowered upper branch; pedicel upto 0.3 cm long. Sepals unequal; dorsal one ovate- lanceolate; lateral ones suborbicular, hairy. Petals blue; dorsal one clawed, upto 0.7 cm long; lateral one 0.4 cm long. Stamens 6 with 3 staminodes. Capsules 5 mm long, pyriform or broadly ovoid, oblong. Seeds 5, pitted.</td>
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<td>Common in grassy areas, gardens, fields and crop fields. Collection : Muzaffarnagar City.</td>
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Diffused, glabrous herbs. Stem creeping and rooting below. Leaves 3-6 cm long, lanceolate or ovate- lanceolate, acute or acuminate. Spathes, base cordate or rounded. Lateral petals long-clawed, dark blue, dorsal one subsessile. Capsules broadly-oblong, 5-seeded. Seeds oblong-cylindric, tubercled and reticulate, brown.

F1. & Fr. : Aug. – Nov.

Common on river banks, gardens and grassy areas. Collection : 3622; Muzaffarnagar City.


A thinly hairy or glabrous, trailing herb with stout stem. Leaves 3-8 cm long, lanceolate, acuminate, scabrid or contracted at base. Sheaths 1-2 cm long, loose, striate, ciliolate along margins. Spathes terminal broadly cordate, recurved. Petals blue. Capsules 2-3 in each spathe, oblong, 2-valved. Seeds of lateral cells ellipsoid compressed, smooth; seed of median cell hemispheric.

F1. & Fr. : Aug. – Nov.

Common along the bank of Ganga and other rivers in sandy soils. Collection : 2287, Jansath.


F1. & Fr. : Aug. – Nov.


Annual, branched, diffused, nearly glabrous herbs with fiberous roots. Leaves 2.5-7.0 cm long, narrowly lanceolate, sub-acute; sheaths glabrous, ciliate. Spathes 1.5-2.5 cm long, ovate-lanceolate, cordate at the base. Flowers in unequal cymes, the lower branch 1-2 flowered; upper 2-4 flowered. Capsules 6-8 mm long apiculate, 5 seeded. Seeds 2-3 mm long; 4 seeds truncate at one-end and rounded at the other; the fifth seed cylindrical, no appendage.

Annual or perennial, stout, branched herbs with decumbent or creeping stem rooting below, suberect upwards, glabrous. Leaves subsessile, 4-12 cm long, variable in shape and size, lanceolate or elliptic – lanceolate, acute or caudate- acuminate, membranous, base rounded or narrowed. Sheath about 2.5 cm long, hairy at the mouth. Spathes about 2.5 cm long, hairy at the mouth. Spathes nearly as broad as long crowded in terminal heads, funnel shaped, filled with a sticky liquid. Flowers blue in simple racemes. Capsules 3-4 mm long, sub-globose, 3-valved, 3-celled with 3 seeds. Seeds oblong or ellipsoid, smooth, slightly hairy.

Collection: 3777; Mirapur.


Common in moist sandy places. Collection : 522; Muzaffarnagar City.

2. **Cyanotis** D. Don *nom. cons.*

Ca 50 species; 14 species in India; 1 in MZN.


Branched, creeping herbs, rooting at the lower nodes. Leaves 2.5-7.0 cm long, sessile, ovate- lanceolate to oblong, sparsely ciliate, base rounded or cordate. Sheaths short, hairy. Flowers blue, in scorpid recurved cymes. Bracts 2.5-6.5 cm long, leaf like, ovate, cordate, acuminate. Sepals 3, nearly equal, lanceolate-oblong, ciliate on midrib, 0.5-0.6 cm long. Petals purplish-blue, oblong-spathulate, 0.7—0.8 cm long. Stamens 6; filaments bearded at top. Capsules oblong, 3- gonous, glabrous. Seeds brown, ribbed.

F1. & Fr. : Aug. – Nov.

Common with in the area in moist sandy localities, river banks and grassy fields. Collection : 3714; Mirapur.

3. **Murdannia** Royle *nom. cons.*

Ca 50 species; 20 species in India; 1 in MZN.

Annual, erect or decumbent herbs with fiberous roots. Leaves 3-10 cm long, linear-lanceolate, flat, glabrous or scabrid on margins. Sheath margins and mouth strongly ciliate. Flowers bluish in sub-globose or subcorymbose cymes. Stamens 2 perfect; staminodes 3. Capsules 3.5mm long, 6-seeded, subglobose, mucronate, 6 seeded. Seeds tuberculate, truncate at one end.

F1. & Fr. : Aug. – Nov.

Common in grassy, sandy and marshy localities. Collection : 1742; Basera.

4. **Rhoeo** (Sw.) Stern.

Probably monotypic.

**R. spathacea** (Sw.) W.T. Stern. [**R. discolor** (L’Harit.) Hance.] HFD. 531. **Tradescantia discolor** L’ Harit. MCP. 199.

Erect or decumbent- ascending, annual perennial herbs. Leaves large, 20-40 cm long, upright, narrowly lanceolate, acute, base sheathed, green above, purple beneath. Flowers white, almost included with in the bracts.

F1. & Fr. : Major part of the year.

Grown in gardens. Collection : 4251; Ailum.

5. **Tonningia** Nocker ex Jauss.

Ca 50 speceis; 14 species in India; 1 in MZN.


Prostrate or suberect, diffused glabrous, annual herbs with fiberous roots. Leaves sessile 10-14 cm long, narrowly linear or linear lanceolate, acute or acuminate, flat. Flowers pinkish-blue, clustered in the inflated sheaths, in reduced axillary fascicles. Capsules oblong- ellipsoid, beaked. Seeds mottled, oblong, compressed.

F1. & Fr. : Aug. – Nov.

Commonly growing in marshy places. Collection : 1673; Rohana.

Note :- This genus is included in **Cynotis** D. Don in most of the Indian floras.

6. **Zebrina** Schinzl.

Ca 5 species; 1 in MZN.

**Z. pendula** Schinzl., MCP. 198.
Decumbent, creeping and rooting at nodes, herbs. Leaves 3-6 cm long, ovate-oblong, green-white striped above, purplish beneath. Flowers small, red-purple enclosed in spathe. Calyx tube whitish. Petals produced in a tube. Stamens 6, stigma 3 lobed.
F1. : Throught Year.
Grown in gardens. Collection : 5099; Shamli.

114. JUNCACEAE

Juncus Linn.

Ca 300 species; 28 species in India; 1 in MZN.
Vern. Pola.

Erect, small, slender, tufted annual herb. Stem slender, dichotomously branched. Leaves 6-8 cm long, few, linear, acute. Flowers pale green, solitary and scattered few flowered cymes forming terminal inflorescence; bract and bracteole ovate, 0.3-0.5 cm long. Outer perianth segments lanceolate, 0.5 cm long, with scarious margins; inner ones smaller. Stamens 6 in lateral flowers and 3 in terminal ones, shorter than perianth segments. Style filiform; stigmatic arms 3. Capsules 4-5 mm long, obovoid, shorter than and closely embraced by perianth, mucronate. Seeds many minute, reticulate.
F1. : Jan. – March.
Common on banks of ponds, ditches and marshy places. Collection : 761; Muzaffarnagar City.

115. ARECACEAE

1a. Leaves flabelliform i.e. fan-shaped; leaflets Connate to the middle........................................ 2. Livistona

1b. Leaves feather-like, i.e. pinnate :

2a. Leaves bipinnate............................... 1. Caryota

2b. Leaves simple pinnate :

3a. Lower leaflets spinescent..................... 3. Phoenix

3b. Lower leaflets not spinescent............. 4. Roystonea

1. Caryota Linn.
Ca 12 species; 3 species in India; 1 in MZN.


F1. & Fr. : Major part of the year.

Planted in gardens. Collection : 4599; Muzaffarnagar City.

Fibre obtained from leaf-sheaths, used for ropes, baskets etc; plant-juice used for making sugar.

### 2. Livistona R. Br.

Ca 30 species; 2 species in India; 1 in MZN.


A large strong, fan-palm. Trunk bearing the persistent bases of removed petioles and fiberous tissues. Leaves reniformely flabellate, multiplicated, upto 1.5 m across, broader than length. Spadix paniculate, surrounded at the base by spathes. Flowers small white. Fruits olive-shaped upto 2.5 cm long, ellipsoid-oblong, black.


Planted in gardens and bungalows. Collection : 2003; Shamli.

Leaves are used for making fans. Fibers from the leaf stalks are used for making ropes.

### 3. Phoenix Linn.

17 species; 7 in India; 2 in MZN

1a. Foot of stem surrounded by root suckers……………. **1. P. dactylifera**

1b. No roots suckers…………………………… **2. P. sylvestris**


A tall, unbranched tree, trunk covered with the persistent bases of petioles; the foot often surrounded by a dense mass of root suckers. Leaves longer than those of *P. sylvestris* Roxb. Pinnae distichous; petioles laterally compressed. Male panicles compact on a short peduncle, flowers sweet-scented. Fruits oblong, reddish or yellowish-brown when ripe, with edible flesh. Seeds cylindric.

F1. : March. - April; Fr. : Aug. – Oct.
Cultivated in gardens and road sides. Collection: 3515; Vahelna.

Fruits edible, leaves yield a fibre used for making ropes, bankets and cordage, leaf stalks used for making walking sticks.


Fl. : Feb. – April; Fr. : Aug.- Oct.

Common on road sides, waste places. Collection: 3514; Vahelna. Fruits are edible, stem tapped for tady; leaves planted into mats.

4. **Roystonea** O. F. Cook.

Ca 15 species; 1 in MZN.


A tall, annualate, fine palm with a columnar upto 12 m tall, single bole. Trunk covered all over with a whitish substance; thickened at the middle. Leaves very large; terminal pinnae in two rows or ranks, or either side of the rachis; leaflets ensiform, many nerved length wise, apex shortly bifid.

Fl. & Fr. : Not observed

Planted in gardens and parks along the roads. Collection: 4598; Kandhla.

### 116. TYPHACEAE

**Typha** Linn.

Ca 20 species; 3 species in India; 2 in MZN.

1a. Leaves semicylindric above the sheath. Pollens simple.......................................................... **1. T. angustata**

1b. Leaves 3-angular above the sheath. Pollens 4-globate.......................................................... **2. T. elephantina**

A tall, perennial marshy shrub. Leaves upto 2.5 cm broad, 1 or 2 m long, semi-cylindric above the sheath, usually exceeding the flowering stems, spongy. Spikes cylindric, the males and females are demarcated by long gap. Male spikes 15-20 cm long; flowers with scaly perianth and mixed with clavate-tipped pistillodes. Female spikes 10-15 cm long, pale-brown; stigma papilose. Bracteoles spatulate.

F1. : Oct.- April

Common or marshy areas and swampy places. Collection : 624; Purkaji.

Leaves used for thatching purpose, making mats, ropes and baskets.


An erect, perennial marshy shrub, 2-3 m tall. Leaves upto 1.5 cm long basal, 3-gonous; Sheaths membranous, margins undulate above the middle. Male flowers in 15-30 cm long spikes. Female in dense spikes of 15-20 cm long, mixed with clavate pistillodes.

F1. : Oct. - April

Common on marshy areas and swampy places. Collection : 748; Muzaffarnagar City.

The leaves are made into mats and hand-fans.

### 117. ARACEAE

1a. Flowers unisexual :

2a. Leaves entire :

3a. Ovules few, basal.........................

1. Alocasia

3b. Ovules many, parietal....................

2. Colocasia

2b. Leaves divided; ovules 2 in each cell ..........

3. Monstera

1b. Flowers bisexual; climber or scandent............

4. Scindapsus

1. Alocasia Neck.

Ca 70 species; 12 species in India; 1 in MZN.


A large stout plant upto 2.5 m tall. Blades 80-100 cm long, broad, sagittate, entire; basal lobes shorter, midrib broad; spathe with glaucous-green yellowish blade, ovules few, basal.

F1. : July. – Sept.
Cultivated in gardens. Collection: 5506; Purkaji.
Rhizome is edible. Leaves are also used as vegetable.

2. Colocasia Schott.

8 Species; 4-5 species in India; 1 in MZN.


Perennial or annual, erect, rhizomatous herbs. Leaves ovate-cordate, 18-30 cm long, entire, apiculate, with a shallowly retuse or triangular basal sinus, white margined. Peduncle 15-20 cm or more. Spathes pale-yellow, with 5-10 cm long tube, oblong, greenish. Spadix with female flowers in middle and male flowers at top; narrowed into a long sterile appendage at top. Male flowers: stamens 7 or 8. Female flowers: ovary ovoid; stigma subsessile, discoid.

F1.: Aug. – Oct.

Cultivated for edible starchy rhizomes. Collection: 5104; Shamli.
Starchy rhizomes are cooked as vegetable. The leaves are also used as vegetable.


Ca 50 species; 1 in MZN.

M. deliciosa Liebm., MCP. 183.

A perennial straggling climber. Leaves upto 60 cm long, pinnatifid, with elliptic space between the segments. Spathes lanceolate, oblong-ovate, boat – shaped upto 30 cm long, apiculate. Fruits cohering into a cone-like body.


Planted in gardens. Collection: 5012; Muzaffarnagar City.
Fruits are edible.

4. Scindapsus Schott.

Ca 40 species; 2 species in India; 1 in MZN.


A perennial, climbing or scrambling herb, rooting at the nodes. Leaves 20-30 cm long, broadly ovate-elliptic to round, cordate to subcordate base, acuminate, entire, glabrous, often 1-2 lateral lobes. Petiole upto 20 cm long. Spathe 10-20 cm long, green, oblong, subcylindric, beaked spadix yellowish green.

F1. & Fr.: Not observed.
Cultivated in pots and bottles in rooms. Collection : 4498; Muzaffarnagar City.

118. LEMNACEAE

1b. Fronds flat, with 1-many roots. Inflorescence spathaceous, with 2-male and 1-female folowers:

2a. Fronds with 1-root.......................... 1. *Lemma*

2b. Fronds with many roots....................... 2. *Spirodea*

1b. Fronds subglobose without roots. Inflorescence not spathaceous, with 1-male or 1-female flowers........ 3. *Wolffia*

1. *Lemma* Linn.

Ca 10 species; 4 species in India; 1 in MZN.


Free floating aquatic herb. Fronds asymmetric, flat on both sides, 1.5-2.0 mm long, obovate-oblong or suborbicular, oblique at base, glabrous, entire. Root sheath slightly winged at base, with a single root; root-cap acute. Spathe 1.5-2.0 mm long, membranous with two male flowers and one female. Male flowers with one stamen. Utricle ovoid and smooth. Female flowers: ovary 1, 1-loculed, 1-ovuled.

F1. & Fr. : Aug. – Nov.

Common in ditches and ponds. Collection : 5017; Shernagar.

*L. paucicostata* Hegelm. is often considered as a distinct species.

2. *Spirodea* Schleid.

6 species; 2 species in India; 1 in MZN.


An aquatic floating herb. Fronds herbaceous, 7-8 mm long, broadly obovate or orbicular, opaque, thick, flat above, slightly convex below dark green above, usually purplish beneath, each frond with multiple roots. Spathe with two male and one female flower. Ovary 2-ovuled.


Common in ditches and ponds. Collection : 3568; Muzaffarnagar City.

3. *Wolffia* Horkel ex Schleid; *nom. cons.*
Ca 10 species; 2 species in India; 2 in MZN.

The smallest known angiospermous plant.

1a. Fronds subglobose on the lower side.................. 1. W. globosa

1b. Fronds conical or subylindric on the lower side...... 2. W. microscopica


A very minute, granular floating plant. Fronds suborbicular or subglobose beneath, slightly canxvex on the upper surface, 0.5-1.5 mm across. Flowering grooves, with one male and one female flower.


Common in ponds and ditches.


A very minute floating plant. Fronds flat on upper surface or slightly conical beneath. Flowers in a groove on the upper surface of the frond. Male flowers solitary, consisting of one stamen. Ovary globose or ovoid.

F1. & Fr. : July. – Sept.

Common in ponds and ditches.

119. ALISMATACEAE

Sagittaria Linn.

Ca 25 species; 2 species in India 1 in MZN.


An aquatic, herb with floating leaves. Roots fiberous. Leaves 2.5- 5.0 cm long, broadly ovate, deeply cordate. Scapes 10-15 cm long. Flowers white, 1.5 cm in diam, in close whorls, pedicels 6 mm long, stout; flowers of lower whorl ternate, bisexual, and of upper whorl male. Achenes many, flat, wing toothed.

F1. & Fr. : Sept. – Oct.

Common in ditches, ponds, tankes and rice fields. Collection : 791; Rohana.
120. APONOGETONACEAE

Aponogeton Linn. f.

Ca 30 species; 4 species in India; 1 in MZN.


A floating, scapigerous, aquatic herb, Root stalk stoloniferous. Leaves 4-15 cm long, floating, oblong to linear oblong, acute, obtuse or rounded at the apex base cordate or rounded. Petiole much longer than the blade. Spikes 3-8 cm long, solitary densely flowered, stamens 6; anthers bluish purple. Follicles subglobose, exceeding the sepals. Seeds ribbed.

F1. & Fr. : July. – Dec.

Common in large ponds and marshy areas. Collection : 1411; Kairana.

121. POTAMOGETONACEAE

Potamogeton Linn.

Ca 100 species; 12 species in India; 3 in MZN.


An aquatic, submerged herb. Stems cylindric, filiform, dichotomously branched. Leaves alternate, 3-6 cm long, semiamplexicaul, linear or linear-oblong, crisped, finely serrulate, sessile. Stipules axillary, hyaline, ligule like, caducous. Flowers small, in spikes, 1-2 cm long. Drupes obliquely ovoid with a compressed curved beak.

F1. & Fr. : Dec. – April.

Common in shallow ponds, ditches and rivers. Collection : 884; Shamli

An aquatic herb. Submerged leaves 20-25 cm long, elliptic-lanceolate, membranous; floating ones 7-15 cm long, thick, opposite, elliptic- lanceolate or oblong. Stipules upto 3 cm long, lanceolate, membranous. Peduncles leaf opposed or axillary, 5-7 cm long. Spikes upto 4 cm long, dense flowered. Drupelets oblique, shortly beaked and ribbed on the back.

F1. & Fr. : Sept. – Nov.

Common in ponds; marshy places and slow running water stream. Collection : 1491; Mirapur.


Much branched filiform, grass like, aquatic herbs. Leaves 2-6 cm long, narrowly 1-3 nerved, filiform. Stipules sheathing. Spikes upto 2-5 cm long. Flowers few, in distant whorls; peduncles filiform. Drupelets 2-3 mm long, broadly ovate with a very small beak.

F1. & Fr. : Dec. – April.

Common in ponds and ditches. Collection : 882; Kairana.

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### 122. ERIOCAULACEAE

**Eriocaulon** Linn.

Ca 400 species; 55 species in India; 1 in MZN.


A marshy annual herb. Leaves 1.5-3.0 cm long, linear subulate. Scapes 3-10 cm long, erect, slender glabrous; heads 2.5-3.0 mm in diam, globose or ovoid, purplish blakish- white or black. Involucral bracts scarious, oblong-obcate, obtuse, glabrous, passing into flower-bracts. Male calyx spathaceous, limb ovate, acute, tridentate, style 3-fid. Petals 0. Fruit a loculicidal membranous capsule. Seeds ellipsoid- ovoid.

F1. & Fr. : Sept. – Nov.

Common in rice fields, pond edges and marshy places. Collection : 2728; Rohana.
123. CYPERACEAE

1a. Nuts enclosed in an utricle.  

1b. Nuts not enclosed in an utricle:
    
    2a. Fertile glumes distichous.  

    2b. Fertile glumes spirally arranged:

        3a. Style base constricted or articulated above the nut:

            4a. Leaves absent. Bristles present.  

            4b. Leaves present. Bristles absent:

                5a. Styles flat, hairy, usually persistent.  

                5b. Styles linear, glabrous, usually deciduous.

        3b. Style base not constricted or articulated above the nut:

            6a. Bristles linear, filiform or absent.  

            6b. Bristles 6, cut into narrow segments.


2. Carex

3. Cyperus

4. Eleocharis

5. Fimbristylis

6. Fimbristylis

1. Bulbostylis Kunth, nom. cons.

Ca 100 species; 4 species India; 1 in MZN.

B. barbata (Rottb.) Clarke, FBI. 6: 651. 1893; FUGP. 3: 358; FD. 361; HFD. 549.


A densely tufted herb with fibrous roots upto 30 cm tall. Stem and leaves filiform, glabrous. Leaves acuminate, margins involute, sheath short, mouth with long, fine hairs. Spikelets 4-5 long, 3-12 in dense heads. Bracts filiform. Glumes 1.6-2.0 mm long, ovate, laterally compressed, margins hyaline. Style leaving a button on nut. Nuts sharply trigonous, dull-white, short stalked, minutely tipped at apex.

Fl. & Fr.: Aug. – Nov.

Common in sandy, moist localities, and river banks.

Collection: 3767; Mirapur.

2. Carex Linn.

Ca 2000 species; 140 species in India; 1 in MZN.

An erect glabrous herb with stoloniferous rhizome, bearing fibrous roots, upto 60 cm or more in tallness. Stem triquetrous, smooth, leafy. Leaves flat, filliform; tips overtopping the stem and inflorescence, coriaceous, scabrid. Spikes 5-7 cm long, cylindric; upper males 4-6 cm long; lower females 2-4 cm long. Glumes ovate, utricles 4 mm long, tipped by a 2-fid beak.

F1. & Fr. : Feb. – April.
Common in sandy localities, river banks and canal sides. Collection : 3104; Titawi.

3. Cyperus Linn.
Ca 1468 species; 100 species in India; 18 in MZN.
Most of the Cyperus species are used as fodder.

1a. Style arms 2. Nuts lenticular :
   2a. Rachilla of spikelets persistent :
      3a. Nuts laterally compressed :
         4b. Glumes obtuse, not aristate.
            Perennials.............................. 8. C. globosus
      3b. Nuts dorsally compressed :
         5a Inflorescence of numerous
            spikelets, arranged in spikes ....... 1. C. alopecuroides
         5b. Inflorescence of a dense head of
            small spikelets.......................... 15. C. pygamaeus
   2b. Rachilla of spikelets deciduous :
      6a. Spikes 3. Plants non- stoloniferous ..... 18. C. triceps
      6b. Spikes usually 1. Plants stoloniferous ... 10. C. Kyllingia

1b. Style arms 3. Nuts trigonous :
   7a. Rachilla of the spikelets caducous :
      8a. Inflorescence a simple or compound
          umbel. Stamens 3 ....................... 6. C. cyperoides
      8b. Inflorescence capitates of terminal
          heads. Stamens 2 ........................ 17. C. sesquiflorus
   7b. Rachilla of the spikelets persistent :
      9a. Spikelets clustered or digitate, not in
          spikes :
10a Perennials with a woody rhizomes

11. *C. niveus*

10b Annuals with fiberous roots:

11a. Glumes mucronate

5. *C. cuspidatus*

11b. Glumes obtuse

7. *C. difformis*

9b. Spikelets in spikes or spike-like racemes:

12a. Annuals:

13a. Glumes prominently cuspidate

3. *C. compressus*

13b Glumes obtuse, shortly mucronate:

14a Rachis of the spike glabrous. Spikelets 0.15-0.2 cm broad. Keel 3-5 nerved. Smooth, not winged

9. *C. iria*

14b Rachis of the spike scabrid on angles. Spikelets 0.2-0.25 cm broad. Keel 7-nerved winged with serrate margins

2. *C. alulatus*

12b Perennials:

15a Spikelets more than 1 cm long:

16a. Rachilla winged. Spikelets crowded

13. *C. pangorei*

16b. Rachilla only distinctly or conspicuously winged. Spikelets
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

4. C. corymbosus

15b Spikelets less than 1 cm

Long:

17a. Spikelets 3-8 in short spikes........ 16. C. rotundus

17b. Spikelets numerous in an elongate spike............ 12. C. nutans


A glabrous, marshy, perennial 1.5 m tall herb with fibrous roots. Leaves linear, acute or acuminate, shorter or longer than the stem. Umbels large, compound. Spikes in clusters, on secondary branches. Spikelets 4-8 mm long, compressed, acute, straw-coloured. Glumes 2 mm long, acute, oblong-ovate, mucronate, with brown streaks. Stigma 2. Nuts ellipsoid, biconvex, dorsally compressed.

