FLORISTIC ANALYSIS OF VEGETATION OF KOTA DISTRICT (RAJASTHAN) IN SPECIAL REFERENCE TO AQUATIC ANGIOSPERMS

THESIS

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BOTANY

Submitted by

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2014

Supervisor's Certificate

It is certified that-

1. The thesis entitled "**FLORISTIC ANALYSIS OF VEGETATION OF KOTA DISTRICT (RAJASTHAN) IN SPECIAL REFERENCE TO AQUATIC ANGIOSPERMS**" submitted by **Subhash Chand Verma** is an original piece of research work carried out by the candidate under my supervision.
2. Literary presentation is satisfactory and the thesis is in a form suitable for publication.
3. Work evinces the capacity of the candidate for critical examination and independent judgement.
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Place : - Kota (Rajasthan)
Date : - (Subhash C. Verma)

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INTRODUCTION

CHAPTER: I

INTRODUCTION

India is one of the 12 Mega diversity countries with 13 biomes and two major hotspots out of a total of 18.As strategies for in-situ conservation and sustainable utilization of bio-resources, a network of protected areas has been created in the country through 85 National Parks, 448 Wildlife Sanctuaries and 10 Biosphere Reserves. India is also one of the global centers for domesticated biodiversity (accounting for 160 domesticated species including Rice, Beans, Sugarcane, Citrus, Mango, Banana, Eggplant, Black pepper and Cucumber). The approximate total number of plant species (including Fungi and Bacteria) recorded until now is between 45, 000 and 49,000.These are distributed in the following groups: Angiosperms (Flowering plants) 15,000-17,000; Gymnosperms 64; Pteridophytes 1,022; Bryophytes 3,700; Lichens 2,400; Fungi 23,000; Algae 2,500 and Bacteria 1,000. The exact numbers are not yet finally established. Among these there are 5,100 endemics in Angiosperms (1,600 in Western Ghats and 3,500 in Eastern Himalaya). These figures highlight the richness of our flora and the incompleteness of our knowledge of plants. About 2,000 species are threatened. Out of 120 endangered species, 60 are prioritized for conservation. (Pursuit and Promotion of Science, INSA, 2010)

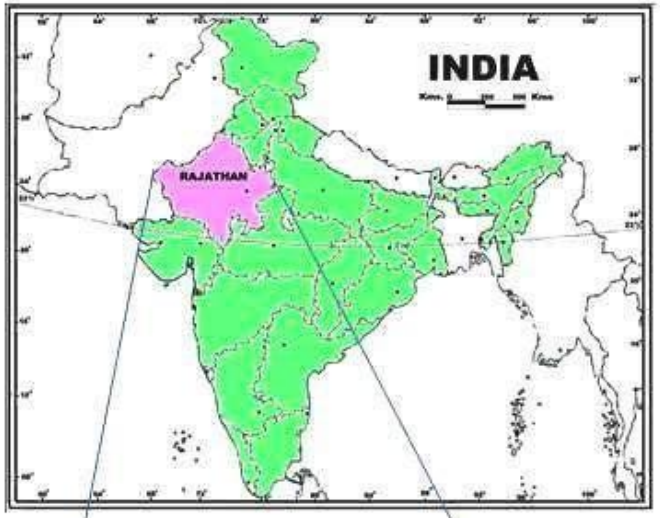
Rajasthan, one of the largest states is situated in the north western part of India covering an area of 3, 42,274 sq. Kilometer. Aravalli ranges, the oldest mountain ranges of world are main physiographic factors of the states. These ranges, diagonally divide the state into two distinct climatic regions. The area West of Aravalli is desert or semi desert, characterized by high wind velocity, high temperature, low relative humidity and thorny vegetation while the area

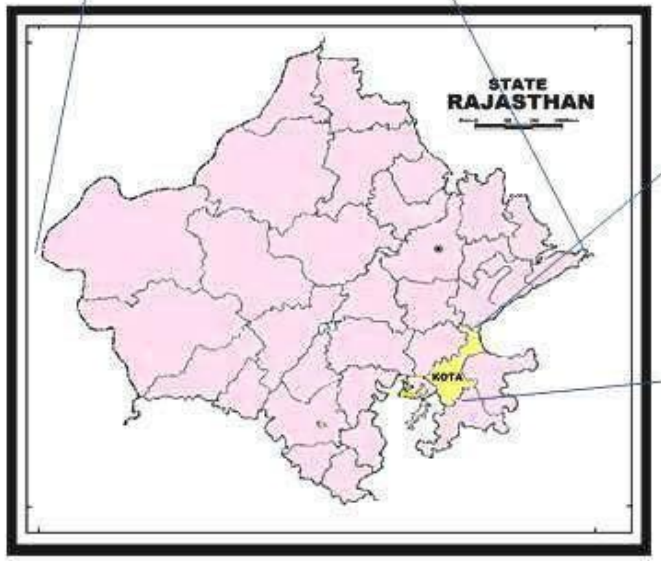
east of Aravalli shows considerable variations in temperature and rainfall distribution and possesses the tropical type of frost vegetation.

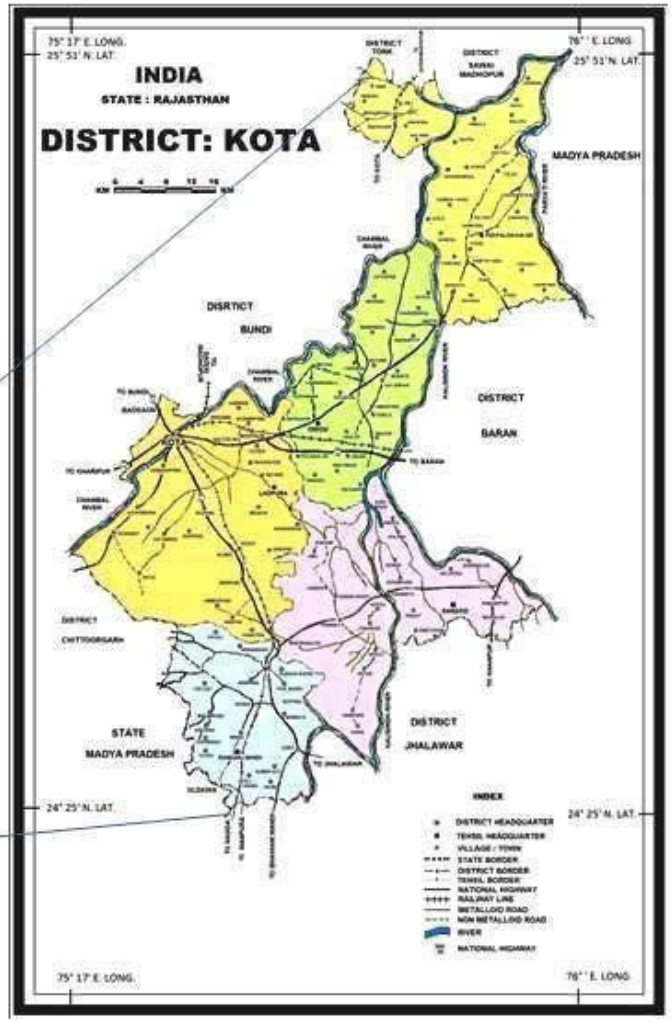
Proposed study area Kota district (Key Map of Location Fig:-1) in south of Rajasthan is situated at latitude 30° 39.125' N and longitude 78° 31.156' E. Kota is located along the eastern bank of the Chambal river in the southern part of Rajasthan. It is the 3rd largest city of Rajasthan followed by Jaipur and Jodhpur respectively. It covers an area of approximately 521324 hectare (12,436 km²) and it is 3.63 per cent of the Rajasthan State). Out of which forests are 125379 hectare, non-agriculture land is 60021 hectare and cultivable barren land is 23011 hectare. It is divided into five sub-divisions namely Kota, Digod, Itawa, Sangod and Ramganjmandi, five tehsils namely Ladpura, Digod, Itawa, Sangod and Ramganjmandi ,three sub tehsils Mandana, Kanwas and Chechat and 864 revenue villages. It has an average elevation of 271 meters (889 ft.). The district is bound on the north and northwest by Sawai Madhopur, Tonk and Bundi districts. The Chambal River separates these districts from Kota district, forming the natural boundary nearly 80% of the mean annual rainfall (1516 mm) occurred in the monsoon season between June and September and 20% fells as snow in winter season. Temperature remains cool and pleasant round the year. Frost is common during winter season, while the higher elevations. Mean minimum monthly temperature ranges from 5.50°C (Jan) to 25.00°C (Jul) and mean maximum monthly temperature ranged from 20.04°C (Jan) to 30.06°C (Jul) in the year 2012.

The flora of Rajasthan has been attended by several workers. Bhandari (1979) and Sharma and Tiagi (1979) have worked out the flora of Western and Northeastern part of Rajasthan respectively. Shetty and Singh (1987, 1991 and 1993) have presented the flora of Rajasthan. Sharma (2002) investigated the flora of Rajasthan which covers mainly the eastern part of the state. Recently,

KEYMAP OF LOCATION OF STUDY AREA







Tiagi and Aery (2007) have published the flora of Rajasthan which mainly deals with the south and south east region of the state. At the district level the flora of Banswara and Tonk have been prepared by Singh (1983) and Shetty and Pandey (1983).

South Eastern and South Western regions are dominated by hilly tracts and include the district of Banswara, Udaipur, Kota, Baran and Sirohi. Studies on these regions include those of Raizada (1954), Jain (1962), Kanodia (1963), Gupta (1965, 66), Kanodia and Rao (1965), Aery and Tiagi (1982, 85, 87), Singh (1983) and Katewa and Tiagi (1984) have made notable contribution to the grasses of these regions.

Systematic enumeration of South East Rajasthan especially of Kota district have been contributed by Majumdar (1971, 1976 and 1980) in form of Synoptic flora of Kota division. Sharma and Tiagi (1979), Sharma (2002a, 2002b), Sharma and Siringi (1986) are also have made significant contributions. Flora of Rajasthan by N.K. Sharma (Floristic studies on Hadoti region. 2002) also provides an account on angiosperms. But at Kota district level with aquatic angiosperms of has been ignored by earlier workers. A thorough survey of literature indicates that no comprehensive studies have been made on the floristic composition of district Kota. This district area is characterized by a variety of habitats and vegetation. Therefore, the present study on Kota district has been taken up with the following objectives:

i. To study the topography, climate and edaphic factors of Kota district for the evaluation of overall nature of local environment and its effects on plants.

ii. To collect plants for Herbarium preparation and general study of the vegetation.

iii. To make an enumeration of angiosperm plant species occurring in the study area and to find out the relative dominance of families.

iv. To make an enumeration of Aquatic Angiosperm plant species occurring inKota district area and to find out the relative dominance of hydrophytic families.

v. To make an enumeration of Angiosperm plant species occurring in the district classifying them into Herbs, Shrubs, Trees, and Lianas.

vi. To find out the medicinal/ economic potential of angiosperm plants occurring in the study area.

This study is carried out to full fill above objectives and some important aspects of this floristic study on phyto-diversity are:-

i. Phyto-exploration for collection and identification of terrestrial and aquatic angiosperms of Kota district from session 2010-11 to 2013-14in different seasons.

ii. Preparation of herbarium and documentation of flora of Kota according to Bentham and Hooker's system of classification (Genera Plantarum, Vol. I, II and III 1862- 1883)

iii. Identification of floral components from family to specific level through identification keys, plant descriptions, illustration plates and photographic plates, available in regional and national flora.

iv. Binomial nomenclature of plants along with vernacular names.

v. To find out possible causes responsible for depletion of plant species and to determine possible strategies for the conservation of plant species and their natural habitats.

vi. Determination of phytogeographical status of the flora of district Kota and sketch of biological spectrum.

vii. To find out some of intra-dependency and impact on each other between various plant species, flora and fauna& flora and human in Kota through personal observations and available literature.

viii. To assess the impact of conservation measures on protected and unprotected phyto-diversity

This study will result into a valuable reference for all those who are concerned with plants in one way or others in general and students of taxonomy in particular. Also, this will be useful to foresters, phytochemists and to those interested in the medicinal and other aspects of plants. Information will also be of some useful in the revision of the national flora of India and state flora of Rajasthan. Outcome of this study will also be a valuable document for:-

i. The development of plant biodiversity enumeration strategies and practices to ensure survival of the unique biodiversity resources not only terrestrial but also in aquatic and semi aquatic habitats of Kota district.

ii. Development of effective ex-situ and in-situ mechanism for biodiversity conservation.

iii. Development of recovery mechanisms of degraded ecosystems not only natural but also manmade like crop fields and agricultural farms for economic, aromatic and medicinal plants.

iv. Encouragement and protection of traditional knowledge about the sustainable uses of plant biodiversity.

v. Formulation of eco-friendly educational plans and public awareness programmes for local and foreign visitors in relation to conservation of the natural plant biodiversity.

vi. Enrichment of supporting information systems that will be helpful for determination of plant biodiversity protected areas and non-protected areas of Kota district.

For the perfect documentation of research work the thesis plan has been divided into following chapters:

I. Introduction
II. Review of Literature
III. Study area and Environmental analysis
   1. Physiography
   2. Historical and Cultural background
   3. Geomorphology
   4. Soil
   5. Climate
   6. Biological Diversity
   7. Land use Pattern
IV. Vegetation
V. Methodology
VI. Synopsis of Families
VII. Systematic enumeration of the species
   1. Class:- Dicotyledoneae
   2. Class:- Monocotyledoneae
VIII. Aquatic Angiosperms
IX. Economic and Medicinal plants
X. Results and Discussion
XI. Summary
Bibliography

CHAPTER: II

REVIEW OF LITERATURE

CHAPTER: II

REVIEW OF LITERATURE

Human beings, in general, are so much dependent on the plant kingdom that people all over the world have been interested in them in some way or the other. Food, clothing and shelter, the three major necessities of human civilization are met with by the plants alone. They, therefore, have been the subject of various kinds of studies.

The Greek philosophers like Aristotle, Plato and Theophrestus are known as founders of Botany. The Greek philosophers like Aristotle, Plato, and Theophrastus are known as founders of botany. The botanical studies flourished well in Indian Vedic culture, well known *Atharvaveda* written around 2000 B.C. contains a wealth of information on medicinal plants and their specific uses. The most celebrated plant that finds frequent mention in the *Rig-Veda* and later *Samhitas* is the Soma plant. The Vedic Indians hail *Soma* as the Lord of the forest (*Vanaraja*). The botanical identity of Soma plant, however, has not been decided till today. The probable plant Genera are *Ephedra* (a Gymnosperm); *Sarcostemma* (flowering plant) and Mushroom (A fungus). The second most mentioned plant was *Peepal* or the *Asvattha* (*Ficus religiosa*) during the Vedic period. The *Rig-Veda* refers to utensils and vessels fashioned out of the wood of the *Asvattha* tree. Some of the other trees that find mention in the Vedas are Silk cotton (*Salmalia malabaricum*), Khadira (*Acacia catechu*), Simsupa (*Dalbergia sissoo*), Vibhitaka (*Terminalia bellerica*), *Sami* (*Prosopis sp*.) and Plaksa (*Ficus infectoria*). Iksu (sugar cane – *Saccharum offcinarum*) was mentioned as a cultivated plant in the *Atharvaveda*, *Maitaryani Samhita* and other texts. The Vedic Indians

knew about many flower-bearing and fruit-bearing plants like Palasa (*Butea monosperma*), two varieties of Lotus – white (*Pundarika*) and blue (*Puskara*), White lily (*Kumuda*), Cucumber (*Urvaruka*), jujuba (*Zizypus jujuba*), Udumbara (*Ficus glomerata*), Kharjura (*Phoenix dactylifera*) and Bilva (*Aegle marmelos*), etc.

Treatises on medicinal plants had been prepared by the Chinese, Egyptian, Assyrians, Aztecs and other long before the Christian era also. But these works do not appear to have had much influence on the modern systems of plant classifications.

The systematic account of certain well defined groups may be found in *Vrikshaayurveda* of ancient India, which was compiled by a competent botanist, Parashara. This treatise was basis of botanical teaching preparatory to medical studies in those days contains a wealth of informations on medicinal plants and their specific uses.

Theophrastus (370-285 BC), a student of Aristotle is considered as the Father of Botany. He gave two works about plants are *Enquiry into plants* and the *Census of Plants*. About 500 different kinds of plants with their names and common usage were discribed. He differentiated between centripetal (indeterminate) and centrifugal (determinate) inflorescences, recognized differences in ovary position and in polypetalous and gamopetalous corollas. He also recognized into annuals, biennials and perennials.

Parasara (250-120 BC), an Indian scholar who compiled *Vrikshayurveda* (Science of Plant Life) was one of the earliest workers dealing with plant life from a scientific stand point. Plants were classified

into numerous families (ganas) on the basis of morphological features not known to the European classification until 18th century. *Samiganyan* (Leguminosae) were distinguished by hypogynous flowers, five petals of different sizes, gamosepalous calyx and a fruit, actually a legume. *Swastikaganyan* (Cruciferae) similarly has a calyx resembling a swastika, ovary superior, 4 free sepals, 4 free petals; six stamens of 2 are shorter and 2 carpels forming bilocular fruit.

Charaka (300 BC), sometimes spelled Caraka, referred to as the Father of Indian Medicine was one of the principal contributors to the ancient art and science of Ayurveda. Ayurveda (Sanskrit: *Ayurveda*, "the complete knowledge for long life") or ayurvedic medicine is a system of traditional medicine native to India and a form of alternative medicine. The earliest literature on Indian medical practice appeared during the Vedic period in India, i.e., in the mid-second millennium BC The *Susrute Samhita* and the *Caraka Samhita* are great encyclopedias of medicine compiled from various sources from the mid-first millennium BC to about 500 CE. They are among the foundational works of Ayurveda. The Caraka Samhita Sutra is an early Ayurvedic text on internal medicine. It is believed to be the oldest of the three ancient treatises of Ayurveda. It is central to the modern-day practice of Ayurvedic medicine; and along with the *Sushruta Samhita* it is identified as an important source of medical understanding and practice in antiquity. Charaka was the first physician to present the concept of digestion, metabolism and immunity.

Sushruta (800 BC), an ancient Indian Ayurvedic surgeon, also known as "Father of Surgery." and is the author of the book Sushruta Samhita, in which he describes over 300 surgical procedures and 120 surgical instruments and classifies human surgery in eight categories. The

Sushruta Samhita contains 184 chapters and description of 1120 illnesses, 700 medicinal plants, a detailed study on Anatomy, 64 preparations from mineral sources and 57 preparations based on animal sources.

PRE-DAVINIAN BOTANICAL EXPLORATION

Caius Plinius Secundus (23-79 AD "Pliny the Elder") wrote *Historia Naturalis* (AD 77) a 37 volume work where he described about the universe, plants and animals. 9 volumes were devoted to medicinal plants. Pedanius Dioscorides (40—90 AD) was a Greek physician, pharmacologist and botanist, the author of a 5-volume encyclopedia about herbal medicine and related medicinal substances (a pharmacopeia), that was widely read for well more than a thousand years. *De Materia Medica* between 50 and 70 AD.

Albertus Magnus, (1193/1206 – November 15, 1280), also known as Albert the Great and Albert of Cologne, was a German Dominican friar and a bishop, who achieved fame for his comprehensive knowledge of and advocacy for the peaceful coexistence of science and religion. His writings collected in 1899 went to thirty-eight volumes of various fields of knowledge like logic, theology, botany, geography, astronomy, astrology, mineralogy, chemistry, zoology, physiology, phrenology and others.

Otto Brunfels (1464-1534) wrote *Herbarium Vivae Eicones* (1530-1536) a 3 volume work not much valuable from the classification point of view but is well known for illustration of living plants. He was the first person to recognize the Perfecti (flowers visible when held at arm's length) and Imperfecti (flowers not visible).

Andraea Caesalpino (1519-1603) wrote a famous book, *De plantis Libri* (1583*)* containing descriptions of about 1520 plant species. He was the first botanist to try to base a taxonomic scheme upon reason and logic rather than utilization concepts.

Jean Bauhin (1541-1631) published *Historia Plantarum universalis* (1650) in three volumes. This was a comprehensive work with synonymy of about 5000 plants, excellent illustrations and description that result into good diagnoses of the species first time in botanical history.

Gaspard Bauhin (1560-1624) published *Pinax theatri botanici* (1623). It is a register of 6000 different kinds of plants accounting the rapidly developing synonymy.

John Ray (29 November 1627 – 17 January 1705), an English naturalist published important works on botany, zoology, and natural theology. His classification of plants in his *Historia Plantarum*, was an important step towards modern taxonomy. He was the first to give a biological definition of the term *species*. Ray's definition of species Ray was the first person to produce a biological definition of what a species is. This definition comes in the 1686 *History of plants*. Ray published about 23 works. Some important works are Catalogue of Cambridge plants (1668),Tables of plants (1668), Catalogue of English plants plus Fasiculus-An appendix (1670), New method of plants (1686), Synopsis of British plants (1691) History of plants-3vols, vol 1 (1686), vol 2 (1688), vol 3 (1704) etc.

Joseph Pitton de Tournefort (5 June 1656 – 28 December 1708) was a French botanist, notable as the first to make a clear definition of the

concept of genus for plants. His principal work was the 1694 *Eléments de botanique, ou Méthode pour reconnaître les Plantes* (the Latin translation of it *Institutiones rei herbariae* was published twice in 1700 and 1719). Though he did indeed cluster the 7,000 plant species that he described into around 700 genera, this was not particularly original.

Carolus Linnaeus (1707-1778) is regarded as father of modern taxonomic Botany and Zoology .Under the guidance of Dr. Rudbeck, Linnaeus published his first paper in 1729 on sexuality of plants. In 1730 he published it under the latinized title of *Hortus Uplandicus*, an enumeration of plants in Uppsala Botanic Garden. This served as the basis for his later publication *Systema Naturae* (1735), where he classified plants, animals and minerals. In 1737 four of his valuable publications—*Flora Lapponica*, *Hortus Cliffortianus*, *Critica Botanica* and *Genera Plantarum* have been published. He proposed his sexual system of classification in *Genera plantarum* (1737) where he gave descriptions to 935 genera. This was published in five editions and two supplements and in all a total of 1336 genera was diagnosed. In *Species Plantarum* (1753) Linnaeus diagnosed 6000 species and 1000 genera. Linnaeus recognized 24 classes, which are based on number, union and length of stamens. These classes were subdivided into orders on the basis of number of styles and unisexuality. All the non-flowering plants and lumped together in a single class, the Cryptogamia. Although this system is highly artificial it was accepted at that time because it provided a very easy means of identification. In *Philosophia Botanica* (1751), Linnaeus enumerated 67 “natural orders”. Some of these represent natural groups like Palmae, Orchidaceae, Graminae, Coniferae, Compositae,

Boraginaceae etc, but some orders are quite mixed, the monocots and dicots appearing together.

Michel Adanson (7 April 1727 – 3 August 1806), a French naturalist published his *Familles naturelles des plantes* and developed the principle of arrangement. In 1774, he submitted 27 large volumes of manuscript occupied with the alphabetical arrangement of 40,000 species; a vocabulary, containing 200,000 words, with their explanations; and a number of detached memoirs, 40,000 figures and 30,000 specimens of the three kingdoms of nature.

Antoine Laurent de Jussieu (12 April 1748 – 17 September 1836 Fig 2F) was a French botanist, notable as the first to propose a natural classification of flowering plants; much of his system remains in use today. In his study of flowering plants, *Genera plantarum* (1789), Jussieu adopted a methodology based on the use of multiple characters to define groups, an idea derived from Scottish-French naturalist Michel Adanson. This was a significant improvement over the original system of Linnaeus, who classified plants into classes and orders based on the number of stamens and pistils. Jussieu did keep Linnaeus' binomial nomenclature, resulting in a work that was far-reaching in its impact; many of the present-day plant families are still attributed to Jussieu.

Augustin Pyrame de Candolle (4 February 1778 – 9 September 1841), a swiss botanist documented hundreds of plant families and create a new natural plant classification system.

George Bentham (22 September 1800 – 10 September 1884) was the premier systematic botanist of the nineteenth century". His major publications are *Catalogue des plantes indigènes des Pyrenees et du Bas*

Languedoc (Paris 1826), *Flora Hongkongensis* (1861), *Handbook of the British flora* and *Flora Australiensis* (Seven volumes, 1863–1878). His greatest work was the *Genera Plantarum* (Three Volumes), begun in 1862, and concluded in 1883 in collaboration with Joseph Dalton Hooker.

Joseph Dalton Hooker (30 June 1817 – 10 December 1911) was founder of geographical botany. His major publications are *Flora Antarctica* (1844–47). *Flora Novae-Zelandiae* (1851–53), *Flora Tasmaniae* (1853–59), *Students Flora of the British Isles* and a monumental work, the *Genera plantarum* (1860–83) based on the collections at Kew in which he had the assistance of George Bentham. Other remarkable publications by Hooker's and Hooker *et.al* are *Flora Antarctica: the botany of the Antarctic voyage*, Three Volumes (1844-general), 1853 (New Zealand), 1859 (Tasmania); *Handbook of the New Zealand flora* (1849); *Niger flora*, (1849–1851); *The Rhododendrons of Sikkim-Himalaya* (1854); *Himalayan Journals, or notes of a naturalist in Bengal, the Sikkim and Nepal Himalayas and Khasia Mountains* (1855); *Illustrations of Himalayan plants* (1855); *Flora indica*, with Thomas Thomson (1858) with George Bentham, *Handbook of the British flora*. ("Bentham & Hooker") (1859); *A century of Indian orchids* (1862–1883); with George Bentham, *Genera plantarum* and *Genera plantarum ad exemplaria imprimis in herbariis kewensibus servata definita* (1867); Primum, Sistens Dicotyledonum Polypetalarum Ordines LXXXIII: Ranunculareas--Cornaceas (1870, 1878); *The student's flora of the British Isles* (1872–1897), *The Flora of British India* (1890), *The Flora of British India* Volume V, Chenopodiaceae to Orchideae (1898–1900); *Handbook to the Ceylon flora* (1904–1906) and "*An epitome to the British Indian species of Impatiens*".

POST-DAVINIAN BOTANICAL EXPLORATION

August Wilhelm Eichler (April 22, 1839 – March 2, 1887), a German botanist, modified the classification system to better reflect the relationships between plants. He divided the plant kingdom into non-floral plants (Cryptogamae) and floral plants (Phanerogamae), The Eichler System was the first to accept the concept of evolution and therefore also the first to be considered phylogenetic. Moreover, Eichler was the first taxonomist to separate the Phanerogamae into Angiosperms and Gymnosperms and the former into Monocotyledonae and Dicotyledonae. Important contributions by Eichler are *Blutendiagramme*, Volume I:1875 and Volume II:1878 (Floral diagrams); *Flora Brasiliensis* (Flora of Brazil); *Syllabus der Vorlesungen uber Phanerogamenkunde* (1883) 3rd Edition, Berlin; List of plants of Caatinga vegetation of Brazil and List of plants of Cerrado vegetation of Brazil.

Heinrich Gustav Adolf Engler (March 25, 1844 – October 10, 1930), a German botanist, worked on plant taxonomy and phytogeography with Karl A. E. von Prantl and published his system of plant classification in *Die Naturlichen Pflanzenfamilien* (The natural plant families).

Karl Anton Eugen Prantl (10 September 1849 – 24 February 1893), a German botanist published *Die Naturlichen Pflanzenfamilien* (The Natural Plant Families) with fellow botanist Adolf Engler. He also published *Lehrbuch der Botanik* (Textbook of Botany), 7 Eds. (1887); *Untersuchungen zur Morphologie der Gefabkryptogamen* (Studies on morphology of the Vascular Cryptogams), 1875 and 1881, 2 fascicles; *Exkursions flora fur das Konigreich Bayern* (Flora of the excursion to the Bavaria kingdom) 1884.

Charles Edwin Bessey (1845–1915), an American botanist published *The Geography of Iowa* (1878), *Botany for High Schools and Colleges* (1880), *The Essentials of Botany* (1884), *Elementary Botany* (1904), *Plant Migration Studies* (1905), *Synopsis of Plant Phyla* (1907), *Outlines of Plant Phyla* (1909).

John Hutchinson, taxonomist from Kew, worked on the phylogeny of flowering plants and published two parts of *The Genera of Flowering Plants*. He proposed a radical revision of the angiosperm classification system proposed by Hooker and by Engler and Prantl that had become widely accepted during the 20th century. Important publications by Hutchinson are *Common Wild Flowers* (1945), *More Common Wild Flowers* (1948), *Uncommon Wild Flowers* (1950), *British Wild Flowers* (1955), *A Botanist in Southern Africa* (1946), *Flora of West Tropical Africa*, *The Families of Flowering Plants: Arranged According to a New System Based on Their Probable Phylogeny* Vol. 1 Dicotyledons, *The Genera of Flowering Plants* (Oxford, Vol.1 (1964), Vol.2 (1967), Vol. 3 (posthumously)) and *Evolution and Phylogeny of Flowering Plants* (1969).

Armen Leonovich Takhtajan (June 10, 1910 – November 13, 2009), a Soviet-Armenian botanist worked on systematics, paleobotany and biogeography flowering plants. He developed his classification (1940) for flowering plants, which emphasized phylogenetic relationships between plants. The "Takhtajan system" of flowering plant classification treats flowering plants as a division (phylum), *Magnoliophyta*, with two classes, *Magnoliopsida* (dicots) and *Liliopsida* (monocots). These two classes are subdivided into subclasses, and then superorders, orders, and families. His other important publications are the "Flora of Armenia" (Vol. 1-6, 1954-73) and "Fossil flowering plants of the USSR "(1974)

Arthur John Cronquist (19 March, 1919–1992), a North American botanist and a specialist on Compositae, formulated a phylogenic system of classification of flowering plants that is known as “Cronquist system”. He published it in *The Evolution and Classification of Flowering Plants* in 1968 with a revised and expanded second edition being released in 1988. He also published *An Integrated System of Classification of Flowering Plants* (1981). *Jepson Manual* (1993), *Flora of North America*, *Flora of China*, *Flora of Australia* and Gleason and Cronquist's *Manual of the Vascular Plants* (1991).

Rolf Martin Theodor Dahlgren (July 7, 1932 – Feb.14, 1987), a Swedish-Danish botanist and professor at the University of Copenhagen from 1973 to his death developed a system of Angiosperm classification based on many more characters simultaneously than previous systems most notably many chemical plant traits. His work on family circumscription in the Monocotyledons, published with H. T. Clifford and Peter Yeo, has had profound influence well into the molecular age.

Robert F. Thorne (July 13, 1920-) is an American botanist and currently Taxonomist and Curator Emeritus at Rancho Santa Ana Botanic Garden and Professor Emeritus at Claremont Graduate University, Claremont, California. His research has contributed to the understanding of the evolution of flowering plants. He is currently working on many projects, one of which is completing “Floristic works on both the San Gabriel and San Bernardino mountains” as well as “Flora of Sierra San Pedro Martir” and his ‘Checklist for the Baja peninsula’. He has also created a system of plant taxonomy known as the “Thorne System” of Classification of Flowering plants.

TAXONOMIC EXPLORATION IN INDIA

In India the work on floral exploration has been initiated by Rouxburgh (1820-24) who published ‘Flora Indica’. He also conducted work on economic botany. He had 700 illustrations by 1790. As Superintendent of the Company garden at Sibpur, Calcutta he published *Hortus Bengalensis* (1814). William Carey edited and published vol. 1 of Dr. William Roxburgh's *Flora Indica* vol. 1(1820)*; or Descriptions of Indian Plants*. In 1824, Carey edited and published Roxburgh's *Flora Indica* (Vol.2), including extensive remarks and contributions by Dr. Nathaniel Wallich.

Colonel Robert Kyd (1746–27 May, 1793), a British army officer, founded the botanical garden at Calcutta in 1787. Kyd was interested in horticulture and owned a private garden in Shalimar near Howrah. He proposed the idea of a botanic garden to East India Company. The plan was approved on July 31 1787. He proposed that the botanical garden would help in introduction of economically important plants and would help the East India Company outstrip our rivals in every valuable production which nature has confined to India.

Nathaniel Wallich (28 January 1786 – 28 April 1854) was a surgeon and botanist who worked in East India Company. He was pioneer for the development of the botanical garden and herbarium at Calcutta. He described many new species of plant and made a large herbarium collection and undertook expeditions to Nepal, West Hindustan, and lower Burma and published "Wallich Catalog” (20,000 specimens). A part of his herbarium collections was held at Kew, and known as the 'Wallich Herbarium' and another part of the collection is the Central National Herbarium of the Botanical Survey of India in Calcutta and

there in all about 20,500 specimens. Some of the important specimens are *Catreus wallichii*, *Clerodendrum wallichii*, *Convolvulus wallichianus*, *Debregeasia wallichiana*, *Diospyros wallichii*, *Dombeya wallichii*, *Dryopteris wallichiana*, *Geranium wallichianum*, *Hoya wallichii*, *Ligusticum wallichii* (Szechuan lovage), *Meconopsis wallichii*, *Memecylon wallichii*, *Nageia wallichiana*, *Pinus wallichiana*, *Rotala wallichii*, *Rubus wallichii*, *Schima wallichii*, *Schefflera wallichiana*, *Taxus wallichiana*, *Ulmus wallichiana* and *Valeriana wallichii*.

Sir Walter Elliot (1803–1887) joined the Indian Civil Service at Madras in 1821 and worked on till 1860. He had a wide range of interests including botany, zoology, Indian languages and geology. He produced a work on ethnobotany *Flora Andhirica* in 1859 which give the Telugu names for various plant species in the Northern Circars, north of the Godavari delta area. He also collected plants and his herbarium was gifted to the Royal Botanic Garden of Edinburgh.

Sir George King (12 April 1840 - 12 February 1909), was a British botanist and the first Director of the Botanical Survey of India from 1890. King was awarded the Linnean Medal in 1901. Species described by him include the climbing fig- *Ficus pantoniana* from New Guinea and northern Australia.

Professor Kattungal Subramaniam Manilal of Kozhikode, is an Emeritus of the Calicut University, a botany scholar and taxonomist devoted over 35 years of his life to research, translation and annotation work of the Latin botanical literature Hortus Malabaricus. Some other important publications by Manilal and Manilal et.al are *Van Rheede's Hortus Malabaricus* (Malayalam Edition) with Annotations and Modern Botanical Nomenclature, 12 Vols (2004); *Orchid Memories: A tribute to*

Gunnar Seidenfaden; *Van Rheede's Hortus Malabaricus* (English Edition) with Annotations and Modern Botanical Nomenclature. 12 Vols (1998); *A Handbook on Taxonomy Training* (1998); *Companion to Gamble's Flora: Additions to the Flora of Kerala since Gamble (1935)*1996; *Hortus Malabaricus and Itty Achuden: A study on the role of Itty Achuden in the compilation of Hortus Malabaricus*-In Malayalam (1996); *Directory of Indian Taxonomists* (1996); *Taxonomy and Plant Conservation* (1994); *A Catalogue of Indian Orchids* (1993); *Field Key for the Identification of the Native Orchids of Kerala* (1988); *An Interpretation of Van Rheede's Hortus Malabaricus* (1988); *Flora of Silent Valley Tropical Rain Forests of India*; *The Flora of Calicut: The Flowering Plants of the Greater Calicut Area* (1980); *The Botany & History of Hortus Malabaricus* (1976) and *Flowering Plants of the Calicut University Campus*.

H. Santapau, Director, BSI from 1961-67 published about 216 scientific publications. Some of them are: - Flora of Khandala in the Western Ghats of India (1953), Flora of Purandhar (1958), The Flora of Saurashtra, (Part I, 1962), The Acacthaceae of Bombay (1952), The Asclepiadaceae and Periplocaceae of Bombay (1962) and The Orchids of Bombay (1966).

William Munro (1818–1880), presented *Hortus Bangalorensis*, a collection of the plants of the Bangalore and he published *Discovery of Fossil Plants at Kamptee*, *Hortus Agrensis, or, Catalogue of All Plants in the Neighbourhood of Agra*, *Gardener's Cronicl* and *The identification of the Grasses of Linnaeus's Herbarium*. He also described 219 bamboo species then known. William Munro also gave his name to a number of plants. Some of them are: *Elaecarpus munroii*, *Eugenia munroii*, *Monocera munroii* and *Munronia piccata*.

Duthie (1905) had covered major portion of south-eastern and eastern Rajasthan in his "Flora of Upper Gangetic Planes" and of the adjascent Siwalik and Sub Himalayan trects 1903-29. This Work has been treated as the first publication on plants of eastern Rajasthan.

Hooker (1907) wrote a chapter on Botany for the imperial gazetteer of India wherein he provided some notes on plants of Rajasthan.

Griffith (1946) published a short note on the Flora of Sindh.

Hooker and Thompson (1853) provided a famous introductory essay in 'Flora Indica' had to conclude that 'The vegetation of plains of Marwar with great tract of Africa is not known in details. They have published The Flora of British India (1872-1897).

TAXONOMIC EXPLORATION IN RAJASTHAN

Mrs. and Mr.G. L. Allen (1852) published a book 'The view and flowers from Rajasthan' containing 13 coloured plates was not of much taxonomic importance but was significant one.

Major Vikor (1853) published a list of some desert plants mostly from Sindh province in journal of Asiatic society. The earliest recorded information on botanical exploration in Rajasthan is about Jacquement's Journey in 1832 from Delhi to Bombay via Ajmer and Neemach.

The systematic work on phytodiversity of Indian Desert was started later in 1868 by Sir George King, he made collections in Rajputana which resulted in the papers. Famine Flora of Marwar (1869), Notes on Vegetable products used as food during famine in Rajasthan and an excellent paper in the Indian Forester entitled 'The sketch of the Flora of Rajputana(1878)'which was the first scientific account of the flora of this

region. For many a years King's account was only scientific record for Rajasthan based on plant explorations made during 1869-1870 in Rajputana forest

Brandis (1874) published the Forest flora of the North, West and Central India

Adam (1899) in his well known book "The Western Rajputana States" listed about fifty species of the plants of the desert area under the chapter 'The Forest and Floras'.

Blatter & Hallberg (1918-21) provided a remarkable work on the plants of the Indian desert. In his own words 'The vast deserts of of North Africa, Arabia, Central Asia and new world have attracted the attention of botanists but the Indian desert has been sadly naglacted. They, in series of publications provided an enumeration in the "the Flora of the Indian Desert (Jodhpur and Jaisalmer)" which for about 30 years remained the only aunthentic systematic account of the plants on Rajasthan. Parker (1918) recorded a number of plants from Jaipur

Ramchandra Rao (1941) and Sankhala (1951) published a list of some plants of desert areas including those of Rajasthan and Sindh.

Bhandari (1961-1965) reported more than 50 species of plants for the first time with critical notes in series of papers. He in "Flora of the Indian desert" (1978) enumerated 592 species belongs to 319 genera and 82 families of flowering plants from the western part of Rajasthan

In recent years, a large number of publications dealing with the floral composition of Desert of Rajasthan have been published. These have been reviewed by Raizada and Sharma, 1962, Vyas and Ramarao,1965, Bhandari,1965, Bhandari (1954, 1961a, 1961b, 1963, 1964a, 1964b, 1965, 1967, 1974, 1977, 1978, 1988, 1990, 1991, 1994, 1995, 1999, 2003), Mertia and Bhandari (1870), Bhandari and Sarup (1954), Bhandari and Sharma (1977a), Bhandari and Singh (1964),

Bhandari and Verdcount (1970), Amal Raj (1982), Pandey (1984), Pandey and Parmar (1993), Pandey, Parmar and Singh (1985), Pandey, Parmar and Verma (1985) ,Pandey, Parmar and Malhotra (1983), Pandey and Shetty (1985) Gupta,1965a, Jain(1970), Shetty and Pandey(1979) and Sharma (1980), Bharucha (1951, 1955, 1960), Bharucha and Mehar Homji (1965), Biswas (1952), Biswas and Rolla (1953), Chapline(1963, 1963b), Puri and Jain (1952, 1961, 1962), Puri(1952, Puri, Jain, Sarup and Kotwal (1964) Krishnaswamy and Gupta (1952), Das and Sarup (1951), Guha and Bakshi (1969), Gupta (1968, 1975), Chakravarty(1968a, 1968b), Maheshwari (1963, 1995), Rao and Kanodia (1962a, 1962b, 1963), Chopra and Hada (1964), Maheshwari and Singh (1974), Pal and Meena (1999), Meena (2000) and Gena (2006).

Many of the taxonomists have been studied on Flora of South, South West Rajasthan. In these Jain (1962,1967, 1968, 1981,1991), Jain and Kotwal(1960), Mathur and Verma (Sirohi Division, 1964), and Vyas & Ramdeo (Udaipur, 1965).

Dhilllon, Bajwa and Bhandari (1974) also discovered few new records in Udaipur and adjascent areas.

Extensive work on grasses of Udaipur and adjascent area has been worked out by Kanodia and Gupta (1969), Kanodia and Rolla (1961, 1965), Katewa and Arora (1997, 2000), Katewa (2001), Katewa and Guria (1997), Katewa and Galav (2005a, 2005b).

On ethnobotany of Udaipur has also been worked out by Deora and Jhala (2002), Katewa, Choudhary, Jain and Galav (2003) Jain, Katewa, Choudhary and Galav (2004, 2005) Katewa and Jain (2006).

A perusal of literature on the flora of Rajasthan revealed that Mt.Abu, The highest peak between the Nilgiri and Himalayas has also attracted the attention of many botanists after Mc Adam's work (1890) due to it's altitudinal, climatic and edaphic factors and the characteristic

vegetation. The important contribution are those of Sutaria (1941), Mahabale and Kharadi (1946), Raizada (1954), Puri and Jain (1958), Chavan and Sabnis (1960), Kanojia and Rolla (1965), Sabastian and Bhandari (1984a, 1984 b,1988), Chauhan, Shah, and Patel (1967), Chavan and Sabnis (1960) and Gupta and Saxena (1968).

Aery and Tiagi (1982) worked on floristics of Udaipur. Tiagi and Aery (2007) published The Flora of Rajasthan (South and South east Rajasthan) and included systematics and up to date representation of 1378 plants species (including cultivated and ornamental) belonging to 126 families growing in south and south east part of Rajasthan.

Flora of North and North East Rajasthan also have been studied by several taxonomists. Some of these are Joshi (Bikaner and Jaipur, 1956,1957, 1958), Dhillon and Bajwa (Ganganagar, 1969), Bakshi (Pilani, 1954), Sarup (1952a, 1952b), Sarup (NW Rajasthan and Bharatpur, 1953, 1954, 1957, 1957a, 1957b, 1958b), Ratnam and Joshi (Pilani, 1952), Mishra, Mulay and Ratnam (Ajmer, 1950), Mulay and Ratnam (Pilani, 1964), Nair (Chirawa and Jhunjhunu, 1956, 1961), Nair and Kanodia (Ajit Sagar, 1959), Nair and Kosy (1963), Nayar and Malhotra (1961), Nair and Nathawat (1956, 57), Nathawat and Deshpande (1960), Nair and Thomas(1962), Sharma (Churu, 1961, 1965), Sharma (Ajmer, 1978), Sharma, Gena and Joshi(Grasses of Ajmer, 1990), Sharma and Asawa (1999) and Yadav and Chaturvedi (Ajmer, 1992).

Trivedi (1974, 1976, 1978) studied the Flora of Bhartapur, Trivedi (2002), Pareek and Trivedi (2011), studied Ethnobotany of North East Rajasthan.Verma (1967) described vegetation types of Jaipur and Vyas (1964, 1965, 1967) studied the floristics of Alwar district.

The first systematic account on Jaipur under the title “Flora of Jaipur” was provided by Sharma (1974), Sharma and Tiagi (1979)

enumerated 627 species grouped into 343 genera assigned to 95 families of angiosperms in their "Flora of North East Rajasthan". 85 species were reported to be of medicinal importance in Ayurveda.

At the district level in Rajasthan the "Flora of Tonk District" was provided by Shetty and Pandey (1983). Singh (1983) also provided a comprehensive study on plants of district Banswara under title "Flora of Banswara".

Sharma and Sharma (1989) published a floristic study entitled "Flora of Rajasthan-Series Inferae" on plants of Rubiaceae, Asteraceae, Campanulaceae and Sphenocleaceae. 159 species grouped under 93 genera were reported by these workers.

The notable contribution for taxonomic accounts of desert flora are :Sarup (1951,1952,1954,1957, 1958a,b) Krishanaswamy and Gupta(1952), Bhandari (1954,1961a,b ,1963,1964a,b,1965,1967), Joshi (1958,1961), Sarup and Puri (1960a,b), Puri et al. (1964), Gupta and Bhandari (1965), Kanodia and Gupta (1969), Bhandari and Sharma(1977 b). More recently Parmar and Singh (1982), Pandy et al. (1983), Pandey (1984), Pandey et al. (1985), Sharma et al. (1990), Meena and Yadav(2006) have further contributed to our knowledge of the flora of Rajasthan desert.

The floristic contribution from eastern Rajasthan was negligible till 1950. Since then, however a large number of papers have been published on the vegetation of Aravalli's and the part of the east of it. The notable contribution are those of Mulay and Ratnam (1950), Nair an Nathawat (1956,57), Jain and Kolwal (1960), Vyas (1964,65,67), Majumdar (1977), Singh (1977,1980), Singh and Pandey (1980), Parmar and Singh (1982),

The Flora of Rajasthan has been published by Shetty and Singh (1987- 1993). in the form of three volumes. They have included 1911 species, 780 genera and 159 families in which one species was of

Gymnosperms. The biodiversity of 'Desert National Park Rajasthan' was worked out by Singh and Singh (2006). Phytodiversity of Thar Desert has been reported by Gena (2006). Biodiversity of Sariska Tiger project in the North east Rajasthan has been compiled by Yadav (2006). Biodiversity of Ranthambhore National Park has been investigated by Singh and Srivastava (2007).

The Flora of Rajasthan published by Sharma, N.K. (2002) covers specially, south east Rajasthan (Haroti Plataeu) included 1187 species, 628 genera, and 139 families. More recently The Flora of Rajasthan (South and South east Rajasthan) published by Tiagi and Aery (2007), included systematics and up to date representation of 1378 plants species (including cultivated and ornamental) belonging to 126 families growing in south and south east part of Rajasthan.

Parmar and Singh (1982) and Meena and Yadav (2006) worked on medicinal plants and floristic diversity of Bhilwara. Most recently The Flora of South Central Rajasthan published by Meena, K.L. and Yadav, B.L. (2011) has been published than includes 686 species belonging to 416 genera and 117 families of South Central region of rajasthan (including 340 plant plates for the reference).

The vegetation types of Rajasthan have been discussed by Champion (1936), Puri and Jain (1961), Mathur and Verma (1964). The Indian desert flora is largely dominated by therophytes which includes a few nanophanerophytes (Bhandari, 1978). Distinct plant communities are found in different habitats (Saxena, 1972). Saxena (1977) recognized six formations in the Indian deserts namely (i) Mixed xeromorphic thorn forests (ii) Mixed xeromorphic riverine thorne forests (iii) Mixed xermorphic woodlands (iv) The Lithophytic scrub desert (v) The Psamophytic scrub desert (vi) The Halophytic scrub desert. Bhandari (1978) has also classified the vegetation of the Indian desert on the basis

of physiographic characters. Accordingly, vegetation type of western Rajasthan was divided into sand, gravel, rock, saline, and aquatic types based on edaphic factors.

Based on the physiography, main ecosystems like rock and hill ecosystem, aquatic ecosystem, saline ecosystem and sand dunes ecosystems have been recognized in Rajasthan.

Thus, the perusal literature has revealed that a lot of work has been done on the different aspects of the vegetation of Rajasthan as a whole but no comprehensive floristic study at the district level has been published so far. Therefore, in the present study floristic analysis of Kota tehsil of Kota district has been worked out.

CHAPTER: III

STUDY AREA

1. PHYSIOGRAPHY
2. HISTORICAL AND CULTURAL BACKGROUND
3. GEOMORPHOLOGY
4. SOIL
5. CLIMATE
6. BIOLOGICAL DIVERSITY
7. LAND USE PATTERN

CHAPTER: III

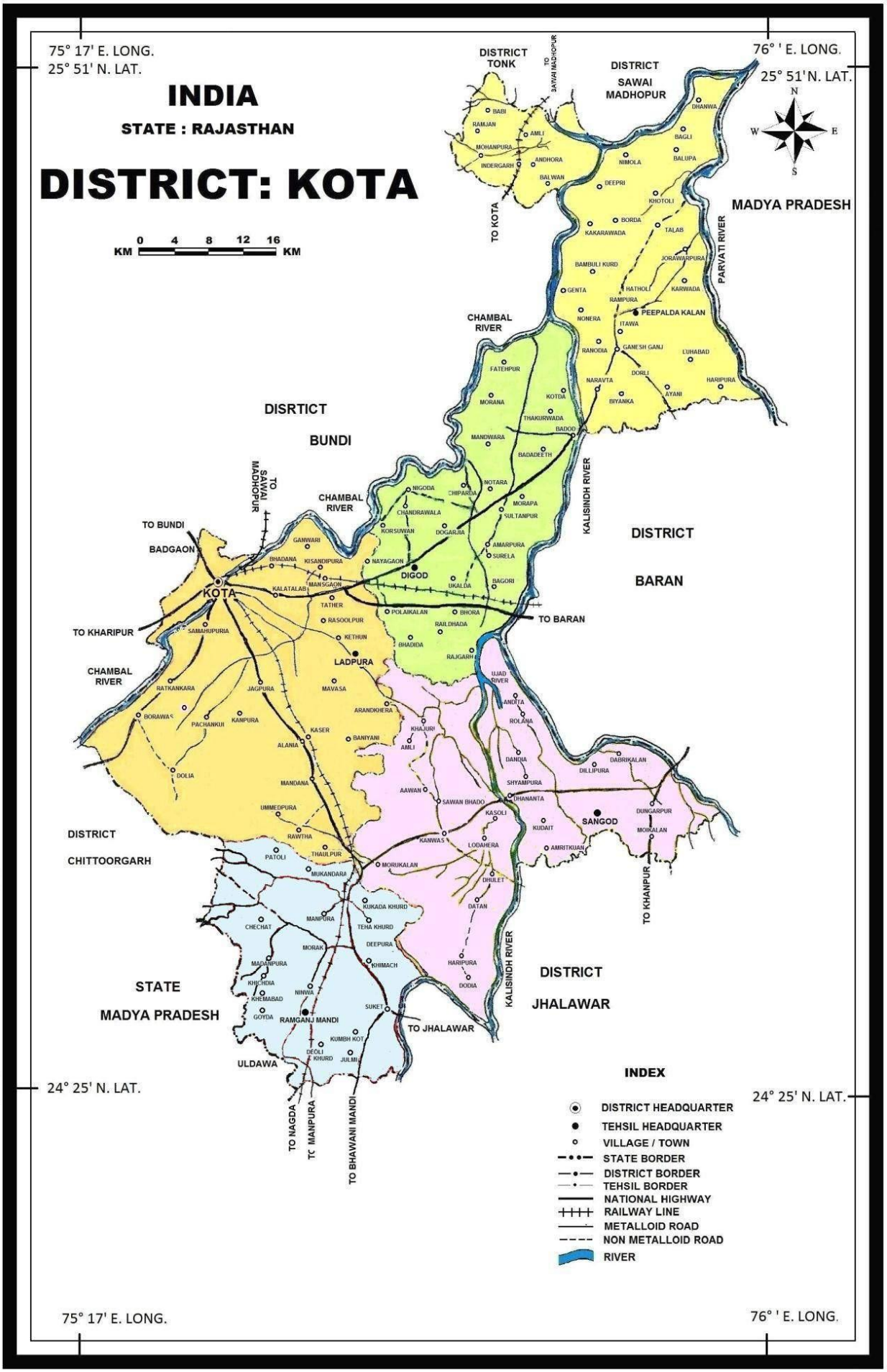
STUDY AREA

India is a huge country and it is quite natural that multitudes of states, towns and cities are located here and Rajasthan is one of the largest state is situated in the north western part of India covering an area of 3,42,274 sq. Kilometer among 32 states. Rajasthan can be segregated in several specific regions. Hadoti is one such significant region. To several Hadoti also is popular as Hadauti, Hadaoli, or Hadavati. The Hadoti region constitutes of districts of Bundi, Baran, Jhalawar and Kota. The Hadoti region is surrounded on the western side by the Mewar region (District Udaipur, Bhilwara)of Rajasthan and on the south by the Malwa region of Madhya Pradesh state. The name of the region has been taken up from the Hada-Rajputs, which comprises a branch of the Chauhan-Hada Rajput clan.

1. PHYSIOGRAPHY:

Proposed study area Kota district (Text Fig:- 2) is situated at latitude 30° 39.125' N and longitude 78° 31.156' E in south of Rajasthan,. Kota is the third largest city in the northern Indian state of Rajasthan after Jaipur and Jodhpur. It is located 240 kilometers south of state capital, Jaipur situated on the banks of Chambal River. The district is bounded on the North by Bundi District, on the East by Baran District, on the South byJhalawar District, and on the West by Chittorgarh District. Northern and Southern ends of Kota district touch the boundaries of Madhya Pradesh state. National highway No.12 (Jaipur-Jabalpur) and National Highway No.76 a part of East-West Corridorpasses through the district.The total road length in the district is 2,052 km (March 2011). as of

TEXT FIG. : - 2


75° 17' E. LONG.
25° 51' N. LAT.
76° ' E. LONG.
25° 51'N. LAT.
INDIA
STATE : RAJASTHAN
DISTRICT: KOTA
0 4 8 12 16
KM KM
DISTRICT TONK
DISTRICT SAWAI MADHOPUR
MADYA PRADESH
PARVATI RIVER
CHAMBAL RIVER
DISRTICT BUNDI
TO SAWAI MADHOPUR
TO BUNDI
BADGAON
KOTA
TO KHARIPUR
CHAMBAL RIVER
KALISINDH RIVER
DISTRICT BARAN
TO BARAN
DIGOD
LADPURA
DISTRICT CHITTOORGARH
STATE MADYA PRADESH
ULDAWA
RAMGANJ MANDI
TO JHALAWAR
DISTRICT JHALAWAR
SANGOD
TO KHANPUR
TO NAGDA
TO MANPURA
TO BHAWANI MANDI
24° 25' N. LAT.
24° 25' N. LAT.
INDEX
DISTRICT HEADQUARTER
TEHSIL HEADQUARTER
VILLAGE / TOWN
STATE BORDER
DISTRICT BORDER
TEHSIL BORDER
NATIONAL HIGHWAY
RAILWAY LINE
METALLOID ROAD
NON METALLOID ROAD
RIVER
75° 17' E. LONG.
76° ' E. LONG.

March 2011.It is 47th most populous city of India. It covers an area of approximately 521324 hectare (12,436 km²) and it is 3.63 per cent of the Rajasthan State). Out of which forests are 125379 hectare, non-agriculture land is 60021 hectare and cultivable barren land is 23011 hectare. It is divided into five subdivisions namely Kota, Digod, Itawa, Sangod and Ramganjmandi, five tehsils namely Ladpura, Digod, Itawa, Sangod and Ramganjmandi ,three sub tehsils Mandana, Kanwas and Chechat and 864 revenue villages. It has an average elevation of 271 metres (889 ft). The district is bound on the north and northwest by SawaiMadhopur, Tonk and Bundi districts. The Chambal River separates these districts from Kota district, forming the natural boundary. According to census of India (2011), Kota had a population of 1,001,365, of which male and female are 529,795 and 471,570 respectively. The sex ratio was 906 and 12.74% were less than six years of age. The effective literacy rate was 83.65%, with male literacy at 90.56% and female literacy at 75.90%. It is 3rd largest city in Rajasthan and 46th largest in India. It has all three types of energy stations those are thermal, hydro and gas.

2. HISTORICAL AND CULTURAL BACKGROUND:-

The history of the city dates back to the 12th century AD when the Hada clan, a Chauhan Rajput Raja Rao Deva, conquered the territory and founded Bundi and Hadoti.The early history of the Haras of Kotah belongs to Bundi, of which they were a junior branch. The separation took place when 'Shah Jahan' was emperor of India, who bestowed Kota and its dependencies on Madho Singh, the second son of RaoRatan Singh for his distinguished gallantry in the battle of Burhanpur. He was awarded the title of Raja, and Kotah with its three hundred and sixty townships independent of his father. So the town of Kota was once the part of the Rajput kingdom of Bundi. It became a separate princely state in the 17th century. Since then Kota became a hallmark of the Rajput gallantry and

culture. In Pre Independence days social activist Guru RadhaKishan worked here along with other prominent freedom fighters and organised people against incense policies of the government. He left Kota after local administration came to know about the arrest warrant issued against him for his activities for freedom movement.

A separate district by the name 'Kota' came into being when former Kota andTonk states had joined the former Rajasthan in March, 1948 and integrated into theUnited States of Rajasthan in the year 1949. In addition to a large area of Kota, thedistrict included certain areas of the former Jhalawar State viz. Kirpapur andChhipabarod and Sironj areas of Tonk State.

Economy of Kota is based on trade center of cotton, millet, wheat, pulses, coriander and oilseeds are grown; industries include cotton and oilseed milling, textile weaving, distilling, dairying, manufacture of metal handcrafts, fertilizers, chemicals and engineering equipment. Kota also has an extensive industry of stone-polishing of a stone called Kota Stone, used for the floor and walls of residential and business buildings. Kota is also famous for the trade of fine translucent muslins called ‘Masuria Malmal’. Originally, such saris were called Masuria because they were woven in Mysore. The weavers were subsequently brought to Kota by Rao Kishore Singh who was a general in the Mughal army. The weavers were brought to Kota in the late 17th and early 18th centuries, and the saris came to be known as 'Kota-Masuria'. Kota saris are popularly known as 'Masuria' in Kota and “Kotadoria” outside the state. 'Doria' means thread.

Another traditional weaving pattern is “Khat” started by MaharanaBhimdeo in the 18th century. Maharaja Bhim Singh of Kota brought some weavers from the Deccan in the early 18th Century and the craft

blossomed under the royal patronage. The warp and weft use a combination of threads creating a fine chequered pattern (Khat) where the cotton portion provides firmness while the silk lends a gossamer finish to the fabric.

Kota is also known by various historical and cultural monuments (Fig:-1). Some of this are-

Chambal Garden: It is a beautifully landscaped garden at the Amar Niwas**MaharaoMadho Singh Museum**: Situated in the old palace and it is collection of Rajput miniature paintings of the Kota school, sculptures, frescoes, armory and rich repository of artistic items used by the Kota rulers.

District Museum: Situated in Brijvilas Palace near the Kishore Sagar It is rich collection of rare coins, manuscripts and Hadoti sculpture.

Kishore Sagar and Jag Mandir: It is artificial lake in which historical palace Jag Mandir is situated.

Haveli of Devtaji: The beautiful Haveli of DevtaShridharji is located in the middle of city and it is noted for its splendid frescoes and rooms ornate with lovely wall paintings.

River Chambal and Kota Barrage: It is a part of the irrigation canal system (Right and Left) on the Chambal River.

Abheda Pond and AbhedaMahal: It Historical Palace surrounded by a large pond full with aquatic, subaquatic vegetation. An ancient Karni Mata temple also near with this pond.

River Alania:- A small dam is made on this river . Alania is famous for beautiful rock paintings adorning the bank of the River Alaniya.

Other places of cultural importance are Daad Devi, Kansua temple with a four faced Shiva Lingam, BhitriaKund, AdharShila,Budh Singh Bafnahaveli.

FIG: - 1 A - H
HISTORICAL MONUMENTS

A:- ABHEAD MAHAL WITH POND

B:-HOLY DAADH DEVI TEMPLE

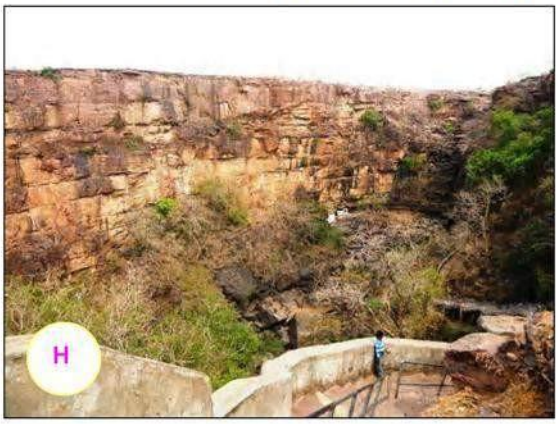
C:-ANCIENT CHANDRESHWAR MAHADEV

D:-KAMAL SAROVAR

E:-CHHTRAWILAS GARDEN AND MAHAL

F:-JAG MANDIR AND KISHORE SAGAR LAKE

G:-ANCIENT GIRADIYA MAHADEV TEMPLE



H:- ANCIENT GAPERNATH TEMPLE

3. GEOMORPHOLOGY:

The district is classified into four geomorphic units namely alluvial plain, bad land (ravines), ridge and valley and structural plain on upper Proterozoic rocks (Text Fig 3).Major part of the district is occupied by alluvial plain where as the bad land is confined to the northern part.Alluvial plain lies between rivers Kalisindh, Chambal and Parwati. Bad land ies in area of Digod, Anta and PipaldaKalan.Ridge and Valleys are small portion occurs in RamganjMandi and Ladpura tehsil.

Kota is rich in building stone, glass sand and limestone. Flaggy limestoneexposed between Devli and Suket over a stretch of 32Kilometer is quarried for slabs used as flooring material. The stone take good polish and iscommercially known as the 'Kota Stone'. The sand stone of the Bhander Group is usedas good roofing material which is found around Mukandara andMandana villages. Blue Kota stone near RamganjMandi and Chechat areas are famous as building stones. Quartz and silicasand, suitable for glass manufacture, are associated with the Bhander sand stone. InKhimach area patches of white Jhalawar sandstone are utilized as glasssand after beneficiation. Reserves of about 5.3 million tons of glass sand have beenestimated in the district. Large reserves of cement grade Vindhyan limestone arereported. This limestone is located in the area between Julmi (240 35':750 59') and Maylaand between Nimana and Devli. Thesebands occupy 12.8 km2 areas and their aggregate thickness varies from 60 to 75 m. Theestimated reserves are placed around 287 million tones.

4. SOILS:

The soil of the Kota (Text Fig: 4)is characterized by deep black, medium black and blackshallow alluvium soils. The soils in general are clay loam to clay in texture and moderately toless permeable and developing cracks in dry season.

The soils can be classified asChromusterts great group of Vertisols orderthe soil of the hillocks contains large amount of coarse cobbles while the plain have soil with higher percentage of clay, silt and sand. Soils of Kota according to Raychaudhari et al. (1963)classification can be divided into following types.

1. **Deep Black Soil**:-

This soil forms a maximum area of district and found in bulk. North, North - West and North - East regions of tehsil like PeepaldaKalan, Digod and Northern half of Ladpura tehsil is covered by this type of soil.These are poor in organic matter and nitrogen. On the basis of soil particle diameter it is loamy and favourable for cropping.

2. **Medium Black Soil**:-

This soil is sedimentary soil mainly present in some area of Ladpura tehsil, North and Northeast area of Sangod and maximum area of Ramganjmandi tehsil. pHof this soil ranges from 6.5 to 7.5 and these are poor in nutrients.

3. **Shallow black Soil:-**

This soil mainly occurs in South and Southwest of Ladpura and sangodtehils and in northern borders of RamganjMandi tehsil. These are either shallow light coloured or deepen clayey. These have high clay content and water holding capacity with their pH usually about 7.0. These soils show accumulation of lime and salts. These are very fertile and well supplied with plant nutrients.

5. CLIMATE:

Kota shows dry climate (Text Fig: - 5). The cold season lasts for about three and a halfmonths from November to the end of February. The period from April to the end of June constitutes the hot seasons. The monsoon season starts in the middle of July. The average annual rainfall in the region is 709.98mm. The rainfall increasesfrom the northwest to southeast. About 93% of the annual rainfall is received during theSouth West monsoon season. On an average, there are 40.48 rainy days in a year as observed in climatological data collected and given in Table No. 01 to 09 and Text Fig 8 to15.

Generally light to moderate winds prevails throughout the year with a slight strengtheningin the early monsoon period. Winds are light and variable in the post monsoon andwinter seasons particularly in the morning while in the afternoons winds are slightlystronger and blow from directions between north-east to northwest. The winds changesits direction gradually in the summer months and by May, they are predominantly fromdirection and between north-west and south-west in the southwest monsoon season.The winds are mainly south western or westerly.Average maximum temperature was recorded 42.4 (May) ºC and minimum 5.98 ºC (January) respectively.

a. RAIN FALL:-

Data on total annual rain fall in Kota for last five years from 2009 to 2013 were consulted.A considerable variation has been observed in the amount of average rain fall as well as in rain fall distribution. These data indicate that the maximum average rain fall has occurred in the year July,2013 and the minimum in 2010. The average annual rain fall of district for last five years has been recorded to be 709.98 mm.

b. TEMPERATURE:-

In this area winters are quite cool and summers are very hot. In winter temperature ranges from 5ºC to 28ºCand in summer it is 20°C to 42ºC. Hot season prevails from March to June. Normally last of May to second week of June is the hottest time of the year. The period of December and January is being the coolest. Nights are generally cool. With start of first shower in June last or first week of July temperature falls down by 8-10ºC. In rainy season temperature fluctuates by 1-2 ºC.

Thus it can be concluded that the climate of Kota district favourablefor vegetation. Even throughout year flowing rivers, ponds and lakessupport the vegetation establishment and survival.

6. BIOLOGICAL DIVERSITY:

There is a rich biological diversity both floral and faunal present in Kota that is represented and protected by various modes like Wildlife Sanctuaries, wetlands, reserve forests and protected forests as well as closed area (Text fig:- 06). A detail about these areas is given below.

Wildlife Sanctuaries:-There are three wildlife sanctuaries namely JawaharSagar, National Chambal and Darah Sanctuary are located in Kota. Related animals in these sanctuaries are given below

a. **JawaharSagar – GhadiwalSanctuary**: - Protected animals in this sanctuary are Tiger, Indian Wild Bear, Baya and Jungle crow.
b. **National Chambal Wild-Life Sanctuary**:- Protected animals in this sanctuary are Panther, Common Langur, Vulture Koyal and Koyel
c. **Darah Games Sanctuary: -** It is situated on Jaipur-Indoor Highway at a distance of 50 Km south of Kota. Sloth Bear Stripped Hyena, Bulbul and Parrot are main protected animals.

Sorsan Closed Area:- The Sorsan area situated in the Kota District has declared in 1984as a closed area under Wildlife (Protection Act, 1972) with the very specific object ofsafeguarding the breeding place of threatened bird 'Godawan /Hunka' (Choriotisnigeiceps) locally known as 'NaharGunjani' . It is highly threatened bird and has beenincluded in the Red Data Book of the UNO. This state has the highest population ofGodawan (Great Indian Bustard), declared this bird as the State bird on 1982. This is alocally migratory bird and harbours the Sorsan Area.

Reserved Forest & Protected Forests:- There are many reserved & protectedforests areas located in Kota. The Reserved forest is particularly predominant land use in Kota. The southern part of Kota, which has also an Alinia reservoir, comes under the zone ofreserved forest. These are mainly concentrated in the south-western and central portionof the Mukandara hills. Some patches are also found in south-eastern part of region.These forests are "Mixed Dry Deciduous Forests" which protect and retains wild vegetation.

Wetlands: - There are many major water bodies located in Kota in addition tonumerous small ones. The major water bodies located in Kota are Krishna Sagar, SurSagar, and Alaniya etc.

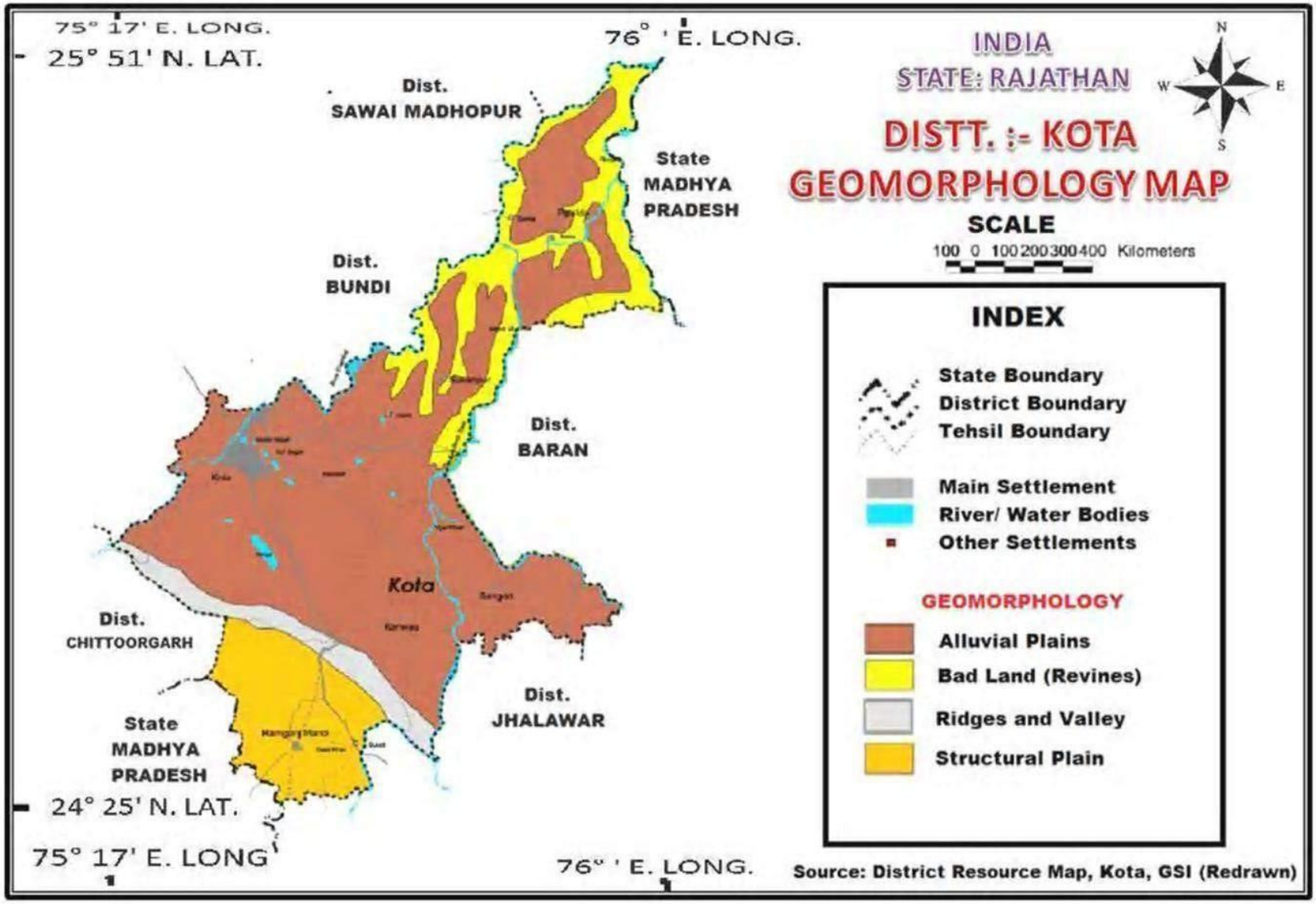
7. LANDUSE PATTERN:

The land use map (Text Fig: 07) shows the pattern and the use of land in the district. The landuse map has been prepared solely from satellite imageries obtained from NRSA.Looking at the land use map, it is observed that almost the entire northern middlepart which is doab of Chambal, Kali Sindh, and Parvati rivers are mostly double crop areaand are irrigated by canals.Kota district is covered by most part of reserved forest. The southern part ofKota, which also has an Alania reservoir, comes under the zone of reserved

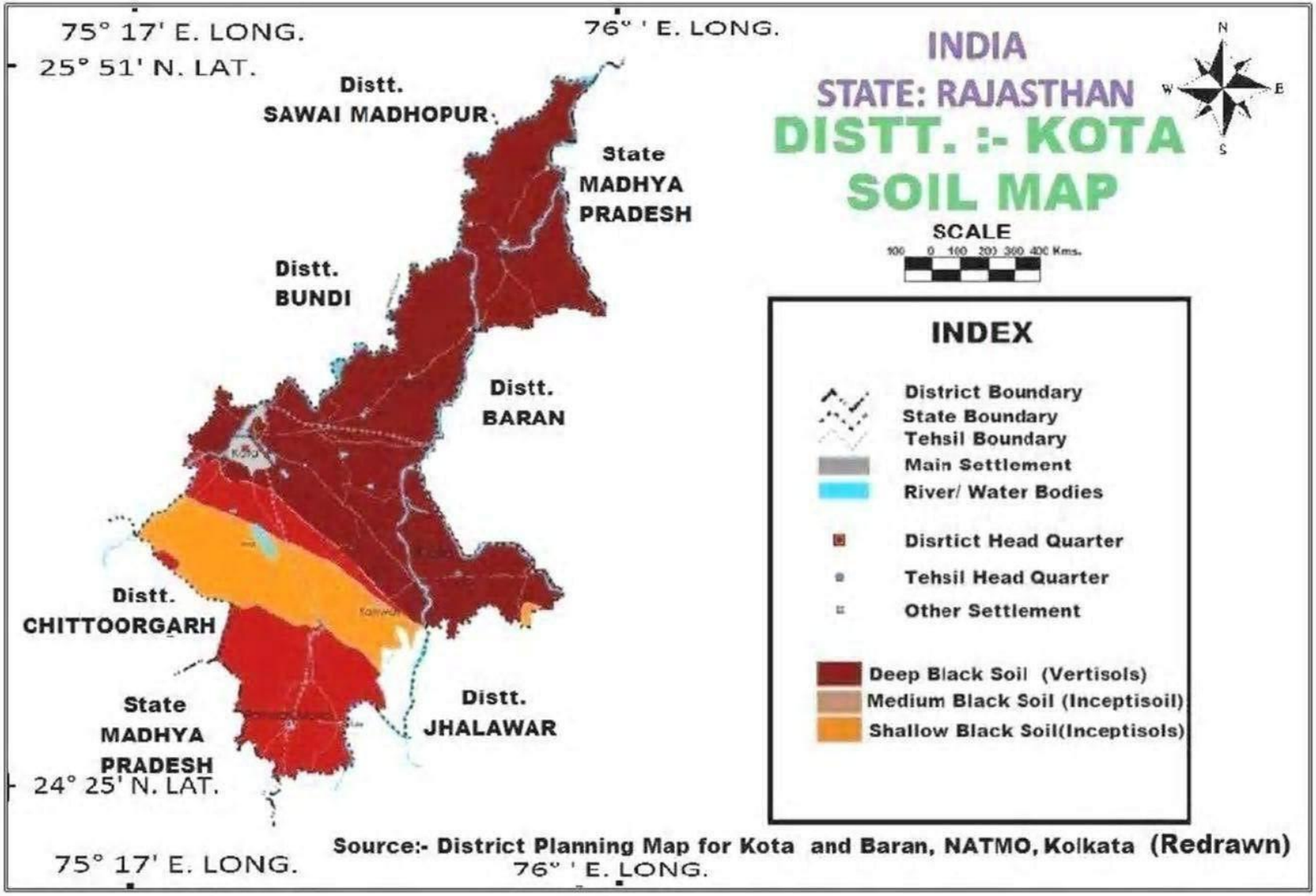
forest.These are mainly concentrated in the south-western and central portion of theMukandara hills. Some patches are also found in South Eastern part of region.

An area of 125.3 thousand hectares iscovered by forests, which is found in all the tehsils of the District.The total land in the Kota is 1042.5 thousand hectare. The landclassification according to the different uses, for the rural areas of the District for the year2008-09 (Table:-10), is givenbelow. Forests are concentrated mainly in the south and central portions on theMukundara hills. The major forest produce consists of timber, fire - wood and charcoal.Minor produce includes gum, resins, tandu leaves, honey, wax etc.