F1. & Fr.: Aug. – Nov.

Common in marshy localities, pond, river and canal sides.

Collection: 3624; Muzaffarnagar City. 1044; Shukartal.


An annual, up to 50 cm tall sedge. Leaves linear, as long or longer than the stems. Spikes umbellate, up to 3 cm long. Bracts 6-8 unequal. Spikelets 3-6 mm long. Glumes about 2 mm long, ovate; keel 7-nerved, winged; the upper part with serrulate margins. Stamens 2; style 2-partite. Nuts up to 1.5 mm long, obovoid, reddish brown, apiculate.

F1. & Fr.: Aug. – Nov.

Common in rice fields, ditches and ponds. Collection: 1143; Baghra.


An erect, glabrous, annual herb up to 30 cm tall with fibrous roots. Stem tufted, trigonous, sheaths purplish. Leaf blades as long as the stem, narrowly linear, 1-
nerved. Inflorescence simple or compound umbel. Spikelets strongly laterally-compressed, 1.2-2.0 cm long, 4-7 in each head, rachis flattened. Glumes 3-4 mm long, oblong lanceolate, winged; margins hyaline. Stamens 3. Style divided half way down, 0.4 cm long. Nuts triquetrous; obovoid, dark brown.

Common in grassy, sandy and marshy areas. Collection: 1889; Ramraj.


A tall, glabrous herb with tuberous root stock. Stems trigonous above, spongy below. Leaves reduced to sheaths or sometimes with linear acute blades. Umbels compound. Bracts of inflorescence 2-3 leaf-like, half or as long as the rays or less. Spikelets up to 2.8 cm long, alternate, subulate and bright brown. Lower glumes smaller, flowering glumes ovate. Nuts narrowly obovoid.

F1. & Fr.: Aug.–Nov.
Common on river beds, ponds, canals banks and rice fields.
Collection: 54; Muzaffarnagar City.


An erect, glabrous, tufted annual herb upto 25 cm tall. Leaves all basal, narrowly linear, acute or acuminate. Spikelets 5-20; clustered in a globose head, 5-11 mm long. Glumes ovate, mucronate; chestnuts brown with a 3- nerved keel. Stamens 3, Nuts obovoid, sharply 3-angled, with 3- flat faces.

F1. & Fr.: Sept.–Nov.
Common in crop fields, lawns and sandy places. Collection: 3073; Kandhala.


A perennial, stout marshy plant with subterranean rhizome. Stem 3-gonous, upto 60 cm tall. Leaves subbasal, as long as or longer than the stem, upto 8 mm broad. Inflorescence a simple or compound umbel with 3-6 rays. Bracts 6-12, unequal, leafy, upto 30 cm long. Spikes cylindric-oblong, 2-3 cm long. Spikelets patent, with 2 florets, sub-terete. Glumes broadly ovate, acute; lowest 2 empty. Stamens 3, Nut 3-gonous, reddish-brown, ellipsoid-oblong, slightly curved.

F1. & Fr.: July–Nov.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTER PRADESH (388)
Common in grassy, agriculture fields, sandy places, gardens and on road sides. Collection : 1478; Mirapur.


   An annual erect, tufted herb with fibrous roots. Stem 3-quetrous. Leaves usually shorter than the stem, smooth. Inflorescence a decompounds umbel of 3-6 compact head of spikelets, nearly globose. Primary bracts 3 or 4, foliaceous, unequal, slightly broader than leaves. Spikelets 7-10 mm long, rachilla winged. Glumes boat shaped, mucronate. Nuts ellipsoid, tapering, trigonous, yellowish.

F1. & Fr. : Aug. – Nov.

Collection : 3070; Kandhla.


   An erect, perennial sedge. Stem trigonous. Leaves subbasal, gland-punctate, equal or more in length than the stem. Inflorescence a simple or compound umbel of dense, short spikes. Spikelets lanceolate patent, with 8-20 florets. Glumes ovate-oblong, obtuse, with a 3- nerved keel. Stamens 2. Nuts compressed, ellipsoid, with a prominent rib on lateral faces.

F1. & Fr. : Aug. – Nov.

Collection : 259; Rampur.


   An erect, annual, glabrous herb variable in size and form. Stem 3-quetrous. Leaves basal, linear, acuminate; sheaths brown. Bracts over topping the umbel. Spikes of 7-25 spikelets, 1-3 cm long. Spikelets 5-10 mm long, compressed. Glumes 1.5-2.0 mm long, elliptic, truncate, margins hyaline. Stamens 2-3. Nuts ovoid, triquetrous, brown or black.


Collection : 3735; Shamli.


   An erect, glabrous herbaceous plant with creeping rhizome. Leaves basal, linear, acuminate, rough on midrib and margins, as long as the stem. Bracts 3-4, unequal, 4-6 cm long. Spikes solitary, sub-globose, 7-8 mm in diam. Spikelets

F1. & Fr. : July. – Oct.
Common in grassy areas, gardens, river and canal banks. Collection : 263; Rampur.


   An erect, tufted, perennial herb with a short, woody rhizome and fibrous roots. Leaves nearly or exceeding the inflorescence, narrowly linear, tapering. Spikelets white, 3-12, in one sessile head or umbel; oblong, elliptic, compressed. Glumes about 5 mm long, ovate-lanceolate, compressed, hyaline margins. Nuts about 1.5-2.0 mm long, obovoid, triquetrous, dark brown.

F1. & Fr.: July. – Nov.
Common in grass-lands and river banks. Collection : 1440; Purkaji.


   A glabrous, perennial, tall upto 1 m high sedge with stoloniferous rhizomes. Leaves basal, linear, acuminate, mid-rib keeled below. Spikelets pale- brown, upto 8 mm long, crowded in corymbose spikes, forming compound umbles; primary rays unequal; rachilla narrowly winged. Primary bracts foliar. Nuts 3-gonous, ellipsoid, brown.

F1. & Fr. : July. – Oct.
Common on canal sides, marshy palace and grassy fields. Collection : 1040; Shukartal.

Note:-Some botanists do not treat this as a distinct taxon but completly marged it with **C. nutans** Vahl.


   An erect, perennial herb with a woody rhizome. Stems ovtsuely 3- angular. Leaves basal, often reduced to sheaths, scabrid on the margins and midrib beneath. Inflorscence compound umbel of spikes. Primary rays 5-11 cm long; secondary rays 2.5-10 cm long; spikelets about 1.7 cm long. Glumes oblong-ellipsoid, with reddish brown sub-hyaline wings; sides of the keel chestnut brown. Nuts oblong- ellipsoid, white.
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH

F1. & Fr.: Aug.–Nov.
Common in marshy and swampy areas. Collection: 560; Chitora.


Common along the banks of canal, rivers and ponds. Collection: 579; Muzaffarnagar City.


A tufted annual, upto 10 cm high sedge. Stem terete, sheaths closed. Leaves narrowly linear. Inflorescence a dense, terminal head, 1.-1.5 cm in diam. Spikelets 3.-4.5 mm long, surrounded by 3-5 bracts. Glumes distichous, narrowy boat shaped, acute or acuminate. Nuts ellipsoid.

F1. & Fr.: Oct.–July.
Common on river banks, sandy areas and crop fields. Collection: 175; Jhinjhana


An erect, perennial, herb with woody, stonloniferous rhizome. Leaves usually shorter than the stem, linear, acuminate or acute. Inflorescence an umbel of more or less condensed spikes; bracts foliar, generally three, exceeding the umbel. Spikelets pale yellow or brown; often with reddish tinge. Glumes decurrent below as hyaline wings. Nuts obovoid- ellipsoid.

F1. & Fr.: July-Nov.
Common weed of rainy season in lawns, crop fields and gardens. Collection: 3713; Jansath.


F1. & Fr.: June. – Sept.

Common near water ponds, ditches and moist sandy soils. Collection: 1735; Nirgajani.


Tufted, glabrous, annuals upto 25 cm tall. Leaves linear, usually as long or shorter than the stem. Bracts 3-4, 5-8.5 cm long. Spikes usually 3, in dense globose heads. Spikelets with one fertile flower. Glumes: lower two hyaline, 1-1.5 mm long, lanceolate or sub- orbicular; third and fourth membranous, apiculate; fourth, the longest, 2-2.5 mm long. Stamens 2. Stigma bifid. Nuts 1-1.5 mm long, ellipsoid, obtuse, compressed.

F1. & Fr.: Aug. – Nov.

Common in grassy-fields and gardens. Collection: 1884; Ramraj.

4. **Eleocharis** R. Br.

Ca 200 species; 14 species in India; 2 in MZN

(Some books on Indian flora describe this genus under *Heleocharis* Lestib.)

1a. Rhizome absent; small tufted sedge upto 10 cm tall, spikelets 0.3-0.5 cm long…………………………………… 1. **E. atropurpurea**

1b. Rhizome creeping, a taller sedge upto 45 cm tall.

Spikelets 1.0-2.5 cm long…………………………………… 2. **E. palustris**


An annual, tufted, filiform small herb with slender, glabrous stem. Leaves absent. Sheaths short, membranous, glabrous. Spikelets solitary-terminal, 3-5 mm long, ovoid, dark brown, broader than the stem. Glumes ovate-oblong, obtuse,
margins darker. Bristles white. Stamen 1 or 2; filaments reddish-brown. Style upto 1 cm long. Stigma 2. Nuts minute, black, biconvex, tipped by the style base.
F1. &Fr. : Sept. – Nov.
Common as rice field weed, on damp and shady places. Collection : 579; Muzaffarnagar City.

*Scirpus palustris* Linn., Sp. P1. 70.1753.

An erect, tufted, marshy sedge 15-300 cm tall having a creeping rhizome. Stem terete. Leaves absent; Sheaths truncate. Spikelets solitary, terminal, upto 2 cm long, ellipsoid or cylindric, yellow or brown, broader than the stem. Glumes closely imbricate, ovate-lanceolate or elliptic. Bristles brown, retrorsely scabrid. Stamens 1 or 2. Style short with 2 very short stigma. Nuts broadly obovoid, biconvex tipped by the broad style base.
F1. &Fr. : Aug. – April.
Common in marshy areas. Collection : 3056; Kandhla.

5. *Eriophorum* Linn.

Over 20 species; 3 species in India; 1 in MZN.


An erect, slender, tufted sedge. Leaves usually longer than the stem, very narrowly linear. Spikelets narrowly ellipsoid, reddish-brown, numerous in compound or decompound, irregular umbels. Bracts several, exceeding the inflorescence. Glume membranous, ovate- lanceolate 0.3-0.4 cm long, with hyaline margings and green keel, closely imbricate. Bristles 4-6, subequal, brown, retrorsely scabrid. Stamens 1 or 2. Style 0.5 mm long, with 0.5 mm long 2 stigmas.
F1. &Fr. : Oct. – Nov.
Common along the banks of ponds and ditches. Collection : 1911; Kakroli.


Ca 300 species; over 50 species in India; 6 in MZN.

1a. Style arms 2. Nuts biconvex :

2a. Stamen 1. Nuts 0.06-0.1 cm long. Spikelets

Smaller.................................

1. *F. bis-umbellata*

2b. Stamens 1-3. Nuts 0.1-0.2 cm long. Spikelets
longer:

3a  Leaves often as long as the stem, not coriaceous; nuts ribbed and trabeculate………………….. 3. F. dichotoma

3b  Leaves always short, coriaceous; nuts not ribbed and trabeculate …………… 2. F. cymosa

1b  Style arms 3. Nuts 3- gonous:

4a  Spikelets solitary……………………………… 5. F. ovata

4b  Spikelets more than 1 : 

5a  Lower glumes distichous……………… 6. F. tenera

5b  All glumes spirally arranged ………… 4. F. miliacea


An annual, tufted, sedge. Leaves as long as or smaller than the stem, scabrous beneath, acute, glabrous. Spikelets in compound or decompounds umbels, 3-5 mm long, primary bract leaf-like, exceeding the inflorescence. Glumes ovate, mucronate, glabrous keel prominent, mucronate. Rachilla deeply pitted after the fall of glumes. Stamen 1. Nuts about 0.7 mm long. Pale brown, biconvex, 5-8 ribbed.

F1. &Fr. : Oct. - April.

Common in river beds and marshy localities. Collection : 1663; Rohana.


A perennial, tufted 20-40 cm tall sedge. Leaves basal much shorter than the stems. Spikelets 4-5 mm long, ovoid in simple or compound umbels which are congested. Bracts nearly as long as the rays. Glumes 0.5-1.5 mm long, boat shaped. Style swollen at the base. Nuts minutely stipitate, biconvex, rubose.


Common in marshy localities and rived beds. Collection : 2888; Jaroda.

Tufted, annual, fibrous-rooted herbs. Leaves basal, falcat-linear, glabrous, scabrous beneath. Umbels compound or decompound. Spikelets ovate, Sub-cylindric, sessile, brown. Glumes boat-shaped; keel excurrent as a mucronate. Rachilla after the fall of the glumes deeply pitted. Nuts pale brown, 5-8 ribbed, transversely rugose.

F1. & Fr. : Jun. – Nov.


Annual, tufted sedges, 30-70 cm tall. Stems angular. Leaves as long or longer than the stamens : sheath glabrous. Spikelets ca 2 mm in diam, subglobose, in decompounds umbels; rays and pedicels filiform. Bracts linear with broad dilated base. Glumes spirally arranged, obtuse; keel 3-nerved, slightly excurrent, margins brown or hyaline. Nutlets globose-obovoid, pale brown or whitish, tuberculate.

F1. & Fr. : Aug. – Nov.


A densely tufted, slender herb. Stems 10-30 cm long, filiform, striate. Leaves about half as long as the stem or more, crowded at base, filiform. Spikelets solitary, 8-15 mm long, subdistichous, ovate, boat-shaped, keeled. Stamens and stigmas 3. Nuts 1.5-2.00 mm long, trigonous, pyriform, obovoid, apiculate, brown.

F1. & Fr. : Sept.–Oct.
Common near ditches, ponds and marshy places, Collection : 3215; Banat.


An erect, tufted annual herb. Leaves about half the length of stems. Spikelets 4-7 mm long, sub-cylindric or narrowly obovoid, in lax subcompound umbels. Pedicles filiform. Bracts leaflike with dilated base, shorter than the rays. Glumes ovate, with an auricle on either side. Lower glume distichous. Rachilla stout with large depressed areoles. Nuts trigonous-obovoid, dirty white, minutely verrucose.

Common in grass lands, river-blanks, road sides and gardens. Collection : 1497; Mirapur

7. Scirpus Linn.
Ca 360 species; 25 species in India; 7 in MZN

1a. Bristles many, silky, smooth, accrescent in fruiting.............................................................. 2. S. comosus

1b. Bristles 6 or rarely absent, filiform, curled or crisped, not silky, usually not accrescent :
2a  Spikelets 1- many, in clusters or heads :
3a. Bristles present.........................  4. S. mucronatus

3b  Bristles absent :
  4a  Glumes obtuse.........................  5. S. roylei
  4b  Glumes mucronate .................  6. S. supinus

2b  Spikelets many, decompounds :
  5a  Umbels lateral. Bracts not foliaceous ....  3. S. littoralis
  5b  Umbels terminal. Bracts foliaceous :
  6a  Nuts lenticular, compressed ..........  1. S. affinis
  6b  Nuts plano-convex, smooth ........  7. S. tuberosus


An erect, spongy-rooted sedge with smooth, horizontal rhizomes. Stem 30-55 cm tall, trigonous leafy. Leaves about 20 cm long. Spikelets capitate, 1-6, in a terminal cluster, 1.5-2.2 cm long, ovoid-lanceolate. Glumes 5-7 mm long, straw-coloured, hairy on the margins. Style 2-fid. Nuts lenticular, 2 mm long, compressed. Fl. & Fr. : Feb. – July.

Common in river beds, canal sides and on pond-banks. Collection : 1450; Kairana.


An erect, tufted, perennial sedge with a short woody rhizome. Stems slender, obtusely trigonous, glabrous, clothed with dark brown, persistent, nonfibrous leaf sheaths at base. Leaves basal, linear, longer than the stem, serrulate margins. Spikelets 5-7 mm long, ellipsoid, reddish-brown, numerous in compound or decompounds.
irregular umbels. Bracts several, leaf like, exceeding the inflorescence. Glumes upto 2.5 mm long, ovate-lanceolate, mucronate, 1-nerved, hyaline. Nuts trigonous, fusiform, brown, supported by a ring of cottony hairs; much longer than the nuts.

Fl. & Fr. : Oct.- Nov.

Rarely occurs in ravine of Ganga. Collection : 3653; Muzaffarnagar City.


An annual, upto 1 m tall sedge. Stems terete. Leaves short or grass like. Spikelets 5-7 mm long, in lax subcorymbose or paniculate umbels, laterals near the apex of stem. Bract upto 10 cm long. Glumes about 4 mm long, ovate-oblong, notched at the apex, mucronate. Bristles 2-7, soft, plumose upwards. Style 2-fid. Nuts 1.5 mm long, obovoid, planoconvex, apiculate, smooth.

Fl. & Fr. : Sept. – Nov.

Common in marshy places and khaddar area. Collection : 371; Muzaffanagar City.


Perennial, erect, sedges upto 40-90 cm tall. Stems triquetrous. Leaf blades 0. Sheath loose, membranous mouth oblique. Spikeletes 0.9-20 cm long, in a single lateral cluster of 5-12, just below the top of the stems. Glumes 4-4.5 mm long, broadly ovate. Bristles 5-6, unequal, hispid. Nuts broadly obovate, apiculate, unequally trigonous, black, smooth and shining.

Fl. & Fr. : Sept. – Nov.

Common in marshy places and near ponds. Collection : 794; Rohana.


An erect, tufted, fibrous rooted annual, 20-40 cm tall sedge. Clumps terete, transversely septate when dry. Leaves almost 0. Spikelets 1-8, in a single lateral, dense head, usually above the middle of the head, 8-12, mm long, ovoid – oblong, slightly compressed, golden–yellow, shining. Glumes 3-4 mm long, striate, usually 5-ranked, elliptic-lanceolate, mucronate, keeled. Nuts 1.5 mm long, obovoid, acutely trigonous, apiculate, rugose, black.

Fl. & Fr. : Sept. – Nov.

Common in rice fields, muddy and marshy area. Collection : 1078; Rohana.

Annual, 10-20 cm tall sedges. Roots fibrous; stems terete. Heads brown, below the apex of the stem. Spikelets 3-5, in a single lateral cluster, 3-6.5 mm long. Glumes upto 2.5 mm long, ovate, mucronate. Bristle 0. Style 3-fid. Nuts trigonous, minutely apiculate, transversely undulate-rugose, pale-white when young, black at maturity.
Occasionally occurs in rice- fields and river beds. Collection : 4260; Ailum.
An erect, robust, glabrous, annual sedge, with creeping rhizomes and woody tubers. Stems stout, trigonous. Leaves about equal to the stems, coriaceous. Umbels simple or compound; rays unequal. Spikelets 3-8 or solitary on each ray, dull or dark brown, ovate oblong, elliptic. Glumes bifid at the apex; keels excurrent as curved awn. Bristles present, scarbid. Nuts plano-convex, smooth, polished, brown.
Fl. & Fr. : July–Nov.
Common in marshy localities, river beds, canal sides. Collection : 793; Rohana.

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Generic key for Poaceae
1a Spikelets 2- flowered, falling entire at maturity, usually upper florets female and lowers male or barren, frequently dorsally compressed. (Panicoideae) :

2a Male & female spikelets in separate inflorescence or in different parts of the same inflorescence and of different appearance; lemmas hyaline or membranous and thinner than the glumes (Maydeae) :

3a Male and female spikelets in separate inflorescence; male spikelets in a large terminal panicle; female spikelets in the axils of subtended leaves, and not enclosed by leaf sheath.............48. Zea

3b Male and female spikelets in same inflorescence; female spikelets completely enclosed in a spherical or cylindrical metamorphosed leaf sheath.........................................................11. Coix

2b Spikelets all hermaphrodite, with male or barren or hermaphrodite spikelets mixed in the same inflorescence and so arranged that the male or barren spikelet is near to a hermaphrodite spikelet; if unisexual than the lemma of the fertile floret indulated :

4a Spikelets often in pairs; one sessile, the other pedicelled, those of each pair similar or more often dissimilar; rarely solitary and all alike. Glumes as long as the spikelets and enclosing the florets, rigid. Lemma hyaline, membranous; upper lemma usually awned (Andropogoneae) :
5a. Spikelets of a pair similar; hermaphrodite; joints slender, linear or more or less clavate above, thickened (Saccharinæ) :
   6a. Spikelets all pedicelled; one with a short pedicel; the other long pedicelled… 26. Imperata
   6b. Spikelets one sessile; the other pedicelled………………………………………40. Saccharum

5b. Spikelets of a pair dissimilar; the sessile hermaphrodite; the pedicelled male or sterile or rarely more or less similar; the joints and pedicels thick and swollen :

7a. Joints and pedicels trigonous, rounded or flat :
   8a. Sessile spikelets with one male and one hermaphrodite floral; upper lemma awned
      (Ischaminæ) ………………………………………………………………………………..2. Apluda
   8b. Sessile spikelets only with one hermaphrodite floret or also with one lower male; upper lemma unawned (Rottboellinæ) …………………………………………………….22. Hemarthria

7b. Joints and pedicels slender, rarely thickened upwards :
   9a. Racemes usually arranged in panicles or verticillate along the main axis; never spatheate
      (Sorghinæ) :
      10a. Lower glume flattened on the back………………………………………42. Sorghum
      10b. Lower glume not flattened on the the back:
         11a. Spikelets in threes at the end of branches; one sessile and the two pedicelled…..
             ……………………………………………………………………..10. Chrysopogon
         11b. Spikelets in pairs; one sessile and the other pedicelled……….47. Vetiveria

9b. Racemes digitate, sub-digitate or in pairs or solitary, usually spatheate (Andropogoninæ):
   12a. Margins of the lower glumes of the fertile spikelets inflexed and the glume sharply bi-keeled. Callus short, obtuse; awns glabrous or scabrid, rarely hairy :
      13a. Sessile spikelets of all pairs perfect, awned…………………………………6. Bothriochloa
      13b. Sessile spikelets of the lower 1-3 pairs male or neuter, awnless…16. Dichanthium
      12b. Margins of the lower glumes or fertile spikelets not in volute, inflexed or 2-keeled.
          Callus elongate, acute or pungent; awns more or less hirsute……..23. Heteropogon

4b. Spikelets solitary or paired, more or less similar. Lower glumes smaller or sometimes suppressed. Lower lemma resembling awnless (Paniceæ) :

14a. Spikelets with an involucres or bristles or subtended by a solitary bristle :
   15a. Uppar lemma transversely rugose……………………………………….41. Setaria
   15b. Upper lemma smooth:
      16a. Bristles of the involucres free, naked or plumose…………………34. Pennisetum
      16b. Bristles of the involucres united at the base into a hard cup, spinous or rigid…..
          ……………………………………………………………………..8. Cenchrus

14b. Spikelets not subtended by an involucres of bristles :
   17a. Spikelets in open panicles…………………………………………………..31. Panicum
17b. Spikelets in second spikes or spike-like racemes, which are digitate or scattered, rarely solitary:

18a. Lower glumes reduced to a minute copular rim, clasping the thick ended lowest internode of the spikelets.................................................................21. Eriochloa

18b. Lower glume not as above:

19a. Lemmas of the upper florets more or less crustaceous or coriaceous, usually with inrolled margins:

20a. Lower glumes turned towards the rachis, with the back, of the upper lemma turned away from it.........................................................7. Brachiaria

20b. Lower glumes turned away from the rachis with the back, the upper lemma facing it:

21a. Lower glumes usually present, often very much reduced:

22a. Glumes acuminate or awned. Upper lemma not mucronate


23b. Leaves ovate-lanceolate, creeping below, leaf-base oblique...........29. Oplismenus

22b. Glumes not awned, if acuminate, then upper lemma mucronate:

24a. Upper lemma acute, not mucronate..............................32. Paspalidium

24b. Upper lemma obtuse, mucronate or very short-awned...........

46. Urochloa

21b. Lower glume usually absent........................................33. Paspalum

19b. Lemma of the upper floret thinly cartilaginous usually with flat, hyaline margins.................................................................17. Digitaria

1b. Spikelets 1-many flowered, breaking up at maturity, if falling entire, then not 2-flowered, laterally compressed or terete (Poaideae):


25b. Not arborescent. Leaves not articulate with sheaths. Stamens 1-3, Lodicles usually 2 or absent:

26a. Spikelets in open or contracted or spike like panicles, less often in racemes or spikes:

27a. Spikelets with one fertile, with or without 1 or 2 male or barren florets below it:

28a. Glumes minute or suppressed. Fertile lemma and palea very similar (Oryzeae)


29b. Leaf-blade linear, acute. Aquatic but not floating herbs ..........9. Oryza

28b. Glumes well developed. Fertile lemma and palea not similar:

30a. Spikelets with 3 florets; lower 2 florets reduced to empty lemmas which are often minute or absent (Phalarideae) ........................................36. Phalaris
30b. Spikelets with 1 or 2 florets:

31a. Spikelets with 2 florets; the lower male or barren; the upper
hermaphrodite.................................................................44. Thysanolaena

31b. Spikelets with 1-floret:

32a. Spikelets very rarely falling entire and then with firmly membranous to
coriaceous, awned or 5-nerved lemmas:

33a. Lemmas hyaline or membranous at maturity, rarely undulated,
laterally compressed:

34a. Lemmas 1-3 nerved, awnless. Glumes and lemmas similar in texture
(Sporoboleae).................................................................43. Sporobolus

34b. Lemmas usually 3-5 nerved, very often awned. Glumes longer than
hyaline lemmas..............................................................39. Polypogon

33b. Lemmas indurated or rigid at maturity, terete or dorsally compressed,
awned (Aristideae) .............................................................3. Aristida

32b. Spikelets falling entire at maturity, either singly or in clusters...35. Perotis

27b. Spikelets with 2 or more fertile florets, if one then with sterile florets above:

35a. Lemmas or rachilla joints long hairy which envelop the lemmas (Arundineae):

36a. Lemmas hairy on the back; rachilla glabrous....................4. Arundo

36b. Lemmas glabrous; rachilla hairy....................................37. Phragmites

35b. Lemmas and rachilla joints glabrous; if hairy then hairs not enveloping lemmas:

37a. Glumes as long as or longer than the lowest floret, often as long as the spikelets
(Aveneae)........................................................................5. Avena

37b. Glumes usually shorter than the lowest floret, with the upper floret distinctly
exerted:

38a. Lemmas 5-13 nerved:

39a. Spikelets in a simple solitary racemes, awned.............28. Lolium

39b. Spikelets in panicles, awnless........................................38. Poa

38b. Lemmas 1-3 nerved:

40a. Inflorescence a panicle; if racemes or spikes, the spikelets not second
(Eragrosteeae):

41a. Lemmas 2-4 lobed or toothed, if entire than hairy on nerves........
......................................................................................27. Leptochloa

41b. Lemmas usually entire at apex, obtuse, acute or acuminate:

42a. Spikelets in open, contracted spike-like panicles...20. Eragrostis

42b. Spikelets in digitate or racemously arranged spikes or spike-like
racemes:

43a. Axis and branches of the inflorescence ending in a spikelet:
44a. Spikelets falling entire at maturity from the axis of straight spikes, the later numerous ………15. Desmostachya

44b. Spikelets breaking up at maturity. Spikes few to several:

45a. Spikes digitate or sub-digitate. Spikelet 3-6 flowered...

………………………………………………………………………………19. Eleusine

45b. Spikes usually in pseudo-whorls or scattered. Spikelets 8-20 flowered……………………………………1. Acrachne

43b. Axis of the spike ending in a sharp point..13. Dactyloctenium

40b. Inflorescence of racemes or panicles or racemes; spikelets second

(Chlorideae):

46a. Spikelets with one or more imperfect flowers, awned………9. Chloris

46b. Spikelets without imperfect flowers, awnless………………12. Cynodon

26b. Spikelets on opposite sides of the rachis of a solitary spike or spike like raceme

(Triticeae):

47a. Spikelets in threes, 1- flowered……………………………………24. Hordeum

47b. Spikelets solitary, 2 or more flowered……………………………………45. Triticum

1. Acrachne Wt. & Arn.

Probably monotypic


An annual, erect, 30-55 cm tall, tufted, simple or branched, glabrous plant. Leaves 8-18 cm long, linear, lanceolate, flat, flaccid, acuminate, margins subdenticulate. Sheaths Compressed with ligules of few hairs. Spikes 3-8 cm long, scattered or whorled. Spikelets 4-6 mm long, 8-12 flowered, Glumes 2-3 mm long, acute, glabrous, involucral glumes broadly ovate, acuminate or aristulate. Flowering glumes 3- nerved ; keel excurrent. Grains rugose, brown.


Common on road sides, waste places, gardens. Collection : 3013; Ramraj.

2. Apluda Linn

Probably monotypic

An erect, perennial leafy grass, branching from the base. Culms many noded, smooth, glabrous. Leaves up to 28 cm long, linear-lanceolate, acuminate. Panicles consist of many, solitary, simple or spike like terminal racemes. Spikelets in thrice, one sessile, hermaphrodite; the rest pedicelled, one staminate and the other reduced to an empty glume.

Fl. & Fr. : Oct. – March.

Common on waste places, river banks. Collection : 982; Shukartal. The grass is used as a good fodder for cows and buffaloes.

3. **Aristida** Linn.

Over 300 species; 16 species in India; 1 in MZN


An annual or perennial, tufted, erect grass. Leaf blades filiform, convolute. Sheaths smooth; ligule with a ridge of short fine hairs. Panicles spike like, interrupted. Spikelets 7-8 mm long, excluding the awns, erect, purplish when mature. Involutrual glumes acute. Floral glumes 6-8 mm long, laterally compressed. Lemmas 10 mm long, linear, awn trifid, central branch longest. Coryopsis as long as the lemma.

Fl. & Fr. : Aug. – Nov.

Common in sandy and dry areas. Collection: 641; Purkaji.

4. **Arundo** Linn.

Ca 15 species; 1 species in India; 1 in MZN

1a Ligule a short scarious rim; Leaves not white striped……………………………………………………………..

1. A. *donax*

1b Ligule hairy; leaves white striped……………………

2. A. *donax* var. *versicolor*


An erect, perennial grass with creeping rhizome. Culms stout, nodes glabrous. Leaves 2-5 cm broad, 30-50 cm long, linear- lanceolate, tapering to a fine point, with glabrous sheath. Ligule a short scarious rim. Panicles large, terminal, 30-35 cm long; spikelets 9-11 mm long, usually two flowered. Rachilla glabrous. Glumes subequal, 5-nerved, scarbid on the keel and marginal nerves. Lemmas 2-toothed, 7-nerved, mid-nerve produced into a small arista, hairy in the lower half. Paleas 2-keeled, ciliate on the keels, 2-nerved.
F1. & Fr. : Sept. – Feb.

Common grown as hedge on field borders. Collection : 3551 ; Jaroda.
The clumps are used in making pipes. The stems are also used for thatch-roofing,
fishing-rods, and in the manufacture of baskets, mats etc.

2. **A. donax** Linn., Sp. P1.81. 1753; GBCIP. 413; var. **versicolor** (Mill.) stokes. HFD. 587.

A cultivated ornamental grass. Leaves white, striped. Ligules hairy.
F1. & Fr. : Sept. – Frb.
Collection : 609; Bhopa.
Cultivated as ornamental grass.

5. **Avena** Linn

70 Species; 8 species in India; 1 in MZN

- **A. sterilis** Linn. var. **culta** Raizada in Ind. For. 80: 36. 1956; GBCIP. 435; FD. 399.

An annual, erect, cultivated grass, culms fistular. Leaves 30-50 cm long,
linear-lanceolate, cordate, acuminate, scabrid. Sheaths subcompressed, glabrous with
prominent ligule. Spikelets 2.5-3.5 cm long, hanging from one side, in lax, terminal
open panicles. Glumes 7- nerved, usually as long as or longer than the lowest floret.
Lemmas 7-nerved, with a long awn, punctuate – scabrid. Paleas 2- keeled, winged and
ciliate on the keels.
F1. & Fr. : Jan. – April.
Cultivated rabi crop. Collection : 3129; Titawi
A rabi crop for fodder and grain.
Commonly in most of the Indian floras cultivated species of oat grown, are
erroneously called *Avena sativa* Linn. which is cultivated in the temperate climates of
Northen Europe. Bose (1929) has pointed out that this species now bears the correct
name of *A. sterilis* Linn. var. **culta**.

6. **Bothriochloa** O. Kuntze

Over 20 species; 16 species in India; 2 in MZN

1a Lower racemes longer than the rachis; raceme 2-8, over
topping the axis………………………………………………………….. 2. **B. pertusa**

1b Lower racemes shorter than the rachis; racemes 8-
many, not over topping the axis……………………………………. 1. **B. intermedia**
var. intermedia


An erect, or decumbent- ascending, perennial grass with noded and glabrous glums. Leaves glabrous or sparsely ciliate. Ligule a ciliate scarious rim. Sheaths compressed, glabrous. Racemes 7-18, 4-7 cm long, 2-3 nate, joints ciliate. Sessile spikelets, 3-3.5 mm long, callus bearded. Lower floret : empty, epealeate. Lower lemma acute, ciliate; upper lemma reduced to the base of an awn, epealeate. Awn 1-1.6 cm long, scabrid. Pedicelled spikelets 2-2.5 cm long, reduced to empty glumes.

F1. & Fr. : Jun.–Dec.

Common on road sides, gardens. Collection : 5465; Khatauli


An erect, slender, perennial grass with pubescent nodes. Leaves linear. Racemes 3-8, subdigitately fasciculate, silky, whitish or purplish, upto 5 cm long, joints and pedicels ciliate. Sessile spikelets 3-4 mm long, oblong lanceolate ; lower involucral glume with a deep pit; upper floral glume reduced to an awn. Pedicelled spikelets male or neuter, not awaned.

F1. & Fr. : July – Oct.

Common in grassy areas, road sides. Collection: 1472; Miranpur.

The grass is used as fodder and also made into hay.


Over 50 Species; 18 species in India; 2 in MZN

1a Spikelets 0.25-0.3 cm long. Pedicles and rachis hairy………………………………………………………………………… 1.B. ramosa

1b Spikelets 0.12-0.2 cm long. Pedicels bristly ............ 2.B. reptans


An erect or ascending annual grass. Leaves 5-8 cm long, linear – lanceolate, forming a round, often clasping base. Racemes 2-4 cm long, 5-10 or more.
Spikelets alternate, 3 mm long, often in pairs, pubescent on long pedicles. Glumes pubescent, 5-7 nerved. Lower floret neuter; upper hermaphrodite. Floral glumes and paleas transversely rugose. Grains broad, elliptic.

F1. & Fr. : July – Nov.

Common in gardens, waste places, and road sides. Collection: 2889; Lachhada, 3630; Muzaffarnagar city.


An annual or perennial, creeping or rambling 15-50 cm tall grass. Leaves 4-8 cm long, acuminate, base broadly cordate and clasping. Panicle of 5-11 racemes, 1.5-3.5 cm long. Spikelets paired, 1.2-2.0 cm long, glabrous; pedicels bearing bulbous based bristles. Lower glume minute, clasping, hyaline; upper glume 7-nerved. Lower floret neuter or male; upper hermaphrodite lemma in–durated with a minute apiculus. Grains flattened-oval.

F1. & Fr. : Aug. – Nov.

Common in gardens, fields. Collection : 3632; Ramraj.

8. **Cenchrus** Linn.

Ca 30 species; 8 species in India; 4 in MZN

1a Bristles of involucres retroserely barbed....................... 1.**C. biflorus**

2a Bristles connate at the base only....................... 2.**C. ciliaris**

2b Bristles connate into a cup, 1-3 mm long :

3a Involucre bristles long, slender; Outer numerous ...................... 3.**C. pennisetiformis**

3b Involucre bristles short, rigid, Flattened; outer absent ...................... 4. **C. setigerous**

1.**C. biflorus** Roxb., F1. Ind. 1. 238, 1820; GBCIP. 287; FD. 377; FBI. 7: 89. C. catharticus Delile. FBI : 7: 90. Vern. *Anjhan*.

An annual, erect tufted, glabrous grass. Culms geniculately ascending. Leaves 5-15 cm long, lanceolate, finely acuminate, scabrid on upper surface. Ligule with a ciliate rim. Panicles 3- 10 cm long. Involucels 1-2 flowered, 6- 8 mm long, tubinate at the base ; bristles grooved on the back, ciliate in side; retroserely scabired.
Spikelets 2, in each involucel, up to 7 mm long, sessile, ovate, shorter than the inner bristles. Caryopsis ovoid-oblong, rugulose.

F1. & Fr. : July – Nov.

Common in dry and sandy areas, waste lands.

Collection : 643; Purkaji.

The seeds are eaten in times of scarcity, plants are also used as fodder.


A tufted, prostrate, erect or decumbent, much branched perennial grass. Leaves 6-15 cm long, linear tapering to fine point. Ligule a densely ciliate rim. Racemes cylindric, dense, 2.5-12 cm long, pale or purplish. Involucels of 2-series of bristles; outer bristles smaller, united at base antrosely barbed up to 8 mm long. Spikelets 4-5 mm long, oblong-lanceolate, 1-3 in each involucel.

F1. & Fr. : Major part of the year.

Common growing in dry, sandy localities, canal sides and borders of fields.

Collection : 171; Muzaffarnagar city.

Grass used as a valuable fodder, especially for hay.


A tufted perennial grass with compressed culms. Spikes 5-11 cm long, pale; rachis scaberulous. Spikelets in clusters of 2-5, sessile 4-5 mm long. Involucels: subsessile; outer bristles squarously spreading; inner twice as long as the spikelets, ciliate below and fuse to form a cup.

F1. & Fr. : Aug. – Nov.

Common in dry open and cultivated fields. Collection : 3708; Muzaffarnagar city.


An annual or perennial, tufted grass, with erect or ascending, glabrous stem; nodes knotted. Leaves 8-20 cm long, linear-lanceolate, finely acuminate, rough with long, scattered hairs. Racemes solitary, cylindric, green. Involucels usually with 3 spikelets, the outer row of bristles short, erect, and the inner row erect, subulate-
lanceolate, all connate into a short cup. Spikelets ovate- oblong, 2-flowered. Lower florate barren; upper hermaphrodite.

F1. & Fr. : Nov.-Dec.

Very common weed of rainy season. Collection : 3552; Bahadurpur.

It is considered to be a good pasture grass, and a good soil binder.

9. Chloris Sw.

Ca 50 species ; 10 species in India; 1 in MZN


Andropogon barbatus sensu. Linn., Mant. 2: 1771. non Linn. 1759.

A perennial, tufted grass with creeping base, proliferously branched. Leaves narrowly linear. Spikes 5-20 , 3-4 cm long, suberect, digitately arranged in a terminal fascicle. Spikelets secund, 4-7 mm long, imbricate, 2-rowed, 3- awned; rachilla produced bearing two, small, awned, barren glumes. Involucral glumes lanceolate. Lowerst floret hermaphrodite ; glume broad elliptic, densely bearded on the margins above the middle, awned.

F1. & Fr. : Aug. – Nov.

Common in waste places, fields and gardens. Collection : 3159 ; Jaroda.


Ca 30 species ; 14 species in India ; 1 in MZN


A tall, densely tufted, perennial grass, Leaves narrow, linear, margins scabrid. Panicles 10-15 cm long, branches capillary, whorled, solitary, spikelets nodding, 5-7 mm long. Sessile spikelets laterally compressed. Lower involucral glume 2- toothed at apex, produced into two small, unequal awns; upper glume pectinate- ciliate, long awned, Pedicelled spikelets dorsally compressed ; pedicels less than half the length of the sessile spikelet.

F1. & Fr. : Sept. – Oct.

Common growing on river bank and canal sides. Collection : 2039; Jhinjhana. & 2953 Kakroli.

Grass is relished by cattle.

11. Coix L.
Ca. 6 Species; 5 species in India; 1 in Mzn.


Annual. Culms erect, robust, 90-175 cm tall, node glabrous & more than 10-noded. Leaves cauline; leaf sheaths shorter than internodes, glabrous; leaf blades linear-lanceolate, 10–40 × 1.5–7 cm, base subrounded or cordate, margins scabrous, acuminate; ligule 0.6–1.2 mm. Male raceme 1.5–4 cm, spikelets in pairs with terminal triad; utricle ovoid to cylindrical, usually bony, shiny, 7–11×6–10 mm, white, bluish or gray-brown, sometimes with apical beak. Male spikelets oblong-ovate, 6–9 mm; lower glume winged on keels; female spikelets solitary; style two; grain orbicular.

Collection: 2651; Khatauli
Leaves are used as fodder


Ca 10 species; 4 species in India; 1 in MZN


A perennial grass with underground, creeping rhizome, and ascending stems with glabrous nodes. Leaves 3-8 cm long, linear, acuminate scabrid on the upper surface and margins. Spikes 4-5, digitate, spreading, green or purplish. Spikelets 2 mm long, unawned, 3-nerved, bidentate, mucronate. Paleas 2 keeled.

Fl. & Fr.: Major part of the year.
Common most uncultivated grass of the area. Collection: 3081; Kandhla.
An important fodder-grass of the area.

**13. Dactyloctenium** Willd.

Ca 10 species; 5 species in India; 2 in MZN

1a Annuals, Spikes 2-3 cm long……………………… 1. *D aegyptium*

1b Perennials, Spikes 0.5-1.5 cm long………………… 2. *D. sindicum*


An erect or decumbent annual grass, variable in habit. Culms creeping and rooting below, ascending upwards, branched at nodes. Leaves distichous, narrowly linear, flat, scabrid on the upper surface. Spikes 2-6, digitate, rachis keeled. Spikelets densely crowded, spreading at right angles to rachis, 3-5 mm long. Lower involucral
MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH


A perennial, erect, arborescent palm. Leaves linear to linear-lanceolate, subcordate at base, Ligule short, sheath hairy. Spikelets in congested large heads which are combined into panicle. Spikelets many nerved, spinose, terete, Lemma ovate, 1.4 cm long, with a prolonged spinose keel. Paleas 2-keeled. Stamen 6. Ligule 0. Caryopsis ovoid to subglobose, beaked. 

F1. & Fr. : June–Oct. 

Occuring on waste place, road sides, old walls, cultivated and fellow fields. Collection : 3755; Ramraj. 

Grass is used as a good fodder.


A perennial, erect, dwarf, slender, prostrate grass, proliferously branched. Culms rooting at nodes. Leaves linear, ciliate with bulbous-based hairs; back of rachis with a slit like groove on each side of the keel. Spikes 2-6, 6-13 mm long; floral glumes ovate, cuspidate, keeled. Grains ovoid, rugose. 

F1. & Fr. : July. – Oct. 

Common in sandy and grassy locations. Collection : 2656 ; Gordhanpur.

14. **Dendrocalamus** Nees 

Ca 20 species; 8 Species in India ; 1 in MZN 


A perennial gregarious bamboo with solid or fistular culms and spinescent branches at the nodes. Leaves linear-lanceolate, subcordate or rounded base, Ligule short, sheath hairy. Spikelets in congested large heads which are combined into panicle. Spikelets many nerved, spinescent, terete, Lemma ovate, 1.3 cm long, with a prolonged spinescent keel. Paleas 2-keeled. Stamen 6. Ligule 0. Caryopsis ovoid-subglobose to ovoid, beaked. 

F1. & Fr. : Feb. – June. 

Planted in gardens and on canal banks. Collection :1420; Muzaffarnagar City. 

Plant is used as raw material for paper manufacture and also for basket makingking, roofing and stick making. 

15. **Desmostachya** Stapf. 

Monotypic genus. 

**D. bipinnata** (Linn.) Stapf., F1. Cap. 7: 632. 1900; GBCIP, 491; FD. 395; FD. 600. 

A perennial tall grass, branching from the base. Culms 30-125 cm tall, tufted, smooth, erect. Leaves up to 40 cm long, linear to linear-lanceolate, rigid, filiform tips, margins hispid. Panicles 20-50 cm long, narrowly pyramidal or linear, reddish-brown, or dark brown at maturity. Spikes many, short, 2.5 cm long, crowded. Spikelets sessile, second, 2-seriate, deflexed.

F1. & Fr. : June–Oct.

Common, growing in khaddar area and sandy soils. Collection : 228; Mansoorpur.

It is planted as good sand binder and used as fodder and also in Hindu ceremonies.


Ca 20 species; 8 species in India; 2 in MZN

1a Lower glume with median nerve; Sheaths terete; Ligule long……………………………………….. 1.D. annulatum

1b Lower glume of sessile spikelet without a median nerve; sheaths compressed; ligule short ciliate….. 2.D. caricosum


An erect, tufted, perennial grass about 1 m tall with usually bearded nodes. Leaves 7-25 cm long, linear, setaceous-acuminate; sheaths terete with long ligule. Racemes 2-4, subdigitately fascicled, spiciform, greenish or publish or violet, 3 or often more, joints and pedicles silky-hairy. Sessile spikelets hermaphrodite, closely imbricate, 3-5 mm long; upper floral glume reduced to a slender awn. Grain plano-convex, obovate–oblong. Pedicellate spikelets male or neuter, 3-5 mm long.

F1. & Fr. : Aug. – May.

Common, growing throughout the area. Collection : 3161, Jaroda.

The whole plant is used as good fodder.

2. D. caricosum (Linn.) A. Camus, GBCIP. 133. Andropogon caricosus Linn. var. genuinus; Hack.; FBI. 7: 196.


Common in dry and sandy localities, gardens, waste places and on old walls.
Collection: 3050; Kandhla.
The grass is relished by cattle.

17. Digitaria Heist. ex Fabricius.
Ca 380 species; 26 species in India; 3 in MZN

1a Hairs on the spikelets clavate

3 D. Stricta var. denudata

1b Hairs if any, not clavate:

2a Upper glumes less than one-third of the length of spikelets, or reduced to a minute scale

2. D. setigera

2b Upper glumes more than one-third the length of the spikelets

1. D. adscendens


An annual, erect or prostrate or decumbent – ascending grass, rooting below. Leaves 3-7 cm long, base contracted, scabrid above, white margined; ligule a truncate rim. Sheaths hirsute. Racemes 2-9, digitate or whorled on a short axis; spikelets about 3 mm long, lanceolate, acute, 2-nate. Pedicels 3 mm long. Lower glume reduced to a minute scale; upper glume acute, 3-nerved, hairy on the nerves. Lower lemma 7-nerved, hairy or glabrous. Upper lemma acute.

F1. & Fr.: July. – Oct.
Common grass of agricultural fields, lawn and gardens. Collection: 3754; Ramraj, 4181; Ailum.
Good fodder grass.

2. D. setigera Roth. in Roem. & Schult. Syst. 2: 1817; GBCIP. 305; FD. 389. HFD. 606. Paspalum sanguinale Lamk. var. extensum; Hook. f., FBI. 7: 15.