TEXT FIG. :- 3

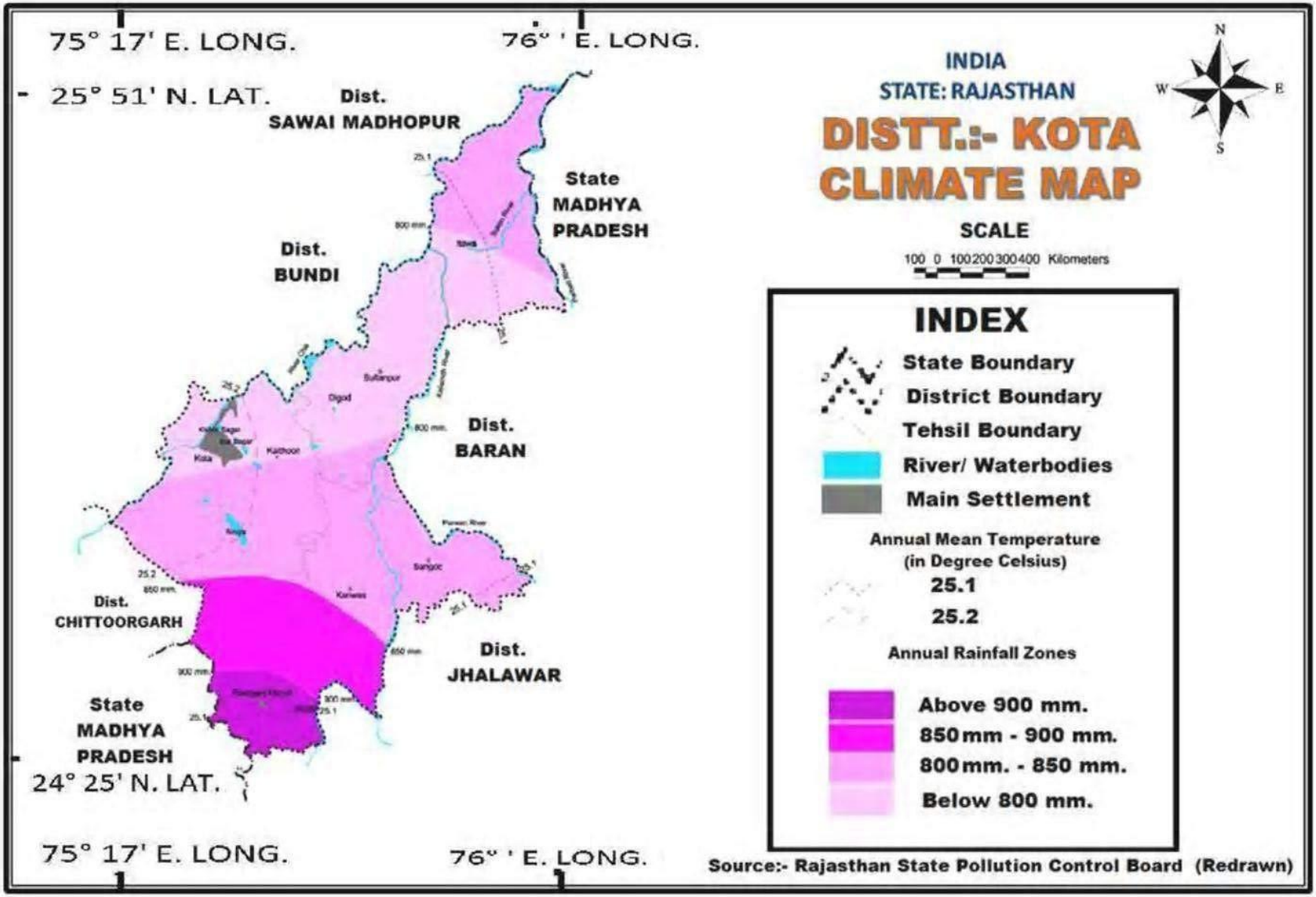

75° 17' E. LONG.
25° 51' N. LAT.
76° ' E. LONG.
INDIA
STATE: RAJATHAN
DISTT. :- KOTA
GEOMORPHOLOGY MAP
SCALE
100 0 100 200 300 400 Kilometers
Dist. SAWAI MADHOPUR
State MADHYA PRADESH
Dist. BUNDI
Dist. BARAN
Kota
Dist. CHITTOORGARH
Dist. JHALAWAR
State MADHYA PRADESH
24° 25' N. LAT.
75° 17' E. LONG
76° ' E. LONG.
INDEX
State Boundary
District Boundary
Tehsil Boundary
Main Settlement
River/ Water Bodies
Other Settlements
GEOMORPHOLOGY
Alluvial Plains
Bad Land (Revines)
Ridges and Valley
Structural Plain
Source: District Resource Map, Kota, GSI (Redrawn)

TEXT FIG. :- 4

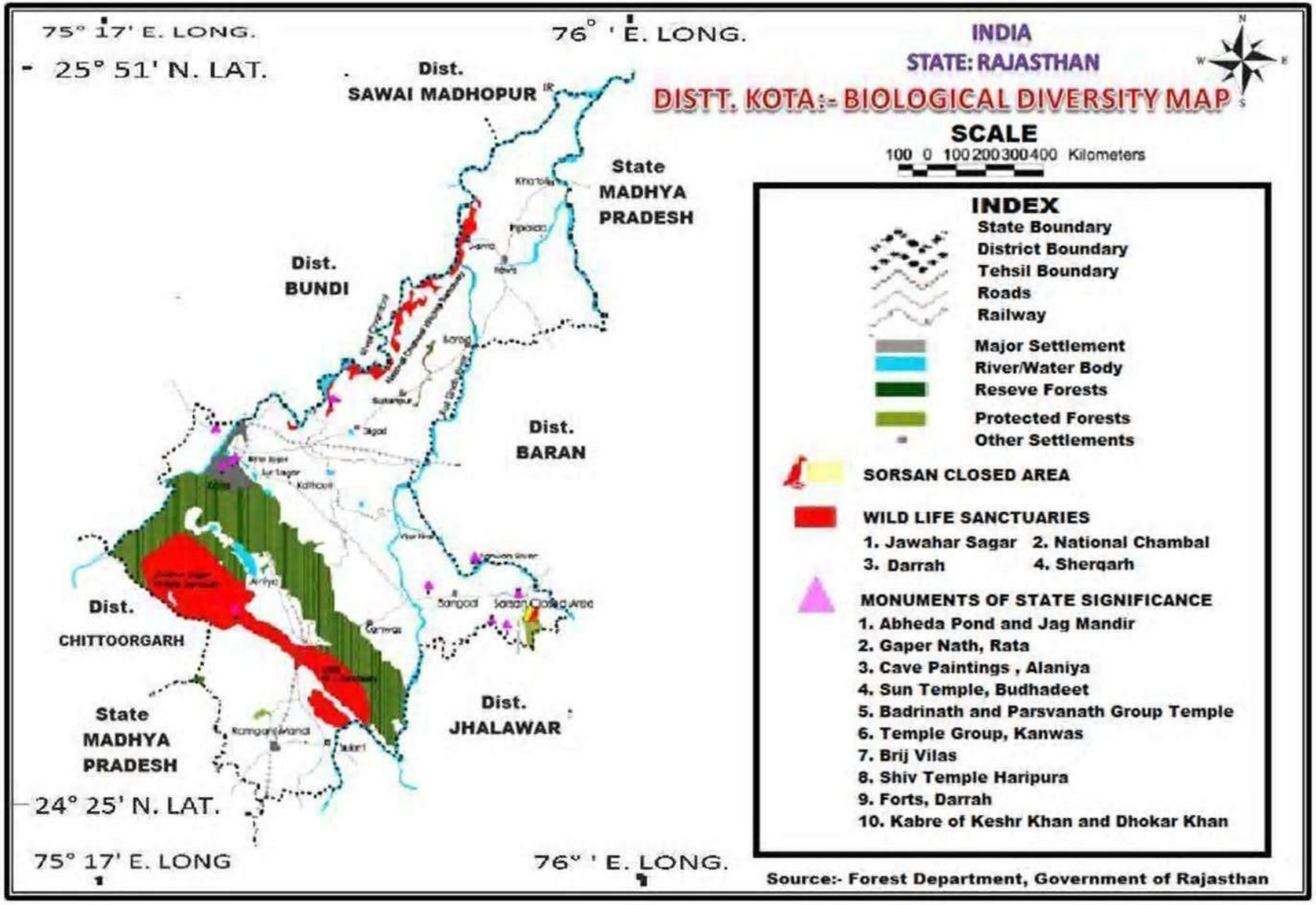


Source:- District Planning Map for Kota and Baran, NATMO, Kolkata (Redrawn)

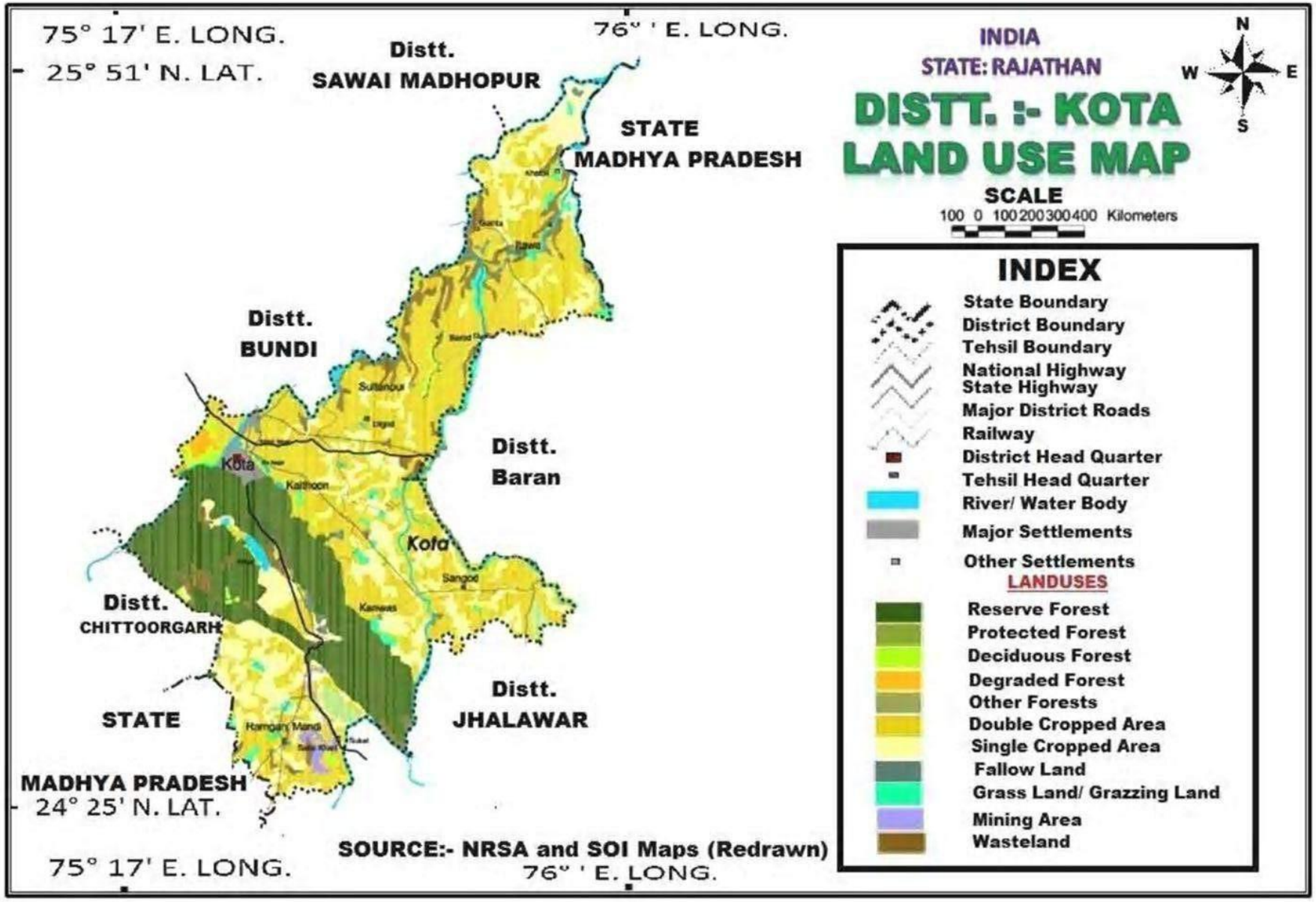
TEXT FIG. : - 5


75° 17' E. LONG.
76° ' E. LONG.
25° 51' N. LAT.
Dist.
SAWAI MADHOPUR
State
MADHYA
PRADESH
Dist.
BUNDI
Dist.
BARAN
Dist.
CHITTOORGARH
Dist.
JHALAWAR
State
MADHYA
PRADESH
24° 25' N. LAT.
75° 17' E. LONG.
76° ' E. LONG.
INDIA
STATE: RAJASTHAN
DISTT.:- KOTA
CLIMATE MAP
N
W
E
S
SCALE
100 0 100200300400 Kilometers
INDEX
State Boundary
District Boundary
Tehsil Boundary
River/ Waterbodies
Main Settlement
Annual Mean Temperature
(in Degree Celsius)
25.1
25.2
Annual Rainfall Zones
Above 900 mm.
850mm - 900 mm.
800mm. - 850 mm.
Below 800 mm.
Source:- Rajasthan State Pollution Control Board (Redrawn)

TEXT FIG. : - 6

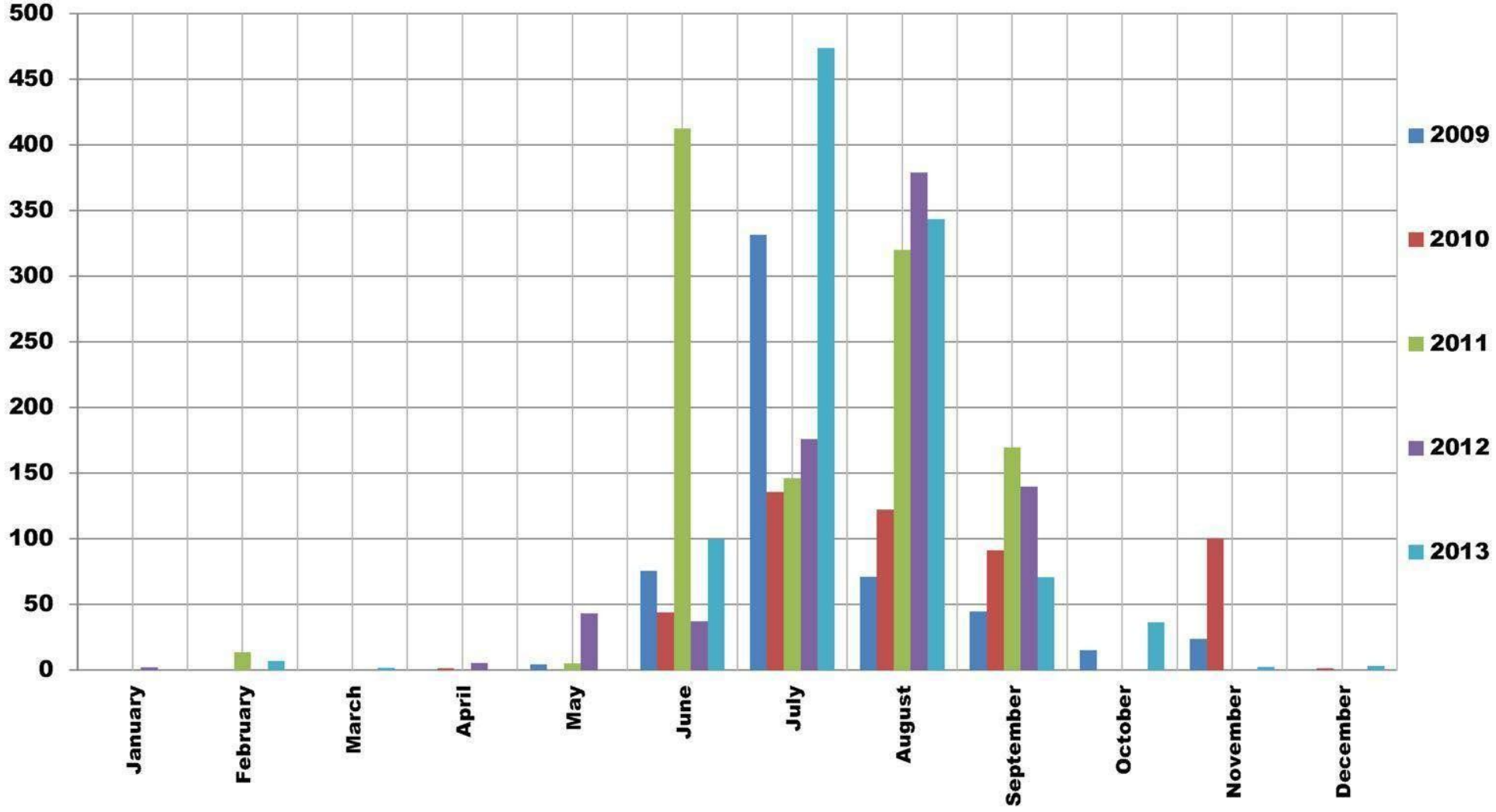

75° 17' E. LONG.
76° ' E. LONG.
25° 51' N. LAT.
24° 25' N. LAT.
75° 17' E. LONG
76° ' E. LONG.
INDIA
STATE: RAJASTHAN
DISTT. KOTA:- BIOLOGICAL DIVERSITY MAP
SCALE
100 0 100 200 300 400 Kilometers
Dist. SAWAI MADHOPUR
State MADHYA PRADESH
Dist. BUNDI
Dist. BARAN
Dist. CHITTOORGARH
State MADHYA PRADESH
Dist. JHALAWAR
INDEX
State Boundary
District Boundary
Tehsil Boundary
Roads
Railway
Major Settlement
River/Water Body
Reseve Forests
Protected Forests
Other Settlements
SORSAN CLOSED AREA
WILD LIFE SANCTUARIES
1. Jawahar Sagar 2. National Chambal
3. Darrah 4. Sherqarh
MONUMENTS OF STATE SIGNIFICANCE
1. Abheda Pond and Jag Mandir
2. Gaper Nath, Rata
3. Cave Paintings , Alaniya
4. Sun Temple, Budhadeet
5. Badrinath and Parsvanath Group Temple
6. Temple Group, Kanwas
7. Brij Vilas
8. Shiv Temple Haripura
9. Forts, Darrah
10. Kabre of Keshr Khan and Dhokar Khan
Source:- Forest Department, Government of Rajasthan

TEXT FIG. : - 7


75° 17' E. LONG.
25° 51' N. LAT.
76° ' E. LONG.
Distt.
SAWAI MADHOPUR
STATE
MADHYA PRADESH
INDIA
STATE: RAJATHAN
DISTT. :- KOTA
LAND USE MAP
N
W
E
S
SCALE
100 0 100200300400 Kilometers
Distt.
BUNDI
Distt.
Baran
Kota
Distt.
CHITTOORGARH
Distt.
JHALAWAR
STATE
MADHYA PRADESH
24° 25' N. LAT.
75° 17' E. LONG.
76° ' E. LONG.
SOURCE:- NRSA and SOI Maps (Redrawn)
INDEX
State Boundary
District Boundary
Tehsil Boundary
National Highway
State Highway
Major District Roads
Railway
District Head Quarter
Tehsil Head Quarter
River/ Water Body
Major Settlements
Other Settlements
LANDUSES
Reserve Forest
Protected Forest
Deciduous Forest
Degraded Forest
Other Forests
Double Cropped Area
Single Cropped Area
Fallow Land
Grass Land/ Grazzing Land
Mining Area
Wasteland

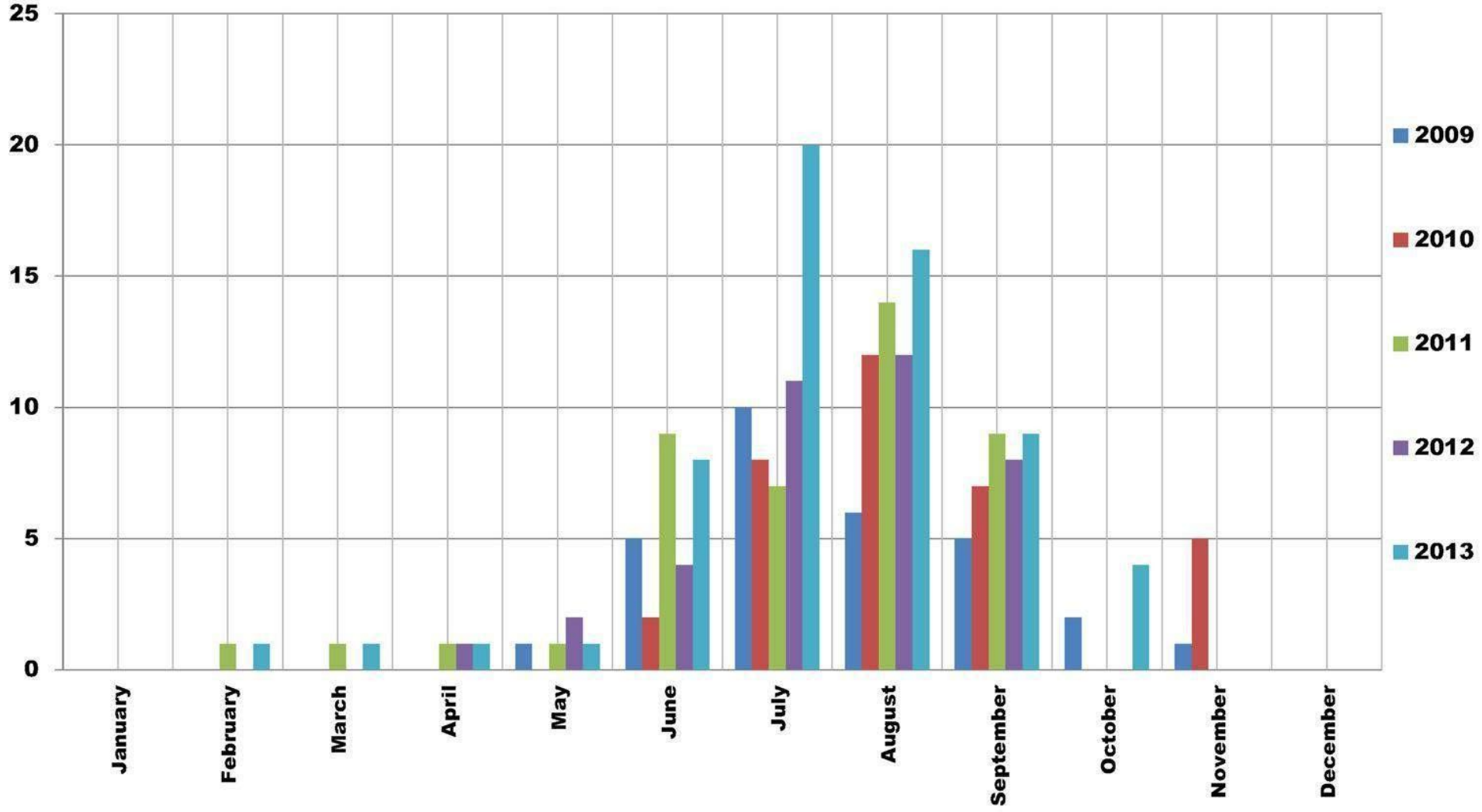
TEXT FIG: 08

Monthly Rain Fall (Millimeter) from 2009 to 2013



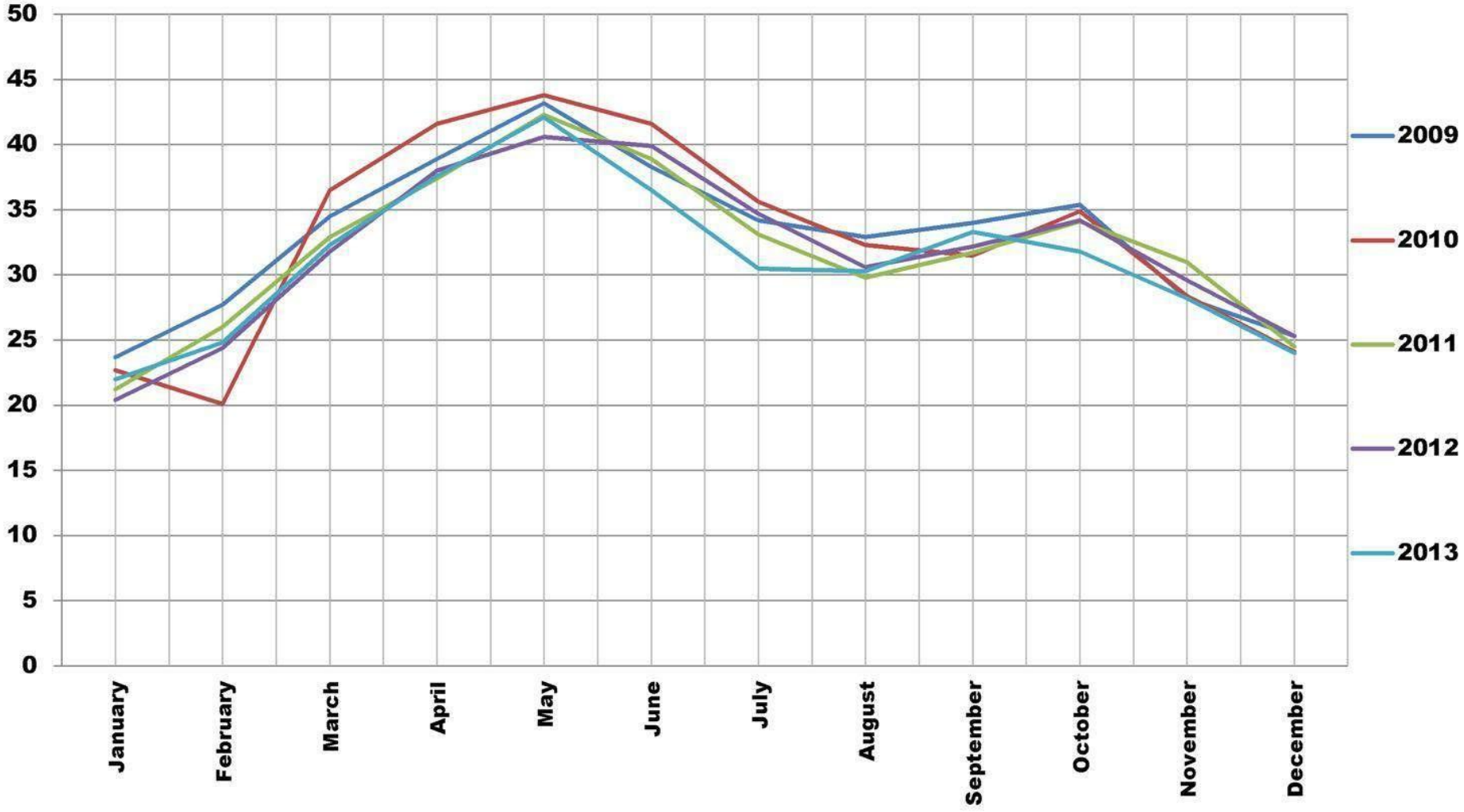
TEXT FIG: 09

Average no. of Rainy days per month (2009-2013)



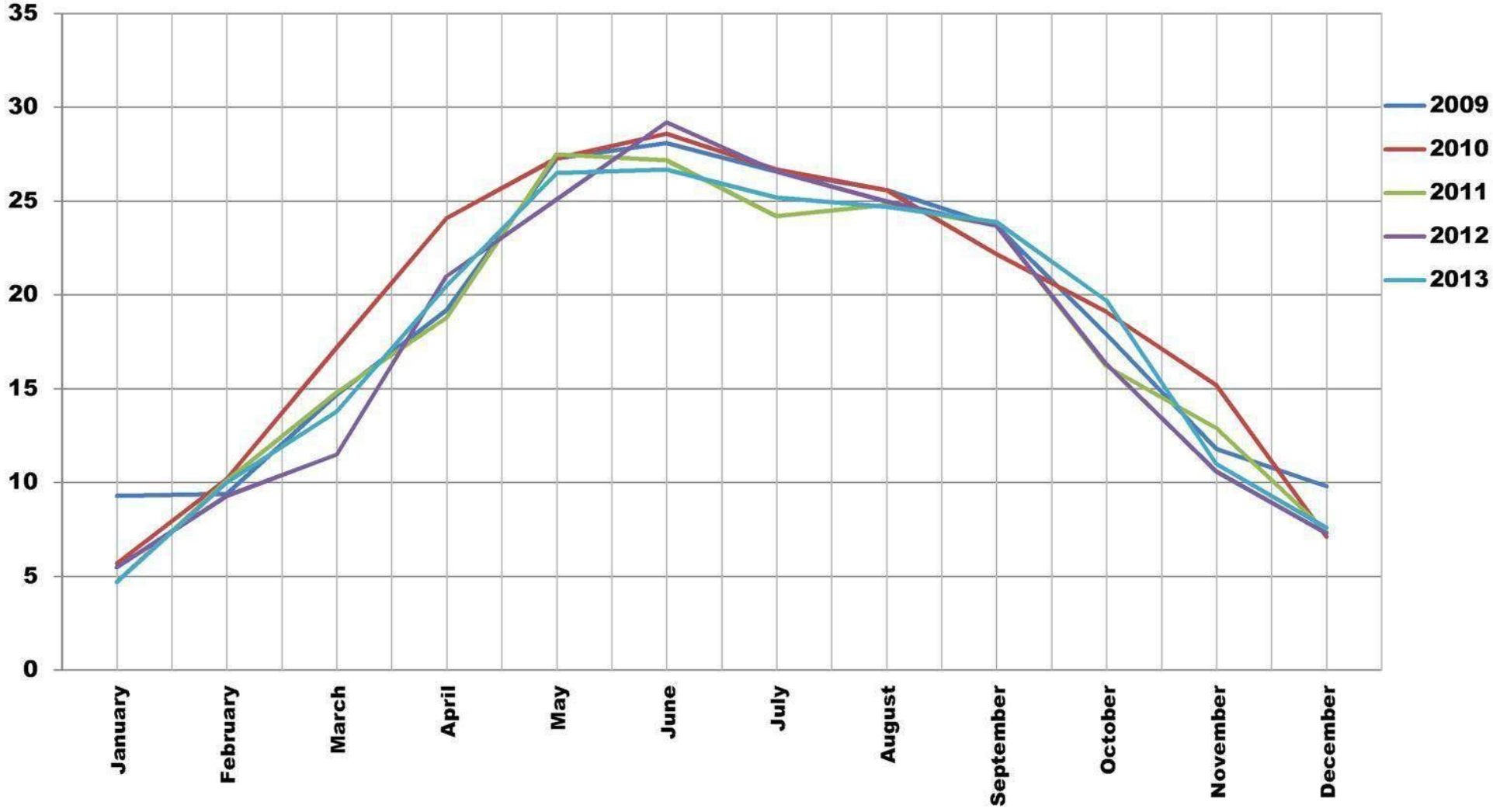
TEXT FIG: 10

Mean Maximum Temperature °C at Kota (2009-2013)



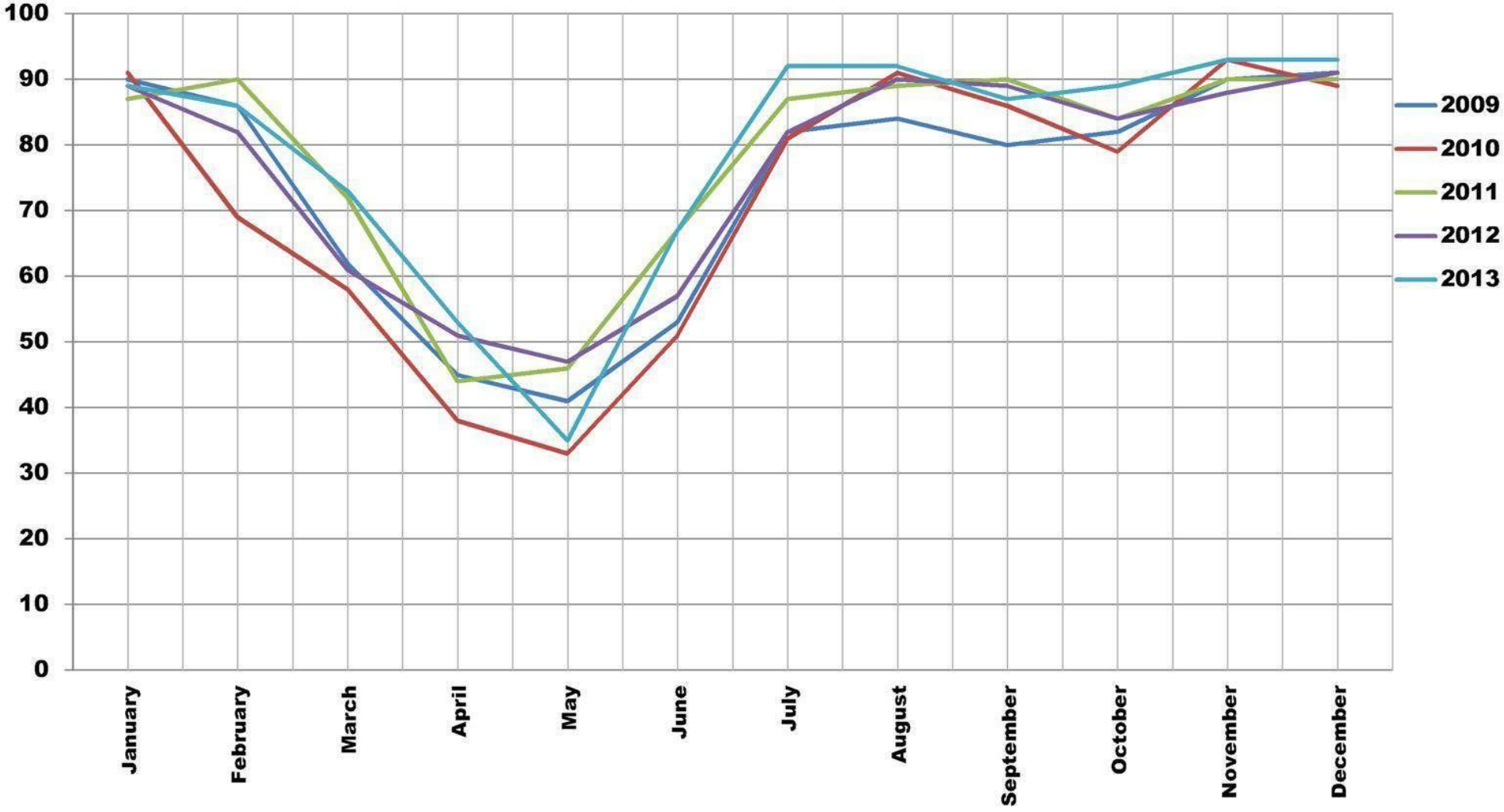
TEXT FIG: 11

Mean Minimum Temperature °C at Kota (2009-2013)



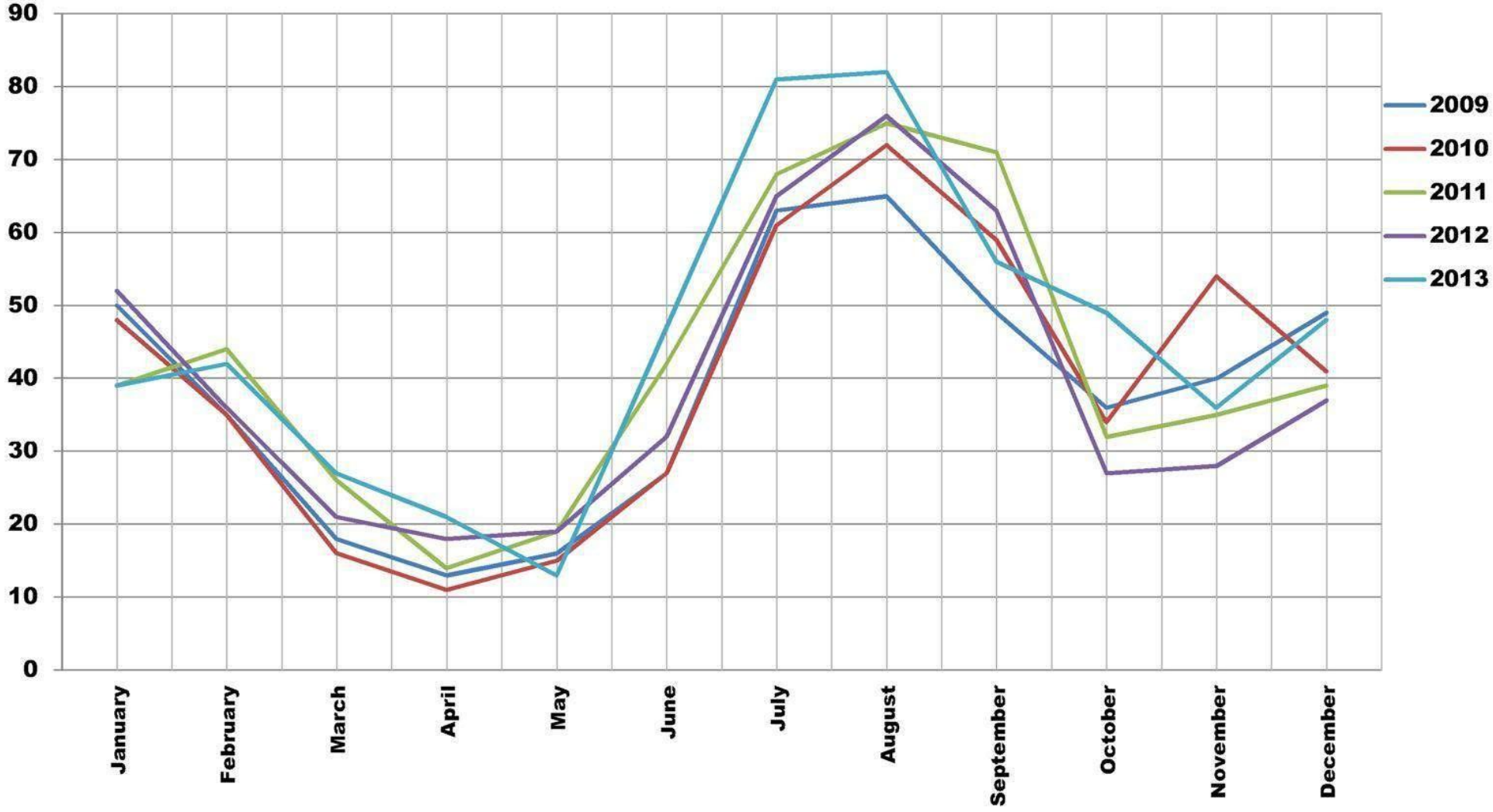
TEXT FIG: 12

Relative Humidity (%) 07:27 Hrs. (2009 - 2013)



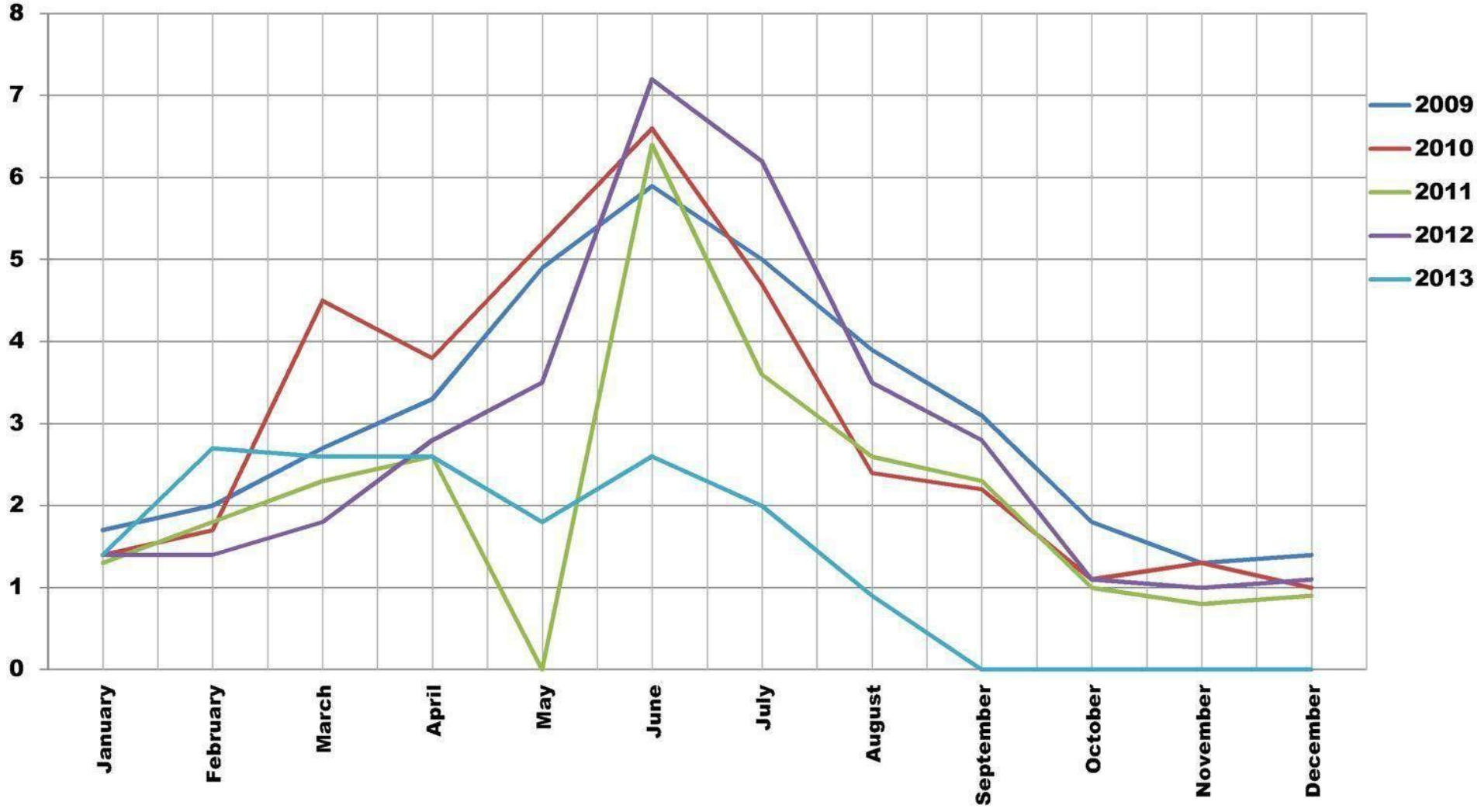
TEXT FIG: 13

Relative Humidity (%) 14:27 Hrs. at Kota (2009-2013)



TEXT FIG: 14

Mean Wind Velocity KM/ Hr. at Kota (2009-2013)



TEXT FIG: 15

Average Vapour Pressure (mm) 14:27 Hr. at Kota (2009-2013)

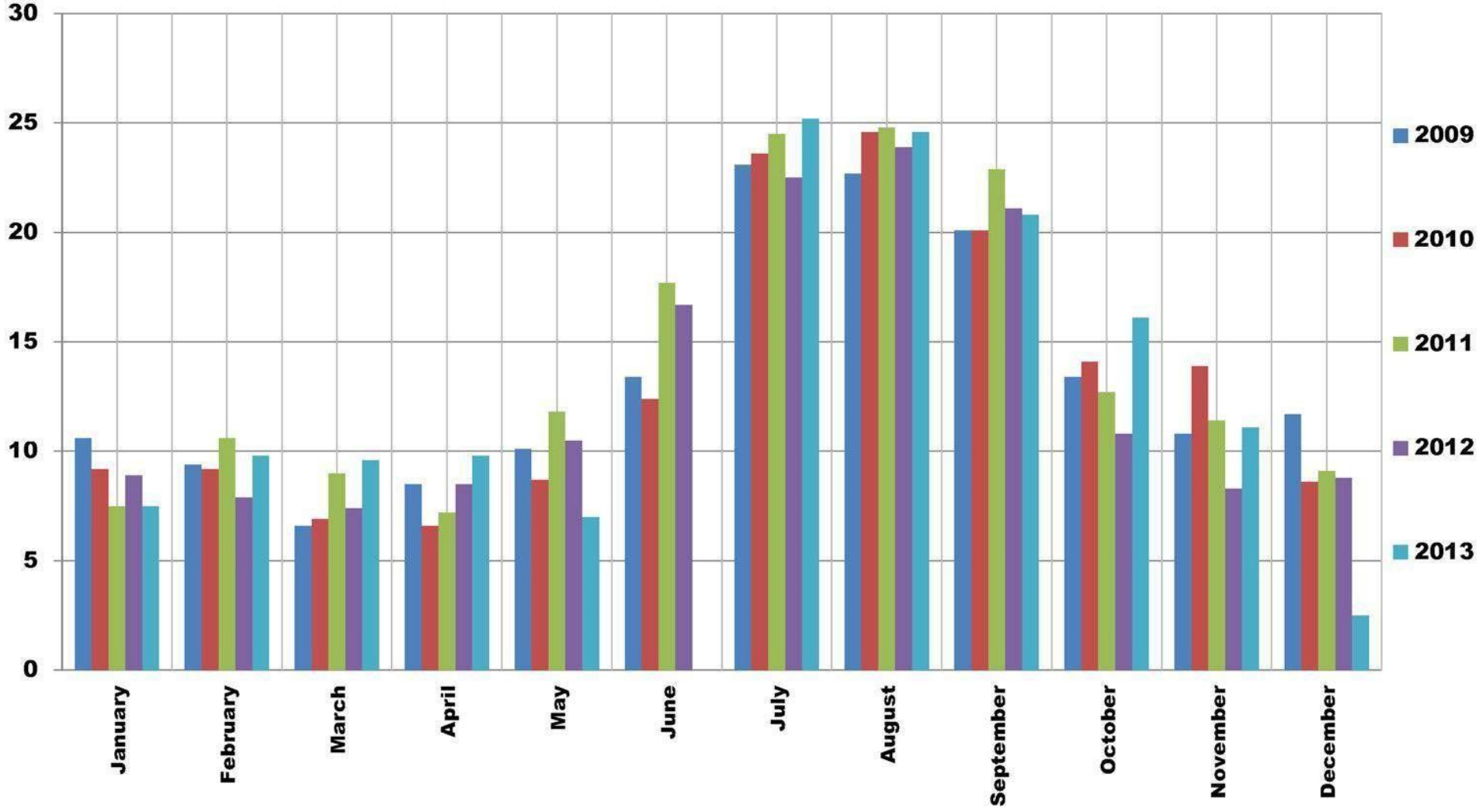


TABLE No:- 01

Climatic Data :- Rainfall (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	0	6.8	1.6	0	0	99.8	473.8	343.6	70.6	36.6	2.4	3.4	1038.6	86.55
2012	2	0	0	5.5	43.1	37	176.1	378.9	139.7	0	0	0	782.3	65.192
2011	0	13.5	0	0	5	412.3	146.1	320.1	169.5	0	0	0	1066.5	88.875
2010	0	0	0	1.5	0	43.8	135.5	122.4	91.2	0	100.4	1.5	496.3	41.358
2009	0	0	0	0	4.5	75.7	331.5	71.1	44.5	15.3	23.6	0	566.2	47.183
Total	2	20.3	1.6	7	52.6	668.6	1263	1236.1	515.5	51.9	126.4	4.9	3949.9	65.832

Average Monthly Rain fall = 65.83 cm

TABLE No:- 02

Climatic Data :- No of Rainy Day per month (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	0	1	1	1	1	8	20	16	9	4	0	0	61	5.083
2012	0	0	0	1	2	4	11	12	8	0	0	0	38	3.167
2011	0	1	1	1	1	9	7	14	9	0	0	0	43	3.583
2010	0	0	0	0	0	2	8	12	7	0	5	0	34	2.833
2009	0	0	0	0	1	5	10	6	5	2	1	0	30	2.5
Total	0	2	2	3	5	28	56	60	38	6	6	0	206	3.433

Average Rainy Days per Year= 40.48 **Average Rainy Days per Month= 3.373**

TABLE No:- 03

Climatic Data :- Mean Maximum Temperature °C (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	22	24.8	32.3	37.6	42.1	36.5	30.5	30.3	33.3	31.8	28.2	24	373.4	31.12
2012	20.4	24.4	31.8	38	40.6	39.9	34.7	30.6	32.2	34.2	29.6	25.3	381.7	31.81
2011	21.2	26	32.9	37.4	42.3	38.9	33.1	29.8	31.7	34.1	31	24.5	382.9	31.91
2010	22.7	20.1	36.5	41.6	43.8	41.6	35.6	32.3	31.5	34.9	28.4	24.1	393.1	32.76
2009	23.7	27.7	34.5	38.9	43.2	38.3	34.2	32.9	34	35.4	28.2	25.3	396.3	33.03
Total	110	123	168	194	212	195.2	168.1	155.9	162.7	170.4	145.4	123	1927.4	32.12

Mean Maximum Temperature per month= 32.12 °C

Hottest month of the Year is May with 42.4 °C per month

TABLE No:- 04

Climatic Data :- Mean Minimum Temperature °C (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	4.7	10	13.8	20.5	26.5	26.7	25.2	24.7	23.9	19.7	11	7.6	214.3	17.86
2012	5.5	9.3	11.5	21	25.1	29.2	26.6	25	23.7	16.3	10.6	7.3	211.1	17.59
2011	4.7	10.1	14.8	18.8	27.5	27.2	24.2	24.8	23.7	16.2	12.9	7.4	212.3	17.69
2010	5.7	10.2	17.2	24.1	27.3	28.6	26.7	25.6	22.2	19.1	15.2	7.1	229	19.08
2009	9.3	9.4	14.7	19.2	27.3	28.1	26.6	25.6	23.7	17.9	11.8	9.8	223.4	18.62
Total	29.9	49	72	104	133.7	139.8	129.3	125.7	117.2	89.2	61.5	39.2	1090.1	18.17

Mean Minimum Temperature per month= 18.17 °C

Coolest month of the Year is January with 5.98 ° C per month

TABLE No:- 07

Climatic Data :- Mean Wind Velocity KM/ Hr. (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	1.4	2.7	2.6	2.6	1.8	2.6	2	0.9	0	0	0	0	16.6	1.383
2012	1.4	1.4	1.8	2.8	3.5	7.2	6.2	3.5	2.8	1.1	1	1.1	33.8	2.817
2011	1.3	1.8	2.3	2.6	0	6.4	3.6	2.6	2.3	1	0.8	0.9	25.6	2.133
2010	1.4	1.7	4.5	3.8	5.2	6.6	4.7	2.4	2.2	1.1	1.3	1	35.9	2.992
2009	1.7	2	2.7	3.3	4.9	5.9	5	3.9	3.1	1.8	1.3	1.4	37	3.083
Total	7.2	9.6	13.9	15.1	15.4	28.7	21.5	13.3	10.4	5	4.4	4.4	148.9	2.482

Maximum Wind Velocity in Month of June with 5.74 Km.Hr (Average)
Minimum Wind Velocity in Month of Nov. & Dec. with 0.88 Km.Hr (Average)

TABLE No:- 08

Climatic Data :- Average Vapour Pressure (mm) 14:27 Hr. (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	7.5	9.8	9.6	9.8	7	2..1	25.2	24.6	20.8	16.1	11.1	2.5	144	12
2012	8.9	7.9	7.4	8.5	10.5	16.7	22.5	23.9	21.1	10.8	8.3	8.8	155.3	12.94
2011	7.5	10.6	9	7.2	11.8	17.7	24.5	24.8	22.9	12.7	11.4	9.1	169.2	14.1
2010	9.2	9.2	6.9	6.6	8.7	12.4	23.6	24.6	20.1	14.1	13.9	8.6	157.9	13.16
2009	10.6	9.4	6.6	8.5	10.1	13.4	23.1	22.7	20.1	13.4	10.8	11.7	160.4	13.37
Total	43.7	46.9	39.5	40.6	48.1	60.2	118.9	120.6	105	67.1	55.5	40.7	786.8	13.11

Maximum Vapour Pressure in Month of August with 24.14 mm (Average)
Minimum Vapour pressure in Month of March with 08.00 mm (Average)

TABLE No:- 05

Climatic Data :- Relative Humidity (%) 07:27 Hrs (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	89	86	73	53	35	67	92	92	87	89	93	93	949	79.08
2012	89	82	61	51	47	57	82	90	89	84	88	91	911	75.92
2011	87	90	72	44	46	67	87	89	90	84	90	90	936	78
2010	91	69	58	38	33	51	81	91	86	79	93	89	859	71.58
2009	90	86	62	45	41	53	82	84	80	82	90	91	886	73.83
Total	446	413	326	231	202	295	424	446	432	418	454	454	4541	75.68

Maximum :- 90.80% (Nov. Dec.)
Minimum :- 40.40% (May)
Average Reletive Humidity 7:27 Hrs. = 75.68 %

TABLE No:- 06

Climatic Data :- Relative Humidity (%) 14:27 Hrs (2009 - 2013)

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total of Year	Average of Year
2013	39	42	27	21	13	47	81	82	56	49	36	48	541	45.08
2012	52	36	21	18	19	32	65	76	63	27	28	37	474	39.5
2011	39	44	26	14	19	42	68	75	71	32	35	39	504	42
2010	48	35	16	11	15	27	61	72	59	34	54	41	473	39.42
2009	50	35	18	13	16	27	63	65	49	36	40	49	461	38.42
Total	228	192	108	77	82	175	338	370	298	178	193	214	2453	40.88

Maximum :- 59.52% (August)
Minimum :- 13.20% (May)
Average Reletive Humidity 14:27 Hrs. = 33.06 %

TABLE: - 09

CLIMATIC DATA (2009-2013)

S NO.	Parameters	Data Obtained
1.	Average Temperature	**25.14 °C**
2.	Average Rain Fall	**65.83 cm.**
3.	No. of Rainy days per Year	**40.48**
4.	Mean Maximum Temperature	**32.12 °C**
5.	Mean Minimum Temperature	**18.17 °C**
6.	Highest Maximum Temperature	**43.80 °C**
7.	Lowest Minimum Temperature	**4.7 °C**
8.	Hottest Month of the Year	**May**
9.	Coolest Month of the Year	**January**
10.	Mean Relative Humidity % at 07:27 Hrs.	**75.68**
11.	Relative Humidity Maximum %	**93 (Nov. Dec.)**
12.	Mean Relative Humidity % at 14:27 Hrs.	**33.06**
13.	Relative Humidity Minimum %	**11 (April)**
14.	Mean Wind Velocity KM/ Hr.	**2.48**
15.	Average Vapour Pressure (mm) 14:27 Hr.	**13.10**

TABLE: - 10

LAND USE PATTERN

S. No.	Total land area	Geographical area	Cultivable area	Forest area	Land under Nonagricultural use	Permanent pastures	Cultivable wasteland	Land under Misc. tree Crops and groves	Barren and uncultivable land	Current fallows	Other fallows
1.	1042.5 ('000 ha)	521.3	269.1	125.3	29.8	14.2	22.7	0.5	39.5	9.6	10.5

Source: Rajasthan Statistics at a Glance, 2008-09

TABLE: 11

LIST OF EQUIPMENTS/MATERIAL

S. No.	Equipment/ Material	S. No.	Equipment/ Material
1	Vasculum	27	Old newspapers
2	Laminated Jute Bags	28	Drying sheets / Blotting sheets
3	Garden Cutter	29	Straps and Ropes
4	Knife	30	Stationary and Dissecting Box
5	Khurpi	31	Identity Cards and Authorization Letters
6	Tree pruner		CHEMICALS
7	Axe	32	Formalin
8	Plant Presses	33	Mercuric Chloride
9	Field Presses	34	Glycerin
10	Field Note Book	35	Ethyl Alcohol
11	Field shoes	36	Acetic Acid
12	Binoculars	37	Cupric Chloride
13	Digital Camera	38	Safferanin
14	Altimeter	39	Fast Green
15	Pocket lens (Folding type)	40	Canada Balsam
16	Shoulder bags	41	Methylated Spirit
17	First Aid Box	42	Lactic Acid
18	Gummed tapes	43	Phenol
19	Thread	44	Cupric Acetate
20	Herbarium/ mounting sheets	45	Lauryl Pentachloro Phenate (LPCP)
21	Translucent paper	46	Naphthalene Balls
22	Hanging labels		
23	Dissecting Microscope		
24	Compound Microscope		
25	Collection Bottles, Slide and Cover Glasses		
26	Tree pruner		

CHAPTER: IV

VEGETATION

CHAPTER: IV

VEGETATION

Rajasthan shows great variation inclimate and vegetation.There are 26 vegetation classes in Rajsthan. The main forest types of Rajasthan includes Dry Deciduous forest, Thorn forest, Broad leaved hill forest, Dhauk forest, Teak mixed forest and Riverine forest.

Vegetation type of Kota (similar to Udaipur, Rajsamand, Ajmer, Baran, and Chittorgarh districts) is classified under catgory of "Dry deciduous forests". In clearer sence it is "Mixed dry deciduous forest" vegetation (Champion and Seth, 1968). This forest type shows dominance of *Anogeissus pendula* Edgew. (Dhauk), *Butea monosperma* (Lam.) Taub. (Tesu); *Boswellia serrate* Roxb ex Coleb, *Anogeissus lalifolia* (Roxb. ex DC.) Well.ex Guill. & Perr. and *Diospyros melanoxylon* Roxb.

Mostly the annual vegetation is noticed during the rainy season that is favourable for germination of seeds and further growth of seedling. Annuals ephemerals and some perennials also show their shoots during this season. Plants occurring in study area according to habit are listed below.

A. TREES:

Major trees present in forests as well on road sides of sub study area are *Acacia leucophloea* (Roxb.) Willd. ; *Acacia nilotica* (Linn.) Willd. ex Del. ; *Acacia senegal* (Linn.) Willd. ; *Acacia tortilis (*Forsk.*)* Hayne.*; Azadirachta indica* A. Juss.; *Ailanthus excelsa* Roxb.; *Balanites aegyptiaca* (Linn.) Delile.; *Ficus benghalensis* Linn.; *Ficus religiosa* Linn.; *Holoptelea integrifolia* Planch.; *Prosopis cineraria* (Linn.) Druce.; *Prosopis juliflora* (Swartz.) DC.; *Tecomella undulata* (Sm.) Seeman..*; Ziziphus mauritiana* Lamk.; *Maytenus*

emarginata (Willd.) Ding-Hou.; *Phoenix sylvestris* (Linn.) Roxb.; *Riccinus communis* Linn.; *Terminalia alata* Heyne *; Terminalia arjuna (R*oxb.) Wight. & Ara.*; Cassia fistula* Linn.*; Tamarix aphylla* (L.) Karst.; *Pithecellobium dulce* Benth.; *Acacia catechu* Willd.*; Terminalia arjuna* Roxb.*; Emblica officinalis* Gaertn.*; Anogeissus pendula* Edgew.*;Anogeissus latifolia* Wall.; *Madhuca indica* Gmel.*; Pongamia pinnata* (L.) Pierre.*; Salvadora persica* Linn.*; Balanites aegyptiaca* (L.) Delile; *Aegle marmelos* (L.) Correa; *Bauhinia racemosa* Lamk; *Boswellia serrata* Roxb.*; Bombax ceiba* Linn.*; Buchnania latifolia* Roxb.*; Butea monosperma* (Lamk.) Taub.; *Leucaena leucocephala* (Lam.) de Wit.; *Moringa oleifera* Lam.*; Mangifera indica* Linn.*; Nyctanthes arbortristis* Linn.; *Wrightia tinctoria* R.Br.*; Cordia gharf* (Farsk.) Her. & Asch; *Erythrina suberosa* Roxb.*; Morus alba* Linn.*;* and *Diospryos melanoxylon* Roxb.

B. SHRUBS:

Generally, these grow in groups of different species on plains, roadsides and hillocks. Some examples of major shrubs present are *Carissa carandas* Linn; *Lawsonia inermis* Linn.*;Rhus mysurensis* Heyne.; *Mallotus philiphinensis* Muell. Arg.*;Capparis deciduas* (Forsk.) Edgew.; *Abutilon indicum* (Linn.) Sweet.; *Sida cordifolia* Linn.; *Hibiscus ovalifolius* Vahl.; *Ziziphus nummularia* (Burm.f.) Wt.et Arn.;*Grewia tenax* (Forsk.) Fiori.; *Crotalaria medicaginia* Lamk.; *Verbesina encelioides* (Cav.) Benth. & Hook.; *Xanthium strumarium* Linn.; *Calotropis procera* (Ait.) R.Br.; *Leptadenia pyrotechnica* (Forsk.) Decne.; *Withania somnifera* (Linn.) Dunal.; *Lantana indica* Roxb.; and *Aerva tomentosa* (Burm. f.) Juss.

C. PERENNIAL HERBS :

Generally present near wetland sites and shadow areas of trees and shrubs. Some examples are *Tephrosia purpurea* (Linn.) Pers.; *Farsetia*

hamiltonii Royle; *Indigofera linnaei* Ali.; *Borreria articularis* (Linn.) F.N. Will..; *Echinops echinatus* Roxb.; *Launaea procumbens* (Roxb.) Rammyya et Rajgopalan. *Pulicaria crispa* Sch.-Bip.; *Convolvulus microphyllous* Sieb. Ex Spreng; *Datura metal* Linn. ; *Solanum nigrum* Linn.; *Boerhavia diffusa* Linn.; *Achyranthes aspera* Linn.; *Amaranthus caudatus* Linn.; *Croton bonplandianum* Baill. and *Euphorbia hirta* Linn.

D. ANNUAL HERBS :

These are the plants with small size which grow and flourish during rainy season and after winter they go for fruiting and seed setting. They periodically grow for one year life. Mojor herbs are *Argemone mexicana* Linn.; *Sismbrium irio* Linn.; *Portulaca oleracea* Linn.; *Melilotus indica* All.; *Fagonia cretica* Linn.; *Trigonella. polycerata* Linn.; *Acanthospermum hispidum* DC. *Grangea maderaspatana* (Linn).Poir.*Gnaphalium indicum* Linn.; *Pulicaria angustifolia* DC.; *Sonchus asper* (Linn.) Gars.; *Vernonia cinerea* (Linn.) Less.; *Anagallis arvensis* Linn.; *Heliotropium ellipticum* Ledeb. *Datura innoxia* Mill.; *Leucas aspera* (Willd.) Spreng.; *Gomphrena celosiodies* Mart.*; Indigofera cordifolia* Heyne.; *Chenopodium album* Linn.; *Chenopodium murale* Linn. and *Phyllanthus fertanus* Webster.

E. EPHEMERALS :

Example of general ephemerals are *Cleome gynandra* Linn.; *Cleome viscose* Linn.; *Polygala erioptera* DC.; *Sida ovata* Forst.; *Corchorus tridens* Linn.; *Tribulus terrestris* Linn.; *Cassia tora* Linn.; *Indigofera linifolia* (Linn.) Retz.; *Indigofera linnaei* Ali. *Evolvulus alsinoides* Linn.; *Physalis minima* Linn.; *Pedalium murex* Linn.; *Sesamum indicum* Linn.; *Martynia annua* Linn.; *Peristrophe bicalyculata* (Retz.) Nees.; *Amaranthus spinosus* Linn.; *Digera muricata* (Linn.) Mart.; *Euphorbia prostrata* Ait.; *Commelina benghalensis* Linn.; and *Commelina forskalaei* Vahl.

F. CLIMBERS AND TWINNERS:

Generally grow over trees and perennial herbs and shrubs. Some examples are *Cocculus pendulus* (Forst.) Diels.; *Tinospora cordifolia* (Willd.) Miers.; *Blastania fimbristipula* (Fensl.) Kotschy et Peyr.; *Citrullus colocynthis* (Linn.) Schrad.; *Cucumis callosus* (Rottl.) Cogn.; *Pergularia daemia* (Forsk.) Chiov.; *Ipomoea pes-tigridis* Linn.

G. PARASITES:

As climber and stem parasite *Cuscuta hyalina* Heyne ex Roth. and *Cuscuta reflexa* Roxb. were found where as *Santalum album* Linn. and *Striga angustifolia* (D.Don.) Saldhana.were found as semi root parasites.

H. GRASSES :

Wetland and plains were found full with grasse during rainy season Grases like *Cyperus rotudus* Linn.; *Cynodon dactylon* (Linn.) Pers.; *Phalaris minor* Retz. *Apluda mutica* Linn.*; Setaria glauca* (Linn.)P. Beauv.*; Aristida funiculata* Trin. et Rupr.; *Brachiaria ramose* (Linn.) Stapf.; *Brachiaria reptans* (Linn.) Gardener et Hubb.; *Cenchrus biflorus* Roxb.; *Cenchrus ciliaris* Linn.; *Chloris virgata* Sw.; *Dactyloctenium sindicum* Boiss.; *Typha elephantine* Roxb.; *Eragrostis ciliaris* (Linn.) R.Br.; *Eragrostis pilosa* (Linn.) P. Beauv.; *Sorghum halepanse* (L.)Pers. and *Saccharum spontaneum Retz*. were commonly occurring.

During the survey, vegetation of following areas of Kota has been studied. Some sites of vegetation are given in **Fig.: 2 A-H**.

i. Plains

ii. Hills and Hillocks

iii. Agriculture fields

iv. Road Sides

v. Aquatic and Water logged areas

vi. Aquatic Wetlands

vii. Urban Area

Vegetatinal plants vary from area to area. Plants according to vegetation areas are listed below.

i. PLAINS:-

The plain localities are represented by trees like *Prosopis chilensis, Holoptelea integrifolia, Maytenus emarginatus, Butea mpnosperma, Phoenix sylvestris, Acacia leucophloea,* along with the shrubs and bushes like *Capparis decidua, Lantana camara, Capparis sepiaria* and *Zizyphus nummularia.*

During rainy season, the area turns into green carpet of semi xerophytic and meadow herbs. The life cycle of most of the herbs comes to close before the winter sets in. Some of the plant species such as *Crotalaria, Indigophera, Polygala, Tridex, Glossocordia, Convolvulus* and several grasses like *Aristida, Cenchrus, Chloris, and Eragrostis* are common herbaceous taxa of these areas.

ii. HILLS AND HILLOCKS:

The majority of hills and hillocks are almost barren but the vegetation comprises of trees like *Anogeissus pendula, Maytenus emerginatus, Boswellia serrata, Diospyros cordifolia, Wrightia tinctoria* and *Acacia nilotica* along with the shrubs like *Dichrostachys cinerea, Euphorbia caudicifolia* and *Grewia tenax.* These areas become lush green during rainy season and shows surface flora full with plants of family asteraceae, poaceae cyperaceae and papilionatae.

iii. AGRICULTURE FIELDS:

The trees of agriculture field are *Ailanthus exelsa, Azardirachta indica, Butea monosperma, Mangifera indica, Dalbergia sissoo, Prosopis cineraria, Moringa oleifera* and *Zizyphus mauritiana.* Shrubs like *Clerodendrum phlomidus, Euphorbia caudicifolia and Lantana camara* are commonly growing as hedge shrubs along the boundries of agricultural fields.

iv. ROAD SIDES:

During the field trip trees and shrubs of agriculture field are *Ailanthus exelsa, Azardirachta indica, Butea monosperma, Mangifera indica, Dalbergia sissoo, Prosopis cineraria, Moringa oleifera* and *Zizyphus mauritiana.* Shrubs like *Clerodendrum phlomidus, Euphorbia caudicifolia and Lantana camara* are commonly growing as hedge shrubs along the boundries of agricultural fields.

v. AQUATIC AND WATER LOGGED AREAS:

Plant in aquatic and water logged sites like Chambal river, Kalisindh river, Abheda pond, Kishore sagar, Alania dam etc. are mainly *Eichornia crassipes, Fimbristylis ferruginea, Nelumbo nucifera, Hydrilla verticillat, Egeria densa, Ipomoea aquatica, Ipomoea carnia, Nymphaea nauchali, Nymphoides indica Lemna perpusilla, Sagittaria guayanensis,Typha angustifolia, Trapa natans and Ceratophyllum demursum.*

vi. AQUATIC WETLANDS:

Plant in wetlands near by aquatic vegetation sites are mainly *Fimbristylis ferruginea, Cyperus difformis, C. rotundus Schoenplectus articulates, S. supinus, Monochordia veginalis, Ipomoea carnia, Bacopa monnieri, Sphaeranthus indicus, Polygonum barbata, Grangea maderaspatana,Typha angustifolia,Chinopodium murale, C. album etc.*

vii. URBAN AREA:

The cities Kota district was surveyed at different times of the year. The tree flora of the areas is represented by *Albizia lebbeck*, *Azardirachta indica*, *Cassia fistula*, *Dalbergia sisoo*, *Eucalyptus camaldulensis*, *Ficus religiosa*, *Ficus bengalensis*, *F.glomerata*, *Michelia champaca*, *Parkinsonia aculeata*, *Polyalthia longifolia*, *Phyllanthus emblica*, *Tamarindus indica* and *Pongamia pinnata*.

Some vegetational series were also seen during vegetational exploration. These are:

1. *Boswellia serrata- Lanna coromandelica* series:-

This series was seen during field survey of Rawatbhata road and Kolipua forest area. *Diospyros melanozylon* Roxb.; *Mitragyna parvifolia* (Roxb.) Korth. and *Calotropis procera* (Ait.) Ait.f. were also seen

2. *Mimosa hamata- Ziziphus nummularia* series.;-

Forest area of Gapernath, Digod and Mandana were specific for this series. *Acacia nilotica* and *A. tortalis* were other dominant trees in this series.

3. *Acacia nilotica- Terminalia arjuna* series:

On Jhalawar road and Sangod tehsil area, this series was seen. *Butea monosperma*, *Prosopis cineraria* with *Prosopis juliflora* was another character of this series.

4. *Acacia leucophloea- Butea monosperma* series:

Girdia mahadev and Peepalda kalan tehsil forest area were specific for this series. *Boswellia serrata*, *Mimosa hamata* were also found.

5. *Anogeissus pendula* series:

It was general series on rocky and hilly areas. A mixing of *Capparis sepieria*, *Ziziphus mauritiana*, *Ziziphus nammulaia* and *Calotopis procera* was also seen in this series.

6. Grass land series:

All over the study area this series was found. Various types of grasses like *Cynodon dactylon* (Linn.) Pers.; *Cyperus rotudus* Linn.; *Apluda mutica* Linn.*; Setaria glauca* (Linn.)P. Beauv.*; Aristida funiculata* Trin. et Rupr.; *Cenchrus biflorus* Roxb.; *Cenchrus ciliaris* Linn. *Sorghum halepanse* (L.)Pers. and *Saccharum spontaneum Retz*. were commonly occurring.

Thus a variety of vegetation occurs in Kota district that represents not only deciduous but also aquatic and xerophytic on hilly areas. The natural aquatic boundry prepared by Chambal River and Kali Sindh River around Kota provides rich vegetation areas in throughout the district. Even canals and ponds with their wetlands are full with a variety of vegetation.

FIG: - 2 A - H
VEGETATION AREAS

A:- CHAMBAL RIVER AFTER RAINS

B:-CHAMABAL RIVER IN RAINS

C:-GAPERNATH-AFTER RAINS

D:-GIRADIYA MAHADEV-AFTER RAINS

E:-DECIDUOUS FOREST-RAWATBHATAROAD

F:-MIXED VEGETATION NEAR ABHEDA

G:-AQUATIC VEGETATION- ABHEDA

H:- DAADH DEVI -WETLAND DURING RAIN

CHAPTER: V

METHODOLOGY

CHAPTER: V

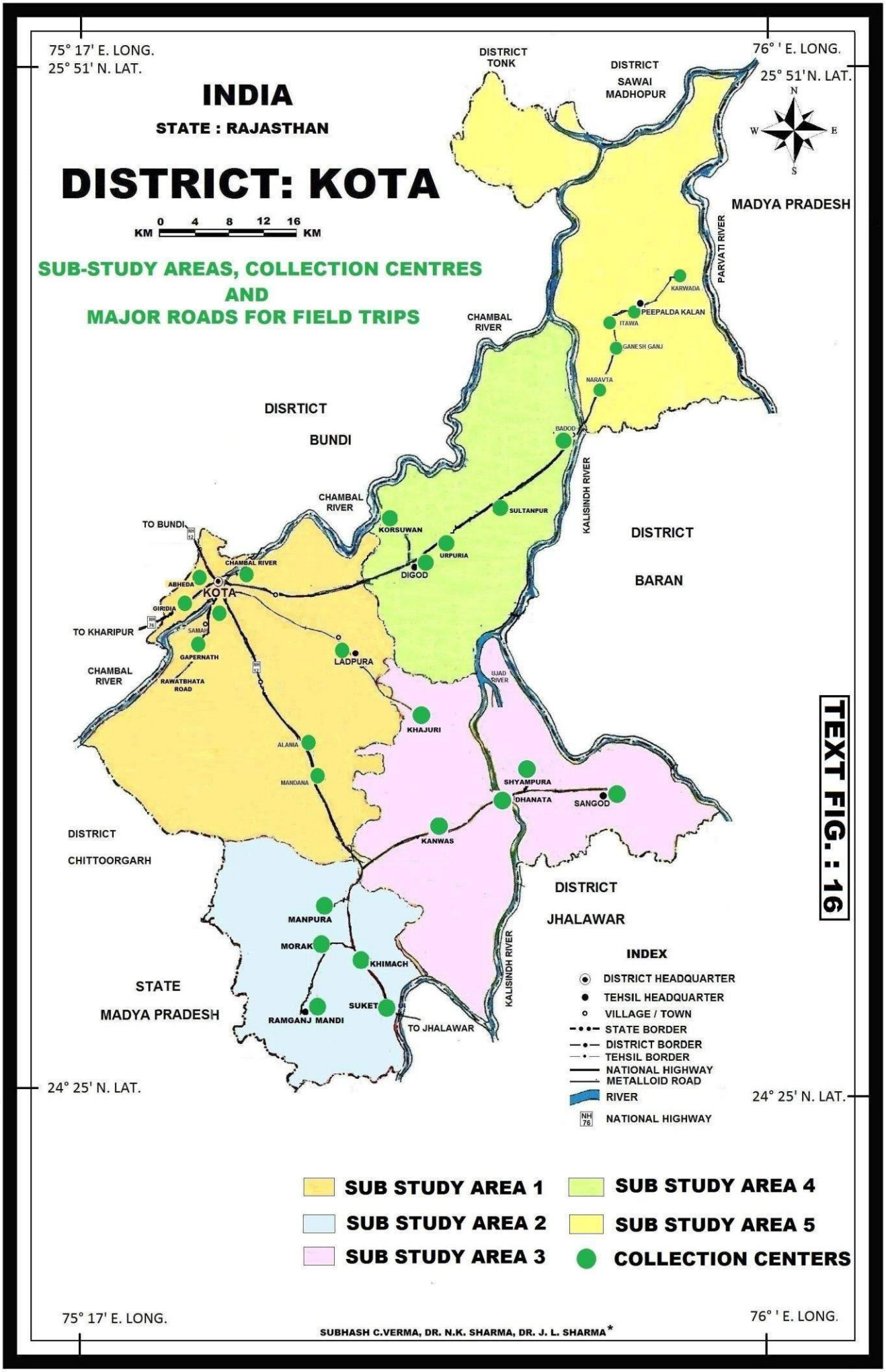
METHODOLOGY

The work on floristic Analysis of vegetation of Kota district is based on the results obtained from both the intensive & extensive studies of the vegetation of area under study. For the sake of convenience the study area has been divided into the smaller sub areas.

DIVISION OF STUDY AREA: -

The area of Kota has been divided into one central city area four peripheral tehsil areas. To collect maximum plant species to cover up maximum plant biodiversity there were 28 collection stations were fixed on the basis of aquatic and terrestrial plant biodiversity (Text Fig: 16). The sub areas are:

Sub area No. 1 (Core urban area of Kota district): This site covers central urban city with rural area of tehsil Ladpura and it is western and north western part of study area. National Highway No.12 diagonally passes through this area. This is largest sub area and there were 08 collection stations determined. These collection stations are- Abheda pond and its surrounding forest area, Kishore sagar and adjacent Chhtravilas garden, Nayapura Chambal River area, Alania dam with adjascent forest area, Mandana (pond and nearby terrestrial area), Gaparnath, Girdia Mahdev (aquatic and forest area) and Ladpura tehsil area. The most important spot of this area are Jawahar Sagar Wildlife Sanctuary and Chambal River that makes western natural boundary of district.


75° 17' E. LONG.
25° 51' N. LAT.
INDIA
STATE : RAJASTHAN
DISTRICT: KOTA
0 4 8 12 16
KM KM
SUB-STUDY AREAS, COLLECTION CENTRES
AND
MAJOR ROADS FOR FIELD TRIPS
DISTRICT TONK
DISTRICT SAWAI MADHOPUR
76° ' E. LONG.
25° 51' N. LAT.
N
W
E
S
MADYA PRADESH
PARVATI RIVER
KARWADA
PEEPALDA KALAN
ITAWA
GANESH GANJ
NARAVTA
CHAMBAL RIVER
DISRTICT
BUNDI
BADOD
KALISINDH RIVER
CHAMBAL RIVER
SULTANPUR
KORSUWAN
URPURIA
DIGOD
DISTRICT
BARAN
TO BUNDI
CHAMBAL RIVER
ABHEDA
KOTA
GIRDIA
TO KHARIPUR
SAMAR
GAPERNATH
LADPURA
CHAMBAL RIVER
RAWATBHATA ROAD
UJAD RIVER
KHAJURI
ALANIA
MANDANA
SHYAMPURA
DHANATA
SANGOD
DISTRICT
CHITTOORGARH
KANWAS
DISTRICT
JHALAWAR
MANPURA
MORAK
KHIMACH
KALISINDH RIVER
STATE
MADYA PRADESH
SUKET
RAMGANJ MANDI
TO JHALAWAR
INDEX
DISTRICT HEADQUARTER
TEHSIL HEADQUARTER
VILLAGE / TOWN
STATE BORDER
DISTRICT BORDER
TEHSIL BORDER
NATIONAL HIGHWAY
METALLOID ROAD
RIVER
NATIONAL HIGHWAY
24° 25' N. LAT.
24° 25' N. LAT.
SUB STUDY AREA 1
SUB STUDY AREA 2
SUB STUDY AREA 3
SUB STUDY AREA 4
SUB STUDY AREA 5
COLLECTION CENTERS
75° 17' E. LONG.
76° ' E. LONG.
SUBHASH C.VERMA, DR. N.K. SHARMA, DR. J. L. SHARMA*

TEXT FIG. : 16

Sub area No. 2 (Tehsil Ramganjmandi) This site covers the southern part of district Kota which includes five collection centres. These are - Ramganjmandi tehsil core, Manpura, Suket, Morak and Kheemach. Tehsil Ramganjmandi shows Eastern natural boundary of Kali Sindh River. For easy approach maximum collection station were made near to National Highway no. 12 that diagonally passes through this tehsil sub area. This subarea is full with rocky plains desertified areas those are full with natural vegetation. Not only mesophytes but also some of xerophytes were characterized in this tehsil.

Sub area No. 3 (Tehsil Sangod):- This sub area covers South east area of Kota district which includes major branches of Kali Sindh River which pass through not only central part of tehsil but also makes a natural Eastern and north Eastern boundary of tehsil. Five collection centers were fixed for plant collection these are Khajuri, Kanvas, Dhananta, Sangod and Shyampura which were in easy approach for frequent plant collection. Vegetation of this area resembles with Kota core area. Sorsan wildlife sanctuary is characteristic biodiversity feature of this area.

Sub area No. 4 (Tehsil Digod) :-

In this Study area National Chambal Wildlife Sanctuary and Urpuria Bird Sanctuary are Major Biodiversity areas. Chambal River and Kali Sindh River are Western and Eastern natural boundary of this tehsil. Five plant collection stations were fixed to cover up this tehsil these these are- Digod, Sultanpur, Urpuria, Korsuwan and Badod.

Sub area No. 5 (Peepalda Kalan) :-

This study area covers the vegetation of northern part of Kota district. There were four collection sites were chosen. These are on road site namely Ganeshganj, Itawa, Peepalda Kalan, Narwta and Karwada.

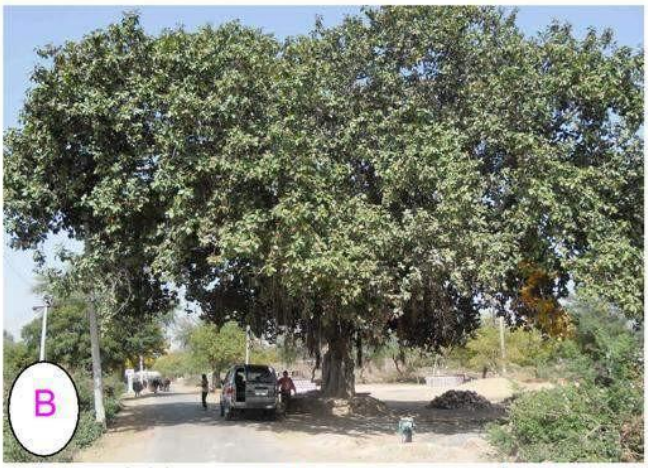
To achieve the objectives of the present work, intensive and extensive botanical exploration tours were conducted in different sub areas of the Kota district in different seasons so as to collect more and more plant species in flowering and fruiting stage. The special attention has been paid to collect the ephemerals which complete their life cycle with in few days and disappear. Field trips were organized in such a way so as to cover all the localities at more or less regular intervals. All the specimens collected were serially numbered. A field note book was maintained for field notes related to habit, habitat, colour of flower, associations and other and other pertinent features which generally can not been studied from the pressed specimens were recorded. Efforts were made to identify the plants from fresh materials, those which could not be identified satisfactorily in the field or in the laboratory at PG Department of Botany, Government College, Kota were preserved and later checked and authenticated at Departmental Herbarium. Possible efforts were also made to authenticate the specimens at Department of Botany, University of Rajasthan, Jaipur and Arid Zone Circle, Botanical Survey of India, Jodhpur.

FLORISTIC SURVEY: -

The rainy season was the best time and efforts were made to visit as many places (Fig: 3 A-G) as possible during this favourable season. The other time suitable for collection was October – December when aquatic plants could be studied as by this time the turbulent water of rainy season settle and allow the aquatic vegetation to come up. Flowering stages of some trees could be collected in this season.

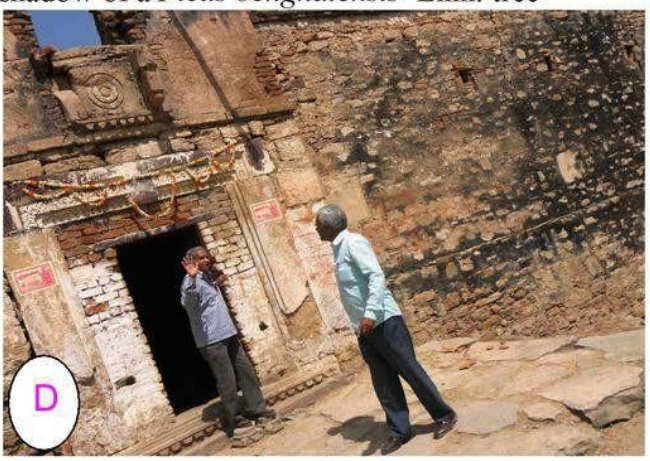
FIG. : - 3 A – G: Field Tours

A :- Field tour near SULTAPUR
A Staff member introducing about the site

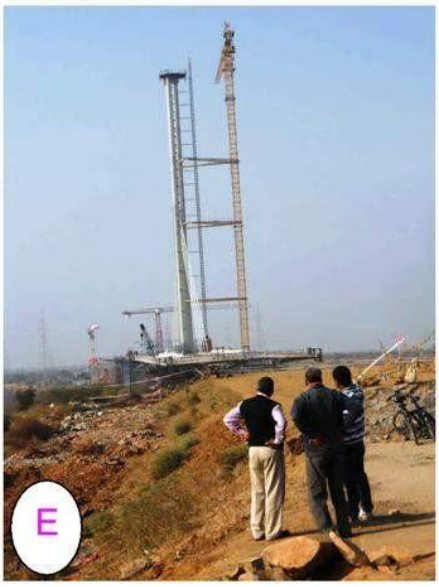


B :- Field tour at DIGOD-Team under shadow of a *Ficus benghalensis* Linn. tree

C. Field tour at URPURIA Sanctuary
Supervisors inspecting aquatic plant collection



D. Field tour at Ancient CHANDRESHWAR
Supervisor explaining historical aspects



E: - Field Tour near
KOTA HANGING BRIDGE

F. Field tour at
KAMAL SAROVAR

G: Field tour at ALANIA
A rural lady collecting water
from wetland of river

Long before the spring season, the collected water in the reservoirs is consumed for irrigational purposes or otherwise evaporated, the bottom exposed exhibits some pioneer colonies.

COLLECTION: -

Apart from the general study of the vegetation during excursion, plant specimens, at least four in the number for a species were collected. For the general study of the vegetation during excursion, plant specimens were collected. Vasculum and laminated jute bags with zip locks were used for carrying terrestrial as well as aquatic plants. For spiny specimens vasculum was best equipment for plant collection as well as for transport. Laminated bags puffed with air and soaked with formalin were easy and safe for plants which facilitate the easy respiration to plants and long duration collection. Jute / Cotton bags (laminated) without Ziplock were also used which can be closed with rubber bands and threads. Finally plants were pressed by using plant press, old newspapers, blotting papers etc. Materials were also fixed in Formalin Acetic Alcohol (F.A.A.) for detailed morphological studies in laboratory. For long duration keeping the plants in bags cotton soaked with formalin helped in preservation of the specimen. Finally plants were pressed using plant press, old newspapers, blotting papers etc. In addition to the specimen for pressing, the materials were fixed in Formalin Acetic Alcohol (F.A.A.) for detailed morphological studies in laboratory.

- **EQUIPMENTS FOR COLLECTION:-**

Various equipment (Fig: 4 and Table: 11, Text Fig:-17 to19) and materials were used for Botanical Collection as well as for Laboratory work. All the efforts were made to make healthy specimens on Herbarium sheet so that easy floristic study can be performed.

- **COLLECTION OF MINUTE PLANTS**

Some very small plants like *Lemna sps.*, *Spirodella sps.* and *Wolfia sps.* are microscopic and cannot be processed for the herbarium in the usual way. These plants should be collected in mass with the collection number, notes, etc., sun-dried and put in a packed, and the packet pasted on the Herbarium Sheet. These were also persevered into following common liquid preservative is :

Ethyl alcohol 95%	50 cc
Glacial acetic acid	5 cc
Formaldehyde 40%	10 cc
Water	35 cc

- **COLLECTION OF SLENDER AQUATIC PLANTS**

Hydrophyes like *Najas, Vallisnaria, Ottelia, Antigonon* etc, after collection, were placed into a tray containing water and are spread out. Then, a wire press or sieve plate with paper or muslin cloth was inserted below the specimen and taken out; the paper or cloth is lifted slowly with both hands and placed between the dryers. Some extra dryers were applied below and above. These plants were frequently changed along with the paper or muslin cloth. For the first or two days, the changing should be more frequent.

MOUNTING OF PLANT SPECIMENS: -

First of all plants were dried and pressed using frequent changes of blotters till got completely dried. Corrugated sheets were placed between blotters for aeration purpose. Cool touch of finger was equipment to decide and verify the absence of moisture into plant specimen.

Before mounting plant specimens were poisoned by immersing them into solution of corrosive sublimate (Mercuric chloride 15gms in one litre of rectified spirit) after poisoning these specimens were mounted on herbarium sheets (Text Fig. 17) of 16.5″x11.5″size. Well pressed specimens were selected

& pasted on the sheet with the help of glue or diluted fevicol to which some corrosive sublimate were added. The specimens were labeled with relevant data. Plant specimens were arranged in corresponding covers of different rank of taxa. The families have been arranged after Bentham and Hooker's System of classification (1862-83).

- **GLUEING THE PLANT ON HERBARIUM SHEET**

The common glue for book-binding, joinery work available in market as flakes, or pieces was used. Synthetic adhesive (like Fevicol) was also used for woody specimens. For Gluing the specimen was laid on an newspaper, lower side facing up. Then, with the help of a small or large brush, depending on the size of the plant, the glue is applied to all parts of the specimen. The specimen is slowly lifted with the help of forceps or hands and placed on the mounting board. .A blotter is placed on the specimen as in the previous method. The newspaper on which the specimen is placed for applying glue is discarded few applications as the excess of glue on it tends to stick on the upper side of the specimens. Detached plant parts of specimens like small fruits, flowers, seeds, etc. were be placed in small packets and pasted on Herbarium sheet. Herbarium sheets with specimens glued on them were kept in press for one day for proper sticking and drying. Next day the bundle was opened and the intermediate blotters on newspaper removed and then dried specimens were gently stitched by using a thread and needle.

- **STRAPPING:**

This method was used to make temporary herbarium specimens and in this process the specimen was not glued to the sheet, but only loosely strapped to the sheet by means of ordinary thread stitches.

- **POISONING AND PRESERVATION OF SPECIMENS**

The specimens were poisoned either immediately in the camp of after reaching the headquarters. It is advisable to poison the plants immediately after collection; poisoning kills the plant and thereby the formations of abscission layer are prevented. The poisoning have been done by dipping the whole plant in a saturated solution of mercuric chloride in ethyl alcohol. The plant is again put in dryers and pressed till it gets completely dried. Lauryl Pentachloro Phenate (LPCP) was another substitute for mercuric chloride and it was reported to be very effective, and comparatively safer in handling.

- **FUMIGATION**

This was done for killing pests in mounted as well as unmounted duplicate specimens. In this process Nephthaline balls and Carbon tetrachloride was used. In small a small petri dishe Carbon Tetra Chloride was kept kept into almirah and closed for about a week.

OTHER METHODS

Green parts preserved in the following liquid medium retained green colour (Lawrence, 1951).

20 gm	Phenol c.p.
20 gm	Lactic acid (sp. Gr. 1.21)
40 gm	Glycerine (sp. Gr. 1.25)
0.2 gm	Cupric Chloride
0.2 gm	Cupric acetate
20 cc	Distilled water.

BOTANICAL LABELS

Various labels like Basic Data Label (Shown on **Herbarium Sheet** Text Fig: 17), Type Labels, and Labels for Genus cover were used during floristic study of taken study area. All the labels were made on computer printing.

IDENTIFICATION OF PLANTS: -

Identification of plant specimens was made with the help of "Flora of Upper Gangetic Planes" by Duthie (1905), Flora of Rajasthan - Hadoti region (Sharma), Flora of Delhi (Maheshwari), Flora of North-East Rajasthan (Sharma and Tiagi) and Flora of Indian Desert (Bhandari), Flora of Rajasthan (Shetty and Singh) and Flora of Rajasthan-East and South east Rajasthan (Tiagi and Aery). Identity of specimens was confirmed and authenticated at Herbarium by comparing them with herbarium specimens of Herbarium, Department of Botany, Government College, Kota; Herbarium, Department of Botany, University of Rajasthan, Jaipur and at Western Regional office (Arid zone Circle), Botanical Survey of India, Jodhpur (Rajasthan).

COLLECTION OF OTHER DATA: -

To study climate, geology, historical and cultural aspects of the study area, attempts were made to collect data and information from various departments. "Annals and Antiquities of Rajasthan (The Central and Western Rajputana States of India)" by Lt. Colonel James Tod (1920) was useful for historical introduction of Kota. Data on soil types, rainfall and temperature of last ten years were obtained from Central Soil and Water Conservation Research and Training Institute (ICAR), Dadwara; district Kota. Land Use and irrigation related data were arranged from Irrigation Management and Training Institute (IMTI, Department of Irrigation, and Government of Rajasthan), Kota. Online

data for public use available on various Central and State government agencies like Central Pollution Control Board, Rajasthan State Pollution Control Board, Forest Department, Kota, Geological Survey of India (GSI) and Botanical Survey of India (BSI) were also collected so that Land use Pattern map, Biological diversity map, Soil types map, Climate map, Geomorphological map and Location map related to Kota district were prepared. Digital Altimeter (Koriyan) was used to record altitude and coordinates of particular plant collection area. Soil Texture was determined by shaking a known quality of soil in "soil sieve set" and weighing each fraction separately. The percentage of each fraction will be calculate and soil type being designated according to the International system of soil classification. For soil pH determination Metzer's Digital pH meter was used. To record Total Dissolved Solvents (TDS) of aquatic plant collection site digital TDS meter and to record temperature digital thermometer was used.

Soil Texture was determined by shaking a known quality of soil in soil sieve set and weighing each fraction separately. The percentage of each fraction calculated and soil type being designated according to the International system of soil classification.

For soil pH determination 5 gm sample of oven dried soil was shaken in 100 ml. of distilled water and the solution was filtered after 8 hours. pH was recorded on portable Digital pH meter.

PRESENTATION OF WORK: -

General plan of the present work the following pages bear results of the study of plants, their occurrence, frequency, association etc. in relation to other

relevant factors. The data of this study have been restricted to the flowering plants alone and are arranged under the following heads:

1. Description and arrangement of families, genera and species:-

   In general arrangement of genera and species is alphabetical order is followed in alphabetic order according to Bentham and Hooker (1862-1883) classification in their Genera Plantarum.

2. Citation of references:-

   Available floras in form of hard copies as well as soft copies have been consulted. Flora of Upper Gangetic plains, Flora of Delhi, Flora of North East Rajasthan, Flora of Rajasthan (Hadauti Region), Flora of South Central Rajasthan, Flora of Indian Desert were the key for reference.

3. Vernacular name and Local Names :-

   Local names, vernacular names, english names, or sanskrit names as available in references and given by local persons has been used.

4. Presentations of other data:-

   Location of study area and related localities had been indicated through maps. Graphical method and Maps with bar chart diagram are used to present rainfall & soil type at different stations of Shahpura tehsil. Beside this general description; tabulation and photographs are the tools of general presentation of work.

FIG: - 4 A-H
EQUIPMENTS

A:- PLANT PRESS

B:-DRIED SPECIMEN IN PLANT PRESS

C:-DIGITAL ALTIMETER

D:-DIGITAL MAX. MIN. THERMOMETER

E:-FOLDING HAND LENS

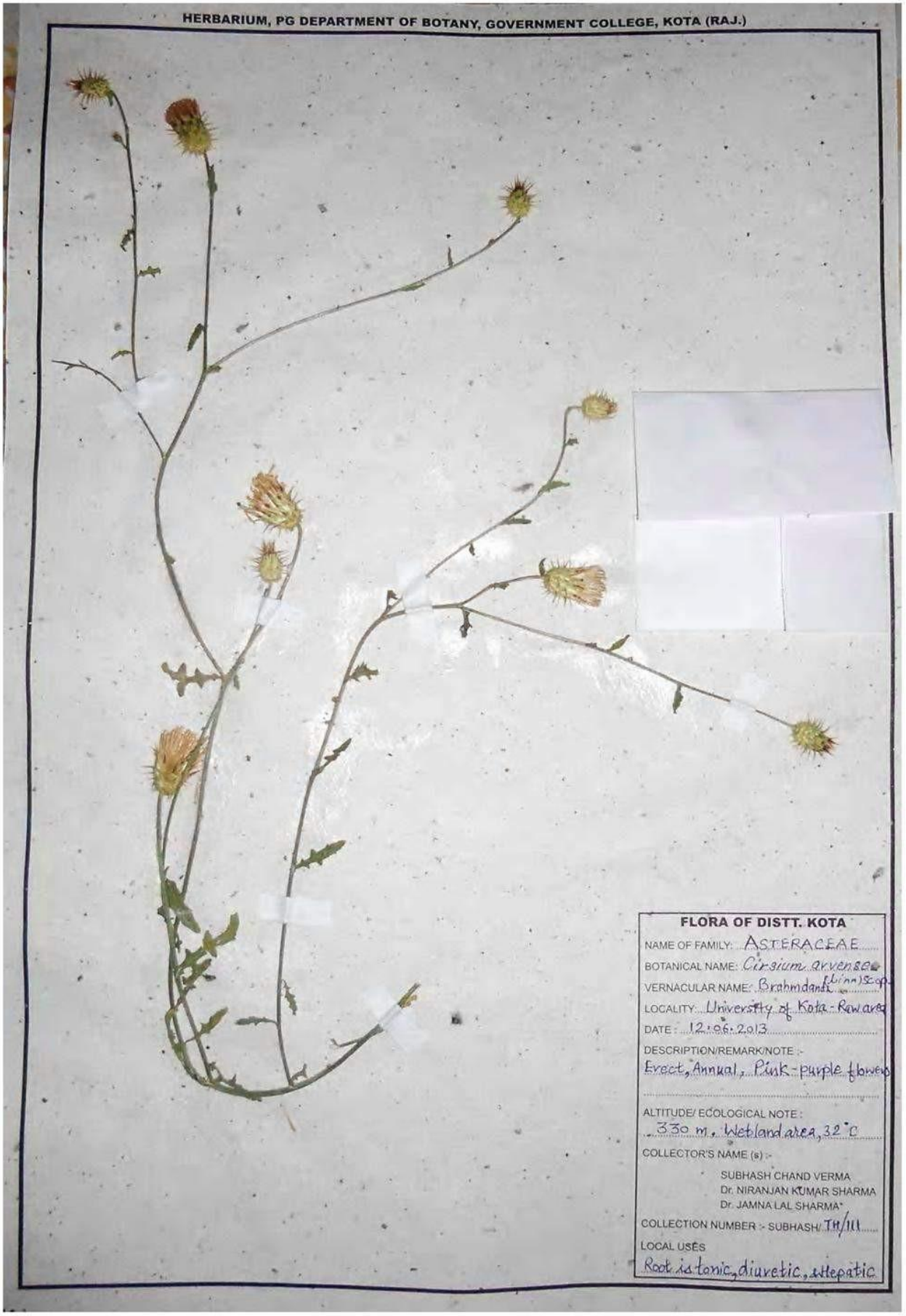
F:-COLLECTION BOTTLES FOR AQ. ANGIOSPERMS

G:-GARDEN CUTTRER

H:- KHURPI

TEXT FIG:- 17

Herbarium Specimen



TEXT FIG:- 18

RESEARCH CARD

HERBARIUM, PG -DEPTT. OF BOTANY

GOVERNMENT COLLEGE KOTA, DISTT. KOTA (RAJASTHAN)

Research Card No.:- 01

1. Name of Scientist/Professor/Researcher/Head of Institute-

Dr. R.K. Singh, HEAD, C.S.W.C.R.I. (ICAR)

2. Name of Institute:-

CENTRAL SOIL & WATER CONSERVATION RESEARCH & TRAINING INSTITUTE, DADWADA, KOTA (RAJ.)

3. Purpose of visit:-

DATA COLLECTION.

4. Notes taken:-

1. Meteorological Data from 2001-2002 to 2011-12.

2. Soil Type, Color, Alkalinity/Salinity related data.

5. Any specific information:-

Conversation c̄ Scientists about on going researches at institute.

Date:- 15.01.2013

Signature of Professor/ Scientist/Head of Institute

अध्यक्ष
केन्द्रीय मृदा एवं जल संरक्षण केन्द्र
Head
Central Soil Cons Res. Centre
कोटा – 2 KOTA – 2

TEXT FIG:- 19

FIELD NOTE BOOK

HERBARIUM, PG -DEPTT. OF BOTANY
GOVERNMENT COLLEGE KOTA, DISTT. KOTA (RAJASTHAN)

FIELD NOTE BOOK No: - ....02.....

Country: INDIA, State: - RAJASTHAN, District: - KOTA, Tehsil:-....Ladpura..... Village:-.....Nayapura.....

Sub Area No:-.....01..... Name of Sub area.-...Kota Core.....

1. Field/collection number (All supplemental material will be given same number:-.....01 (KOTA CORE) Nayapura.....
2. Name of plant (Family and Binomial, if known):- Convolvulaceae
   .....Ipomoea aquatica Forsk.....
3. Name of plant (Local/Vernacular if known):-
   .....Nari.....
4. Sample/Specimen no.:-.....SUBHASH/AQ/107.....
5. Day and Date: - .....Sunday., January 06., 2013.....
6. Locality (Distance and direction to nearest landmark) :-
   .....Chambal River bank.....
7. Any treatment the plant received (*i.e.*, Pretreated with preservatives) :-
   .....— No —.....
8. Altitude, Latitude, Longitude (GPS coordinates) :-
   .....Alt. 238 m..... Baro: 983 hpa..... 28°C.....
9. Ecological conditions at the site (i.e., shady, slope, south-facing, soil type) :-
   .....Clay at bank & Sandy away from bank.....
10. Habitat or Vegetation type, neighboring plants :-
   .....Aquatic & Semi aquatic.....

11. Observations not apparent from the specimens :-

- Habit:-.....Herb..... Height of plant:-....06 inches.
- Root System: - .....Adventitious Root system.....
- Stem: - ...Floating & Creeping, Herbaceous,.....
- Leaf: - Cordate (Elongated) / Lenceolate, Alternate.
- Leaf Color: - ...Green.....Leaf odor: - .....—.....
- Inflorescence: - ..Axillary Solitary.....
- Flower Colour:-..White, c̄ Purple shading.....Flower Shape:- Funnel (Campanulate)
- Flower: - ...Actinomorphic, Bisexual, Bracteate Gamopetalous, Pentamerous, Epipetalous. Bicarpellary, Syncarpous, Ovary - Superior
- Fruit:-.....—.....
- Special Character (If any):-.....—.....

12. No. of specimens taken:-..01..... 13.No. of photograph taken:- 02

Plant Collectors:-

SUBHASH C. VERMA; Dr. N.K.SHARMA; Dr. J.L.SHARMA

TABLE: 11

LIST OF EQUIPMENTS/MATERIAL

S. No.	Equipment/ Material	S. No.	Equipment/ Material
1	Vasculum	27	Old newspapers
2	Laminated Jute Bags	28	Drying sheets / Blotting sheets
3	Garden Cutter	29	Straps and Ropes
4	Knife	30	Stationary and Dissecting Box
5	Khurpi	31	Identity Cards and Authorization Letters
6	Tree pruner		CHEMICALS
7	Axe	32	Formalin
8	Plant Presses	33	Mercuric Chloride
9	Field Presses	34	Glycerin
10	Field Note Book	35	Ethyl Alcohol
11	Field shoes	36	Acetic Acid
12	Binoculars	37	Cupric Chloride
13	Digital Camera	38	Safferanin
14	Altimeter	39	Fast Green
15	Pocket lens (Folding type)	40	Canada Balsam
16	Shoulder bags	41	Methylated Spirit
17	First Aid Box	42	Lactic Acid
18	Gummed tapes	43	Phenol
19	Thread	44	Cupric Acetate
20	Herbarium/ mounting sheets	45	Lauryl Pentachloro Phenate (LPCP)
21	Translucent paper	46	Naphthalene Balls
22	Hanging labels		
23	Dissecting Microscope		
24	Compound Microscope		
25	Collection Bottles, Slide and Cover Glasses		
26	Tree pruner		

CHAPTER: VI

SYNOPSIS OF THE FAMILIES

A. DICOTYLEDONS:

POLYPETALAE

A.1.1.:- Series: THALAMIFLORAE

A.1.2.:- Series: DISCIFLORAE

A.1.3.:- Series: CALYCIFLORAE

GAMOPETALAE

MONOCHLAMYDAE

B. MONOCOTYLEDONS:

B. 1:- OVARY INFERIOR

B. 2:- OVARY SUPERIOR

CHAPTER: VI

SYNOPSIS OF THE FAMILES

The families of flowering plants in the present account are mostly arranged according to Bentham and Hooker's "Genera Plantarum,(162-1883)" the arrangement which has been following by the writers of most of the other India Floras. Newer families after Bentham and Hooker are according to Hutchinson's "Genera of Flowering Plants (1967)". According to Bentham and hookers System of Classification various families are divided into following main group:-

ANGIOSPERMS

- A sterile jacket present over seeds.
- Ovules present inside a closed ovary.
- Pollination takes places through stigma and the style.

A. DICOTYLEDONS:

In stem, vascular bundles are in a circle. When perennial, concentric layers of xylem, separable bark and fascicular cambium is seen. Leaves with reticulate venation reticulate. Flower 'Pentamerous' or 'Tetramerous'. Two cotyledons in seed.

POLYPETALAE.

Flower with both calyx and corolla, Petals free (Polypetalous)

.

A.1.1:-Series: THALAMIFLORAE

Flower mostly regular and bi-sexual; sepals mostly free; sepals, petals and stamens hypogenous; disk mostly absent; ovary superior.

A.1.1.1.:- Pistill apocarpous (carpels embodded in the receptaclo in Nymphaeaceae). Flower regular, bisexual (unisexual in Menaspermaceae.)

I. Ranunculaceae (Ranunculus.) Herbs with radical and alternate leaves. Calyx often petaloid; stamens and carpels indefinite. Fruit a head of achenes.

II. Menispermanceae. Twining shrubs with alternate exstipulate leaves. Flower small, dioecious or polygamous, usally 3-merous; stamens 6, in two series, opposite the petals; staminodes present or 0 in the female flower; carpels 3.

III. Nymphaeaceae. Aquatic herbs with usually large peltate leaves. Sepals 4-5; petals and stamens many; carpels many, in pits of the torus or confluent with it. Fruit a spongy berry or of nuts sunk in the of a turbinate tours.

A.1.1.2. Pistil syncarpous, Unilocular (Bilocular in *Polygala*); Parietel Placentation (Pseudo velum Present in the middle To form Bilocular ovary in Cruciferae)

IV. Papaveraceae. Herbs with milky or coloured latex. Leaves alternate, exstipulate. Flower regular; sepals 2 or 3, caducous; petals 4 or 6; stamens indefinite, free; ovary 1-celled; ovules many, on parietal placentas which project into the ovary. Fruit a capsule.

V. Fumariaceae. Herbs with watery juice and much divided leaves. Flower small, Zygomorphic; sepals 2, small. scale-like; petals 4, in usually two very dissimilar pair; 2 outer large, one gibbous or spurred; stamens 2, tripartite; ovary 1-celled; ovules 2 or more on parietal placentas. Fruit indehiscent, 1-seeded.

VI.Cruciferae. Herbs with a alternate, exstipulate leaves. Flowers regular; sepals 4; petals 4, arranged in a cruciform manner, rarely 0; stamens tetradynamous, sometime less; ovary usually 2-celled by the projection inwards of the parietal placentas; ovules generally many. Fruit a siliqua or silicula, rarely indehiscent or transversely septate.

VII. Capparidaceae. Herbs, shrubs or trees, with alternate, simple or compound leaves; stipules modified into spines in Capparis. Flower regular or irregular; sepals 4; petals 4; stamens 4- many, at the base of or on a long or short gynophore; ovary sessile or stalked, 1-celled; ovules many, on 2-1 parietal placentas. Fruit capsular or baccate.

VIII. Resedaceae (Oligomeris) Herbs with linear fascicled leaves. Flower small, in pikes; calyx 4-partite; petals 2, free or connate; stamens 3-8; ovary 4-lobed, open above; ovules many, on 4 parietal placentas. Fruit a capsule.

IX. Violaces. Herbs with alternate, usually stipular leaves. Flower irregular; sepals 5, imbricate, persistent; petals 2, lowest largest, spurred or saccate at the base; stamens 5; ovary 1-celled with 3 parietal placentas. Fruit a 3-valved capsule.

X. Polygalaceae. Herbs with simple entire alternate exstipulate leaves. Flower irregular; sepals 5, unequal, the 2 inner petaloid; petals 3, the

anterior keel-shaped and generally crested; stamens 8, united in their lower half; ovary 2-celled, with one pendulous ovule in each cell. Capsule 2-celled, 2-seeded.

.:- Ovary Syncarpous, Monolocular, ovuled on Free cental or Basal Placentation

XI. Caryophyllaceae. Herbs, Leaves opposite, simple; stipules 0 or scarious. Flower regular, in dichasial cymes; sepals 4-5 free or connate; petals 4-5, rarely 0; stamens usually twice the petals, sometimes less; ovary usually unilocular, at least in the lower part; styles 2-5; ovules 2-many, on basal funicles or on a free central column. Fruit a 2-6 valved capsules. Embryo curved round the mealy perisperm.

XII. Portulacaceae. Succudages herbs with entire leaves having scaly or hairy nodal appendages. Flower regular; sepal 2, connate below, the free portion deciduous; petal 4-6, pergynous; stamens 4- many, pergynous; ovary ½-inferior. Fruit a capsules dehiscing transversely.

XIII. Tamaricaceae. Shrubs or tree with minute alternate exstipulate leaves. Flower bisexual or unisexual, regular; sepals and petals stamens mostly 5; ovary 1-celled; ovules many, basal. Fruit a 3-valved capsule. Seeds with a tuft of hairs.

.:-Ovary syncarpous, Mainly Bilocular/ Multilocular Axile Placentation

XIV. Elatinaceae. herbs or undershrubs. Leaves opposite. Flower minute regular; sepal and petals 5; stamens 5 or 10; overy 3-5 celled; cells many-ovules. Fruit a 3-5 valved septicidal capules.

XV. Malvaceae. Herbs, shrubs or tree, generally with stellate hair and mucilaginous juice. Leaves alternate, stipulate. Flower regular, usually bisexual; petals 5, valvate, free or conate; epicalyx often present; petals 5, twisted; stamens many, monadelphous; anthers 1-celled; overy 2-many-celled; ovules 1,2 many in each cell, axile. Fruit schizocarpic or capsular.

XVI.Tiliaceae. Herbs or shrubs. Leaves usually alternate, simple, stipulate. Flower mostly bisexual, regular; sepal 5 or 4, free or connate; petals 5 or 4; stamens usually many, free; anther 2-celled; ovary 2-5-celled; ovules 2-many in each cell; style simple. Fruit capsular.

.Families : **I-XVI.**

.:- Series: DISCIFORAE

Sepals free or united; torue generally expanded into a eushion-like or cupular disk between the petals and the ovary; disk rarely of glands; ovary often immersed in the disk

Families: ***XVII-XXII.***

XVII. Zygophyllaceae. Herbs with alternate or opposite leaves. Flower regular, bisexual; sepals and petals 4-5, free, imbricate; stamens 10-15, inserted at the base of the lobed disk; ovary 2-12lobed and celled; ovules 2 many in each cell. Fruit Schizocarpic or capsular.

XVIII. Geraniacae *(Oxalis)* Herbs with 3-folilate leaves and acid taste. Flowers regular, bisexual; sepals 5, imbricate; petals 5, contorted;

stamens 10; disk 0, ovary 5-celled; cells few-or many ovuled. Fruit capsule.

XIX. Rutaceae. Tree or shrubs. Leaves simple or compound, exstipulate, doted with pellucid gland. flowers bi- or unisexual, regular; sepals and petals generally 4-5; disk large or small; stamens definite or many; ovary 4-10 celled; ovules 1, 2 or many in each cell. Fruit fleshy.

XX. Meliaceae. Tree with alternate exstipulate compound leaves. Flowers regular, bisexual; calyx 5-6 lobed; petals 5-6; stamens 5-12, monadelphous or free; disk annular; ovary 3-6 celled; ovules 1-many in each cell. Fruit capsular or drupaceous.

XXI. Rhamnaceae. Tree or shrubs. Leaves alternate, simple, with 3-5 main nerves; stipules spinose. Flowers bisexual, regular; calyx 4-5 lobed, segment valvate; petals 4-5 small, sometimes 0;disk lining the calyx-tube 4-5 opposite the petals; ovary 2-4 celled with I ovule in each cell. Fruit indehiscent.

-Series: CALYCIFLORAE

Flower regular of irregular; sepals mostly connate, superior of inferior; disk mostly absent; stamens perigynous or epgynous ; ovary superior or inferior. Families: ***XXIII-XXXIV***

.

.:-Ovary superior, of 1-many free carpels.

XXIII. Papilionaceae. Herbs, shrubs or trees, often climbing, Leaves, alternate, stipulate, simple or compound. Flwers bisexual zygomorphic ; sekpals 5, generally more or less connate; petals 5, imbricate, posterior outermost and usually largest, two anterior innermost and connate ; stamens 10 or 9, diadelphous or monadelphous, rarely free ; carpel 1;

ovules 1-many on the ventral suture. Fruit a legume, sometimes indehiscent or lomentaceous. Endosperm generally absent.

XXIV. Caesalpiniaceae. Like Papilionaceae, but petals some-times fewer by obortion and the posterior innermost in bud (just the reverse of what is found in the Papilionaceae) ; stamens 10 or fewer by obortion, sometimes many, free or variously connate.

XXV. Misosaceae. Trees or shrubs. Leaves bipinnate. Flowers small, bisexual, rarely polygamous, regular, actinomorphic, 4- or 5-merous; calyx generally tubular; lobes valvate ; petals also usually valvate and connate below ; stamens as many or twice as many as petals or numerous, free or connate below, usually exserted; ynaecium, fruit and seeds as in Papilionaceae.

XXVI. Rosaceae. Herbs with alternate, compound, stipulate, leaves. Flowers regular, bisexual; clayx 5-lobed ; petals 5; stamens many, free ; carples few to may, fee; ovules solitary. Achenes on a dry receptacle.

Ovary inferior or included in the calyx-tube, syncarpous; style simple.

XXVII. Cactaceae. Stems flattened, jointed, succulent, prickly, apparently leafless. Flowers large, regular; sepals and petals alike in several series ; stamens numerous ; ovary inferior, 1-celled ; placentas 3 or more, parietal. Fruit a succulent berry.

XXVII. Combretaceae. Trees or shrubs with simple extipulate leaves. Flowers regular, bisexual; sepals 5, superior ; petals 5 or 0 ; stamens 10, 2-seriate; ovary 1-celled, inferior; ovules 1-5, pendulous from the top. Fruit indehiscent, generally angled or winged.

XXIX. Myrtaceae. Trees or shrubs with simple, entire, usually gland-dotted leaves. Flowers regular, bisexual ; calyx 4-5 lobed; petals 4-5, free

or united in a cap; stamens many, epigynous; ovary inferior, 2-4 celled ; cells many-ovuled ; style simple. Fruit capsular or fleshy.

XXX. Lythreaceae. Herbs, shrubs or trees. Leaves commonly opposite, exstipulate. Flowers bisexual, regular; calyx-tube free, persistent, 3-6 or more-lobed; petals 3-6 or 0 inserted near the top of the calyx-tube ; stamens 4-many, inserted on the calyx-tube ; ovary free in the bottom of the calyx-tube, 2-6 celled; ovules numerous; style simple. Fruit generally a many-seeded capsule.

XXXI. Onagraceae (Trapa). Floating herbs. Leaves alternate. Flowers regular, bisexual ; calyx-lobes 4, valvate ; petals 4; stamens 4, epigynous; ovary ½-inferior, 2-celled ; ovules solitary in each cell. Fruit indehiscent, 1-seeded.

.:- Ovary inferior or superior, synearpous (apocarpous in Gisekia), 1-5-celled;

styles free or only connate below.

XXXII. Cucurbitaceae. Large, weak, cirrose herbs. Leaves alternate, simple, lobed or compond. Flowers regular, unisexual; calyx-tube short, 5-lobed; petals 5, usually connate; stamens 3, on the calyx-tube ; anthers free or connate ; cells usually conduplicate; ovary inferior, 1-celled ; placentas 3, fleshy, often meeting in the centre stigmas 3; ovules many. Fruit fleshy.

XXXIII. Ficoileae. Herbs with simple, opposite or whorled leaves. Flowers regular, bisexual; sepals 5; petals 0; stamens perigynous or ------ 3-20; ovary free, 1-5 celled with many ovules or of 5 free 1-ovuled carples. Fruit capsular or of 5 achenes. Seeds reniform ; embryo curved round the mealy perisperm.

XXXIV. Umbelliferae, Herbs with alternate, simple or compound, exstipulate leaves, usually with sheathing bases. Flowrs in simple or compound unbels, bisexual, regular or corolla of outer flowers of an umbel rayed ; calyx superior, limb 5-fid or 0 ; petals 5, often in-flexed, free; stamens 5, epigynous, free ; ovary 2-celled, crowned with a large epigynous disk; styles two ; ovules solitary in each cell, pendulous. Fruit of two indehiscent mericarps, pendulous from the summit of the carpophore.

A.2. GAMOPETALAE

Flower with both calyx and corolla; Petals fused (Gamopetalous)

Families: ***XXXV-L.***

- ✓ Corolla is sometimes wanting in the *Cruciferae, Caryophyllacece, Lythracece and Ficoidece.*
- ✓ Flower with petals more or less united at the base occur in *Malvacece* and *Cucurbitaccae.*
- ✓ Calyx and ovary are ½-inferior in *Portulaca.*
- ✓ Disk is about in *Oxalis.*
- ✓ Stamens obscurely perigynous in *Papilinaceae, Caesalpiniaceae* and *Mimosaceae.*
- ✓ Limb of the calyx is suppressed in many *Composita:* free petals sometime occur in *Campanulaceae*; corolla scarious in *Plantaginaceae*

.:- Ovary inferior

XXXV. Rubiaceae (Galium). herbs with simple entire leaves in whorles of 3-8. Flowers bisexual, regular ; corolla 4-5 lobed ; stamens 4-5, epipetalous ; ovary inferior, 2-celled ; ovules solitary in each cell; styles 2.

XXXVI. Composite. Herbs or shrubs. Flowers arranged in a head on a common receptacle and surrounded by an involucre of bracts, all tubular, or the outer or all ligulare; calyx superior, limb of hairs scales or 0; corolla tubular in disk flowers, with 4 or 5 volavate lobes, ligulate in ray flowers ; stamens 5, epipetaloous, syngenesious ; ovary inferior, 1-celled ; ovule 1, basal, erect. Fruit an achene, with or without pappus.

XXXVII. Campunulaceae, Herbs. Leaves simple, alternate, exstipulate. Flowers regular, bisexual ; calyx superior or ½-superior, limb 5-partite ; corolla 5-lobed, lobes valvate; stamens 5, epipetalous ; anthers free or connate ; ovary 2-3 celled, many-ovuled ; stigma 2-3-lobed. Fruit a many-seeded capsule.

.:- Ovary superior ; placentation free central

XXXVIII. Primulaceae.*(Anagallis)*. Herbs with opposite, exstipulate leaves. Flower regular, bisexual; calyx 5-lobed, persistent; corolla 5-lobed, lobes imbricate; stamens 5, epi- and anti-petalous; ovary 1-celled; ovules many, on a free central. Fruit capsular.

.:-Ovary superior; placentation not free central; flower regular; leaves opposite (also Solanaccae and Plaantaginaceae also)

XXXIX. Salvadoraceae. Tree or shrubs with opposite, entire, exstipulate leaves. Flowers small, bisexual or functionally unisexual; calyx 4-partite; corolla 4-lobes; stamens 4, epipetalous; ovary 1-celled, with a solitary erect ovule. Fruit a 1-seeded drupe.

XL. Asclepiadacae Herbs or shrubs with milky juice, often twining. Leaves opposite, exstipulate, entire. Flowers regular, bisexual; calyx with 5 imbricate lobes; corolla 5-lobes; corona simple or of 5 or more scales, either corolline or staminal; stamens 5, epipetalous; filaments usually connate into a fleshly tube; anther 2-cekked, coherent round the stigma; pollen forming a pollinium in each cell, rarely granular; pollinia of contigous cells of different anthers attached to gland at the angles of the stigma; carpels 2, free, enclosed in the staminal-tube, many-ovuled; style 2; stigma 1, disk-like. Fruit of two follicles. Seeds crowned with a large tuft of hairs.

XLI. Gentianaceae. Herbs with opposite exstipulate leaves. Flowers regular, bisexual; calyx 4-5 partite; corolla 4-5 lobed; stamens 4-5, epitalous; ovary 1-celled; ovules many, on two parietal placentas; style simple; stigma 2. Fruit a many-seeded capsule.

.:- Ovary superior; placentation not free central; flower regular; leaves. alternate

XLII. Boraginaceae. Herbs, shrubs or tree. Leaves alternate (sub-opposite in Cordia Rothii), mostly entire, exstipulate. Flowers, bisexual, regular; calyx 4-8, usually 5-, lobed, persistent; corolla gererally 5-lobed, lobes imbricate ; stamens as many as the corolla-lobes, epipetalous ; ovary 2-celled, with 2 ovules in each cell, or 4-celled, with 1 ovule in each cell ; style commonly gynobasic. Fruit drupaceous or of 2-4 nutlets.

XLIII. Convolvulaceae. Herbs or shrubs, generally twining. Leaves alternate (absent in Cuscuta). Flowers regular, bisexual calyx of 5 sepals or 5-partite, persistent ; corolla campanulate or funnel-shaped, plinted or contorted in bud; stamens 5, epipetalous; ovary often surrounded by an annular disk, 2-celled, with 2 ovules in each cell, or 4-celled with one ovule in each cell ; style simpel or 2-fid ; stigmas 2- Fruit capsular, opening by valves or a lid, or indehiscent.

XLIV. Solanaceae. Herbs or under-shrubs. Leave alternate (rarely in unequal pairs), simple. Calyx 5-cleft, persistent, often accrescent ; corolla 5-lobed ; stamens 5, epipetalous ; ovary 2-celled or 4-celled ; oules many on large axile placentas. Fruit many-seeded, a berry or capsule.

.:-Ovary superior ; placentation not free central; flowers zygomorphic.

XLV. Scrophulariaceae. herbs. Leaves opposite or all or the upper alternate. Flowers zygomorphic, bisexual; calyx 5-fid or partite; corolla 4-5 lobed, generally 2-lipped, lobes imbricate ; stamens 4, or 2, or 5; ovary 2-celled; ovules many ; placentas axile, generally large ; style simple ; stigmas 2. Fruit a many-seeded capsule.

XLVI. Orobanchaceae. herbaceous root-parasites of a yellowish colour. Leaves only scaly. Flowers on a scape, bisexual, zygomorphic ; calyx 5-partite or spathulate ; corolla-tube funnel-shaped, with 5 imbricate lobes; stamens 4, didynamous ; anthers cohering in pairs, 1- or 2-celled ; ovary 1-celled ; ovules many, on 2 or 4 parietal placentas. Fruit a many-seeded capsule, obpening by valves.

XLVII. Acantheaceae. Herbs with opposite, exstipulate, simple leaves. Flowers zygomorphic, bisexual, generally with conspicuous bracts and bracteoles ; calyx 4-5 partite ; corolla 2-lipped ; stamens 4 or 2,

epipetalous ; anthers 2-celled ; ovary 2-celled ; ovules 1 or more, superposed in each cell ; stigmas often of unequal size. Fruit a loculicidal capsule. Seeds often on hook-like processes (retinaculae).

XLVIII. Verbenaceae. Herbs, shrubs or trees with generally opposite or whorled, exstipulate leaves. Flowers zygomorphic, bi-sexual, in heads, spikes or racemes; calyx persistent, usually 4-5 toothed; corolla 4-5 lobed, bilabiate or not; stamens generally 4, didynamous ; dsk present; ovary 2-4 celled (sometimes 1-celled in Verbena); ovules 1 or 2 in each cell (4 in Verbena). Fruit drupaceous, rarely capsular.

XLIX. Labilatae. Usually aromatic herbs or undershrubs. Leaves opposite exstipulate. Flowers zygomorphic, bisexual, usually in axillary cymose clusters ; calyx persistent, 4-5-cleft or bilabiate ; corolla mostly bilabiate ; stamens 4, didynamous, or 2; disk present; ovary 4-lobed, 4-celled ; ovule 1 in each cell ; style gynobasic. Fruit of 4 small indehiscent nutlets.

A.3.6. :- Ovary superior ; placentation not free central ; calyx, corolla and androecium 4-merous ; corolla scarious.

L. Plantaginaceae. Scapigerous herbs with radical leaves. Flowers in spikes, bisexual, regular ; sepals 4, imbricate, persistent ; corolla, scarious, tubular, 4-lobed ; stamens 4, epitetalous ; filaments long, flexuous ; ovary 2celled ; ovules many in each cell. Fruit a capsule opening transversely.

A.3. MONOCHLAMYDAE

Perianth single cycled, if double cycled both series ‘Sepaloid’;

Flowers often Dioecious (Unisexual)

Families: ***LI-LVIII.***

LI. Nyctaginaceae (Boerhaavia). Herbs with opposite, exstipulate leaves. Flowers small, bisexual ; perianth 5-lobed, coloured, tube persistent ; stamens 1-5, hypogynous, exserted ; ovary 1-celled, with 1 etect ovule. Fruit membranous, enclosed in the hardened perianth tube.

LII. Illecebraceae (Herniaria). Small, tufted herbs. Leaves opposite or upper alternate, narrow, with scarious stipules. Flowers minute, in green axillary clusters ; calyx 4-5 partite, persistent, closing over the fruit ; petals 4-5, minute, setaceous or 0 ; disk annular ; stamens 5 ; ovary superior, 1-celled, with 1 erect ovule ; style 2-fid. Fruit a small nut. Embryo annular, enclosing the mealy perisperm.

LIII. Amarantaceae. herbs or undersrubs. Leaves opposite or alternate, exstipulate, simple Flowers ini- or bisexual, generally with scarious bracts or bracteoles ; perianth-leaves 3-5, generally scarious, imbricate, persistent ; stamens mostly 3-5, oppposite the perianth leaves, filaments free or connate, or united with intervening staminodes into a hypogynous cup ; anthers 1- or 2-celled ; ovary superior, 1-celled ; ovule 1; styles 1-3. Fruit a small nut, occasionally opening by a lid. Embryo annular, enclosing the mealy perisperm.

LIV. Chenopodiaceae. Herbs or shrubs with simple, alternate exstipulate leaves. Flowers small, 1- or 2-sexual ; perianth-segments 3-5, rarely in female flowers 0, free or connate, imbricate, generally herbaceous, persistent ; stamens mostly as many as and opposite the perianth-segments, hypogynous or perigynous ; ovary superior, 1-celled, 1-ovuled ; stigmas 2-5. Fruit a small nut or achene enclosed within the perianth. Seeds with or without perisperm ; embryo annular or spirally coiled.

LV. Polygonaceae. Herbs with alternate, usually ochreate leaves. Perinath-segments 5 or 6, often coloured, persistent ; stamens 5-8 ; ovary

superior, 2-3-gonous, 1-celled ; ovule 1, basal, orthotropous ; styles 2 or 3. Fruit a small nut, generally enclosed in the perianth.

LVI. Euphorbiaceae. Herbs, shrubs or trees, often with milky juice. Leaves alternate or opposite, simple or rarely compound. Flowers small or minute, always 1-sexual (in Euphorbia, the males consisting of single naked stamens surround a female consisting of a solitary pistil and the whole surrounded by a perianth-like involucre formed by united bracts) : perianth single, rarely double or 0 ; disk often present ; stamens 1 or more; ovary superior, generally 3-celed ; ovules 1 or 2 in each cell, axile. Fruit schizocarpic, rarely drupaceous. Seeds albuminous, with or without an aril.

LVII. Urticaceae. Shrubs or tree, often with milky juice. Leaves alternate, stipulate. Flowers unisexual, small or minute, often sunk in a fleshy disk or enclosed in a fleshy receptacle ; perianth gamophyllous, lobed or partite ; stamens as many as and opposite the perianth-segments or fewer ; ovary superior, 1-celled, 1-ovuled. Fruit simple achenial, or compound of confluent pericarps, perianths and the inflorescence axis.

LVIII. Salicaceae. Dioecious trees or shrubs. Leaves alternate, stipulate. Flowers in catkins, bracteate; perianth 0; disk of glands or cupular; stamens 2-many ; ovary 1-celled, with many ovules on 2-4 parietal placentas. Fruit a capsule opening by 2-4 valves. Seeds with a basal tuft of long silky hairs.

B. MONOCOTYLEDONS.

Generally herbs. Vascular bundles in a trans. verse section of the stem mostly scattered and without cambium. Secondary growth in thickness in

the stem generally absent. Leaves largely paralled-veined. Perianth generally trimerous. Embryo with a single cotyedon; radicle not growing into a tap root, but soon stopping its growth, its function being taken up by adventitious roots from the base of the stem. Families: ***LIX-LXXI.***

A. DICOTYLEDONS.

I. Polypetalae.

a. **Thalamiflorae**.

I. Pistill apocarpous (carpels embodded in the receptaclo in Nymphaeaceae). Flower regular, bisexual (unisexual in Menaspermaceae.)

I. Ranunculaceae (Ranunculus.) Herbs with radical and alternate leaves. Calyx often petaloid; stamens and carpels indefinite. Fruit a head of achenes.

II. Menispermanceae. Twining shrubs with alternate exstipulate leaves. Flower small, dioecious or polygamous, usally 3-merous; stamens 6, in two series, opposite the petals; staminodes present or 0 in the female flower; carpels 3.

III. Nymphaeaceae. Aquatic herbs with usually large peltate leaves. Sepals 4-5; petals and stamens many; carpels many, in pits of the torus or confluent with it. Fruit a spongy berry or of nuts sunk in the of a turbinate tours.

2. Pistil syncarpous, 1-celled(2-0celled in Polygala); placentas parietal (meeting in the meddle to form a 2-celled fruit in Crucifera).

IV. Papaveraceae. Herbs with milky or coloured latex. Leaves alternate, exstipulate. Flower regular; sepals 2 or 3, caducous; petals 4 or 6;

stamens indefinite, free; ovary 1-celled; ovules many, on parietal placentas which project into the ovary. Fruit a capsule.

V. Fumariaceae. Herbs with watery juice and much divided leaves. Flower small, Zygomorphic; sepals 2, small. scale-like; petals 4, in usually two very dissimilar pair; 2 outer large, one gibbous or spurred; stamens 2, tripartite; ovary 1-celled; ovules 2 or more on parietal placentas. Fruit indehiscent, 1-seeded.

VI.Cruciferae. Herbs with a alternate, exstipulate leaves. Flowers regular; sepals 4; petals 4, arranged in a cruciform manner, rarely 0; stamens tetradynamous, sometime less; ovary usually 2-celled by the projection inwards of the parietal placentas; ovules generally many. Fruit a siliqua or silicula, rarely indehiscent or transversely septate.

VII. Capparidaceae. Herbs, shrubs or trees, with alternate, simple or compound leaves; stipules modified into spines in Capparis. Flower regular or irregular; sepals 4; petals 4; stamens 4- many, at the base of or on a long or short gynophore; ovary sessile or stalked, 1-celled; ovules many, on 2-1 parietal placentas. Fruit capsular or baccate.

VIII. Resedaceae (Oligomeris) Herbs with linear fascicled leaves. Flower small, in pikes; calyx 4-partite; petals 2, free or connate; stamens 3-8; ovary 4-lobed, open above; ovules many, on 4 parietal placentas. Fruit a capsule.

IX. Violaces. Herbs with alternate, usually stipular leaves. Flower irregular; sepals 5, imbricate, persistent; petals 2, lowest largest, spurred or saccate at the base; stamens 5; ovary 1-celled with 3 parietal placentas. Fruit a 3-valved capsule.

X. Polygalaceae. Herbs with simple entire alternate exstipulate leaves. Flower irregular; sepals 5, unequal, the 2 inner petaloid; petals 3, the anterior keel-shaped and generally crested; stamens 8, united in their

lower half; ovary 2-celled, with one pendulous ovule in each cell. Capsule 2-celled, 2-seeded.

3. ovary syncarpous, 1-celled; ovuled on free central or basal placentas.

XI. Caryophyllaceae. Herbs, Leaves opposite, simple; stipules 0 or scarious. Flower regular, in dichasial cymes; sepals 4-5 free or connate; petals 4-5, rarely 0; stamens usually twice the petals, sometimes less; ovary usually unilocular, at least in the lower part; styles 2-5; ovules 2-many, on basal funicles or on a free central column. Fruit a 2-6 valved capsules. Embryo curved round the mealy perisperm.

XII. Portulacaceae. Succudages herbs with entire leaves having scaly or hairy nodal appendages. Flower regular; sepal 2, connate below, the free portion deciduous; petal 4-6, pergynous; stamens 4- many, pergynous; ovary ½-inferior. Fruit a capsules dehiscing transversely.

XIII. Tamaricaceae. Shrubs or tree with minute alternate exstipulate leaves. Flower bisexual or unisexual, regular; sepals and petals stamens mostly 5; ovary 1-celled; ovules many, basal. Fruit a 3-valved capsule. Seeds with a tuft of hairs.

4. Ovary syncarpous, 2 many-celled; placentation axile.

XIV. Elatinaceae. herbs or undershrubs. Leaves opposite. Flower minute regular; sepal and petals 5; stamens 5 or 10; overy 3-5 celled; cells many-ovules. Fruit a 3-5 valved septicidal capules.

XV. Malvasae. Herbs, shrubs or tree, generally with stellate hair and mucilaginous juice. Leaves alternate, stipulate. Flower regular, usually bisexual; petals 5, valvate, free or conate; epicalyx often present; petals 5, twisted; stamens many, monadelphous; anthers 1-celled; overy 2-many-celled; ovules 1,2 many in each cell, axile. Fruit schizocarpic or capsular.

XVI.Tiliaceae. Herbs or shrubs. Leaves usually alternate, simple, stipulate. Flower mostly bisexual, regular; sepal 5 or 4, free or connate;

petals 5 or 4; stamens usually many, free; anther 2-celled; ovary 2-5-celled; ovules 2-many in each cell; style simple. Fruit capsular.

b.Disciflorae

XVII. Zygophyllaceae. Herbs with alternate or opposite leaves. Flower regular, bisexual; sepals and petals 4-5, free, imbricate; stamens 10-15, inserted at the base of the lobed disk; ovary 2-12lobed and celled; ovules 2 many in each cell. Fruit Schizocarpic or capsular.

XVIII. Geraniacae *(Oxalis)* Herbs with 3-folilate leaves and acid taste. Flowers regular, bisexual; sepals 5, imbricate; petals 5, contorted; stamens 10; disk 0, ovary 5-celled; cells few-or many ovuled. Fruit capsule.

XIX. Rutaceae. Tree or shrubs. Leaves simple or compound, exstipulate, doted with pellucid gland. flowers bi- or unisexual, regular; sepals and petals generally 4-5; disk large or small; stamens definite or many; ovary 4-10 celled; ovules 1, 2 or many in each cell. Fruit fleshy.

XX. Meliaceae. Tree with alternate exstipulate compound leaves. Flowers regular, bisexual; calyx 5-6 lobed; petals 5-6; stamens 5-12, monadelphous or free; disk annular; ovary 3-6 celled; ovules 1-many in each cell. Fruit capsular or drupaceous.

XXI. Rhamnaceae. Tree or shrubs. Leaves alternate, simple, with 3-5 main nerves; stipules spinose. Flowers bisexual, regular; calyx 4-5 lobed, segment valvate; petals 4-5 small, sometimes 0;disk lining the calyx-tube 4-5 opposite the petals; ovary 2-4 celled with I ovule in each cell. Fruit indehiscent.

XXIII. ANACARDIACEAE: - Tree or shrubs, branched; leaves, alternate, oblong lanceolate; flowers on terminal panicle; yellowish green; fruits are drupes; ellipticle and light brown seeds.

XXIV. MORINGACEAE: - **E**vergreen tree; leaves bipinnate, leaflets abovate, flowers creamish-white in panicles; fruits 20-25 cm long, triquetrous, constricted between seeds; seeds tri-winged, blackish-brown.

A.1.3:-Series: CALYCIFLORAE

Flower regular of irregular; sepals mostly connate, superior of inferior; disk mostly absent; stamens perigynous or epgynous ; ovary superior or inferior.

Families: **XXV to -XXXIV**

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.:-Ovary superior, of 1-many free carpels.

XXV. FABACEAE: - Herbs, shrubs or trees, often climbing, Leaves, alternate, stipulate, simple or compound. Flowers bisexual zygomorphic; sepals 5, generally more or less connate; petals 5, imbricate, posterior outermost and usually largest, two anterior innermost and connate; stamens 10 or 9, diadelphous or monadelphous, rarely free; carpel 1; ovules 1-many on the ventral suture. Fruit a legume, sometimes indehiscent or lomentaceous. Endosperm generally absent.

XXVI. CAESALPINIACEAE:- Like Papilionaceae, but petals some-times fewer by obortion and the posterior innermost in bud (just the reverse of what is found in the Papilionaceae) ; stamens 10 or fewer by obortion, sometimes many, free or variously connate.

XXVII. MIMOSACEAE: - Trees or shrubs. Leaves bipinnate. Flowers small, bisexual, rarely polygamous, regular, actinomorphic, 4- or 5-merous; calyx generally tubular; lobes valvate ; petals also usually valvate and connate below ; stamens as many or twice as many as petals or numerous, free or connate below, usually exserted; gynoecium, fruit and seeds as in Papilionaceae.

XXVIII. ROSACEAE: - Herbs with alternate, compound, stipulate, leaves. Flowers regular, bisexual; calyx 5-lobed; petals 5; stamens many, free; carpels few to may, fee; ovules solitary. Achenes on a dry receptacle.

Ovary inferior or included in the calyx-tube, Syncarpous; style simple.

XXIX. COMBRETACEAE: - Trees or shrubs with simple exstipulate leaves. Flowers regular, bisexual; sepals 5, superior; petals 5 or 0; stamens 10, 2-seriate; ovary 1-celled, inferior; ovules 1-5, pendulous from the top. Fruit indehiscent, generally angled or winged.

XXX. MYRTACEAE: - Trees or shrubs with simple, entire, usually gland-dotted leaves. Flowers regular, bisexual; calyx 4-5 lobed; petals 4-5, free or united in a cap; stamens many, epigynous; ovary inferior, 2-4 celled ; cells many-ovuled ; style simple. Fruit capsular or fleshy.

XXXI. LYTHRACEAE: - Herbs, shrubs or trees. Leaves commonly opposite, exstipulate. Flowers bisexual, regular; calyx-tube free, persistent, 3-6 or more-lobed; petals 3-6 or 0 inserted near the top of the calyx-tube; stamens 4-many, inserted on the calyx-tube; ovary free in the bottom of the calyx-tube, 2-6 celled; ovules numerous; style simple. Fruit generally a many-seeded capsule.

.:- Ovary inferior or superior, syncarpous (apocarpous in Gisekia), 1-5-celled;

Styles free or only connate below.

XXXII. CUCURBITACEAE: - Large, weak, cirrose herbs. Leaves alternate, simple, lobed or compound. Flowers regular, unisexual; calyx-tube short, 5-lobed; petals 5, usually connate; stamens 3, on the calyx-

tube ; anthers free or connate ; cells usually conduplicate; ovary inferior, 1-celled ; placentas 3, fleshy, often meeting in the centre stigmas 3; ovules many. Fruit fleshy.

XXXIII. CACTACEAE: - Stems flattened, jointed, succulent, prickly, and apparently leafless. Flowers large, regular; sepals and petals alike in several series; stamens numerous; ovary inferior, 1-celled; placentas 3 or more, parietal. Fruit a succulent berry.

XXXIV. MOLLUGINACEAE: - Stems flattened, jointed, succulent, prickly, and apparently leafless. Flowers large, regular; sepals and petals alike in several series; stamens numerous; ovary inferior, 1-celled; placentas 3 or more, parietal. Fruit a succulent berry.

GAMOPETALAE

Flower with both calyx and corolla; Petals fused (Gamopetalous)

Families: **XXXV-LVI**

- ✓ Corolla is sometimes wanting in the *Cruciferae, Caryophyllacece, Lythracece and Ficoidece.*
- ✓ Flower with petals more or less united at the base occur in *Malvacece* and *Cucurbitaccae.*
- ✓ Calyx and ovary are ½-inferior in *Portulaca.*
- ✓ Disk is about in *Oxalis.*
- ✓ Stamens obscurely perigynous in *Papilinaceae, Caesalpiniaceae* and *Mimosaceae.*
- ✓ Limb of the calyx is suppressed in many *Composita:* free petals sometime occur in *Campanulaceae*; corolla scarious in *Plantaginaceae*

.:- Ovary inferior

XXXV. RUBIACEAE: - Herbs with simple entire leaves in whorles of 3-8. Flowers bisexual, regular; corolla 4-5 lobed; stamens 4-5, epipetalous; ovary inferior, 2-celled; ovules solitary in each cell; styles 2.

XXXVI. ASTERACEAE: - Herbs or shrubs. Flowers arranged in a head on a common receptacle and surrounded by an involucre of bracts, all tubular, or the outer or all ligulare; calyx superior, limb of hairs scales or 0; corolla tubular in disk flowers, with 4 or 5 valvate lobes, ligulate in ray flowers ; stamens 5, epipetalous, syngenesious ; ovary inferior, 1-celled ; ovule 1, basal, erect. Fruit an achene, with or without pappus.

.:- Ovary superior; placentation free central

XXXVII. PRIMULACEAE: - Herbs with opposite, exstipulate leaves. Flower regular, bisexual; calyx 5-lobed, persistent; corolla 5-lobed, lobes imbricate; stamens 5, epi- and anti-petalous; ovary 1-celled; ovules many, on a free central. Fruit capsular.

XXXVIII. SAPOTACEAE: - Evergreen tree, 10-20 m high; black-gray bark; odovate , alternate leaves; white, axillary solitary, flowers; yellow-red ovoid berries; ovoid seed.

XXXIX. EBENACEAE: - Tall deciduous tree; branched, palmately compound leaf, broad elliptic leaves penta to hepta foliate, leaflets elliptic lanceolate; inf. solitary axillary, flowers large cup shaped, red; fruit is a capsule; seeds brown covered with white wooly hairs

.:-OVary superior; placentation not free central; Flower regular; leaves opposite (also Solanaceae and Plantaginaceae also)

XL. OLEACEAE: - Erect, evergreen, perennial shrub; much branched, stem branched green, angular; small elliptic ovate leaves; pale white flowers in terminal corymb; black ellipsoid berries.

XLI. NYCTANTHACEAE: - Erect, evergreen, large, perennial shrub; much branched, stem branched green, quadriangular; simple, ovate, opposite leaves covered with hairs; axillary solitary, orange coloured, tubular flowers; fruit is a capsule.

XLII. SALVADORACEAE: - Tree or shrubs with opposite, entire, exstipulate leaves. Flowers small, bisexual or functionally unisexual; calyx 4-partite; corolla 4-lobes; stamens 4, epipetalous; ovary 1-celled, with a solitary erect ovule. Fruit a 1-seeded drupe.

XLIII. APOCYNACEAE: - Erect spreading perennial shrubs with milky juice, shrub; stem spiny or glabrous, much branched; leaves opposite, ex-stipulate, entire, elliptic, opposite white or yellow flowers in corymb; fruit are violet/ brown, elliptic berries or capsules.

XLIV. ASCLEPIADACAE: - Herbs or shrubs with milky juice, often twining. Leaves opposite, ex-stipulate with entire margin. Flowers regular, bisexual; calyx with 5 imbricate lobes; corolla 5-lobes; corona simple or of 5 or more scales, either corolline or staminal; stamens 5, epipetalous; filaments usually connate into a fleshly tube; anther 2-cekked, coherent round the stigma; pollen forming a pollinium in each cell, rarely granular; pollinia of contiguous cells of different anthers attached to gland at the angles of the stigma; carpels 2, free, enclosed in the staminal-tube, many-ovuled; style 2; stigma 1, disk-like. Fruit are with two follicles. Seeds crowned with a large tuft of hairs.

.:- Ovary superior; placentation not free central;

Flower regular; leaves. Alternate

XLV. BORAGINACEAE: - Herbs, shrubs or tree. Leaves alternate (sub-opposite in *Cordia rothii)*, mostly entire, exstipulate. Flowers, bisexual, regular; calyx 4-8, usually 5-, lobed, persistent; corolla generally 5-lobed, lobes imbricate ; stamens as many as the corolla-lobes, epipetalous ; ovary 2-celled, with 2 ovules in each cell, or 4-celled, with 1 ovule in each cell ; style commonly gynobasic. Fruit drupaceous or of 2-4 nutlets.

XLVI. EHRETIACEAE: - Long tree; much branched; leaves, simple, broad, alternate, elliptic axillary cyme; flowers small, white; fruits are globose, drupe, filled with sticky pulp, single seeded.

XLVII. CONVOLVULACEAE:- Herbs or shrubs, generally twining. Leaves alternate (absent in *Cuscuta*). Flowers regular, bisexual calyx of 5 sepals or 5-partite, persistent; corolla companulate or funnel-shaped, plinked or contorted in bud; stamens 5, epipetalous; ovary often surrounded by an annular disk, 2-celled, with 2 ovules in each cell, or 4-celled with one ovule in each cell; style simple or 2-fid; stigmas 2- Fruit capsular, opening by valves or a lid, or indehiscent.

XLVIII. CUSCUTACEAE: - Herb; stem thin, dark or light yellow, twinning, densely branched over host plant; yellow flowers in cyme. Fruit is a capsule; seeds 4, brown.

XLIX. SOLANACEAE: - Herbs or under-shrubs. Leave alternate (rarely in unequal pairs), simple. Calyx 5-cleft, persistent, often accrescent; corolla 5-lobed; stamens 5, epipetalous; ovary 2-celled or 4-celled; ovules many on large axile placentas. Fruit many-seeded, a berry or capsule.

.:-OVary superior; placentation not free central; Flowers zygomorphic.

L. SCROPHULARIACEAE: - Herbs. Leaves opposite or all or the upper alternate. Flowers zygomorphic, bisexual; calyx 5-fid or partite; corolla 4-5 lobed, generally 2-lipped, lobes imbricate; stamens 4, or 2, or 5; ovary 2-celled; ovules many; placentas axile, generally large; style simple; stigmas 2. Fruit a many-seeded capsule.

LI. BIGNONIACEAE: - Tall evergreen tree; much branched, gray-black rough bark; leaves long, elongate ovate , imperipinnate, 20-30 cm long, ovate-lanceolate, serrate; flowers cup shaped, dark red; long ovate elongated woody fruits.

LII. PEDALIACEAE: - Annual, erect, herb; stem soft, branched, spreading; upper leaves lenceolate, lower leaves segmented, alternate, opposite, serrate margin; flowers white, infundibulate, axillary, solitary; fruit is beaked, oblong capsule; minute black seeds.

LIII. MARTYNIACEAE: - Annual, erect, herb or shrub, stem succulent, branched, covered with glandular hairs; leaves ovate, opposite, dentate margin, flowers in axillary raceme , tubular, white, purple, infundibulate; fruits are green drupes with two terminal hooks, seeds black, oblong.

LIV. ACANTHEACEAE: - Herbs with opposite, exstipulate, simple leaves. Flowers zygomorphic, bisexual, generally with conspicuous bracts and bracteoles; calyx 4-5 partite; corolla 2-lipped; stamens 4 or 2, epipetalous; anthers 2-celled; ovary 2-celled; ovules 1 or more, superposed in each cell; stigmas often of unequal size. Fruit a loculicidal capsule. Seeds often on hook-like processes (retinaculae).

LV. VERBENACEAE: - Herbs, shrubs or trees with generally opposite or whorled, exstipulate leaves. Flowers zygomorphic, bi-sexual, in heads, spikes or racemes; calyx persistent, usually 4-5 toothed; corolla 4-5 lobed, bilabiate or not; stamens generally 4, didynamous ; disk present;

ovary 2-4 celled (sometimes 1-celled in Verbena); ovules 1 or 2 in each cell (4 in Verbena). Fruit drupaceous, rarely capsular.

LVI. LAMIACEAE: - Usually aromatic herbs or undershrubs. Leaves opposite exstipulate. Flowers zygomorphic, bisexual, usually in axillary cymose clusters; calyx persistent, 4-5-cleft or bilabiate; corolla mostly bilabiate; stamens 4, didynamous, or 2; disk present; ovary 4-lobed, 4-celled; ovule 1 in each cell; style gynobasic. Fruit of 4 small indehiscent nutlets.

MONOCHLAMYDAE

Perianth single cycled, if double cycled both series 'Sepaloid';

Flowers often Dioecious (Unisexual)

Families: **LVII-LXVI**

LVII. NYCTAGINACEAE:-Herbs with opposite, exstipulate leaves. Flowers small, bisexual; perianth 5-lobed, coloured, tube persistent; stamens 1-5, hypogynous, exserted; ovary 1-celled, with 1 erect ovule. Fruit membranous, enclosed in the hardened perianth tube.

LVIII. AMARANTACEAE: - herbs or undersrubs. Leaves opposite or alternate, exstipulate, simple Flowers uni- or bisexual, generally with scarious bracts or bracteoles ; perianth-leaves 3-5, generally scarious, imbricate, persistent ; stamens mostly 3-5, oppposite the perianth leaves, filaments free or connate, or united with intervening staminodes into a hypogynous cup ; anthers 1- or 2-celled ; ovary superior, 1-celled ; ovule 1; styles 1-3. Fruit a small nut, occasionally opening by a lid. Embryo annular, enclosing the mealy perisperm.

LIX. CHENOPODIACEAE: - Herbs or shrubs with simple, alternate exstipulate leaves. Flowers small, 1- or 2-sexual ; perianth-segments 3-5, rarely in female flowers 0, free or connate, imbricate, generally

herbaceous, persistent ; stamens mostly as many as and opposite the perianth-segments, hypogynous or perigynous ; ovary superior, 1-celled, 1-ovuled ; stigmas 2-5. Fruit a small nut or achene enclosed within the perianth. Seeds with or without perisperm; embryo annular or spirally coiled.

LX. POLYGONACEAE: - Herbs with alternate usually ochreate leaves. Perinath-segments 5 or 6, often coloured, persistent; stamens 5-8; ovary superior, 2-3-gonous, 1-celled; ovule 1, basal, orthotropous; styles 2 or 3. Fruit a small nut, generally enclosed in the perianth.

LXI. ARISTOLOCHIACEAE: - Perennial, prostrate herb; stem angular, branches spreading; leaves simple, alternate, reniform, margin wavy; light yellow flowers; solitary axillary; fruit is elongated capsule.

LXII. SANTALACEAE: - Small, evergreen tree; semi root parasite; bark red; leaves alternate, thin, elliptic, acute apex; terminal bichacial cyme; flowers red-brown; fruit is a globose drupe.

LXIII. EUPHORBIACEAE: - Herbs, shrubs or trees, often with milky juice. Leaves alternate or opposite, simple or rarely compound. Flowers small or minute, always 1-sexual (in Euphorbia, the males consisting of single naked stamens surround a female consisting of a solitary pistil and the whole surrounded by a perianth-like involucre formed by united bracts): perianth single, rarely double or 0; disk often present; stamens 1 or more; ovary superior, generally 3-celled; ovules 1 or 2 in each cell, axle. Fruit schizocarpic, rarely drupaceous. Seeds albuminous, with or without an aril.

LXIV. ULMACEAE:- Large, deciduous tree, bark gray, much branched; leaves simple, alternate, cordate; flowers dioeceous but plant is monoecious; yellow- green flowers in clusters; fruit is orbicular samara. Single seeded.

LXV. MORACEAE: - Very large, evergreen, much branched tree; long prop root present for additional support; leaves simple, alternate, obovate, covered by downy hairs; flowers develop internally; inflorescence is axillary, paired hypanthodium, male flowers near mouth and female flowers in center; fruit is syconus; globular seeds

LXVI. CASUARINACEAE: - Erect, deciduous, conical, monoecious, much-branched tree; grey-brown bark; drooping branches; leaves long, scaly- lanceolate; male spikelets axillary in group, female spikelets in conelike cluster. Fruit is samara.

B. MONOCOTYLEDONS

Generally herbs. Vascular bundles in a trans. verse section of the stem mostly scattered and without cambium. Secondary growth in thickness in the stem generally absent. Leaves largely parallel-veined. Perianth generally trimerous. Embryo with a single cotyledon; radicle not growing into a tap root, but soon stopping its growth, its function being taken up by adventitious roots from the base of the stem.

Families: **LXVII-LXXIII**

B.1.:- OVARY INFERIOR

LXVII. CANNACEAE: - Erect , perennial, rhizomous herb; pseudostem; leaves subsessile, elliptic- lanceolate, entire margin,acute apex; inflorecence terminal panicle; flowers funnel shape, yellow with red shades; fruit is capsule. **LXVIII.MUSACEAE:-** Perennial herbs, sometimes quite large. Flowers zygomorphic, bisexual; perianth in two whorls, inner or both petaloid; fertile stamens 1-5; ovary inferior,

generally 3-celled; style not adnate to any stamen, generally long; ovules a few or many. Fruit capsular or baccate.

B. 2.:- OVARY SUPERIOR

LXIX. LILACEAE: - Terrestrial herbs. Flowers bisexual, regular; perianth-segments 6, free or connate, 2-seriate, petaloid; stamens 6, hypogynous or on the perianth; ovary superior, 3-celled; cells 2- or more-ovuled. Fruit capsular. Seeds aluminous.

LXX. PANDANACEAE: - Erect, perennial, shrub; cylindrical stem supported by stilt roots; leaves simple, very long linear with spiny margin; Inflorecence spadix; male flower on spike branches, female flowers in group; fruits are drupe, single seeded.

LXXI. ARECACEAE (PALMAE):- Dioecious trees with a columnar stem and a crown of pinnate leaves. Inflorescence large, at first enclosed in coriaceous spathes. Flowers 1-sexual, regular; perianth-segments 6, 2-seriate; stamens 6, at the base of perianth-segments; anthers versatile; ovary superior, of 3 free carpels. Fruit a berry.

LXXII. CYPERACEAE: - Erect herbs, branched diffused herb, stem glabrous, triangular, branched, leaves alternate, linear, inflorescence spike, greenish white, unilocular ovary, fruits caryopsis.

LXXIII. POACEAE: - Erect or runner, herbs or shrub, annual or perennial, adventitious roots from nodes, branched and diffused herb, stem glabrous, cylindrical branched, leaves alternate, linear, inflorescence spike of spikelets,, greenish white, fruits caryopsis.

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CHAPTER: VII

SYSTEMATIC ENUMERATION OF SPECIES

A. DICOTYLEDONS:

POLYPETALAE

Series: THALAMIFLORAE

Family I to XIII

Series: DISCIFLORAE

Family XIV to XXIV

Series: CALYCIFLORAE

Family XXV to XXXIV

GAMOPETALAE

Family XXXV to LVI

MONOCHLAMYDAE

Family LVII to LXVI

B. MONOCOTYLEDONS:

B. 1:- OVARY INFERIOR

Family LXVII to LXVIII

B. 2:- OVARY SUPERIOR

Family LXIX to LXXIII

CHAPTER: VII

SYSTEMATIC ENUMERATION OF SPECIES
(FIG: - 05 A-D TO 48 A-D)

A. DICOTYLEDONS

I. RANUNCULACEAE

1. ***Ranununculus sceleratus*** Linn.

Ranununculus sceleratus Linn. in Sp. Pl. 551. 1753; Roxburgh, Fl. Ind. 35. 1820; Hooker, Fl. Brit. India 2: 661. 1881; Duthie, Fl. Gangetic Plain 1: 19. 1903; Maheshwari, Fl. Delhi. 50, 1963; Maheshwari, Ill. Fl. Delhi. 01. 1966; Sharma, Fl. Raj (Hadoti). 26, 2002.

Local name: Jal dhania

Characteristics:

Erect glabrous, annual; steml-2 ft., fleshy and branched; leaves 3-lobed / partite, lower petioled, upper leaves trifid with linear segments; flowers small, yellow; Calyx reflexed, woolly outside; petals oblong; achenes numerous.

Fl. and Fr. : October-January.

Habitat : Found near margins of stagnant or running water.

II. MENISPERMACEAE

2. ***Cocculus hirsutus*** (Linn.) Diels

Cocculus hirsutus (Linn.) Diels in Engler, Pflenzner. IV. 94: 236. 1910; Hooker, Fl. Brit. India 1 : 102. 1872; Duthie, Fl. Gangetic Plain 1: 29. 1903; Bhandari, Fl. Ind. Desert 27. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 61. 1987; Sharma, Fl. Raj (Hadoti). 28. 2002.

Local name: Pilwan

Characteristics:

Twining, woody, 4-5 m high, much-branched shrub; branches slender; Leaves oblong-lanceolate to oblong-ovate, cuneate at base, glabrous or slightly puberulous on both surface; Male flowers minute, sub sessile, in axillary fascicles peduncles; sepals ovate-elliptic; Female flower axillary, solitary; fruit s are drupes black on drying.

Fl. and Fr. : October-January.

Habitat : Found twining usually on *Prosopis juliflora* or *Capparis decidua*

3. ***Tinospora cordifolia*** (Willd.) Meirs.

Tinospora cordifolia (Willd.) Meirs in An. & Mag, Hat. Hist. Ser. 27: 38.1851; Hooker. Fl. Brit. India 1 : 97. 1872; Duthie, Fl. Gangetic Plain 1: 26. 1903; Bhandari, Fl. Ind. Desert 29. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 62. 1987; Sharma, Fl. Raj (Hadoti). 28. 2002. Yadav and Meena Fl. SC Rajasthan 36. 2011.

Local name: Nim giloe

Characteristics:

Tall deciduous climber, much-branched; Leaves Ovate to oblong-ovate, glabrous on both surface; Male flowers minute, in two series, sub sessile, sepals ovate-elliptic; petal subequal, membranous; female flower axillary, solitary; fruit are drupes crimson.

Fl. and Fr. : March- June.

Habitat : Found twining usually on trees and hedges.

III. PAPAVERACEAE

4. ***Argemone maxicana*** Linn.

Argemone maxicana Linn. in Sp. Pl. 508.1753; Hooker. Fl. Brit. India 1 : 117. 1872; Duthie, Fl. Gangetic Plain 1: 36. 1903; Bhandari, Fl. Ind. Desert 30. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 64. 1987; Sharma, Fl. Raj (Hadoti). 28. 2002. Yadav and Meena Fl. SC Rajasthan 39. 2011.