A tall tufted annual grass. Leaves linear, up to 20 cm long, margins subdenticulate. Racemes densely pubescent in the lower axils, subdigitate. Spikelets elliptic, acute, 2-2.5 mm long, shortly pubescent on the margins. Lower glume hyaline; upper glume 3-nerved. Lower fl racer sterile; upper hermaphrodite.

F1. & Fr.: July. – Nov.
Common on waste places, fields and river beds. Collection: 3647; Muzaffarnagar City.


An erect grass upto 6-90 cm tall. Leaves acute, scabried, ciliate at base; sheaths glabrous, hairy on the throat. Racemes 2-3, subdigitate, 4 cm long. Spikelets elliptic-lanceolate, acute, 1.5 mm long. Lower lemma hairy, 5- nerved; upper lemma purple or dark brown., apiculate. Fruit as long as spikelet often slightly longer than lower lemma, purplish when fresh and on drying almost black.

F1. & Fr. : Sept. – Oct.

Common on canal and river banks. Collection: 2550; Bhopa.


Ca 30 species; 7 species in India, 3 in MZN

1a Panicles dense, with crowded spikes………………. 3. **E. frumentacea**

1b Panicles lax, interrupted, with alternate, distant spikes :

2a Spikelets unawned. Plants slender………………. 1. **E. colonum**

2b Spikelets awned. Plants robust………………. **E. crus-galli**


An annual, prostrate or decumbent-ascending, grass, rooting below with glabrous nodes. Leaves 10-20 cm long, linear or lanceolate, ligule absent. Panicles 5-10 cm long, lax interrupted with alternate distinct spikes. Spikelets crowded, elliptic, acute, 2.5-3.0 mm long, hairy. Lower glume ovate, acute, 5- nerved. Upper glume and lower lemma equally acute or cuspidate, not awned. Grains broadly elliptic.

F1. & Fr. : July. – Nov.

Common in rice fields, water logged fields. Collection:1626; Titawi, 3773; Miranpur, Used as fodder.

An annual, erect, about 1 m tall grass with creeping and rooting rhizome. Leaves 30 cm long or more, linear, tapering to fine point. Sheaths keeled upwards. Ligule a fringe of stiff hairs. Panicles upto 15 cm long; lower branches long. Spikelets 5-6 mm long, ovate- oblong, acuminate, cuspidate or awned, greenish with purple tinge. Lower floret barren; floral glume cuspidate or produced into a long, flexuous awn. Upper floret hermaphrodite, polished. Grains broadly elliptic.

F1. & Fr. : July. – Nov.
Common weed of rainy season crops or very rarely cultivated as mixed rainy season crop. Collection : 3227 ; Shamli.

Plants used as cattle fodder and grains are used as food.


Erect, tall annual herbs. Nodes glabrous. Leaves 10-45 cm long, after tinged purple on margins. Ligule absent. Panicles dense, upto 20 cm long, lobed; spikes upto 25 cm long; spikelets 3-4 nate, hairy, not awned. Lower lemma empty. Upper lemma acuminate.

F1. & Fr. : May. – Nov.
Common weed of crop fields. Collection : 3172; Banat.

Ca 10 species; 4 species in India; 3 in MZN

1a Prostrate or creeping grasses; rooting at nodes…

1b Erect grasses :

2a Spikes digitate…………………………………….. 2. E. indica

2b Spikes scattered or whorled…………….. 3. E. verticillata

1. E. coracana (Linn.) Gaertn., Fruct. Sem. 1: 8. t. 1 . f. 11. 1789; FBI. 7: 294


F1. & Fr. : July – Nov.
Rare, occurs in waste places and fields. Collection : 3336; Banat.
Cultivated as a cereal in certain parts of India. The grain-flour is used in making breads and also used for preparing an alcoholic beverage.


An annual or biennial, erect or prostrate or decumbent-ascending grass. Leaves linear, hairy or scabrid above, glabrous beneath. Ligule a minute ciliate rim. Sheaths compressed, glabrous or hairy along the margin. Spikes 1-4 subdigitate, erect, upto 15 cm long. Spikelets 2 seriate, ovate – oblong. Lower glume lanceolate, subacute, 1-nerved, with a winged keel, 0-25 cm long. Upper glume 5-nerved, 3 mm long. Lemmes boat-shaped, 3- nerved, mucronate, 3 mm long. Palea 2-keeled, 3 mm long. Grains reddish brown, 3- gonous, upto 1.2 mm long.

F1. & Fr. : May. – Feb.

Common grass on road sides, gardens, waste places and crop fields. Collection : 2542; Babri.

3. **E. verticillata** Roxb., F1. Ind. 1: 346. 1820; FBI. 7: 295; FD. 391.

Annual. Clumps tufted, erect, 30-35 cm tall simple or branched. Leaves linear, lanceolate, 20 cm long or more, subdenticulate. Spikes 6-20, scattered or whorled, suberect, with numerous, close spikelets. Spikelets 6-12 flowered, 4-7 mm long shining. Empty glumes unequal, keel subdenticulate, upper one acuminate or aristulate. Grains oblong, rugose.

F1. & Fr. : July. – Oct.

Common on waste places and grass fields. Collection : 3626; Muzaffarnagar City.


Ca 300 species; 37 species in India; 8 in MZN

1a Spikelets breaking up from above downwards.

Rachis fragile:

2a Keels of the palea ciliate:

2b Spikes scattered or whorled

3a Panicles compact and dense .................. 2. **E. ciliaris**

3b Panicles effuse :

4a Panicles very diffuse. Spikelets 10-20 mm long..................... 8.**E. tremula**

4b Panicles loose, Spikelets 1.5 – 3.0
mm long……………………… 7. E. tenella
var. plumosa

2b Keels of the palea eciliate………………

3. E. diarrhena

1b Spikelets breaking up from below upwards. Rachis tough :

5a Perennials……………………………….. 1. E. atrovirens

5b Annuals :

6a Glandular:

7a Lemmas 1- 1.2 mm long .............. 6. E. pilosa

7b Lemmas more than 1.5 mm long 5. E. minor

6b Eglandular………………………….. 4. E. gangetica


F1. & Fr. : Major part of the year.

Common growing on canal banks, ponds and ditch edges. Collection : 1410 ; Purkaji.


An annual, erect, glabrous grass. Leaves 4-7 cm long, linear, tapering to fine–point. Sheaths hairy at mouth. Panicles 1.3 – 4.5 cm long, cylindric, spiciform, aterrupted. Spikelets 3-4.5 cm long, 6- 12 flowered, strongly compressed. Involutural glumes sub-equal, acute, 1.3 mm long. Floral glumes 1 mm long, spreading. Paleas equal to glumes : keels with long soft hairs.
F1. & Fr. : Aug. – Nov.

Common on river, canal banks, gardens and fields. Collection : 1504; Jaroda.

A perennial, erect grass. Leaves linear. Panicles variable 20-50 cm long; branches contracted and mostly solitary, breaking above downwards. Spikelets minute, densely clustered, pubescent, 6-12 flowered; lemma 1 mm long, keels of palea smooth.

F1. & Fr. : Aug. – Nov.

Common on road sides, old walls and gardens. Collection : 699; Jaroda.


An erect, annual grass up to 70 cm tall. Leaves flat or involute, linear, 10-25 cm long. Sheaths long, glabrous. Panicles up to 35 cm long, nodding, branches solitary, distant. Spikelets 4-6 mm long, 8-14 flowered, slate-grey and crowded. Lower and upper glumes lanceolate acute, 1-nerved. Lemmas 3-nerved, about 1.2 mm long, not closely imbricate. Palea with rounded tip. Grains quadrate, rounded dark brown.

F1. & Fr. : Sept. – Nov.

Common near marshy places on margins of tanks, ponds, and ditches. Collection : 1488 ; Ramraj.


An annual, erect, tufted grass, 15-40 cm tall. Leaves linear, scabrid, glandular, margins convolute, with appressed sheaths, bearded at the mouth. Panicles 5-15 cm long, oblong or ovate, rachis glabrous. Spikelets 6-7 mm long, 12-14 flowered, breaking from below upwards. Involucral glumes 1.2 mm long, subequal. Floral glumes 1.5 – 2.0 cm long, strongly nerved. Grains 0.5 mm long, globose or ellipsoid-globose.

F1. & Fr. : July. – Nov.

Common weed of rainy crops, gardens. Collection : 4104; Bharsi.


An annual, densely tufted erect, 15-60 cm tall grass. Leaves 4-10 cm long, convolute. Sheaths appressed. Ligule a soft hairy ridge. Panicles 6-15 cm long, open...
or contorted; rachis glabrous, filiform; branches capillaries, fascicled or sub-whorled at the lowest node. Spikelets 3-6 mm long, 5-12 flowered, often purplish at the tips. Glumes hyaline, very unequal; lower ovate, nerveless; upper much larger, acuminate, 1-nerved. Floral glumes 2 mm long; lemmas with a purple patch at the tip; keels scabridulous. Grains ellipsoid.

F1. & Fr. : May. – Nov.

Common growing in grassy localities, road side fields and gardens. Collection : 3727; Mirapur.


A loosely tufted, annual, up to 40 cm tall grass. Leaves 6-12 cm long, tapering to a fine point. Panicles 8-14 cm long, loose; branches spreading, axis more or less hairy at the nodes. Spikelets 1.5-3.0 mm long, 3-7 flowered. Involucral glumes unequal. Floral glumes less than 1 mm long; keels of palea pectinately ciliate with long hairs. Grains ovoid, about 4.5 mm long.


Common on waste places, fields, gardens, river banks, and road sides. Collection : 2537; Karoda.


An erect, or ascending tufted annual grass, 15-50 cm tall, Leaf margins eglandular. Panicles very diffuse; branches solitary, filiform, ascending. Spikelets 10-20 mm long, narrowly linear; branchlets with long, white hairs in all axils of the panicles. Floral glumes broad ovate, 3-nerved. Grains slightly compressed, nearly globose.

F1. & Fr. : Aug. – Nov.

Common grass found in cultivated and fellow fields, on damp and sandy soils. Collection : 3728; Ramraj.

Used as fodder.

21. **Eriochloa** Kunth.

Ca 20 species; 2 species in India; 1 in MZN

An erect, tufted, annual leafy grass with fibrous roots. Leaves linear-acuminate, inrolled when dry; sheaths upto 10 cm long. Pansaes 10-20 cm long; rachis flat, forming a copular rim at the base. Spikelets 3-3.5mm long, ususlly in pairs, pedicellate; ovate-lanceolate. Lower glumes 0; upper glumes ovate, 5- nerved, hairy on the back, 3 mm long. Paleas 0, upper lemma scaberulate at the tip with a short, stout, arista. Caryopsis oblong, smooth.

Fl. & Fr. : Aug. – Nov.
Common on road- sides, gardens, waste places and agriculture fields. Collection : 1713; Badehadi.
A good fodderer grass for cattle.

**22. Hemarthria** R. Br.

Ca 10 species; 4 species in India; 1 in MZN


An erect or decumbent perennial grass. Leaves 5-12 cm long flat, smooth or scabrid. Racemes erect, straight or curved, 5-8 cm long; upper often fascicled. Spikes compressed; sessile spikelets 3-4.5 mm long. Lower glumes obtuse, ciliolate, 5-7 nerved; upper glumes mucronate. Lower lemma empty; upper lemma hermaphrodite : Pedicelled spikelets male or neuter, acute, similar to sessile spikelets.

Fl. & Fr. : Aug. – Dec.
Common or road-side, ditches, ponds and other water resource banks. Collection : 1721; Badehadi.
Used as fodder for live- stock.

**23. Heteropogon** Pars.

12 species; 7 species in India; 1 in MZN


An erect or decumbent, tufted perennial grass with glabrous nodes. Leaves linear, 20-50 cm long, acute or acuminate, ciliate at base. Ligule a scarius ciliate rim. Racemes stout, compressed to cylindrical, 3-5 cm long. Spikelets 8-11 mm long,
closely imbricate; the lowest awnless, male or neuter; the upper ones longer awned. Sessile female spikelets hispid; upper floral glume reduced to an awn, upto 10 cm long. Pedicellate spikelets hispid on the back.


Common on railway tracts, river beds and agriculture fields. Collection :692; Jaroda.

It is a good fodder only in young stage. The roots are stimulant and diuretic. The culms are used for mats and paper industries.

24. Hordeum Linn.

Ca 20 species; 8 species in India; 1 in MZN

H. vulgare Linn., Sp. P1. 84. 1753; Duthie, Gr. N.W. Ind. 45; FBI. 7: 371; FD. 376.

Vern. Jow.

An erect, glabrous, tufted annual grass upto 1.25 m tall. Leaves linear, elongate, 2-auriculate. Spikelets in threes upto 10 cm long or more; spikes irregularly 4- sided. Floral glumes end in a long awn. Grains narrowly oblong, lemma and palea tightly enclosed and adhere the seeds.

F1. & Fr. : Jan. – March.

Cultivated rabi crop in the area. Collection : 2463; Kandhla.

The grains are used variously for food. Dried leaves and stem are used as fodder.

25. Hygroryza Nees

Monotypic genus.

H. aristata (Retz.) Nees e Wt. & Arn. in Edinb. New Phil. Jour. 15: 380. 1833; FBI. 7: 95; GBCIP. 597; FG. 368.

An aquatic floating grass with green whorled feathery roots, spongy stems and inflated leaf sheaths. Leaves 3-5 cm long, ovate-oblong or ovate- lanceolate, base rounded, apex obtuse. Panicles short, triangular; the lower branches deflexed. Spikelets narrow, 1-flowered, sessile or pedicellate. Floral glumes lanceolate, awned; paleas as long as the glumes, awnless with a bisexual floret. Lodicules 2, stamens 6. Grains narrowly oblong.


Rare, found in tanks and ponds. Collection : 1033; Shukartal.

The plants are relished by cattle.

26. Imperata Cyr.

Ca 12 species; 8 species in India; 1 in MZN


F1. & Fr.: June.-Oct.

Common in grassy, sandy and marshy places. Collection: 1501; Jaroda.

It is an excellent thatching-grass, can be made into paper. Young shoots, after annual fire, relished by grazing animals.

**27. Leptochloa** P. Beauv.

27 species; 5 species in India; 2 in MZN

1a Florets 3-6 Panicles 15-25 cm long ..................  **1.L. chinensis**

1b Florets 2, rarely 3. Panicles 10-22 cm long ........  **2. L. panicea**


An annual, erect grass, culms ascending from a geniculate base, up to 1 m tall. Leaves 15-25 cm long; ligule lacerate. Panicles up to 25 cm long, with erect or patent branches. Spikelets 4-6 flowered, 2-3 mm long. Lower glumes lanceolate-subulate; upper glumes lanceolate. Lemmas lanceolate. Grains trigonous, subrugose.

F1. & Fr.: July. – Nov.

Rare, growing in rice fields and marshy localities. Collection: 2408; Budhana.


An annual, tufted grass, erect or ascending with 30-80 cm tall culms, glabrous. Leaves flat, finely acuminate. Panicles 10-22 cm long, contracted or diffused; branches many, capillary. Spikes 5-8 cm long, ascending or spreading. Spikelets very small, 2-3 flowered. Lower glumes mucronate; upper glumes sharply acute. Lemmas obtuse, ciliate, 3-nerved. Paleas bidentate, 2-keeled, glabrous.

F1. & Fr.: June.-Oct.

Common on road sides, gardens, waste places and rice-fields, river and canal sides. Collection: 469; Muzaffarnagar City.
28. **Lolium** Linn.

12 species; 6 species in India; 1 in MZN

*L. temulentum* Linn., Sp. P1. 83. 1753; FBI. 7: 364; GBCIP. 546; FD. 374; HFD. 622.


Common weed of winter crops. Collection : 824; Muzaffarnagar City.
The grains are said to be poisonous.

29. **Oplismenus** P. Beauv.

Ca 15 species; 3 species in India; 2 in MZN

1a  Racemes dense upto 1 cm long; rachis and pedicel long hairy. Awns pale-brown, barabellate ...............  *1.O. burmannii*

1b  Racemes lax upto 5 cm long; rachis and pedicel short hairy. Awns reddish smooth, viscid ........  *2.O. compositus*


A prostrate or procumbent annual grass, rooting below. Leaves 2-5 cm long, ovate-lanceolate, acuminate, hairy; sheaths hairy. Panicles upto 10 cm long, hairy. Racemes 5-8, 1.5 cm long, dense. Rachis and pedicels long, ciliate, 3- nerved, Upper glumes ciliate, 5-nerved; lower lemmas ovate, acute, awned, ciliate; upper lemma acute.

F1. & Fr. : Sept. – Nov.
Common in gardens, moist and shady places. Collection : 671; Muzaffarnagar City, 3709; Mirapur


A prostrate or suberect annual grass upto 1 m tall. Leaves 5-9 cm long. Ovate-lanceolate, acuminate. Panicles upto 10 cm long, rachis trigonous, hairy all
over. Racemes lax upto 5 cm long. Spikelets distant, 4 mm long. Lower glumes obtuse, ciliate, reddish-awned, 3-nerved; upper glumes ciliate, 5-nerved. Lemmas ovate, acute, ciliate. Caryopsis dorsally compressed.


Common in grassy and shady areas and on road sides. Collection : 3634 ; Muzaffarnagar.

30. Oryza Linn.

Ca 30 species; 14 species in India; 1 in MZN


An annual, erect, upto 1 m tall, culms fistular, nodes glabrous. Leaves linear- acuminate, scabrid above, glabrous below; ligule 7-10 mm long; sheaths compressed. Panicles upto 25 cm long. Spikelets 5-8 mm long, ovate – oblong, laterally compressed, 3-flowered. Pedicels scabrid, dilated at the tip. Floral glumes hispid-ciliate, dorsally spinescently ciliate. Caryopsis oblong, angular, tightly enclosed in the lemma and palea.


Common important rainy season crop. Collection : 30, Muzaffarnagar City.

Grains are used as food all over India. Plants are also useful; for cattle feed and in paper industry.

31. Panicum Linn.

Over 500 species; 30 species in India; 5 in MZN

1a Upper floral glumes quite smooth

2a Lower involucral glumes cuspidate-acuminate.............................................. 5. P. trypheron

2b Lower involucral glumes not cuspidate – acuminate :

3a Spikelets long, narrowly lanceolate acuminate leaves broad ...................... 4. P. paludosum

3b Spikelets oblong, ovate-oblong toelliptic or ovoid, acute or obtuse :

4a Perennials; spikelets laxy clustered on branches......................... 1. P. antidotale
4b Annuals, erect, leafy grasses; spikelets solitary or in pairs……

3. P. miliare

1b Upper floral flumes finely transversely rugose ......

2. P. maximum

1. P. antidotale Retz., Obs. 4: 17. 1786; FBI. 7: 52; GBCIP, 322; FD. 406.

A tall, perennial glabrous grass. Root stalks villous hairy with stoloniferous woody culms. Leaves 15-45 cm long, linear; Sheaths glabrous. Panicles open, pyramidal; branches usually fascicled, filiform, drooping; branchlets filiform. Spikelets 3 mm long, laxy crowded, ovoid, acute, glabrous. Lower glumes ovate, 3-nerved; upper glumes 7-8 nerved, acuminate. Lower lemmas neuter and upper hemaphrodite.

F1. & Fr. : June – Nov.

Common, growing on river banks. Collection : 1765 ; Barla.
The plants are used as fodder and also for the fixation and reclamation of sand-dunes.

2. P. maximum Jacq., Coll. 1. 1786; FBI. 7: 49; GBCIP, 327; FD. 405.

A perennial, densely tufted grass. Culms erect, usually stout, simple or branched. Leaves glabrous, softly hairy or coarse-hirsute with tubercle-based hairs, linear to linear – lanceolate ; margins scaberulous to spinulously scabrid. Panicles erect or nodding contracted or open, decompounds; lower branches whorled, suberect or spreading, pedicels capillary. Spikelets 3-4 mm long, oblong. Lower floret male ; upper hemaphrodite.

F1. & Fr. : Nov.- April.

Common weed of agriculture fields during wither season. Collection : 4106; Ailum.
Whole plant is used fodder.


An annual grass. Leaves linear , glabrous with a rounded or truncate base, margins cartilaginous; sheaths loose, compressed. Ligules hairy, Panicles 15-35 cm long, with 5-8 branches. Spikelets 2-nate, 2-3 mm long, glabrous. Lower glumes orbicular-apiculate, 5-7 nerved; upper glumes elliptic-ovate, 9-12 nerved. Lower lemma acute, 9-nerved, empty, epaleate; upper lemma hermaphrodite, apiculate, margins inflexed. Paleas similar, slightly shorter.

F1. & Fr. : July. – Nov.

Common in agriculture fields. Collection : 4169; Ailum, 6, Muzaffarnagar City,

An aquatic spongy annual grass with erect scandent culms, rooting at the compressed. Panicles 15-25 cm long; branches trigonous, scabrous. Spikelets lanceolate, acute, solitary, 3-4 mm long. Lower glumes 0.6-0.8 mm long, orbicular or reniform, 3-5 nerved hyaline; upper glumes 3-4 mm long, ovate-acuminate, 7-8 nerved. Lower lemmas neuter or male; upper hermaphrodite, pale-yellow with inturned margins and auricled base.

F1. & Fr.: July. – Oct.

Common in rice fields, marshy and water logged areas. Collection: 2976; Ramraj.


An annual, erect grass upto 45 cm tall. Nodes glabrous. Leaves 15-50 cm long, linear, flat, hairy. Sheaths glabrous or hirsute; ligule fimbricate. Panicles upto 18 cm long, erect, hairy, branches filiform and drooping. Spikelets upto 3 mm long, ovoid, acute, glabrous, wide-open during anthesis. Lower glumes cuspidate-acuminate, empty; uppers elliptic, margins incurved. Lower lemmas cuspidate, and upper obtuse.

F1. & Fr.: Aug. – Nov.

Common on road sides, agriculture fields and gardens. Collection: 4133; Ailum.

32. *Paspalidium* Stapf.

Ca 20 species; 3 species in India; 3 in MZN

1a. Annuals – spikes shorter than the internodes:

2a. Leaves acute, sheaths short; spikes short…..

2b. Leaves acuminate, sheaths terete; spikes long........................................

1b. Perennials. Spikes longer than the internodes…..

2. **P. geminatum**

3. **P. punctatum**


An annual, tufted grass. Leaves 10-25 cm long, linear-lanceolate, obtuse, sheaths compressed, keeled, ciliate at the mouth. Panicles of 6-9 recemes upto 25 cm
long; upper racemes shorter than the internodes. Spikelets 2-20, 2-3 mm long, closely imbricate, second, double rowed, ovate-oblong, acute, gibbous. Lower and upper glumes sub-orbicular or cordate, clasping. Lower lemmas barren; uppers hermaphrodite.

F1. & Fr. : June. – Oct.

Common in gardens, agriculture fields and on road sides. Collection : 4182; Bharsi, 3645; Jansath.

It is an excellent fodder grass.


An annual tufted grass upto 1 m tall; culms stout, rooting at the base. Leaves linear- lanceolate, sheath loose, finely striate; ligules reduced to a ciliate rim, acuminate or obtuse; spikes 15 or more in number, 1-2.5 cm long; spikelets 2-3 mm long, ovate, acute; upper most imperfect. Glumes unequal. Lower lemma coriaceous, shining.

F1. & Fr. : Sept. – Oct.

Rare on moist shady places. Collection : 1500; Jaroda.


A tall, erect, perennial grass with stout culms and rooting at the base, spongy. Leaves 10-30 cm long, flaccid, linear- lanceolate, acuminate. Sheaths terete, 10-20 cm long. Ligule of stiff bristles. Panicles 20-40 cm long, terminal, made up of spike like racemes, 1.5-4.0 cm long. Upper racemes as long or longer than internodes. Spikelets 15-35, ovate-oblong, 2.5mm long, glabrous. Lower glumes truncate, clasping, uppers broader, 2- nerve. Lower lemma neuter and upper pointed, rugose. Caryopsis orbicular, compressed.