Local name: Pili Kateli, Satyanashi

Characteristics:

Pricky annual herb; stem tall, branched, covered with prikles; leaves Leaves alternate, elliptic-oblong, pinnatified, covered with prikles; flowers sessile, right yellow, ovary ovate; fruit is capsule, seeds many , black.

Fl. and Fr. : May- June.

Habitat : Common in waste places.

5. ***Argemone achroleuca*** Sweet

Argemone achroleuca Sweet. in Brit. Fl. Gaerd.3: 242.1828; Hooker, Fl. Brit. India 1 : 117. 1872; Duthie, Fl. Gangetic Plain 1: 36. 1903; Maheshwari, Fl. Delhi. 55, 1963; Bhandari, Fl. Ind. Desert 30. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 64. 1987; Sharma, Fl. Raj (Hadoti). 29. 2002; Yadav and Meena Fl. SC Rajasthan 40. 2011.

Local name: Satyanashi

Characteristics:

Pricky annual herb; stem tall, branched, covered with prikles; leaves Leaves alternate, elliptic-oblong, pinnatified, covered with prikles; flowers sessile, white (pale white), ovary ovate; fruit is capsule, seeds many , black.

Fl. and Fr. : May- June.

Habitat : Common in waste places.

IV. BRASSICACEAE

6. ***Sisymbrium irio*** Linn.

Sisymbrium irio Linn. in Sp. Pl.659.1573; Hooker, Fl. Brit. India 1 : 150. 1872; Duthie, Fl. Gangetic Plain 1: 42. 1903; Bhandari, Fl. Ind. Desert 35. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 77. 1987; Sharma, Fl. Raj (Hadoti). 32. 2002; Yadav and Meena, Fl. SC Rajasthan 45. 2011.

Local name: Asalio

Characteristics:

Annual herbs, erect, branched; leaves pinnately lobed, laurate; Inflorescence a terminal raceme; Flowers 5-6mm across, yellow; Sepals 3-4 mm long, oblong, strigose; Petals oblong, cuneate at base, rounded at apex; stamens long, stigma bilobed. Fruit a siliqua (linear); seeds brownish-black.

Fl. and Fr. : January -February

Habitat : Common in agriculture fieds and wetlands.

V. CLEOMACEAE

7. ***Cleome gynandra*** Linn.

Cleome gynandra Linn. in Sp. Pl.671. 1753; Hook. F. & Thoms in Hooker. f. F1. Brit. India 1 : 171. 1872; Duthie, F1 Gangetic Plain 1 : 51 1903; Bhandari,F1. Indian Desert 40. 1978; Parmar in Shetty & Singh, F1. Rajasthan 1 : 80. 1987; Sharma, Fl. Raj (Hadoti). 32. 2002; Yadav and Meena, Fl. SC Rajasthan 46. 2011.

Local name: Safed-bagro.

Characteristics:

Annual herbs, upto 50 cm high; stem much-branched, clothed with long and short, glandular, spreading hairs; Leaves 3 to 5-foliolate, leaflets unequal, obovate-elliptic, inflorescence many-flowered corymbose raceme; Flowers white, filiform sepals, ovate-obovate; petals obovate to oblanceolate; fruit is capsule ; reniform seeds, brown.

Fl. and Fr.: July- November

Habitat: Commonly found in waste lands and wetlands.

8. ***Cleome viscosa*** Linn.

Cleome viscosa L. Sp. Pl. 672. 1753; Hook. f. & Thoms. in Hook. f. Fl Brit. India 1 : 170. 1872; Duthie, Fl. Gangetic Plain 2 : 50. 1903; Bhandari, Fl. Indian Desert 41. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 82. 1987; Sharma, Fl. Raj (Hadoti). 32. 2002; Yadav and Meena, Fl. SC Rajasthan 49. 2011.

Local name : Bagro

Characteristics:

Erect, annual herbs, upto 1 mm high, clothed with glandular hairs. Leaves 3 to 5-foliolate; leaflets obovate to elliptic-oblong; racemes leafy, few-flowered; flowers yellow, bracteate, bracts subsessile; sepals, lanceolate, petals obovate; stamens 12-15; ovary ,beaked, densely glandular hairy; fruit is capsules, seed many, reniform, black.

Fl. and Fr.: Almost throughout the year.

Habitat : Found in sandy habitats near water availability.

VI. CAPPARIDACEAE

9. ***Capparis desidua*** (Forssk) Edgew.

Capparis desidua (Forssk) Edgew.in J. Linn. Soc. Bot. 6 : 184. 1862; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1 : 174, 1872. Bhandari, Fl. Indian Desert 37. 1978; Parmar in Shetty & Singh Rajasthan 1 : 85, 1987; Sharma, Fl. Raj (Hadoti). 32. 2002; Yadav and Meena, Fl. SC Rajasthan 50. 2011.

Local name: Ker.

Characteristics:

Much-branched shrubs, upto 5 m high, twigs zig-zag, glabrous, armed with stipular spines; spine yellowish straight; leaves confined to young twigs, fleshy subsessile, linear, spinous-tipped; inflorecence corymbose racemes , flowers pinkish-red, Sepals elliptic, acute, unequel, tomentose. Petals oblong, obtuse. Stamens 10-15; filaments 1-1.8 cm long, reddish, glabrous., ovary glabrous, breaked. Fruits berry, Seeds many, reniform, black.

Fl. and Fr.: June – November

Habitat: Very common plant of waste lands.

10. ***Capparis sepiaria*** Linn.

Capparis sepiaria Linn. in Syst. Nat. ed. 2. 1071 J. Linn. Soc. Bot. 6: 184. 1862; Hook. f. & Thoms. in Hook. f. Fl. Brit. India 1: 174, 1872.Bhandari, Fl. Indian Desert 37. 1978; Parmar in Shetty & Singh Rajasthan 1: 85, 1987; Sharma, Fl. Raj (Hadoti). 33. 2002; Yadav and Meena, Fl. SC Rajasthan 50. 2011.

Local name: Patta Ker.

Characteristics:

Much-branched shrub, upto 5 m high; stem branched, twigs zig-zag, leaves ovate; corymbose racemes; flowers pale white; fruits berry, purple-red on maturity; seeds many, reniform, black.

Fl. and Fr.: March – June

Habitat: Near croplands, Frost forests.

VII. CARYOPHYLLACEAE

11. ***Spergula arvensis*** Linn.

Spergula arvensis Linn. in Sp. Pl. 184. 1753; Hooker Fl. Brit. India 1: 243, 1872; Parmar in Shetty & Singh Rajasthan 1: 100. 1987.

Characteristics:

Annual, herb; branched from base; needle shape leaves, whorled; umbellate cyme; flowers white, keeled seeds, black.

Fl. and Fr. : December-January

Habitat: Found in cultivated places and gardens with grasses.

VIII. PORTULACACEAE

12. ***Portulaca oleracea Linn.***

Portulaca oleracea Linn. Sp. Pl. 445, 1753; Dyer in Hook. f. Fl. Brit, India) 246. 1874; Duthie, Fl. Gangetic Plain 1: 69. 1903; Bhandari, Fl.Indian Desert 50, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 102. 1987; Sharma, Fl. Raj. (Hadoti) 36. 2002; Yadav and Meena, Fl. SC Rajasthan 59. 2011.

Local name: Luni

Characteristics:

Prostrate or diffuse herbs; branches many; leaves alternate , fleshy, sessile, obovate; flowers yellow; sepals united below into a tube, petals obovate; Stamens 8; ovary ovoid; fruit is capsules; Seeds many, granulate, black.

Fl. and Fr. : Throughout the year.

Habitat: Common in moist places and as a weed in cultivated fields.

IX. TAMARICACEAE

13. ***Tamarix ericoides*** Rottl. & Willd.

Tamarix ericoides Rottl. & Willd. In Gesel. Naturf. Fr. Berl. Neue. Schr.4: 214. T.4.1814; Hooker Fl. Brit. India 1 : 249. 1874; Duthie, Fl

Gangetic Plain 1 : 72. 1903; Bhandari, Fl. Indian Desert 53. 1978; Parmar in Shetty & Singh Rajasthan 1 : 106. 1987; Sharma, Fl. Raj (Hadoti). 37. 2002; Yadav and Meena, Fl. SC Rajasthan 61. 2011.

Characteristics:

Tree (Shruby), deciduous, perennial; drooping branches; scaly leaves, Inf. dense spike, flowers light pink (pinkish white); fruit is capsule,

Fl. and Fr. : Through out year

Habitat: Found in salty areas, damaged margins of rivers.

X. ELANTINACEAE

14. ***Bergia ammannioides*** Roxb. ex Roth.

Bergia ammannioides Roxb. ex Roth, Nov. Pl. Sp. 219. 1821; Roxburgh, Fl. Ind. 2: 457, 1832; Dyer in Hooker f. Fl. Brit. India 1: 251. 1874; Duthie, Fl. Gangetic Plain 1: 73. 1903; Bhandari, Fl. Indian Desert 57, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 107, 1987; Sharma, Fl. Raj (Hadoti). 37. 2002; Yadav and Meena, Fl. SC Rajasthan 61. 2011.

Local name: Jal-bhangra.

Characteristics:

Annual, erect, much-branched herbs, 10-20 cm high; reddish-purple branches, swollen at nodes; leaves oblanceolate; axillary cyme; flowers minute in dense reddish-pink cluster; fruit is capsules; dark brown seeds.

Fl. and Fr.: August-March

Habitat: Commonly found in the moist sandy places and near tanks.

XI. MALVACEAE

15. ***Abutilon indicum*** (L.) Sweet.

Abutilon indicum (L.) Sweet. in Hort. Brit. ed. 1: 54. 1826; Mast. in Hooker. f. Fl. Brit. India 1 : 326. 1874; Bhandari, Fl. Indian Desert 61. 1978; Parmar in Shetty & Singh, Fl Rajasthan 1: 116. 1987; Sharma, Fl. Raj (Hadoti). 39. 2002; Yadav and Meena, Fl. SC Rajasthan 63. 2011.

Local name: Kanghi

Characteristics:

Erect, perennail, shrubs,; stem woody; leaves ovate; solitary axillary; flowers yellow, campanulate; schizocarpic fruits; reniform mericarps.

Fl. and Fr.: October-Jauary.
Habitat: Found in wastelands, near crop fields and canals.

16. ***Hibiscus caesius*** Garke

Hibiscus caesius Garke in Oestr. Bot. Zeit. 850. 1819**;** Roxburgh, Fl. Ind. 2: 457, 1832; Mast. in Hooker f. Fl. Brit. India 1: 339. 1874; Duthie, Fl. Gangetic Plain 1: 91. 1903; Bhandari, Fl. Indian Desert 60, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 121, 1987; Sharma, Fl. Raj (Hadoti). 40. 2002; Yadav and Meena, Fl. SC Rajasthan 72. 2011.

Characteristics:

Erect, perennial, shrub; long stem, branches with bristles; leaves palmate, 3-5 partite, elliptic, simple stellate hairs on veins; flowers axillary solitary, yellow; epicalyx 10; fruit is capsule, 5 valves, each cell with 3-5 seeds, reniform.

Fl. and Fr.: August-October.
Habitat: Found in wetlands, moist and shady places.

17. ***Malvestrum cormandelianum*** (Linn.) Garcke

Malvestrum cormandelianum (Linn.) Garcke IN bonplandia. 5: 297. 1857; Mast. in Hooker f. Fl. Brit. India 1 : 321. 1874; Duthie, Fl. Gangatic plain 1 : 79. 1903; Maheshwari, Ill. Fl. Delhi f. 26. 1966; Bhandari, Fl. Indian Desert 72. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 126-127. 1987; Sharma, Fl. Raj (Hadoti). 42. 2002; Yadav and Meena, Fl. SC Rajasthan 64. 2011.

Characteristics:

Annual prostrate herb; stellate branches; leaves ovate-lenceolate, crenate margins; flowers yellow, axillary solitary; globular schizocarps, mericarps 10; seeds brownish-black, reniform, one seed per mericarp.

Fl. and Fr.: Throughout year
Habitat: Commonly found in croplands, gardens and wetlands.

18. ***Sida cordifolia*** Linn.

Sida cordifolia Linn. Sp. Pl. 684. 1753; Mast. in Hooker f. Fl. Brit. India 1: 324. 1874; Duthie, Fl. Gangatic plain 1: 82. 1903; Bhandari, Fl. Indian Desert 72. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 131. 1987; Sharma, Fl. Raj (Hadoti). 43. 2002; Yadav and Meena, Fl. SC Rajasthan 67. 2011.

Characteristics:

Perennial, erect undershrubs; branched; leaves cordate(ovate-oblong), crenate margins; flowers yellow, axillary solitary; mericarps 10, seeds trigonous, glabrous, brownish black.

Fl. and Fr. : September-January

Habitat: found in shady places of trees and wetlands.

19. ***Sida ovata*** Forsk.

Sida ovata Forsk. in Fl. Aegypt.-Arab. 124. 1775; Mast. in Hooker f. Fl. Brit. India 1 : 323. 1874; Duthie, Fl. Gangetic Plain 1 : 81, 1903; Bhandari, Fl. Indian Desert 73, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 131, 1987; Sharma, Fl. Raj (Hadoti). 43. 2002; Yadav and Meena, Fl. SC Rajasthan 67. 2011.

Local name: Balro

Characteristics

Erect undershrub; stem and branches with stellate hairs; leaves oblong-ovate, rounded at base, obtuse at apex, crenate, densely covered with stellate hairs on both surfaces; flowers yellow, axillary solitary; mericarps 7-8, seeds rounded-reniform, black.

Fl. and Fr. : July-February

Habitat: found near cultivated fields.

20. ***Sida spinosa*** Linn

Sida spinosa Linn. in Sp. Pl. 683. 1753, Mast. in Hooker f. Fl. Brit. India 1 : 323. 1874; Duthie, Fl. Gangetic Plain 1: 80. 1903, Parmar is Shetty & Singh, Fl. Rajasthan 1: 133. 1987; Maheshwari, Ill. Fl. Delhi 23. 1966; Sharma, Fl. Raj (Hadoti). 43. 2002.

Characteristics:

Annual, undershrub; stem and branches covered with sellate hairs; leaves ovate-cordate, acute apex, dentate margin; flowers yellow, axillary, solitary; mericarps 5, Seeds glabrous, brownish-black.

Fl. & Fr.: August-November

Habitat: Common plant in garden and margis of crop fields.

21. ***Thespesia populnea*** (Linn.) Sol. & Corr.

Thespesia populnea (Linn.) Sol. & Corr. in Ann. Mus. Hist. Nat. Paris. 9: 290, t.8.f.1: 1807; Mast. in Hooker f. Fl. Brit. India 1 : 345. 1874; Parmar in Shetty & Singh, Fl. Rajasthan 1: 134. 1987; Maheshwari, Fl. Raj (Hadoti). 44. 2002. Yadav and Meena, Fl. SC Rajasthan 73. 2011.

Local name: Paras peepal

Characteristics:

Pernnial tree; branches with hairs; leaves ovate, acute apex, entire margin; flowers yellow, axillary solitary fruit is capsule mericarps 5, Seeds glabrous, brownish-black.

Fl. & Fr.: August-November

Habitat: Common plant in temples, on road sides also.

XII. BOMBACACEAE

22. ***Bombax ceiba*** Linn.

Bombax ceiba Linn. Sp. Pl. 511. 1753; Mast. in Hooker f. Fl. Brit. India 1 : 349. 1874; Duthie, Fl. Gangetic Plain 1 : 98, 1903; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 137, 1987; Sharma, Fl. Raj (Hadoti). 44. 2002; Yadav and Meena, Fl. SC Rajasthan 78. 2011.

Local name: Semal

Characteristics

Tall tree; brached, branching starts after some height; palmately compound leaf, penta to hepta foliate, leaflets elliptic lanceolate; inf. solitary axillary, flowers large cup shaped, red; fruit is a capsule; seeds brown covered with white wooly hairs.

Fl. and Fr.: December- March

Habitat: Fund in forest area as wild and cultivated in gardens.

XIII. TILIACEAE

23. ***Corcorus capsularis*** Linn.

Corcorus capsularis Linn. in Sp. Pl. 529.1753; Mast. in Hooker. f. Fl. Brit. India 1 : 397. 1874; Duthie, Fl. Gangetic Plain 1 : 119, 1903; Bhandari, Fl. Indian Desert 73, 1978; Singh in Shetty & Singh, Fl. Rajasthan 1 :146,

1987; Sharma, Fl. Raj (Hadoti). 47. 2002; Yadav and Meena, Fl. SC Rajasthan 85. 2011.

Local name: Amberi

Characteristics

Large annual herb; branched; simple leaves, elliptic lanceolate; inf. solitary axillary, flowers yellow; penta carpellary ovary; fruit is a capsule; seeds cuneiform, brown.

Fl. and Fr. : Sepember- October

Habitat: Found near canals, cultivated plant also.

24. ***Grewia tenax*** (Forsk.) Fiori

Grewia tenax (Forsk.) Fiori in Bos. Piant. Legn, Eritr. 246. 1909 & in Agri. Colon. 5: Suppl. 23, 1912; Mast. in Hooker. f. Fl. Brit. India 1 : 385, 1874; Duthie, Fl. Gangetic Plain 1 : 111, 1903; Singh in Shetty & Singh, Fl. Rajasthan 1: 155. 1987; Yadav and Meena, Fl. SC Rajasthan 89. 2011.

Local name : Gangan.

Characteristics:

Perennial shrubs, 2-3 m high, with pubescent branches; leaves ovate-oblong, rounded at base, acute or obtuse at apex, palmately 3 to 5-nerved; flowers white in 3-4 axillary cyme, fruit is drupes 2 to 4-lobed, orange when ripe; seeds subglobose, black.

Fl. and Fr.: May – February

Habitat: Found in sandy plains.

XIV. ZYGOPHYLLACEAE

25. ***Fagonia cretica*** Linn.

Fagonia cretica Linn. in Sp. Pl. 386. 1753; Duthie, Fl. Gangetic Plain 1: 127. 1903; Maheshwari, Ill. Fl. Delhi t. 39. 1966; Sharma and Tiagi, Fl. NE Rajasthan 77. 1979; Sharma, Fl. Raj (Hadoti). 50. 2002.

Characteristics

Erect, spreading perennial herb; branched; trifoliate palmately compound leaf. inf. solitary axillary, flowers redissh yellow, pentacarpellary; schizocarpic fruit.

Fl. and Fr. : August

Habitat: Found on hard and waste land.

26.*Tribulus terrestris* Linn.

Tribulus terrestris Linn. in Sp. Pl. 387. 1753; Edgew & Hooker in Hooker f. Fl. Brit. India 1: 423, 1874; Duthie, Fl. Gangetic Plain 1: 127. 1903; Pandey in Shetty & Singh, Fl. Rajasthan 1: 166. 1987; Sharma, Fl. Raj (Hadoti). 50. 2002; Yadav and Meena, Fl. SC Rajasthan 92. 2011.

Local name : Gokhru

Characteristics

Erect, spreading perennial herb; branched; trifoliate palmately compound leaf. Inflorescence solitary axillary, flowers redissh yellow, pentacarpellary; schizocarpic fruit.

Fl. and Fr.: August

Habitat: Found on hard and waste land.

XV. OXALIDACEAE

27.*Oxalis corniculata* Linn.

Oxalis corniculata Linn. in Sp. Pl. 435.1753; Edgew & Hooker in Hooker. f. Fl. Brit. India 1: 436. 1874; Duthie, Fl. Gangetic Plain 1: 130, 1903; Maheshwari, Fl. Delhi 93. 1963; Maheswari, Ill. Fl. Delhi 41. 166; Bhandari, Fl. Indian Desert 87. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1:170, 1987; Sharma, Fl. Raj (Hadoti) 50. 2002; Yadav and Meena, Fl. SC Rajasthan 94. 2011.

Local name: Khatti booti

Characteristics

Small perennial creeping herb; stem runner rooted at nodes; trifoliate leaves, obcordate; inf. axillary umbel; flowers yellow; penta carpellary ovary; fruit is a linear cylendric capsule; flat- ovoid, brown.

Fl. and Fr.: Through out year.

Habitat: Common weed of study area.

28.*Oxalis corymbosa* D.C. ***Syn. O. martiana*** Zucc.

Oxalis corymbosa D.C. in Prodr. 1: 696. 1824; Duthie, Fl. Gangetic Plain 1:36, 1903; Maheshwari, Fl. Delhi 93. 1963; Maheswari, Ill. Fl. Delhi 42. 166; Parmar in Shetty & Singh, Fl. Rajasthan 1:171, 1987; Sharma, Fl. Raj (Hadoti) 50. 2002.

Local name: Khatti booti

Characteristics

Small perennial acaulescent herb; stem on bulbous root stock, trifoliate leaves, obcordate; inf. axillary umbel; flowers yellow; pedicel and calyx hairy; fruit is a linear cylendric capsule; flat- ovoid, brown.

Fl. and Fr.: Through out year.

Habitat: Found in shady places.

XVI. RUTACEAE

29. ***Aegle marmelos*** (Linn.) Corr.

Aegle marmelos (Linn.) Corr. in Trans. Linn. Soc. 5: 223.1800; Hooker in Hooker. f. Fl. Brit. India 516. 1875; Duthie, Fl. Gangetic Plain 1: 143, 1903; Parmar in Shetty & Singh, Fl. Rajasthan 1:173, 1987; Sharma, Fl. Raj (Hadoti) 51. 2002; Yadav and Meena, Fl. SC Rajasthan 96. 2011.

Local name: Bel, Beel

Characteristics

Long tree; branched, spines on braches; palmately compound trifoliate leaves, alternate, ovate; flowers white; penta carpellary ovary; fruits are berry withglobose with thick and hard pericarp; flat- ovoid, seeds, brown.

Fl. and Fr.: September- February

Habitat: Common in deciduous forest, Cultivated in gardens.

30. ***Limonia crenulata*** Roxb. Syn. ***L. acidissima*** Auct. Plur. (Not Linn.)

Limonia crenulata Roxb. in Cor. Pl. 1: 60. t. 86; Roxburgh Fl. Ind. 2: 381, 1824; Hooker in Hooker. f. Fl. Brit. India 1: 507. 1875; Duthie, Fl. Gangetic Plain 1: 143, 1903; Yadav and Meena, Fl. SC Rajasthan 97. 2011.

Local name: Kaith

Characteristics

Long tree; much branched, zig-zag; leaves, alternate, ovate; flowers small, light red; fruits are berrywhite; penta carpellary ovary; fruit is a berry, gobose with thin pericarp, pulp sweet sour; flat- ovoid seeds, slight wooly, brown.

Fl. and Fr.: March- December

Habitat: Common in waste land, cultivated in gardens also.

XVII. SIMAROUBACEAE

31. ***Ailanthus exelsa*** Roxb. Linn.

Ailanthus exelsa Roxb. in Pl.Cor. 1: 24, t. 23. 1795; Bannett. in Hooker. f. Fl. Brit. India 1: 518. 1874; Duthie, Fl. Gangetic Plain 1 : 144, 1903; Bhandari, Fl. Indian Desert 88, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 :176, 1987; Sharma, Fl. Raj (Hadoti). 53. 2002; Yadav and Meena, Fl. SC Rajasthan 99. 2011.

Local name: Ardu, Aldu.

Characteristics

Large deciduous tree, greenish white trunk, branched; bipinnate leaves, leaflet ovate, irregular dentate margin, Inflorecence panicle, flowers greenish white; hairy ovary; fruit is samara; seed single in a samara.

Fl. and Fr. : February- April

Habitat: Waste land plant, cultivated in croplands.

XVIII. BALANITACEAE

32.*Balanites aezyptiaca* (Linn.) Del.

Balanites aezyptiaca (Linn.) Del.in Fl. Aegypt. 77. 221.t. 28. f. 1:1813; Bannett. in Hooker. f. Fl. Brit. India 1: 522. 1874; Duthie, Fl. Gangetic Plain 1 : 145, 1903; Bhandari, Fl. Indian Desert 88, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 :177, 1987; Sharma, Fl. Raj (Hadoti). 53. 2002; Yadav and Meena, Fl. SC Rajasthan 99. 2011.

Local name: Hingota

Characteristics

Small deciduous spiny tree, brown-pale trunk; branched, braches end into thorn; bifoliate leaves, leaflet elliptic, acute apex, rounded base, Inflorescene axillary cyme, pale-green flowers, fruit is globose berry.

Fl. and Fr.: March-July

Habitat: Found in scrub forests and at borders of croplands.

XIX. BURSERACEAE

33. ***Boswellia serrata*** Roxb. ex Colebr.

Boswellia serrata Roxb. ex Colebr. in Asia. Res. 9: 379. t. 5. 1807; Bannett. in Hooker. f. Fl. Brit. India 1: 528. 1874; Duthie, Fl. Gangetic Plain 1 : 147, 1903; Bhandari, Fl. Indian Desert 89, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 :177, 1987; Sharma, Fl. Raj (Hadoti). 53. 2002; Yadav and Meena, Fl. SC Rajasthan 100. 2011.

Local name: Saalar

Characteristics:

Large deciduous tree; silver white trunk; branched, branches with annular swellings; leaves at tip of branch, lanceolate; white flowers, trigonous fruits, three seeds per fruit, seeds flats to margin.

Fl. and Fr.: December - March

Habitat: Found in deciduous forests.

XX. MELIACEAE

34. ***Azardirachta indica*** A. Juss.Roxb. ex Colebr.

Azardirachta indica A. Juss. in Mem. Mus. Hist. Nat. Paris 19: 221. T. 13. f. 5. 1820; Hiern. in Hooker. f. Fl. Brit. India 1: 544. 1874; Duthie, Fl. Gangetic Plain 1 : 150, 1903; Bhandari, Fl. Indian Desert 90, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 :179, 1987; Sharma, Fl. Raj (Hadoti). 54. 2002; Yadav and Meena, Fl. SC Rajasthan 101. 2011.

Local name : *Neem.*

Characteristics:

Tall evergreen tree; branched, gray-black rough bark; leaves unipinnate, 20-30 cm long, ovate-lanceolate, serrate; flowers white in axillary panicle; Ovray 3-celled, unilocular; fruit is a drupe, single seeded drupes.
Fl. and Fr.: December-May
Habitat: Common in waste lands, planted near roads.

35. ***Melia azadarach*** Linn.

Melia azadarach Linn. in Sp. Pl. 384. 1753; Hiern. in Hooker. f. Fl. Brit. India 1: 544. 1874; Duthie, Fl. Gangetic Plain 1 : 151, 1903; Bhandari, Fl. Indian Desert 90, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 :179-180, 1987; Sharma, Fl. Raj (Hadoti). 54. 2002; Yadav and Meena, Fl. SC Rajasthan 102. 2011.
Local name: Bakain
Characteristics:
Tall evergreen tree; branched, gray-black rough bark; leaves imparipinnate, 20-30 cm long, ovate-lanceolate, serrate; flowers white in axillary panicles; Ovary pantalocular; fruit is a drupe, one seed in each locule.
Fl. and Fr.: December-May
Habitat: Common in wastelands, planted near roads.

XXI. CELASTRACEAE

36. ***Maytenus emarginata*** (Willd.) Ding Hou.

Maytenus emarginata (Willd.) Ding Hou in Van steenis, Fl. Males. I 6 (2); 241. 1962; M. Lawson in Hooker. f. Fl. Brit. India 1: 621. 1875; Duthie, Fl. Gangetic Plain 1 : 159, 1903; Bhandari, Fl. Indian Desert 91, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 182-83, 1987; Sharma, Fl. Raj (Hadoti). 55. 2002; Yadav and Meena, Fl. SC Rajasthan 104. 2011.
Local name: Kankedo
Characteristics:
Tall shrub; branched, spiny purple branches, spines bear leaves and flowers; simple small abovate leaves; small flowers in dichacial cyme;

flowers white; fruit is globose, red-purple capsule; brown and elliptic seed in each drupe.

Fl. and Fr.: October-March.

Habitat: Common in wastelands and borders of cropland.

XXII. RHAMNACEAE

37. ***Zizphus mauritiana*** Lam.

Zizphus mauritiana Lam Encycl. 3 : 319. 1789; M. Lawson in Hooker. f. Fl. Brit. India 1: 632. 1875; Duthie, Fl. Gangetic Plain 1 : 163, 1903; Bhandari, Fl. Indian Desert 99, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 185, 1987; Sharma, Fl. Raj (Hadoti). 55. 2002; Yadav and Meena, Fl. SC Rajasthan 105. 2011.

Local name : Bor

Small evergreen tree, branched; leaves alternate, ovate to ovate-elliptic; flowers in short cyme 10 to 12 flowers, greenish-white; fruits are drupes; ellipticle and brown seeds.

Fl. and Fr.: January – March

Habitat: Found in plains and croplands.

38. ***Ziziphus nummularia*** (Burm. f.) Wight & Am.

Ziziphus nummularia (Burm. f.) Wight & Am. in Prodr. 162. 1834; M. Lawson in Hooker. f. Fl. Brit. India 1: 633. 1875; Duthie, Fl. Gangetic Plain 1 : 164, 1903; Bhandari, Fl. Indian Desert 99, 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1 : 185, 1987; Sharma, Fl. Raj (Hadoti). 55. 2002; Yadav and Meena, Fl. SC Rajasthan 105. 2011.

Local name: Bordi.

Characteristics:

Shrubs with1-2 m height; branched stem with zigzag branches; Leaves ovate-orbicular, rounded at both ends; flowers greenish white in axillary, cymes; fruits are small, single seeded globose drupes (red); single sphericle seed in a fruit.

Fl. and Fr.: January – March.

Habitat: Commonly found in waste lands, forest areas and road sides.

XXIII. ANACARDIACEAE

39. ***Mangifera indica*** Linn.

Mangifera indica Linn. in Sp. Pl. 200. 1753; Hooker, Fl. Brit. India 1: 13. 1875; Duthie, Fl. Gangetic Plain 1: 189, 1903; Bhandari, Fl. Indian Desert 99, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 194-195, 1987; Sharma, Fl. Raj (Hadoti). 58. 2002; Yadav and Meena, Fl. SC Rajasthan 109. 2011.

Local name: Amb, Aam.

Characteristics:

Large evergreen tree; branched; leaves, alternate, oblong lanceolate; flowers on terminal panicle; yellowish green; fruits are drupes; ellipticle and light brown seeds.

Fl. and Fr.: February - July

Habitat: Found in forest area, cultivated in cropland and gardens.

40. ***Rhus mysurensis*** G. Don.

Rhus mysurensis G. Don. Gen. Syst. 2: 74. 1832; Hooker. f. Fl. Brit. India 2: 9. 1876; Duthie, Fl. Gangetic Plain 1 : 186, 1903; Bhandari, Fl. Indian Desert 94, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 185, 1987; Sharma, Fl. Raj (Hadoti). 58. 2002; Yadav and Meena, Fl. SC Rajasthan 111. 2011.

Local name: Bordi.

Characteristics:

Deciduous shrub; branched stem; trifoliate leaves, abovate leaflets, wavy margin; flowers in axillary panicle, unisexual, light yellow flowers, fruits are small, single seeded globose drupes (yellow-brown).

Fl. and Fr.: July – October

Habitat: Commonly found in waste rocky lands or at hilly tracts.

XXIV. MORINGACEAE

41. ***Moringa oleifera*** Lam.

Moringa oleifera Lam. in Encyl. Meth. 1:398.1785; Hooker, Fl. Brit. India 2: 45. 1876; Duthie, Fl. Gangetic Plain 1: 192, 1903; Bhandari, Fl. Indian Desert 95, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1 : 196-195, 1987; Sharma, Fl. Raj (Hadoti). 58. 2002; Yadav and Meena, Fl. SC Rajasthan 111. 2011.

Local name : Sainjana

Characteristics:

Large evergreen tree; leaves bipinnate, leaflets abovate, flowers creamish-white in panicles; fruits 20-25 cm long, triquetrous, constricted between seeds; seeds tri-winged, blackish-brown.

Fl. & Fr.: January to April

Habitat : Found in roadsides, cultivated in gadens and croplands.

XXV. FABACEAE

42. ***Abrus precatorious.***Linn.

Abrus precatorious.Linn. Syst. Nat.ed 12:472, 1767; Baker in Hooker, Fl. Brit. India 2: 175. 1876; Duthie, Fl. Gangetic Plain 1: 262, 1903; Maheshwari, Ill. Fl. Delhi f. 71.1966; Bhandari, Fl. Indian Desert 97, 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 201, 1987; Sharma, Fl. Raj (Hadoti). 58. 2002; Yadav and Meena, Fl. SC Rajasthan 113. 2011.

Local name: Chirmi**,** Ratti

Charcteristics:

Perennial climber; much branched; leaves paripinnate, linear, deciduous; pink flower in axillary raceme; pods, oblong, beaked; seeds shining white with black spot.

Fl.and Fr. : August – January.

Habitat: Common on clumps of shrubs in forest.

43. ***Butea monosperma*** (Lam.)Taub.

Butea monosperma (Lam.)Taub. in Engler & Pratl. Pflanzen fam. 3(3): 366. 1894; Baker in Hooker, Fl. Brit. India 2: 194. 1876; Duthie, Fl. Gangetic Plain 1: 240, 1903; Maheshwari, Ill. Fl. Delhi f. 74.1966; Bhandari, Fl. Indian Desert 97, 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 211, 1987; Sharma, Fl. Raj (Hadoti). 60. 2002; Yadav and Meena, Fl. SC Rajasthan 116. 2011.

Local name: Palash, Keshu, Dhak

Charcteristics:

Deciduous Tree; branched; pinnate leaves, three leaflets, ovate deciduous; saffron (red-orange) flower on axillary raceme; pods with terminal single seed.

Fl.and Fr.: March- April.

Habitat: Common in groups in forest (Flame of Forest)

44.*Clitoria ternatea* Linn. in Sp. Pl. 753. 1753 Baker in Hooker, Fl. Brit. India 2: 208. 1876; Duthie, Fl. Gangetic Plain 1: 230, 1903; Bhandari, Fl. Indian Desert 102, 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 213, 1987; Sharma, Fl. Raj (Hadoti). 61. 2002; Yadav and Meena, Fl. SC Rajasthan 116. 2011.

Local name : Gokran

Characteristics:

Perennial, woody climber; leaves elliptic; Inflorescence is solitary axillary; dark blue-white flowers; long beaked pods with 8-10 seeds; yellow-brown seeds.

Fl. & Fr.: August- October

Habitat : Common on hedges, cultivated also.

45. *Crotalaria burhia* Buch.-Ham. ex Benth.

Crotalaria burhia Buch.-Ham. ex Benth. in Hooker. Lond. J. Bot. 2 : 474, 1843; Baker in Hooker f. Fl. Brit. India 2 : 66, 1876; Duthie, Fl. Gangetic Plain 1: 202. 1903; Bhandari, Fl. Indian Desert 111. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 216. 1987; Sharma, Fl. Raj. (Hadoti) 62. 2002; Yadav and Meena, Fl. SC Rajasthan 117. 2011

Local name: Senia.

Characteristics:

Under srubs, numerously branched; leaves lower larger, upper small, oblong, pale green, silky hairy; yellow flower on terminal raceme; pods oblong,beaked, 1-seeded; shinig black seeds.

Fl. and Fr. : August – January.

Habitat: Found in sandy uplands areas

46. *Dalbergia sissoo* Roxb.

Dalbergia sissoo Roxb. in Fl In. 3: 233. 1832; Baker in Hooker f. Fl. Brit. India 2 :231, 1876; Duthie, Fl. Gangetic Plain 1: 264. 1903; Bhandari, Fl. Indian Desert 104. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 224. 1987; Sharma, Fl. Raj (Hadoti). 65. 2002; Yadav and Meena, Fl. SC Rajasthan 120. 2011

Local name: Shisham

Characteristics:

Large tree; numerously branched; leaves imparipinnate; zig-zag leaf rachis, two pairs of leaflets; lower larger, upper small, Flowers in axillary panicle; yellow- white flowers; pod with 1-4 seeds, lensoid seeds.

Fl. and Fr. : March – June.

Habitat: Found in roundsides and plains.

47. ***Dalbergia lalatifolia*** Roxb.

Dalbergia latifolia Roxb. in Pl. Cor. 2: 7. T. 113. 1798; Baker in Hooker f. Fl. Brit. India 2 :231, 1876; Duthie, Fl. Gangetic Plain 1: 263. 1903; Bhandari, Fl. Indian Desert 104. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 223. 1987; Sharma, Fl. Raj (Hadoti). 64. 2002; Yadav and Meena, Fl. SC Rajasthan 119-120. 2011.

Local name: Shisham

Large tree; numerously branched; leaves imparipinnate; zig-zag leaf rachis, three to four pairs of leaflets; Flowers in axillary panicle; yellow-white flowers; pod with 1-4 seeds, lensoid seeds.

Fl. and Fr. : March – June.

Habitat: Found in roundsides and plains.

48. ***Indigofera cordifolia*** Heyne ex Roth.

Indigofera cordifolia Heyne ex Roth. in Nov. Pl. Sp. 357. 1821; Baker in Hooker f. Fl. Brit. India 2: 93. 1876; Duthie, Fl. Gangetis Plains 1: 250. 1903; Bhandari, Fl. Indian Desert 117. 1978; Singh in Shetty and Singh Fl. Rajasthan 1: 239. 1987; Sharma, Fl. Raj. (Hadoti) 67. 2002; Yadav and Meena, Fl. SC Rajasthan 122. 2011.

Characteristics:

Annual, prostrate or diffuse herbs; leaves simple, ovate-cordate; flowers pinkish-red; pods cylindric, 2-seeded.

Fl. and Fr: August-December

Habitat: Very common in plains and wetland.

49. ***Indigofera linifolia*** (Linn. f.) Retz.

Indigofera linifolia (Linn. f.) Retz. In Obs. Bot. 4: 29. 1786; Baker in Hooker f. Fl. Brit. India 2: 92.1876; Duthie, Fl. Gangetic Plain 1: 249. 1903; Bhandari, Fl. India Desert 108.1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 242. 1987; Sharma, Fl. Raj. (Hadoti) 67. 2002; Yadav and Meena, Fl. SC Rajasthan 124. 2011.

Charcteristics:

Annual, prostrate/suberect herb; branches from base, many; leaves simple, elliptic-lanceolate; right red flowers in axillary raceme; pods globose; dark brown seeds.

Fl. and Fr.: August-November.

Habitat: found in road sides, grasslands and cultivated fields.

50. ***Indigofera linnaei*** Ali

Indigofera linnaei Ali in Bot. Notis. 111 : 549. 1958. & in Nasir & Ali, Fl. West Pakistan 100 : 75. 1977; Baker in Hooker f. Fl. Brit. India 2 : 94. 1876; Duthie, Fl. Gangetic Plains 1: 250. 1903; Sharma, Fl. Raj. (Hadoti) 67. 2002; Yadav and Meena, Fl. SC Rajasthan 125. 2011.

Characteristics:

Prostate, annul herb; laterally branched; leaves obvate rounded at apex , cuneate at base; axillary solitary flowers, pinkish-red; pods strainght, 2 to 3-seeded; seeds light brown.

Fl. and Fr.: August-November.

Habitat: Found in plains, gardens and croplands.

51.***Lathyrus aphaca*** Linn.

Lathyrus aphaca Linn. Sp. Pl. 729. 1753; Baker in Hooker f. Fl. Brit. India 2: 179.1876; Duthie, Fl. Gangetic Plain 1: 260. 1903; Bhandari, Fl. India Desert 110.1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 246. 1987; Sharma, Fl. Raj. (Hadoti) 67. 2002; Yadav and Meena, Fl. SC Rajasthan 127. 2011.

Local Name: Adak Matar

Charcteristics:

Annual, trailing herb; branches from base, many; leaves simple, hastate; yellow flowers, axillary solitary; pods long flattened, 4-6 seeded.

Fl. and Fr.: August-November.

Habitat: Found in crop fields as weed.

52. ***Medicago polymorpha*** Linn.

Medicago polymorpha Linn. in Sp. Pl. 779.1753; Baker in Hooker f. Fl. Brit. India 2: 90. 1876; Duthie, Fl. Gangetic Plain 1: 211. 1903; Maheshwari, Ill. Fl. Delhi f. 51.1966; Singh in Shetty & Singh, Fl.

Rajasthan 1: 246. 1987; Sharma, Fl. Raj. (Hadoti) 69. 2002; Yadav and Meena, Fl. SC Rajasthan 128. 2011.

Charcteristics:

Annual, suberect, herb; weak, soft, branched stem; trifoliate leaves abovate; white-pale flowers in axillary raceme; spiral fruits covered small spines; dark brown seeds.

Fl. and Fr.: January- March

Habitat: Found in aquatic wetlands

53. ***Melilotus indica*** (Linn.) All.

Melilotus indica (Linn.) All. in Fl. Pedem. 1: 308. 1785; Baker in Hooker f. Fl. Brit. India 2: 89. 1876; Duthie, Fl. Gangetic Plain 1: 208. 1903; Maheshwari, Ill. Fl. Delhi f. 53.1966; Bhandari, Fl. India Desert 118.1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 249. 1987; Sharma, Fl. Raj. (Hadoti) 69. 2002; Yadav and Meena, Fl. SC Rajasthan 129. 2011.

Local Name: Adak Methi

Charcteristics:

Erect annual herb; stem branched soft; leaves lanceolate; yellow flowers I axillary raceme; pods elliptic single seeded; brown seeds.

Fl. and Fr.: January-February.

Habitat: Found wetland near running water.

54. ***Mucuna pruriens*** (Linn.) DC.

Mucuna pruriens (Linn.) DC. Prodr. 2:405. 1825; Baker in Hooker f. Fl. Brit. India 2: 187. 1876; Duthie, Fl. Gangetic Plain 1: 208. 1903; Bhandari, Fl. India Desert 118. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 251. 1987; Sharma, Fl. Raj. (Hadoti) 70. 2002; Yadav and Meena, Fl. SC Rajasthan 129. 2011.

Local Name: Konch Ki Phali

Charcteristics:

Climbing herb; branches from base, many; leaves simple, elliptic-lanceolate; right red flowers in axillary raceme; pods globose; dark brown seeds.

Fl. and Fr.: August-November.

Habitat: Found on road sides, grasslands and cultivated fields.

55. ***Pongamia pinnata*** (Linn.)Pierre.

Pongamia pinnata (Linn.) Pierre. Fl. For. Cochinch. 5: t. 385. 1899; Baker in Hooker f. Fl. Brit. India 2: 240.1876; Duthie, Fl. Gangetic Plain 1: 267. 1903; Singh in Shetty & Singh, Fl. Rajasthan 1: 272. 1987; Yadav and Meena, Fl. SC Rajasthan 130. 2011.

Local Name: - Karanj

Charcteristics:

Tall evergreen tree; branched; leaves simple and ovate; white flowers in axillary raceme; single seeded, ovate, beaked and flat pods; dark brown seeds.

Fl. and Fr.: April- May

Habitat: Found in waste lands, roadsides and gardens.

56. ***Rhynchosia minima*** (L.) DC.

Rhynchosia minima (L.) DC. Prodr. 2: 385. 1825; Baker in Hooker f. Fl. Brit. India 2: 223. 1876; Duthie, Fl. Gangetic Plain 1: 222. 1903; Bhandari, Fl. Indian Desert 124. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 255. 1987; Sharma, Fl. Raj. (Hadoti) 71. 2002; Yadav and Meena, Fl. SC Rajasthan 131. 2011.

Local name: Chidi Moth

Characteristics:

Annual, twining, much-branched herbs; trifoliate leaves, rhomboid-obovate; Flowers yellow in axillary racemes; pods linear, 2-seeded; seeds ovate, pale green.

Fl. and Fr. : July to Decmber.

Habitat: Found in gravel soil and hard surface.

57. ***Tephrosia purpurea*** (L.) Pers.

Tephrosia purpurea (L.) Pers. Syn. Pl. 2: 329. 1807; Baker in Hooker f. Fl. Brit. India 2: 112. 1876; Duthie, Fl Gangetic Plain 1: 245. 1903; Bhandari, Fl. Indian Desert 131. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 264. 1987; Yadav and Meena, Fl. SC Rajasthan 134. 2011.

Characteristics:

Perennial, erect, much-branched, woody, herb; 1 m high; unipinnate leaves; leaflets elliptic-oblong; flowers purplish-pink; pods linear, slightly recurved, 5 to 8-seeded; seeds cylindrical, dark brown.

Fl. and Fr.: August-February

Habitat: Found in roadsides and wastelands.

58. ***Tephrosia strigosa*** (Dalz.) Sant. & Mahesh.

Tephrosia strigosa (Dalz.) Sant. & Mahesh. in J. Bombay Nat. Hist.Soc. 54 (3): 805. 1957; Baker in Hooker f. Fl. Brit. India 2: 111. 1876; Duthie, Fl. Gangetic Plains 1: 244. 1903; Bhandari, Fl. Indian Desert 131. 1978; Singh in Shetty & Singh Fl.Rajasthan 1: 265. 1987; Sharma, Fl. Raj. (Hadoti) 72. 2002; Yadav and Meena, Fl. SC Rajasthan 135. 2011.

Characteristiccs:

Annual, erect, much branched herbs; 20-30 cm high; leaves unipinnate, alternate, subsessile, linear-lanceolate; axillary, solitary, violet flowers; pods linear-oblong, flat, hairy, 6-8 seeded; seeds suborbicular, smooth, dark brown.

Fl. and Fr.: July- October

Habitat: Found in waste sandy plains.

59. ***Tephrosia villosa*** (L.) Pers.

Tephrosia villosa (L.) Pers. Syn. Pl. 2: 329. 1807; Baker in Hooker f. Fl. Brit. India 2: 113. 1876; Duthie, Fl. Gangatic Plain 1: 245. 1903; Bhandari, Fl. Indian Desert, 133. 1978; Singh in Shetty, Fl Rajasthan 1: 266 : 1987; Sharma, Fl. Raj. (Hadoti) 73. 2002; Yadav and Meena, Fl. SC Rajasthan 135. 2011.

Characteristic

Small, perennial herb; branched stem covered with grey hairs; leaves uni pinnate, oblanceolate; flowers pinkish-red, inraceme; pods flat, curved; seeds ovate, light brown.

Fl. and Fr.: December-April

Habitat: Found in wasteland, grows solitary.

60. ***Vigna trilobata*** (L.) Verde.

Vigna trilobata (L.) Verde. in Taxon 17: 172. & in Kew Bull. 24: 560. 1970; Baker in Hooker f. Fl. Brit. Indai 2: 201. 1876; Duthie, Fl. Gangetic Plains 1: 224. 1903; Bhandari, Fl. Indian Desert 133. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 274. 1987; Sharma, Fl. Raj. (Hadoti) 75. 2002; Yadav and Meena, Fl. SC Rajasthan 138. 2011.

Local name: Jangal moong

Characteristics:

Annual, prostrate herb; hairy branches; leaves trifoliolate; leaflets ovate-oblong; yellow flowers, 2 to 4-flowers in a axillary raceme; long cylindric pods, 8-12-seeded; seeds long, papilla present, brown.

Fl. and Fr.: September-December
Habitat: Found in cultivated land as weed.

XXVI. CAESALPIACEAE

61. ***Bauhinia racemosa*** Lamk.

Bauhinia racemosa Lamk.Encycl. 2: 390. 1785; Baker in Hooker, Fl. Brit. India 2: 276. 1878; Duthie, Fl. Gangetic Plain 1: 298, 1903; Bhandari, Fl. Indian Desert 127, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 279, 1987; Sharma, Fl. Raj (Hadoti). 76. 2002; Yadav and Meena, Fl. SC Rajasthan 140. 2011.

Local name: Kachanar

Charcteristics:

Deciduous Tree; branched; simple leaves, divided into two equal ovate halves; white flowers on terminal raceme; long pods with 12-20 seeds; black flat seeds.

Fl.and Fr.: March- April.
Habitat: Found in forest.

62. ***Bauhinia variegata*** Linn. Sp. Pl. 375.1753;

Bauhinia variegata Linn. Sp. Pl. 375. 1753; Baker in Hooker, Fl. Brit. India 2: 284. 1878; Duthie, Fl. Gangetic Plain 1: 300, 1903; Parmar in Shetty & Singh, Fl. Rajasthan 1: 290, 1987; Sharma, Fl. Raj (Hadoti). 76. 2002; Yadav and Meena, Fl. SC Rajasthan 141. 2011.

Local name: Kachanar

Charcteristics:

Deciduous Tree; branched; simple leaves, divided into two equal ovate halves; white flowers on terminal raceme; long pods with 12-20 seeds; black flat seeds.

Fl.and Fr.: March- April.
Habitat: Found in forest as well as cultivated gardens.

63.*Caesalpinia pulcherrima* (Linn.) Swartz. *var*. *flava*

Sharma, Fl. Raj (Hadoti). 76. 2002;
Local name: Gultorus
Charcteristics:
Evergeen small Tree; branched; bipinnate leaves, ovate leaflet; yellow flower on axillary raceme; pods with 1-2 seeds.
Fl.and Fr.: March- April.
Habitat: Common in road sides of urban area.

64. ***Caesalpinia pulcherrima*** (Linn.) Swartz.*var. rubra*
Sharma, Fl. Raj (Hadoti). 76. 2002;
Local name: Gultorus
Charcteristics:
Evergeen small Tree; branched; bipinnate leaves, ovate leaflet; red flower on axillary raceme; pods with 1-2 seeds.
Fl.and Fr.: March- April.
Habitat: Common in road sides of urban area.

65. ***Cassia alata*** Linn.
Singh in Shetty & Singh, Fl. Rajasthan 1: 291, 1987.
Charcteristics:
Shrub, spreading branches; 5-14 pair of leaflets; yellow flower on axillary corymb; fruit is flat pod.
Fl.and Fr.: March- April.
Habitat: Common in road sides (Rawatbhata road).

66.*Cassia fistula* Linn.
Cassia fistula Linn. in Sp. Pl. 377. 1753; Baker in Hooker, Fl. Brit. India 2: 261. 1876; Duthie, Fl. Gangetic Plain 1: 291, 1903; Parmar in Shetty & Singh, Fl. Rajasthan 1: 283, 1987; Sharma, Fl. Raj (Hadoti). 77. 2002; Yadav and Meena, Fl. SC Rajasthan 142. 2011.
Local name: Amaltas
Charcteristics:
Evergreen tree; unipinnate leaves, 3-8 pairs of opposite leaflets, ovate leaflets; yellow flowers in drooping racemes; dark black, cylindrical pods, 40-80 seeds per pod.
Fl.and Fr.: March- April.
Habitat: Common in roadside, cultivated in gardens.

67.*Cassia occidetalis* Linn.

Cassia occidetalis Linn. in Sp. Pl. 377. 1753; Baker in Hooker, Fl. Brit. India 2: 262. 1876; Duthie, Fl. Gangetic Plain 1: 292, 1903; Bhandari, Fl. Indian Desert 97, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 285, 1987; Sharma, Fl. Raj (Hadoti). 77. 2002.

Charcteristics:

Shrub; branched; pinnate leaves, 3-4 pairs leaflets, ovate leaflets; yellow flowers in axillary corymb; linear oblong pods; green-brown seeds.

Fl.and Fr.: October- November.

Habitat: Common in groups in wetlands.

68.*Cassia siemia* Lam**.**

Cassia siemia Lam. in Encycl. 1: 651. 1785; B ake in Hooker, Fl. Brit. India 2: 264. 1876; Duthie, Fl. Gangetic Plain 1: 295, 1903; Sharma, Fl. Raj (Hadoti). 78. 2002;

Local name: Amaltas

Charcteristics:

Evergreen tree; unipinnate leaves, 4-16 pairs of opposite leaflets, ovate leaflets; yellow flowers in axillary racemes; dark brown flat pods; flat dark brown seeds.

Fl.and Fr.: Almost whole year.

Habitat: Common in roadside, cultivated in gardens.

69. *Cassia tora* Linn.

Cassia tora Linn. in Sp. Pl. 376. 1753; Baker in Hooker, Fl. Brit. India 2: 263. 1876; Duthie, Fl. Gangetic Plain 1: 293, 1903; Parmar in Shetty & Singh, Fl. Rajasthan 1: 286, 1987; Sharma, Fl. Raj (Hadoti). 78. 2002;

Charcteristics:

Small, annual herb; branched; pinnate leaves, ovate sessile leaflets; yellow axillary flowers; linear beaked pods.

Fl.and Fr.: October - November

Habitat: Found in plains after rainy season.

70. *Delonix regia* (Boj.) Raf.

Baker in Hooker, Fl. Brit. India 2: 260. 1876; Duthie, Fl. Gangetic Plain 1: 240, 1903; Maheshwari, Fl. Delhi f. 143.1963; Sharma, Fl. Raj (Hadoti). 78. 2002.

Local name: Gulmohar

Charcteristics:

Evergreen tree; branched; bipinnate leaves, numerous small ovate leaflets; red big axillary flowers; flat long woody pods; many flat seeds.

Fl.and Fr.: November- April.

Habitat: Common in road sides, cultivated in gardens.

71.*Parkinsonia aculeata* Linn.

Parkinsonia aculeata Linn. in Sp. Pl. 375. 1753; Baker in Hooker, Fl. Brit. India 2: 260. 1876; Duthie, Fl. Gangetic Plain 1: 303, 1903; Bhandari, Fl. Indian Desert 131, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 288, 1987; Sharma, Fl. Raj (Hadoti). 79. 2002; Yadav and Meena, Fl. SC Rajasthan 146. 2011.

Local name: Palash, Keshu, Dhak

Charcteristics:

Evergreen tree; branched; bipinnate leaves, spines at base of leaves, Axillary raceme; yellow flower on axillary raceme; pods with 2-6 seeds.

Fl.and Fr.: March- April.

Habitat: Common in roadsides and gardens.

72. *Peltophorum pterocarpum* (D.C.) Backer ex K. Heyne

Peltophorum pterocarpum (D.C.) Backer ex. K. Heyne. in Nutt. Pl. Ned. Ind. Ed. 2: 755. 1927; Baker in Hooker, Fl. Brit. India 2: 257. 1876; Parmar in Shetty & Singh, Fl. Rajasthan 1: 292, 1987; Sharma, Fl. Raj (Hadoti). 79. 2002; Yadav and Meena, Fl. SC Rajasthan 146. 2011.

Charcteristics:

Tall evergreen tree; branched; bipinnate leaves, oblong leaflets, yellow flwers on axillary raceme; flat pods with 4-10 flat seeds.

Fl.and Fr.: March- May

Habitat: Found in roadsides abd boundaries of croplands.

73. *Saraca indica* Linn.

Saraca indica Linn. in Mant. 98; Roxb. Fl. Ind. 2: 218. 1824; Hooker, Fl. Brit. India 2: 271. 1876; Sharma, Fl. Raj (Hadoti). 79. 2002.

Local name: Sita- Asok.

Charcteristics:

Evergreen, brached tree, cone like appearance; unipinnate leaves, leaflets oblong ovate, yellow flwers, fruit is pod,

Fl.and Fr.: June- December.

Habitat: Found in Kolipura forest area.

74. ***Senna italica*** Mill.

Senna italica Mill. in Gard. Dict. ed. 8: 2. 1786; Baker in Hooker f. Fl. Brit. India 2: 264. 1878; Duthie, Fl. Gangetic Plain 1: 294, 1903; Bhandari, Fl. Indain Desert 142. 1978; Parmar in Shetty & Singh, fl. Rajasthan 1: 283. 1987; Yadav and Meena, Fl. SC Rajasthan 148. 2011.

Characteristics:

Perennial, erect herbs; 30-40 cm high; stem and branches; leaflets 3-7 pairs, obovate; Flowers yellow in axillary 6-flowered racemes; long glabrous pods; Seeds 6-12 per pod.

Fl. and Fr.: August-January

Habitat: Found in wetlands and waste plains.

75. ***Tamarindus indica*** Linn.

Tamarindus indica Linn. in Sp. Pl. 34. 1753; Baker in Hooker, Fl. Brit. India 2: 273. 1876; Duthie, Fl. Gangetic Plain 1: 301, 1903; Bhandari, Fl. Indian Desert 131, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 289, 1987; Sharma, Fl. Raj (Hadoti). 79. 2002; Yadav and Meena, Fl. SC Rajasthan 152. 2011.

Local name: Imli

Charcteristics:

Evergreen, large tree; branched; unipinnate leaves, oblong leaflets; yellow flower on axillary raceme; pods with dark brown 2-5 seeds.

Fl.and Fr.: March- April.

Habitat: Common in roadsides and forest area.

XXVII. MIMOSACEAE

76. ***Acacia jacquemontii*** Benth. in Hook

Acacia jacquemontii Benth. in Hook. Lond. Journ. Bot. 1: 499. 1842; Baker in Hooker f. Fl. Brit. India 2: 293. 1878; Duthie, Fl. Gangatic Plains 1: 314. 1903; Bhandari, Fl. Indian Desert 146. 1978; Pandey in

Shetty and Singh Flora Raj. 1: 296. 1987; Sharma, Fl. Raj. (Hadoti) 80. 2002; Yadav and Meena, Fl. SC Rajasthan 153. 2011.

Local name: Bu-bhanwali.

Characteristics:

Erect, much-branched shrubs; grey-brown bark; zig zag branches; leaves bipinnate, sessile and oblong leaflets; flowers in white-yellow axillary heads; flat ovate oblong pods with 5-6-seed.

Fl. and Fr.: December-May.

Habitat: Found on sandy plains.

77. ***Acacia nilotica*** (Linn.) Willd. ex. Del.

Acacia nilotica (Linn.) Willd. ex. Del. subsp. *indica* (Benth.) Brenan in Kew Bull. 12: 84. 1957; Baker in Hooker f. Fl. Brit. India 2: 293. 1878; Bhandari, Fl. Indain Desert 147. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 299. 1987; Sharma, Fl. Raj. (Hadoti) 80. 2002.

Local name: Babul.

Characteristics:

Evergreen trees, 6-12 m high; branches show long spines, leaves bipinnate, linear-oblong leaflets, yellow flowers in axillary globose heads; moniliform pods; 10-12 seeds per pod.

Fl. & Fr.: September-March.

Ecology: Found usually in waste lands of forest and croplands.

78. ***Acacia senegal*** (L.) Willd.

Acacia senegal (L.) Willd. Sp. Pl. 4: 1077, 1806; Baker in Hooker f. Fl. Brit. India 2 : 295. 1878; Duthie, Fl. Gangetic Plains 1: 317. 1903; Bhandari. Fl. Indian Desert 148. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 300. 1987; Sharma, Fl. Raj. (Hadoti) 80. 2002; Yadav and Meena, Fl. SC Rajasthan 156-157. 2011.

Local name: *Kumatiyo*.

Characteristics:

Medium-sized trees, 3-6 m high; spines on branches, white grey bark; bipinnate leaves, elliptic-oblong leaflets; creamy flower in axillary spikes; flat linear pods; 4-6 dark dark brown seeds in each pod.

Fl. and Fr.: July-February.

Habitat- Found in forest area and croplands.

79. ***Acacia tortilis*** (Forsk.) Heyne

Acacia tortilis (Forsk.) Heyne. in Kew Bull. 1957 : 87. 1957; Pandey in Shetty & Singh, Fl. Rajasthan 1 : 299. 1987; Sharma, Fl. Raj. (Hadoti) 81. 2002; Yadav and Meena, Fl. SC Rajasthan 157. 2011.

Characteristics:

Small tree, upto 3 m hieght; reddish-brown bark; stipulat spines upto 1 cm long, curved at apex, white; pinnate leaves, 5-14 pairs of oblenceolate leaflets, cream white flowers in axillary heads; black-brown seeds.

Fl. and Fr.: July – December.

Habitat: Found on cropland borders and forest area.

80. ***Albizia lebbeck*** (L.) Benth.

Albizia lebbeck (L.) Benth. in Hook. Lond. J. Bot. 3 87. 1844; Baker in Hooker f. Fl. Brit. India 2 : 298. 1878; Duthie, Fl. Gangetic Plain 1: 320. 1903; Bhandari, Fl. Indian Desert, 148. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 301. 1987; Sharma, Fl. Raj. (Hadoti) 81. 2002; Yadav and Meena, Fl. SC Rajasthan 157. 2011.

Local name : Sares.

Characteristics:

Tall deciduous tree; grey-bark; bipinnate leaves with 2-4 pairs of leaflets; elliptic-oblong leaflets; pale white flowers in umbellate heads; linear oblong pods with 4-12 seeds.

Fl. and Fr. : June – November

Habitat: Common plant in forest area and cultivated on road sides.

81. ***Dichrostachys cinerea*** Linn. Wight & Arn.

Dichrostachys cinerea Linn. Wight & Arn. Prodr. 271. 1834; Baker in Hooker, Fl. Brit. India 2: 288. 1876; Duthie, Fl. Gangetic Plain 1: 310. 1903; Bhandari, Fl. Indian Desert 135, 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 303, 1987; Sharma, Fl. Raj (Hadoti). 81. 2002; Yadav and Meena, Fl. SC Rajasthan 116. 2011.

Local name: Goya Khair

Charcteristics:

Shrub; branched; brach end inti spine; bipinnate leaves, 4-14 pairs of linear leaflets; upper yellow half of spike shows bisexual flowers, lower red half is neuter; clustered fruits with ovoid seeds.

Fl.and Fr.: March- April.

Habitat: Found in groups in forest.

82. ***Leucaena latisiqua*** (Linn.) Gillis ***L. leucocephala*** Willd. syn.

Leucaena latisiqua (Linn.) Gillis in Taxon 23: 190. 1974; Baker in Hooker, Fl. Brit. India 2: 290. 1878; Duthie, Fl. Gangetic Plain 1: 310, 1903; Bhandari, Fl. Indian Desert 135, 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 303, 1987; Sharma, Fl. Raj (Hadoti). 81. 2002; Yadav and Meena, Fl. SC Rajasthan 159. 2011.

Local name: Su babool.

Charcteristics:

Large evergreen spineless tree; branched; bipinnate leaveswith 4-9 pairs of leaflets; white flowers in globose pair of heads; flat and long pods 15-20 seeds.

Fl. and Fr.: September- March.

Habitat: Common in gardens and road sides.

83. ***Mimosa hamata*** Willd.

Mimosa hamata Willd. in Sp. Pl. 4: 1033. 1806; Baker in Hooker f. Fl. Brit. India 2 : 291. 1878; Duthie, Fl. Gangetic Plain 1: 312. 1903; Bhandari, Fl. Indian Desert 150. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 304. 1987; Fl. Raj. (Hadoti) 82. 2002; Yadav and Meena, Fl. SC Rajasthan 159-160. 2011.

Local name: Jinjani

Characteristics:.

Pricky Shrub; branched, 2 m high; bipinnate leaves with 6-10 pairs of ovate leaflets; pink flowers in axillary pricky globose head; flat, pricky and twisted pods with 3 to 8-jointed.

Fl. and Fr. : August – March.

Habitat: Found in wasteland of forest area.

84. ***Pithecellobium dulce*** (Roxb.) Benth.

Pithecellobium dulce (Roxb.) Benth. in Hooker Lond. J.Bot. 3: 199. 1844; Baker in Hooker, Fl. Brit. India 2: 302. 1878; Duthie, Fl. Gangetic Plain 1: 322, 1903; Bhandari, Fl. Indian Desert 137. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 306, 1987; Sharma, Fl. Raj (Hadoti). 83. 2002; Yadav and Meena, Fl. SC Rajasthan 161. 2011.

Local name: Jangal Jalebi

Charcteristics:

Evergreen tree; branched; unipinnate leaves; one pair of elliptic leaflets, leaf modified into spines; greenish white flowers in globose heads; twisted pods with 5-9 seeds.

Fl.and Fr.: November - April.

Habitat: Common in groups in forest (Flame of Forest)

85. ***Prosopis cineraria*** (L.) Druce.

Prosopis cineraria (L.) Druce. in Rep. Bot. Soc. Exch. Club Brit. Isles 3: 422. 1914; Baker in Hook. f. Fl. Brit. India 2: 288. 1878; Duthie, Fl. Gangetic Plain 1: 309. 1903. Bhandari, Fl. Indian Desert 151. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 307. 1987; Sharma, Fl. Raj. (Hadoti) 83. 2002; Yadav and Meena, Fl. SC Rajasthan 162. 2011.

Local name: Khejari

Medium-sized tree; 3-10 m high; deep fissured grey bark; straight prickles on slender brances; bipinnate leaves with 7-12 pairs of oblong leaflets; yellow flowers in axillary spikes; pendulous with 10-15 seeds.

Fl. and Fr.: March – June.

Habitat : Found in waste plains.

86. ***Prosopis juliflora*** (Swartz) DC.

Prosopis juliflora (Swartz) DC. Prodr. 2: 447. 1825; Duthie, Fl. Gangetic Plain 1: 309. 1903;; Bhandari, Fl. Indian Desert 151. 1978, Pandey in Shetty & Singh, Fl. Rajasthan 1: 307. 1987; Sharma, Fl. Raj. (Hadoti) 83. 2002; Yadav and Meena, Fl. SC Rajasthan 163. 2011.

Local name: Angreji-banwal

Characteristics:

Evergreen, small tree, 2-5 m high; branches long, long, paired, axillary, prickles on branches; bipinnate leaves with 15-25 pairs of leaflets; greenish-yellow flowers in axillary spikes, yellow pods with 10-25 seeds.

Fl. and Fr. : Throughout the year.

Habitat: Found in wastelands and croplands

XXVIII. ROSACEAE

87. ***Potentilla supina*** Linn.

Potentilla supina Linn in Sp. Pl. 497. 1753; Hooker, Fl. Brit. India 2: 359. 1881; Duthie, Fl. Gangetic Plain 1: 327. 1903; Bhandari, Fl. Indian Desert 139. 1978, Pandey in Shetty & Singh, Fl. Rajasthan 1: 309. 1987 Sharma, Fl. Raj (Hadoti). 83, 2002; Yadav and Meena, Fl. SC Rajasthan 163. 2011.

Characteristics:

Prostrate, annual, herb; many hairy branches arise from base; pinnate leaves, 3-9 ovate leafleys; solitary, axillary, yellow flowers; fruits, globose, smooth, achenes.

Fl. and Fr. : November-January.

Habitat : Found near river banks, margins of cropland.

XXIX. COMBRETACEAE

88. ***Anogeissus pendula*** Edgew.

Anogeissus pendula Edgew. in Cat.Pl. Banda Dist. 47. 1851; Hooker, Fl. Brit. India 2: 451. 1881; Duthie, Fl. Gangetic Plain 1: 339. 1903; Bhandari, Fl. Indian Desert 140. 1978, Pandey in Shetty & Singh, Fl. Rajasthan 1: 309. 1987 Sharma, Fl. Raj (Hadoti). 84, 2002; Yadav and Meena, Fl. SC Rajasthan 164. 2011.

Local Name : Dhok

Characteristics:

Medium Tree, 4-10 m high; elliptic, alternate leaves; yellow flowers in solitary heads; beaked fruits with wings;

Fl. and Fr. : July-November

Habitat : Found in forest area.

89. ***Terminallia arjuna*** (Roxb ex DC) Wight & Arn.

Terminallia arjuna (Roxb ex DC) Wight & Arn. Prodr.314.1834; Clarke in Hooker, Fl. Brit. India 2: 447. 1881; Duthie, Fl. Gangetic Plain 1: 336. 1903; Pandey in Shetty & Singh, Fl. Rajasthan 1: 316. 1987 Sharma, Fl. Raj (Hadoti). 85, 2002; Yadav and Meena, Fl. SC Rajasthan 165. 2011.

Local Name: Dhok

Characteristics:

Large deciduous tree; 6-15 m high; white-gray bark; simple, elliptic opposite broad leaves; ovoid 5-winged fruits.

Fl. and Fr. : July-November

Habitat : Found in forest area.

XXX. MYRTACEAE

90. ***Syzygium cumini*** (Linn.) Skeels.

Syzygium cumini (Linn.) Skeels. U,S.D. ept.Agric. Bur.Pl.Industr. Bull. 248: 25.1912; Duthie in Hooker, Fl. Brit. India 2: 499. 1881; Duthie, Fl. Gangetic Plain 1: 342. 1903; Parmar in Shetty & Singh, Fl. Rajasthan 1: 318. 1987; Sharma, Fl. Raj (Hadoti). 86, 2002; Yadav and Meena, Fl. SC Rajasthan 167. 2011.

Characteristics:

Large deciduous tree; 5-25m high; thick and rough bark; broad elliptic leaves; white flowers in axillary group of heads; fruits purple/black berries, single seeded.

Fl. and Fr. : March -July

Habitat : Found in forest area cultivated in gardens also.

XXXI. LYTHRACEAE

91. ***Lawsonia inermis*** Linn.

Lawsonia inermis Linn. in Sp. Pl. 349.1753; ; Clarke in Hooker, Fl. Brit. India 2: 573. 1881; Sharma, Fl. Raj (Hadoti). 88, 2002; Yadav and Meena, Fl. SC Rajasthan 169. 2011.

Local Name: Mehandi

Characteristics:

Shrub, much branched; Sessile elliptic leaves, Inflorecence terminal cymose, small greenish- white flowers in groups; fruits are capsules; many pyramid shaped seeds in fruits.

Fl. and Fr. : March -July

Habitat : Grown as hedges in gardens, Found in wasteland also.

XXXII. CUCURBITACEAE

92. ***Coccinia grandis*** (Linn.) Voigt

Coccinia grandis (Linn.) Voigt in Hrt. Suburb. Cale. 59. 1845; Clarke in Hooker, Fl. Brit. India 2: 621. 1881; Duthie, Fl. Gangetic Plain 1: 376. 1903; Bhandari, Fl. Indian Desert 163. 1978, Pandey in Shetty & Singh, Fl. Rajasthan 1: 335. 1987; Yadav and Meena, Fl. SC Rajasthan 175. 2011.

Characteristics:

Climber, perennial; cylindrical branched stem; ovate triangular leaves, alternate; large white flowers, dioecious, red cylindrical fruits; thin flat seeds.

Fl. and Fr. : Throughout year.

Habitat : Found near crop fields and on genral roadside plants.

93. ***Luffa acuntagula*** (Linn.) Roxb. var. *amara* (Roxb.) Clarke.

Luffa acuntagula (Linn.) Roxb. var. *amara* (Roxb.) Clarke. in Hooker, Fl. Brit. India 2: 615. 1881; Duthie, Fl. Gangetic Plain 1: 367. 1903; Bhandari, Fl. Indian Desert 154. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 342. 1987; Sharma, Fl. Raj (Hadoti). 91, 2002; Yadav and Meena, Fl. SC Rajasthan 179. 2011.

Local name: Mar- turai

Characteristics:

Climber, annual; pentagonal palmate leaves, alternate; female axillary solitary flowers; male axillary raceme, in same axil; oblong, beaked, ribbed (10) fruit. thin flat seeds.

Fl. and Fr. : After rainy season.

Habitat : Found near crop fields.

94. ***Luffa acuntagula*** (Linn.) Roxb. var. *amara* (Roxb.) Clarke.

Luffa acuntagula (Linn.) Roxb. var. *amara* (Roxb.) Clarke. in Hooker, Fl. Brit. India 2: 615. 1881; Duthie, Fl. Gangetic Plain 1: 367. 1903; Bhandari, Fl. Indian Desert 154. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 342. 1987; Sharma, Fl. Raj (Hadoti). 91, 2002; Yadav and Meena, Fl. SC Rajasthan 179. 2011.

Local name: Mar- turai

Characteristics:

Climber, annual; pentagonal palmate leaves, alternate; female axillary solitary flowers; male axillary raceme, in same axil; oblong, beaked, ribbed (10) fruit. thin flat seeds.

Fl. and Fr. : After rainy season.
Habitat : Found near crop fields.

95. ***Momordica charantia*** Linn.

Momordica charantia Linn. in Sp. Pl. 1009. 1753; Clarke in Hooker, Fl. Brit. India 2: 616. 1881; Duthie, Fl. Gangetic Plain 1: 369. 1903; Bhandari, Fl. Indian Desert 173. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 346. 1987; Sharma, Fl. Raj (Hadoti). 92, 2002; Yadav and Meena, Fl. SC Rajasthan 182. 2011.

Local name: Mar- Karelo, Marelo

Characteristics:

Climber, annual; pentagonal palmate leaves, wavy margin, alternate; monoecious plant; yellow axillary solitary flowers; oblong fruit with rough surface; flat oblong seeds.

Habitat: Near cropland borders and wastelands. Cultivated varieties of the plant is grown in cropfields.

Fr. and Fl. : June –November

96. ***Momordica dioica*** Roxb.ex Willd.

Momordica dioica Roxb.ex Willd. in Sp. Pl. 4: 605. 1805; Clarke in Hooker, Fl. Brit. India 2: 617. 1881; Duthie, Fl. Gangetic Plain 1: 370. 1903; Bhandari, Fl. Indian Desert 156. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 1: 347. 1987; Sharma, Fl. Raj (Hadoti). 92, 2002; Yadav and Meena, Fl. SC Rajasthan 182. 2011.

Local name: Kikkoda

Characteristics:

Climber, perennial ; trilobed and trigonal palmate leaves; wavy margin, alternate; dioecious plant; solitary, axillary, yellwo, small, male flowers on small peduncle; solitary, axillary, yellow, broad flowers on long peduncle axillary solitary flowers; elliopsoid fruits covered with soft spines.

Habitat: Near cropland borders and wastelands.

Fr. and Fl. : June –November.

XXXIII. CACTACEAE

97. ***Opuntia elatior*** Mill.

Opuntia elatior Mill. in Gar. Dict. Ed. 8: 4. 1768; Clarke in Hooker f. Fl. Brit. India 2: 657. 1879; Duthie, Fl. Gangetic Plain 1: 384. 1903; Bhandari, Fl. Ind. Desert 158. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 353. 1987; Sharma, Fl. Raj (Hadoti). 94. 2002; Yadav and Meena Fl. SC Rajasthan 184. 2011.

Local name: Nagphani

Characteristics:

Erect perennial shrub; succulant stem (Phyllode), leaves modify into spines, stem broads into abovate leaf like structure; terminal solitary flowers; pink red flower flowers; purple stemens; fruits are berries (Red).

Fl. and Fr. : January- June.

Habitat : Found in hilly area and wastelands.

XXXIV. MOLLUGINACEAE

98.*Glinus lotoides* Linn.

Glinus lotoides Linn. in Sp. Pl. 463. 1753; Clarke in Hooker, Fl. Brit. India 2 : 662. 1879; Duthie, Fl. Gangetic Plain 1: 386. 1903; Bhandari, Fl. Ind. Desert 161. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 358. 1987; Sharma, Fl. Raj (Hadoti). 94. 2002; Yadav and Meena, Fl. SC Rajasthan 186, 2011

Characteristics:

Annual, prostrate herb; plant body covered with wooly hairs; leaves opposite, obovate; flowers in axillary cluster; fruit is globose capsule; seeds many, covered withlinear appandages.

Fl. and Fr. : February to May

Habitat : Found in waste lands and slits of rocky surface.

99.*Glinus oppositifolius* (Linn.) DC,

Glinus oppositifolius (Linn.) DC in Bull. Herb. Boiss. Ser 2. 1: 559.1901; Clarke in Hooker. Fl. Brit. India 1: 662. 1879; Duthie, Fl. Gangetic Plain 1: 387. 1903; Bhandari, Fl. Ind. Desert 29. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 1: 358. 1987; Yadav and Meena Fl. SC Rajasthan 36. 2011.

Characteristics:

Annual herb; base branches prostrate, top branches erect; leaves, oblanceolate, whorled; white-pink flowers in axillary cyme; fruit is ellipsoid capsule; small brown seeds.

Fl. and Fr. : July -April.

Habitat : Found in aquatic wetlands.

XXXV.RUBIACEAE

100. Hamelia patens Jacq.

Evergreen, perennial, woody, shrub, 2-4 meters high; densely branched; simple leaves, whorled, ovate, terminal cyme, orange-red, cylindric flowers; ovoid red berries.

Fl. and Fr. : April- September

Habitat : Found on roadsides as invasive.

101. ***Mitragyna parvifolia*** (Roxb.) Korth.

Mitragyna parvifoliab (Roxb.) Korth. in Obs. Naucl. Ind. 19. 1839; Hooker, Fl. Brit. India 3: 25. 1880; Duthie, Fl. Gangetic Plain 1: 408. 1903; Bhandari, Fl. Ind. Desert 161. 1978; Singh in Shetty & Singh, Fl. Rajasthan 1: 376. 1987; Sharma, Fl. Raj (Hadoti). 98. 2002; Yadav and Meena, Fl. SC Rajasthan 190, 2011

Characteristics:

Deciduous tree, grey scaly bark; leaves simple, ovate, opposite decussate; light yellow flowers in terminalheads; fruit capsule; many winged seeds.

Fl. and Fr. : July- October.

Habitat : Found in forest area near gapernath.

XXXVI. ASTERACEAE

102. ***Ageratum conyzoides Linn.***

Ageratum conyzoides Linn. Sp. Pl. 1753; Hooker. f., Fl. Brit. India 3: 309.1881; Duthie, Fl. Gangetic Plain 1: 99. 1905; Maheshwari, Fl. Delhi. 190, 1963. Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 194. 1979. Shetty & Singh Fl. Rajasthan 1: 390. 1987; Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 166, 1996. Sharma, Fl. Raj (Hadoti). 100, 2002. Yadav and Meena, Fl. SC Raj. 192, 2011.

Characteritics:

Erect, annual, herb, stem 20-80 cm long, much branched, leaves opposite, petiolated, ovate to cordate, acute base, acute apex, serrate margin, heads purple/ blue, small terminal corymb, based by involucre, globose, numerous crowed florets, florets packed with scales, corolla 5, tubular, basal placentation, fruits linear acenes.

Fl. and Fr. : September- October
Habitat: Moist and shady area.

103. ***Blumea mollis*** (D. Don) Merr. Phillip

Blumea mollis (D. Don) Merr. Phillip J. Sci (Bot.) 5: 395.1910; Hook. f., Fl. Brit. India 3: 261. 1881; Duthie, Fl. Gangetic Plain 1: 453. 1905; Maheshwari, Fl. Delhi. 195, 1963. Sharma and Tiagi Fl. NE Raj. 199, 1979. Shetty & Singh Fl. Rajasthan 1: 398. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 171, 1996. Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 195, 2011.

Characteristics:

Erect, annual wooly herb, stem 11-55 cm long, branched at base, leaves alternate, narrow at base, ovate, covered with soft hairs, dentate margin, obtuse apex, dense spike of heads, unrobed angled achenes.

Fl. and Fr.: January- February

Habitat: Found in wastelands

104. ***Caesulia axillaris*** Roxb**.**

Caesulia axillaris Roxb. Fl. Cor.1:64. t. 93.1798; Pant in Hajra *et al.* Fl. India 13: 2. f. 1. 1995; Hook. f., Fl. Brit. India 3: 291.1881; Duthie, Fl. Gangetic Plain 1: 462. 1905; Maheshwari, Fl. Delhi. 192, 1963. Bhandari, Fl. Indian Desert 174. 1978; Sharma and Tiagi Fl. NE Raj. 199, 1979. Shetty & Singh Fl. Rajasthan 1: 400. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 173, 1996. Sharma, Fl. Raj (Hadoti). 102, 2002. Yadav and Meena, Fl. SC Raj. 195, 2011.

Characteristics:

Erect, annual, marshy herb. stem 40-100 cm long, branched, leaves alternate,4-10 cm long, lanceolate, acute base, entire margin, heads homogenous, axillary, sessile, florets white, numerous crowed florets, florets packed in scales, corolla 5, tubular, staminate; fruits flat acenes.

Fl and Fr.: November- December

Habitat: Found in moist wasteland

105. ***Cirsium arvense*** (Linn.) Scop.

Cirsium arvense (Linn.) Scop. in. Fl. Carn. 2: 126. 1772. Hooker Fl. Brit. India 3: 362. 1881; Duthie, Fl. Gangetic Plain 1: 481. 1905; Maheshwari, Fl. Delhi. 201, 963; Maheshwari, Fl. Delhi. 113. 1966; Shetty & Singh Fl. Rajasthan 1: 404. 1987.

Local name : Brahm dandi, Rissa

Characteristics:

Erect, annual, leafy Herb stem 60-100 cm long, branched, leaves alternate, obovate, acute base, serrate margin tipped with spines, Flowers pink- purple, corolla 5, tubular, bisexual heads ovoidal, covered by bristles, basal placentation, fruits acenes.

Fl. and Fr. : September-March

Habitat:- Found on waste and hard soil.

106. ***Cotula hemisphaerica*** (Roxb.)Wall. Ex Benth & Hook**.**

Cotula hemisphaerica (Roxb.)Wall. Ex Benth & Hooker in Fl. Ind. 3: 447. 1832; Hooker f., Fl. Brit. India 3: 358.1881; Duthie, Fl. Gangetic Plain 1: 480. 1905; Maheshwari, Fl. Delhi. 196, 1963; Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979; Shetty & Singh Fl. Rajasthan 1: 408. 1987; Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 197, 2011.

Characteristics:

Prostrate, annual, many branched diffused herb, stem glabrous, branched, spinulated, leaves alternate, pinnatified into thin linear segments, heads bisexual, pale yellow, solitary, angled achenes.

Fl. and Fr. : February- April

Habitat: Found in wetlands of riverbanks.

107. ***Echinops echinatus*** Roxb.

Echinops echinatus Roxb. Fl. Ind. 3: 447. 1832; Hooker f., Fl. Brit. India 3: 358.1881; Duthie, Fl. Gangetic Plain 1: 480. 1905; Maheshwari, Fl. Delhi. 196, 1963; Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979; Shetty & Singh, Fl. Rajasthan 1: 408. 1987; Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 176, 1996. Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 197, 2011.

Local Name: - Oont Katili

Characteristics:

Erect, annual, herb, stem erect, branched, spinulated, leaves alternate, pinnatified, lobed, covered with yellow spines, White homogenous heads, globose, solitary, numerous spinulate crowed florets, florets bisexual disc florets only, packed in scales, corolla 5, tubular, covered by bristles, corolla tube white, basal placentation, fruits acenes 4 mm.

Fl and Fr.: September- June

Habitat: Found on wastelands bordersof croplands.

108. ***Eclipta prostrata*** (Linn.) Linn.

Eclipta prostrata (Linn.) Linn. in Mant. Pl. 2:286.1771; Hook. f., Fl. Brit. India 3: 304.1881; Duthie, Fl. Gangetic Plain 1: 468.1905; Maheshwari, Fl. Delhi. 196, 1963. Sharma and Tiagi Fl. NE Raj. 202, 1979. Shetty & Singh Fl. Rajasthan 1: 409. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 177, 1996. Sharma, Fl. Raj (Hadoti). 105, 2002. Yadav and Meena, Fl. SC Raj. 198, 2011.

Local name: Bhringraj

Characteristics*:*

Erect or prostrate, annual, hirsute herb, stem erect/ prostrate 40-60 cm long, branched, leaves simple opposite, sub sessile, lanceolate, entire , solitary heads, peripheral ray florets 2/3 whorls, ligulate, pistillate, disc florets bisexual, tubular, style branched, basal placentation, Fruits brown acenes.

Fl and Fr.: September -January

Habitat : Found in aquatic wetlands and near running water.

109. ***Grangea maderaspatana*** (Linn.) Poir

Grangea maderaspatana (Linn.) Poir. in Lam. Encycl. Suppl. 2: 825. 1812; ***Artimisia maderaspatana*** Linn. Sp. Pl. 849.1753; Hooker, f., Fl. Brit. India 3: 247. 1881; Duthie, Fl. Gangetic Plain 1: 446. 1905; Maheshwari, Fl. Delhi. 196. 1963; Bhandari, Fl. Indian Desert 181. 1978; Sharma and Tiagi, Fl. NE Raj. 224. 1979; Shetty & Singh, Fl. Rajasthan 1: 417. 1987; Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 182. 1996; Sharma, Fl. Raj (Hadoti). 107. 2002; Yadav and Meena, Fl. SC Raj. 200. 2011.

Characteristics;

Prostrate, annual herb, stem 11-65 cm long, branched, leaves alternate, sessile, pinnatified broadly ovate to cordate, 3-5 lobed, acute base, serrate- dentate margin, Heads globose, yellow, solitary or paired, involucre bracts, outer ray florets pistillate and filiform, central disc florets bisexual, basal placentation, fruits acenes 2 mm long.

Fr. and Fr.: Throughout year

Habitat:- Borders of ponds.

110. ***Gnaphalium pulvinatum*** Delile

Gnaphalium pulvinatum Delile. Fl. Aegypt. 122. t. 44. f. 1812. Hook. f., Fl. Brit. India 3: 289.1881; Duthie, Fl. Gangetic Plain 1: 462. 1905; Bhandari, Fl. Indian Desert 180. 1978; Sharma and Tiagi Fl. NE Raj. 209, 1979. Shetty & Singh Fl. Rajasthan 1: 416. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 180, 1996. Sharma, Fl. Raj (Hadoti). 106, 2002. Yadav and Meena, Fl. SC Raj. 200, 2011.

Characteristics:

Prostrate, annual, herb, woolly, stem 20-30 cm long, branched, leaves alternate, abovate, acute base, obtuse apex, entire margin, heads crowded, sub-globose, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, Fruits acenes.

Fl and Fr.: Winter season

Habitat: Aquatic wetlands, Moist places

111. ***Gnaphalium luteo-album*** Linn.

Gnaphalium luteo-album Linn. in Sp. Pl. 185. 1753; Hook. f., Fl. Brit. India 3: 288.1881; Duthie, Fl. Gangetic Plain 1: 461. 1905; Maheshwari,

Fl. Delhi. 194, 1963. Bhandari, Fl. Indian Desert 180. 1978; Sharma and Tiagi Fl. NE Raj. 208, 1979. Shetty & Singh Fl. Rajasthan 1: 415. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 178, 1996. Sharma, Fl. Raj (Hadoti). 106, 2002. Yadav and Meena, Fl. SC Raj. 199, 2011

Characteristics:

Erect/Semi prostrate, annual, white wooly herb. stem 15-30 cm long, branched, leaves alternate, sessile, oblong linear, wooly surface, 4mm long, corymb heads white pale, heterogenous, axillary, sessile, florets light yellow, fruits flat cypsela.

Fl. And Fr.: December- March

Habitat: Near croplands and margins of ponds

112. ***Launaea procumbens*** (Roxb.) Ramayya & Rajgopal

Launaea procumbens (Roxb.) Ramayya & Rajgopal in Kew Bull. 23:465.1969; Bhandari, Fl. Indian Desert 182. 1978; cop; Shetty & Singh Fl. Rajasthan 1: 423. 1987; Hook. f., Fl. Brit. India 3: 404.1881; non Less. 1832; Duthie, Fl. Gangetic Plain 1: 494. 1905; Maheshwari, Fl. Delhi. 189, 1963. Maheshwari, Ill. Fl. Delhi. F.99, 1966. Shetty & Singh Fl. Rajasthan 1: 423. 1987. Sharma, Fl. Raj (Hadoti). 108, 2002. Yadav and Meena, Fl. SC Raj. 200, 2011.

Local Name: Jangi Gobi, Gobi

Characteristics:

Erect, biennial, several flowering stems arise from base ,leafy herb, stem 60-80 cm, branched, leaves sessile, whorled, pinnatified, minutely toothed, acute apex, dentate margin, infloresence-head, flowers bright yellow, ligulate ray florets and tubular disc florets both present, fruits acenes.

Fl. and Fr.: Throughout the year.

Habitat : General plant of area.

113. ***Sphaeranthus indicus*** Linn.

Sphaeranthus indicus Linn. Sp. Pl. 927. 1753; Hook. f., Fl. Brit. India 3: 275.1881; Duthie, Fl. Gangetic Plain 1: 459. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 436. 1987. Kumar in Hajra *et al.* Fl. India 13: 160. f. 117. 1995. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 191, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 203, 2011.

Characteristics:

Prostrate, Erect, annual, stem 10-60 cm long, much branched, leaves alternate, lanceolate, covered with glandular hairs, acute base, wavy margin, heads spherical globose, compound, pink/pinkish, homogenous, disc florets only, bisexual, corolla 5, tubular, basal placentation, fruits acenes.

Fl and Fr.: Throughout the year.

Habitat: Aquatic wetlands, near running water.

114. ***Parthenium hysterophorus*** Linn.

Parthenium hysterophorus Linn. Sp. Pl. 988. 1753; Rao, in J. Bombay Nat. Hist. Soc. 54: 218. 1956; Raizada, Suppl. Duthie, Fl. Gangetic Plain 127. 1976; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 189. 1978; Shetty & Singh Fl. Rajasthan 1: 425. 1987. Choudhary in Hajra *et al.* Fl. India 12: 403. f. 113. 1995; Sharma, Fl. Raj (Hadoti). 108, 2002. Yadav and Meena, Fl. SC Raj. 201, 2011.

Local name: Gajar ghaas.

Characteristics:

Erect, annual, herb, stem 40-150 cm long, much branched, leaves alternate, lanceolate, corymb heads, terminal and axillary, pale white, heterogenous, ray florets 5, many tubular disc florets, flat achenes,

Fl. and Fr.: Throughout the year.

Habitat: Wasteland, near croplands.

115. ***Pulicaria angustifolia*** DC.

Pulicaria angustifolia DC. Prodr. 5: 479.1836; Hook. f., Fl. Brit. India 3: 299.1881; Duthie, Fl. Gangetic Plain 1: 465. 1905; Bhandari, Fl. Indian Desert 187. 1978; Sharma and Tiagi Fl. NE Raj. 215, 1979. Shetty & Singh Fl. Rajasthan 1: 429. 1987. Sharma, Fl. Raj (Hadoti). 109, 2002. Yadav and Meena, Fl. SC Raj. 201, 2011.

Characteristics:

Erect, annual, herb, woolly, stem 50-60 cm high, branched at base, leaves sessile, linear, abovate, acute base, solitary terminal heads, yellow, heterogenous, ligulate ray florets, 6-8 mm, hairy acenes,

Fl. and Fr.: September- January

Habitat: Moist and Shady places.

116. ***Sonchus asper*** *(*Linn) Hill.

Sonchus asper **(**Linn) Hill. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al*. Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Local name: - Peeli doodhi

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

117. ***Tridex procumbens*** Linn.

Tridex procumbens Linn. Sp. Pl. 900.1753; Hook. f., Fl. Brit. India 3: 311.1881; Duthie, Fl. Gangetic Plain 1: 475.1905; Maheshwari, Fl. Delhi.

199, 1963; Bhandari, Fl. Indian Desert 190. 1978 Sharma and Tiagi Fl. NE Raj. 220, 1979. Shetty & Singh Fl. Rajasthan 1: 439. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 192, 1996. Sharma, Fl. Raj (Hadoti). 111, 2002. Yadav and Meena, Fl. SC Raj. 204, 2011.

Local Name: Ghamraj

Prostrate, annual, diffused herb, stem erect/ prostrate 40-60 cm long, nodes show rooting, branched, Leaves simple opposite, sub sessile, ovate/ elliptical, hairy surface, acute apex, petiole and young branches densely hairy, Solitary apical heads, 5/6 toothed ligulate ray floret, Many tubular disc florets, silky black cypsela.

Fl. and Fr.: - September to March.

Habitat: - Waste and moist lands.

118. ***Vernonia cinerascens*** Sch.-Bip.

Vernonia cinerascens Sch.-Bip**.** In Sch.-Bip. In Schwweinf. Beitr.Aethiop. 162. 1867; Fl. Ind. 3.610. 1832; Hook. f., Fl. Brit. India 3: 237.1881; Duthie, Fl. Gangetic Plain 1: 441. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 190. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 443. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 193, 1996. Sharma, Fl. Raj (Hadoti). 111, 2002. Yadav and Meena, Fl. SC Raj. 204, 2011.

Local name: Sandri,

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, leaves alternate, petiolate, sphathulate,, 3-5 lobed, acute apex, narrow, corymbose head, purple coloured, homogenous, 3-5 bracts in involucre, fruits acenes.

Fl. and Fr. : September- February

Habitat: Plants near croplands, shady wetlands.

119. ***Xanthium indicum*** Koen.ex Roxb.

Xanthium indicum Koen. Ex. Roxb., Fl. Ind. 3.610. 1832; Hook. f., Fl. Brit. India 3: 309.1881; Duthie, Fl. Gangetic Plain 1: 472. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 443. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 195, 1996. Sharma, Fl. Raj (Hadoti). 112, 2002. Yadav and Meena, Fl. SC Raj. 205, 2011.

Local name: - Adhasisi, Chirchitta

Characteristics:

Erect, annual, stem 20-100 cm long, branched, leaves alternate, broadly ovate to cordate, 3-5 lobed, acute base, serrate margin, Male heads globose, numerous crowed florets, florets packed in scales, corolla 5, tubular, staminate; Female heads ovoidal , covered by bristles, florets 2, corolla absent, pistillate, basal placentation, fruits acenes.

Fl. and Fr.: August to January

Habitat: Wetlands, roadsides, croplands.

XXXVII. PRIMULACEAE

120. ***Anagallis arvensis*** Linn.

Anagallis Arvensis Linn. in Sp. Pl. 1: 211. 1753; Hooker f., Fl. Brit. India 3: 506.1882; Duthie, Fl. Gangetic Plain 2: 6. 1905; Maheshwari, Ill. Fl. Delhi. 117.1966. Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Sing in Shetty & Singh Fl. Rajasthan 2: 457. 1991. Sharma, Fl. Raj (Hadoti). 113, 2002. Yadav and Meena, Fl. SC Raj. 206, 2011.

Characteristics:

Annual, erect, herb;10-30 cm, quadriagular stem, branched from base; ovate, opposite, sessile leaves; axillary solitary, blue, rotate, flowers; fruit is capsule; trigonous brown-black seeds.

Fl. and Fr. : January- April

Habitat: Found in cultivated places and gardens with grasses.

XXXVIII. SAPOTACEAE

121. ***Manilkara hexandra*** (Roxb.) Dub.

Manilkara hexandra (Roxb.) Dub. in Ann. Mus. Colon. Maseille ser 3. 23:9.1915; Clarke in Hooker. f. Fl. Brit. India 3 : 549. 1882; Duthie, Fl. Gangetic Plain 2: 13. 1905; Singh in Shetty & Singh, Fl. Rajasthan 2: 460. 1991; Sharma, Fl. Raj (Hadoti). 114. 2002; Yadav and Meena, Fl. SC Rajasthan 209. 2011.

Local name: Khirni

Characteristics:

Evergreen tree, 10-20 m high; black-gray bark; odovate , alternate leaves; white, axillary solitary, flowers; yellow-red ovoid berries; ovoid seed.

Fl. and Fr.: October-April

Habitat: found in forest area and historical gardens.

122. ***Manilkara zapota*** (Linn.) P.van Royen.

Manilkara hexandra (Roxb.) P. van Royen. in Blumea 7: 410. 1953; Clarke in Hooker. f. Fl. Brit. India 3: 534. 1882; Duthie, Fl. Gangetic Plain 2: 13. 1905; Singh in Shetty & Singh, Fl. Rajasthan 2: 460. 1991; Sharma, Fl. Raj (Hadoti). 114. 2002; Yadav and Meena, Fl. SC Rajasthan 210. 2011.

Local name: Khirni

Characteristics:

Evergreen tree, 10-20 m high; black-gray bark; leaves ovate , crowned at top of braches; white, axillary solitary, flowers; brown berries; flat black elliptic seed.

Fl. and Fr.: Sepember -March

Habitat: Cultivated in cropland, planted in gardens.

XXXIX. EBENACEAE

123. ***Diospyros melanoxylon*** Roxb.

Diospyros melanoxylon Roxb. Pl. Cor. 1: 36.t. 46.1795; Clarke in Hooker f. Fl. Brit. India 1 : 564. 1882; Duthie, Fl. Gangetic Plain 2 : 15 1911; Singh in Shetty & Singh, Fl. Rajasthan 2: 462. 1991; Sharma, Fl. Raj (Hadoti). 114. 2002; Yadav and Meena, Fl. SC Rajasthan 211. 2011.

Local name: Tendu patta

Characteristics

Tall deciduous tree; branched, palmately compound leaf, broad elliptic leaves penta to hepta foliate, leaflets elliptic lanceolate; inf. solitary

axillary, flowers large cup shaped, red; fruit is a capsule; seeds brown covered with white wooly hairs.
Fl. and Fr.: December- March
Habitat: Fund in forest area as wild and cultivated in gardens.

XL. OLEACEAE

124. ***Jasminum humile*** Linn.

Jasminum humile Linn. in Sp. Pl. 7. 1753; Clarke in Hooker. f. Fl. Brit. India 1 : 602. 1882; Duthie, Fl. Gangetic Plain 2 : 24, 1911; Singh in Shetty & Singh, Fl. Rajasthan 2 :264, 1991; Sharma, Fl. Raj (Hadoti). 115. 2002; Yadav and Meena, Fl. SC Rajasthan 212. 2011.
Local name: Ban Chameli
Characteristics
Erect, evergreen, perennial shrub; much branched, stem branched green, angular; small elliptic ovate leaves; pale white flowers in terminal corymb; black ellipsoid berries.
Fl. and Fr.: Throughout year
Habitat: Found in borders of some croplands and garden

.XLI. NYCTANTHACEAE

125. ***Nyctanthes arbor-tristis*** Linn.

Nyctanthes arbor-tristis Linn. in Sp. Pl. 6. 1753; Clarke in Hooker. f. Fl. Brit. India 3 : 603. 1882; Duthie, Fl. Gangetic Plain 2 : 24, 1911; Singh in Shetty & Singh, Fl. Rajasthan 2: 265, 1991; Sharma, Fl. Raj (Hadoti). 115. 2002; Yadav and Meena, Fl. SC Rajasthan 212. 2011.
Local name: Harsingar
Characteristics
Erect, evergreen, large, perennial shrub; much branched, stem branched green, quadriangular; simple, ovate, opposite leaves covered with hairs; axillary solitary, orange coloured, tubular flowers; fruit is a capsule.
Fl. and Fr.: Throughout yhe year.
Habitat: Found in gardens and hilly tracts of Girdia.

XLII. SALVADORACEAE

126. ***Salvadora persica*** Linn.

Salvadora persica Linn**.** in Sp. Pl. 122. 1753; Clarke in Hooker. f. Fl. Brit. India 3 : 603. 1882; Duthie, Fl. Gangetic Plain 2 : 28, 1911; Bhandari, Fl. Indian Desert 216. 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 467, 1991; Sharma, Fl. Raj (Hadoti). 116. 2002; Yadav and Meena, Fl. SC Rajasthan 214.

Characteristics

Erect, evergreen tree; much branched, drooping branches; simple, opposite,ovate leaves; green yellow, campanulate flowers, axillary or terminal panicle; inflorescence also drooping; fruit is a drupe.

Fl. and Fr. : Throughout year

Habitat: Found on wastelands, borders of crop fields.

XLIII. APOCYNACEAE

127. ***Carissa congesta*** Wight.

Carissa congesta Wight. in. Ic.4 (2) : t. 1289.1848; in Sp. Pl. 387. 1753; Hooker f. Fl. Brit. India 3: 630. 1882; Duthie, Fl. Gangetic Plain 2: 31. 1911; Singh in Shetty & Singh, Fl. Rajasthan 2: 468. 1991; Sharma, Fl. Raj (Hadoti). 116. 2002; Yadav and Meena, Fl. SC Rajasthan 215. 2011.

Local name : Karonda

Characteristics

Erect, spreading perennial shrub; stem spiny, much branched; elliptic, opposite leaves; white flowers in corymb; fruit are violet, elliptic berries.

Fl. and Fr.: April- June

Habitat: Found on borders of cropfields, cultivated in gardens.

128. ***Nerium indicum*** Mill. Gard. Dict. N.2. 1768.

Nerium indicum Mill. Gard. Dict. n. 2. 1768; Hooker f. Fl. Brit. India 3: 655. 1882; Duthie, Fl. Gangetic Plain 2: 40. 1911; Sharma, Fl. Raj (Hadoti). 117. 2002; Yadav and Meena, Fl. SC Rajasthan 217. 2011.

Local name : Lal Kaner

Characteristics

Erect, spreading perennial shrub; stem branched, glabrous, laticiferous; leaves simple, lenceolate, whorled; terminal cyme, pink- red flowers, fruit is long cylindrical capsule..

Fl. and Fr.: Throughthout year

Habitat: Cultivated in gardens.

129. ***Thevetia peruvina*** (Pers.) Merill.

Thevetia peruvina (Pers.) Merill. in Phil. J. Sci. Bot. 9.130.1914; Duthie, Fl. Gangetic Plain 2: 42. 1911; Singh in Shetty & Singh, Fl. Rajasthan 2: 473. 1991; Sharma, Fl. Raj (Hadoti). 117. 2002; Yadav and Meena, Fl. SC Rajasthan 217. 2011.

Local name : Peeli Kaner

Characteristics

Erect, spreading perennial shrub; stem branched, glabrous, laticiferous; leaves simple, lenceolate, whorled; terminal cyme, yellow or pale white flowers, fruit is long cylindrical capsule.

Fl. and Fr.: Throughout year

Habitat: Cultivated in gardens.

XLIV. ASCLEPIADACEAE

130. ***Calotropis procera*** (Ait.) Ait. f.

Calotropis procera (Ait.) Ait. f. in Notes Roy. Bot. Gard. Edinberg 38 (2): 287-290 f. C-D. 1980; Hooker f. Fl. Brit. India 4: 18. 1882; Duthie, Fl. Gangetic Plain 2: 48, 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2:475, 1991; Sharma, Fl. Raj (Hadoti) 119. 2002; Yadav and Meena, Fl. SC Rajasthan 222. 2011.

Local name: Aak

Characteristics

Perennial, erect, evergreen shrub; sten branched, laticiferous, coverd with cottony hairs; leaves simple, ovate, opposite decussate, laticiferius; flowers white- purple in axillary corymb; fruit is a ovoid follicle; seeds ovate, covered with silky hairs.

Fl. and Fr.: Through out year.

Habitat: found in wasteland

131. ***Calotropis gigantea*** (Linn.) R. Br.

Calotropis gigantea (Linn.) R. Br. In W.T. Aiton f. Hort. Kew. ed. 2. 2: 78.1811; Hooker f. Fl. Brit. India 4: 18. 1882; Duthie, Fl. Gangetic Plain 2: 48, 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2:475, 1991; Sharma, Fl. Raj (Hadoti) 119. 2002; Yadav and Meena, Fl. SC Rajasthan 221. 2011.

Local name: Safed Aak

Characteristics

Perennial, erect, evergreen shrub; stem branched, laticiferous, covered with cottony hairs; leaves simple, ovate, opposite decussate, laticiferius; flowers white in axillary corymb; fruit is a ovoid follicle; seeds ovate, covered with silky hairs.

Fl. and Fr.: Through out year.

Habitat: General plant of urban area.

132. ***Ceropegia bulbosa*** Roxb**.**var**.** ***lushii*** (Grah.) Hook.

Ceropegia bulbosa Roxb. ***var.*** *lushii* (Grah.) Hook. in Hooker f. Fl. Brit. India 4: 18. 1882; Duthie, Fl. Gangetic Plain 2: 66, 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2:477. 1991; Sharma, Fl. Raj (Hadoti) 120. 2002; Yadav and Meena, Fl. SC Rajasthan 221. 2011.

Local name: Mastan

Characteristics

Perennial, twinner, evergreen, herb; stem green, branched, laticiferous, covered with cottony hairs; leaves simple, linear, opposite decussate, laticiferius; flowers purple-white in axillary corymb; fruit is a ovoid follicle; seeds ovate, covered with silky hairs.

Fl. and Fr.: Through out year.

Habitat: Found in borders of crop fields.

133. ***Cryptostegia grandifolia*** R. Br.

Cryptostegia grandifoloia Roxb. in Bot. Reg. 5.t. 435.1820; Hooker f. Fl. Brit. India 4: 32. 1882; Duthie, Fl. Gangetic Plain 2: 152, 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2: 489. 1991; Yadav and Meena, Fl. SC Rajasthan 230. 2011.

Local name: Chabuk Chadi

Characteristics

Perennial, climber, evergreen, shrub; stem green, branched, laticiferous, ; leaves simple, elliptic, opposite decussate, laticiferius; terminal dichacial cyme, flowers white, funnel shape, purple base; fruit is a ovoid follicle; seeds ovate.

Fl. and Fr.: Through out year.

Habitat: Found in borders of crop fields.

134. ***Leptadenia pyrotechnica*** (Forsk.) Decne.

Leptadenia pyrotechnica (Forsk.) Decne. in Ann. Sci. Nat. ser. 2. 9: 269.1839: Hooker f. Fl. Brit. India 4: 64. 1882; Duthie, Fl. Gangetic Plain 2: 63, 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2: 480, 1991; Sharma, Fl. Raj (Hadoti) 120. 2002; Yadav and Meena, Fl. SC Rajasthan 224. 2011.

Local name: Kheep

Characteristics

Perennial, erect, evergreen shrub; stem, very thin, branched, laticiferous; leaves small, linear, scale like; leaves fall after some time green stem act as photosynthetic organ; axillary umbel; flowers green white, fruit is a elongate follicle; seeds ovate, covered with silky hairs.

Fl. and Fr.: August- January

Habitat: Wasteland of forest.

135. ***Pergularia daemia*** (Forsk.) Chiov.

Pergularia daemia (Forsk.) Chiov.in Result Sc. Miss. Stefanini Paoli Somal. Ital. 1: 115, 1916; Hooker f. Fl. Brit. India 4: 20. 1882; Duthie, Fl. Gangetic Plain 2: 52, 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2: 484. 1991; Sharma, Fl. Raj (Hadoti) 121. 2002; Yadav and Meena, Fl. SC Rajasthan 226. 2011.

Local name: Godariya bel

Characteristics

Perennial, twinner, evergreen, shrub; stem green, branched, laticiferous, covered with cottony hairs; leaves simple, broad, cordate; opposite

decussate, laticiferius; axillary, drooping corymb; flowers white, fruit is a ovoid follicle, covered with soft spines over follicle; seeds ovate, covered with silky hairs.

Fl. and Fr.: Throughout year.
Habitat: Borders of crop fields; present on shrubs in forest area.

XLV. BORAGINACEAE

136. ***Heliotropium supinum*** Linn.

Heliotropium supinum Linn**.** in Sp. Pl. 130. 1753; Clarke in Hooker. f. Fl. Brit. India 4: 149. 1875; Duthie, Fl. Gangetic Plain 2: 91. 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2: 513. 1987; Sharma, Fl. Raj (Hadoti) 124. 2002; Yadav and Meena, Fl. SC Rajasthan 237. 2011.

Characteristics

Annual, prostrate, herb; stem branched, light brown, covered with cottony hairs; leaves simple, alternate, ovate, surface hairy; flowers white, sessile; fruit is nut with persistant calyx.

Fl. and Fr.: November- February
Habitat: Common near wetland of ponds.

137. ***Heliotropium strigosum*** Willd.

Heliotropium strigosum Willd. in Sp. Pl. 1: 743. 1798; Clarke in Hooker. f. Fl. Brit. India 4: 151. 1875; Duthie, Fl. Gangetic Plain 2: 93. 1911; Bhandari, Fl. Indian Desert 212. 1978; Parmar in Shetty & Singh, Fl. Rajasthan 2: 513. 1987; Sharma, Fl. Raj (Hadoti) 123. 2002; Yadav and Meena, Fl. SC Rajasthan 236-237. 2011.

Characteristics

Annual, prostrate, herb; stem branched, light brown, covered with cottony hairs; leaves simple, alternate, linear - lenceolate, surface hairy; flowers white, sessile; fruit is nut with persistant calyx.

Fl. and Fr.: November- February
Habitat: Common near wetland of ponds.

XLVI. EHRETIACEAE

138. ***Cordia gharaf*** **(**Forsk.) Ehran ex Asch.

Cordia gharaf. (Forsk.) Ehran ex Asch. Sitzungber. Ges. Naturf. Freunde Berlin 4. 1879; Clarke in Hooker. f. Fl. Brit. India 4: 138. 1875; Duthie, Fl. Gangetic Plain 2: 85. 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2: 519. 1987; Sharma, Fl. Raj (Hadoti) 124. 2002; Yadav and Meena, Fl. SC Rajasthan 239. 2011.

Local name: Goondi

Characteristics

Long tree; much branched; leaves, simple, broad, alternate, obovate; axillary cyme; flowers small, white; fruits are ovate, drupe, filled with sticky pulp, single seeded.

Fl. and Fr.: March- December

Habitat: Found in forest area and wastelands.

139. ***Cordia dichotoma*** Forster

Cordia dichotoma Forster. f. Prodr. 18: 1.1876; Clarke in Hooker. f. Fl. Brit. India 4: 137. 1875; Duthie, Fl. Gangetic Plain 2: 82. 1911; Parmar in Shetty & Singh, Fl. Rajasthan 2: 519. 1987; Sharma, Fl. Raj (Hadoti) 124. 2002; Yadav and Meena, Fl. SC Rajasthan 239. 2011.

Local name: Lessua, Goonda

Characteristics

Long tree; much branched; leaves, simple, broad, alternate, elliptic axillary cyme; flowers small, white; fruits are globose, drupe, filled with sticky pulp, single seeded.

Fl. and Fr.: March- December

Habitat: Found in forest area and wastelands.

XLVII. CONVOLVULACEAE

140. ***Convolvulus arvensis*** Linn.

Convolvulus arvensis Linn. in Sp. Pl.1: 153. 1753; Clarke in Hooker. f. Fl. Brit. India 4: 219. 1883; Duthie, Fl. Gangetic Plain 2 : 106, 1911; Bhandari, Fl. Indian Desert 217, 1978; Singh in Shetty & Singh, Fl.

Rajasthan 2 : 528. 1991; Sharma, Fl. Raj (Hadoti). 126. 2002; Yadav and Meena, Fl. SC Rajasthan 240. 2011.

Local name: Hiran pagi

Characteristics

Perennial, herb; stem twinner, branched; leaves simple, alternate, oblong ovate, hastate base; axillary cymose; flower small, white, broad funnel shape; fruit globose capsule, seed 4, dark brown.

Fl. and Fr.: December- April

Habitat: Found in waste and grassland.

141. ***Convolvulus prostratus*** Forsk. syn. ***C. microphyllus*** Sieb.

Convolvulus prostratus Linn. in Sp. Pl.1: 153. 1753; Duthie, Fl. Gangetic Plain 2 : 106, 1911; Bhandari, Fl. Indian Desert 220, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2 : 530. 1991; Sharma, Fl. Raj (Hadoti). 126. 2002; Yadav and Meena, Fl. SC Rajasthan 241. 2011.

Local name: Sankhpushpi

Characteristics

Perennial, prostrate, herb; Stem thin, creeping, branched; leaves 4-8 cm, leaves simple, alternate, oblong ovate, hastate base; axillary cymose; flower small, white, broad funnel shape; fruit globose capsule, seed 4, dark brown.

Fl. and Fr.: December- April

Habitat: Found in waste and grassland.

142. ***Ipomoea indica*** (Burm f.) Merrill.

Ipomoea indica(Burm f.) Merrill. in Interpr. Rumph. Herb. Amboin. 445. 1917; Duthie, Fl. Gangetic Plain 2 : 117, 1911; Bhandari, Fl. Indian Desert 228, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2 : 542. 1991; Sharma, Fl. Raj (Hadoti). 127. 2002; Yadav and Meena, Fl. SC Rajasthan 245. 2011.

Local name: Morning glory

Characteristics

Annual, herb, prostrate, stem thin, creeping, branched; leaves 4-8 cm, leaves simple, alternate, circular, cordate base; dense umbellate cyme; flower blue (morning) and pink in (afternoon), broad funnel shape; fruit globose capsule, seed 4, dark brown.

Fl. and Fr.: December- April
Habitat: Found in waste and grassland.

143. ***Ipomoea sindica*** Staf.

Ipomoea sindica Staf. in Kew. Bull. 93: 346. 1894; Clarke in Hooker. f. Fl. Brit. India 4: 219. 1883; Maheshwari, ill. Fl. Delhi f. 140. 1966; Duthie, Fl. Gangetic Plain 2 : 113, 1911; Bhandari, Fl. Indian Desert 231, 1978; Sharma, Fl. Raj (Hadoti). 128. 2002; Yadav and Meena, Fl. SC Rajasthan 247. 2011.

Characteristics

Annual, prostrate, herb; Stem branched, many branches from base; leaves simple, alternate, oblong ovate, hastate at base; axillary cymose; flower small, white, broad funnel shape; fruit globose capsule, seeds grey.
Fl. and Fr.: August- November
Habitat: Found in wasteland, cropfield boundaries.

144. ***Ipomoea nil*** (Linn.) Roth.

Ipomoea nil (Linn.) Roth. in Cat. Bot. 1: 36. 1797; Clarke in Hooker. f. Fl. Brit. India 4: 199. 1883; Duthie, Fl. Gangetic Plain 2 : 116, 1911; Maheshwari, ill. Fl. Delhi f. 145. 1966; Bhandari, Fl. Indian Desert 229, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2 : 543. 1991; Sharma, Fl. Raj (Hadoti). 127. 2002; Yadav and Meena, Fl. SC Rajasthan 246. 2011.
Local name: Kala dana

Characteristics

Annual, twinner, herb; stem thin, green, branched; leaves 4-8 cm, leaves simple, alternate, ovate, cordate base; axillary umbel cyme; flower medium size, bright blue, broad funnel shape, trilocular ovary; fruit globose capsule, seeds black.
Fl. and Fr.: August - November
Habitat: Found in wasteland of forests.

145. ***Merremia aegyptia*** (Linn) Urban

Merremia aegyptia (Linn.) Urban in Antill 4: 505.1910; Sp. Pl.1: 153. 1753; Clarke in Hooker. f. Fl. Brit. India 4: 202. 1883; Duthie, Fl. Gangetic Plain 2 : 110, 1911; Bhandari, Fl. Indian Desert 233, 1978;

Singh in Shetty & Singh, Fl. Rajasthan 2 : 552. 1991; Sharma, Fl. Raj (Hadoti). 129. 2002; Yadav and Meena, Fl. SC Rajasthan 248. 2011.

Local name: Roti bel

Characteristics

Annual, prostrate, twinning, herb; Stem thin, creeping, rooting at nodes; branched; leaves simple, alternate, circular, axillary cymose; flower small, yellow, funnel shape; fruit globose capsule, seed 4, dark brown.

Fl. and Fr.: December- April

Habitat: Found in fprest wasteland and grassland.

XLVIII. CUSCUTACEAE

146. ***Cuccuta hyalina*** Heyne ex Roth.

Cuscuta hyalina Heyne ex Roth. in Nov. Pl. Sp. 100. 182; Hooker. f. Fl. Brit. India 4: 226. 1883; Bhandari, Fl. Indian Desert 238, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 561, 1991; Yadav and Meena, Fl. SC Rajasthan 250. 2011.

Local name: Amar bel

Characteristics

Herb; stem thin, light yellow, twinning, densely brached over host plant; yellow- white flowers in cyme. Fruit is a capsule; seeds 4, brown.

Fl. and Fr.: July- October

Habitat: Generally found on trees of forest.

147. ***Cuccuta reflexa***

Cuccuta reflexa Roxd. Pl. Cor. 2: 3.t. 104.1798; Hooker. f. Fl. Brit. India 4: 225. 1883; Duthie, Fl. Gangetic Plain 2 : 100, 1911; Bhandari, Fl. Indian Desert 238, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 561, 1991; Yadav and Meena, Fl. SC Rajasthan 250. 2011.

Local name: Amar bel

Characteristics

Herb; stem thin, dark yellow, twinning, densely brached over host plant; yellow flowers in cyme. Fruit is a capsule; seeds 4, brown.

Fl. and Fr.: July- October

Habitat: Generally found on trees of forest.

XLIX. SOLANACEAE

148. ***Datura stramonium*** Linn.

Datura stramonium Linn**.** in Sp. Pl. 179.1753; Clarke in Hooker. f. Fl. Brit. India 4: 242. 1883; Bhandari, Fl. Indian Desert 241, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 565. 1991; Sharma, Fl. Raj (Hadoti). 131. 2002; Yadav and Meena, Fl. SC Rajasthan 253. 2011.

Local name: Dhatura

Characteristics:

Erect, perennial shrub; light purple branches; leaves ovate oblong; dentate margin; flowers axillary solitary, long ,white purple, funnel shaped; fruit ovoid, erect, capsule, spinulated densely, 4 valves.

Fl. and Fr.: December - May

Habitat: Commonly found in wastelands.

149. ***Datura inoxia*** Mill.

Datura inoxia Mill. Gard. Dic. ed. 8. no. 5. 1768; Clarke in Hooker. f. Fl. Brit. India 4: 243. 1883; Duthie, Fl. Gangetic Plain 131: 1911 Bhandari, Fl. Indian Desert 240, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 564. 1991; Sharma, Fl. Raj (Hadoti). 131. 2002; Yadav and Meena, Fl. SC Rajasthan 253. 2011.

Local name: Dhatura

Characteristics:

Erect, perennial shrub; stem branched, covered with hairs; leaves ovate lenceolate, margin entire; flowers axillary solitary, long ,white purple, funnel shaped; fruit ovoid, erect, capsule, spinulated densely

Fl. and Fr.: Throughout year.

Habitat: Commonly found in wastelands

150. ***Solanum nigrum*** Linn.

Solanum nigrum Linn**.** in Sp. Pl. 186.1753; Clarke in Hooker. f. Fl. Brit. India 4: 229. 1883; Duthie, Fl. Gangetic Plain 2: 124.1911; Bhandari, Fl. Indian Desert 245, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 573. 1991; Sharma, Fl. Raj (Hadoti) 133. 2002; Yadav and Meena, Fl. SC Rajasthan 262. 2011.

Local name: Makoy

Characteristics:
Annual herb; densely branched; leaves ovate, irregularly dentate; flowers in axillary cyme; flowers small, pale-white, rotate; fruit ovoid, berries.
Fl. and Fr.: October- January
Habitat: Found in crop fields and wetlands.

151. ***Solanum virginianum*** Linn. syn. ***S. xanthocarpum*** Schrad.

Solanum virginianum Linn**.** in Sp. Pl. 187.1753; Clarke in Hooker. f. Fl. Brit. India 4: 236. 1883; Duthie, Fl. Gangetic Plain 2: 125.1911; Bhandari, Fl. Indian Desert 246, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 575. 1991; Sharma, Fl. Raj (Hadoti) 133. 2002; Yadav and Meena, Fl. SC Rajasthan 262. 2011.
Local name: Pasar kantili
Characteristics:
Prostrate, annual, pricky herb; stem solid, cylindrical, branched, zig-zag branches; leaves elliptic, lobulated, pricky lamina; Inflorescence axillary solitary; flowers, purple, elongated yellow anthers; yellow globose berries; Flat brown seeds.
Fl. and Fr.: December - May
Habitat: Commonly found in wastelands.

152. ***Withania somnifera*** (Linn.) Dunal.

Withania somnifera (Linn.) Dunal. in DC. Prodr. 13. (1): 453.1852; Clarke in Hooker. f. Fl. Brit. India 4: 239. 1883; Duthie, Fl. Gangetic Plain 2: 128.1911; Bhandari, Fl. Indian Desert 247, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 556-257. 1991; Sharma, Fl. Raj (Hadoti). 133. 2002; Yadav and Meena, Fl. SC Rajasthan 263. 2011.
Local name: Ajgandh
Characteristics:
Shrub, perennial; dichotomously branched; leaves ovate –oblong, entire, acute apex; flowers in axillary cluster; sessile, greenish yellow; fruit is globose berry; yellow brown seeds.
Fl. and Fr.: Throughout year.
Habitat: Found in wastelands.

L. SCROPHULARIACEAE

153. ***Bacopa monnieri*** (Linn.) Wettst.

Bacopa monnieri (Linn.) Wettst. in Engl. & Prantl. Pflan. 4 (3B) 77. 891;

Duthie, Fl. Gangetic Plain 2: 142.1911; Bhandari, Fl. Indian Desert 250, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 585. 1991; Sharma, Fl. Raj (Hadoti) 134. 2002; Yadav and Meena, Fl. SC Rajasthan 264. 2011.

Local name: Brahmmi

Characteristics:

Annual, prostrate, herb; stem creeping, solid, cylindrical, branched; branches arise from base; leaves sessile, small, spathulate, opposite: Inflorescence axillary solitary; flowers, white, purple, rotate; fruit is ovoid capsule.

Fl. and Fr.: August - May

Habitat: Found in wetlands and moist wastelands.

154. ***Striga angustifolia*** (D. Don.) Saldhana

Striga angustifolia (D. Don.) Saldhana. in Bull. Bot. Surv. India 5: 70.1963; Duthie, Fl. Gangetic Plain 2: 149.1911; Bhandari, Fl. Indian Desert 255, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 604. 1991; Sharma, Fl. Raj (Hadoti) 138. 2002; Yadav and Meena, Fl. SC Rajasthan 268. 2011.

Characteristics:

Annual, erect, herb; 1-1,5 ft. high; solid, cylindrical, dichotomously branched; leaves simple, alternate, linear, bidentate margin, inflorescence axillary solitary; flowers, white, tubular; fruit is ovoid capsule.

Fl. and Fr.: August – October

Habitat: Found in grasslands.

LI. BIGNONIACEAE

155. ***Kigelia africana*** (Lam.) Benth. syn ***K. pinnata*** (Jacq.) DC

Kigelia africana (Lam.) Benth**.** in Hook. t. Nigir. Fl. 463. 1849; Singh in Shetty & Singh, Fl. Rajasthan 2 : 620. 199; Sharma, Fl. Raj (Hadoti). 159. 2002; Yadav and Meena, Fl. SC Rajasthan 102. 2011.

Local name: Balam Kheera,

Characteristics:

Tall evergreen tree; much branched, gray-black rough bark; leaves long, elongate ovate , imparipinnate, 20-30 cm long, ovate-lanceolate, serrate; flowerscup shaped, dark red; long ovate elongated woody fruits.

Fl. and Fr.: July- October.

Habitat: Found in forest area.

156. ***Tecomella undulata*** (Sm.) Seem.

Tecomella undulata (Sm.) Seem in Ann. Mag.Nat. Hist. ser. 3. 10: 30. 1862; Clarke in Hooker. f. Fl. Brit. India 4: 378. 1875; Bhandari, Fl. Indian Desert 260, 1978; Duthie, Fl. Gangetic Plain 2: 171. 1911; Singh in Shetty & Singh, Fl. Rajasthan 2: 623. 1987; Sharma, Fl. Raj (Hadoti) 141. 2002; Yadav and Meena, Fl. SC Rajasthan 272-273. 2011.

Local name: Roheeda

Characteristics:

Evergreen tree, gray-black rough bark; much branched, drooping braches; leaves simple, opposite, elliptic-oblong, entire margin; inforescence axillary receme; flowers large, orange-red, infundibulate; fruit is a long linear capsule, winged minute seeds.

Fl. and Fr.: December - July

Habitat: Found in cropland and forest area.

157. ***Tecoma stans*** (Linn.) Juss. ex Kunth.

Tecoma stans (Linn.) Juss. ex Kunth Humb. Bonol and Kunth, Nov. Gen. Sp.3: 144.1818; Maheshwari, Fl. Delhi 258. 1963; Sharma, Fl. Raj (Hadoti) 141. 2002; Yadav and Meena, Fl. SC Rajasthan 272. 2011.

Characteristics:

Evergreen, perennial, shrub; much branched; unipinnate leaves, 5-7 leaflets, elliptic lenceolate; inflorescence terminal raceme, flowers large, yellow, tubular, long yellow stamens; fruit is long capsule, winged seeds.
Fl. and Fr.: Throughout year
Habitat: Found in boundries of gardens.

LII. PEDALIACEAE

158. ***Sesemum indicum*** Linn.

Sesemum indicum Linn. in Sp. Pl. 634, 1753; Clarke in Hooker. f. Fl. Brit. India 4: 387. 1884; Duthie, Fl. Gangetic Plain 2: 175. 1911; Maheshwari, Ill. Fl. Delhi 161. 1966; Bhandari, Fl. Indian Desert 262, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 625. 1991; Sharma, Fl. Raj (Hadoti) 141. 2002; Yadav and Meena, Fl. SC Rajasthan 274. 2011
Local name: Til
Characteristics:
Annual, erect, herb; stem soft, branched, spreading; upper leaves lenceolate, lower leaves segmented, alternate, opposite, serrate margin; flowers white, infundibulate, axillary, solitary; fruit is beaked, oblong capsule; minute black seeds.
Fl. and Fr.: July - December
Habitat: Wild in grassland, cultivated as oil crop.

159. ***Pedallium murex*** Linn.

Pedallium murex Linn.in Syst. Nat.ed. 10:1123.1759. Clarke in Hooker. f. Fl. Brit. India 4: 386. 1884; Bhandari, Fl. Indian Desert 261, 1978; Singh in Shetty & Singh, Fl. Rajasthan 2: 624. 1991; Sharma, Fl. Raj (Hadoti) 141. 2002; Yadav and Meena, Fl. SC Rajasthan 273. 2011
Local name: Bada Gokhru
Characteristics:
Succulent herb, annual; stem soft, much branched, creeping, spreading; leaves simple, opposite, ovate, serrate margin; flowers yellow, infundibulate, axillary, solitary; fruit is capsule, quadriangled, one spine on each angle of capsule.
Fl. and Fr.: July - December
Habitat: Common in wastelands.

LIII. MARTYNIACEAE

160. ***Martynia annua*** Linn**.**

Martynia annua Linn**.** in Sp. Pl. 618. 1753; Clarke in Hooker. f. Fl. Brit. India 4: 386. 1875; Duthie, Fl. Gangetic Plain 2 : 176, 1911; Bhandari, Fl. Indian Desert 263, 1991; Singh in Shetty & Singh, Fl. Rajasthan 2 : 625, 1987; Sharma, Fl. Raj (Hadoti). 142. 2002; Yadav and Meena, Fl. SC Rajasthan 274. 2011.

Local name: Baghnakhi

Characteristics:

Annual, erect, herb, stem succulent, branched, covered with glandular hairs; leaves ovate, opposite, dentate margin, flowers in axillary raceme , tubulat, white, purple, infundibulate; fruits are green drupes with two terminal hooks, seeds black, oblong.

Fl. and Fr.: July – November.

Habitat: Found in wastelands.

LIV. ACANTHACEAE

161. ***Adhatoda vasica*** Medic.

Adhatoda vasica Medic. Hist. & Commentant. Acad. Elec. Sci.Thed.-Palat. 6:369; Hooker, Fl. Brit. India 4: 540. 1885; Duthie, Fl. Gangetic Plain 2: 207. 1911; Bhandari, Fl. Indian Desert 265, 1995; Pandey & Singh in Shetty & Singh, Fl. Rajasthan 2 : 630, 1991; Sharma, Fl. Raj (Hadoti). 142. 2002; Yadav and Meena, Fl. SC Rajasthan 276. 2011.

Local name: Adusa

Characteristics:

Erect, shrub; 1-2 m; stem green-brown, branched, many ascending branches; Leaves simple, opposite, elliptic, acute apex, acute base; cream white flowers on spike, fruit is capsule.

Fl. and Fr.: February - October

Habitat: Found in forest area, on sides of canals.

162. ***Barleria acanthoides*** Vahl.

Barleria acanthoides Vahl. in Symb. Bot. 1: 47.1790; Hooker, Fl. Brit. India 4: 484. 1884; Duthie, Fl. Gangetic Plain 2: 200. 1911; Bhandari, Fl. Indian Desert 265, 1995; Pandey & Singh in Shetty & Singh, Fl.

Rajasthan 2 : 632, 1991; Sharma, Fl. Raj (Hadoti). 142. 2002; Yadav and Meena, Fl. SC Rajasthan 277. 2011.

Local name: Vajradanti

Characteristics:

Small, erect, priky, shrub; much branched; leaves, simple, alternate, oblong – ovate; flowers, white, tubular, in axillary group; fruits is ellipsoid capsule, flat ovoid seeds.

Fl. and Fr.: August- February

Habitat: Found in hard surfaces of forest area.

163. ***Barleria prionitis*** Linn.

Barleria prionitis Linn.. in Sp. Pl. 636.1753; Hooker, Fl. Brit. India 4: 482. 1884; Duthie, Fl. Gangetic Plain 2: 200. 1911; Bhandari, Fl. Indian Desert 266, 1995; Pandey & Singh in Shetty & Singh, Fl. Rajasthan 2 : 635, 1991; Sharma, Fl. Raj (Hadoti). 142. 2002; Yadav and Meena, Fl. SC Rajasthan 278. 2011.

Local name: Kala bans

Characteristics:

Erect, perennial shrub; stem pricky at nodes and terminals, branched; leaves, simple, alternate, oblong – ovate; flowers, yellow tubular, in axillary group; fruits is ellipsoid capsule, flat ovoid seeds.

Fl. and Fr.: September - January

Habitat: Found in hilly tracts and wastelands.

164. ***Elytraria acaulis*** (Linn. f.) Lindau

Elytraria acaulis **(**Linn. f.) Lindau in Eng. and Prantl. Pflanz. Nacht. 1:304.1897; Hooker, Fl. Brit. India 4: 394. 1884; Duthie, Fl. Gangetic Plain 2: 180. 1911; Maheshwari, Ill. Fl. Delhi f. 163.1966; Bhandari, Fl. Indian Desert 266, 1995; Pandey & Singh in Shetty & Singh, Fl. Rajasthan 2 : 637, 1991; Sharma, Fl. Raj (Hadoti). 143. 2002; Yadav and Meena, Fl. SC Rajasthan 281. 2011.

Characteristics:

Prostrate, herb; very small stem, leaves, simple, spathulate, radicle, whorled; green-white, biliped, flowers on long branched spike; fruits is brown, ovoid capsule; very small, ovoid seeds.

Fl. and Fr.: February - August

Habitat: Found in forest area, cultivated in cropland and gardens.

165. ***Hygrophila auriculata*** (Schum.) Hein.

Hygrophila auriculata (Scum.) Hein. in Kew Bull. 16: 172.1962; Hooker, Fl. Brit. India 4: 408. 1884; Duthie, Fl. Gangetic Plain 2: 180. 1911; Bhandari, Fl. Indian Desert 270, 1995; Pandey & Singh in Shetty & Singh, Fl. Rajasthan 2 : 646, 1991; Sharma, Fl. Raj (Hadoti). 145. 2002; Yadav and Meena, Fl. SC Rajasthan 283. 2011.

Characteristics:

Erect, annual, herb; stem angular, branched, thick at nodes, spines at nodes, hairs on internodes; leaves, simple, whorled, leniar lenceolate, sessile; purple flower in group at node; fruits is linear capsule, flat ovoid seeds.

Fl. and Fr.: July- December

Habitat: Found near water bodies and wetlands.

166. ***Peristophae paniculata*** (Forsk.) Brum.

Elytraria acaulis **(**Linn. f.) Lindau in Kew Bull. 38: 451. 1983; Hooker, Fl. Brit. India 4: 554. 1884; Duthie, Fl. Gangetic Plain 2: 210. 1911; Bhandari, Fl. Indian Desert 276, 1995; Pandey & Singh in Shetty & Singh, Fl. Rajasthan 2 : 646, 1991; Sharma, Fl. Raj (Hadoti). 143. 2002; Yadav and Meena, Fl. SC Rajasthan 281. 2011.

Characteristics:

Erect, annual, herb; stem angular, branched; leaves, simple, hairy, opposite, lanceolate; flower pink, biliped, in terminal cyme; group at node; fruits is linear capsule,ovoi d seeds

Fl. and Fr.: July- December

Habitat: Found in forest area and on cropland.

167. ***Ruellia tuberosa*** Linn.

Ruellia tuberosa Linn. in Sp. Pl. 635. 1753; Hooker, Fl. Brit. India 4: 554. 1884; Duthie, Fl. Gangetic Plain 2: 209. 1911; Maheshwari, Ill. Fl. Delhi f. 163.1966; Bhandari, Fl. Indian Desert 276, 1995; Pandey & Singh in Shetty & Singh, Fl. Rajasthan 2 : 646, 1991; Sharma, Fl. Raj (Hadoti). 147. 2002; Yadav and Meena, Fl. SC Rajasthan 288. 2011.

Characteristics:

Erect, annual, herb; stem quadri angular, branched, thick at nodes; leaves, simple, hairy, opposite, ovate; flower blue, companulte, biliped, in axillary cyme; fruits is linear fusiform capsule,ovoid small seeds.

Fl. and Fr.: July- December

Habitat: Found in wasteland and gardens.

LV. VERBENACEAE

168. ***Lantana camara*** Linn.

Lantana camara Linn. in Sp. Pl. 627. 1753; Hooker, Fl. Brit. India 4: 562. 1884; Duthie, Fl. Gangetic Plain 2: 216, 1911; Bhandari, Fl. Indian Desert 95, 1978; Pandey in Shetty & Singh, Fl. Rajasthan 2 : 201. 1991; Sharma, Fl. Raj (Hadoti). 148. 2002; Yadav and Meena, Fl. SC Rajasthan 290. 2011.

Local name : Badbina

Characteristics:

Large evergreen shrub; stem branched, branches many, small hook spines on surface of branches, leaves simple, ovate, opposite decussate, capitate spike; orange or yellow tubular flowers; fruit is globose, fleshy, black drupe.

Fl. & Fr.: Throughout the year.

Habitat : Found in roadsides, wastelands and boundaries of croplands.

169. ***Lantana wightiana*** Wall. ex, Gamble

Lantana wightiana Wall. ex. Gamble in Fl. Madras, 2: 761. 1087. 1924; Hooker, Fl. Brit. India 4: 562. 1884; Duthie, Fl. Gangetic Plain 2: 216, 1911; Bhandari, Fl. Indian Desert 279, 1995; Pandey in Shetty & Singh, Fl. Rajasthan 2 : 201. 1991; Sharma, Fl. Raj (Hadoti). 148. 2002; Yadav and Meena, Fl. SC Rajasthan 290. 2011.

Local name : Badbina

Characteristics:

Large evergreen shrub; stem branched, branches many, small hook spines on surface of branches, leaves simple, ovate, opposite decussate, capitate spike; white tubular flowers; fruit is globose, fleshy, black drupe.

Fl. & Fr.: Throughout the year.

Habitat : Found in roadsides, wastelands and boundaries of croplands.

170. ***Tectona grandis*** Linn.

Tectona grandis Linn. f. Suppl. 151. 1781; in Syst. Nat.ed 12:472, 1767; Clarke in Hooker, Fl. Brit. India 4: 570. 1884; Duthie, Fl. Gangetic Plain 2: 290, 1911; Pandey in Shetty & Singh, Fl. Rajasthan 1: 201. 1991; Sharma, Fl. Raj (Hadoti). 149. 2002; Yadav and Meena, Fl. SC Rajasthan 292. 2011.

Local name: Sagaon

Charcteristics:

Large deciduous tree; stem dichotomously branched; leaves simple, ovate, large, opposite; white, tubular flower in dichacial cyme; fruits are tetragonal drupes.

Fl.and Fr. : August – December

Habitat: Found on boundaries of croplands and roadsides.

LVI. LAMIACEAE

171. ***Leucus aspera (***Willd.) Link.

Leucus aspera (Willd.) Link. in Enum. Hort. Berol. Ait. 2: 113. 1822; Hooker, Fl. Brit. India 4: 690. 1884; Duthie, Fl. Gangetic Plain 2: 250. 1911; Bhandari, Fl. Indian Desert 280, 1995; Pandey in Shetty & Singh, Fl. Rajasthan 2 : 694. 1991; Sharma, Fl. Raj (Hadoti). 150. 2002; Yadav and Meena, Fl. SC Rajasthan 296. 2011.

Charcteristics:

Annual herb, densely hairy, many branches; leaves simple, opposite, linear lanceolate, serrate margin; flowers labiate in axillary and terminal verticellasters; fruits are nuts, trigonous nutlets.

Fl.and Fr.: September-January

Habitat: Found in cropfield boundries.

172. ***Ocimum canum*** Sims.

Ocimum canum Sims. in Curtis, Bot. mag. 51: t. 2452. 1824; Hooker, Fl. Brit. India 4: 607. 1884; Duthie, Fl. Gangetic Plain 2: 234. 1911; Bhandari, Fl. Indian Desert 276, 1995; Parmar in Shetty & Singh, Fl. Rajasthan 2 : 701, 1991; Sharma, Fl. Raj (Hadoti). 152. 2002; Yadav and Meena, Fl. SC Rajasthan 298. 2011.

Local name : Ban tulshi

Characteristics:

Annual, erect herb; branched and densely hairy, quadriangualr stem; leaves simple, opposite, linear lanceolate, serrate margin; flowers labiate in axillary and terminal verticellasters; posterior sepal very broad; fruits are nuts, trigonous nutlets.

Fl. & Fr.: August- October

Habitat : Found on open wastelands.

173. ***Salvia aegyptiaca*** Linn.

Salvia aegyptiaca Linn in Sp. Pl. 23. 1753; Hooker, Fl. Brit. India 4: 656. 1884; Duthie, Fl. Gangetic Plain 2: 256. 1911; Bhandari, Fl. Indian Desert 283, 1995; Parmar in Shetty & Singh, Fl. Rajasthan 2 : 707, 1991; Sharma, Fl. Raj (Hadoti). 152. 2002; Yadav and Meena, Fl. SC Rajasthan 299. 2011.

Characteristics:

Annual, erect herb; much branched and densely hairy, leaves simple, opposite, linear lanceolate, densely hairy on both surfaces; flowers labiate in axillary and terminal verticellasters; perfect stemens two only, fruits are nuts, trigonous nutlets.

Fl. and Fr. : November- January.

Habitat: Found in moist areas.

LVII. NYCTAGINACEAE

174. ***Boerhavia diffusa*** Linn.

Boerhavia diffusa Linn. in Sp. Pl. 3. 1753; Baker in Hooker f. Fl. Brit. India 4 :709, 1884; Duthie, Fl. Gangetic Plain 3: 2. 1915; Bhandari, Fl. Indian Desert 97. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 2: 201. 1991; Sharma, Fl. Raj (Hadoti). 153. 2002; Yadav and Meena, Fl. SC Rajasthan 300. 2011

Local name: Punarnava

Characteristics:

Perennial diffused herb; grows prostrate but sexual braches grow upward; pink coloured branches; leaves simple, opposite, ovate; flowers in terminal panicles; axillary panicle; flowers pink. 5 ribbed anthocarp.

Fl. and Fr. : July - March

Habitat: Found in roadsides and wasteand area.

175. ***Boerhavia rapens*** Linn.

Boerhavia rapens Linn. in Sp. Pl. 3.1753; Hooker f. Fl. Brit. India 4: 709, 1884; Duthie, Fl. Gangetic Plain 3: 2. 1915; Bhandari, Fl. Indian Desert 104. 1978; Pandey in Shetty & Singh, Fl. Rajasthan 2: 201. 1991; Sharma, Fl. Raj (Hadoti). 153. 2002;

Local name: Punarnava

Perennial prostrate herb; pink coloured branches; leaves simple, ovate, unequal pair of opposite leaves; flowers in terminal panicles; axillary panicle; flowers pink. 5 ribbed anthocarp.

Fl. and Fr. : July -March

Habitat: Found in roundsides and grassland.

176. ***Bougainvillea glabra*** Choisy

Bougainvillea glabra Choisy in Nov. Pl. Sp. 357. 1821; Baker in Hooker f. Fl. Brit. India 2: 93. 1876; Duthie, Fl. Gangetis Plains 1: 250. 1903; Bhandari, Fl. Indian Desert 117. 1978; Singh in Shetty and Singh Fl. Rajasthan 1: 239. 1987; Sharma, Fl. Raj. (Hadoti) 300. 2002.Yadav and Meena, Fl. SC Rajasthan 122. 2011.

Characteristics:

Evergreen, shrub, cliber; stem woody, branched, armed with spines; leaves simple, ovate, alternate; flowers in cluster of cyme, involucral bract become magenta coloured, flower tubular.

Fl. and Fr: August-December

Habitat: Very common in plains and wetland.

LVIII. AMARANTHACEAE

177. ***Achyranthes aspera*** Linn.

Achyranthes aspera Linn in Sp. Pl. 204. 1753; Baker in Hooker f. Fl. Brit. India 4: 730. 1885; Bhandari, Fl. India Desert 288.1990; Parmar in Shetty & Singh, Fl. Rajasthan 2: 719. 1991; Sharma, Fl. Raj. (Hadoti) 154. 2002; Yadav and Meena, Fl. SC Rajasthan 303. 2011.

Local name: Andhi Jhada

Charcteristics:

Annual, erect herb, stem dichotomously branched, angular, leaves simple, lanceolate, opposite, marin entire; whitish-green flovers in terminal spike; bracts of flower are membranous and spiny; cylindrical seeds.

Fl. and Fr.: Throughout the tear.

Habitat: Found in dry wasteland and road sides.

178. ***Amaranthus hybridus*** Linn. Syn. ***A. paniculatus*** Linn.

Amaranthus hybridus Linn. in Sp. Pl. ed 2: 1406. 1753; Hooker f. Fl. Brit. India 4: 718. 1991; Duthie, Fl. Gangetic Plains 3: 11. 1915; Sharma, Fl. Raj. (Hadoti) 155. 2002; Yadav and Meena, Fl. SC Rajasthan 307. 2011.

Characteristics:

Annual, erect herb; stem angular, herbaceous, branched, leaves simple, alternate, oblong ovate; green flowers in terminal or axillary spike; fruit is ovoid capsule; seeds black.

Fl. and Fr.: Throughout the year.

Habitat: Found in wetlands.

179. ***Amaranthus spinosus*** Linn.

Amaranthus spinosus Linn. Sp. Pl. 991. 1753; Hooker f. Fl. Brit. India 4: 718.1885; Duthie, Fl. Gangetic Plain 3: 10. 1915; Bhandari, Fl. India Desert 292. 1995; Parmar in Shetty & Singh, Fl. Rajasthan 2: 729. 1991; Sharma, Fl. Raj. (Hadoti) 155. 2002; Yadav and Meena, Fl. SC Rajasthan 308. 2011.

Charcteristics:

Annual, erect herb; stem herbaceous, branched, spine on nodes; leaves simple, alternate, oblong ovate; green white flowers in terminal or axillary spike; fruit is ovoid capsule.

Fl. and Fr.: Throughout year.

Habitat: Found in wetland and near cropfields.

180. ***Celosia argentea*** Linn.

Celosia argentea Linn. in Sp. Pl. ed. 1: 205. 1753; Hooker f. Fl. Brit. India 4: 714. 1885; Duthie, Fl. Gangetic Plain 3: 7. 1915;Parmar in Shetty & Singh, Fl. Rajasthan 2: 731. 1991; Sharma, Fl. Raj. (Hadoti) 156. 2002; Yadav and Meena, Fl. SC Rajasthan 310. 2011.

Charcteristics:

Annual, erect, herb; ascending, angular stem with long branches; leaves simple, elongate-lanceolate, entire margin; flowers in terminal pink-white spike; fruit is a capsule, seeds globose.

Fl. and Fr.: July- December

Habitat: Found in wasteland near crops fields.

LIX. CHENOPODIACEAE

181. ***Chenopodium album*** Linn. ***Melilotus indica*** (Linn.) All.

Chenopodium album Linn. in Sp. Pl. 219. 1753; Hooker f. Fl. Brit. India 5: 5. 1886; Duthie, Fl. Gangetic Plain 3: 22. 1915; Bhandari, Fl. India Desert 296.1998; Parmar in Shetty & Singh, Fl. Rajasthan 2: 737. 1991; Sharma, Fl. Raj. (Hadoti) 157. 2002; Yadav and Meena, Fl. SC Rajasthan 314. 2011.

Local Name: Bathli

Charcteristics:

Erect annual herb; stem soft, dichotomously branched; leaves simple, alternate, ovate, dentate margin, powdery appearance on lamina, flowers light green in terminal panicle; globose seed.

Fl. and Fr.: December -March

Habitat: Found as agriculture weed.

182. ***Chenopodium murale*** Linn.

Chenopodium murale Linn. in Sp. Pl. 219. 1753; Hooker f. Fl. Brit. India 5: 4. 1886; Duthie, Fl. Gangetic Plain 3: 23. 1915; Bhandari, Fl. India Desert 296.1998; Parmar in Shetty & Singh, Fl. Rajasthan 2: 738. 1991; Sharma, Fl. Raj. (Hadoti) 157. 2002; Yadav and Meena, Fl. SC Rajasthan 315. 2011.

Local Name: Bathua

Charcteristics:

Erect annual herb; stem soft, dichotomously branched; leaves simple, alternate, triangular, acute apex, acute base, dentate margin, leathery appearance on lamina, flowers light green in terminal panicle; globose seed..

Fl. and Fr.: December- March.

Habitat: Found on road sides and aricultural weed.

LX. POLYGONACEAE

183. ***Polygonum plebeium*** R. Br.

Polygonum plebeium R. Br**.** Prodr. 420. 1810; Hooker f. Fl. Brit. India 5: 27.1886; Duthie, Fl. Gangetic Plain 3: 31. 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 750. 1991; Sharma, Fl. Raj. (Hadoti) 158. 2002; Yadav and Meena, Fl. SC Rajasthan 317. 2011.

Charcteristics:

Annual, prostrte herb; densely branched; leaves simple, alternate, lanceolate; pink flowers in axillary cluster; fruit is nut; nutlets black.

Fl. and Fr.: December- April

Habitat: Found in wetland of pond.

184. ***Rumex dentatus*** Linn.

Rumex dentatus Linn. Mant. 2: 226. 1771; in Sp. Pl.2: 385. 1825; Baker in Hooker f. Fl. Brit. India 5: 59. 1886; Duthie, Fl. Gangetic Plain 3: 41. 1915; Bhandari, Fl. Indian Desert 301. 1995; Parmar in Shetty & Singh, Fl. Rajasthan 2: 754.1991; Sharma, Fl. Raj. (Hadoti) 158. 2002; Yadav and Meena, Fl. SC Rajasthan 317. 2011.

Characteristics:

Annual, erct herb; stem branched, fistular, leaves cauline and radicle, simple, linear-lancolate; 6 lobe parienth, flowers green on nodes, whorled, appear like set of teeth; fruit is nut.

Fl. and Fr. : January to april.

Habitat: Found in wetlands and moist cropland.

LXI. ARISTOLOCHIACEAE

185. ***Aristolochia bracteolata*** Lamk.

Aristolochia bracteolata Lamk. Encyl. Bot. 1: 258. 1783; Hooker f. Fl. Brit. India 5: 75. 1886; Duthie, Fl Gangetic Plain 3: 44. 1915; Bhandari, Fl. Indian Desert 301. 1995; Parmar in Shetty & Singh, Fl. Rajasthan 2: 756. 1991; Sharma, Fl. Raj. (Hadoti) 159. 2002;Yadav and Meena, Fl. SC Rajasthan 318. 2011.

Characteristics:

Perennial, prostrate herb; stem angular, branches spreading; leaves simple, alternate, reniform, margin wavy; light yellow flowers; solitary axillary; fruit is elongated capsule.

Fl. and Fr.: August-November

Habitat: Found in roadsides and cropfield.

LXII. SANTALACEAE

186. ***Santalum album*** Linn.

Santalum album Linn. in Sp. Pl. 349. 1753; Hooker f. Fl. Brit. India 5: 231. 1886; Duthie, Fl Gangetic Plain 3: 67. 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 761. 1991; Sharma, Fl. Raj. (Hadoti) 160. 2002; Yadav and Meena, Fl. SC Rajasthan 319. 2011.

Local name:- Lal Chandan

Characteristics:

Small, evergreen tree; semi root parasite; bark red; leaves alternate, thin, elliptic, acute apex; terminal bichacial cyme; flowers red-brown; fruit is a globose drupe.

Fl. and Fr.: April – September.

Habitat: Found in gardens (Chhatravilas Garden)

LXIII. EUPHORBIACEAE

187. ***Acalypha ciliata*** Forsk.

Acalypha ciliata Forsk. in Fl. aegypt. Arab. 162.17175; Hooker f. Fl. Brit. India 5: 417. 1887; Duthie, Fl. Gangetic Plains 3: 108. 1915; Bhandari, Fl. Indian Desert 304. 1978; Parmar in Shetty & Singh Fl. Rajasthan 2: 763. 1991; Sharma, Fl. Raj. (Hadoti) 160. 2002; Yadav and Meena, Fl. SC Rajasthan 320. 2011.

Characteristiccs:

Annual, erect herb; much branched herbs; 20-30 cm high; leaves simple, alternate, ovate, linear-lanceolate; flowers yellow green in axillary spikes; tepals minute, female flowers without leavy bracts, trilobed ovary, flower is capsule, ovoid seed.

Fl. and Fr.: Through out year

Habitat: Commonly found

188. ***Crozophora rottleri*** (Geis.) A.Juss.

Crozophora rottleri (Geis.) A.Juss. ex Spreng. Syst. Veg.3: 850. 1826; Duthie, Fl. Gangatic Plain 3: 105. 1915; Bhandari, Fl. Indian Desert, 305. 1995; Parmar in Shetty, Fl Rajasthan 2: 771 : 1991; Sharma, Fl. Raj. (Hadoti) 162. 2002; Yadav and Meena, Fl. SC Rajasthan 321. 2011.

Characteristic

Annual herb; green hairy stem, leaves simple, alternate , broadly ovate, inflorescence terminal or axillary raceme, male flowers sessile, yellow, female flowers green-yellow, pedicellate, tricarpellary ovary, fruit is a capsule, covered with stellate hais, seeds globose.

Fl. and Fr.: September-April

Habitat: Found near running water of canals.

189. ***Croton bonplandianum*** Bail.

Croton bonplandianum Bail.in Adansonia 4: 339. 1863-1864; Duthie, Fl. Gangetic Plains 1: 247. 1903; Parmar in Shetty & Singh, Fl. Rajasthan 2: 771. 1991; Sharma, Fl. Raj. (Hadoti) 162. 2002; Yadav and Meena, Fl. SC Rajasthan 322. 2011.

Characteristics:

Perennial herb, erect; 50-60 cmm high; branched, leaves simple, alternate, lenceolate, wavy margin; inflorescence terminal raceme; top of spike with yellow male flowers, baseof spike with female flowers, ovary tricarpellary, stellate hairs on surface; fruit is a capsule, globular seeds with white spongy cap.

Fl. and Fr.: February- May

Habitat: Found in wastelands.

190. ***Euphorbia caducifolia*** Haines.

Euphorbia caducifolia Haines. In Ind. For. 40: 154. 1914 et. Bot.Bihar and Orissa 2: 143. 1921; Bhandari, Fl. Indian Desert 306, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 2: 775. 1991; Sharma, Fl. Raj (Hadoti). 164. 2002; Yadav and Meena, Fl. SC Rajasthan 1323. 2011.

Local name: Danda Thor.

Charcteristics:

Succulant, fleshy, dendroid shrub; branches green act as photosynthetic organ, leaves shown in rainy season and fall soon; leaves simple,

alternate, obovate; Inflorecence is cyathium, flowers red coloured, many male flowers, single female flower; fruit is a capsule; ovate, brown seeds.
Fl.and Fr.: January- MayApril.
Habitat: Found in hilly waste areas.

191. ***Euphorbia heterophylla*** Linn.
Euphorbia heterophylla Linn. Sp. Pl. 453. 1753; Baker in Hooker, Fl. Brit. India 5: 266. 1887; Yadav and Meena, Fl. SC Rajasthan 325. 2011.
Charcteristics:
Annual herb; 70-80 cm. high; Deciduous Tree; branched; simple leaves, divided into two equal ovate halves; white flowers on terminal raceme; long pods with 12-20 seeds; black flat seeds.
Fl.and Fr.: March- April.
Habitat: Found in forest as well as cultivated gardens.

192. ***Euphorbia hirta*** Linn.
Euphorbia hirta Linn. in Sp. Pl. 2. 454. 1753; Hooker, Fl. Brit. India 5: 250. 1887; Duthie, Fl. Gangetic Plain 3: 80, 1915; Bhandari, Fl. Indian Desert 309, 1990 Parmar in Shetty & Singh, Fl. Rajasthan 2: 780, 1991; Sharma, Fl. Raj (Hadoti). 163. 2002; Yadav and Meena, Fl. SC Rajasthan 326. 2011.
Local name: Dudhi
Charcteristics:
Annual, sub-prostrate shrub; 20-30 cm high; stem weak, branched covered with glandular hairs; leaves simple, opposite, lanceolate, inflorescence cyathium; many male flowers single female flower in a cyathium; fruit casule, ovular seeds.
Fl.and Fr.: Throughout the year
Habitat: Common in wasteland, grassland and moist places.

193. ***Mallotus philippensis*** (Lam.) Muell. ***Jatropha gossypifolia*** Linn.
Mallotus philippensis (Lam.) Muell.-Arg in Linnaea 34:196. 1865; Hooker f. Fl. Brit. India 5: 442. 1887; Duthie, Fl. Gangetic Plain 3: 110. 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 785, 1991; Sharma, Fl. Raj (Hadoti). 165. 2002.
Charcteristics:

Evergreen tree, much branched; gray bark; leaves simple, alternate, ovate; Inflorescene terminal raceme; top of raceme male flower and on base female flowers; tricarpellary ovary; fruit is capsule; ovate seeds.

Fl.and Fr.: December- March

Habitat: Found in forest area (Kolipura)

194. ***Jatropha gossypifolia*** Linn.

Jatropha gossypifolia Linn. in Sp. Pl. 2: 1006. 1753; Hooker, Fl. Brit. India 5: 383. 1887; Duthie, Suppl. Fl. Gangetic Plain 251, 1976; Bhandari, Fl. Indian Desert 97, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 2: 784, 1991; Sharma, Fl. Raj (Hadoti). 165. 2002;Yadav and Meena, Fl. SC Rajasthan 328. 2011.

Charcteristics:

Shrub; 1-1.5 m high; branched, branches covered with glandular hairs; leaves palmate, 5 lobes, lobes are ovate lanceolate; cordate at base alternate, flowers in terminal and axillary corymb, flowers with dark red bracts; fruits, capsule, ovate seeds with caruncle.

Fl.and Fr.: Throughout year.

Habitat: Found in moist areas of roadsides.

195. ***Phyllanthus fraternus*** Webster.

Phyllanthus fraternus Webster **C**ontr. Grey. Herb. 176: 53. 1955; Hooker, Fl. Brit. India 5: 298. 1887; Duthie, Fl. Gangetic Plain 3: 98, 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 788, 1991; Sharma, Fl. Raj (Hadoti). 165. 2002; Yadav and Meena, Fl. SC Rajasthan 329. 2011.

Local name: Bhui Amla

Charcteristics:

Annual, erect herb; 40-60 cm high; branced, branches with leaves appear like a pinnately compound leaf; leaves simple, ovate, opposite; axillary minute male flowers on upper and female flowers in lower portions of branches, tepals 5; ovary tricarpellary, 2 ovules per locule; fruit is capsule, seeds ovate.

Fl.and Fr.: Through out year

Habitat: Common plant of moist area, gardens and grasslands..

196. ***Ricinus communis*** Linn.

Ricinus communis Linn. in Sp. Pl. 1007. 1753; Hooker f. Fl. Brit. India 5: 457. 1887; Duthie, Fl. Gangetic Plain 3: 113, 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 791, 1991; Sharma, Fl. Raj (Hadoti). 166. 2002; Yadav and Meena, Fl. SC Rajasthan 330. 2011.

Local Name:- Arandi

Charcteristics:

Small, evergreen, perennial tree; soft wooded, branched; annual herb; branched; leaves palmate, 6-12 lobes, lobes are ovate lanceolate; alternate, flowers in terminal raceme, yellow male flowers, green female flowers; fruit is casule, ovate seeds with caruncle.

Fl.and Fr.: October - November

Habitat: Found in plains after rainy season.