F1. & Fr. : Sept. – Nov.

Common on banks of ponds, ditches and marshy places. Collection : 1875 ; Ramraj.

33. **Paspalum** Linn.

Ca 250 species ; 14 species in India ; 2 in MZN

1a Spikelets ovate-elliptic, acute. Lower glume present; upper lemma greenish-white .................. 1. *P. paspaloides*

1b Spikelets orbicular-ovate. Lower glume absent;
upper lemma brown.......................... 2. **P. scrobiculatum**


An annual or perennial, moisture–loving, rhizomatous grass, Culms creeping and rooting below, ascending upwards, nodes pubescent. Leaves 3-7 cm long, linear-lanceolate, acute, base of lamma more or less rounded. Sheaths loose striate. Ligule with a ciliate rim. Racemes usually 2, rarely 3, 2-4 cm long, divaricate, sessile, axis flattened. Spikelets 3 mm long, ovate-elliptic, acute, 2 seriate, imbricate. Upper glumes ciliate. Upper lemmas greenish-white. Caryopsis elliptic, depressed-convex.

F1. & Fr. : Sept. – Nov.

Common on sides of ponds, ditches & marshy localities. Collection :1470; Jansath.

2. **P. scrobiculatum** Linn., Mant. Pl. 1: 29, 1767; FBI. 7: 10 pro parte; GBCIP. 340; HFD. 632.

An annual, glabrous grass with tufted culms, erect or shortly decumbent upto 1 m or more tall. Leaves upto 40 cm long, linear-lanceolate, acuminate, white margins. Sheaths compressed, keeled. Racemes 2-5, subdigitate. Spikelets 2.5 mm long, in two rows, elliptic-rounded to orbicular, obtuse; rachis flattened. Lower glumes 0; uppers 5-6 nerved. Upper lemmas 5-7 nerved, epaneate; upper lemmas brown. Caryopsis biconvex.

F1. & Fr. : Aug. – Nov.

Common on marshy and water logged areas. Collection : 5551 ; Purkaji.

34. **Pennisetum** Rich.

Ca 130 species; 16 species in India; 1 in MZN


An annual erect, grass upto 2.5 m tall. Leaves 1-3 cm wide, upto 75 cm long, linear-lanceolate, acuminate, scabrid. Ligule a ring of white hairs; sheaths hairy. Panicles cylindrical, upto 30 cm long, on pubescent peduncles. Spikelets 2-3 mm long, ovate-elliptic, falling with bristles. Involucre bristles free, white or brownish. Pedicles long, white hairy.

F1. & Fr. : Sept. – Oct.
Cultivated for grains and fodder. Collection: 4126; Ailum.

It is an important edible grain and straw used as good fodder.

35. *Perotis* W. Ait.

Ca 10 species in India; 2 in MZN

1a Glumes with definite lines of hairs on dorsal surface; callus obsolete.  

1b Glumes with loosely scattered hairs on dorsal surface; callus definite.  


F1. & Fr.: July. – Oct.

Common on wet shady, sandy soils and edge of small water ponds. Collection: 617; Khatauli, New Report 16


An annual tufted grass with geniculate, suberect, ascending, glabrous stems, terminating in inflorescence. Leaves short, 3-5 cm long, ovate or lanceolate, acute, broad amplexicaul base, glabrous. Racemes slender, crinite, spike-like, dense, purplish-violet. Spikelets narrowly linear, 1-flowered. Involucral glume long awned. Caryopsis almost cylindric, equalling the glume, free.


Common in wet, unused places near temporary ponds. Collection: 3207; Banat. The leaves and stems are used as fodder.


Ca 20 species; 5 species in India; 1 in MZN

An erect or decumbent annual grass, 30-50 cm tall. Culms branched with swollen nodes. Leaves 10-25 cm long, linear- lanceolate, finely pointed, glabrous. Panicles spike-like, contracted, cylindric in outline, erect, 2-6 cm long. Spikelets strongly laterally compressed, flattened, 1- flowered and with 1 or 2 reduced scales or imperfect glumes below the floral glumes. Empty glumes boat-shaped, strongly keeled; keels broadly winged. Floral glumes half the length of empty glumes, keeled. Grains free, ovate.

F1. & Fr. : Feb.–April.

Common weed of winter crops. Collection : 2382 ; Kandhla.

37. Phragmites Trin.

3 species ; 2 species in India ; 1 in MZN


An erect, perennial grass with creeping root-stock and fistular culms. Nodes glabrous. Leaves 10-20 cm long, broadly auricled at the base, lanceolate, acuminate, glabrous. Sheaths smooth, striate. Panicles effuse, silvery-hairy at anthesis. Spikelets 8-10 flowered, 1-2 cm long. Rachilla hairy. Lower glume lanceolate, 4mm long, 3- nerved; upper 5 mm long, glabrous, acute. Lemmas 3- nerved, inrolled and glabrous; palea 2.5 mm long, 2- nerced. Caryopsis free; oblong – cylindric.


Common on river banks and canal sides. Collection : 4569; Rampur.

38. Poa Linn.

300 species; Ca 45 species in India ; 1 in MZN

P. annua. Linn., Sp. P1. 68. 1753; FBI. 7: 345; GBCIP. 555; FD. 407; HFD. 635.

An annual glabrous grass with decumbent-ascending culms, flaccid, upto 20 cm tall; nodes glabrous. Leaves 4 -6 cm long, linear, flat, flaccid. Pannicles lax flowered, upto 6 cm long, branched, filiform. Spikelets 4-5mm, oblong, ovate, green, 3-7 flowered. Lower glumes 1-nerved, smooth; upper glumes 3- nerved. Lemmas ovate-oblong, obtuse, hairy on the nerves. Paleas truncate with ciliate keels. Caryopsis oblong.

F1. & Fr. : Dec. – March.
Common on moist and shady places. Collection : 3572 ; Bahadurpur.

It is considered to be a nutritious fodder grass.

39. Polypogon Desf.
Ca 15 species ; 2 species in India ; 1 in MZN


An annual, tufted grass; culms decumbent ascending, upto 50 cm tall with glabrous nodes. Leaves 8-15 cm long, ovate–lanceolate, scabrid; Sheaths often swollen. Ligules lanceolate. Panicles cylindrical, spike-like, spreading, lobulate, 3-6 cm long. Spikelets 2-2.5 cm long, pubescent. Lower and upper glumes notched, awned. Lemmas 5-toothed, 5-nerved. Palea 2-toothed. Stamens 3.
F1. & Fr. : Jan.- May.

Common weed of winter crops. Collection : 2525 ; Babri.

40. Saccharum Linn.
Ca 30 (?) species; 15 species in India ; 3 in MZN

1a  Peduncles not hairy :
2a  Lower glume of the sessile spikelet with long hairs.............................................. 1. **S. bengalense**

2b  Lower glume of the sessile spikelet glabrous.................................................. 2. **S. officinarum**

1b  Peduncles hairy below the panicles ; hairs white silvery............................................. 3. **S. spontaneum**


A tall, perennial, erect culms. Leaves 80-120 cm long, broad in the middle, linear, some-what glabrous beneath, scabrid on the margins. Ligule a ciliate, truncate rim. Sheaths silky at base, hairy on margins and at the top. Panicles 30-60 cm long, silky, silvery or grey, erect, ovoid or oblong. Spikelets 3-5 mm long. Lower glumes of sessile spikelet flat with long hairs and uppers glabrous, acuminate. Lower lemmas, canal sides and edges of waste ponds and road sides.
Common on river beds, canal sides and edges of waste ponds and road sides. Collection: 3167; Jaroda.
It is an efficient sand binder and is also used for thatching, mat-making and in paper industry.


An erect, tall, many noded grass, waxy below the nodes. Leaves 40-90 cm long, linear-lanceolate, rigid, acuminate, drooping at the tip. Panicles pyramidal, large, dense, primary branches filiform with appressed hairs below the panicles. Spikelets lanceolate. Lower and upper glumes of the sessile spikelets glabrous.
F1. & Fr.: Feb. – May.
Cultivated for its juicy stems. Collection: 2924; Bhopa.
The stems yield the juice used for sugar industry, the byproducts of sugar industry are commercially used for various purpose; dried inflorescence often used for ornamental. Leaves and young stems are used as fodder.


A perennial grass, upto 1.5 m tall, very variable, densely tufted, with solid & fistular stem. Leaves 15-60 cm long, narrow-linear, acuminate, coriaceous. Sheaths longer than the internodes. Ligules ovate or deltoid. Panicles 15-50 cm long, conical-oblong, branches whorled, spreading, hairy below. Peduncles softly silky just below the panicles. Spikelets in pairs, awnless, sessile and pedicelled, each 1-flowered, hermaphrodite.
F1. & Fr.: Sept. – Dec.
Common on canal-banks-sides, waste places. Collection: 70; Muzaffarnagar City.
Culms are used in chick-making and for protection of cucurbita seeding against frost.
It is also used for paper-pulp and as good sand-binder.

41. **Setaria** P. Beauv.

Ca 140 species; 15 species in India; 3 in MZN

1a  Bristles antrorsely barbellate:

2a  Panicles spiciform, continuous, cylindric…

2b  Panicles interrupted, narrow, lobed,

1b  Bristles retrorsely barbellate

---

41. **Setaria** P. Beauv.

Ca 140 species; 15 species in India; 3 in MZN

1a  Bristles antrorsely barbellate:

2a  Panicles spiciform, continuous, cylindric…  **1A. glauca**

2b  Panicles interrupted, narrow, lobed..............  **2 S. intermedia**

1b  Bristles retrorsely barbellate..........................  **3 S. verticillata**

   An annual or perennial tufted grass with decumbent-ascending culms, upto 1 m tall; nodes glabrous. Leaves 5-25 cm long, linear, glabrous or few hairs at the base. Spikelets like racemes, cylindrical upto 8 cm long. Bristles 6-8 in each involucre. Spikelets broadly oblong to elliptic, 3.5 mm long, 2-flowered. Lower glumes male or barren; upper ones hermaphrodite. Lemmas with transverse ridges; uppers slightly keeled upwards. Caryopsis plano-convex, hilum punctate.

   F1. & Fr. : June – Oct.

   Common weed of rainy crops. Collection : 470; Muzaffarnagar City.


   An erect, annual grass loosely tufted upto 80 cm tall, with glabrous nodes.

   Leaves 5-15 cm long, linear or narrowly lanceolate, tapering to fine point, thin, flaccid. Panicles linear, tapering to narrowly lanceolate, lax, interrupted, 4-10 cm long, in the upper branches, reduced to subsessile clusters or solitary spikelets, supported by a bristle. Spikelets broadly-ovate to elliptic, 2.5 mm long. Lower glumes ovate – orbicular, apiculate, glabrous and upper ones shortly apiculate. Lower lemmas neuter and uppers transversely wrinkled.

   F1. & Fr. : June. – Dec.

   Common, growing in agriculture fields, waste places and gardens. Collection : 544; Makhayali.

   The plants are used as fodder.


   An annual grass with erect culms upto 1 m tall with glabrous nodes.

   Leaves 15-25 cm long, linear - lanceolate, narrow at base, scabrid on margins, hairy with tubercle – based hairs, acute apex. Panicles cylindrical, 5-12 cm long, erect or curved. Bristles retrorsely barbed. Spikelets 1-1.5 mm long, ellipsoid. Glumes ovate-apiculate, 3-5 nerved. Lower lemmas sterile; uppers hermaphrodite, apiculate, transversely rugose.
F1. & Fr. : Aug. – Nov.
Common on road-sides and as weed of rainy season crops. Collection : 3663; Muzaffarnagar City.
The grains are eaten by poor people.

42. Sorghum Moench. nom.cons. prop.
Ca. 75 species; probably 25 species in India; 2 in MZN

1a Panicles effuse, open, lax................................. 1. S. halepense
1b Panicles usually close and dense....................... 2. S. vulgare


A perennial, stout grass with stoloniferous root stocks. Culms erect, nodes glabrous. Leaves linear, acuminate, cordate at base with glabrous sheaths. Junctions of sheath and blade villous. Panicles upto 30 cm long, open, brown and purplish. Rachis fragile; branches 1-3 nate, distant, diffuse, lower one upto 12 cm long. Spikelets 4-5 mm long. Sessil spikelets; lower glumes 2- toothed, ciliate, 7- nerved; uppers acute, ciliate hairy on back. Lower lemmas empty; upper hermaphrodite. Pedicelled spikelets : upper florets barren.
F1. & Fr. : Sept.- March.
Common on field boarders, waste fields and grassy locations. Collection : 4233; Ailum.
The stems and leaves are used as fodder.


A tall stout annual grass. Leaves 30-90 cm long, broad linear, midrib channelled above, acuminate, glabrous. Panicles 10-20 cm long, ovate, dense, thyrsiform, decompounds, with crowded erect branchlets. Rachis of the spike tenacious. Spikelets green first and turns brownish at maturity, large, broad. Sessile spikelets fertile, awned and pedicellate male or neuter.
Cultivated crop of rainy season. Collection : 165; Muzaffarnagar City. Largely cultivate in rainy season as fodder crop and grains are also edible.

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (433)
43. Sporobolus R. Br.

Ca 150 species; 18 species in India; 2 in MZN

1a. Lower involucral glumes shorter than the upper and
floral glumes.............................................................1. S coromandelianus

1b. Both involucral glumes shorter than the floral glume………2. S indicus


An annual, densely tufted grass. Glums 15-25 cm tall ascending or prostrate; leafy at base. Leaves 2-6 cm long, linear-lanceolate, acuminate, spinulosely toothed or margins near the base. Panicles pyramidal, erect; branches capillary; lower branches in whorls of 3-6, spikelets 1 mm long, ovate-lanceolate, acuminate, crowded on the distal end of the branches. Lower glumes suborbicular. Caryopsis ellipsoid, compressed.
F1. & Fr. : July. – Oct.
Common on road sides, grassy – localities and gardens. Collection : 4561; Rampur
The stems and leaves are used as fodder.


An erect, perennial compressed grass upto 1 m tall; nodes glabrous. Leaves 15-20 cm long, linear flat or convolute, strongly nerved. Ligule ring of hairs; sheaths glabrous. Panicles 5-10 cm long, branches whorled, capillary, greenish, narrowly pyramidal. Spikelet 1-1.5 mm long, 1-flowered. Lower glumes ovate, truncate, nerveless; upper ones elliptic-ovate, truncate, 1-nerved, shorter than the lemmas. Lemmas lanceolate, 1-nerved. Grains compressed, subtruncate.
F1. & Fr. : July. – Nov.
Common in grassy and agriculture fields, gardens and river sides. Collection : 3619; Muzaffarnagar City.

44. Thysanolaena Nees

Probably monotypic.


MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH
A perennial grass with rounded, polished, erect or ascending culms, 2-3 m tall. Leaves large, broad, lanceolate, 20-60 cm long, 2-6 cm broad. Panicles large soft, glabrous, branches filiform. Spikelets with 1-2 florets, 1-1.5 cm long, acuminate, pedicellate, falling with a part of pedicel. Involutural glumes subequal, hyaline. Lower floral glumes lanceolate, empty; uppers hermaphrodite, ovate, ciliate. Caryopsis minute, free.

F1. & Fr. : Nov. – Feb.
Planted in gardens. Collection : 2839; Jaroda.
The inflorescences are used as brooms and the roots are used in medicines.

45. Triticum Linn.
Ca 20 species; 8 species in India; 1 in MZN

An erect, annual tufted grass upto 1 m tall, with fistular culms. Leaves 30-40 cm long, linear-lanceolate, or broad linear, flat, acuminate, sheaths glabrous; ligules 2 mm long. Rachis compressed. Spikes erect, upto 10-12 cm long, compact; spikelets solitary, laterally compressed, 3-5 flowered. Glumes ovate, hairy, rounded at base, keeled at the top, shortly awned. Lemmas 5-nerved, awned. Paleas 2-keeled.
Grains oblong, ventrally grooved. Palea adhering to the seed coat.
F1. & Fr. : Jan. – April.
Cultivated throughout the area as a rabi crop. Collection : 3530; Muzaffarnagar City.
An important rabi crop for grains and straw.
Other Cultivated species :
T. durum Desf., GBCIP. 679.

45. Urochloa Beauv.
25 species; 4 species in India ; 1 in MZN

An annual, tufted grass upto 50 cm tall. Culms geniculately ascending, rooting at base. Leaves 5-10 cm long, ovate-lanceolate, base semiamplexicaul, finely hirsute, margins crisped, ciliate. Sheaths densely ciliate upwards. Racemes dense, 2-seriate, 2.5-4.5 cm long; rachis flat on back, triquetrous. Spikelets ovate to elliptic-
oblong, 4mm long, pubescent. Lower glumes ovate rounded, obtuse, 5-nerved, away from the rachis; upper glumes glabrous, 9-nerved. Lower lemmas empty or male and upper ones hermaphrodite, transversely rugose. Caryopsis 2 mm long, elliptic.
Common on road sides, gardens and agriculture fields. Collection : 1486 ; Jansath.

47. Vetiveria Lem.–Lisanc.
Ca 10 species; 2 species in India; 1 in MZN


A perennial, densely tufted grass with aromatic spongy root stocks; culms stout, smooth, covered by sheaths. Leaves erect, rigid. Panicles oblong, contracted. Leaves erect, rigid. Panicles obong, contracted upto 30 cm long; branches whorled. Spikelets laterally compressed in pairs. Sessile spikelets 4-5 mm long, linear or lanceolate, turning to purplish or black. Involucral glumes muricate on the back. Pedicelled spikelets with the lower involucral glumes, tubercled on the back; upper glumes tubercled on the keel.
F1. & Fr. : July – Nov.
Common on river and canal sides, waste places and field-borders. Collection : 662; Muzaffarnagar City.

An essential oil is obtained from the roots, used in perfumery, cosmatics etc. Grass is also used in manufacture of paper and board. The dried – roots are made into aromatic – scented mats, fans and ornamental – baskets, also woven into curtains which, when moistened simultaneously cool and scented air.

48. Zea Linn.

Probably monotypic genus.


An annual, erect, cultivated crop upto 2.5 m tall and culms solid, monoecious. Leaves 30-50 cm long, broad, lanceolate, flat; sheaths glabrous, throat hairy. Spikelets unisexual. Male spikelets in terminal lax panicled- branches, pendulous. Lower glumes ciliate, 2-toothed and uppers subacute. Lower lemmas lanceolate, hyaline, ciliate, paleate; upper paleate. Female spikelets axillary, enclosed in the sheaths of leaves and surrounded by bracts. Caryopsis naked at maturity.
F1. & Fr. : July. – Oct.
Cultivated rainy season crop. Collection : 4234; Muzaffarnagar City.
A rainy season crop for grains and fodder. The grains are eaten variously. Oil is also extracted. Stems are also used in paper industry and as fodder.
**EPILOGUE**

Santapau (1968) advocated a compilation of flora for each and every region of India, especially of those provinces which have not been studied so far. During floristic studies of district Muzaffarnagar, the total number of species recorded 887 belonging to 525 genera and 124 families of Magnoliophytes. Out of which 709 species under 429 genera and 103 families belong to Dicotyledons and 178 species under 96 genera and 21 families belong to Monocotyledons. The ratio of families belonging to Monocotyledons and Dicotyledons is 1:4.9; of genera 1:46 and of species 1:3.98 (Table 1). The ratio of genera to species is 1:1.68 as compared 1:2.2 for Upper Gangetic Plain, 1:1.63 for Delhi state, 1:1.7 for British India (Hook. f., 1904) and 1:6 for India (Chatterjee 1939). This distribution pattern of genera and species shows that within the same floral region the smaller the area, the smaller the genera species ratio.

<table>
<thead>
<tr>
<th>TABLE – 1</th>
<th>PROPORTIONAL RELATIONSHIP OF DICOTYLEDON AND MONOCOTYLEDON TAXA IN DISTRICT MUZAFFARNAGAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic Group</td>
<td>Families</td>
</tr>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Dicotyledons</td>
<td>103</td>
</tr>
<tr>
<td>Monocotyledons</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>124</td>
</tr>
</tbody>
</table>

By the analysis of the number of species represented by each family, it is clear that there are 24 families with 10 or more than 10 species. Such families with number of species along with number of genera are given in the Table 2 in order of dominance.

<table>
<thead>
<tr>
<th>TABLE – 2</th>
<th>LARGE FAMILIES WITH THEIR NUMBERS OF SPECIES AND GENERA</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.No.</td>
<td>FAMILIES</td>
</tr>
<tr>
<td>1.</td>
<td>Poaceae</td>
</tr>
<tr>
<td>2.</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>3.</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>4.</td>
<td>Cyperaceae</td>
</tr>
<tr>
<td>5.</td>
<td>Euphorbiaceae</td>
</tr>
<tr>
<td>6.</td>
<td>Malvaceae</td>
</tr>
</tbody>
</table>
7. Lamiaceae  24  16
8. Cucurbitaceae  23  12
9. Convolvulaceae  22  7
10. Acanthaceae  21  17
11. Caesalpiniaceae  21  8
12. Scrophulariaceae  19  12
13. Solanaceae  19  10
14. Verbenaceae  18  11
15. Amaranthaceae  18  8
16. Rutaceae  16  13
17. Moraceae  16  4
18. Brassicaceae  15  9
19. Apocynaceae  12  10
20. Commelinaceae  12  6
21. Caryophyllaceae  11  9
22. Mimosaceae  10  6
23. Myrtaceae  10  6
24. Polygonaceae  10  3

In respect of number of species the Poaceae are the largest family of the district followed by Fabaceae. However, the Leguminosae (sensulato) with the traditional 3 sub- families is the largest family of the district (50 genera and 108 species) followed by Poaceae.

Except for the Poaceae, Cyperaceae and Commelinaceae, Monocotyledons are poorly represented; of the 177 species of Monocotyledons, 84 species belong Poaceae 36 to Cyperaceae, 12 to family Commelinaceae and remaining 46 species to 18 different families; none of which has more than 6 species.

There are 16 families of Dicotyledons with 15 or more than 15 species. For finding out the relationship of the present work with other important works done in neighbouring places, a comparative list of 10 dominant families based on the number of species is given in Table 3.

TABLE-3 TEN DOMINANT FAMILIES IN DISTRICT MUZAFFARNAGAR, DELHI STATE, UPPER GANGETIC PLAIN AND BRITISH INDIA
Leguminosae (including Fabaceae, Caesalpinaceae and Mimosaceae) stand at no. 1 position in the Magnoliophytes of Muzaffarnagar. Leguminosae, Poaceae, Asteraceae and Cyperaceae occupy first 4 positions in district Muzaffarnagar, Upper Gangetic Plain and Delhi State while in British India besides Leguminosae and Poaceae, Orchidaceae and Rubiaceae are among first four. Orchidaceae is at the top in British India while it is represented with single species in district Muzaffarnagar (Table 3). Families Euphorbiaceae, Malvaceae, Lamiaceae, Acanthaceae and Convolvulaceae are among the first 10 families in both Upper Gangetic Plain and district Muzaffarnagar, which indicates clear relation in the pattern of flora of two regions. Cucurbitaceae is not in first 10 families in Upper Gangetic Plain while it occupies eighth position in the Muzaffarnagar.

There are 39 monotypic families with single species each, out of which 15 families belong to class Polypetalae, 8 to Gamopetalae, 9 to Monochlamydeae and 7 to Monocotyledons. Thus class Monochlamydeae is the smallest and Polypetalae is the largest (Table 4).

**TABLE – 4**

**LIST OF MONOTYPIC FAMILIES**

<table>
<thead>
<tr>
<th>District Muzaffarnagar (Maheshwari, 1963)</th>
<th>Delhi State</th>
<th>Upper Gangetic Plain (Duthie, 1903-29)</th>
<th>British India (Hooker, 1907)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poaceae</td>
<td>Poaceae</td>
<td>Poaceae</td>
<td>Orchidaceae</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Leguminosae</td>
<td>Leguminosae</td>
<td>Leguminosae</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Asteraceae</td>
<td>Cyperaceae</td>
<td>Poaceae</td>
</tr>
<tr>
<td>Cyperaceae</td>
<td>Cyperaceae</td>
<td>Asteraceae</td>
<td>Rubiaceae</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>Acanthaceae</td>
<td>Scrophulariaceae</td>
<td>Euphorbiaceae</td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Euphorbiaceae</td>
<td>Malvaceae</td>
<td>Acanthaceae</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Convolvulaceae</td>
<td>Acanthaceae</td>
<td>Acanthaceae</td>
</tr>
<tr>
<td>Cucurbitaceae</td>
<td>Malvaceae</td>
<td>Euphorbiaceae</td>
<td>Cyperaceae</td>
</tr>
<tr>
<td>Convolvulaceae</td>
<td>Amaranthaceae</td>
<td>Convolvulaceae</td>
<td>Lamiaceae</td>
</tr>
<tr>
<td>Acanthaceae</td>
<td>Scrophulariaceae</td>
<td>Lamiaceae</td>
<td>Urticaceae</td>
</tr>
</tbody>
</table>

MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH (440)
Table-5 shows the distribution of genera among different families, 16 of them are Monogenetic but with more than one species, 17 with two genera, 31 with 3-6 genera and 22 families have 7 or more than 7 genera each.

**TABLE -5**

**DISTRIBUTION OF GENERA AMONG DIFFERENT FAMILIES**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Families with 1 genus but more than 1 species</th>
<th>Families with 2 genera</th>
<th>Families with 3-6 genera</th>
<th>Families with 7 or more than 7 genera</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nymphiaceae</td>
<td>Magnoliaceae</td>
<td>Ranunculaceae</td>
<td>Brassicaceae</td>
</tr>
<tr>
<td>2</td>
<td>Cleomaceae</td>
<td>Papaveraceae</td>
<td>Annonaceae</td>
<td>Caryophyllaceae</td>
</tr>
<tr>
<td>3</td>
<td>Flacourtiaceae</td>
<td>Capparaceae</td>
<td>Menispermaceae</td>
<td>Malvaceae</td>
</tr>
<tr>
<td>4</td>
<td>Polygalaceae</td>
<td>Violaceae</td>
<td>Sterculiaceae</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>5</td>
<td>Portulacaceae</td>
<td>Malpighiaceae</td>
<td>Tiliaceae</td>
<td>Caesalpiniaceae</td>
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<td>Tamaricaceae</td>
<td>Vitaceae</td>
<td>Oxalidaceae</td>
<td>Cucurbitaceae</td>
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<tr>
<td>---</td>
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<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>7</td>
<td>Passifloraceae</td>
<td>Crassulaceae</td>
<td>Rutaceae</td>
<td>Apiaceae</td>
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<td>8</td>
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<td>Combretaceae</td>
<td>Meliaceae</td>
<td>Rubiaceae</td>
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<td>Plumbaginaceae</td>
<td>Aizoaceae</td>
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<td>Mimosaceae</td>
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<td>Lantibulariaceae</td>
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<td>Rosaceae</td>
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<td>Dioscoreaceae</td>
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<td>Myrtaceae</td>
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<td>Lythraceae</td>
<td>Bignoniaceae</td>
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<td>16</td>
<td>Potamogetonaceae</td>
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<td>Onagraceae</td>
<td>Acanthaceae</td>
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<td>17</td>
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<td>Molluginaceae</td>
<td>Verbenaceae</td>
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<td>18</td>
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<td>Sapotaceae</td>
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<td>Chenopodiaceae</td>
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<td>Polygonaceae</td>
<td>Poaceae</td>
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<td>23</td>
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<td>Urticaceae</td>
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<td>Moraceae</td>
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<td>Hydrocharitaceae</td>
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<td>Zingiberaeae</td>
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<td>27</td>
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<td></td>
<td>Araceae</td>
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<tr>
<td>31</td>
<td></td>
<td>Lamnaceae</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Among the Dicotyledons Polypetalae dominates and is represented by 56 families, 202 genera and 343 species. The largest family of the group is Fabaceae which comprise 78 species belonging to 37 genera. The Gamopetalae finds the second place and is represented by 30 families having 177 genera and 268 species. Asteraceae, the largest family of the group are represented by 58 species and 37 genera. The Monochlamydeae is represented by 98 species belonging to 50 genera.
and 17 families (Table 6). It is worth-while to note that Monochlamydeae is the smallest of all taxonomic groups among the Dicotyledons. The largest family of this group is Euphorbiaceae having 28 species belonging to 15 genera. *Ipomoea* is the largest genus among Dicotyledons comprising 14 species followed by *Cassica* (11 species) and *Blumea, Euphorbia, Ficus* (each having 8 species). Among Monocotyledons *Cyperus* comprising 18 species is the largest genus.

**TABLE – 6**

NUMBER OF FAMILIES, GENERA AND SPECIES OF DIFFERENT GROUPS OF DICOTYLEDONS

<table>
<thead>
<tr>
<th>Name of Taxa</th>
<th>Number of Families</th>
<th>Number of Genera</th>
<th>Number of species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polypetalae</td>
<td>56</td>
<td>202</td>
<td>343</td>
</tr>
<tr>
<td>Gamopetalae</td>
<td>30</td>
<td>177</td>
<td>268</td>
</tr>
<tr>
<td>Monochlamydeae</td>
<td>17</td>
<td>50</td>
<td>98</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>429</td>
<td>709</td>
</tr>
</tbody>
</table>
HERBARIUM METHODOLOGY

Herbarium is a store-house of plant specimens collected from far and wide, mounted on appropriate sheets, arranged according to some known system of classification and kept in pigeonholes of steel or wooden cupboards, usually specially prepared for the purpose. It is the principal tool used by the taxonomist.

It is a special type of museum. Early systematic botany was preoccupied with medicinal plants, generally termed as herbs. It also grew up in a part of the world where much of the flora was composed of grasses and other herbs, as opposed to shrubs and trees. One or both of these facts may have influenced Linnaeus in the coining of the simple and usable word “herbarium” for what had been variously called a ‘Hortus Siccus’, ‘Hortus Mortuus’, ‘Horths Hiemalis’, or ‘phytophylacum’. Herbaria are generally associated with botanic gardens and educational or research organizations.

With proper preparation and adequate care dried plant specimens will last indefinitely. The herbaria of Ghini (1519-1556) and Caesalpino (1519-1603) are still in existence in Italy and that of Rauvolff (1573-1576) in Leiden. The word herbarium superseded the term hortus siccusi literally a garden of dried plants. Today, “herbarium” is perhaps more commonly used for the building or room in a building which houses the hortus siccus, but equally we can refer to the herbarium of a particular collector, as “Herbarium of Roxburgh”.

According to Fosberg and Sachet (1965) a modern herbarium is a great filing system of information about plants both primary in the form of actual specimen and secondary in the form of published information, pictures and recorded notes”.

Actually, any collection of dried plants can be called herbarium but now, after long experience, almost standard methods of preparation and arrangement of sheets have been adopted; thus, botanists in different parts of the world can exchange specimens conveniently and can also work in other herbaria without difficulty.

What to collect

Choice of material to be collected depends solely on objective of the assignment. Plants or specimens selected for collection should show the essential features of leaves, flowers, fruits and seeds. Plant material is gathered from the natural habitat for botanical research and studies such as flora writing, taxonomic revision, ethnobotanical studies, enrichment of museum and herbarium, introduction in live collection etc.
A whole plant in case of small plants, and a healthy leaf branch in case of large plants should be collected. A botanical sample collected for the purpose of taxonomic objective must have either flowers or fruits or separately both. In case of plants where flowers are unisexual or male or female flowers are found on different individuals, perfect specimens of both sexes must be collected as far as possible.

How to collect

While making collection in the field following tips will be helpful for the collectors:

Size of the specimen

As the specimen has to be affixed to the herbarium sheet with the dimensions of 28x40 cm (+1cm), so the size of the specimen should be such that can be conveniently accommodated on it. If it is desirable to collect the whole plant, e.g. annual and biannual herbs, and the length of plant is more than 40 cm then it may either be folded like N, M, V or W or cut into two or more segments. While pressing in latter case it must be ensured that all such segments bear the same collector number however they may be marked A, B, C or 1, 2, 3 and so on. Similarly in case of small plants all the replicates which are to be mounted on one sheet should be marked in same fashion.

Number of specimens of each plant

Depending upon the availability, six samples or replicates of each plant should be collected. Loose material such as inflorescences, flowers, fruits, seeds and some vegetative parts, depicting species specific diagnostic features is desirable where possible.

Field Numbers

Each leaf of the collector’s or organization’s field book bears a numbers at the lower end. It has up to six number tags which are marked with the same number. These tags or number tickets are threaded and can easily be detached along the perforated lines. One ticket is attached to each replicate.

Field Notes

Field notes should be jotted down very carefully, as they provide very valuable information to the researchers. These include date of collection, place of collection, altitude, habitat information, salient field observation, tentative identification, local, common and vernacular names, uses, occurrence, frequency and distribution, etc. Characteristic features on specimens recorded in the field are written on the herbarium label. For further information field notes can be referred on the basis
of field numbers as and when required. After attaching field ticket and taking down necessary field notes specimens are either field pressed or brought to base camp or herbarium for further processing.

**Herbarium Equipment**

Equipments, materials of herbarium and fieldwork are described below:

**Vasculum**

It is a container of tin or aluminum with an airtight lid. Generally the size of Vasculum is 50x30x15 cm. Vasculum is painted white to deflect heat and so that it can also be easily spotted in the greenery of the forest. It is used to keep plants during collection in the field. If weather is hot and dry, collection is moistened before keeping in the Vasculum. Instead of Vasculum, polythene bags of various sizes can serve the purpose. These are very light in weight and convenient to use and carry.

**Field press**

It is made of two simple hard boards, thin plywood boards or rectangular grids of thin metallic bars or wire of 30x42 cm dimensions. Between two planks a number of driers or blotting papers containing plant specimens are placed and the press is tied tightly by two leather or cotton straps. Field press should be as light as possible. In the herbarium heavy-duty wood presses with nuts and bolts are used.

**Field book**

These are specially prepared notebooks for labeling the plants and recording field notes. The pages of field books are specially printed punched and perforated; one book usually contains 100 leaves. Each page has some tags or tickets (generally 4-6), which are punched and can be detached from main page through perforated lines. Tags bears the same number as the page. Tags with thread loop are used to label the specimen collected and field observations about it are recorded on the page.

**Blotting papers/Absorbents/Drying sheets/News paper folders**

These are required for pressing and drying specimens in the press. Dried specimens are then transferred to newspaper folders.

**Herbarium sheets/Genus covers/Species covers**

Herbarium sheet or mounting board is made from heavy and long-lasting paper. Species covers are folders of thick paper in which sheets are kept. Genus covers are folders of card paper and are used for keeping species covers in the herbarium.

**Polythene bags**
Polythene bags of different sizes are required for keeping specimens, floral parts, etc.

**Specimen tubes**

Required in assorted sizes with fixatives for keeping pickled material for further study.

**Other tools**

Tools such as scissors, knife, secateurs (small clippers), pruning shears, axe, trowel, etc. are required during field and herbarium activities.

**Magnifying glass and pocket lens**

These are very helpful in examining fresh and detailed specimens.

**Microscopes**

Dissecting and compound microscopes are used for studying the finer details of specimens.

**Photographic equipments**

It is desirable that two good quality cameras one with black and white and other with color film should be available for taking photographs of plants.

**Binocular & Altimeter**

Used during field excursions.

**First-Aid box**

Complete first-aid kit should be available in the herbarium. It is essential for field trips also.

**Poisoning equipments**

Materials such as fine quality brushes, enamel coated trays, bottles for keeping preservatives, gloves, protective glasses, muslin cloth etc should be available. Fumigation chamber is used for disinfecting herbarium collection before introduction to the herbarium.

**Stove, Utensils etc.**

Used for treating woody and succulent specimens and for preparing glue paste for mounting purpose.

**Needle & Thread**

Required for stitching of herbarium specimens and threading of plant labels of field books.
Besides many other items such as various chemicals, glassware, herbarium seal, rubber stamps, herbarium labels, scales, petromax, ropes, straps, soaps etc. are used in the herbarium for preservation of specimens.

**Preservation of Herbarium Specimen**

**Size of specimens**

The size of herbarium sheet is 28 x 42 (± 1) cm. Therefore, size of the specimen should be such that it can easily accommodated on this sheet. If whole plant like herbs, grasses and sedges) is to be collected and the size of the specimen is more than the above specifications then the specimen is either folded in the shape of N, M, or W or cut into two or more parts bearing the same number.

**Pressing and drying**

After specimens have been collected, numbered with recorded fields notes, these are placed in the press, Vasculum or polythene bags. Some preservative treatment is given to protect the specimens. Preservation of the collected material is secured by drying followed by chemical treatment. The process of drying fresh specimens is an attempt to remove water from the tissues of specimen because water contents allow for bacterial and fungal growth. Drying of specimens is done by placing the specimens in the folders of absorbent material such as blotting paper under some pressure. Here moisture is transferred from the specimen to the absorbent through diffusion. Drying folders are changed after suitable period depending upon moisture content of the specimens and climatic conditions. Drying of specimens is usually done by atmospheric drying or by providing artificial heat.

**Atmospheric drying**

In dry climate it is the most convenient method to press and dry specimens satisfactorily without using artificial heat. In this method driers containing specimens are placed in the press and the latter is tied tightly. For this purpose the absorbent sheet should be at lower moisture content than the specimens. This is achieved by replacing the moist with dry driers. The used driers are sun dried for reuse.

**Drying with artificial heat**

In this method field press containing drying sheets with specimens are kept on a frame and are heated with kerosene pressure lanterns. Some collectors use special field driers of timber with metal support and a loose tray of perforated aluminium sheet for supporting the specimens. This type of drier can be operated round the clock.
but requires attention about every three hours. In this method specimens should be examined initially after 36 hours, then every 24 years until they are dry.

**Poisoning**

Poisoning of the specimens is very necessary. They are poisoned either in the field immediately after collection or are done so after being brought to the base camp or herbarium. It saves valuable plant specimens from destruction. It gives better results if the specimens are poisoned immediately after collection, as it would kill the organisms on plant and prevent the formation of abscission layer apart from killing the damaging insect and fungi present on the green plant. Various agents used for this purpose are described below.

**Mercuric chloride**

A saturated solution of this chemical is prepared in alcohol and unmounted plant is dipped into it in enamel tray (because Mercuric chloride is corrosive for metals). This solution is also used for poisoning mounted specimens with the aid of a fine brush. Mercuric chloride is a cumulative poison hence care should be taken while using it. Poisoning work should be avoided by persons having cuts in their hands.

**Lauryl Pentachlorohenenate (LPCP)**

This is also used in some herbaria as a substitute of Mercuric Chloride. It is reported to be very effective and comparatively safe in handling.

**Formalin**

Poisoning by using formalin is done during the collection trip. It is very useful in tropical regions. In this method folders containing freshly collected specimens are piled up in a large polythene bag and 10% formaline is sprinkled over them thoroughly, the bag is then airtight. It keeps the specimens safe for 3-4 months without requiring any change of folders.

**Fumigation**

It is measure to kill harmful insect pests in mounted as well unmounted specimens. For this purpose plant specimens are placed in the fumigation box and volatile chemical liquids such as Methyl bromide, carbon disulphide or carbon tetrachloride are placed in petridishes and chamber of cupboard is kept closed for about a week. Paradichlorobenzene (PDB) and Naphthalene are used for fumigation. They are tied in a small cloth pieces or kept in cloth bags, which are kept in the pigeonholes of almirahs. These chemicals can also be sprinkled on the sheets. Care
should be taken not to use them simultaneously. Fumigation does not kill eggs and pupae of insects. So fumigation should be done at regular intervals.

**Heating**

In some countries specimens are electrically heated in special type of insulated herbarium cupboards instead of fumigation.

**Preservation of pigments**

Various techniques employed during poisoning and fumigation result in discoloration of flowers and leaves and render the specimen an unnatural look. However by certain preparation natural colors can be retained up to some extent. For preserving the color of flowers they are treated with the fumes of carbonmonohydroxide soaked in formaldehyde. Retention of green color can be achieved by pickling the fresh material in the following preparation for class use (Lawrence, 1951)-

- 90 cc  50% Ethyl alcohol (or Isopropyl alcohol)
- 5 cc   Commercial formaldehyde
- 2.5cc  Glycerin
- 2.5cc  Glacial acetic acid
- 20gm  Cupric chloride (For yellow-green leaves used half this quantity)
- 2.5gm  Uranium nitrate

Green color can also be preserved in the following liquid medium.

- 20gm  Phenol c. p.
- 20gm  Lactic acid (Sp. Gr. 1.21)
- 40gm  Glycerin (Sp. Gr. 1.25)
- 0.2gm  Cupric chloride
- 0.2gm  Cupric acetate
- 20ml  Distilled water

Preservation of hyaline less parasitic materials, which ordinarily turn black in the usual preservative can be preserved as under reported by Newsland & Salvin (1928). Place the specimen in a test tube containing 95% Ethyl alcohol, add 0.5 gm of sodium sulphite and 0.5cc of conc. Hydrochloric acid. Seal tightly and shake. Allow to stand for a week, siphon out the alcohol, replace with xylol and seal airtight.

**Mounting of specimens**
For the purpose of keeping the specimens in the herbarium after completing the processes of collection, pressing, drying and poisoning they are fastened to herbarium sheets or mounting sheets. This sheet or board is made from heavy, long lasting, white, handmade paper. Its size is 28 x 42 cm.

Mounting sheets displays the processed specimens in such a manner that it is well spread on the sheet. All parts such as branches, both surfaces of the leaves, flowers, fruits etc. must be well displayed and spread on herbarium sheet. Specimens are incorporated in the herbarium in mounted state only. For achieving better results before pasting the specimens on the sheet, the precautions observed are: only one specimen (a few in case of small plants) are used on each sheet, lower part of the plant should point towards the base of sheet; some space is left on right hand bottom for herbarium level. If label is already there on the sheet, it should not get covered by any part of specimen. Field number ticket tagged with specimen is pasted on the sheet in proper position to ensure that some space is left on the right hand bottom for affixing date slip.

Specimens are affixed to the sheet mainly by using glue as an adhesive. For this purpose flake of common animal glue are added in boiling water gradually and a paste is prepared. As this paste becomes hard and thick on cooling, it has to be kept on low heat while mounting specimens. Small quantity of mercuric chloride, thymol crystals or copper sulphate is added to it to make it somewhat insect repellant.

Glue paste is uniformly applied on the under surface of the specimens either by putting the specimen on a glass plate evenly spread with a thick coating of paste, or by placing the specimen on the paper with lower side facing up and then applying glue paste on it with a brush. After applying glued surface facing (sheet) down, a blotting sheet is placed on the specimen to drain out the excessive pasts. The sheets with specimens mounted on them are kept in plant press for a day for proper sticking and drying. Now a day instead of using glue other adhesive like Fevicol etc are easily available in the market. Its use is less cumbersome and less time consuming and result is equally good.

**Stitching**

Sheet with glued specimens are taken out from the press and blotters are removed. Leaf surface are cleaned of extra adhesive if any. Now in order to give extra protection to the mounted specimens, the stiff parts of the specimens are stitched to the sheet with the help of needle and thread. Stitches should be small and uniform and
thread not to be allowed to run from one stitch to another stitch. On each side of branch midrib, pedicel, or any other stiff structure holes are made. Thread is passed through over the plant part and a knot is put on the backside of the sheet. Thread is cut at each knot. It is advisable to apply a piece of gummed paper on the knot for its security and long life. For fastening large fruits, seeds etc many loops of thread are required.

If some loose materials like flowers, seeds or small fruits are to be retained with the sheet, they are enclosed in separate paper or polythene packets and pasted or stitched to sheet at some proper place. Sometimes instead of pasting and stitching, specimens are simply strapped to sheet either by thread stitches or simply strapped to sheet by some other devices like adhesive tapes or liquid paste etc.

**Herbarium Storage**

Various types of storage are in use in herbaria throughout the world. Tied folios are not suitable and should not be used. Boxes or Metal containers can be used as they provide secure storage and facilitate effective treatment with Naphthalene or Paradichlorobenzene. But these are not so good for consultation as all specimens have to be removed when access to a single sheet is required. Pigeonhole type of shelving in cupboards with tightly fitting doors is quite satisfactory and is general use in most herbaria. Wooden Cabinets with pigeonhole are also used and door must fit reasonably tightly. Cabinets and cupboards may also be provided with sliding doors. Some herbaria have adopted compactor type of storage arrangement which provides great economy of space, safety from dust, infection fire etc.

**Filing system**

Specimens are arranged according to certain system of classification. For example arrangement of specimens into families and genera in Indian herbaria is according to Bentham and Hookers System. In DD herbarium arrangement of species is according to phytogeographical zonation and follows the pattern as in Hooker’s Flora of British India.

- **Systems of classification**: For Phanerogams and Cryptogams different systems depending upon tradition and convenience are followed.
- **Geographical separation within the herbarium**: In large herbaria, collection is desirable to have some sort of geographical separation of the same species on a worldwide basis.
Type collection: Those specimens upon which botanists have based their descriptions of new taxa are kept in special steel cupboards under lock and key.

Cultivated plants: Some herbaria keep collection of cultivated plants either in separate folders in general collection or may maintain a separate section for routine identification.

Partially identified or indeterminate specimens: Some herbaria store them separately for further studies.

Duplicates: Such specimens are also stored carefully in mounted or loose form for future reference.

Inclusion of literature, drawings, notes etc in the herbarium: Some herbaria for example FRI (DD) herbarium keep such references in literature and plates files at family and genus level with the main collection.

Herbarium equipment:

- Herbarium cases: These are almirahs or cupboards of universally accepted dimensions. They are either wooden or of steel, provided with pigeonholes of internationally recognized specifications.
- Pigeonholed cupboards or racks for storing duplicates.
- Family separators.
- Covers: for literature and illustrations under each family and genus; Genus covers (thick); Species covers (thin), and Dubia covers (same as genus cover and species covers for keeping doubtful or unidentified specimens).

Carpological collections

Carpological collections form an important adjunct to herbarium which includes specimens, either dried or in pickled state of large fruits and seeds. Besides rhizome, tubers, bark and gall samples are also preserved in carpological museum in the form of dried or spirit collection. Curation of dried collection is periodically poisoned and fumigated as herbarium collection.

Collection of wood specimens

Some herbaria have collection of wood samples for anatomical studies as well as an adjunct to the taxonomic studies.

Scientific work in herbarium
Identification; Plant nomenclature; Taxonomic revision; Flora writing; Monographic studies etc.

**Ancillary services**

Botanical library; Map collection; Drawing and reprography section; Illustration section; Photographic facilities; Botanical garden etc.