LXIV. ULMACEAE

197. ***Holoptelea integrifolia*** (Roxb.)Planch.

Holoptelea integrifolia (Roxb.) Planch. Linn. in Sp. Pl. 375. 1753; Baker in Hooker, Fl. Brit. India 5: 481. 1887; Duthie, Fl. Gangetic Plain 3: 120, 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 797. 1991; Sharma, Fl. Raj (Hadoti). 167. 2002; Yadav and Meena, Fl. SC Rajasthan 332. 2011.

Local name: Bandar Baati

Charcteristics:

Large, deciduous tree, bark gray, much branched; leaves simple, alternate, cordate; flowers dioeceous but plant is monoecious; yellow-green flowers in clusters; fruit is orbicular samara. Single seeded.

Fl.and Fr.: January to June.

Habitat: Common in roadsides and forest area.

LXV. MORACEAE

198. ***Ficus benghalensis*** Linn.

Ficus benghalensis Linn. in Sp. Pl. 1059. 1753; Nutt. Pl. Ned. Ind. Ed. 2: 755. 1927; Hooker, Fl. Brit. India 5: 499. 1888; Duthie, Fl. Gangetic Plain 3: 147, 1915 Bhandari, Fl. Indian Desert 314, 1978; Parmar in

Shetty & Singh, Fl. Rajasthan 2: 801. 1991; Sharma, Fl. Raj (Hadoti). 168. 2002; Yadav and Meena, Fl. SC Rajasthan 332. 2011.

Local Name: Badd, Bargad

Charcteristics:

Very large, evergreen, much branched tree; long prop root present for additional support; leaves simple, alternate, obovate, covered by downy hairs; flowers develop internally; inflorescence is axillary, paired hypanthodium, male flowers near mouth and female flowers in center; fruit is syconus; globular seeds.

Fl.and Fr.: Throughout year

Habitat: Found in roadsides, forest areas and croplands.

199. ***Ficus racemosa*** Linn.

Ficus racemosa Linn. in Sp. Pl. 1060. 1753; Hooker, Fl. Brit. India 5: 535. 1888; Duthie, Fl. Gangetic Plain 3: 150, 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 805. 1991; Sharma, Fl. Raj (Hadoti). 169. 2002; Yadav and Meena, Fl. SC Rajasthan 334. 2011.

Local name: Goolar

Charcteristics:

Very large, evergreen, much branched tree; long prop root present; leaves simple, alternate, elliptic, covered by downy hairs; flowers develop internally; inflorescence is axillary, paired hypanthodium, male flowers near mouth and female flowers in center; fruit is light red, syconus; globular seeds.

Fl.and Fr.: Through out the year.

Habitat: Found in forest area and roadsides..

200. ***Ficus palmata*** Forsk.

Ficus palmata Forsk. subsp. Virgate (Roxb.) Browicz in Rechinger, Fl. Iranica 153: 12. 1982; Hooker, Fl. Brit. India 5: 530. 1888; Duthie, Fl. Gangetic Plain 3: 158, 1915; Parmar in Shetty & Singh, Fl. Rajasthan 2: 803. 1991; Sharma, Fl. Raj (Hadoti). 169. 2002; Yadav and Meena, Fl. SC Rajasthan 333. 2011.

Local name: Adakh Anjeer

Charcteristics:

Very large, evergreen, branched tree; leaves simple, alternate, broad covate, finely dentate margin. covered by downy hairs; flowers develop

internally; inflorescence is axillary, paired hypanthodium, male flowers near mouth and female flowers in center; fruit is syconus; globular seeds.

Fl. and Fr.: August-January

Habitat: Found in wetlands and waste plains.

201. ***Ficus religiosa*** Linn.

Ficus religiosa Linn. in Sp. Pl. 1059. 1753; Hooker, Fl. Brit. India 5: 513. 1888; Duthie, Fl. Gangetic Plain 3: 150, 1915 Bhandari, Fl. Indian Desert 314, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 2: 804. 1991; Sharma, Fl. Raj (Hadoti). 168. 2002; Yadav and Meena, Fl. SC Rajasthan 335. 2011.

Charcteristics:

Very large, evergreen, much branched tree; long prop root present for additional support; leaves simple, alternate, cordate, glabrous, flowers develop internally; inflorescence is axillary, paired hypanthodium, male flowers near mouth and female flowers in center; fruit is syconus; globular seeds.

Local name: Peepal

Fl.and Fr.: March- April.

Habitat: Common in roadsides and forest area.

202. ***Morus alba*** Linn.

Morus alba Linn. Linn. in Sp. Pl. 986. 1753; Hooker, Fl. Brit. India 5: 492. 1888; Duthie, Fl. Gangetic Plain 3: 147, 1915 Bhandari, Fl. Indian Desert 314, 1978; Parmar in Shetty & Singh, Fl. Rajasthan 2: 807. 1991; Sharma, Fl. Raj (Hadoti). 198. 2002; Yadav and Meena, Fl. SC Rajasthan 336. 2011.

Local name: Shahtoot

Charcteristics:

Very large, evergreen, much branched tree; long prop root present for additional support; leaves simple, alternate, obovate, covered by downy hairs; flowers develop internally; inflorescence is axillary, paired hypanthodium, male flowers near mouth and female flowers in center; fruit is syconus; globular seeds.

Fl. and Fr.: December-May.

Habitat: Found on sandy plains.

LXVI. CASUARINACEAE

203. ***Casuarina equsetifolia*** Linn.

Casuarina equisetifolia Linn. Amoen. Acad. 4: 143.1759; Hooker f. Fl. Brit. India 5: 598. 1888; Duthie, Fl. Gangatic Plains 3: 162. 1915; Bhandari, Fl. Indian Desert 146. 1978; Pandey in Shetty and Singh Flora Raj. 2: 812-813. 1987; Sharma, Fl. Raj. (Hadoti) 170. 2002; Yadav and Meena, Fl. SC Rajasthan 337. 2011.

Local name: Jhau

Characteristics:

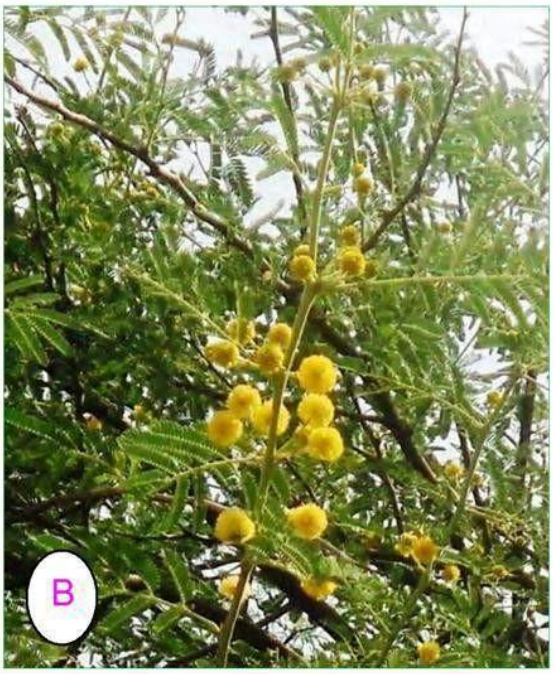
Erect, deciduous, conical, monoecious, much-branched tree; grey-brown bark; drooping branches; leaves long, scaly- lanceolate; male spikelets axillary in group, female spikelets in conelike cluster. Fruit is samara.

Fl. and Fr.: Throughout year.

Habitat: Found in forest plains.

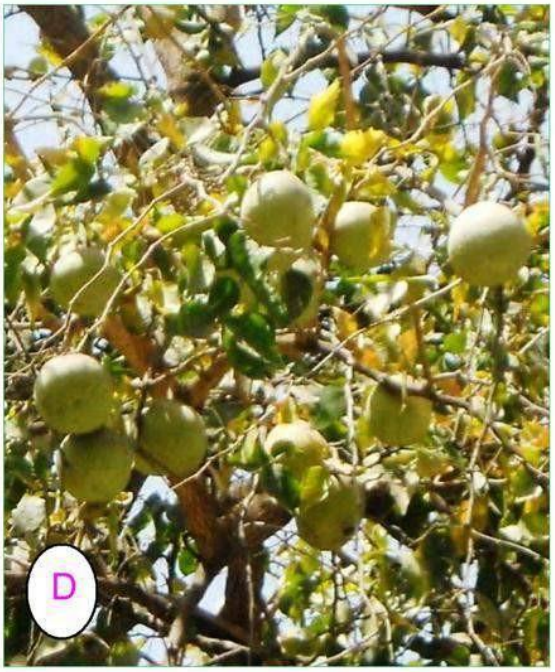
FIG. : - 5 A – D

A :-*Abutilon indicum* (Linn.) Sweet
(MALVACEAE)



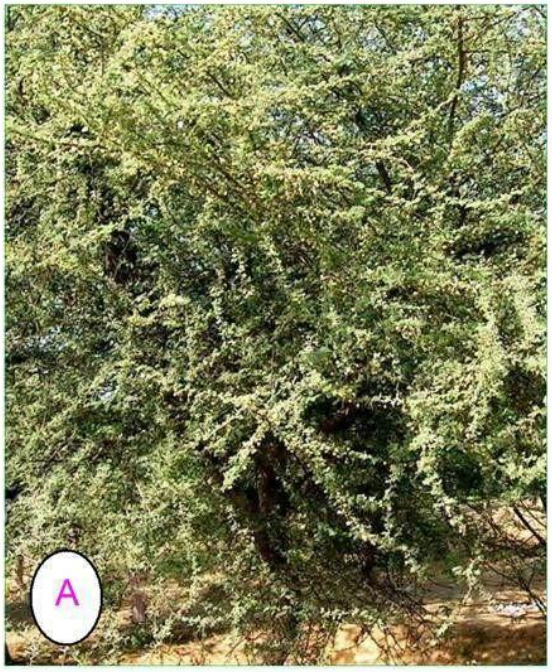
B :-*Acacia nilotica* (Linn.) Willd.
(MIMOSACEAE)

C :-*Ailanthus excelsa* Roxb.
(SIMAROUBACEAE)

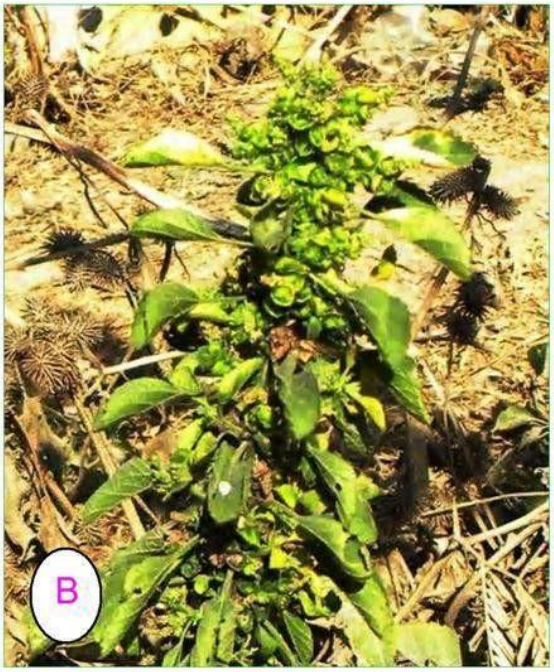


D:- *Aegle marmelos* (Linn).Corr
(RUTACEAE)

FIG. :- 6 A – D



A :- *Acacia tortilis* (Forsk.) Heyne
(MIMOSACEAE)



B :-*Acalypha indica* Linn.
(EUPHORBIACEAE)

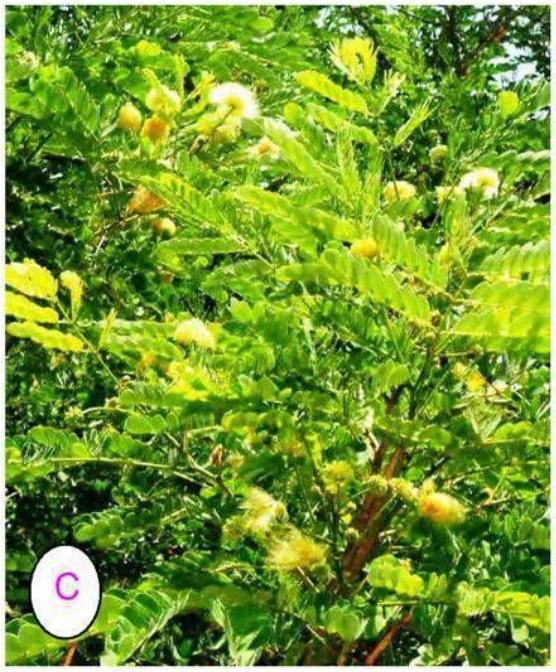
C :- *Achyranthes aspera* Linn.
(AMARANTAHCEAE)

D:- *Adhatoda vasica* Nees.
(ACANTHACEAE)

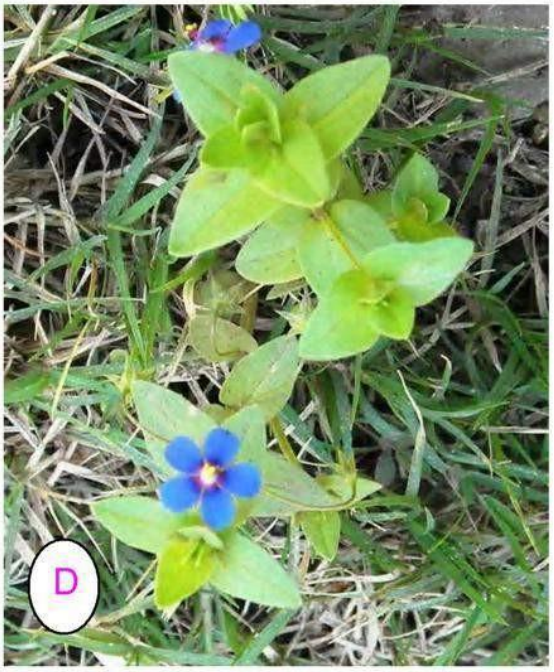
FIG. :- 7 A – D

A :- *Acacia jacquemontii* Benth
(MIMOSACEAE)

B :- *Aloe vera* Linn.
(LILIACEAE)

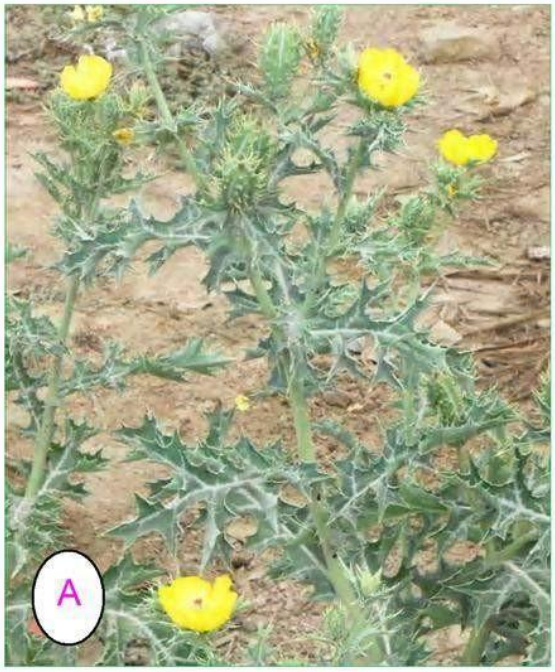


C :- *Albizia lebbek* (Linn.) Benth.
(MIMOSACEAE)



D:- *Anagallis arvensis* Linn.
(PRIMULACEAE)

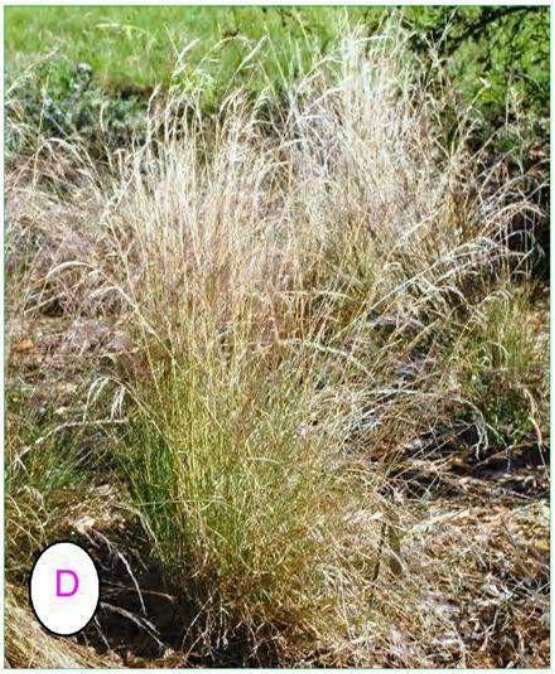
FIG. :- 8 A – D



A :- *Argemone mexicana* Linn
(PAPAVERCEAE)

B :- *Argemone ochroleuca* Sweet.
(PAPAVERACEAE)

C :- *Apluda mutica* Linn.
(POACEAE)

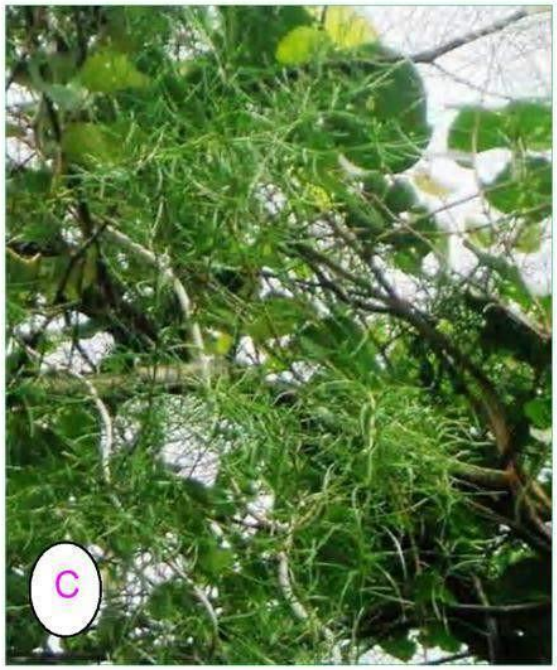


D:- *Aristida adcensionis* Linn.
(POACEAE)

FIG. :- 9 A – D

A :- *Balanites aegyptiaca* (Linn.) Delile
(SIMORAUBACEAE)

B :-*Bacopa monnieri* (Linn.) Wettst.
(SCROPHULARIACEAE)



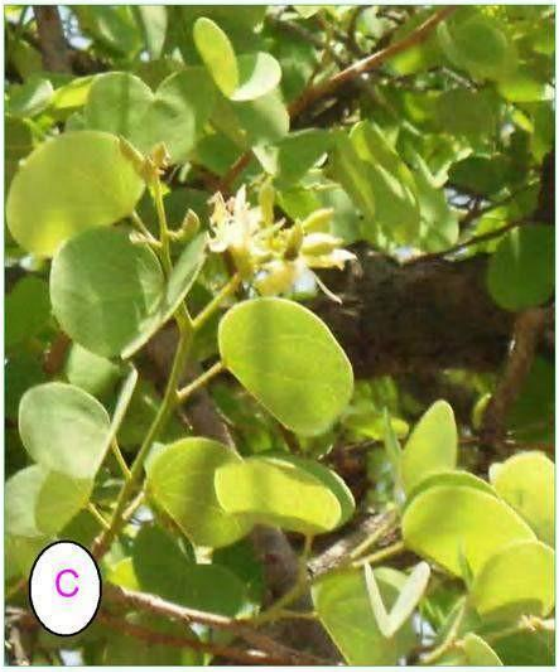
C :- *Asparagus racemosus* Linn.
(LILIACEAE)

D:- *Azardirachta indica* Linn.
(MELIACEAE)

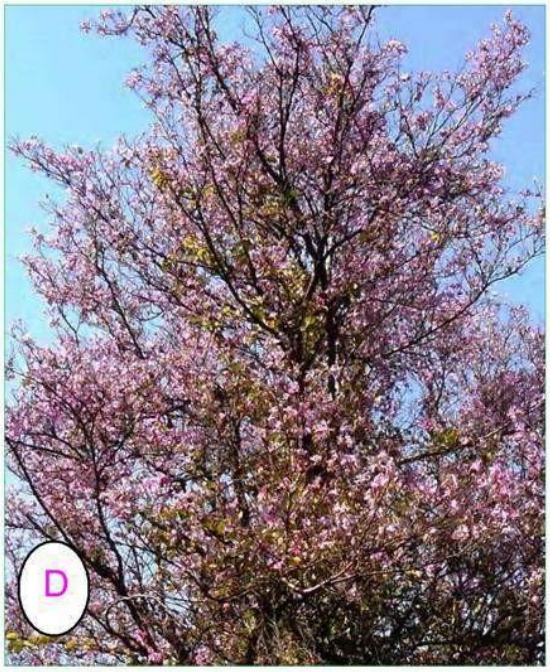
FIG. :- 10 A – D

A :- *Barleria prionitis* Linn.
(ACANTHACEAE)

B :- *Barleria acanthoides* **Vahl.**
(ACANTHACEAE)



C :- *Bauhinia racemosa* Lamk.
(CAESALPINIACEAE)

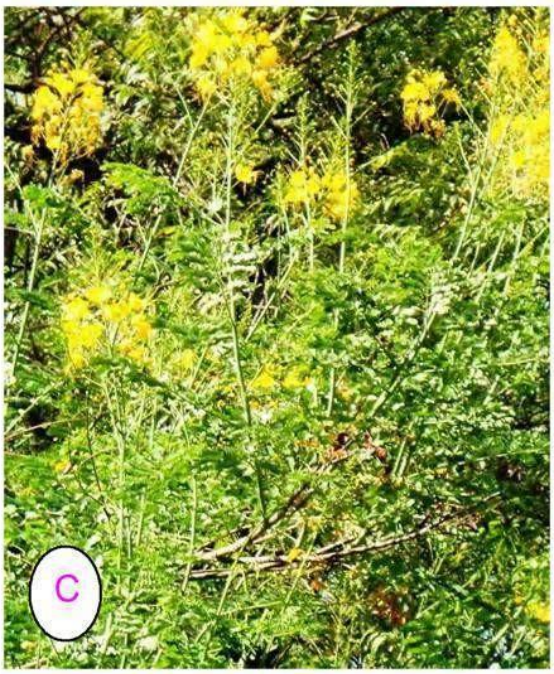


D:- *Bauhinia variegata* Linn.
(CAESALPINIACEAE))

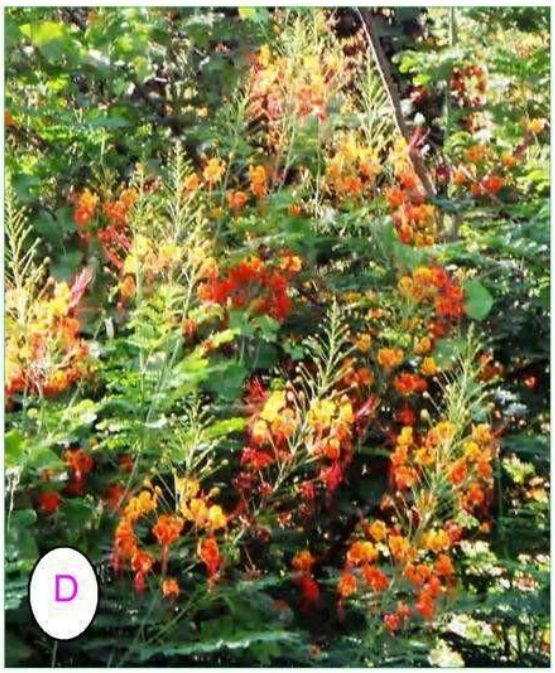
FIG. :- 11 A – D

A :- *Butea monosperma Roxb.*
(PAPILIONACEAE)

B :- *Bombax ceiba Linn.*
(BOMBACACEAE)

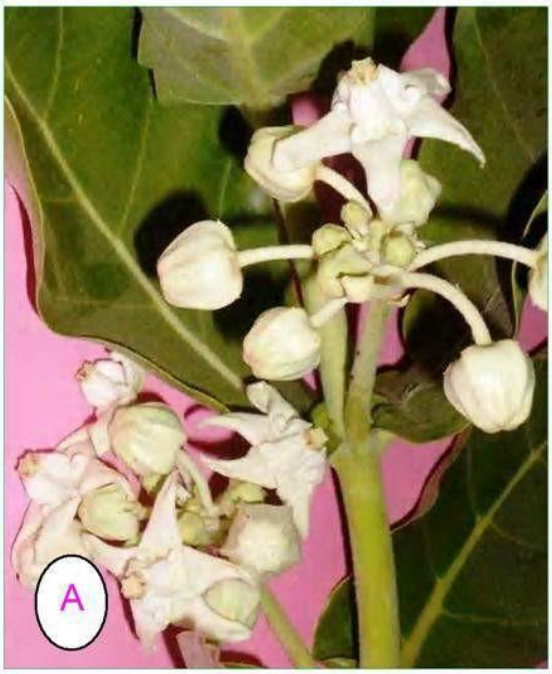


C :- *Caesalpinia pulcherrima* (Linn.) Sw.
var. flava.
(CAESALPINIACEAE)



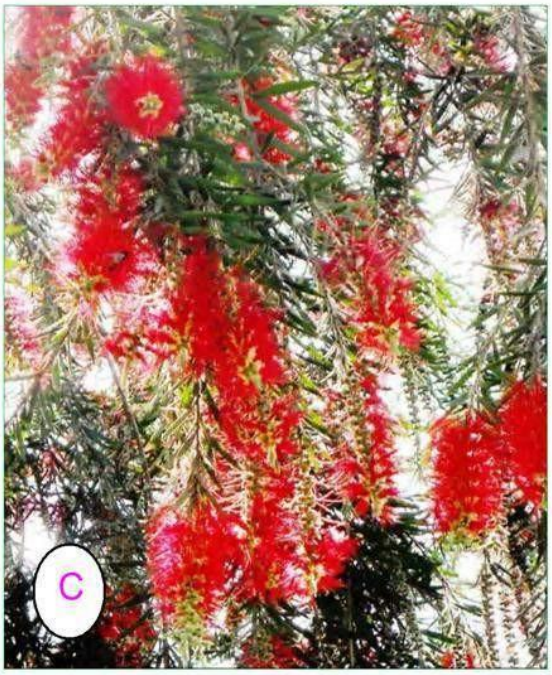
D:- *Caesalpinia pulcherrima* (Linn.) Sw.
var. rubra
(CAESALPINIACEAE)

FIG. :- 12 A – D

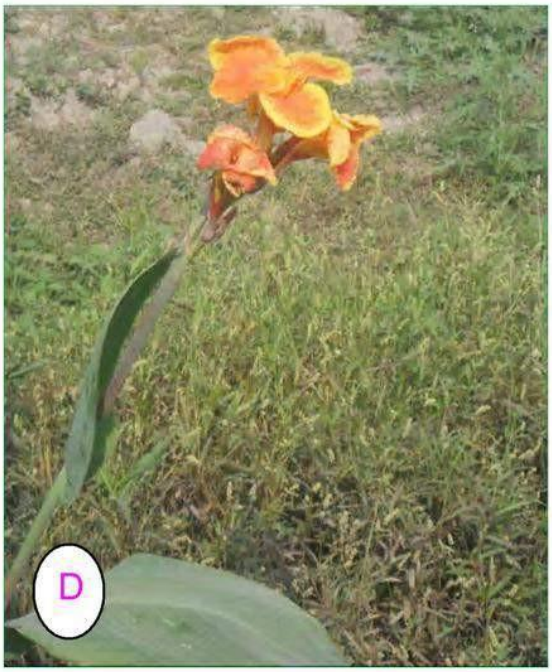


A :- *Calotopis gigantea* (Linn.) R.Br.
(ASCLEPIADACEAE)

B :- *Calotropis procera* (Ait.) R.Br.
(ASCLEPIADACEAE)

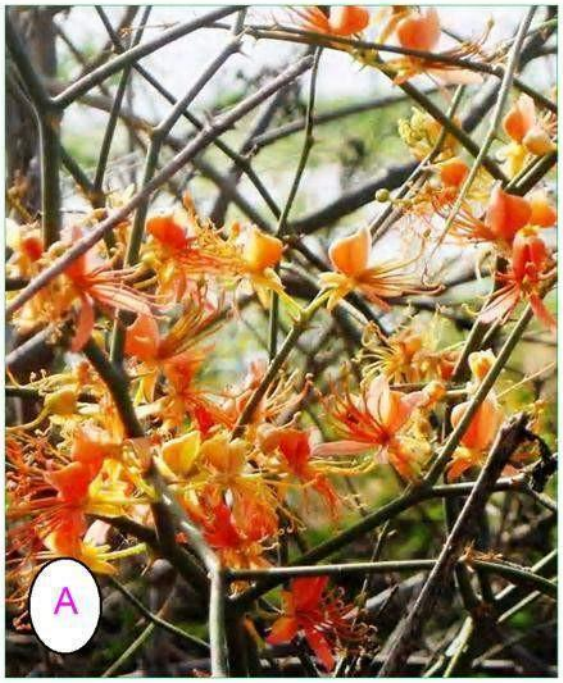


C :- *Callistamon citrinus (Curtis) Skeels.*
(MYRTACEAE)



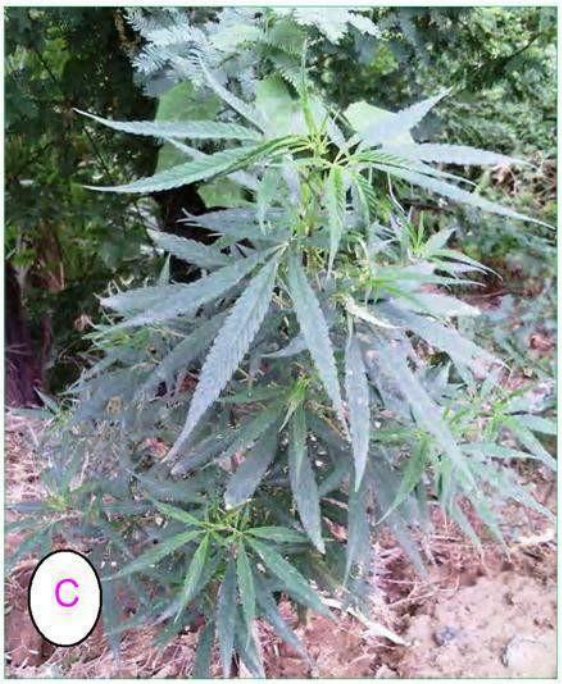
D:- *Canna indica Linn. var orientalis*
(CANNACEAE)

FIG. :- 13 A – D

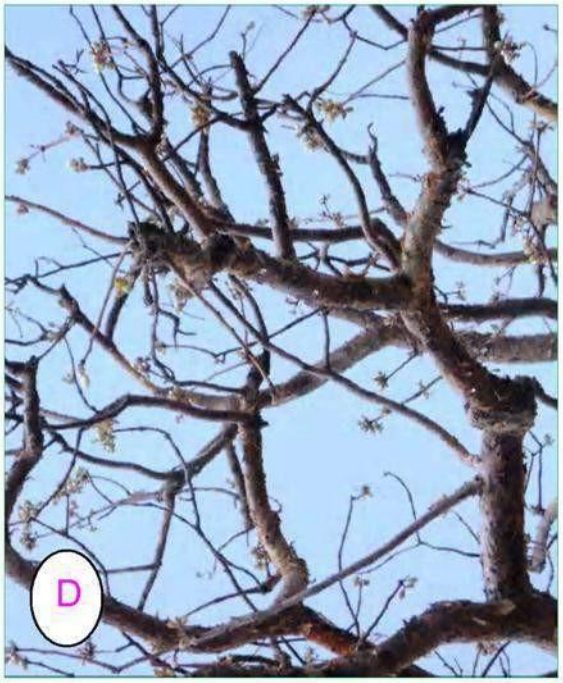


A :- *Capparis decidua* (Forsk.) Edgew.
(CAPPARIDACEAE)

B :- *Capparis sepiaria* Linn.
(CAPPARIDACEAE)

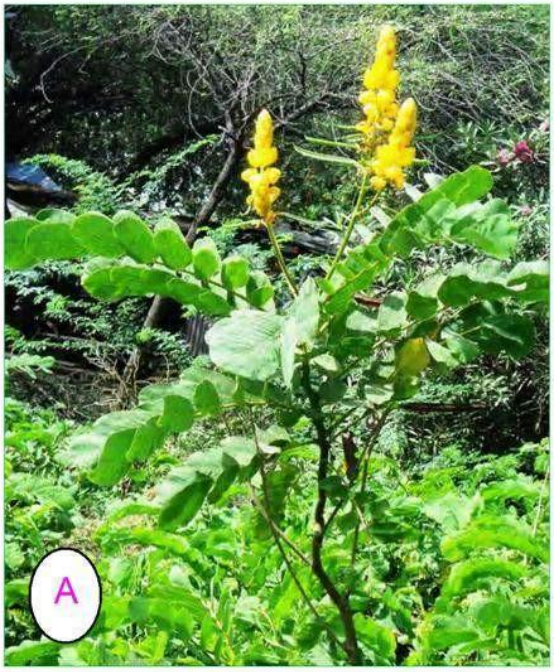


C :- *Cannabis sativa* Linn
(CANNABINACEAE)

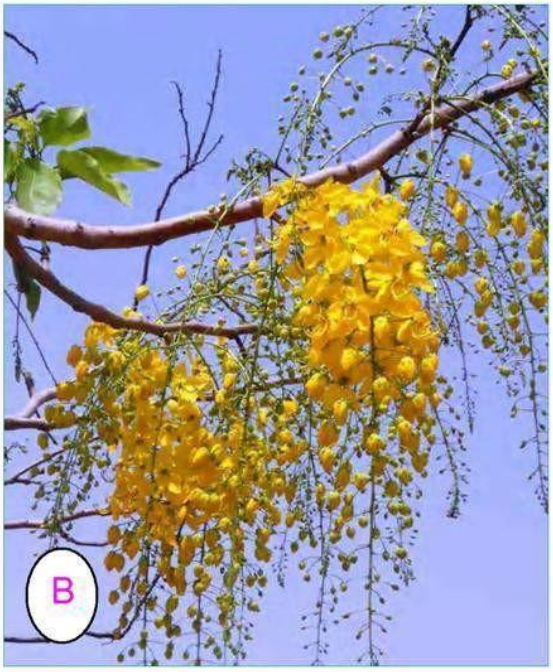


D:- *Boswellia serrata* Triana & Planch
(BURSERACEAE)

FIG. :- 14 A – D

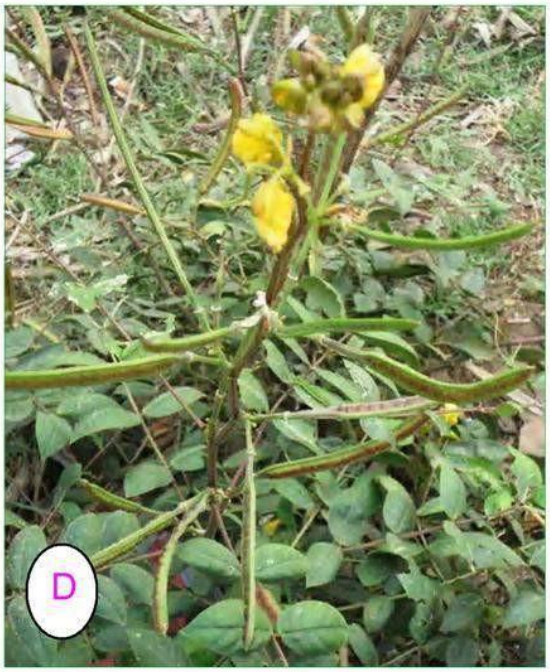


A :- *Cassia alata* Linn.
(CAESALPINIACEAE)



B :- *Cassia fistula* Linn.
(CAESALPINIACEAE)

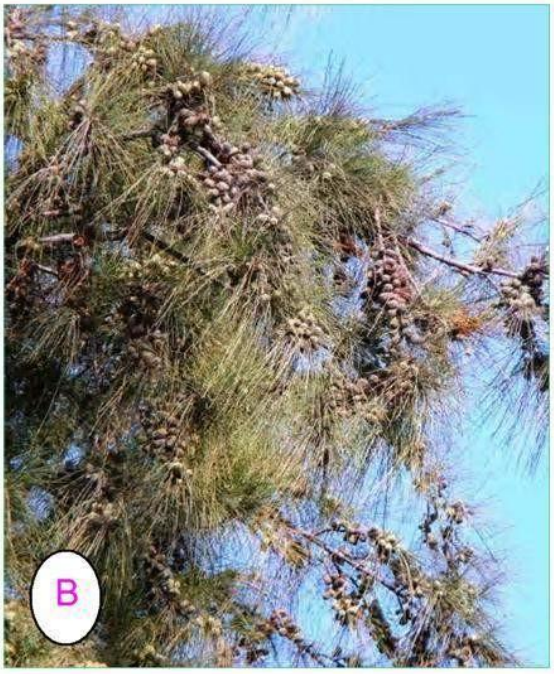
C :- *Cassia siemia* Lam.
(CAESALPINIACEAE)



D:- *Cassia occidetalis* Linn.
(CAESALPINIACEAE)

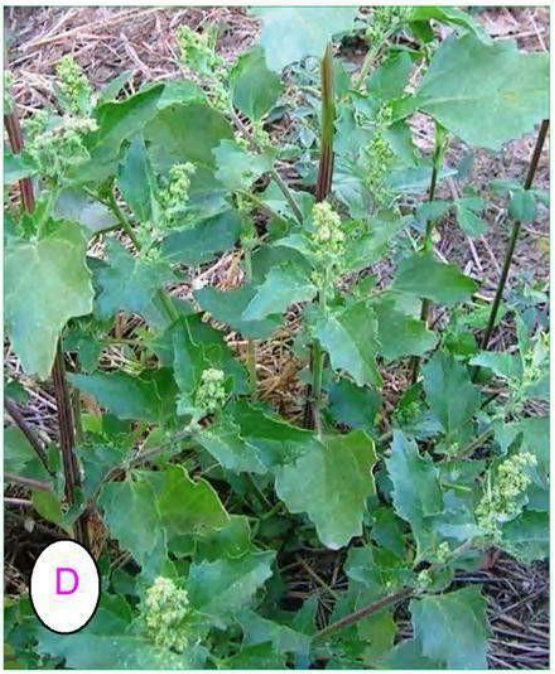
FIG. :- 15 A – D

A :- *Cassia tora* (Linn.) Roxb.
(CAESALPINIACEAE)



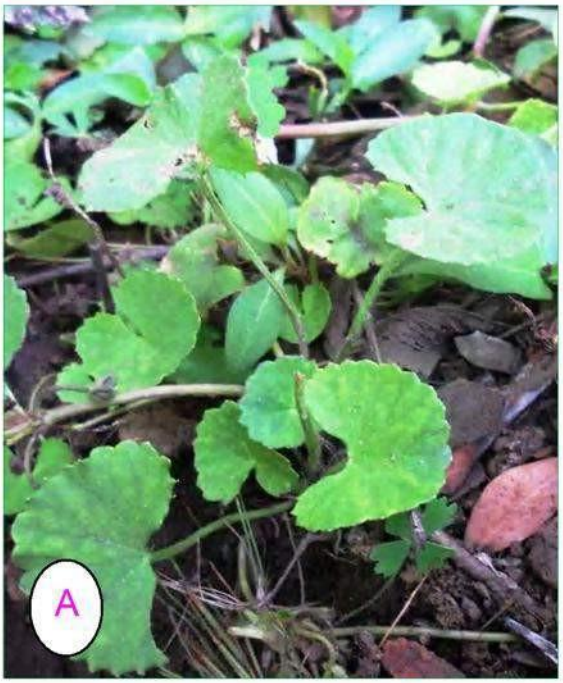
B :- *Casuarina equisetifolia* Linn.
(CASUARINACEAE)

C :- *Cenchrus setigerus* Vahl.
(POACEAE)



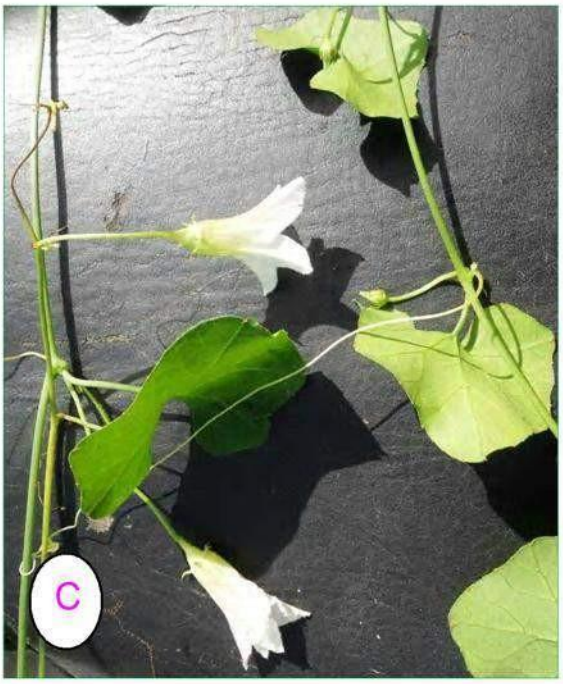
D:- *Chenopodium murale* Linn.
(CHENOPODIACEAE)

FIG. :- 16 A – D



A :- *Centella asiatica* (Linn.) Urban
(APIACEAE)

B :- *Cirsium arvense* (Linn.) Scop.
(ASTERACEAE)

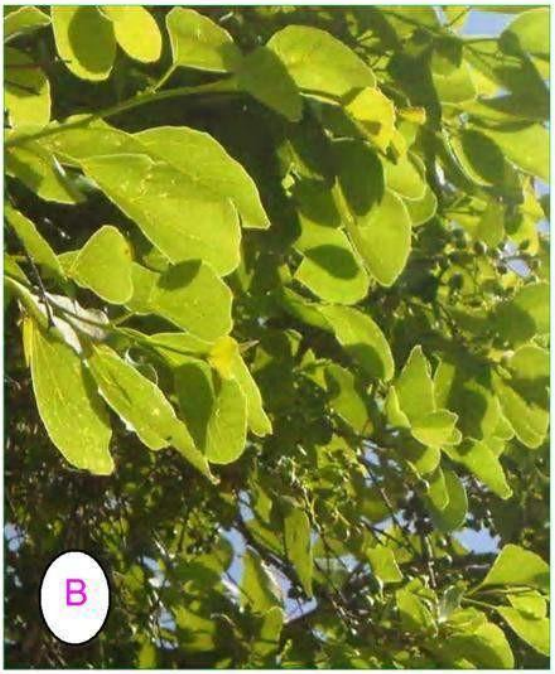


C :- *Coccinia grandis* (Linn.) J.O. Voigt.
(CUCURBITACEAE)

D:- *Convolvulus arvensis* Linn.
(CONVOLVULACEAE)

FIG. :- 17 A – D

A :- *Corcorus capsularis* Linn.
(TILIACEAE)

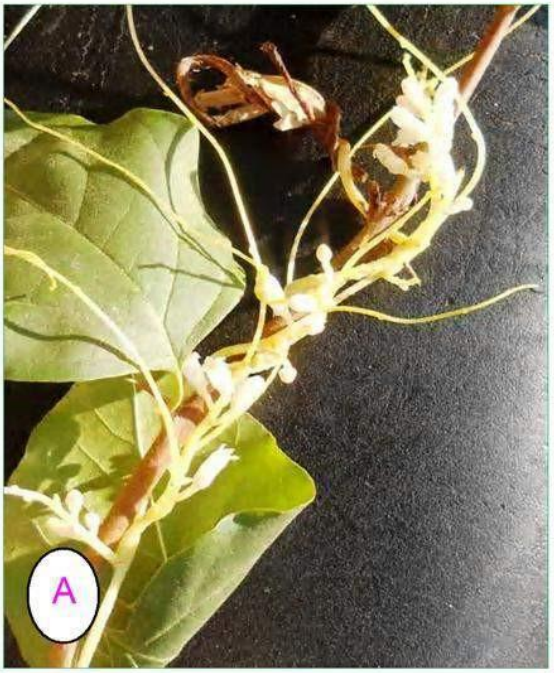


B :- *Cordia gharaf* (Forsk.) Ehren. ex Asch.
(EHRETIACEAE)

C :-*Cotula hemisphaerica* (Roxb.) Wall ex Benth. & Hook. f.
(EUPHORBIACEAE)

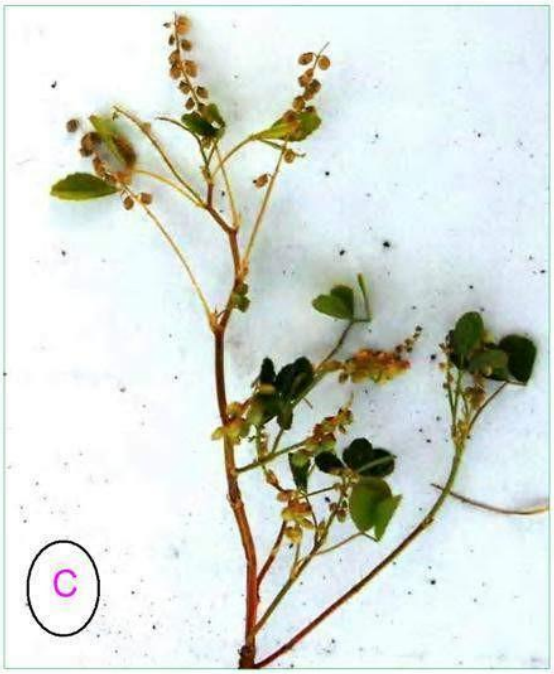
D:- *Crozophora rottleri* Gies A. Juss.ex. Spreng.
(ASTERACEAE)

FIG. :- 18 A – D



A :- *Cuscuta hyalina* Heyne ex Roth.
(CUSCUTACEAE)

B :- *Cuscuta reflexa* Roxb.
(CUSCUTACEAE)

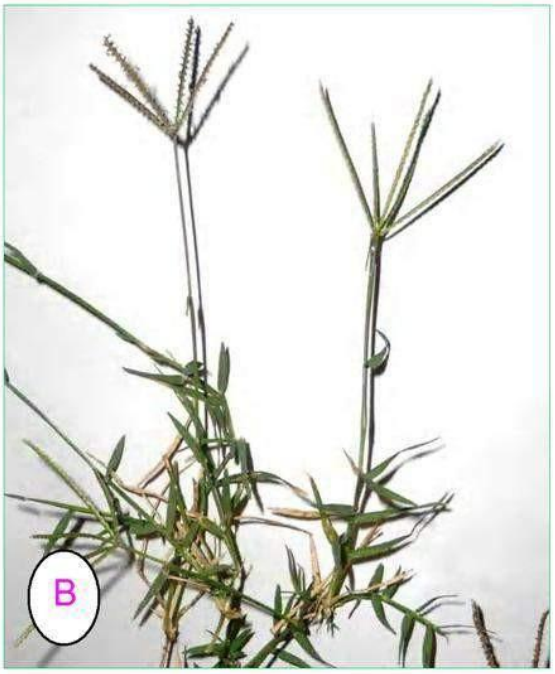


C :- *Crotolaria medicaginea* Lamk.
(PAPILIONATAE)

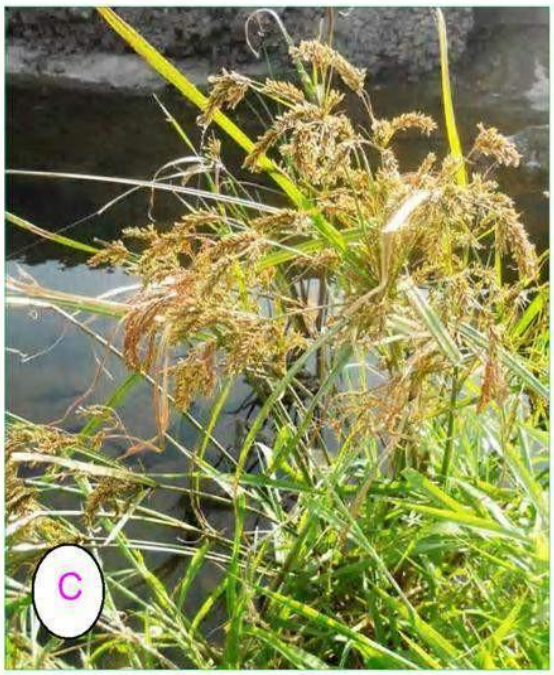
D:- *Croton bonplandianum* Baill.
(EUPHORBIACEAE)

FIG. :- 19 A – D

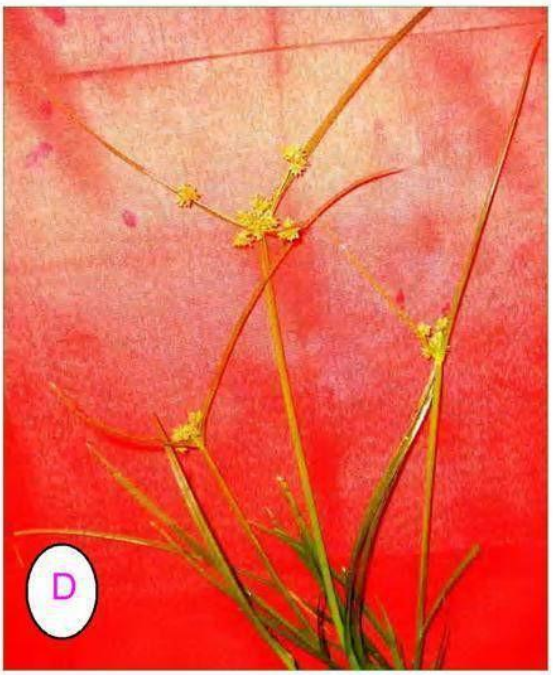
A :- *Cryptostegia grandiflora* R.Br.
(PERIPLOCACEAE)



B :- *Cynodon dactylon* (Linn.) Pers.
(POACEAE)

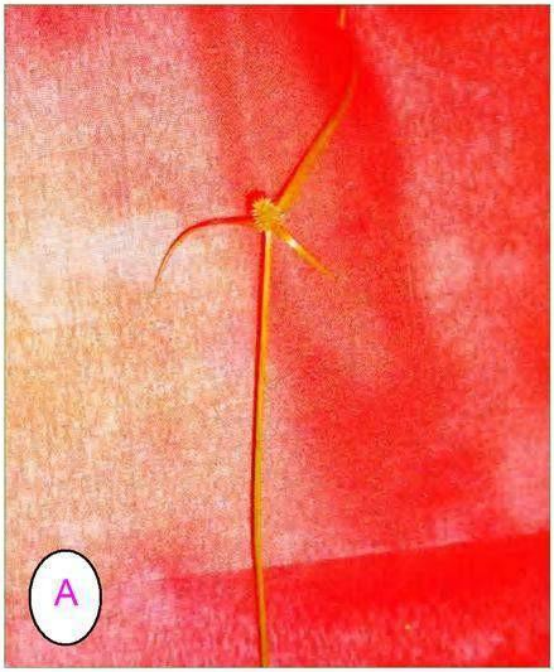


C :- *Cyperus alopecuroides* Rottb.
(CYPERACEAE)



D:- *Cyperus difformis* Linn.
(CYPERACEAE)

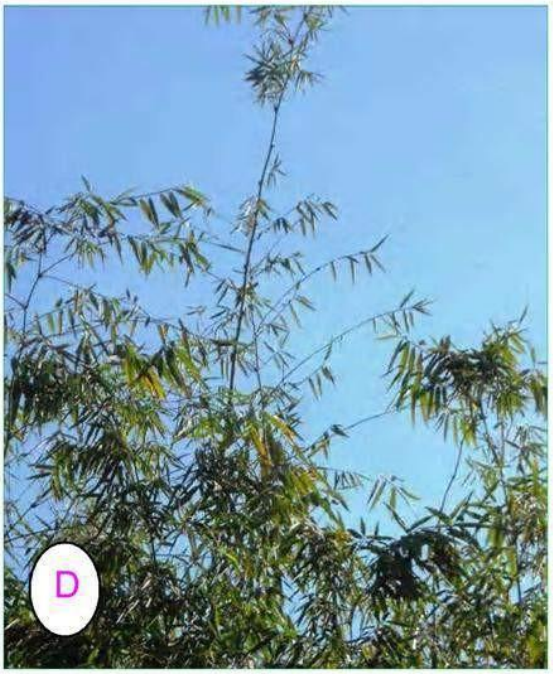
FIG. :- 20 A – D



A :- *Cyperus kyllinga* Endl.
(CYPERACEAE)

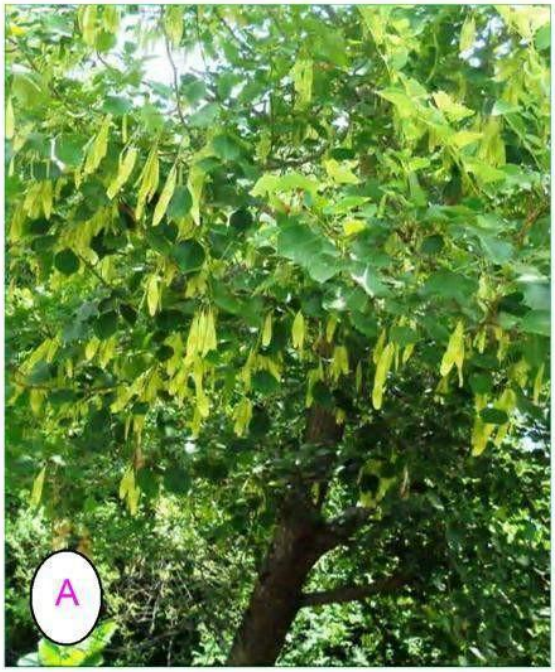
B :- *Cyperus pygmaeus* Rottd.
(CYPERCEAE)

C :- *Cyperus rotondus* Linn.
(CYPERACEAE)

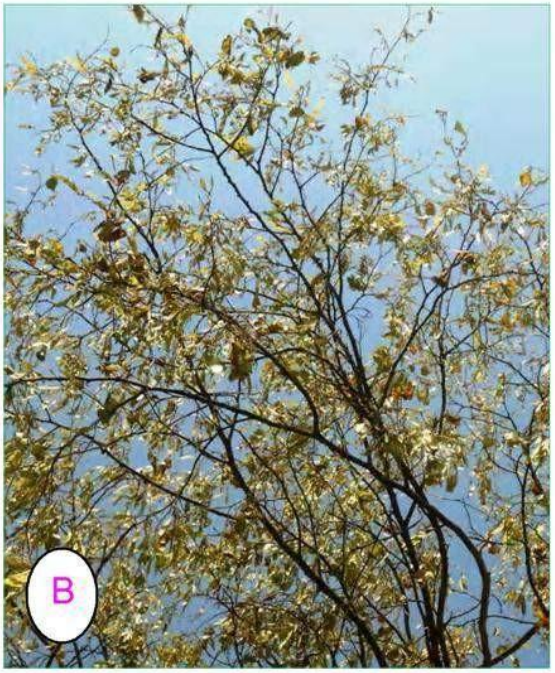


D:- *Dendrocalamus strictus* (Roxb.) Nees.
(POACEAE)

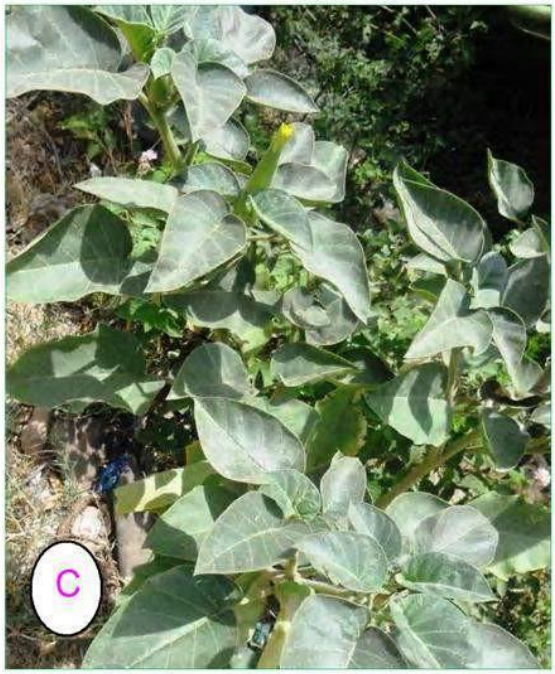
FIG. :- 21 A – D



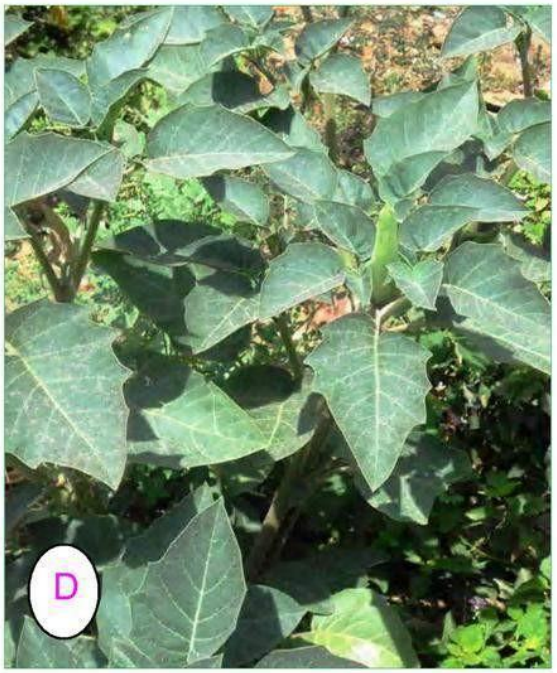
A :- *Dalbergia sisso* Roxb.
(PAPILIONACEAE)



B :- *Dalbergia latifolia* Roxb.
(PAPILIONACEAE)

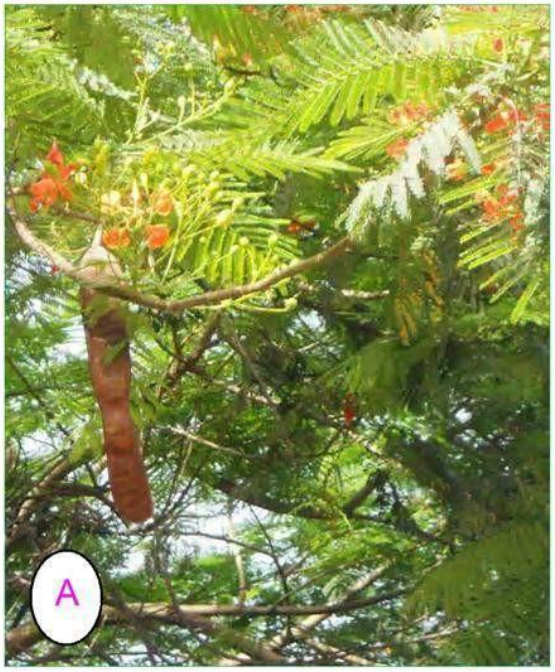


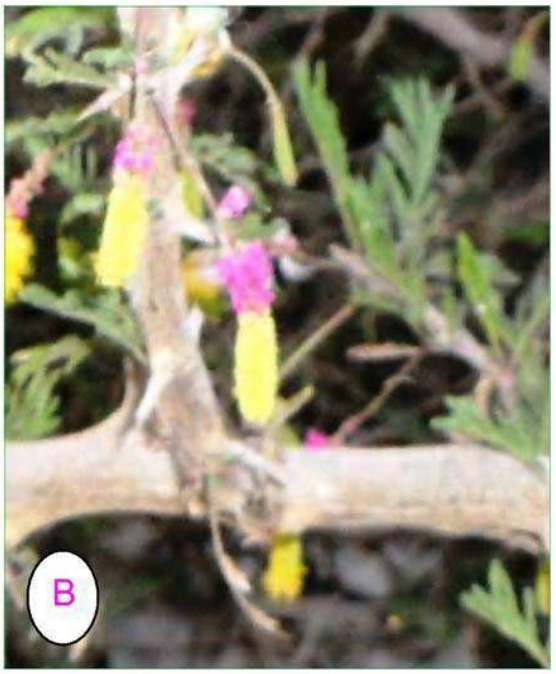
C :- *Datura innoxia* Mill.
(SOLANACEAE)



D:- *Datura stramonium* Linn.
(SOLANACEAE)

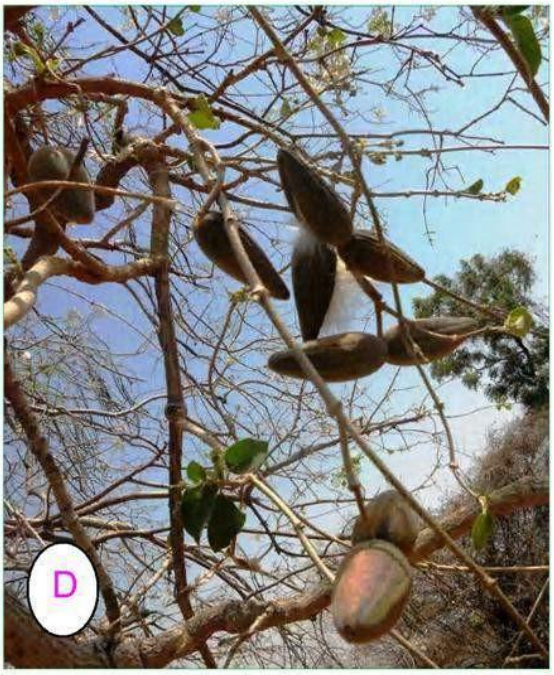
FIG. :- 22 A – D





A :- *Delonix regia* (Boj.ex Hook.) Raf. (CAESALPINIACEAE)

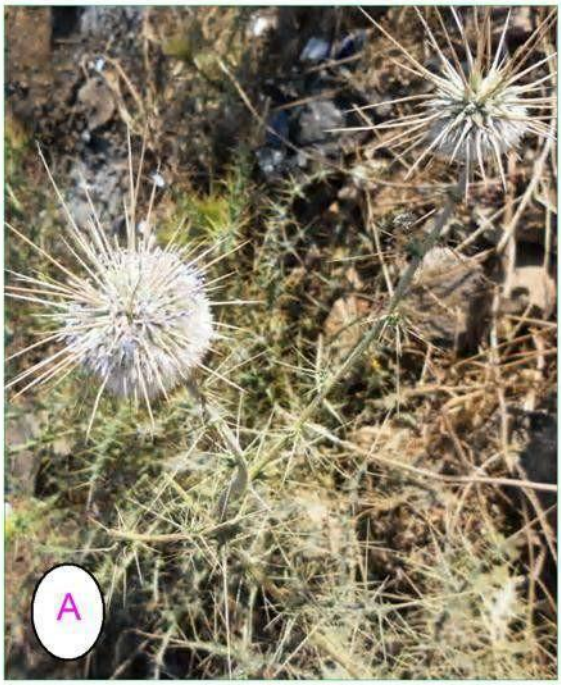
B : *Dichrostachys cinerea* (Linn).Wight & Arn. (MIMOSACEAE)



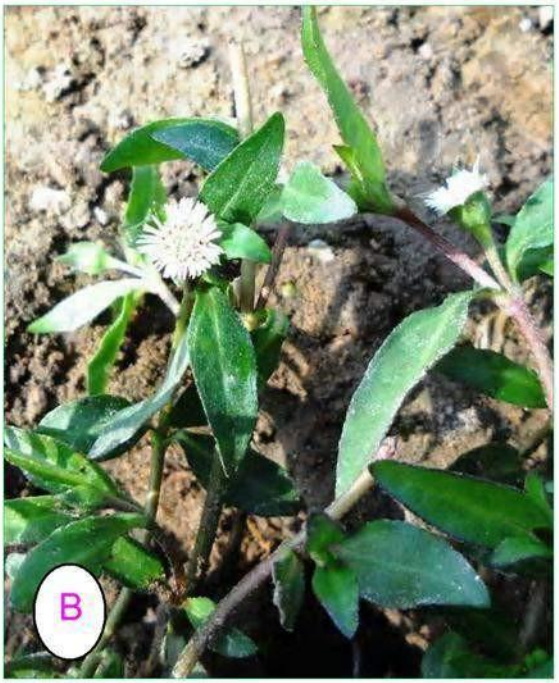
C :- *Diospyros melanoxylon* Roxb. (EBENACEAE)

D:- *Dregea volubilis* Benth. ex Hook. (ASCLEPIADACEAE)

FIG. :- 23 A – D



A :- *Echinops echinatus* Roxb.
(ASTERACEAE)

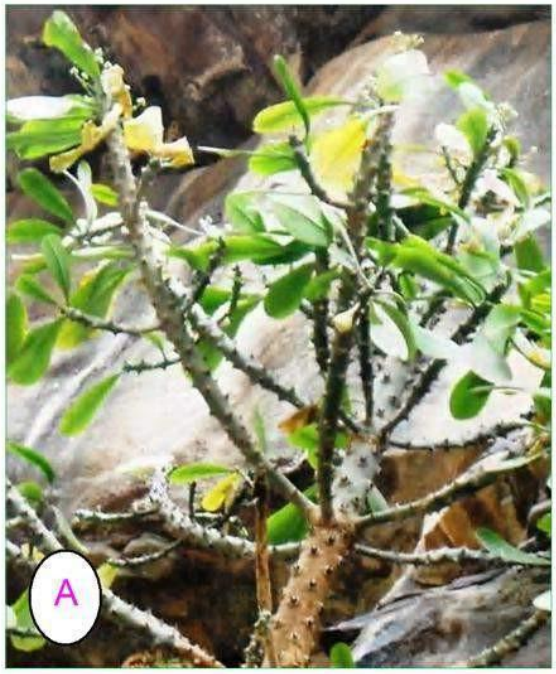


B :- *Eclipta prostrata* (Linn.)L. Mant.
(ASTERACEAE)

C :- *Elytraria acaulis* (Linn.)Kuntz.
(ACANTHACEAE)

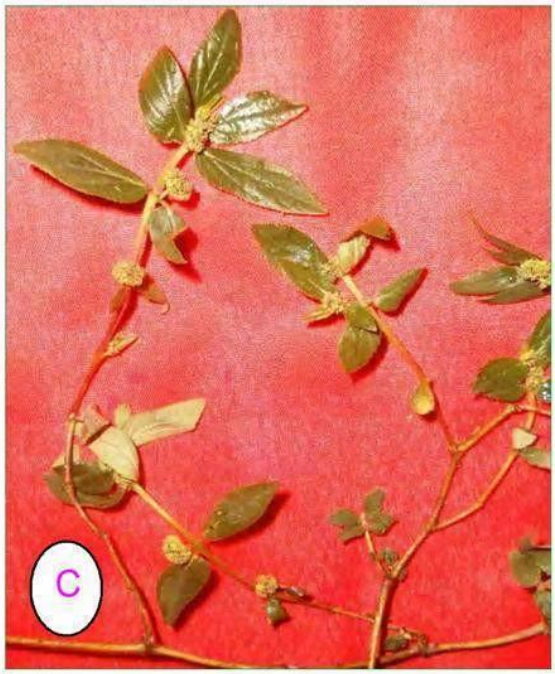
D:- *Gomphrena celosiodes* Mert.
(AMARANTHACEAE)

FIG. :- 24 A – D

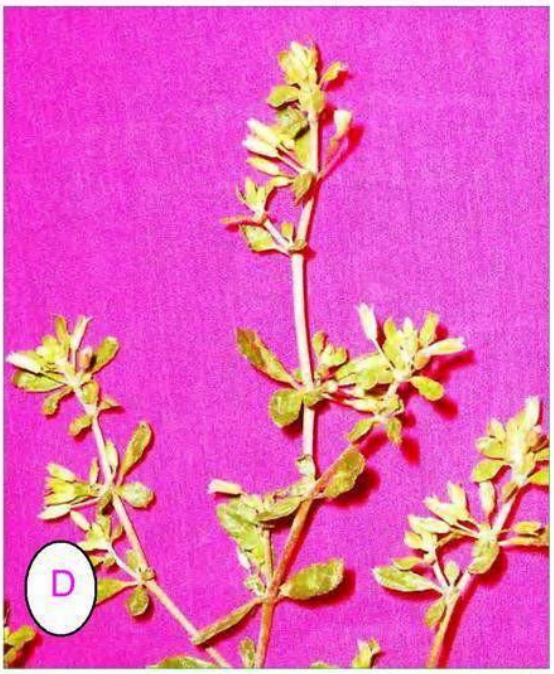


A :- *Euphorbia caducifolia.* Linn.
(EUPHORBIACEAE)

B :- *Euphorbia heterophylla* Linn.
(EUPHORBIACEAE)



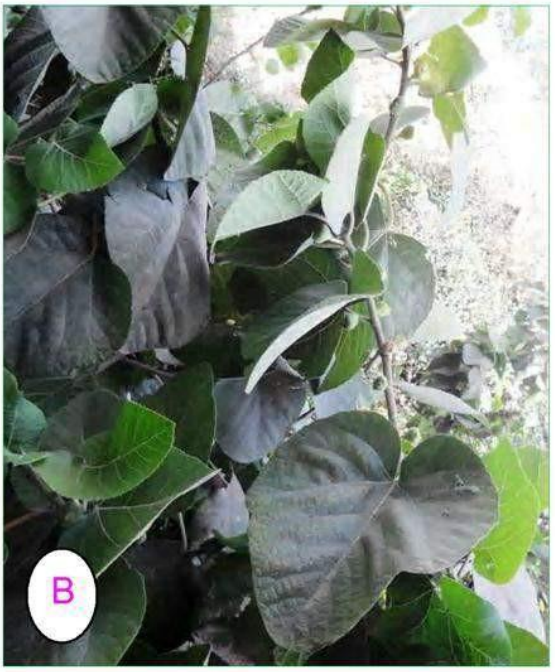
C :- *Euphorbia hirta* Linn.
(EUPHORBIACEAE)



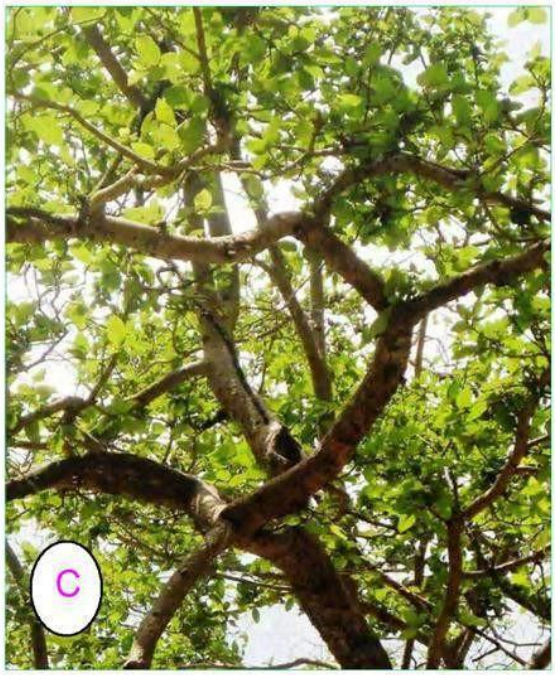
D:- *Glinus oppositifolius* (Linn.) D.C.
(MULLUGINACEAE)

FIG. :- 25 A – D

A :- *Ficus benghalensis* Linn.
(MORACEAE)



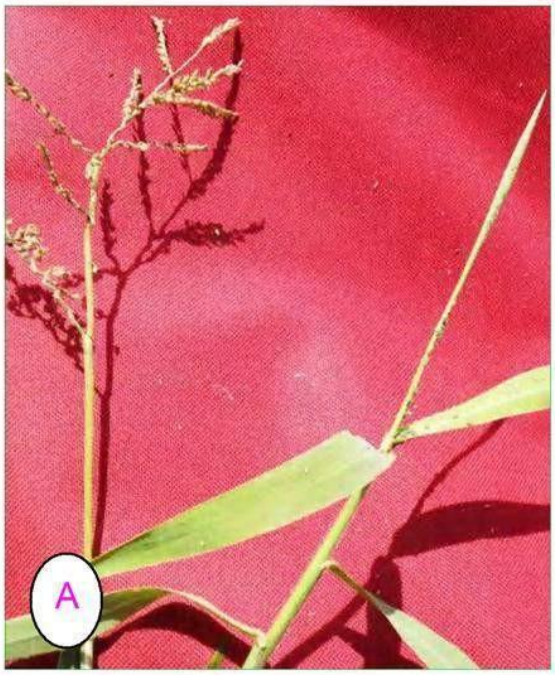
B :- *Ficus palmata* Forsk.
(MORACEAE)



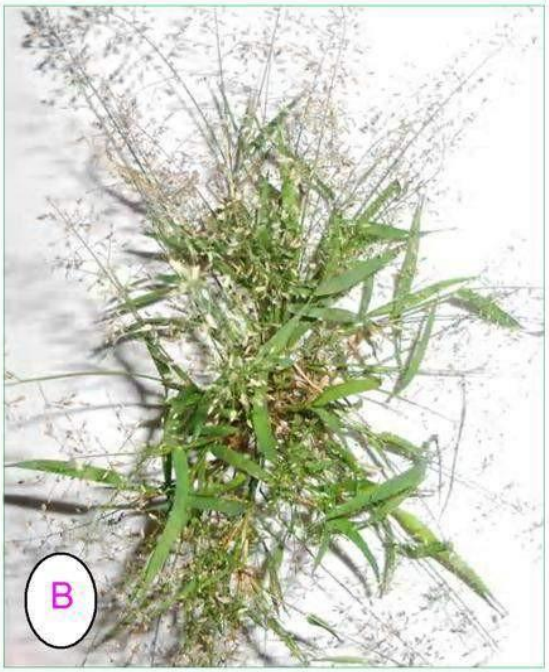
C :- *Ficus racemosa* Linn.
(PAPILIONATAE)

D:- *Hamelia patans* Jacq.
(RUBIACEAE)

FIG. :- 26 A – D

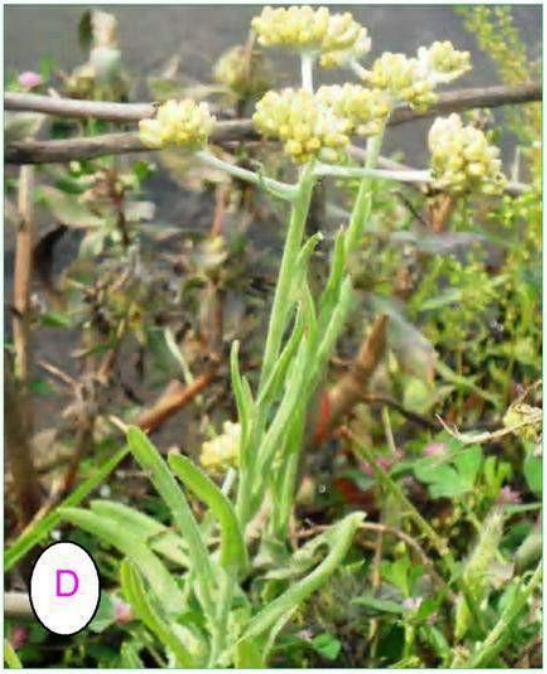


A :- *Eriochloa procers* (Retz.) Hubb.
(POACEAE)



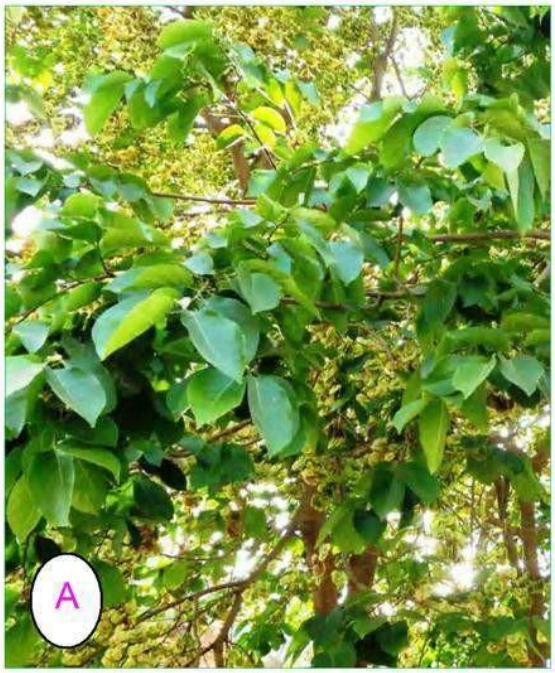
B :- *Eragrostis japonica* (Thunb.) Trin.
(POACEAE)

C :- *Grangea maderspatana* (Linn.) Poir.
(ASTERACEAE)



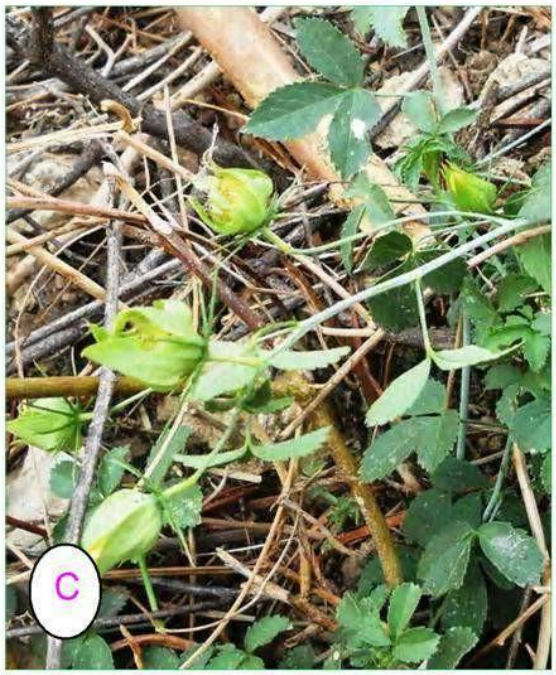
D:- *Gnaphalium luteo-album* Linn.
(ASTERACEAE)