### IMPORTANT INDIAN HERBARIA

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Herbarium</th>
<th>No. of Sheets</th>
<th>Year</th>
<th>Acronym</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Central National Herbarium, Calcutta</td>
<td>13,00,000</td>
<td>1793</td>
<td>CAL</td>
</tr>
<tr>
<td>2.</td>
<td>Forest Research Institute, Dehradun</td>
<td>3,30,000</td>
<td>1890</td>
<td>DD</td>
</tr>
<tr>
<td>3.</td>
<td>Botanical Survey of India, Southern Circle, Coimbatore</td>
<td>2,29,210</td>
<td>1853</td>
<td>MH</td>
</tr>
<tr>
<td>4.</td>
<td>Blatter Herbarium St. Xavier’s College, Mumbai</td>
<td>2,00,000</td>
<td>1906</td>
<td>BLAT</td>
</tr>
<tr>
<td>5.</td>
<td>Botanical Survey of India, Eastern Circle, Shillong</td>
<td>2,25,000</td>
<td>1956</td>
<td>ASSAM</td>
</tr>
<tr>
<td>6.</td>
<td>Botanical Survey of India, Western Circle, Pune</td>
<td>1,45,464</td>
<td>1880</td>
<td>BSI</td>
</tr>
<tr>
<td>7.</td>
<td>National Botanical Research Institute, Herbarium, Lucknow</td>
<td>1,20,000</td>
<td>1948</td>
<td>LWG</td>
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<tr>
<td>8.</td>
<td>Rapinat Herbarium, St. Joseph’s College, Tiruchirapalli</td>
<td>96,077</td>
<td>1967</td>
<td>RHT</td>
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<td>9.</td>
<td>Botanical Survey of India Industrial Section, Indian Museum, Calcutta</td>
<td>52,675</td>
<td>1897</td>
<td>BSIS</td>
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<td>10.</td>
<td>Botanical Survey of India, Central Circle, Allahabad</td>
<td>50,000</td>
<td>1962</td>
<td>BSA</td>
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</table>
## SOME IMPORTANT HERBARIA OF THE WORLD

<table>
<thead>
<tr>
<th>Herbarium</th>
<th>No. of sheets</th>
<th>Year</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Botanic garden, Kew, London, U.K.</td>
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<td>K</td>
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<tr>
<td>V. K. Komarov Botanical Institute of the Academy of Sciences of USSR,</td>
<td>5,770,000</td>
<td>1823</td>
<td>LE</td>
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<tr>
<td>Leningrad, Russian, S.F.R., USSR</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Herbier, Laboratoire de Phanerogamie, Museum, National d' Histore</td>
<td>7,000,000</td>
<td>1635</td>
<td>P</td>
</tr>
<tr>
<td>Naturelle, Paris, France</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herbarium, Conservatoire et Jardin botaniques de la Ville de Geneve,</td>
<td>5,000,000</td>
<td>1824</td>
<td>G</td>
</tr>
<tr>
<td>Genera</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York Botanical Garden, New York, USA</td>
<td>5,300,000</td>
<td>1891</td>
<td>NY</td>
</tr>
<tr>
<td>United States National Herbarium, Washington, USA</td>
<td>4,340,000</td>
<td>1848</td>
<td>US</td>
</tr>
<tr>
<td>Herbarium, Department of Botany, Naturehistorisches Museum, Wien,</td>
<td>3,750,000</td>
<td>1807</td>
<td>W</td>
</tr>
<tr>
<td>Austria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Museum of Natural history, Chicago, USA</td>
<td>2,415,000</td>
<td>1893</td>
<td>F</td>
</tr>
<tr>
<td>Royal Botanic Garden, Edinburgh, Scotland, U.K.</td>
<td>2,000,000</td>
<td>1839</td>
<td>E</td>
</tr>
<tr>
<td>Missouri Botanical Garden, St. Louis, Missouri</td>
<td>3,700,000</td>
<td>1859</td>
<td>MO</td>
</tr>
</tbody>
</table>
1. The number includes those of Arnold Arboretum also.
2. Formerly the Stewart Herbarium, Gordeon College, Rawalpindi, RAW transferred to Islamabad in 1974.
INTRODUCTION

Classification and nomenclature are two different aspects of biological system. Classification is a division or category in a system which divides things into group. Nomenclature is a discipline that guides the selection of names for the taxa. Scientific naming of plant is necessary because they are universal; they are precise and often help in certain character details and interrelationships of the taxa concerned. As there are innumerable taxonomic groups of plants, a satisfactory system for naming is required for easy reference of these taxa as well as to avoid confusion regarding their identity. Thus knowing the plants by its correct name is called plant nomenclature. In simpler words, plant nomenclature is a science of naming the plants.

WHY DO WE REQUIRE SCIENTIFIC NAMES WHEN WE HAVE VERNACULAR NAMES OF PLANTS OR ANIMALS?

It is because-
- Vernacular names are available for only relative few plants and animal species.
- They are extremely restricted in use and can be used only by ethnic or linguistic groups.
- Within the same language, even within a single country, a single species can have more than one common name.
- Different taxa may be known by the same name.
- The same species will have a different common name in every language.
- Common names might be misleading.

POLYNOMIAL (many-parted name)

Earlier, plant names were actually short descriptions of the plants, often a string of 6 to 12 Latin words. For example Salix pumila angustifolia altera glabra. So learning the names was extremely tedious. In 1753, Carolus Linnaeus (Swedish physician and naturalist) devised a simple way of indexing names in his monumental work Species Plantarum. Thus Salix pumila angustifolia altera alba has become Salix alba. As mentioned above the ordinary vernacular language can’t furnish precise names, botanists were compelled to invent a vocabulary of their own. At the time when nomenclature for plants was devised Latin was the common language of scholars and thus Latin vocabulary was adopted.
Botanists of the world engaged in the field of systematic botany, have formulated the rules of naming the plants and for the selection of the correct name. These rules have been published in a book entitled “international code of the botanical nomenclature (ICBN, now ICN)”. In other words ICBN Or ICN is a book of LAW, containing the rules and recommendations prescribed for naming plants in international context. The aims of the CODE are stable method of naming taxonomic groups ; avoidance and rejection of the name which may cause error or ambiguity or confusion; avoidance of useless creation of name. All the rules of nomenclature, have been set in 6 principles and 62 articles in the code.

**History**

For the first time in 1867 the international botanical congress held at Paris dealt with botanical nomenclature and adopted a set of rules framed by Alphonse de Candolle. The ‘Paris code’ contained the strict observation of the law of priority i.e. the oldest specific name had to be preserved. The British botanists who did not participate in the congress continued with their system of limited and the unofficial “Kew Rule”. The present confusion in nomenclature of most of Indian plants is due to the fact that the flora of British India and other regional flora were written by English men who did not follow the rule of priority. After that the congress held at Vienna in 1905 brought out the first edition of the “international rules of botanical nomenclature”. However, most of the American botanists were following Rochester Code, 1892 prepared under the leadership of N.L. Britton, and later on they followed the American Code 1907. During this period the central European botanists followed Vienna code. Thus, there was no understanding among botanists of different regions regarding the acceptance of the nomenclature rule. It was in 1930, in the International Botanical Congress held at Cambridge, the blocs following Vienna Code and American Code reached a compromise and brought out a set of rule which was truly international as it was accepted by most of the botanists. International Botanical Congress are held at internals of about six years with some amendment in the code. The official version of code is published in English, French and German language. There are 17 edition up to 2005 edition code (Vienna Code). Now the most recent code is Melbourne code, 2011. The current numbering system for the congresses starts from the year 1900 gives a total of XVIII. The XVIII IBC was held in Melbourne, Australia, 24–30 July 2011. It supersedes the Vienna Code, published six years ago. It is written entirely in (British) English. The Vienna Code was translated
into Chinese, Japanese, Portuguese, Russian, and Turkish; it is therefore true for the Melbourne Code. The XIX IBC will be held in Shenzhen, China, 23–29 July 2017.

**Melbourne Code (2011)**

Since the VII International Botanical Congress in Stockholm in 1950, successive editions of the Code have been published as the International Code of Botanical Nomenclature, commonly abbreviated as ICBN. In Melbourne, reflecting the view, particularly amongst mycologists, that the word “Botanical” was misleading and could imply that the Code covered only green plants and excluded fungi and diverse algal lineages, it was agreed that the name be changed to **International Code of Nomenclature for algae, fungi, and plants.** In referring to the Code under its new title, we will use the abbreviation ICN. The name of the Code is partly capitalized and partly not. The lower-case for "algae, fungi, and plants" indicates that these terms are not formal names of clades, but indicate groups of organisms that were historically known by these names and traditionally studied by botanist, mycologist, and phycologists. The Nomenclature Section held in conjunction with the XVIII International Botanical Congress (IBC), met at the University of Melbourne from 18-22 July, 2011. Some 200 delegates, most of them members of the International Association for Plant Taxonomy (IAPT), attended the Section, which meets once every six years on the occasion of the IBC. Very briefly, proposals to amend the Code are submitted by any interested individual and are published in *Taxon* (the journal of IAPT) during the six years between Congresses. Prior to each IBC/Nomenclature Section, all members of IAPT and authors of proposals may vote on proposals to modify the Code. The proposed amendments are then discussed, debated, and voted on at the Nomenclature Section. All approved amendments are examined for conflicts by the Editorial Committee, which then finalizes the text for the new Code. In addition to the change in the title of the Code and the separation of the Appendices, there were five other following major changes to the rules of nomenclature adopted in Melbourne:

I. The acceptance of certain forms of electronic publication;

II. The option of using English as an alternative to Latin for the descriptions or diagnoses of new taxa of non-fossil organisms;

III. The requirement for registration as a prerequisite for valid publication of new names of fungi;
IV. The abolition of the provision for separate names for fungi with a pleomorphic life history; and

V. The abandonment of the morphotaxon concept in the nomenclature of fossils.

The Nomenclature Section approved overwhelmingly the series of proposals prepared by the Special Committee on Electronic Publication set up by the Vienna Congress in 2005. This means that it is no longer necessary for new names of plants, fungi, and algae (and designations of types) to appear in printed matter in order to be effectively published. As an alternative, publication online in Portable Document Format (PDF) in a publication with an International Standard Serial Number (ISSN) or International Standard Book Number (ISBN) is permitted. The Special Committee had proposed 1 January 2013 as the starting date for the new rules (the beginning of the year following the expected publication of this edition of the Code), but the Section believed implementation so important that it decided to bring the date forward to 1 January 2012. As this was ahead of publication of the Code and because of the significance of the change, a paper reporting the details of the decision and incorporating a draft of the new rules was published in September 2011 almost simultaneously in 17 journals, and has been translated from English into eight languages.

The Melbourne Section accepted the term “replacement name” as the preferred term in the Code over “nomen novum” and “avowed substitute”, although use of the term nomen novum (or its abbreviation nom. nov.) is still recommended when publishing a replacement name. The terms “isolatecotype”, “isoneotype”, and “isoepitype” do not apply to any element that has particular significance under the rules, and so have not hitherto appeared in the Code.

Previous Codes have provided for “form-genera,” “organ-genera,” and most recently “morphotaxa” to accommodate different degrees of precision in understanding the taxonomic relationships of these fossils. The new Code clarifies for taxonomists that plant fossils are named and it eliminates the concept of morphotaxa. In essence paleobotany has adopted the principle of “one fossil, one name,” analogous to the changes in mycological nomenclature. Historically, different names were applied to the sexual and vegetative forms of some fungi, but from now only a single name applies to each fungal species: a principle that has been articulated as “one fungus, one name.”
Melbourne code (2011) is divided into three divisions and eight appendices

**Division I:** It includes six principle which form the very basis of nomenclatural rules. These are set in 62 articles.

**Principle I**

*The nomenclature of algae, fungi, and plants is independent of zoological and bacteriological nomenclature. This Code applies equally to names of taxonomic groups treated as algae, fungi, or plants, whether or not these groups were originally so treated.*

**Explanation:** Although the codes of botanical and zoological nomenclature are similar in their basic principles, there are many differences in detail. One result of the independent of the two codes is that a “plant” and an “animals” may have the same scientific name, *Cecropia* (showy moths and weedy tropical trees of the Cacropiaceae) and *Pieris* (cabbage butterflies and shrubs of the Ericaceae) are two examples (Judd *et al*., 2008). Besides, *Morus alba* according to the Botanical Code is the mulberry genus, while *Morus serrator* according to the Zoological Code is the gannet (Bird of Australia) genus. Tautonyms are allowed in Zoological Nomenclature. (*Bison bison, Gorilla gorilla, Naja naja*); not in Plant Nomenclature. The word identifying the species in zoology is called “specific name” and the word identifying the species in botany is called “specific epithet”. Term “valid publication” in ICBN is equivalent to “establishing a name” in ICZN and "Valid name” of ICZN is equivalent to “correct name” of ICBN.

**Principle II**

*The application of name to taxonomic groups is determined by means of nomenclature types.*

**Type Concept or Nomenclatural Type (Typification) (Art. 7-10)**

“The Nomenclatural type is that constituent *element of a taxon to which the name is permanently attached, whether as a correct name or as a synonym”. The type need not be the most typical member of the group, it only fixes the name of a particular taxon and the two are permanently associated. For example *Mimosa* is the type genus of Mimosaceae. It has tetramerous flower but other member of this family has pentamorous flower.

**What do you mean by the term element ?**

The term ‘*element’ means different things according to the rank of the taxon concerned e.g.
(1). For the rank of a species and a taxon below the rank of a species it is a single specimen-exceptions to small herbaceous plants and most non-vascular plants

(2). For the name of a genus and of any taxon between genus and species is a species e.g.

(a). The type of *Thespesia* Sol. ex Correa is *Thespesia populnea* (L.) Sol. ex Correa

(b). The type of *Thespesia* sect. Lampas (Ulbr.) Borss. is *Thespesia lampas* (Cav.) Dalz. & Gibs.

(3). For a name of a family and of any taxon between family and genus is a genus.

**Explanation of Typification**

When a species is described as new to science the author must indicate which is the type specimen on which the new species is based. A type specimen is that specimen upon which the name description of the species is based. For names of species (and lower ranks, except for autonyms) the nomenclatural type is a specimen (sometimes an illustration), called the type specimen. Above the rank of species, a nomenclatural type is typically a name. The type of an order is the family, the type of a family is the genus, the type of a genus is a species and a type of a species is a single specimen. For example, the type of the order Malvales is Malvaceae, type of the family Malvaceae is the genus *Malva*, type of genus *Malva* is *Malva sylvestris* and the type of the species of *M. sylvestris* is a herbarium sheet. Types are the most valuable possession of any herbarium. Types are record for the future for solving taxonomic problem. The various kinds of types designated by the Code are:

**Holotype:** The concept of holotype is an important part of Linnaean taxonomy. It is one specimen or illustration used by the author, or designated by the author as the nomenclatural type (obligatory from 01-01-1958). Or A holotype (sometimes simply type) is the single physical example or illustration of an organism that defines the characteristics of the whole species. It is the carrier of the name, preferably a single sheet or specimen, which the original author had in front of him when he described the species. It is the definitive member of that species. Other specimens can be compared with the holotype to determine whether they are actually a member of that species. The comparison against a holotype often unnecessary if the organism is well-known and complete. Organisms that were described before the 19th century do not normally have holotypes. A holotype may define not only a species or lower taxon, but it may also define higher taxa, e.g. Cactus *Opuntia* is the holotype for the *Opuntia* genus. This type species is now known as *Opuntia ficus-indica*. 

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Isotype: Duplicate of the holotype is called Isotype. Plant specimen are generally collected in sufficient numbers (minimum 4 specimen), out of which when one is selected as a holotype others become isotype. These are also called sister types. Here field number is same and it is from same collection of same date and same locality. There can be only one sheet for holotype while there can be a number of sheets of isotypes and paratypes.

Syntype: Syntype is any specimen cited in the protologue when no holotype was designated, or any one of two or more specimens simultaneously designated as type. In other words when a species is first described, the author may choose several specimens as being representative of the species rather than pick a single holotype. Each specimen is known as a syntype. Here there are several gatherings probably made by different people in different places at different times: these are syntypes of each other, you might call them cousin type, one of which must be chosen as the lectotype. In the lectotype gathering there may again be duplicates, one of which is then appointed as the hololectotypes, the duplicates remaining as isolectotypes (not in Melbourne Code, 2011), and the other syntypes remain syntypes.

Explanation of Syntype:
If author studies collections from different localities & by different collectors & decides to establish a new species, labels all of them as types, all these specimen becomes syntype.

Example of Syntype.
In the protologue of *Laurentia frontidentata* E. Wimm., a single gathering in two herbaria was designated as the type. There must exist, therefore, at least two specimens and these are syntypes.

Paratype: It is a specimen cited in the protologue that is neither the holotype nor an isotype, nor one of the syntypes if two or more specimens were simultaneously designated as types. Locality, time, collector and field number are different in paratype. In this way for paratype, number of sheets may be more than one. Here specimen is same. In other words a paratype usually is a specimen from a collection other than the type, but on which description of new taxon has been based. It often happens that flowering and fruiting branches of the same tree may be collected with a fairly long interval between two collection, both flower and fruit should be described as original description either collection will be the type; the other become paratype.
In other words a biological specimen other than a holotype used for the development of the original description of a taxonomic group is called paratype. So it is taxonomically just as important as holotype but it is nomenclaturally irrelevant (at least when holotype is extant).

In most cases in which no holotype was designated there will also be no paratypes, since all the cited specimens will be syntypes. However, when an author designates two or more specimens as types, any remaining cited specimens are paratypes and not syntypes.

**Explanation of Paratype:**

A paratype is a specimen cited with original description other than the holotype(s) or isotype. If a new taxon is described based on more than one gathering made at different times, the author will designate one gathering as holotype or isotype (s). The rest of the gathering bearing different field number form the paratypes. eg. If the new taxon is collected with flowers in one season and in fruit in other season, these two gatherings will bear two different field numbers. while describing the new taxon, the author (s) will choose one gathering for holotype and isotype, the next gathering cited in the protologues forms the paratype.

**Examples of Paratype:**

(1). The holotype of the name *Rheedia kappleri* Eyma (1932), which applies to a polygamous species, is a male specimen, Kappler 593a (U). The author designated a hermaphroditic specimen, *Forestry Service of Surinam B. W. 1618 (U)*, as a paratype.

(2). In the protologue of *Eurya hebeclados* Y. Ling (1951) the author simultaneously designated two specimens as types, Y. Ling 5014 as “typus, ♂” and Y. Y. Tung 315 as “typus, ♀”, which are therefore syntypes. Ling also cited the specimen Y. Ling 5366 but without designating it as a type; it is therefore a paratype.

**Lectotype:** It is a specimen or illustration designated from the original material as the nomenclatural type, if no holotype was indicated at the time of publication, or if it is missing. When two or more specimens have been designated as types by the author for specific or infraspecific name, the lectotype must be chosen among them. If a originally designated holotype is lost or destroyed, the lectotype is chosen from isotype (s). If no holotype was designated and if syntypes exist, one of them must be chosen as lectotype. If neither a isotype, nor a syntype is extant, a paratype if exists may be chosen lectotypte. The choice of a lectotype is necessary if the syntypes cover more than one taxon.
**Explanation of Lectotype:**

(1). Suppose a scientist has described new species X and cited several specimens in the protologue but fail to indicate one as the type or holotype. So all these specimens become syntypes. Now another scientist made a critical study of this protologue and correctly selected one of the specimens as lectotype.

(2). Suppose a author/scientist published a new genus under the name 'A' with two species (a1 & a2) in 1830 but the type species of the genus was not indicated at the time of original publication. Now another scientist chose 'a1' as the lectotype of the genus in 1970 and his choice should be retained.

**Neotype:** It is a specimen or illustration selected to serve as nomenclatural type if no original material is extant, or as long as it is missing. A neotype may be designated only when all the originally cited material is believed to be destroyed or lost. While selecting a neotype more care and critical knowledge are essential, because the reviewer has no guide except his own judgment as to what best fits the protologue. Here the specimen comes from the type locality and is in complete agreement with original diagnosis.

**Explanation for Neotype & Lectotype**

Two new plant species, A & B were described in 1872. Subsequently it was found that the type for species A was never designated & for species B there was one specimen designated as type but missing. As per ICBN (ICN), typification should be neotype for A & neotype for B

**Epitype:** It is a specimen or illustration selected to serve as an interpretative type when the holotype, lectotype, or previously designated neotype, or all original material associated with a validly published name, is demonstrably ambiguous & cannot be critically identified for purposes of the precise application of the name of a taxon. When an epitype is designated, the holotype, lectotype or neotype that epitype supports must be explicitly cited.

**Topotype:** When no original material is available and a specimen collected from type locality is chosen to serve as type it is called topotype. In other words topotype is often the name given to a specimen collected from same locality from which the holotype was originally collected.

**Icnotype:** An icnotype is an illustration that serve as holotype or lectotype. Some botanists, Roxburgh, for example, did not preserve the specimen on which they based
new names, but instead made good and detailed illustration. Many of these illustration have since been selected as Icnotype.

**Advantage of Type Materials:**
Type material can help in various ways. Some of them are given below.

(1). **In detecting new taxa:** Genus *Pileostegia* of family Hydrangeaceae was thought to have only species i.e. *P. viburnoides* Hook. f. & Th. A species collected from Arunachal Pradesh revealed that it differs from *P. viburnoides* in having longer leaves with 9-11 pairs of nerves, longer panicles and shorter stamens with filaments flattened at the base. This revealed that this collection from Arunachal Pradesh is new to the science and have been described as *Pileostegia subansiriana* Naithani & Bennet (*Indian For.* 110:518. 1984).

(2). **To detect wrong identification:** *Clerodendrum lasiocephalum* Clarke, was originally based on Griffith’s collection No. 6055 from Arunachal Pradesh, which is in fruiting stage. Later Fischer, 1941 (Kew Bull. 1940:299-300) amended its description on the basis of the flowering specimens of Clarke No. 38106 (A) and 44144 (A), both form Meghalaya. He also cited two more specimen viz. Booth's No. 4318 and Bor No. 2724 collection form Arunachal Pradesh and Nagaland respectively. On examination it has been found that only Booth’s and Griffith’s collection belongs to proper *Clerodendron lasiocephalum*. However other specimen cited by Fischer (1941) belongs to a species new to the science i.e. *Clerodendrum fischeri* Naithani & Bennet (*Indian For.*109:280. 1983).

(3). **In redefining taxa:** *Mullago pentaphylla* Linn., was until recently considered to be a highly polymorphic species that include *M. stricta* L. Linnaeus recognized two species based on leaf and inflorescence character which subsequent author regarded as intergrading. On reinvestigation Sivarajan & Usha, 1983 (Taxon 32; 123-6) found that they keep distinct not only in their aforesaid character, but also in their seed coat pattern and tepal venation patterns.

**Principle III**
The nomenclature of a taxonomic group is based upon priority of publication.

**Explanation:** The correct name for a taxon is the earliest name that is in accordance with the rules of nomenclature. Linnaeus’ Species Plantarum (published on 1 may 1753) is the starting point (for purposes of priority) for species name of vascular plants. Other plant groups may have other starting points. Later –published names for the same taxon are called synonyms and are not considered to be the correct name for
the species. Name that duplicate name already in existence (for other species) are also not to be used and are called homonyms (Judd et al., 2008).

Examples:

*Cannabis sativa* L. 1753
*Cannabis indica* Lam. 1785
*Cannabis ruderalis* J. Janischevsky 1924

When 3 names refer to a single species, or when 3 species are lumped into 1 comprehensive single entity, the entity must bear the earliest published name—*Cannabis sativa* L. But retroactive only to 1 May 1753, the date of Linnaeus' *Species Plantarum*. Similarly *Lawsonia inermis* Linn. (1753) and *Lawsonia alba* Lamk. (1789) are synonym and correct name is *Lawsonia inermis* Linn. (1753)

Limitation of the Principle of Priority:
The principle of priority does not apply above the rank of family. The dated for different taxa are given below.

Spermatophyta and Pteridophyta, 1 May 1753.
Musci (*Sphagnaceae* excepted), 1 January 1801.
Sphagnaceae and Hepaticae, 1 May 1753.
Fungi (including slime moulds), 1 May 1753.
Other fungi, January 1821 (Fries. *Systema mycologicum*).
Algae, 1 May 1753. Exceptions: *Nostocaceae* (1 January 1886), *Desmidiaceae* (1 January 1848), *Oedogoniaceae* (1 January 1900).
Fossil Plants, 31 December 1820

**Principle IV**

*Each taxonomic group with a particular circumscription, position, and rank can bear only one correct name, the earliest that is in accordance with the rules, except in specified case.*

**Explanation:** Certain widely used names are not actually the earliest published in accordance with the rules, but to avoid unnecessary name changes, many of these have been (or are being) conserved—that is, allowed to be considered the correct of a taxon-through special action of botanical congresses (Judd et al., 2008). Come to earlier example of *Cannabis sativa* L. 1753, *Cannabis indica* Lam. 1785 and *Cannabis ruderalis* J. Janischevsky 1924. Only one of these names can be the correct, accepted name for the species, and that must be the earliest name published on or after 1 May 1753. Thus, *Cannabis sativa* L. 1753 is the correct name.
In addition, the eight families mentioned below may have more than one correct name.