FIG. :- 27 A – D

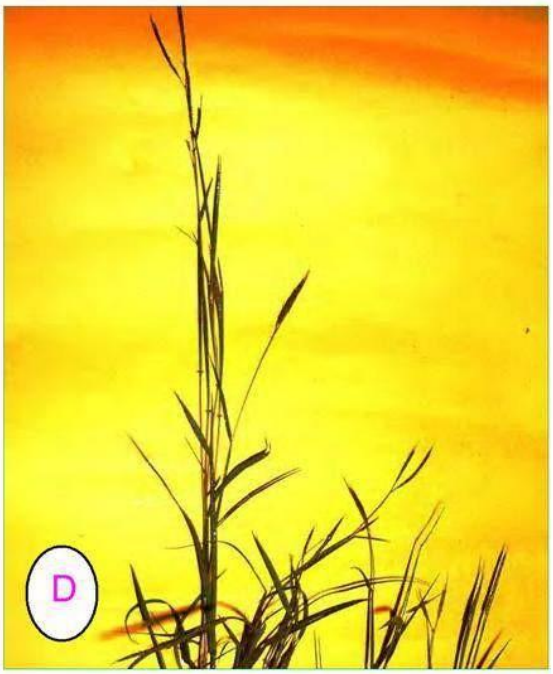


A :- *Holoptella integrifolia* (Roxb.) Planch.
(ULMACEAE)

B :- *Heliotropium supinum* Linn.
(BORAGINACEAE)



C :- *Hibiscus caesius* Gracke
(MALVACEAE)



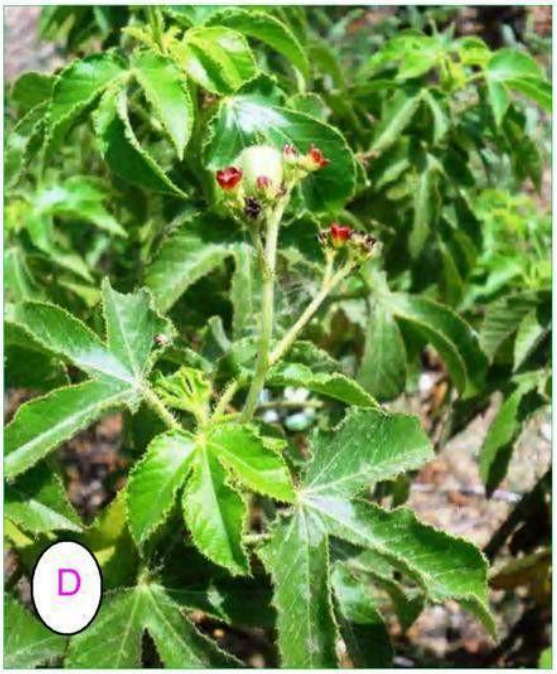
D:- *Heteropogon contortus* (Linn.) Roem & Schult.
(POACEAE)

FIG. :- 28 A – D

A :- *Ipomoea nil* (Linn.) Roth
(CONVOLVULACEAE)

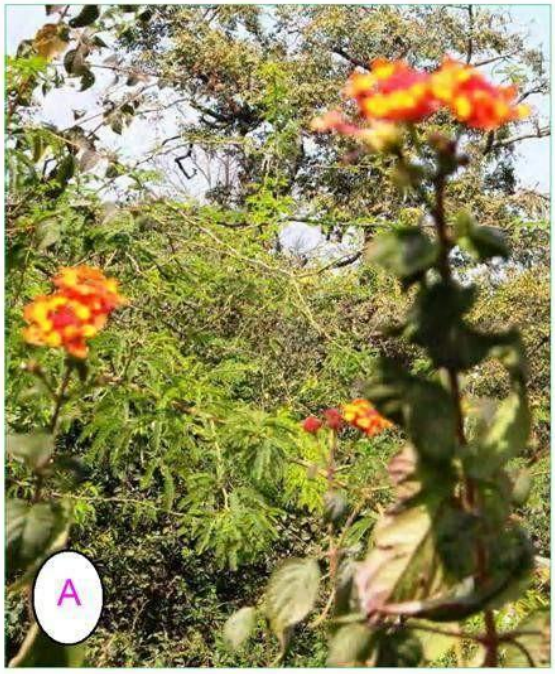
B :- *Ipomoea sindica* Stapf.
(CONVOLVULACEAE)

C :- *Hygrophila auriculata (Schumach.) Hein.*
(ACANTHACEAE)

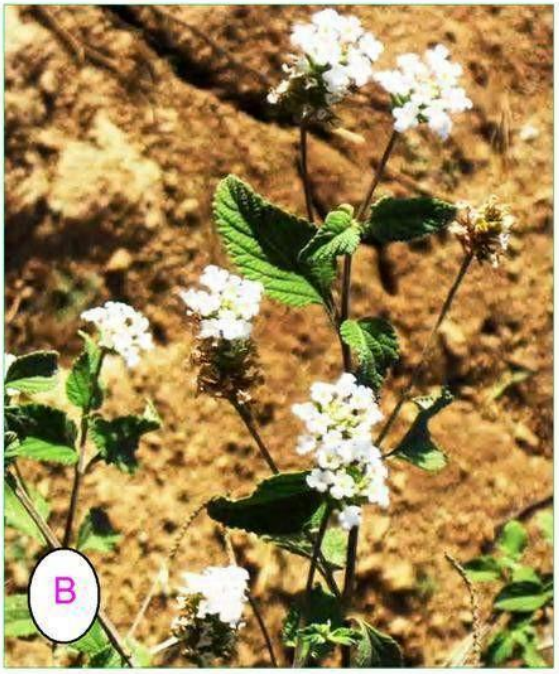


D:-*Jatropha gossypifolia* Linn.
(EUPHORBIACEAE)

FIG. :- 29 A – D

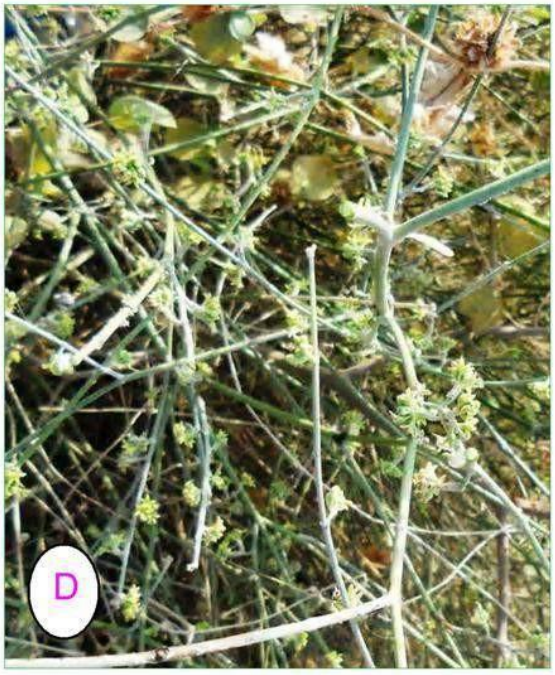


A :- *Lantana camara* Linn.
(VERBENACEAE)



B :- *Lantana wightiana* Wall. ex Gamble
(VERBENACEAE)

C :- *Kigelia pinnata* D.C.
(BIGNOBIACEAE)

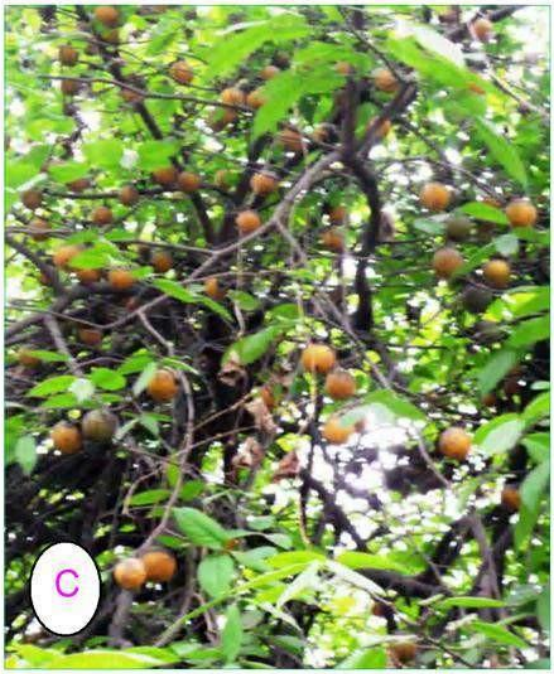


D:- *Leptadenia pyrotechnica (Forsk.) Decne*
(ASCLEPIADACEAE)

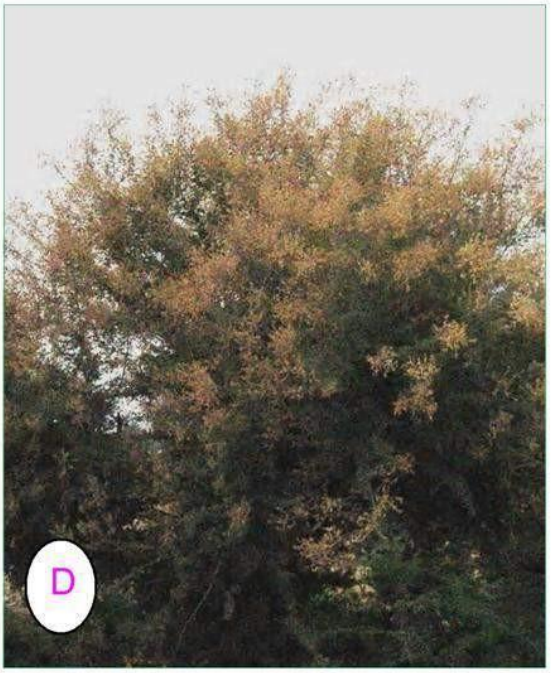
FIG. :- 30 A – D

A :- *Lathyrus aphaca* Linn.
(PAPILIONACEAE)

B :- *Luffa aculangula* (Roxb.) Clarke
(CUCURBITACEAE)



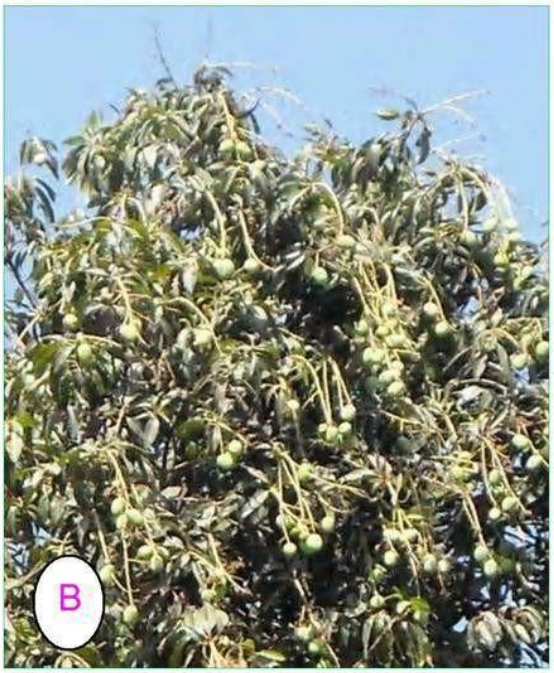
C :- *Limonia acidissima* Linn
(RUTACEAE)



D:- *Leucaena leucocephala* (Lam.) de Wit.
(MIMOSACEAE)

FIG. :- 31 A – D

A :- *Mallotus philippensis* (Lam.) Muell.
(EUPHORBIACEAE)



B :- *Mangifera indica* Linn.
(ANACARDIACEAE)

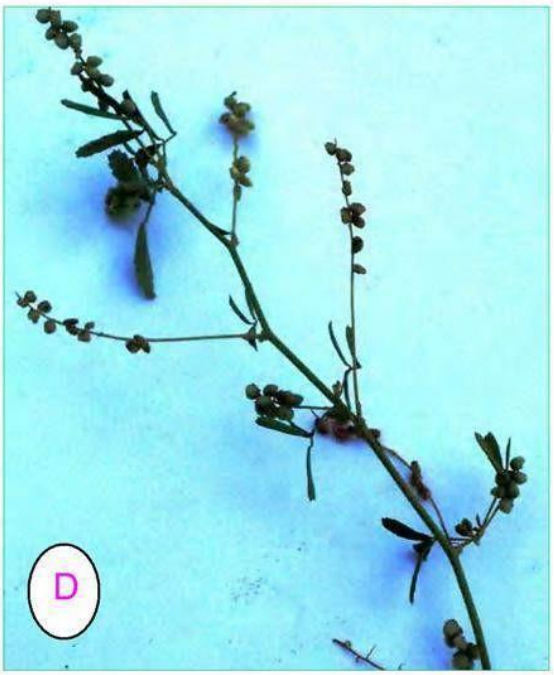
C :- *Manilkara zapota* (Linn.) P.Royen
(SAPOTACEAE)

D:- *Manilkara hexandra* (Roxb.) Dubard
(SAPOTACEAE)

FIG. :- 32 A – D

A :- *Malvestrum cormandelianum* (Linn.) Garcke (MALVACEAE)

B :- *Martynia annua* Linn. (MARTYNIACEAE)

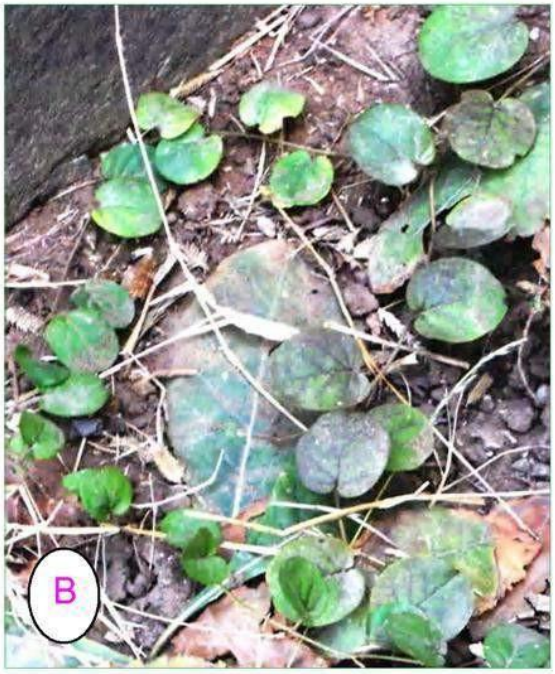


C :- *Maytenus emarginata* (Willd.) Ding Hou. (CELASTRACEAE)

D:-*Melilotus indica* All. (PAPILIONACEAE)

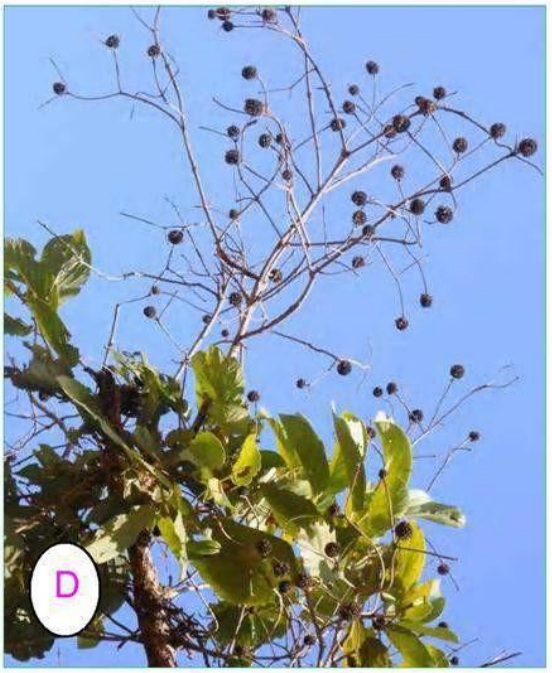
FIG. :- 33 A – D

A :- *Medicago polymorpha* Linn
(PAPILIONACEAE)



B :- *Merramia aegyptia* Linn.
(CONVOLVULACEAE)

C :- *Mimosa hamata* Willd.
(MIMOSACEAE)

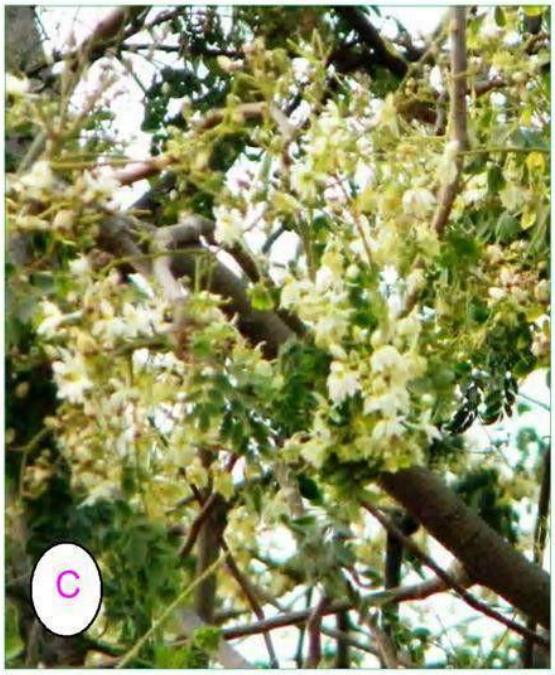


D:- *Mitragyna parvifoliab* (Roxb.) Korth
(RUBIACEAE)

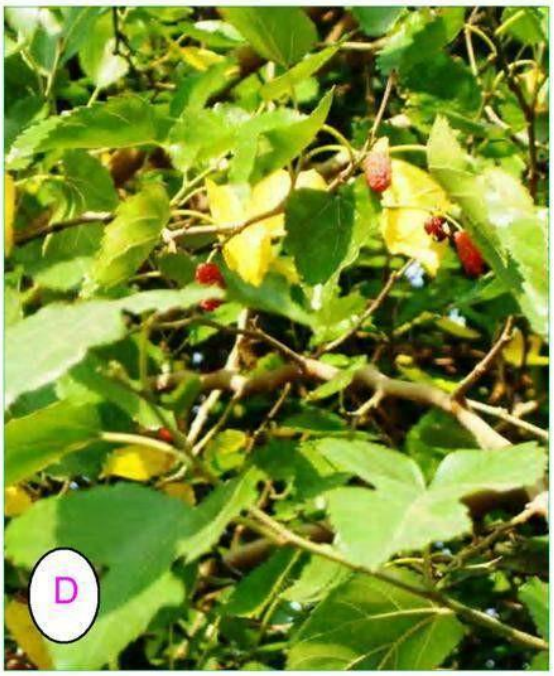
FIG. :- 34 A – D

A :-*Momordica dioica* Roxb. ex Willd
(CUCURBITACEAE)

B :- *Mucuna pruriens* (Linn.) D.C.
(PAPILIONACEAE)

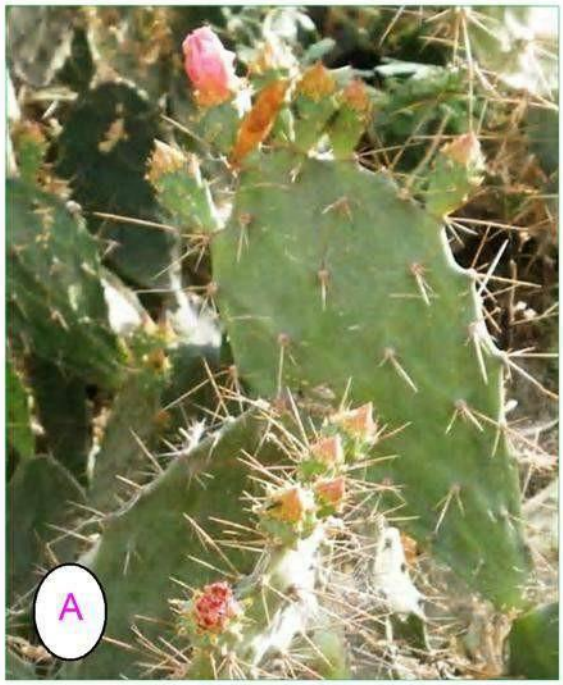


C :- *Moringa oleifera* Lam.
(MORINGACEAE)

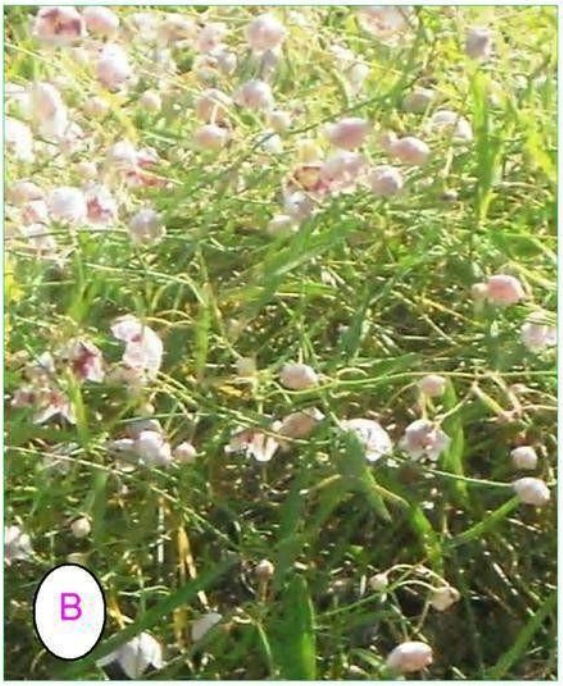


D:- *Morus alba* Linn.
(MORACEAE)

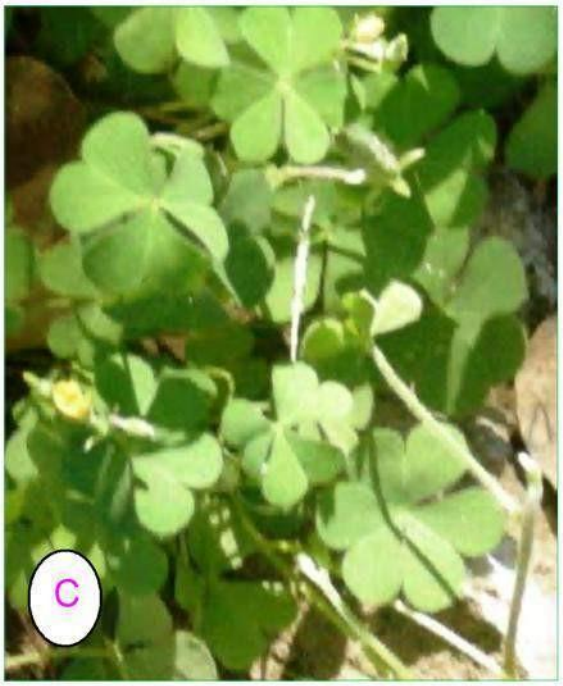
FIG. :- 35 A – D



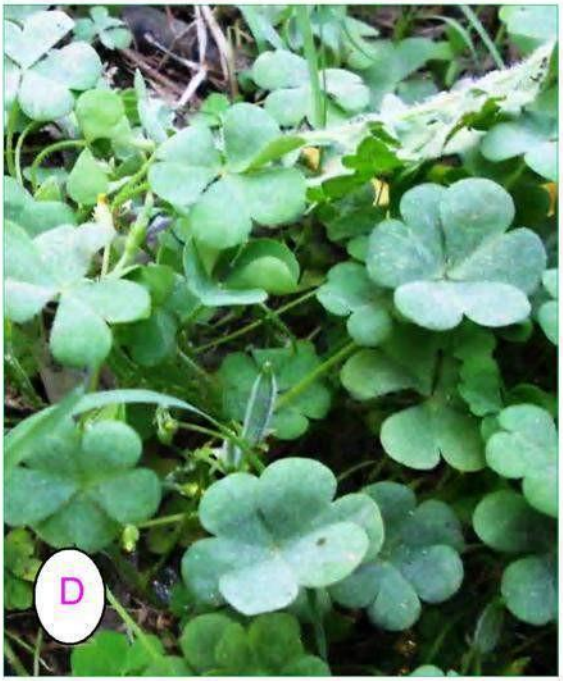
A :- *Opuntia elatior* Mill.
(CACTACEAE)



B :- *Oxystelma secamone* (Linn.) K.Schum.
(ASCLEPIADACEAE)

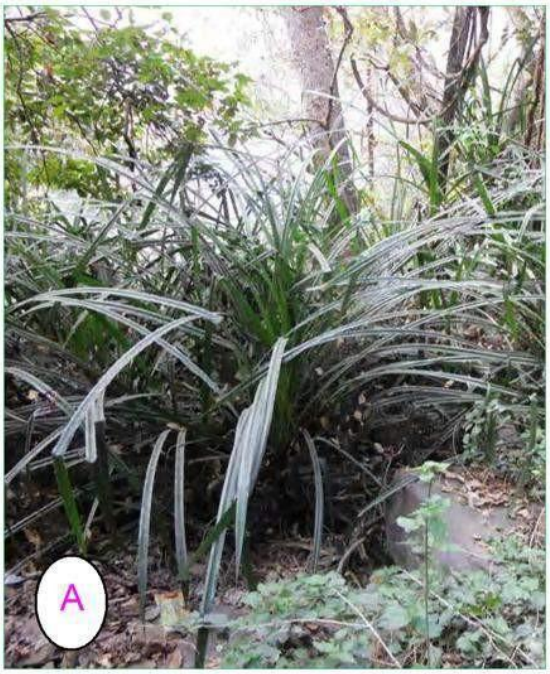


C :- *Oxalis corniculata* Linn.
(OXALIDACEAE)

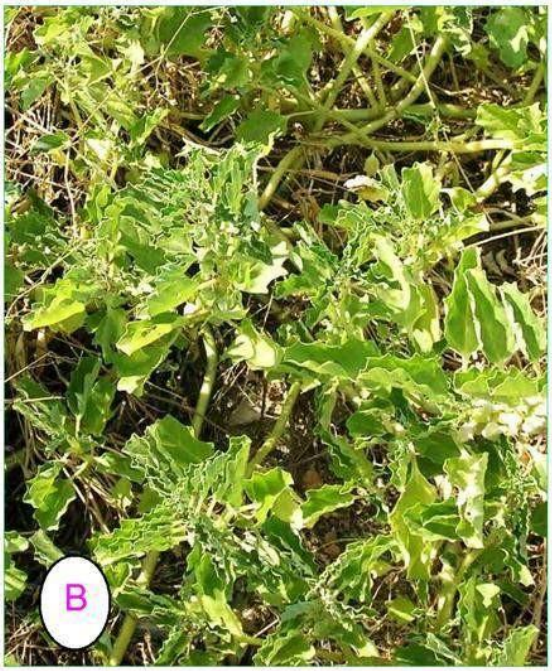


D:- *Oxalis corymbosa* D.C.
(OXALIDACEAE)

FIG. :- 36 A – D

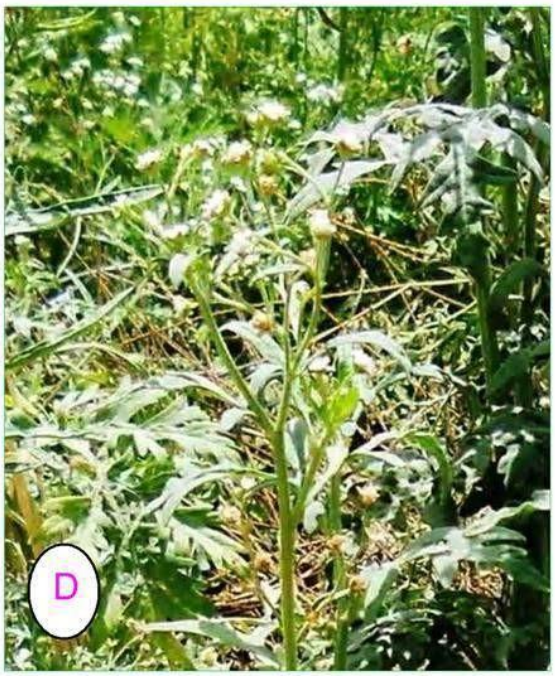


A :- *Pandanus odoratissimus* Linn.
(LILIACEAE)



B :- *Pedalium murex* Linn.
(PEDALIACEAE)

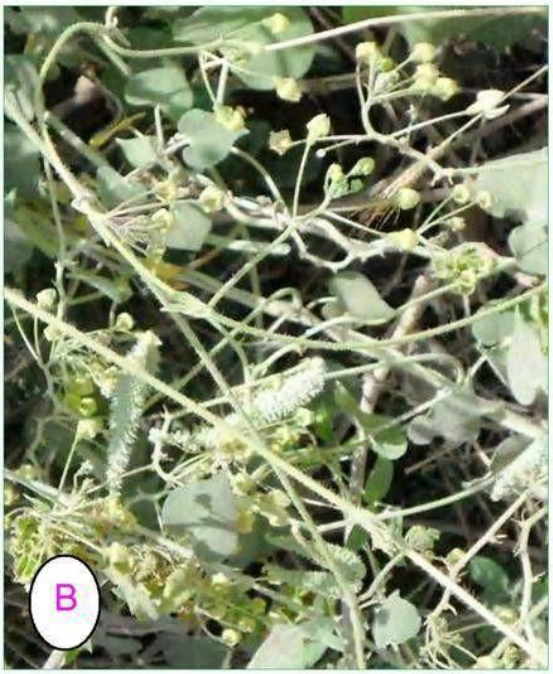
C :- *Parkinsonia aculeata* Linn.
(CAESALPINEIACEAE)



D:- *Parthenium hysterophorus* Linn.
(ASTERACEAE)

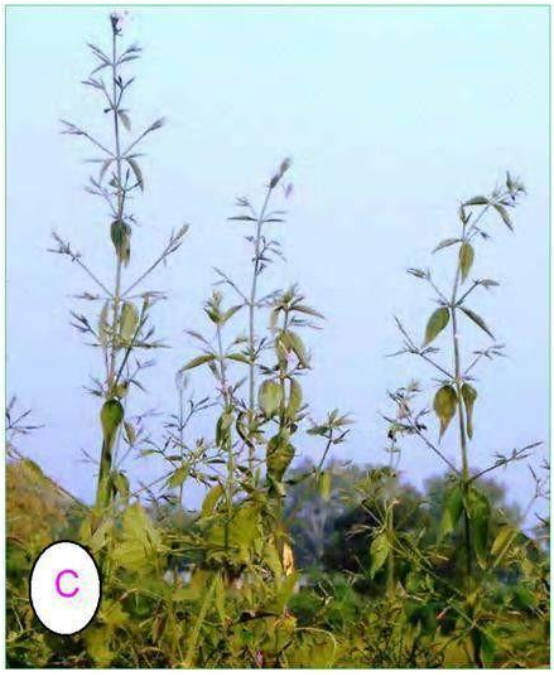
FIG. :- 37 A – D

A :- *Peltophorum pterocarpum* (D.C.) Backer ex K. Heyne
(CAESALPINIACEAE)

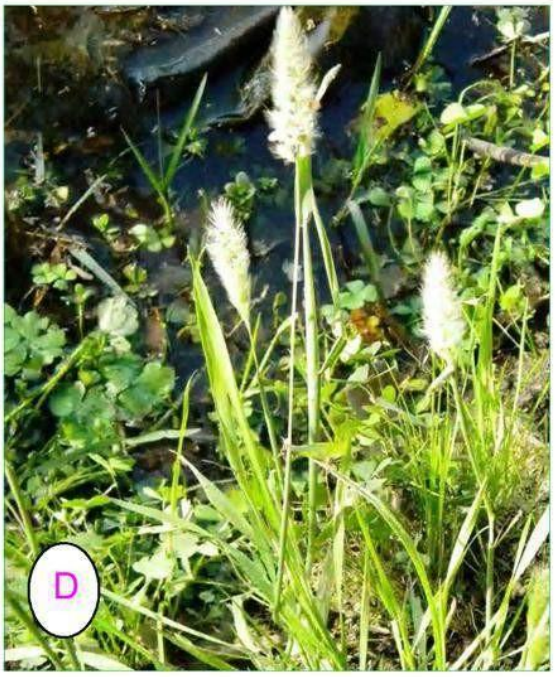


B *Pergulariya daemia* (Forsk.) Chiov.

(ASCLEPIADACEAE)



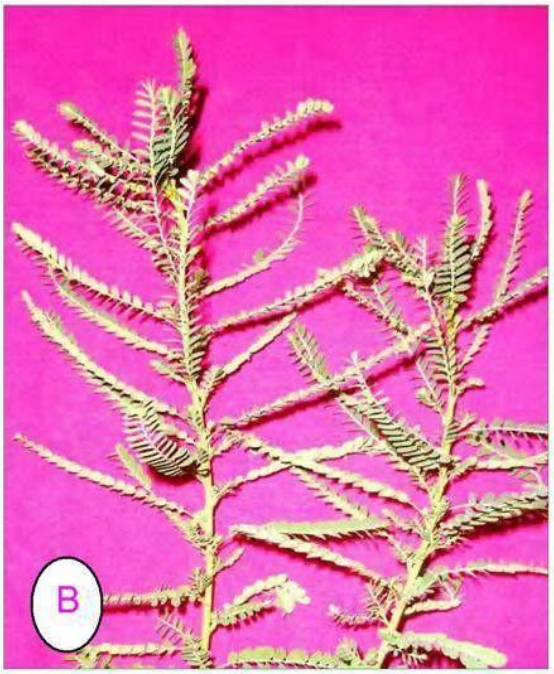
C :- *Peristophae paniculata* (Forsk.) Brum.
(ACANTHACEAE)



D:- *Phalaris minor* Retz.
(POACEAE)

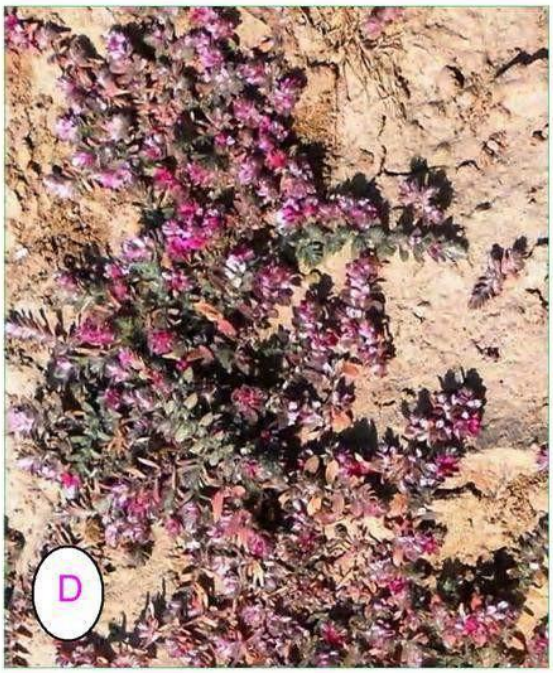
FIG. :- 38 A – D

A :- *Phoenix sylvestris* (Linn.) Roxb.
(ARECACEAE)



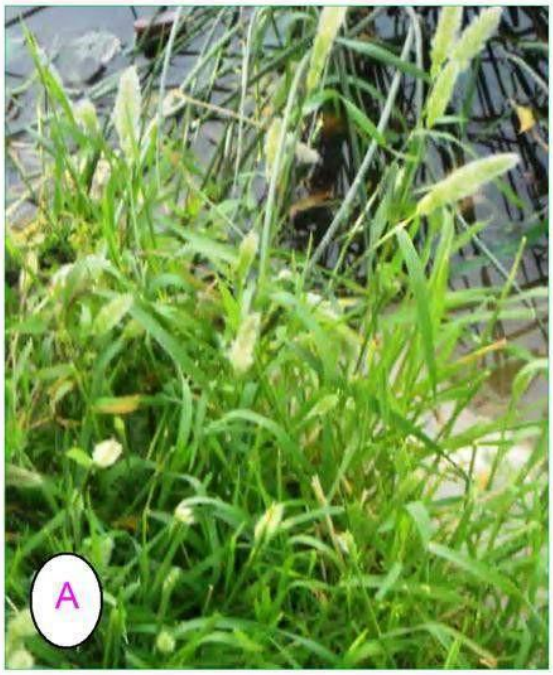
B :- *Phyllanthus fraternus* Webster
(EUPHORBIACEAE)

C :- *Pithecellobium dulce* (Roxb.) Benth.
(MIMOSACEAE)



D:- *Polygonum plebeium.* R.Br.
var indica (Roth) Hook.
(POLYGONACEAE)

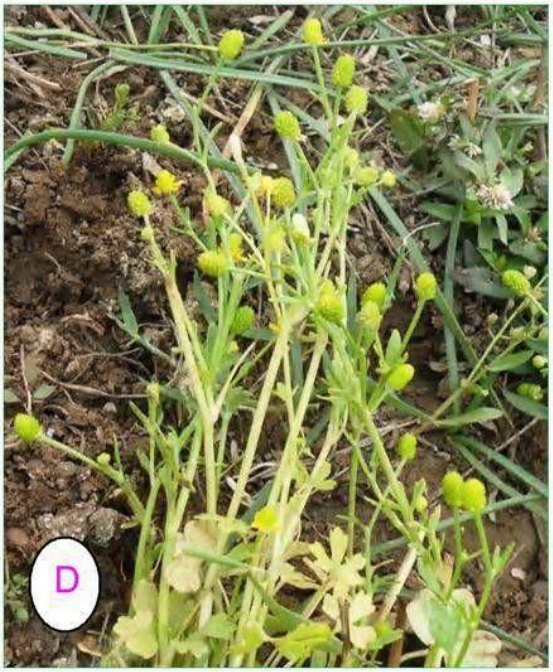
FIG. :- 39 A – D



A :- *Polypogon monspelinsis* (Linn.) Desf.
(POACEAE)

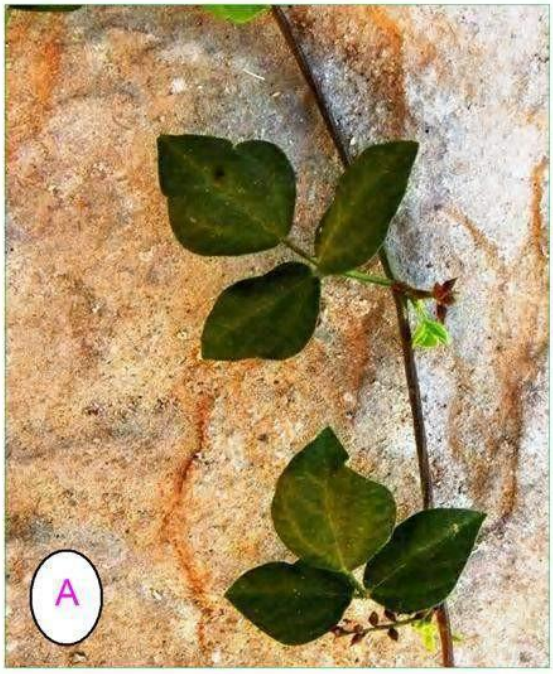
B :- *Pongamia pinnata* (Linn.) Pierre
(PAPILIONACEAE)

C :- *Potentilla supina* Linn.
(ROSACEAE)

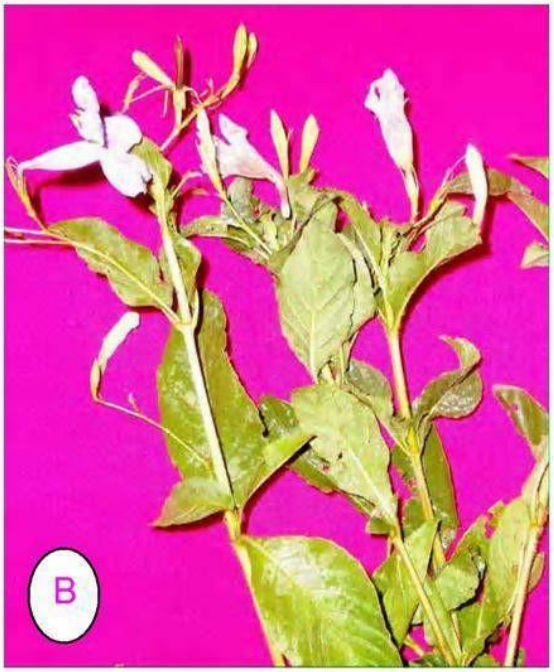


D:- *Ranununculus sceleratus* Linn..
(RANUNCULACEAE)

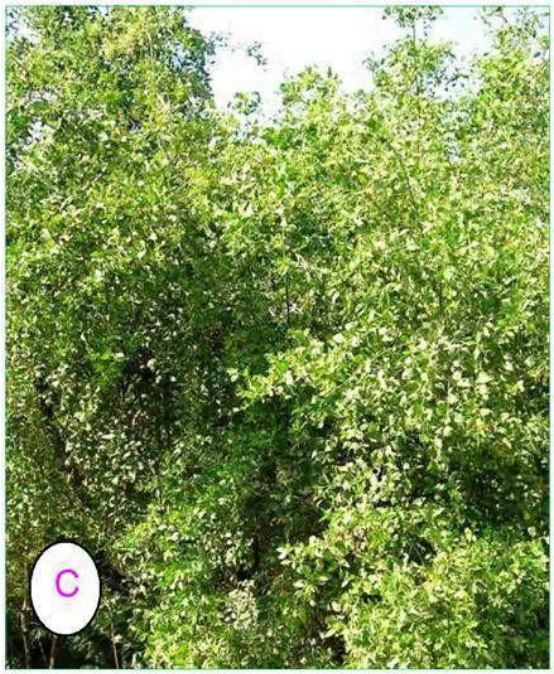
FIG. :- 40 A – D



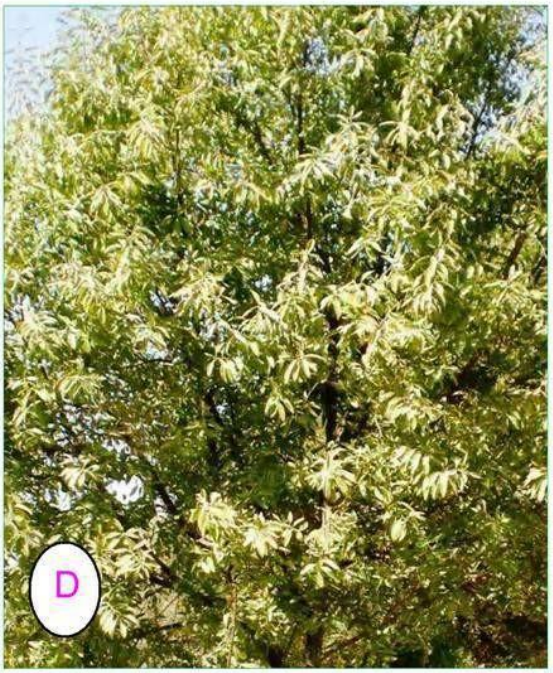
A :- *Rhynchosia minima* (Linn.) D.C.
(MALVACEAE)



B :- *Ruellia tuberosa* Linn.
(ACANTHACEAE)

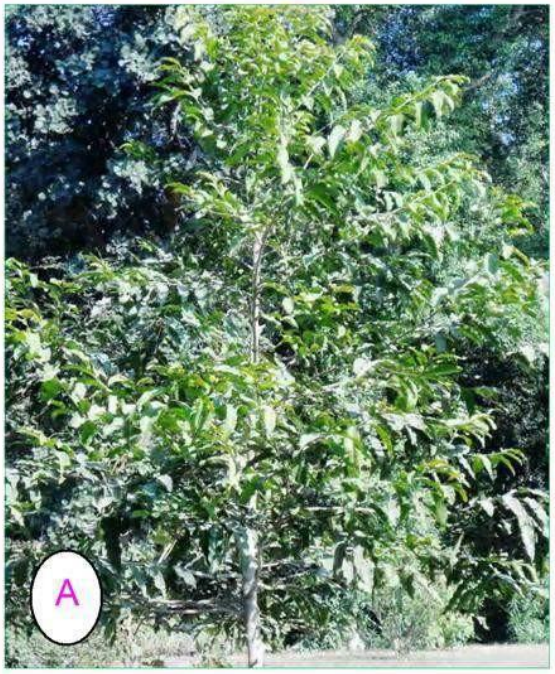


C :- *Salvadora persica* Linn.
(SALVADORACEAE)



D:- *Santalum album* Linn
(SANTALACEAE)

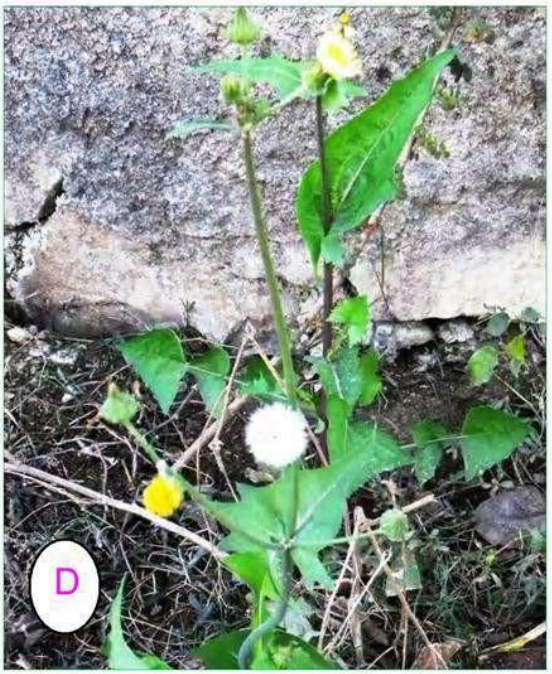
FIG. :- 41 A – D



A :- *Saraca indica* Linn.
(CAESALPINIACEAE)

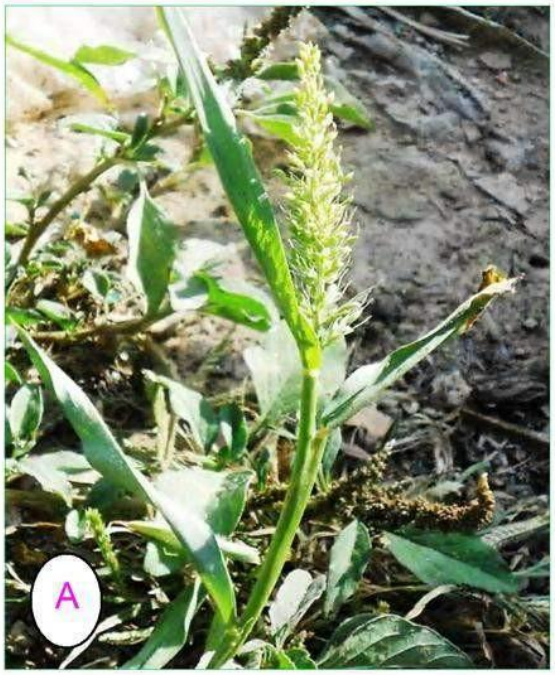
B :- *Sida ovata* Forsk.
(MALVACEAE)

C :- *Sida spinosa* Linn.
(MALVACEAE)



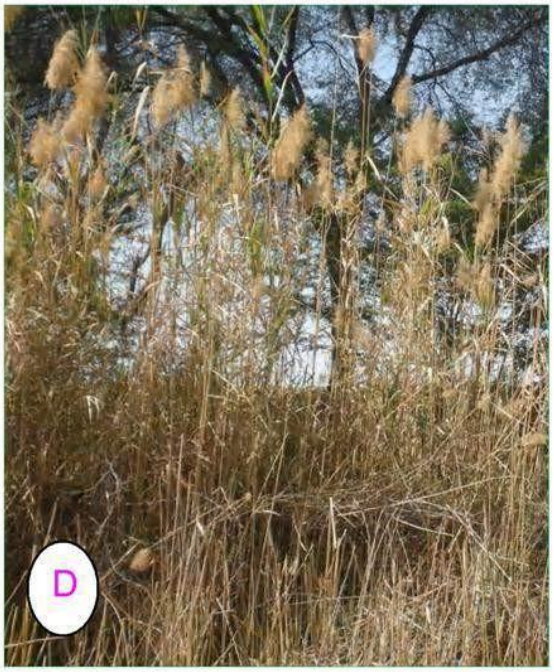
D:- *Sonchus arvensis* Linn..
(MALVACEAE)

FIG. :- 42 A – D



A :- *Setaria verticillata* (Linn.) P. Beauv (POACEAE)

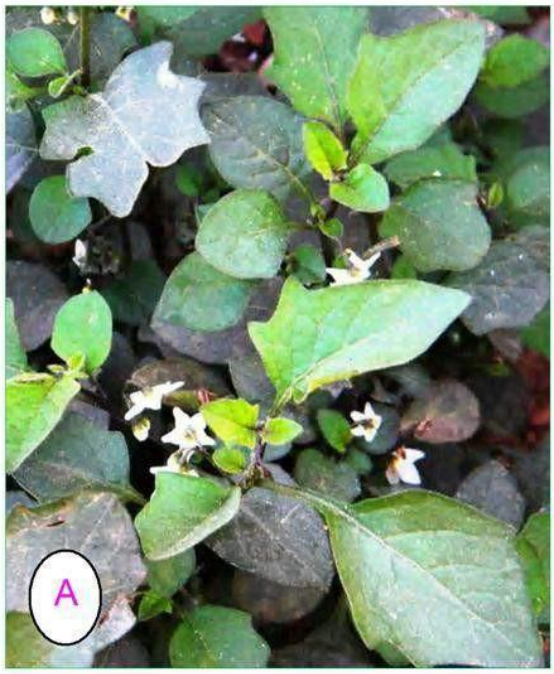
B :- *Schoenoplectus articulatus* (Linn.) Palla (CYPERACEAE)



C :- *Scirpus lateriflorus* Gmel. (CYPERACEAE)

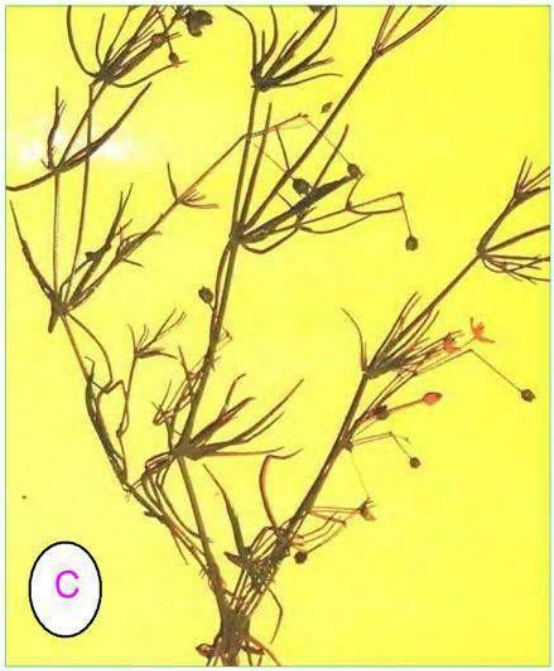
D:- *Sorgham helpans* (Linn.) Pers. (POACEAE)

FIG. :- 43 A – D

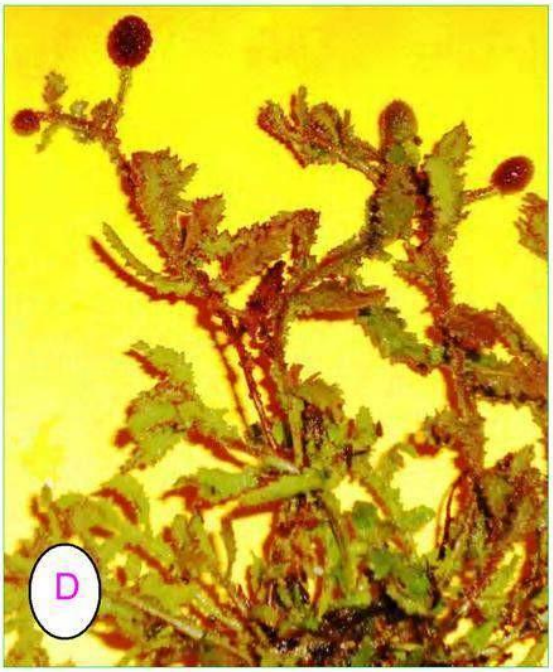


A :- *Solanum nigrum* Linn.
(SOLANACEAE)

B :- *Solanum virginianum* Linn.
(SOLANACEAE)

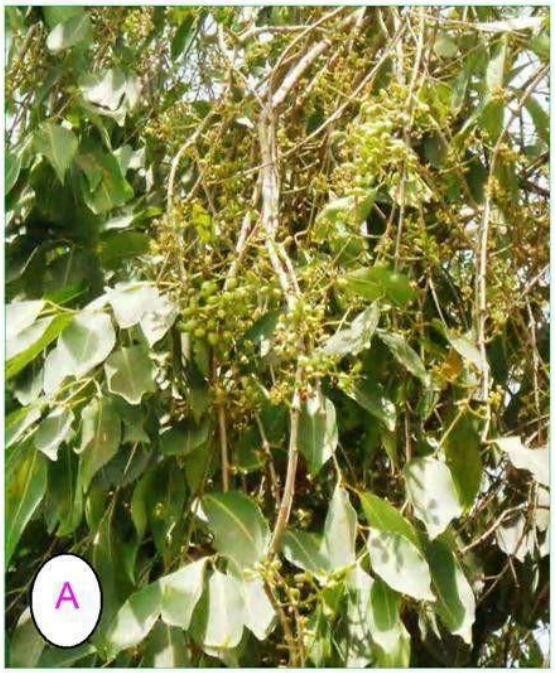


C :- *Spergula arvensis.* Linn.
(CARYOPHYLLACEAE)



D:- *Sphaeranthus indicus* Linn.
(ASTERACEAE)

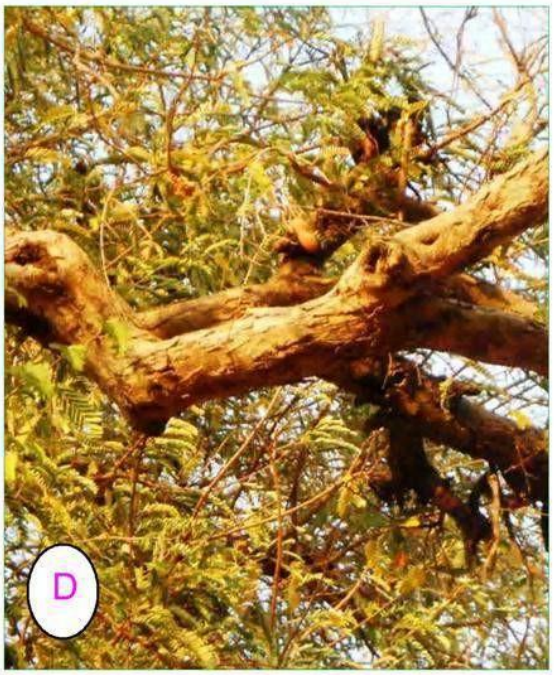
FIG. :- 44 A – D



A :- *Syzygium cumini* (Linn.) Skeels
(MYRTACEAE)

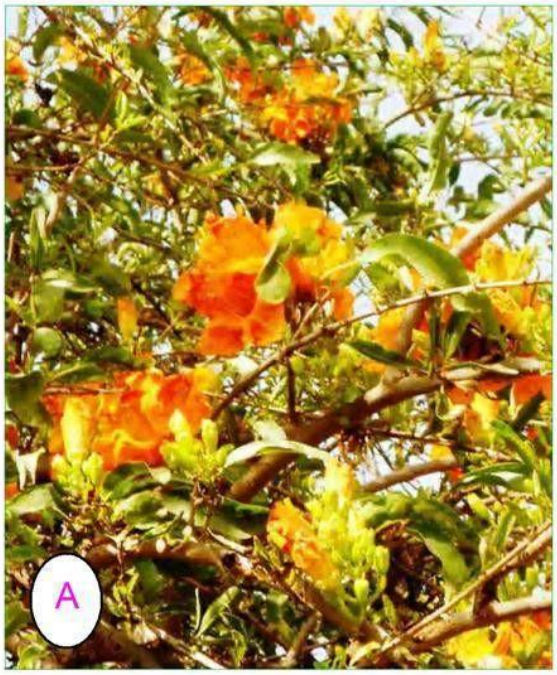
B :- *Striga angustifolia* (D.Don.) Sald.
(SCROPHULARIACEAE)

C :- *Tamarix ericoides* Rottl.
(TAMARICACEAE)



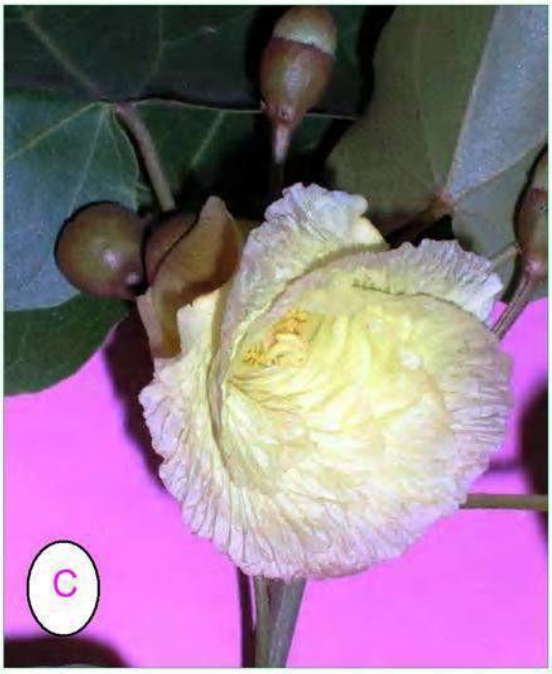
D:- *Tamarindus indica* Linn.
(CAESALPINIACEAE)

FIG. :- 45 A – D

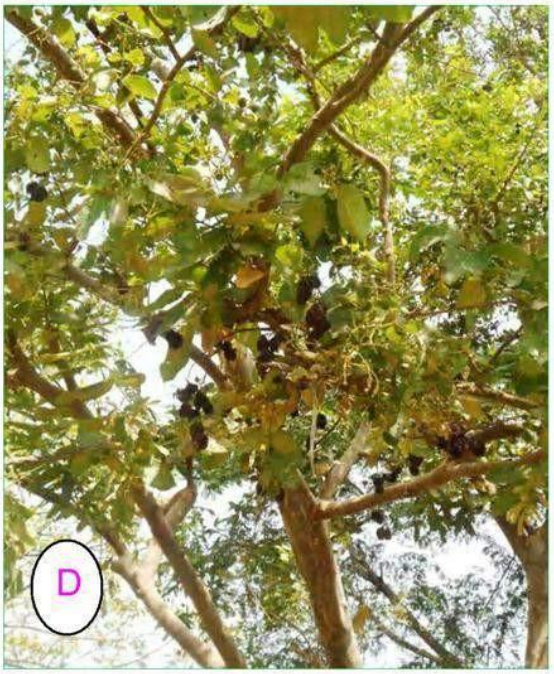


A :- *Tecomella undulata* (Sm.) Seem.
(BIGNONIACEAE)

B :- *Tectona grandis Linn. f.*
(VERBINACEAE)



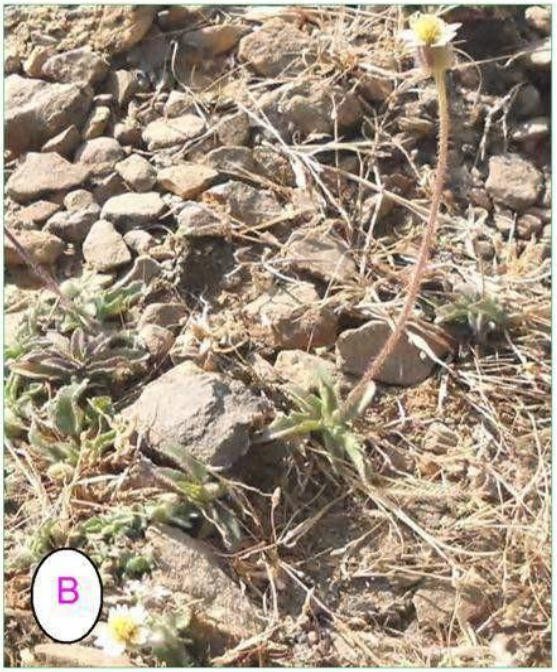
C :- *Thespesia populnia* Solad.
(MALVACEAE)



D:- *Terminalia arjuna (Roxb. ex DC) Wight & Arn.*
(COMBRETACEAE)

FIG. :- 46 A – D

A :- *Tinospora cordifolia* (Willd.) Meirs.
(MENISPERMACEAE)



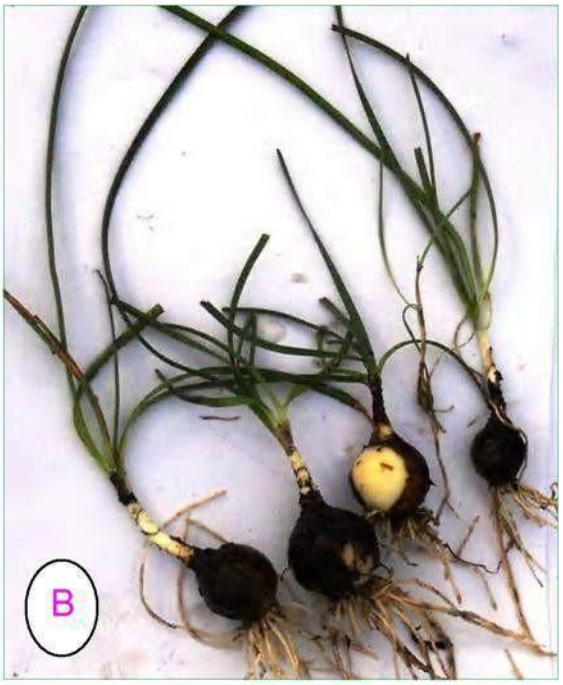
B :- *Tridax procumbens* Linn.
(ASTERACEAE)

C :*Thevetia peruviana* (Pers.) Merrill.
(White)
(APOCYNACEAE)

D. *Thevetia peruviana* (Pers.) Merrill.
(Yellow)
(APOCYNACEAE

FIG. :- 47 A – D

A :-*Urginea indica* (Roxb.) Kunth.
(LILIACEAE)

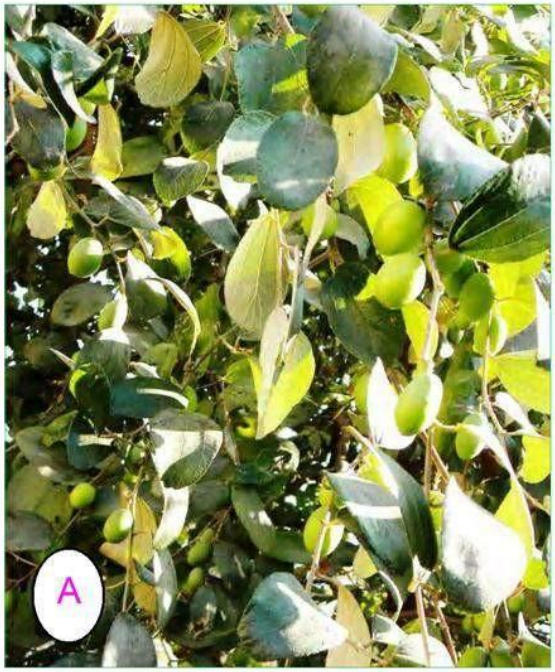


B :- *Urginea indica* (Roxb.) Kunth.
(LILIACEAE)

C :- *Withania somnifera* (Linn.) Dunal.
(SOLANACEAE)

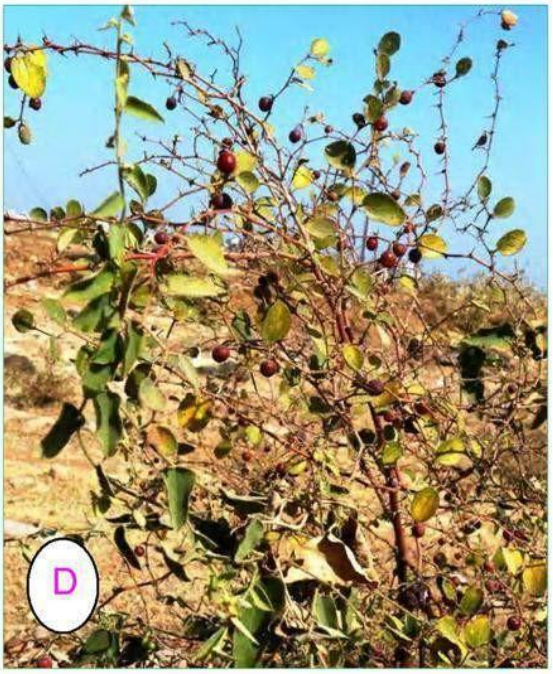
D:- *Xanthium indicum* Koen.ex Roxb.
(ASTERACEAE)

FIG. :- 48 A – D



A :- *Ziziphus mauritiana* Lamk.
(RHAMNACEAE)

B :- *Mimordica charantia* Linn. *var.charantia*
(CUCURBITACEAE)



C:-*Convolvulus microphyllus* Sieb.ex Spreng
(CONVOLVULACEAE)

D:- *Zyziphus nummularia* (Burn. f.) Wt. Arn.
(RHAMNACEAE)

CHAPTER: VIII

AQUATIC ANGIOSPERMS

- **OBJECTIVE OF STUDY**
- **AQUATIC SITES FOR STUDY**
- **SYSTEMATIC ENUMERATION OF AQUATIC SPECIES**

A. DICOTYLEDONS:

Family I to XI

B. MONOCOTYLEDONS:

Family XII to XXII

SYSTEMATIC EUMERATION OF SPECIES
(FIG: - 05 A-D TO 48 A-D)

B. MONOCOTYLEDONS

I. CANNACEAE

100. ***Canna indica*** Linn.

Canna indica Linn. in Sp. Pl. 1. 1753; Roxburgh, Fl. Ind. 35. 1820; Baker in Hooker f., Fl. Brit. India 6: 260. 1892; Duthie, Fl. Gangetic Plain 3: 237. 1920; Pandey in Shetty & Singh, Fl. Rajasthan 2: 829. 1987; Sharma, Fl. Raj (Hadoti). 172, 2002.

Local name: Keli, Sudarshan

Characteristics:

Erect , perennial, rhizomous herb; pseudostem; leaves subsessile, elliptic-lanceolate, entire margin,acute apex; inflorecence terminal panicle; flowers funnel shape, yellow with red shades; fruit is capsule.

Fl. and Fr. : Througout the year.

Habitat : Found in mudland and margins of stagnant or running water.

II. MUSACEAE

101. ***Musa superba*** Roxb.

Musa superba Roxb. in Sp. Pl. 1. 1753; Roxburgh, Hort. Beng. 19. 1820; Hooker f., Fl. Brit. India 6: 261. 1892; Sharma, Fl. Raj (Hadoti). 172, 2002.

Local name: Jangli Kela,

Characteristics:

Erect, tree like stoloniferous herb, 10-12 feet; stem short covered with persistant sheath of leaves; leaves sessile on the sheath, upper crowded; bracts large; inflorescence drooping spike; calyx dull red, petal white (pale), shorter than the calyx; fruit trigonous.

Fl. and Fr. : March- April

Habitat : Rarely found in hilly area (Gapernath)

III. LILIACEAE

102. ***Aloe vera*** (Linn.) Burm.

Aloe vera (Linn.) Burm. f. Fl. Ind. 83.1768; non. Miller, Gard. Dict. Ed. 8. no. 20. 1968; Bhandari, Fl. Indian Desert 317. 1990; Parmar in Shetty & Singh Fl. Rajasthan 2: 839. 1991; Sharma, Fl. Raj (Hadoti). 173, 2002. Yadav and Meena, Fl. SC Raj. 344, 2011.

Characteritics:

Succulat, erect, perennial herb; stem short block like (Sucker), hick, fleshy leaves arise from ground; leaves sessile, erect, lanceolate, spinulate margin, Inflorecence long, terminal spike; perianth light red, tubular; ovary tricarpellary, axile placentation; fruit is capsule, seeds winged.

Fl. and Fr. : January – June.

Habitat: Found in grassland, boundaries of cropfields.

103. ***Asparagus racemosus*** Willd.

Asparagus racemosus Willd. in Sp. Pl. 2:152. 1799; Hook. f., Fl. Brit. India 6: 316. 1892; Duthie, Fl. Gangetic Plain 3: 259. 1920; Bhandari, Fl. Indian Desert 317. 1990 Parmar in Shetty & Singh Fl. Rajasthan 21: 841. 1991; Sharma, Fl. Raj (Hadoti). 174, 2002. Yadav and Meena, Fl. SC Raj. 344, 2011.

Characteristics:

Shrub, climber, much branched, cladode stem modification; cladodes in cluster; inflorescence axillary solitary; flowers cream coloured, tepals linear; ffruts are red, biseeded.

Fl. and Fr.: September - March

Habitat: Found on shrubs of forest area.

III. PANDANACEAE

104. ***Pandanus odoratissimus*** Linn.

Pandanus odoratissimus Linn. f. Suppl. 64. 1782; Hook. f., Fl. Brit. India 6: 363.1892; Duthie, Fl. Gangetic Plain 3: 270. Pandey in Shetty & Singh Fl. Rajasthan 3: 893. 1991; Sharma, Fl. Raj (Hadoti). 179, 2002. Yadav and Meena, Fl. SC Raj. 353, 2011.

Characteristics:

Erect, perennial, shrub; cylindrical stem supported by stilt roots; leaves simple, very long linear with spiny margin; Inflorecence spadix; male flower on spike branches, female flowers in group; fruits are drupe, single seeded.

Fl and Fr.: March- May

Habitat: Found in shady, moist, waste area of river bank.

105. ***Urginea indica*** (Roxb.) Kunth.

Urginea indica (Roxb.) Kunth. Rox Enum. 4: 433. 1843; Hook. f., Fl. Brit. India 6: 347.1892; Duthie, Fl. Gangetic Plain 3: 264. 1920; Bhandari, Fl. Indian Desert 318. 1995; Parmar in Shetty & Singh Fl. Rajasthan 2: 845. 1991. Sharma, Fl. Raj (Hadoti). 175, 2002. Yadav and Meena, Fl. SC Raj. 346, 2011.

Local name: - Jangli Pyaj

Characteristics:

Prennial herb, stem is white bulb, in aerial part leaves are linear and erect; in rooted part leaves are scaly and fleshy; flowers funnel shaped, yellow; fruit is a capsule, elliptic black seeds.

Fl. and Fr.: August to January

Habitat: found in very moist wasteland.

IV. ARECACEAE

106. ***Phoenix sylvestris*** (Linn.) Roxb.

Phoenix sylvestris (Linn.) Roxb. Fl. Ind. 3: 787. 1832; Hooker f., Fl. Brit. India 6: 363.1892; Duthie, Fl. Gangetic Plain 3: 287. 1920; Parmar in Shetty & Singh, Fl. Rajasthan 3: 861. 1993; Sharma, Fl. Raj (Hadoti). 178, 2002. Yadav and Meena, Fl. SC Raj. 353, 2011.

Local Name: - Khajoor

Characteristics:

Erect, unbrached tree; 5-10 meter high; stem cylindric, persistant leaf bases seen; leaves, 1-3 meters long, pinnately compound; leaflets linear,opposite, sharp and spiny apex; inflorescence spadix covered by hard brown, platelike bracts; male flowers white, small, sessile; female flowers green; fruits are drupe, single seeded.

Fl and Fr.: May- July
Habitat: Found on aquatic wetlands and roadsides.

V. CYPERACEAE

107. ***Cyperus alopecuroides Rottb.***

Cyperus alopecuroides Rottb. in. Fl. Carn. 2: 126. 1772. Hooker Fl. Brit. India 3: 362. 1881; Duthie, Fl. Gangetic Plain 1: 481. 1905; Maheshwari, Fl. Delhi. 201, 963; Maheshwari, Fl. Delhi. 113. 1966; Shetty & Singh Fl. Rajasthan 1: 404. 1987.

Local name : Brahm dandi, Rissa

Characteristics:

Erect, annual, leafy Herb stem 60-100 cm long, branched, Leaves alternate, obovate, acute base, serrate margin tipped with spines, Flowers pink- purple, corolla 5, tubular, bisexual heads ovoidal, covered by bristles, basal placentation, fruits acenes.

Fl. and Fr. : September-March

Habitat:- Found on waste and hard soil.

108. ***Cyperus difformis Linn. (Cyperaceae)***

Cyperus difformis Linn. (Cyperaceae). Ex Benth & Hooker in Fl. Ind. 3: 447. 1832; Hooker f., Fl. Brit. India 3: 358.1881; Duthie, Fl. Gangetic Plain 1: 480. 1905; Maheshwari, Fl. Delhi. 196, 1963; Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979; Shetty & Singh Fl. Rajasthan 1: 408. 1987; Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 197, 2011.

Characteristics:

Prostrate, annual, many branched diffused herb, stem glabrous, branched, spinulated, Leaves alternate, pinnatified into thin linear segments, heads bisexual, pale yellow, solitary, angled achenes.

Fl. and Fr. : February- April

Habitat: Found in wetlands of riverbanks.

109. ***Cyperus kyllinga Endl.***

Cyperus kyllinga Endl. (Linn.) Linn. in Mant. Pl. 2:286.1771; Hook. f., Fl. Brit. India 3: 304.1881; Duthie, Fl. Gangetic Plain 1: 468.1905; Maheshwari, Fl. Delhi. 196, 1963. Sharma and Tiagi Fl. NE Raj. 202, 1979. Shetty & Singh Fl. Rajasthan 1: 409. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 177, 1996. Sharma, Fl. Raj (Hadoti). 105, 2002. Yadav and Meena, Fl. SC Raj. 198, 2011.

Local name: Bhringraj

Characteristics*:*

Erect or prostrate, annual, hirsute herb, stem erect/ prostrate 40-60 cm long, branched, Leaves simple opposite, sub sessile, lanceolate, entire , solitary heads, peripheral ray florets 2/3 whorls, ligulate, pistillate, disc florets bisexual, tubular, style branched, basal placentation, Fruits brown acenes.

Fl and Fr.: September -January

Habitat : Found in aquatic wetlands and near running water.

110. ***Cyperus rotondus Linn.***

Cyperus rotondus Linn. (Linn.) Poir. in Lam. Encycl. Suppl. 2: 825. 1812; ***Artimisia maderaspatana*** Linn. Sp. Pl. 849.1753; Hooker, f., Fl. Brit. India 3: 247. 1881; Duthie, Fl. Gangetic Plain 1: 446. 1905; Maheshwari, Fl. Delhi. 196. 1963; Bhandari, Fl. Indian Desert 181. 1978; Sharma and Tiagi, Fl. NE Raj. 224. 1979; Shetty & Singh, Fl. Rajasthan 1: 417. 1987; Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 182. 1996; Sharma, Fl. Raj (Hadoti). 107. 2002; Yadav and Meena, Fl. SC Raj. 200. 2011.

Characteristics;

Prostrate, annual herb, stem 11-65 cm long, branched, Leaves alternate, sessile, pinnatified broadly ovate to cordate, 3-5 lobed, acute base, serrate- dentate margin, Heads globose, yellow, solitary or paired, involucre bracts, outer ray florets pistillate and filiform, central disc florets bisexual, basal placentation, fruits acenes 2 mm long.

Fr. and Fr.: Throughout year

Habitat:- Borders of ponds.

111. ***Schoenoplectus articulatus (Linn.)*** Delile

Schoenoplectus articulatus (Linn Delile. Fl. Aegypt. 122. t. 44. f. 1812. Hook. f., Fl. Brit. India 3: 289.1881; Duthie, Fl. Gangetic Plain 1: 462. 1905; Bhandari, Fl. Indian Desert 180. 1978; Sharma and Tiagi Fl. NE Raj. 209, 1979. Shetty & Singh Fl. Rajasthan 1: 416. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 180, 1996. Sharma, Fl. Raj (Hadoti). 106, 2002. Yadav and Meena, Fl. SC Raj. 200, 2011.

Characteristics:

Prostrate, annual, herb, woolly, stem 20-30 cm long, branched, Leaves alternate, abovate, acute base, obtuse apex, entire margin, heads crowded, sub-globose, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, Fruits acenes.

Fl and Fr.: Winter season

Habitat: Aquatic wetlands, Moist places

V. POACEAE

112. ***Apluda mutica Linn.***

Apluda mutica Linn. . Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al*. Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Local name: - Oat grass

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

113. ***Aristida mutica Linn.***

Aristida adcensionis Linn. (Poaceae) . Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

114. ***Cenchrus setigerus Vahl***

Cenchrus setigerus Vahl **.**Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

115. ***Cynodon dactylon (Linn.) Pers.***

Cynodon dactylon (Linn.) Pers. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

116. ***Dendrocalamus strictus (Roxb.) Nees.***

Dendrocalamus strictus (Roxb.) Nees. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

117. ***Eragrostis japonica (Thunb.) Trin.***

Eragrostis japonica (Thunb.) Trin. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

118. ***Eriochloa procers (Retz.) Hubb.***

Eriochloa procers (Retz.) Hubb. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

119. ***Heteropogon contortus (Linn.) Roem & Schult.***

Heteropogon contortus (Linn.) Roem & Schult. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493.

1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

120. ***Phalaris minor Retz.***

Phalaris minor Retz.Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland.

121. ***Polypogon monspelinsis (Linn.)***

Polypogon monspelinsis (Linn.)Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978;

Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland

122. ***Setaria verticillata (Linn.) P. Beauv.***

Setaria verticillata (Linn.) P. Beauv. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Moist places, grassland

123. ***Sorgham helpans (Linn.) Pers.***

Sorgham helpans (Linn.) Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason,

Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Characteristics:

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Fl. and Fr: September- February

Habitat: Grassland

CHAPTER: VIII

AQUATIC ANGIOSPERMS

- **OBJECTIVE OF STUDY**
- **AQUATIC SITES FOR STUDY**
- **SYSTEMATIC ENUMERATION OF AQUATIC SPECIES**

A. DICOTYLEDONS:

Family I to XI

B. MONOCOTYLEDONS:

Family XII to XXII

CHAPTER: VIII

AQAUTIC ANGIOSPERMS

Aquatic and semi-aquatic plants are those species which normally stands in water and must grow for atleast a part of their life cycle in water, either completely submerged or emerged. Aquatic angiosperms spend most of their lives into water, banks of water body and marshy land of water. Kota district is rich in aquatic and semi-aquatic vegetation due to presence of rivers, artificial lakes, ponds and canals.