**Alternative (conserved) family names**
- Cruciferae (Brassicaceae)
- Guttiferae (Clusiaceae)
- Leguminosae (Fabaceae)
- Umbelliferae (Apiaceae)
- Compositae (Asteraceae)
- Labiatae (Lamiaceae)
- Palmae (Arecales)
- Gramineae (Poaceae)

**Principle V**

*Scientific name of taxonomic groups are treated as Latin regardless of their derivation.*

**Explanations:** The use of Latin for scientific names originates from the use of Latin in medieval scholarship. Botanical publications were frequently written in Latin even as late as the middle of the nineteenth century. Use of Latin name greatly facilitates communication among plant systematists, who belong to diverse cultural and language groups.

**Why botanical names are Latinized?**
- Latin was the common universal language of scholars.
- Latin is specific and exact in its meaning which is particularly pertinent to the needs of descriptive phrases of the biological sciences.
- Most of the old literature that deal with plants are either in Greek or Latin.
- Latin is a dead language and as such its meaning and interpretation does not change with time.
- Grammatical sense of the word is commonly obvious. e.g. White is translated as album for NEUTER, alba for FEMININE, & albus for MASCULINE (Singh, 2010).
- Latin language employs the Roman alphabet, which fits well in the text of most languages.

Further an acceptable system of nomenclature must be international in character and therefore the scientific names of plants although derived from any language must be Latinized.

**Principle VI**

*The rules of nomenclature are retroactive unless expressly limited.*

**Explanation:** The various rules outlined in the ICBN (ICN) constitute an applied legal system. They do not necessarily have a biological basis. Just as priority is
retroactive to 1 May 1753, various other rules are retroactive to other dates. New rules often have a modern starting date. For example “Article 35.1. A new name or combination published on or after 1 January 1953 without a clear indication of the rank of the taxon concerned is not validly published”.

**Division II: Rules and Recommendations (9 chapter and 62 articles):** The main objective of the rules is to put nomenclature of the past into order and also provide that for future. The rules give detail prescriptions on all the points with the naming of plants. The recommendations are practical applications of code.

**Division III:** Provisions for the Governance of the Code,

**Appendix I:** Names of Hybrids, the Glossary, the Index of scientific names, and the Subject index.

**Appendices II–VIII:** Cover conserved and rejected names and suppressed works as in the Vienna Code.

**Rules and Recommendations:**

**Some important rules are as follows:**

The early part of the code deals with the ranks of taxa in plants classification. Early individual plant is treated as belonging to a number of categories of successively higher ranks with the species as a basic unit. The category must always follow the same relative position in the hierarchy (Art. 1-5). The code also stipulates the name of every taxonomic group should be end in a certain manner. The main categories of their descending order and the stipulated ending of their names are given below.

<table>
<thead>
<tr>
<th>Category</th>
<th>Ending of Name</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Division</td>
<td>-phyta</td>
<td>Magnoliophyta</td>
</tr>
<tr>
<td>Subdivision</td>
<td>-phytina</td>
<td>Magnoliophytina</td>
</tr>
<tr>
<td>Class</td>
<td>-opsida</td>
<td>Magnoliopsida</td>
</tr>
<tr>
<td>Subclass</td>
<td>-idea</td>
<td>Magnoliidae</td>
</tr>
<tr>
<td>Order</td>
<td>-ales</td>
<td>Malvales</td>
</tr>
<tr>
<td>Suborder</td>
<td>-ineae</td>
<td>Chenopodineae</td>
</tr>
<tr>
<td>Family</td>
<td>-aceae</td>
<td>Asteraceae</td>
</tr>
<tr>
<td>Subfamily</td>
<td>-oideae</td>
<td>Caesalpiniodeae</td>
</tr>
<tr>
<td>Tribe</td>
<td>-eae</td>
<td>Phyllanthae</td>
</tr>
<tr>
<td>Subtribe</td>
<td>-ineae</td>
<td>Rutineae</td>
</tr>
</tbody>
</table>
Rank of Taxa: (Article-1 of the Code).

The world taxa (taxon=singular) means taxonomic group of any rank. The rank of species is basic and one or more species form a genus; one or more genera form a family; one or more families form an order; one or more orders form a class; one or more classes form a division and several divisions forms a kingdom. Principal ranks of the taxa are:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Taxa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Plantae (plant)</td>
</tr>
<tr>
<td>Division</td>
<td>Magnoliophytina</td>
</tr>
<tr>
<td>Class</td>
<td>Magnoliopsida</td>
</tr>
<tr>
<td>Order</td>
<td>Malvales</td>
</tr>
<tr>
<td>Family</td>
<td>Malvaceae Juss.</td>
</tr>
<tr>
<td>Species</td>
<td>Thespesia populnea (L.) Sol. ex Corr.</td>
</tr>
</tbody>
</table>

If greater number of ranks of taxa is required, then the term of these are coined as follows:

1. By adding the prefix “sub” to the term; e.g. subspecies; subgenus, subfamily, etc.
2. By introducing supplementary terms e.g. between family and genus – Tribe; between genus and species - section, subgenus & series; and below species – variety and form. ICBN recognizes five infraspecific ranks viz. subspecies, variety, subvariety, form and subform. This was considered insufficient by many workers and over 100 different infraspecific ranks were proposed. Nowadays only three ranks i.e. subspecies, variety and form are commonly used. Subvariety and subform have been abandoned.

Forms of Scientific Name:

Family and subdivision of family: A name of a family is formed by adding the suffix –aceae at the end to a legitimate name of a genus. Similarly the name of a subfamily is formed by adding the suffix – oideae, tribe – eae and subtribe – inae.

The family name Caesalpiniaeae and subfamily Caesalpinioideae.

The following families have an exception to this rule Composite, Cruciferae, Germainae, Guttiferae, Labiatae, Leguminosae, Palmae and Umbelliferae. Alternative name of these families ending in -aceae is also written, e.g. Asteraceae for Compositae, Brassicaceae (Cruciferae), Poaceae (Graminae), Clusiaceae (Guttiferae), Lamiaceae (Labiatae), Fabaceae (Leguminosae), Araceae (Palmae) and Apiaceae.
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(Umbelliferae) (Art. 16-27). The names of families and orders (ends with -ales) should be treated as feminine plural nouns. So the expression "Poaceae consists of 10000 gerera" is wrong. It must be "Poaceae consist of 10000 gerera". Similarly "Rosales are a big order" is correct expression and "Rosales is a big order" is wrong expression.

Genus: Name of genus is always a singular noun. It is written with capital initial letter e.g. Caelaspinia Linn.

Species: Earlier plant name were polynomial i.e. they consisted of several words in series. For example Sida acuta was earlier named as 'Althea coromandeliana angustis praelongis follis semina bicornio'. This polynomial system was suppressed by the binomial system of Linnaeus in his Species Plantarum (1773). This system postulates that every species consist of two words: the first designates the genus and second a particular species. Name of species should be written with small initial letter. Specific name when adjective in form must agree in gender with generic name which is always a noun. Thus Acacia nilotica (not niloticus or niloticum), Anthocephalus indicus (not indica or indicum) are grammatically correct. Specific name when used as a substantive (Noun in possessive case) need not agree grammatically with the generic name. Persons who do not know Latin grammar may give a name of plant after the name of a distinguished botanist or a person connected with plant science. However, there are some rules for this also, for instance when the name of a person ends in a vowel, the letter ‘i’ is added (Dendrocalamus sahnii Naithani), except when the name ends in ‘a’ like Raizada where ‘e’ is added (Dendrocalamus raizadae); when the name ends in a consonant the letters ‘ii’ are added (Dendrocalamus jainii) except when the name ends in ‘er’ where a single ‘i’ is added (Dendrocalamus hookeri).

Principle of Priority: When a plant is known by more than one botanical name it can bear only one correct name–the earliest, legitimate one, validly published in accordance with the rule of nomenclature. For example Anthocephalus chinensis (1843) is the correct name of the ‘Kadamb’ tree commonly known as Anthocephalus cadamba (1856). In other words A. chinensis has priority, as it is 13 years older than A. cadamba, and should be adopted as the correct name. Other example Sapindus emarginatus (1794) is the correct name for ‘Ritha’ tree generally known as Sapindus trifoliatus (1875). Cassia roxburghii (1825) is the correct name of the ornamental tree commonly known as Cassia marginata (1832).
Effective and valid publication of new plant name: Under (Art. 29) publication of new plant–name is effective only by distribution of printed matter appearing in standard scientific journals though sale, exchange or gift to at least 10 Botanical Institution. New names announced at public meetings or non-scientific journals are not treated effective publication. There are several requirements of an effectively published name to be validly published (Art. 32-45). Some of the major conditions are given below.

A name published without accompanying description of the taxon or a reference to an earlier description is not valid and has to be rejected as nomen nudum (nom. nud.) (Art. 41). Diagnosis means the statement of the distinctive characters of the taxon by which it can be differentiated from other. Name publication on or after 1st January 1953 must be accompanied by Latin description or diagnosis (According to ICBN) and now in English also (According to ICN).

Name of the families and lower taxa (except those of certain hybrids published on or after 1st January 1958) are valid only if the nomenclature types are indicated. New name or combination published on or after 1st January 1953 are not validly published without a clear indication of the taxon. It should be clearly indicated whether it is a new genus (gen. nov.), new species (sp. nov.) or new combination (comb. nov.) etc. Publication of new combination published on or after 1st January 1953 should clearly indicate the basionym in the new combination.

Name: All the scientific name are treated as Latin. Some of them are given below:

Synonym: One or two or more names considered to apply to the plant e.g. 
For all three names the nomenclature type is the same. Therefore all the names are nomenclatural synonyms. The correct name is Melocalamus maclellandii (Munro) Naithani.

Conserved name (Latin nomen conservandum abbreviated nom. cons.): Certain generic name have been treated by ICBN as exception to the rule of priority. These name have been conserved against their valid and otherwise legitimate names published much earlier due to long usage e.g. Butea (1802) was conserved against its earlier valid name Plaso (1767), Terminalia is a well-known genus with many species, but it had other earlier available name. If the earlier available name has to be
adopted according to the rule of priority, there would be many name changes i.e. most of the taxa under that should have new combination under the new generic name to be adopted. In order to avoid such disadvantageous changes in the nomenclature the generic name *Terminalia* (1767) was conserved and the earlier name *Adamaram* (1763) was rejected. Genus *Aglaia* Lour. (1790) of family Meliaceae is a later homonym of *Aglaiaceae* allo (1770) of the family Cyperaceae, but it has been conserved. *Derris* Lour. (1790) was conserved and earlier names, *Salken* Adanson (1763), *Solori* Adanson (1763) and *Deguelia* Aublet were rejected. So *Terminalia*, *Butea*, *Derris* etc are conserved name

**Tautonym**: It is name which the specific epithet repeat the generic name. Tautonyms are inadmissible in plant nomenclature e.g. *Malus malus*, *Lycopersicon lycopersicon*, *Eragrotis eragrotis*, *Linaria linaria* etc.

**Basionym**: When a new name or epithet required by a changes in the position or rank of a taxon is taken from a previous name for the taxon that previous name is the basionym of the new name.


In this example the basionym of *Loeseneriella andamanica* (King) Naithani & Sas Biswas is *Hippocratea andamanica* King.

**Ambiguous name (Latin nomen ambiguum abbreviated nom. ambig.)**: A name used in different sense by different authors that become persistent source of error is called *nomen ambiguum*. A misapplied name should be indicated by word *auct. non.*

Viz. *Polygala chinensis auct. non.* Linn. The author citation means that the plant treated as *Polygala chinensis* Linn., by many authors is not species *P. chinensis* described by Linnaeus. *P. chinensis* has been applied to two distinct species-one found almost throughout India which is *P. arvensis* Willd., and the other found in S.E. Continental Asia (in India only in Assam) and Malaysia which is *P. chinensis* L. The name *P. chinensis* L., being a source of confusion, as it has been applied to two different species equally. Burt in notes. Roy. Bot. Gard. Edinb. 32:404. 1973 has rejected it and adopted the next earlier available name *P. glomerata* Lour. In this example *P. chinensis* become a long-persistent source of error. Thus it is a ambiguous name therefore, and was rejected by Burt (1973) (Art. 69).
Naked name (Latin nomen nudum, abbreviated nom. nud.): It is a name published without description or diagnosis or reference. Naked name are not validly published. Thus many names published by Roxburgh in the ‘Hortus Bengalensis’ and by Wallich in his Catalogue are nom. nud. e.g. Odina woiley Roxb., Erigeron asteroids Roxb., Centranthera humifusa Wall. etc.

Homonym: Homonyms are name spelt identically but based on different types. A single plant name has been applied to two or more entirely different species. According to the rule no two plants should bear the same name. In this condition later homonym is illegitimate and must be rejected. This the region why the name of ‘Chir Pine’ had to be changed from Pinus longifolia to P. roxburghii. The name Pinus longifolia (Indian pine) was published by Roxburgh in 1832. It is actually a later homonym of Pinus longifolia Salisbury (1796) an American pine. Sergeant therefore, gave a new name Pinus roxburghii in 1897 to Indian pine.

Confused name (Latin nomen confusum, abbreviated nom. confus.): A name based on a type consisting of two or more entirely discordant element e.g. the genus Actinotinus whose type represents flower of Viburnum and foliage of Aesculus.

Autonym: (Art.26): It is an automatically established name. Autoname should not be taken into consideration for the purpose of priority. The valid publication of the name of subspecies Sagittaria guayanensis HBK ssp. lappula (D. Don) Bogin (1955), has automatically established name of another subspecies viz. S. guayanensis HBK ssp. guaganensis. In such autoname the epithet will have no author citation.

Author(s) Citation: In botanical nomenclature for complete & accurate name, the author(s) name(s) must be credited & often abbreviated. Abbreviation should always be before a vowel i.e. full stop should be placed before a vowel. Examples- Linn. or L. for Carolus Linnaeus; Linn. f. or L. f. ‘f’ stands for filius or son i.e. son of Carolus Linnaeus; Hook. for William Hooker; Hook. f. for sir J.D. Hooker; Lamk. for J. P. Lamarck etc.

Single author: The name of single author follows the name of species when a single author proposes a new name e.g. Mangifera indica L.

Multiple author: The names of two or more authors may follow the name of species. The names of authors may be linked in the following ways (Singh, 2010).

Use of et: When two or more authors publish or proposes new name eg. Delphinium viscosum Hook.f. et Thomson.
Use of *ex*: *ex* is used when first author had proposed a name & second author published the same name validly eg. *Cerasus cornuta* Wall. *ex* Royle.

Use of *in*: *in* is used when first author publish new name in the publication of another author eg. *Carex kashmiriensis* Clarke *in* Hook.f.

Use of *emend*: It is used when second author makes some changes in the diagnosis or in circumscription of a taxon without changing the type eg. *Phyllanthus* Linn. *emend*. Mull.

Use of square bracket: when a name was already suggested before the publication of Species Plantarum (1753), the name of author will be put in bracket [ ], eg. *Lupinus* [Tourn.] Linn. Here Tournefort suggested the name in 1753 i.e. before the publication of Species Plantarum (1753).

Use of parenthesis: According to article 49 when a taxon of lower rank is altered in upper rank but retains its name or epithet, the author who first publish this as legitimate name or epithet must be cited in parenthesis followed by the name of author who effected the alteration. Eg. *Citrus aurantium* var. *grandis* L; when raised to rank of species it becomes *Citrus grandis* (L.) Osbeck. Here L. is the first author & Osbeck altered it.

**Nomenclature of Hybrids (Article H.1-H.12):** Different terms, sign and nomenclature used in the code for hybrids are given below-

**Nothogenus.** A hybrid genus (Art. 3.2).

**Nothomorph.** A term formerly denoting the only infraspecific rank, equivalent to variety, permitted within nothospecies. Names published as nothomorphs are now treated as names of varieties (Art. H.12.2).

**Nothospecies.** A hybrid species (Art. 3.2).

**Nothotaxon.** A hybrid taxon (Art. 3.2 and H.3.1).

Hybridity is indicated by use of the multiplication sign × or by addition of the prefix “notho-” to the term denoting the rank of the taxon. A hybrid between named taxa may be indicated by placing the multiplication sign between the names of the taxa; the whole expression is then called a hybrid formula. ex. *Agrostis* L. × *Polypogon* Desf.; *Agrostis stolonifera* L. × *Polypogon monspeliensis*. The name of intergeneric hybrids are framed by a combination of both the generic name preceded by multiplication signs e.g. *Triticum* × *Secale* × *Triticale*. Graft between two species indicated by plus (+) sign *Rosa webbiana* + *R. floribunda*. There is no provision in the code for
cultivated plants. For cultivated plants there is a separate International code for nomenclature of cultivated plants.

**Causes of justifying name changes in Indian flora.** There is a widespread dissatisfaction among botanist, foresters and others that the name of plants changes very rapidly. They complain that frequent name changes result in endless production of plant name. According to the principle laid down by the code, plant name may have to be changed for several reasons. Some of the main causes of justifying changes in plant name are given below.

**Better understanding or correct identification:** This is very often the case why plant name have been changed in the past. (1) There has been a great deal of confusion in the identity. For example recent work on the identity of *Crataeva religiosa* has shown that the real *C. religiosa* is a Polynesian species and does not occur in India. What has been known as *C. religiosa* includes two species i.e. *C. nurvala* and *C. adansonii*, both of which occur intermixed in India. (2) The name of our famous ‘Ashok’ tree which is generally known as *Saraca indica* should be *Saraca asoca* because *Saraca indica* is a Malaysian species and is not found in India. (3) *Fraxinus excelsior*, the European Ash, was for long considered to be a Trans-Indus species in Indian floras. It has been reported to occur in North-west Himalaya. Infect it does not occur in India except perhaps under cultivation. *Fraxinus excelsior* of the Indian floras is now considered to be *Fraxinus hookeri*, a distinct species. (4) The famous timber ‘Laurel’ largely exported from India known as *Terminalia tomentosa*. Morden research has shown that ‘Laurel’ is actually a mixture of three species of *Terminalia* viz. *Terminalia alata*, *Terminalia coriacea* and *Terminalia crenulata*. It is infect the *Terminalia crenulata* which produce the best figured—laurel, the other two provide less attractive timber.

**Transfer of a species from one genus to another:** The best example can be cited is that the Indian Silk-cotton tree, commonly known as ‘semal’ or ‘semul’ which was earlier known as *Bombax malabaricum* but later transferred to the genus *Salmalia*, thus becoming *Salmalia malabarica*, on the plea that the genus *Bombax* was exclusively of Tropical America. Later, however, it has been shown beyond doubt that the genus *Bombax* is truly Asiatic although it also occurs in America. The generic name *Bombax* was accompanied by names and description of three species at the time of publication by Linnaeus' Species Plantarum 511.1753. These are *Bombax ceiba*, *Bombax pentandra* and *Bombax religiosa*. The latter two species are evolved with the
typification of other generic name. They are currently known as *Ceiba pentandra* (L.) Gaertn. (Kapok) in the Bambaceae and *Cochlospermum religiosum* (L.) Alston in the Cochlospermaceae. *Bombax cebia* L. has unanimously been regarded as the residual lectotype species of *Bombax*. The correct name of the plant should, therefore, be *Bombax cebia* on ground of priority of the specific epithet.

Similarly, the genus *Cedrela* in India should now be called *Toona*. The reason for transference of Indian *Cedrela to Toona* is that morden research has shown that the genus *Cedrela sensu stricto* is purely American and does not occur in India.

The bomboo genus *Oxytenanthera* Munro is a monotype with *O. abyssinica* (A. Rich.) Munro, a native African type species. Therefore, the species of Asiatic *Oxytenanthera* have been placed either to *Gigantochloa* or *Pseudoxytenanthera*. For example the correct name for South Indian *Oxytenanthera bourdillonii* is now *Pseudoxytenanthera bourdillonii*. Similarly the correct name of Burmese *Oxytenanthera paravifola* is now *Gigantochloa parvifolia*.

**Splitting or merging of species:** In case of ‘Babul’ Tree, earlier known *Acacia arbica* is now known by the correct name *Acacia nilotica* ssp **indica**. Recent research shows that *Acacia nilotica* has a very wide range of distribution occurring in Asia as well as Africa. The differences in the morphology in this species due to geographical factors are recognized at subspecies level and thus the plants which occur in India falls under ssp **indica**.

*Bridelia retusa* from India is mentioned as a single species. But as a matter of fact it is a complex name which cover two distinct species viz. *Bridelia retusa* (proper) and *B. squamosa*.

The two common ‘Maahua’ species which were earlier known as *Bassia latifolia* and *Bassia longifolia* have been transferred to the genus *Madhuca*. According to modern research they must be merged into a single species i.e. *Madhuca longifolia* and the differences should be maintained only at the varietal level (*Madhuca longifolia* var. **longifolia** and *Madhuca longifolia* var. **latifolia**).

The two ‘Ritha’ species of South India known as *Sapindus trifoliatus* and *S. laurifolia* have been merged into a single species viz. *Sapindus emerginatus*, the North Indian ‘Ritha’ however, remain as *Sapindus mukorossii*.

**Superfluous name:** New names given to taxa already having legitimate name is called Superfluous name. As mentioned earlier that the nomenclature of taxon is based upon priority of its publication. For example Indian ‘Khasi pine’ - *Pinus kesiya*
Royle ex Gord. (1840) Syn. *P. insularis* Endl.(1847), *P. Khasya* Royle ex Parl.(1868); the latter two are superfluous name. *Pinus kesiya* should be correct name on the basis priority of specific epithet.

In the case of ‘Blue Pine’ *Pinus excelsa* Wall.(1831) is *nomen nudum* and so is *P. chylla* Lodd. (1836). The next two epithets are of the same date viz. *Pinus wallichiana* Jackson (1836) and *Pinus griffithii* McClel (also 1836). *Pinus griffithii*, however, was only a provisional name. McClelland while proposing ‘griffithii’ had written that if the taxon that he had examined was found to be different from *P. excelsa*, it should be called *P. griffithii*, which was not the case. The name *Pinus wallichiana*, therefore, gets the priority. All other names should be regarded as superfluous name. The famous medicinal plants *Tylophora asthamatica* has been used as a correct name till 1921. Later it was found that it is based on older legitimate name *Cynanchum indicum* Burm. f. (1768). Burman’s specific name is the oldest valid one and should be adopted. Thus *Tylophora indica* should be considered for *Tylophora asthamatica*.

**Later homonyms:** Due to inadequate means of communication and limited contacts amongst botanists in the past, in many cases a single plant name has been applied to two or more entirely different species. The commonest Oak, *Quercus incana*, has been recently changed to *Quercus leucotrichophora* A. Camus. This has been done because the Indian *Quercus incana* Roxb. was later homonym of an American Oak, also known as *Quercus incana* Bart. These two have nothing to do with each other.

Similarly another species of Oak viz. *Quercus dilatata* has been changed to *Quercus floribunda* Rehder (1941). It was necessary because Indian *Quercus dilatata* Wall. ex DC. was later homonym of an American *Quercus dilatata* Refin.

Another wild edible fruit tree of Himalayan *Myrica nagi* (Kafal) has also been changed to *Myrica esculenta* Ham. because the Indian *M. nagi* sensu Hook. f. is a later homonym of Korean *M. nagi* Thunb.

*Podocarpus latifolius* a Gymnosperm known from North-East India and Western Ghats is now known as *Podocarpus wallichianus* Presl. It has been done because *Podocarpus latifolius* Wall. is later homonym of *Podocarpus latifolius* R.Br. of South Africa.
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MAGNOLIOPHYTES OF MUZAFFARNAGAR, UTTAR PRADESH


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