The present survey is centered over the pure aquatic angiosperms only, where angiosperms belonging to 19 families (Total 22families, 03 Aquatic and Semi aquatic both) were studied. Rest of semi aquatic (amphibious) and wetland angiosperms were studied with whole floristic study of vegetation of Kota district.

OBJECTIVE OF STUDY:-

The vegetation in ponds, lakes, canals, and rivers of Kota is rich in aquatic flora. It can constitute very important resource of food and medicine for the rural population as well as for urban population but these natural resources hardly been given due attention for more scientific studies and industrial mindset and thus their potentialities remain still untapped. The importance of these water flora in agriculture, pisciculture, and as a source of food and medicine can hardlybeen emphasized. Cropping of *Trapanatans*in some sites is only exception in this.The peak flowering time of the aquatic angiosperms is

generally during the monsoon but some plants exhibitflowers throughout the year.

Aquatic plants are the most important component of the aquatic ecosystem they act as producers and phytoplankton in the aquatic ecosystem. Aquatic plants also produce carbohydrate with the help of sunlight, chlorophyll, carbondyoxide and water.They also increase productivity of aquatic ecosystem and thus help to maintain ecosystem balance.Some of them are*Ceratophyllum, Eichhornia, Hydrilla, Lemna, Nymphaea, Ottelia,Pistia, Potamogeton, Spirodella, Vallisaneria, Wolffia*etc. Aquatic plantsincrease productivity of aquatic ecosystem and thus they help in ecosystem maintenance.

AQUATIC SITES FOR STUDY:-

Kota is well watered and drained byrivers flowing in North and North-Eastern directions. Major rivers are Chambal,Kalisindh, Parvati and Ujad River. The Chambal is Principal River of the district and itsright and left tributaries flowin the area. Chambal is deep and wide near the Kota City in all the seasons. Its water is held at Kota Barrage near Kota City and at JawaharSagarDam.Other than rivers Abheda pond, Kishore Sagar, Sur Sagar, Chhatra Vilas Pond, Alania Dam, Mandawara Dam and SawanBhadoon are other sites where aquatic and semi aquatic vegetation flourish. During the survey aquatic and semi aquatic plants were collected mainly from Chambal River, Abheda pond, KishoreSagar, Alania and Sur Sagar.

Generally plants with water of vegetation site in which plant occurring was collected with specimen. Collection bottles were used for collection. In Laboratory these were transferred to FAA preservative.

SYSTEMATIC ENUMERATION OF AQUATIC FAMILIES

(FIG.:- 49 A-D TO 58 A - D)

I. ALISMATACEAE

1. ***Sagittariaguayanensis***H. B. & K.F,

FBI 6:561; Fl. of Delhi 347; Fl. NE Raj.403.

Characteristics:

Aquatic Herb with floating leaves, Petiole very long, Leaves hastate, terminal lobes acute or obtuse, basal lobes finely acuminate and rounded. Upper whorl of flowersis male and lower is female. Fruit are achene.

Habitat:

Found in Shallow open water

II. AMARANTHACEAE

2. ***Alternantherasessilis***(Linn.) R. Br.

F.B.I. 6:561; Fl. of Delhi 299; Fl. NE Raj.346.

Characteristics:

Annual floating herb rooting at nodes.Leaves elliptic-lanceolate, entire, and acute. Flowers are in axillary heads and white. Fruit is an urticle, compressed, obcordate, margins often winged or thickened.

Habitat: Margin of aquatic site or found in shallow water.

Fl. and Fr.: August to May

III. AMARYLLIDACEAE

3. ***Crinum asiaticum***Linn.

F.B.I. 6:280; FUGP 3:348; Fl. SC Raj. 341.

Characteristics:

Perennial herbs, Ovoid bulb, Neck covered with leaf sheaths, Flowers in Umbel. White, Annual floating Herb, rooting at nodes. Leaves linear - lanceolatee

Habitat: Margin of aquatic site or found in shallow water.

Fl. and Fr.: October -November

IV. APIACEAE

4. ***Hydrocotyljavanica***Thunb.

Asian J. of Pl. Sci. & Res., 2013, 3(3):54-60

Characteristics:

Annual creeping herb, Leaves tri- lobed, Flowers in Umbel. White, Annual floating Herb, rooting at base.

Habitat: Margin of aquatic site and shallow water.

Fl. and Fr.: August

V. ARECEAE

5. ***Colocasiaesculanta*** Linn.

Fl. Raj.(Hadauti Region), 179.

Characteristics:

Herb (Cormy), palmate leaves, large spathe, Yellow berries.

Habitat: Margin of aquatic site. Near running water.

Fl. and Fr.: August- October.

6. ***Pistiastratiotes***Linn.

Fl. Raj.(Hadauti Region), 180.

Characteristics:

Floating herb, stolon, roots fibrous, aboavte leaves in whorl, green-whitespathe.

Habitat:fresh water ponds, stagnant rain water.

Fl. and Fr.: May - June

VI. CERATOPHYLLACEAE

7. ***Ceratophyllumdemersum***Linn.

F.B.I. 5:639; Fl. of Delhi 331; Fl NE Raj. 387; FUGP 3:348;

Fl. SC Raj. 337.

Characteristics:

Submerged Slender Herb, Free floating, Leaves arranged in whorlsand divided into fork segments. Axillary solitary flowers.

Habitat: Common in Shallow water.

Fl. and Fr.: August- November.

VII. CONVOLVULACEAE

8. ***Ipomoea aquatica***Forsk.

In Fl. aegypt- Arab.44.1775; FBI.4: 210.1883; FBP.2: 315.

Characteristics:

Free floating/amphibious, Herb, Perennial, Stem thick and hollow, nodal rooting, leaves 4-8 cm, ovate, triangular/cordate, Inflorescence axillary solitary, minute, calyx 7-8 mm long, Corolla 3-5 cm long, funnel shaped, pink with purple colour, fruit capsule, globose, seed 4.

Habitat: Free floating into margins of water

Fl. and Fr.: Throughout the year.

9. ***Ipomoea carnea***Jacq**.**

Fl of Delhi 234; Fl NE Raj.269; FUGP 163, Fl. SC Raj. 244.

Characteristics:

Free floating/amphibious, Herb, Perennial, Stem thick and hollow, nodal rooting, leaves 4-8 cm, leaves 4-8 cm, ovatelanceolate,

truncate leaf base,Inflorescence Axillary solitary, minute, calyx 7-8 mm long, Corolla 3-5 cm long, funnel shaped, pink with purple colour, fruit capsule, globose, seed 4.

Habitat: Free floating into margins of water

Fl. and Fr.: Throughout the year.

VIII. CYPERACEAE

10.*Eleocharisatropurpurea* (Retz.) Kuntz.

FBI. 6:627, FUGP. 3:348, Fl. Ind. Des.337.

Characteristics:

A tufted perenial herb. Culms erect or recurved, terete, wide blew, transversely septate, hollow, Upper basal sheaths cylindrical, lower sheaths reduced and scale-like. Inflorescence a pseudolateral head, located at the midway position of the culm, bearing spikelets in a dense cluster, bract 1, culm like, glumes ovate, imbricate.

Habitat: Free floating into margins of water

Fl. and Fr.: Throughout the year.

IX. HYDROCHARITACEAE

11.*Hydrillaverticillata*(L.f.) Royle

FBI.5: 659; Fl of Delhi 349; Fl. NE Raj. 388.

Characteristics:

Glabrous, submerged weed.Leaves sessile, linear, green, often with redishbrown dots and dashes, sharply serrate-dentate, acute.Male flower solitary in a spathe and female spathe with apex shortly bidentate.

Habitat: Free floating into margins of water

Fl. and Fr.: August to November

12.*Otteliaalismoides* (Linn.) Pers.

FBI.5:662; FUGP.3:177; Fl. Sc Raj. 340.

Characteristics:

Herb attached and rooted on the mud. The floating leaves broadovate, ,transperent, entire, base cordateobtuse, sometimes apiculate, spathespeduncled, the sessile female and hermaphrodite ones 1-flowered, pedicilled male ones many flowered. Fruit oblong, apex attenuate.

Habitat: Submerged into water

Fl. and Fr.: Throughout the year.

13.*Vallisnerianatans*(Lour.) Hara

FBI. 5:66o; FUGP. 3:174; Fl. NE Raj, 38.

Characteristics:

Fully submerged, tufted, stemless, stoloniferous, dioiceous herb.

Leaves radical, linear, ribbon-shaped, sheathing at base, apexacute

Male spathe on a scape, ovoid, flowers many, white, stamens 1-3.

Female spathe on long, slender anffiliform scape; flowers solitary.

Habitat: Free floating into shallow open water.

Fl. and Fr.: October to May

14.*Vallisneriaspiralis* Linn.

FUGP.3:174; Fl. SC Raj. 340

Characteristics:

Fully submerged, tufted, stemless, stoloniferous, dioiceous herb. Leaves radical, linear, ribbon-shaped, sheathing at base, apexobtuse. Male spathe on a scape, ovoid, flowers many, white, stamens 1-3. Female spathe on long, slender anffiliform scape; flowers solitary

Habitat: Free floating into water

Fl. and Fr.: October -December

X. LEMNACEAE

15.*Spirodellapolyrhiza*(Linn) Scheild.

FBI.6: 557.1893; FPB.3: 3; Fl. Indian Desert 326; Fl. SC Raj. 355.

Characteristics:

Free floating, herbaceous, roots fibrous and many, green and flat frond, beneath purplish, not tailed, opaque and thick.

Habitat: Free floating into water

Fl. and Fr.: Throughout year.

16.*Wolffiaarriza*(Linn.)Horkel ex Wimmer

FBI.6: 306; FUGP 306; Fl. Ind. Desert 361; Fl. SC Raj. 355.

Characteristics:

Minute, free floating, annual herb, fronds opaque, ovate oblong, not tailed, rootless, young frond solitary but older may show budding, pocket at base.

Habitat: Free floating into water

Fl. and Fr.: Smallest flowering plant of world.

17.*Lemnaperpussila*Torry.

FBI. 6. 556. 1893;FUGP.3:305; Fl. Indian Desert 360.; Fl. SC Raj.354.

Characteristics:
Minute, aquatic, herb, fronds sub orbicular/obviate not single root fiber,cylindrical root.
Habitat: Free floating into water
Fl. and Fr.: Throughout Year

XI. LENTIBULARIACEAE

18.*Utriculariaaurea*Lour.

FBI.4:329;FUGP.2:166; Fl. SC Raj. 270.

Characteristics:

Floating herb with numerous bladders.Inflorescence a raceme on stout peduncle with rather long, recurved pedicels, calyx segments ovate, Corolla yellow, Seeds obovoid.

Habitat: Free floating into water

Fl. and Fr.: April-May

19.*Utriculariastellaris*Linn.f.

FBI.4:328;FUGP.2:165; Fl. SC Raj. 270.

Characteristics:

Floating herb. Leaves multifid, interspersed with bladders, floating leaves ellipsoid or ovoid. Peduncle stout and without scales, bearing a whorl of oblong vesicles about the middle, pedicels thickened, calyx segments ovate, enlarged in fruit. corolla yellow, seeds discoid.

Habitat: Free floating into water

Fl. and Fr.: April-May

XII. MENYANTHACEAE

20.*Nymphoidesindica*(Linn.) O.Kuntz.

FBI.4:131;FUGP.2:79; Fl. SC Raj.233.

Characteristics:

A floating annual herb with several long branches which reach the surface of the water, producing a node with a tuft of roots, a cluster of flowers, a single floating leaf and a branch. Leaves orbicular and deeply cordate with obtuse base and triangular sinus. Flowers white corolla (5-7petals) with bristles and appear above the water between the basal lobes of leaf. Fruit subglobose.

Habitat: Free floating into water

Fl. and Fr.: October- December

21.*Nymphoideshydrophilla*(Lour.) O. Kuntze:

FBI.4:131;FUGP.2:79; Fl. SC Raj.232

Characteristics:

Floating herb with elongate stems; not rooting at the nodes, but with several nodes producing leaves and flowers. Leaves alternate,purple margin, orbicular-ovate, rounded at the apex, deeply cordate at base with a narow sinus and subacute basal lobes; petioles dilated and sheathing at the base. Flower white (5 petals); Fruit subglobose.

Habitat: Free floating into water

Fl. and Fr.: October- December

XIII. NAJADACEAE

22.*Najas minor* All.

FBI. 6:569; FUGP. 3:317; Fl. SC Raj. 358.

Characteristics:

Grass like slender herb, aquatic and rooted at the nodes. The tips of the main shoot and lateral branches densely leaved resulting in a

plumosehabit. Flowers solitary, male perianth ends directly above the anther in form of 2 ear-like lobes. Fruits ellipsoid.

Habitat: Free floating into water

Fl. and Fr.: August to November

XIV. NELUMBONACEAE

23.*Nelumbonucifera*Gerth.

FBI. 1:116; FUGP. 1:35; Fl. of Raj. (Hadauti) 28; Fl. SC Raj.39.

Characteristics:

Perennial aquatic herb with milky juice, creeping root stock, flowers large and light pink, orange anther, corolla many, torus spongy.

Habitat: Free floating into water, Common in ponds and tanks.

Fl. and Fr.: August to November

XV. NYMPHAEACEAE

24.*Nymphaeanouchali*Burm. f.

FBI. 1:114; FUGP. 1:34; Fl. of Raj. (Hadauti) 28; Fl. SC Raj.37.

Characteristics:

Aquatic herb with floating leaves and rounded rhizome. Leaves are elliptic with entire margin. Flowers are white and solitary on long paduncle with fleshy sepal. Fruit a globose berry with persistent stamens.

Habitat: Common in water reservoirs.

Fl. and Fr.: August to November.

25.*Nymphaeapubescens*Willd.

FBI. 1:114; FUGP. 1:33; Fl. of Raj. (Hadauti) 28; Fl. SC Raj.38.

Characteristics:

Aquatic herb with floating leaves and rounded rhizome. Leaves are elliptic, large with sharply toothed margin. Flowers are white / pale white and solitary on long paduncle with fleshy sepal. Fruit a globose berry with persistent stamens.

Habitat: Free floating into water, Common in ponds and tanks.

Fl. and Fr.: August to October

XVI. POLYGONACEAE

26.*Polygonumbarbatum* Linn.

FBI.5:37;Fl. NE Raj. 359; Fl. of Delhi 306; Fl. of Raj. (Hadauti) 158.

Characteristics:

An annual, erect or prostrate herb rooting at lower nodes, branches erect, leaveselliptic oblong, Stipules strigose with long cilia at tip. Flowers are white in erect raceme, Nutlets ovate (triangular).

Habitat: Rooted at banks of water bodies, present on moist places also.

Fl. and Fr.: September to April.

27.*Polygonumglabrum*Willd.

FBI.5:37;Fl. NE Raj. 359; Fl. of Delhi 306; Fl. of Raj. (Hadauti) 158.

Characteristics:

An annual, erect glabrous herb rooting at lower nodes, stem red shaded, branches erect, leaves elliptic oblong, Stipules membranous. Flowers are pink in erect raceme, Nutlets ovate (bicovex).

Habitat: Free floating into water, Common in ponds and tanks.

Fl. and Fr.: October to April

XVII. PONTEDERIACEAE

28.*Eichhorniacrassipes* (Mart.) Solms.

FUGP. 279, Fl. of Delhi 338; Fl. of Raj. (Hadauti) 175; Fl. SC Raj.347.

Characteristics:

Aquatic, free floating herb, Leaves emerged, radical, with petioles spongy swollen petiole, short and much swollen in young specimens. Flowers blue, 10-20, Fruit is capsule.

Habitat: Common in monsoonal ponds.

Fl. and Fr.: August to November

29.*Monochordiahastata* (Linn.) Solms.

Fl. of Raj. (Hadauti) 176.

Characteristics:

Slender, perennial herb, rhizomous, stem erect or obliquely erect, rootstock short, spongy. Leaves triangular ovate, hastate base, Flowers in dense raceme, Flowers white in colour, Fruit is capsule.

Habitat: Common in ponds and tanks.

Fl. and Fr.: June to September

30.*Monochoriavaginalis*(Burm.f.) Presl:

FBI.6:363;FUGP. 3:270; Fl. of Raj. (Hadauti) 176.Fl. SC Raj.348.

Characteristics:

Perennial herb, rhizomous, stem erect, rootstock short and spongy, leaves cordate, inflorescence raceme, flowers blue in colour. Fruit is capsule.

Habitat: Near margins of free floating water, common in ponds and tanks.

Fl. and Fr.: September to December

XVIII. POTAMOGETONACEAE

31.*Potamogetoncrispus* Linn

FBI.6:566; FUGP.3: 315; Fl. of Delhi 361; Fl. of Raj.(Hadauti) 181.

Characteristics:

Submerged slender herb, creeping root stalk, sessile linear leaves, axillary spike inflorescence, fruit drupe.

Habitat: Common in ponds and tanks.

Fl. and Fr.: February to April

32.*Potamogetonnodosus*Poir.

FBI.6: 556; Fl. of Delhi 348; Fl. of Raj. (Hadauti) 181.

Characteristics:

Perennials herb, creeping rhizome, lower leaves submerged, translucent and lanceolate, upper leaves free floating elliptic, alternate, inflorescence long spike, brown, Fruits are druplets.

Habitat: Free floating into water, Common in ponds and tanks.

Fl. and Fr.: February to April

XIX. SCROPHULARIACEAE

33.*Limnophilaindica* (Linn.) Druce.

FBI.4:271;FUGP. 2:146,

Characteristics:

Aquatic herb, rooted from base, submerged leaves highly dissects, arrange d as whorl, emergent leaves trifid, toothed, opposite, entire leaves and numerous whorled in middle part, Flowers axillary, solitary, white, fruit is capsule.

Habitat: Common in margins of aquatic areas.

Fl. and Fr.: August to February

XX. TRAPACEAE

34.*Trapanatans*Linn. ***var. bispinosa***(Roxb.)Makino

FBI.2:590; FUGP.1: 358; Fl. of Raj. (Hadauti) 89; Fl. SC Raj. 172.

Characteristics:

Annual aquatic herb.Leaves floating, rosette, petiole long swollen and triangular leaf lamina. Flowers solitary, axillary and white, Fruits are single seeded drupes.

Habitat: Free floating into water, Common in ponds and tanks.

Fl. and Fr.: September to November

XXI. TYPHACEAE

35.*Typhaangustata*Bory&Chaub.

FBI.5:37;Fl. NE Raj. 359; Fl. of Delhi 306; Fl. of Raj. (Hadauti) 158.

Characteristics:

Perennial herb, very long linear leaves, creeping rhizome, Very long flowering stem, both flowers on single strand with a gap, upper are male flower, lower are female flowers, very small hairy seeds.

Habitat: Common in ponds and banks of rivers.

Fl. and Fr.: May to November

XXII. APONOGETONACEAE

36.*Aponogetonnatans*(Linn.)Engl. & Krause

FBI.6:564; FUGP. 3: 313.

Characteristics:

Aquatic herb, rooted at base with rhizome, leaves long linear, membranous leaf lamina, Inflorescence spike, white flowers.

Habitat: Common after rains and present in shallow water ponds.

Fl. and Fr.: August.

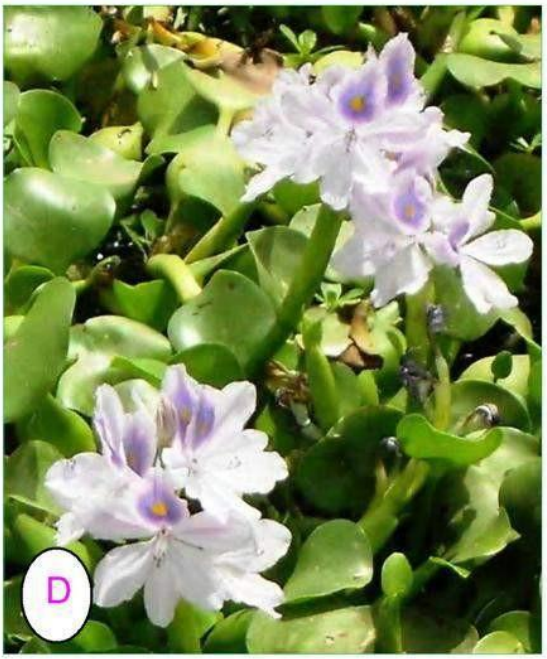
RESULTS AND DISCUSSIONS

The taxonomic investigationsresult into collection and identification of 22 (Twenty two)aquatic families with 28 Genera and 36 species. 12 families were dicot and remaining 10 were monocot. Semi aquatic plants and aquatic wetland plants were included into general survey. Submerged aquatic plants produce oxygen in the process of photosynthesis at the littoral zone ofponds. This oxygen controls the dissolve oxygen in the ponds. That result into balance of oxygen in thewater and this water is suitable for pisci-culture, cropping *Trapa* and general aquatic environment for aquatic ecosystem. In this research both of aquatic and amphibious angiosperms were studied.

FIG. :- 49 A – D

A :-*Alternanthera sessilis* (Linn.)D.C.
(AMARANTHACEAE)

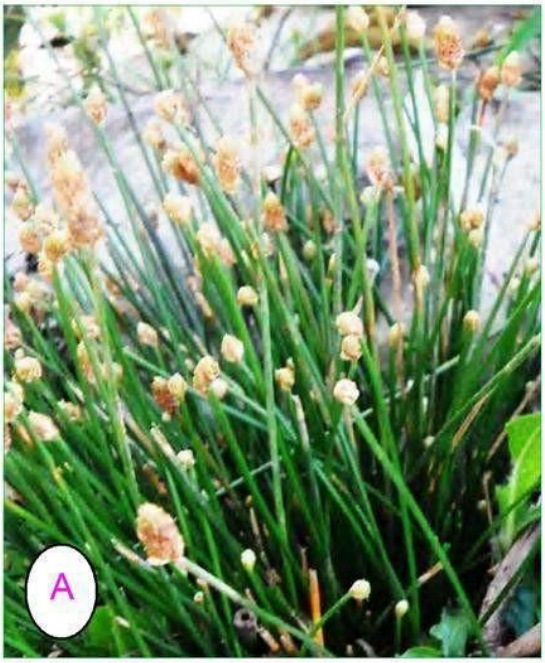
B :- *Colocasia esculanta* Linn.
(ARECEAE)



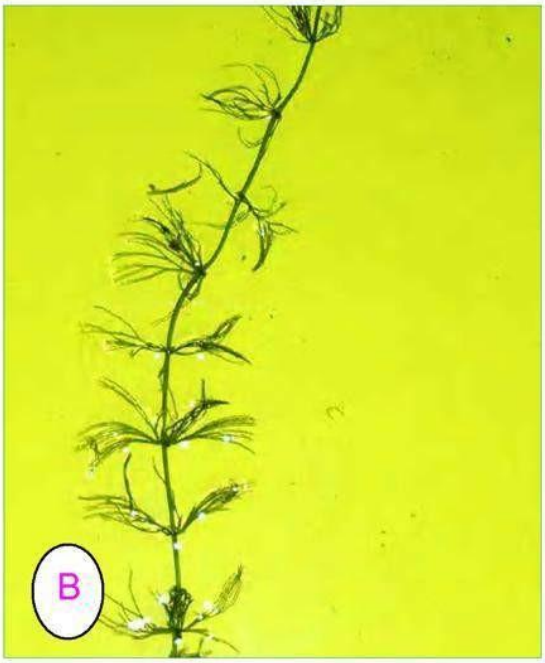
C :- *Crinum asiaticum* Linn..
(AMARLLIDACEAE)

D:- *Eichhornia crassipes* (Mart.) Solms
(PONTEDERIACEAE)

FIG. :- 50 A – D

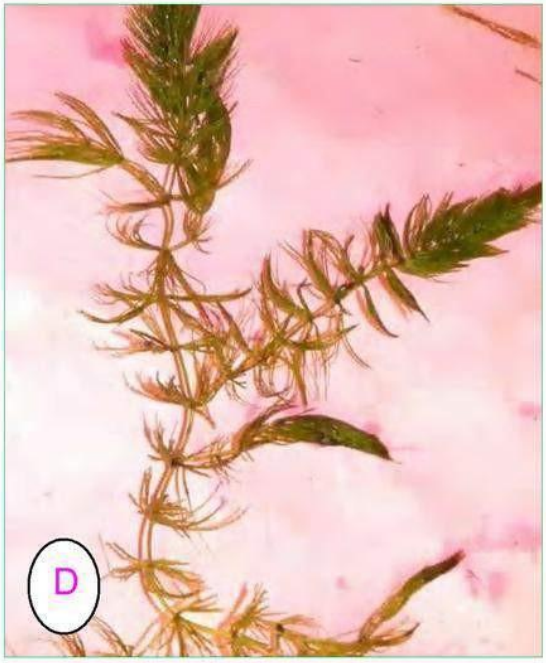


A :-*Eleocharis atropurpurea* (Retz.) Kuntz.
(CYPERACEAE)



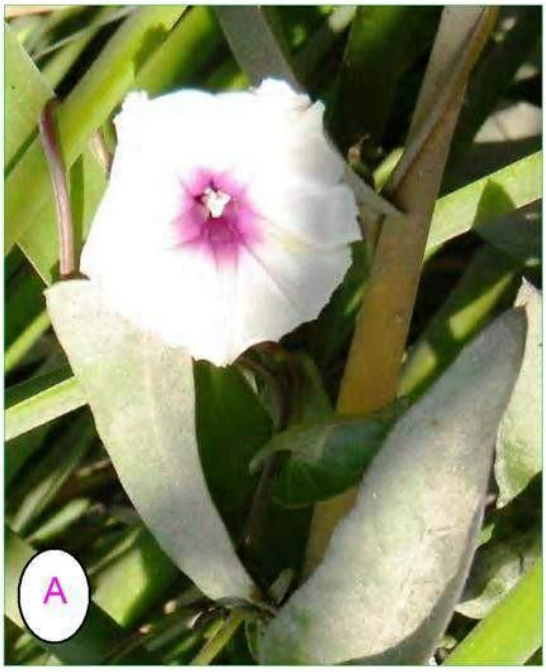
B :- *Najas minor* All.
(NAJADACEAE)

C :-*Hydrilla verticellata* (Linn. f.) Royle.
(HYDROCHARITACEAE)



D:- *Ceratophyllum demersum* Linn
(CERATOPHYLLACEAE)

FIG. :- 51 A – D



A :- *Ipomoea aquatica* Forsk.
(CONVOLVULACEAE)

B :- *Ipomoea carnea* Cooke
(CONVOLVULACEAE)

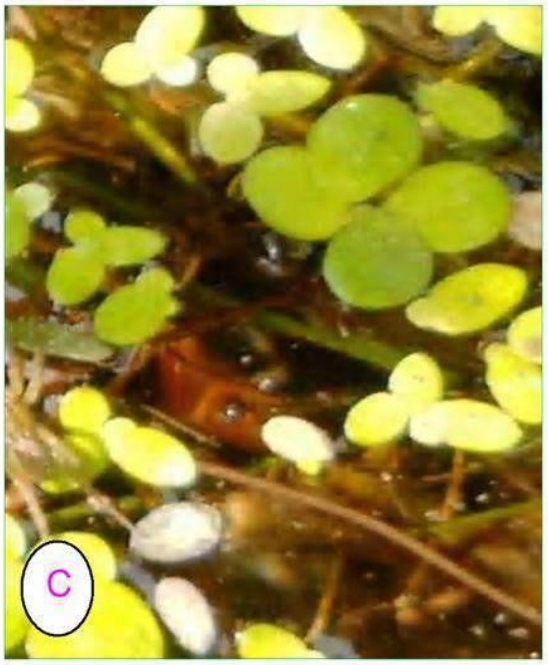
C :- *Hydrocotyl javanica* Thunb.
(APIACEAE)

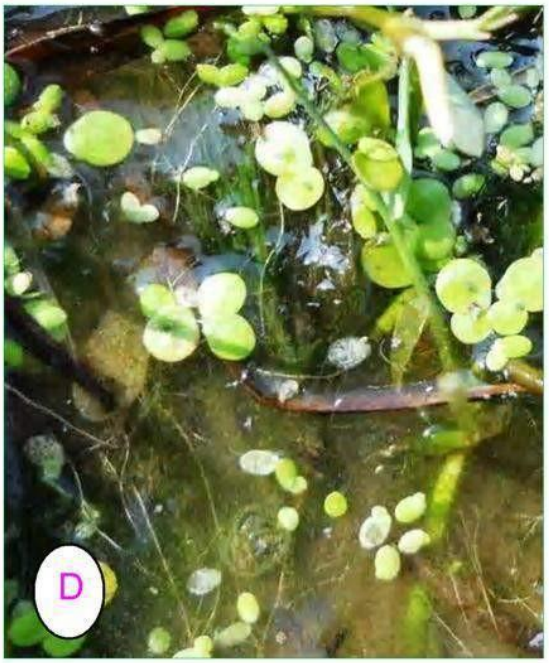
D:- *Limnophila indica* (Linn.) Druce.
(SCROPHULARIACEAE)

FIG. :- 52 A – D

A :- *Monochordia hastata* (Linn.) Solms. (PONTEDERIACEAE)

B :- *Monochordia vaginalis* (Burm.f.)Presl. (PONTEDERIACEAE)

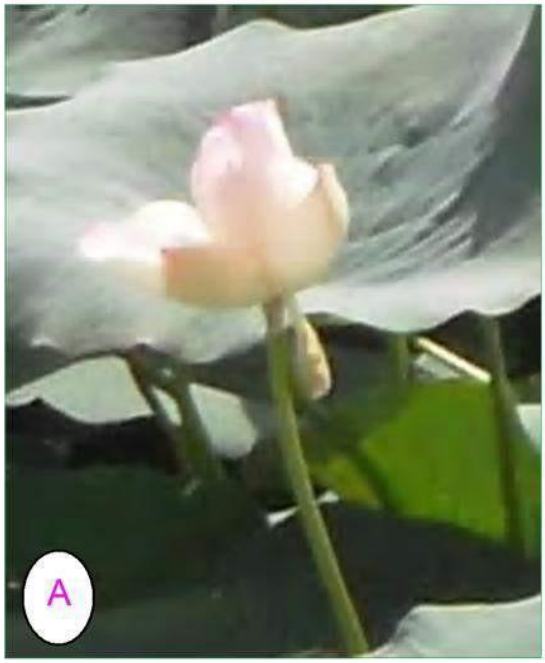




C :- *Lemna perpussila* Torry (LEMNACEAE)

D:- *Spirodella polyrhiza* (Linn.) Scheild. (LEMNACEAE)

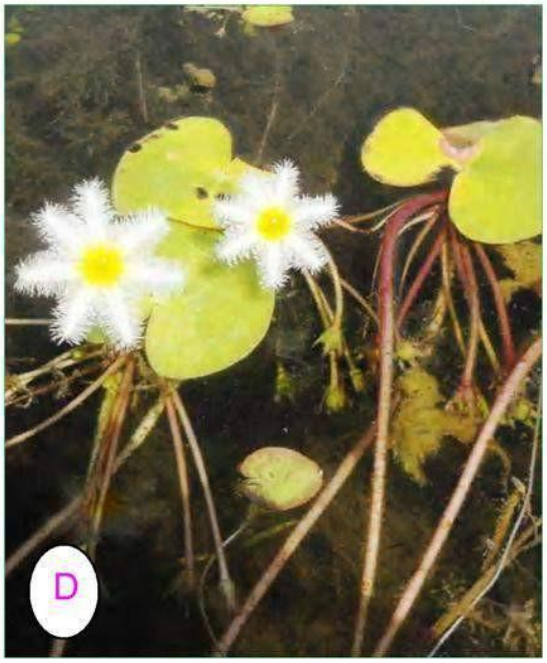
FIG. :- 53 A – D



A :- *Nelumbo nuceifera* Gerth
(NELUMBONACEAE)

B :- *Nymphaea pubescens* Willd.
(NYMPHAEACEAE)

C :- *Nymphaea nouchali* Burm. f.
(NYMPHAECEAE)



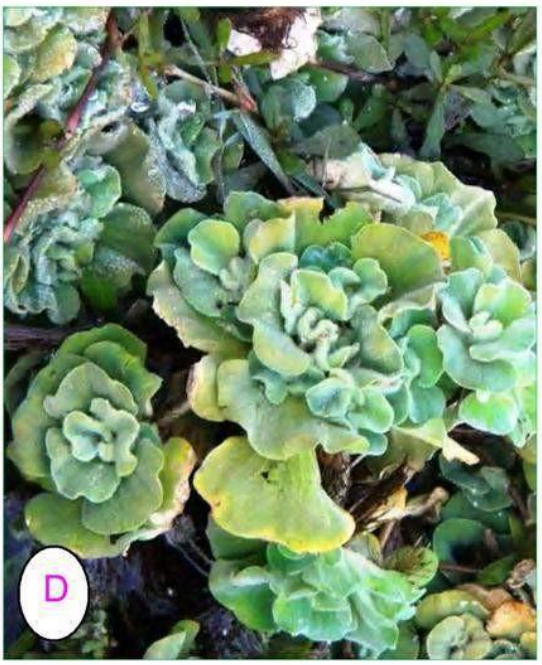
D:- *Nymphoides indica* (Linn.) Kuntz.
(MENYANTHACEAE)

FIG. :- 54 A – D

A :- *Polygonum barbatum* Linn
(POLYGONACEAE)

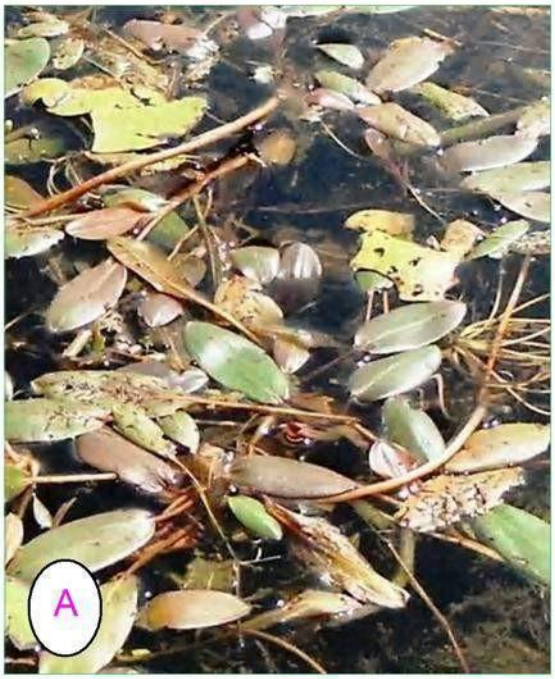
. **B** :- *Polygonum glabrum* Willd.
(POLYGONACEAE)

C :- *Ottelia alismoides* (Linn.) Pers.
(HYDROCHARITACEAE)

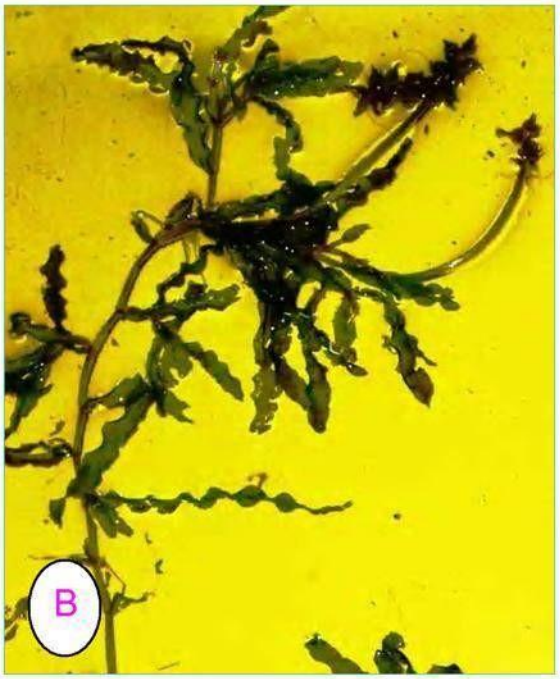


D:- *Pistia stratiotes* Linn.
(ARECEAE)

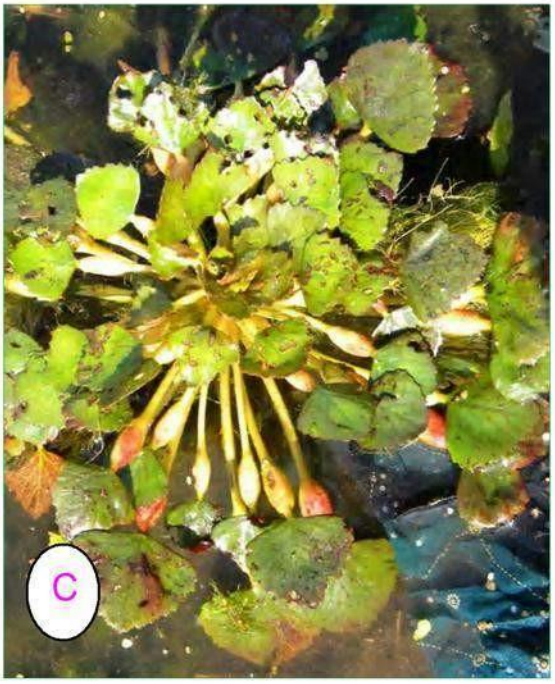
FIG. :- 55 A – D



A :- *Potamogeton nodosus Poir.*
(POTAMOGETONACEAE)



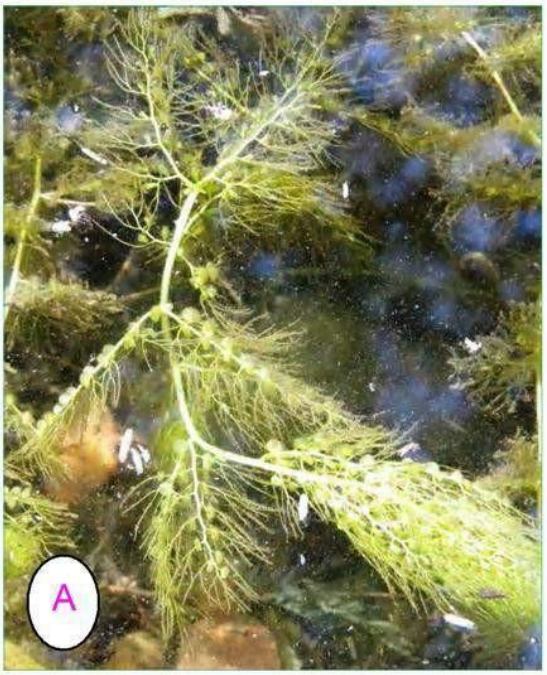
B :- *Potamogeton crispus* Linn.
(POTAMOGETONACEAE)



C :- *Trapa natans* Linn. *var. bispinosa*
(TRAPACEAE)

D:- *Sagittaria guayanensis* Kunth.
(ALISMATACEAE)

FIG. :- 56 A – D



A :- *Utricularia aurea* Lour.
(LENTIBULARIACEAE)

B :- *Utricularia stellaris* Linn. f..
(LENTIBULARIACEAE)

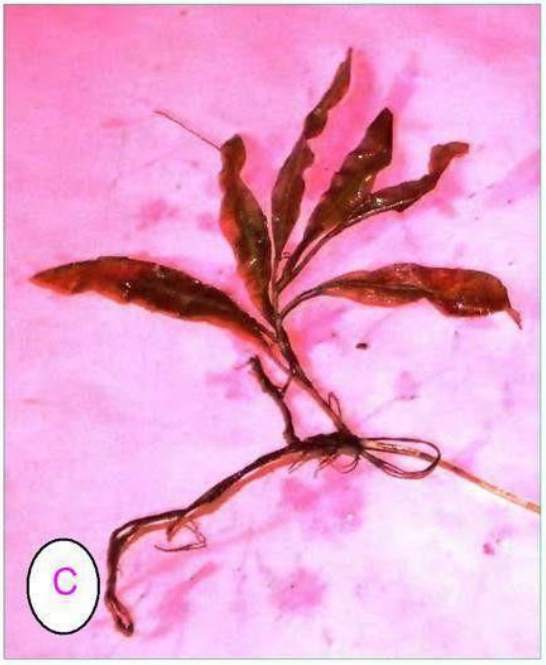
C :- *Typha angustata* Bory & Chaub.
(TYPHACEAE)

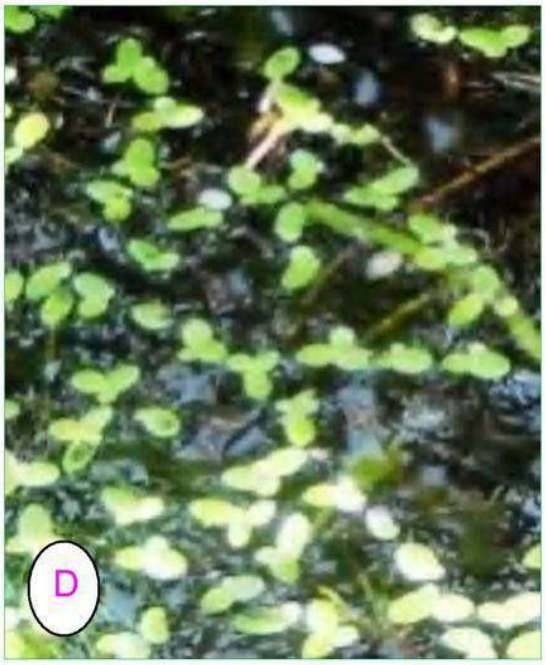
D:- *Vallisnaria natans* (Loureiro) H.Hara.
(HYDROCHARITACEAE)

FIG. :- 57 A – D

A :- *Vallisnaria spiralis* Linn. (HYDROCHARITACEAE)

B :- *Nymphoides hydrophilla* (Lour.) O. Kuntz. ((MENYANTHACEAE)





C :-*Aponogeton crispus* Thumbi. (APONOGETONACEAE)

D:- *Wolffia arriza (Linn.) Horkel ex Wimmer.* (LEMNACEAE)

CHAPTER: IX

ECONOMIC AND MEDICINAL PLANTS

- **PLANTS WITH ECONOMIC IMPORTANCE**

  1. **FOOD AND VEGETABLES**
  2. **NON EDIBLE OILS**
  3. **GREEN FODDER**
  4. **GUM AND RESIN**
  5. **TIMBER AND FIREWOOD**
  6. **FIBERS**
  7. **DYEING AND TANNING**
  8. **PLANT WITH SPRITUAL VALUE**
  9. **MISLANIOUS**

- **PLANTS WITH MEDICINAL VALUE**

CHAPTER: IX

ECONOMIC AND MEDICINAL PLANTS

Kota district has a rich biodiversity of medicinal plants as well as economically important plants In addition to medical value plants fulfill many economic objectives for human. These can be in form of food and vegetables, timber and firewood, gums and resins, essential oils, dyes, spiritual values, fibers and ornamental values. Attempts were made collect these plants in wild form and to categorize them. The following plant species have been recorded from different area of the Kota in differentseasons.

PLANTS WITH ECONOMIC IMPORTANCE:

1. FOOD AND VEGETABLES:

During the survey and study of literature some plants were found for food and vegetable importance in rural as well as urban areas. Leaves, fruits and seed portions of plants are of food and vegetable importance. But young stems as well as juvenile roots have also shown the food importance. Some of important plants are in this category are: *Acacia nilotica, A.senegal, Brachiariaramosa, Calligonumpolyonoides, Capparissepieris, Citrulluscolocynthis, C. lanatus, Cordiagharaf, Cucumiscallosus, Euphorbia caducifolia, Indigoferacordifolia, Momordicacharantia, Moringacancanensis, Salvadoraoleoides, S. persica, Pedalliummurax*and *Tribulusterrestris. Pheonixsylvestris* trees provide edible date fruits. Fruits of *Capparis decidua* are pickled. Fruits of *Mangiferaindica*are edible and pickled also. Some other plants with similar uses are*Amaranthusblitum*Linn. (Leaves and branch tops are vegetable), *Bauhinia*

variegata. Linn.(Floral buds are vegetable), *Capparisdeciduas*(Forsk.)Edgue. (Berries are vegetable), *Chenopodium album*. Linn. (Leaves are vegetable), *Chenopodiummurale*.Linn. (Leaves are vegetable), *Emblicaofficinalis*.Gaertn. (Berries are vegetable), *Moringaoleifera*. Lamk. (Fruits/pods are vegetable),*Prosopis cineraria*.(Linn.) Druce (Fruits are vegetable), *Trapabispinosa*Linn (Nuts are fruits), *Zizyphusmauritiana*Lamk. (Ripen fruits are edible) and *Zizyphusnummularia* (Burn.f.)Wt.Arn.(Ripe fruits are edible).

2. NON EDIBLE OILS:

Other than cultivated (crop) plants some plants were also identified that provide non edible oils.Generally seeds or fruits are the medium for extraction of these oils. Non edible oils are used in various ways like medicine industry paint industry, greasing agent or as fragrance products. Some source plants are *Riccinuscommunis*Linn. (Arundi seeds), *Madhucaindica*Gmel.(Mahua fruits), *Pongamiapinnata*(Linn.) Pierre.,*Azadiracthaindica*A.Juss.*Citrulluscolocynthis*(L.)Schard.,*Argemonemaxicana*Linn., *Salvadoraoleoides*Decne. *Salvadorapersica*Linn.and*Balanitesaegyptiaca*(L.) Delile.

3. GREEN FODDER:

Many leguminous plants are used as fodder for cattle, goats and sheep. Grasses are primary fodder resources almost all grasses are being used as fodder. Some other plants like *Acacia nilotica, Prosopis cineraria,Anogeissuspandula, Buteamonosperma, Cordiagharaf,Anogeisuspendula, Ziziphusmauritiana, Z. nammularia and Azardirachtaindica*are also used as green fodder.

4. GUM AND RESIN:

Many of wild trees and shrubs are source of gums and resins. These were found as good source of tannin also. Some source plants are *Acacia nilotica*(L.) Willd.*Acacia senegal*Willd.*Acacia jacquemontii*Benth.*Anogeissuslatifolia*Wall.,*Anogeissuspendula*Edgew., *Aeglemarmelos*(L.) Correa.*Azadirachtaindica*A.Juss.*Bauhinia racemosa*Lamk.,*Boswelliaserrata*Roxb. *Bombaxceiba*Linn.*Buchnanialatifolia*Roxb.,*Buteamonosperma*(Lamk.) Taub.*Moringaoleifera*Lam., *Mangiferaindica*Linn.and*Acacia catechu* Willd.

5. TIMBER AND FIREWOOD:

Rural people as well as urban people use wood as timber and firewood. During survey some trees with timber and firewood value were also identified as big source. Some of these are *Acacia nilotica*(Linn.) Del., Acacia senegal (Linn.) Willd., *Azardirachtaindica*. A.Juss., *Bauhinia variegata*.Linn.,*Buteamonosperma*.Roxb.,*Cassia siamea*. Lam.,*Dalbergiasissoo*.Roxb.,*Ficusbengalensis*.Linn.,*Ficusreligiosa*. Linn., *Mitragynaparviflora*. Korth.,*Pongamiapinnata*. (Linn.)Pierre.,*Prosopis cineraria*.(Linn.) Druce., *Prosopisjuliflora*(Swartz.) D.C., *Zizyphusmauritiana*.Lamk.and *Zizyphusnummularia (Burn.f.)*Wt. Arn.

6. FIBERS

Some plants other than crop plants as source of fibers especially in rural area are*Buteamonosperma*(Lamk.), Taub.*Sterculiaurens*Roxb.,*Pandanustectorius*Sol. ex.Rark., *Typhaelephantina*Roxb.*Bauhinia racemosa*Lamk.*Calotropisprocera*(Ait.)R.Br.,*Bombaxceiba*Linn., *Leptadeniapyrotechnica(*Forsk.*)* Decne.and*Phoenix sylvestre*Roxb. Generally

bark and leaves from these plants are the big source of fiber which is used to prepare strings, ropes and mats.

7. DYEING AND TANNING:

Generally bark of trees is a big source of tannin and on other hand flowers are source of colour or dyes. Generally bark from *Acacia nilotica*(Linn.) Del.*Bauhinia variegata*Linn.and*Cassia siamea*Lam. is used for leather tanning in villages. *Acacia catechu* Linn.is source of commercial tanning dye from bark and source of oleo resin "Kattha". Flowers of *Bombaxceiba*Linn.and*Buteamonosperma*Roxb. are traditional source of pink color. Some other tannins yielding plant are *Terminaliaarjuna (R*oxb.) Wight.&Ara.,*Cassia fistula* Linn.,*Rhusmysurensis*Heyne., *Tamarixaphylla*(L.) Karst.*Pithecellobiumdulce*Benth.,*Anogeissuspendula*Edgew., *Carissa carandas*Linn. *Lawsoniainermis*Linn.*Prosopis cineraria* (L.) Druce.,and *Wrightiatinctoria*R.Br.

8. PLANT WITH SPRITUAL VALUE

According to Hindu mythology many of the plants have spiritual value. These plants are linked with gods and goddesses and used during their "*Pooja*". Some of the spiritual plants are *Aervatomentosa, Aeglemarmelos, Datura alba, Daturastromonium, Ficusreligiosa,Ficusbenghalensis,Mengiferaindica, Musa pesardiaca, Trapabispinosa, Prosopiscineraria, Cynodondacytylon, and Ocimumsanctum.and O. basilcum* etc. This mythological belief strongly recommends the ecological aspect of protection and cultivation of plants.

9. MISLANIOUS:

Many plants were reported as ornamental plant. Some of them are *Abutilon persicum, Ageratum conzoyides, Asparagus officinalis, Asterammelus, Baugainvilleasps., Buteamonosperma, Callistamonesps. Catharanthusroseus, Euphorbia pulcherrima, Heliotropiumstrigosum, Hibiscus-rosa-sinensis, Lantana camara, Lawsoniya alba (Mehandi), Neriumindicum., Rhoeo discolor, Tageteserecta,* and*Thevatiaperuviana.*Some plant like*Zizyphusmauritiana*Lamk. *Buteamonosperma (*Lamk.*)* Taub.*Ficusreligiosa*Linn.are host plants for "Lakh worm". *Morusalba*Linn, *Terminaliaarjuna (*Roxb.*)* Wight.&Arn.*Ricinuscommunis*Linn.are host plant of Silk worm. *Diospryosmelanoxylon*Roxb.and*Bauhinia racemosaLamk*are source of leaves to make *"Beedies"*(A way of tobacco smoking).*Balanitesaegyptiaca*(L.)Delile.is a soap substitute. *Acacia catechu* Willd. and*Madhucaindica*Gmel.are used to make alcoholic products by extraction and distillation.*Santalum album* Linn.is used to extract fragrance byextraction and distillation.

PLANTS WITH MEDICINAL VALUE:

Medicinal values are another important aspect of plant utility. People of rural area especially are dependent on herbal medicines for the treatment of various diseases as they are still devoid of modern medical facilities. Ayurveda is totally dependent on plant world. During the present investigations efforts have been made to document the medicinal plants frequently being used for the treatment of various disorders in traditional manner as well as in Ayurveda. Observations are listed below in following Table No.:-12

TABLE: - 12

S.No.	Name of Plant	Vernacular/ Local Name	Family	Uses
1.	*Abrusprecatorius* Linn	Chirmi,	Fabaceae	Used in healing of wounds, polyurea, arthritis, and fever.
2.	*Abutilon indicum*. Linn.	Karandi, Kanghi	Malvaceae	Seeds in piles, leaves in bronchitis, diarrheoa, gonorrhoea, chest infection, bark and roots are diuretic.
3.	*Acacia leucophloea* Willd.	SafedKeekar	Mimosaceae	Leaves and bark portions of plant are used to cure urinary tract bleeding, sexual impotency, and as

				contraceptive and for menstrual problems.
4.	*Acacia nilotica.* (Linn.) Del.	Banwal, Babool	Mimosaceace	Tender leaves are used in diarrhoea, sore throat, spongy gums, washing of wounds. Juice of bark is used for stopping bleeding.
5.	*Acacia senegal*Willd	Kumtha	Mimosaceae	Gum is used internally in inflammation of intestinal mucosa and externally to cover inflamed surfaces as burns, sore nipples and nodular leprosy .

6.	*Acalyphaciliata*Forssk.	Kuppi	Euphorbiaceae	Decoction of leaves mixed with common salt is applied to scabies.
7.	*Achyranthesaspera.* Linn.	Latjeera	Amaranthaceae	Herb is used as diuretic, fresh applied over insect bites. Paste of root is applied in ophthalmia and opacity of cornea.
8.	*Aeglemarmelos*Linn	Bel	Rutaceae	The reputed medicinal properties of ripe fruits for curing chronic dysentery, habitual

				constipation and dyspepsia are widely known to the tribal communities
9.	*Ageratum conyzoides.* Linn.	Ajgandha	Asteraceae	Juice of herb pasties used in prolapse of anus tonic of diarrohea. Leaves are antitetanic, and also used in skin diseases.
10.	*Albizialebbeck* (Linn.) Benth.	SarasPapda	Mimosaceae	Leaf juice is used as eye drop for night blindness. To heal gums decoction of the bark is used as mouth wash. The powder root bark is

				applied externally as plaster in leprous ulcers.
11.	*Aloe vera*. Tourn.	Ghee kunwar, Gwar Patha	Liliaceae	Leaves are alternative, stomacic, cathartic and anti-dontal used in Jaundice, lever enlargement, Pulp of one leaf is given in abdominal tumour, dropsy and piles.
12.	*Alternantherasessilis*Linn.	GarundiGaroo.	Amaranthaceae	Plant shows ophthalmic and detergent properties. Stem and leaves are used in cure of

				various troubles. Decoction of stem and leaves is used to check blood vomiting.
13.	*Amaranthusspinosus*Linn.	KateliChouli	Amaranthaceae	Herb is used for mouth wash for toothache. Drinking of root extract with the same of *Convolvulus trupethum*helps one to overcome the effects of poisons of snake and insects. A piece of root in black

				thread is tied on left arm of a pregnant to cure piles
14.	*Anogeissuslatifolia* Bedd	Dhokda	Combretaceae	Gum is used to cure the damaged tissue and back pain during delivery.
15.	*Argemonemaxicana.* Linn	Satyanashi	Papaveraceae	Roots decoction is vesciculacalculis. skin diseases, eye wash,tapeworm administration, oil of seed for

				skin diseases.
16.	*Asparagus racemosus*Wild.	Satawari	Liliaceae	Root part is used in increased lactation, diabetes, muscle pain, muscular disorders, leucorrhoea and fertility increasement.
17.	*Azardirachtaindica.* A.Juss.	Neem	Meliaceae	Leaves carminative, anti-dontal, diuretic, fresh juice with salt used to cure intestinal worms. Fresh juice with honey for jaundice and skin

				diseases cure, tender twigs chewed to keep gums and teeth healthy and clean. Fruits highly recommended for urinary diseases and piles. Seed Oil for chronic malaria.
18.	*Bacopamonnieri.* Linn.	Brahmi	Scrophulariaceae	Whole plant consists 'Brhami' drug that is tonic for nerves and prescribed in nervous disorders , mental diseases,

				constipation, and as diuretic promotes urination, leaf juice is given to infants in bronchitis; plant consists alkaloid 'Bramhine' that is cardiac tonic provides strength and tone to heart.
19.	*Balanitesaegyptiaca* Linn.	Hingota	Simoraubaceae	Fruit, stem and leaves are in form of paste or powder used in toothache, worms in teeth and cough.

20.	*Bauhinia racemosa* Lamk.	Kachnar	Caesalpiniaceae	Fruits and leaves used in burning sensation of urine.
21.	*Boerhaviadiffusa*. Linn.	Punarnava	Nyctaginaceae	Root is diuretic, laxative, antithalmintic and useful in diseases of kidney and heart.
22.	*Bombaxceiba*Linn	Semal	Bombacaceae	Flower and root in burning sensation, leucorrhoea and other sexual diseases, burning.
23.	*Boswelliaserrata* Colebr.	Saalar	Burseraceae	Gum is used to make fragrant ointment for

				skin eruption and for impotency treatment
24.	*Buteamonosperma*.Roxb.	Dhak, Palash	Papilionateae (Fabaceae)	Leaves useful in diabetes, diarrhoea, heartburn, and bark with sugar for abnormal thirst. Bark also given in cold cough. Gum is rich in Gallic and Tannic acid useful in trukino.
25.	*Calotropisprocera* R.Br. (Aak)	Aak	Asclepiadaceae	The decoction of root bark along with black pepper is used for malarial fever. Powdered flowers

				with black pepper are given with ash of barley seeds for cure of Cholera.
26.	*Capparis decidua (Forsk.)* Edgew.	Ker	Capparidaceae	The stem is used in pyorrhea and rheumatism. Paste of charcoal from wood of this plant applied externally to muscular injuries
27.	*Capparissepiaria* Linn.	Himasra	Capparidaceae	Powder of root is used in cough.
28.	*Cassia fistula* Linn.	Amaltas	Caesalpiniaceae	Bark is used for the treatment of constipation and as

				anti-helminthes.
29.	*Celosia argentea* Linn	Kukidi	Amaranthaceae	Crushed seed are taken orally for uterine diseases
30.	*Centellaasiatica*(L.)Urb.	Brahmi	Apiaceae	Infusion of the leaves is taken orally during diabetes. Plant extract and essential oils are useful in hair health and prevent hair problems.
31.	*Chenopodium album* Linn.	Bathua	Chenopodiaceae	Tea of the leaves and plant is used to relieve stomach pains.
32.	*Cleome gynandra*	Hulhul	Capparidacea	In typhus fever

	Linn		e	decoction of seeds and leaves taken daily gives relief. Fresh leaves used as vegetable kills intestinal worms. Powdered seeds are used in piles.
33.	*Cordiadichotoma*Forster.f.	Gunda	Boraginaceae	Bark and leaves are used in abortificiet. Fruit as pickle also helpful for stomach health.
34.	*Crinum asiaticum* Linn.	Kundh	Amaryllidaceae	Decoction of tuber

				and leaf are used for ear ache and wound healing treatments.
35.	*Croton macrostachyus*Hochst. ex Del.	Najang	Euphorbiaceae	Root is purgative and decoction is administered orally.
36.	*Cynodondactylon* (Linn.) Pers		Poaceae	Infusion of the roots and stem is used for stopping bleeding from piles, haematuresis, and catarrhal ophthalmic.
37.	*Cyperusrotundus*Linn.	Motha	Cyperaceae	The bulbous roots and rhizomes are scraped and pounded with green ginger mixed with honey

				and given in cases of dysentery, snake bite, irregular menstruation
38.	*Dalbergiasisoo*Roxb.	Shishum	Papilionaceae	and diarrhea. The leaves are warmed and tied over inflamed mammary glands.
39.	*Daturainoxia*. Mill.	Dhatura	Solanaceae	Juice of fruits useful to dandruff and falling of hairs, paste made with turmeric is applied to inflamed breast roasted.
40.	*Echinopsecinatus*Roxb.	OontKante	Asteraceae	Taking root extract with light warm

		eli		water helpful during whooping cough. During parturition fresh root kept below root of neck is helpful in easy delivery.
41.	*Eicchorniacrassipes (Mart.)Solms.*	Jalkumbhi	Pontideriaceae	Young leaves and petiole cooked virtually tasteless carotene rich vegetable act as antioxidant.
42.	*Eubhorbiahirta*Linn.	Dhudhi	Euphorbiaceae	Leaves are crushed and the extract is given orally with honey once a day in

				the morning Leucorrhoea problems. In dysentery the juice of plant is used.
43.	*Euphorbia caducifolia Haines.*	Danda Thor	Euphorbiaceae	To keep injured and paining body part into smoke of plant is helpful to remove pain.
44.	*Ficusracemosa*Linn	Goolar	Moraceae	Fruit are useful for stomach health. Stem bark ash paste with cow ghee is used with ghee for curing boils and pimples.

45.	*Holopteleaintegrefolia*(Roxb.) Planch	Bandarbati , Kanjeri	Ulmaceae	Fresh leaf paste is applied on rotten hoofs of cattle to kill germs.
46.	*Hydrillaverticillata*(Linn. f.)Royle	Jhangi, Kureli	Hydrocharitaceae	Decoction of leaves is used in treatment of abscesses boil and wound. Dried powder applied on wounds accelerates healing.
47.	*Ipomoea aqatica*Forsk.	Rassapatti	Convolvulaceae	Leaves are boiled and taken orally to cure the fractured bone.
48.	*Jatrophagossipifolia* Linn.	Ratanjot	Euphorbiaceae	Leaves are tied locally in treatment of guinea worm.

49.	*Kigeliaafricana*(Lam.)Benth.	Thaei	Bignoniaceae	Stem bark and leaves are useful in rheumatism.Decoction of the stem and leaves is taken orally.
50.	*Lantana camara*Linn. Moldenke	Gendi	Verbinaceae	A decoction of the leaves is appliedin Rheumatism. Also useful in tetanus, Healing ofwounds and fistula.
51.	*Launaeaprocumbens*(Roxb.) Ramayya&Rajgopal	Lampri	Asteraceae	Warm leaves are tied around neck during night to cure Goiter.
52.	*Leptadeniapyrotechnica*(Forsk.) Decne	Kheenp	Asclepiadaceae	The bruised stem and leaves are used to promotehealing of

				wounds
53.	*Leucasasperaa*Spreng	Paniharin	Lamiaceae	The juice of leaves and flowers mixed with milk is given in Jaundice, fevers, ulcers, intestinal catarrhs.
54.	*Luffaacutangula* (Linn) Roxb.	JangalTurai	Cucurbitaceae	The juice of fresh leaves in form of drops is useful in granular conjunctivitis. The pounded leaves are applied in splenitis, haemorrhoids, piles and leprosy. The root with equal partsof

				root of *Hibiscus rosa-sinensis* and *Hemisdesmusindicus* is given with milk, cummin and sugar inGonorrhoea.
55.	*Mangiferaindica*. Linn.	Mango, Amb	Anacardiaceae	Powder of tender leaves is given in diarrhoea and diabetes, resinous gum is ointment and used in dressing of parasitic diseases and scabes. Bark used in throat disease. Leucorrhea, gonorrhoea.

56.	*Momordicacharantia* Linn.	Janglikarela (Marela)	Cucurbitaceae	The whole plant with cinnamon, long pepper, rice and the oil of *Hyrocarpuswightiana* is employed externally for Scabies and other cutaneous diseases. The leaf juice is externally applied round the eyes for night blindness. One spoonful of fruit paste in water is taken internallyto reduce blood sugar and a paste of the

				roots is applied externally over piles
57.	*Moringaoleifera.*Lamk.	Sainjna	Moringaceae	Tender leaves given in scurvey, cattrrahal, diseases, wound ointment, swelling, barkin, headache, earache and nervous pain.
58.	*Nelumbonucifera.* Gaertn.	Kamal	Nymphaeceae	Flower, root, seed and stem product are cardio tonic, hypotensive tonic and vasodilators. Decoction of flower, stem & leaves for cardiac problems and

				paste of seeds for skin diseases is useful.
				Chancre, ulcers and leprosy. The roots are made into a paste with water and are applied
59.	*Neriumindicum*Mill.	Kaner	Apocynaceae	Externally. Piles A paste of roots is applied
				externally on piles Ring worm and other skin diseases The paste of its leaves with oil of

				its root bark is used Termination ofpregnancy The roots is used for procuring abortion both by local applicationand internal administration
60.	*Nyctanthesarbo-tristis*Linn.	Harsingar,	Oleaceae	Crushed leaves are applied to cure ringworm on external ear.
61.	*Nymphaeanauchali*Burm.	Neel kamal	Nymphaeceae	Decoction and paste of leaves is tonic. Also used in cure of irregular

				mensuration.
62.	*Nymphoides indicium* Linn.	Kumudani	Menyanthaceae	Paste of leaf is diuretic. Paste dissolved into semi warm water is helpful to cure fever and jaundice.
63.	*Ocimum sanctum.* Linn.	Tulsi	Lamiaceae	Plant used as expectorant, stomacic, daimatric, anticeptic, bronchitis, cardiac stimulant, given in malariya, gastric diseases. Fresh root applied on bites of insects and

				leeches.
64.	*Oxalis corniculata*L.	KhattiBooti	Oxalidaceae	Stem and leaves are helpful to cure navel pains. Decoction of the stem and leaves is taken orally.
65.	*Pedalium murex* Linn.	BadaGokhru	Pedaliaceae	The mucilaginous water produced from the fresh leaves is takenduring gonorrhea and dysuria. Decoction of whole fruit is used for treatment of renal

				calculi.
66.	*Phoenix dactylifera.* Linn.	Khajoor	Arecaceae	Parts of seed applied for cornea opacity, fumigation of piles, used as vitamin B-2 and C diet.
67.	*Phyllanthusfraternus* Webster. Sensu Hook. f.	BhuianAmla	Euphorbiaceae	Leaves are effective in skin affections, swelling and ulcers. Young tender leaves are given inChronic dysentery Infusion.
68.	*Pistiastratiotes*Linn.	Topapanna	Araceae	Root extract is diuretic. Decoction of root or root powder is used to cure eczema cold & cough and

				ringworm
69.	*Polygonumbarbatum*Linn.	Gulabi	Polygonaceae	Decoction of leaves and seeds is anthelmintic, astringent and cardiotonic.
70.	*Pongamiapinnata*(Linn)Pierre	Karanj	Papilionaceae	Dried seed powder is dissolved into water and applied on hairs to kill lice.
71.	*Prosopis cineraria* (Linn.) Druce.	Khejri	Mimosaceae	Inflorescence mixed with sugar in water is used for prevention of skin diseases. Flowers mixed with sugar and taken by

				women during pregnancy act as safe guard against miscarriage.
72.	*Ricinuscommunis*. Linn.	Castor	Euphorbiaceae	Seed oil rheumatic, swelling, purgative and given in acute diarrhoea, conjunctivitis.
73.	*Sagittariaguayanensis*Kunth.	Hartog	Alismataceae	Paste of leaf and decoction of tuber are diuretic and antiscobutic. Helpful in skin problem also used as premature

				terminator of fetus in tribes.
74.	*Salvadorapersica*. Linn.	Peelu Jaal	Salvadoraceae	Leaves are bitter, aromatic, carminative, antithelmitic, Berries are digestive used in spleen enlargement, rheumatism, tumour.
75.	*Tecomellaundulata* (Sm.) Seem	Rohida	Bignoniaceae	The bark of young branches is used as a remedy for syphilis and leucorrhoea
76.	*Tephrosiapupurea*(Linn.)Pers.	Sarphonka	Papilionaceae	Decoction of the roots with ginger is consumed to relieve headache. The root

				extract is useful inspermatorrhoea. The stem is used as tooth brush fore cure ofpyrrhoea. The bark of the root ground with little black pepper is made into pills and given in refractory cholic.
77.	*Terminaliaarjuna* (Roxb. ex D.C.) Wt. &Arn.	Arjuna	Combretaceae	Decoction of stem bark is taken thrice a day for prevention of high blood pressure and blockages in veins

78.	*Thevetiaperuviana*(Pers.) Merrill.	PeeliKaner	Apocynaceae	Leaves are used as local analgesic. These are grind into a paste which is applied on affected parts.
79.	*Tinosporacardifolia* (Willd.) Miers Ex Hook F. and Thomas	Neemgiloy	Menispermaceae	Stem juice is valued in high fever and given in jaundice and fever either alone or mixed with honey. Stem paste with a little ginger is given in urticasia. Stem juice with sweet oil is administered in elephantiasis. Juice of stem orally with

				honey is used to treat Asthma.
80.	*Trapabispinosa*Roxb.	Singhada	Trapaceae	Stem and fruit show astringent, tonic, nutritive, stomachic and refrigerant properties.
81.	*Tribulusterrestris* Linn.	ChhotaGo khru	Zygophyllace ae	The dry fruits are powdered and are given withSugar and black pepper to cure of impotence. The infusion of the stem is used in gonorrhoea. Decoction of the plant is usedfor gravels, gout and

				kidney diseases
82.	*Tridexprocumbens.* Linn.	Rookdi	Asteraceae	Leaves are useful for ointment of wounds and skin infections.
83.	*Wolffiaarrhiza*(Linn.) Horkel.	Thali	Lemnaceae	Plant is nutritive appetizer. Plant cooked as vegetable has nutrition and taste.
84.	*Xanthium strumarium.* Linn.	Aanasisi	Asteraceae	Fruit is tonic, diuretic, sedative, demulcent, antiringnant, antiscrophulusand long standing malaria fever.

85.	*Zizyphusmauritiana*. Lamk.	Ber	Rhamnaceae	Milk given in virulent gonorrhea, Berries are blood purifier; oil to digestion, bark is bitter, diarrhoea, dysentery, colic and gum infection.
86.	*Acacia catechu* Willd	Kher, Kattha	Mimosaceae	The paste of the bark is applied locally in stomatis. The exudates of the plant are given orally in case of difficult child birth.
87.	*Adhatodavesica*Nees.			The tribal widely eat the fresh leaves and

		Adusa	Acanthaceae	roots with ginger against cough, cold, bronchitis and asthma.
88.	*Amaranthuspolygamus.* Hook.	Cholai	Amaranthaceae	Roots in gonoarrhoea, eczema,Seeds are used in leucorrhea.
89.	*Arundodonax*Linn.	Yengthou	Poaceae	Fresh tender shoot paste with honey given to children to cure intestinal worms, typhoid and pneumonia.
90.	*Carissa congesta* Linn.	Karaunda	Apocynaceae	The roots in combination with other roots are used

				in rheumatism
91.	*Colocasiacuclata*(Linn.) Scott.	Singjupan.	Areceae	Petiole juice is applied on fresh cut and injuries to stop bleeding and as an antiseptic.
92.	*Cuscutareflexa*Roxb.	Amarbel.	Cuscutaceae	The juice of the plant about two teaspoon full is given to treat haematuria.
93.	*Eclipta alba.* (Linn.) Hassk.	Bhringraj	Asteraceae	Fresh plant is tonic in liver enlargement and spleen, chronic skin disease, antiasthmatic. Root in

				scading urine and it´s powder in liver enlargement and skin disease.
94.	*Ficusbenghalensis Linn.*	Bargad	Moraceae	Tender ends of aerial roots, latex, fruits, leaves and bark are used as medicine. In obstinate vomiting tender ends of hanging roots are given.The tips of adventitious roots arecrushed and boiled in cow’s milkand the decoction thus obtained,is strained and served hot in

				piles. The milky juice of the branches is Applied to cure cracked heels. The bark with black pepper is used to cure snake bite.
95.	*Ficusreligiosa*. Linn.	Bodhivriksha, Pepal.	Moraceae	Bark is astringent, scabes, gonorrhoea, Juice relieves toothache, strengthen the gums, fruits are digestive laxative, and also used in asthma.
96.	*Hydrocotylejavanica* Thunb.	Sarumanimuni	Apiaceae	Whole plant with

	syn. H. nepalensis HK	(Assamese)		equal amount of tender leavesof*Psidiumguajava* and extracted juice is given in amoebicdysentery
97.	*Monochariahastata Linn.*	BhatMateka (Assamese)	Pontederiaceae	It is good fodder. Tender petioles and leaves are used as vegetable.
98.	*Opuntiaelatior*. Mill.	Nagphani	Cactaceae	Fruits baked or made into syrup are a good remedy in asthma and

				whooping cough. The leaves made into a pulp are used as a poultice to allay heat and inflammation in scorbutic ulcers.
99.	*Otteliaalismodes L Pers*	Pani kola (Assamese)	Hydrocharitaceae	Leaf paste is used as poultice.
100.	*Ranunculus scleratus*Linn.	Khujil	Ranunculaceae	Boiled extract of plant is applied in blisters andeczema as anticeptic.

101.	*Withaniasomnifera*. (Linn.) Dunal	Asva gandha	Solanaceae	Leaves are antithelmic used on swoolen hands and feet , root is tonic stimulant, narcotic, diuretic, are also used for toning up the uterus of women those show habitual miscarry and glandula swelling.

CHAPTER: X

RESULTS AND DISCUSSION

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RESULTS

AND

DISCUSSION

Rajasthan is situated in the north western part of India between 23^0 3' and 30^0 12' N. Latitude and 69^0 30' and 78^0 17' E longitude, occupying an area of about 3, 42, 274 sq.km. The elevation of land surface varies from 214 to 1375 m. It is rhomboid in shape with north-south 784 kilometer and east-west 850 kilometer diagonals. The western and north-western boundaries are marked by Pakistan. In the north and north-east, it is bounded by Punjab, Haryana and Uttar Pradesh, in the east by Madhya Pradesh and in the south-east by Gujarat state of India.

The climate of Rajasthan is characterized by extremes of temperature and drought with high wind velocity, low humidity, low rainfall and high evaporation. All are in against to support appreciable vegetation.

During post monsoon period and winters i.e. October to January the winds are very light and variable, with north westerly northerly winds being more frequent. In the hot and rainy monsoons, the winds usually move between west and south-west. In summers, dust storms are also very common. Fogs are more frequent, usually occurring between December to January.

Soil of Rajasthan are desert soil, grey brown desert soil, red and yellow soil, ferruginous red soil, mixed red and soil, medium black soil and alluvial soil groups.

KOTA: PHYSIOGRAPHY, SOIL AND CLIMATE

Rajasthan is one of the largest state is situated in the north western part of India covering an area of 3, 42,274 sq. kilometer among 32 states. Rajasthan can be segregated in several specific regions. Hadoti is one such significant region. The Hadoti region constitutes of districts of Bundi, Baran, Jhalawar and Kota. The Hadoti region is surrounded on the western side by the Mewar region (District Udaipur, Bhilwara) of Rajasthan and on the south by the Malwa region of Madhya Pradesh state. The name of the region has been taken up from the Hada Rajputs, which comprises a branch of the great Chauhan Rajput clan. In the Hadoti region, there is Kota, which had gained its status as an independent state in the year 1579. Similarly Jhalawar became separate state in the year 1838.

Kota district in south of Rajasthan is situated at latitude 30° 39.125' N and longitude 78° 31.156' E located along the eastern bank of the Chambal river in the southern part of Rajasthan. It is the 3rd largest city of Rajasthan followed by Jaipur and Jodhpur respectively. It covers an area of approximately 521324 hactare **(**12,436 km²) and it is 3.63 per cent of the Rajasthan State). Out of which forests are 125379 hactare, non-agriculture land is 60021 hectare and cultivable barren land is 23011 hectare. It is divided into five subdivisions namely Kota, Digod, Itawa, Sangod and Ramganjmandi, five tehsils namely Ladpura, Digod, Itawa, Sangod and Ramganjmandi ,three sub tehsils Mandana, Kanwas and Chechat and 864 revenue villages. It has an average elevation of 271 metres (889 ft.). The district is bound on the north and northwest by Sawai Madhopur, Tonk and Bundi districts. The Chambal River separates these districts from Kota district, forming the natural boundary nearly 80% of the mean annual rainfall (1516 mm) occurred in the monsoon season between June and September and 20% fells as snow in winter season. Temperature remains

cool and pleasant round the year. Frost is common during winter season, while the higher elevations. Mean minimum monthly temperature ranges from 7.12°C (Jan) to 23.20°C (Jul) and mean maximum monthly temperature ranged from 17.56°C (Jan) to 33.35°C (Jul) in the year 2009. Kota district is located in the south eastern side in the Rajasthan state between 25°and 25°50' North latitudes and 74°and 25' East longitudes. This district covers an area of 10,4582 square kilometer which is about 3.1% of the total area of state and stands 14th rank amongst districts of Rajasthan and has a population of 20,09,516 (census) Undertaken district Kota occupies an area of 10sq. km. and 2,93,928 population (2011 census).

The alluvial soil, brown soil, yellowish soil and deep medium black soils usually occur together in Kota. They are poorer in carbonate and humus with the pH ranging from 5.21 to 6.96. The soils have good water holding capacity due to considerable percentage of silty loam and silty clay soils. The alluvial soils of recent origin, brown soils of recent origin, yellowish brown soil and deep medium black soil are also common.

Climate of Kota is moderate as the district lies in-between dry climate of western part and humid climate of southern part of Rajasthan. Average minimum temperature of the tehsil ranges from 15-17°C and an average maximum temperature is ranging between 27.5°C to 30.0°. The normal Annual rainfall of the tehsil is 74.54cms, and lasts from July to september. The normal rainy days are about 32 a year.

The location of Kota district in the control eastern part of Aravallis assumed to be ecological significant as it shares the climatic conditions of western arid and south eastern humid zones.

FLORISTIC STUDIES

Starting from Kings “Sketch of the flora of Rajputana” in 1879 many workers have contributed to our knowledge of the flora of Rajasthan. On Great Indian

desert Blatter & Hallberg (1918-1921) published a remarkable work on the plants of the Indian desert. Sarup (1951, 1954) and Sankhala (1951) enumerated plants of the north western Rajasthan. Plants of Jaisalmer and Bikaner were compiled by Sarup (1952a, 1952b, 1957a,1957b, 1958),Dash & Sarup (1951), Agarkar (1952), Ratnam & Joshi (1952), Biswas & Rolla (1953), Nair & Joshi (1955) and Joshi (1958) have studied ecology and plants association of this region. Bhandari (1978) worked on the flora of the Indian Desert make a notable contribution on the flora of the North West part of Rajasthan. Recently, Singh & Singh (2006) made a notable contribution about the Biodiversity of Desert National Park.

Studies on vegetation of north-eastern Rajasthan are made by Sarup (1960, Bharatpur); Vyas (1962. 1967, Alwar); Vyas and, Gupta (1962, Alwar) and Verma (1967, Jaipur). First systematic taxonomic report on Jaipur district was made by Sharma (1974). Shetty & Singh & Sing (1987-93) edited flora of Rajasthan in 3 volumes. Recently Sharma (2002) published the flora of Rajasthan which includes the Hadoti region and more recently, Tiagi and Aery (2007) published the flora of Rajasthan specially the South and south-eastern part of the state.

The presently study is a report based on survey of Angiospermic plants of Kota over a period of three years (2010-11 to 2013-2014). Regular and periodical visits to different habitats were made during these years of intensive survey. A total of 558 species, grouped into 364 genera assigned to 58 families according to Bentham and Hookers system of classification have been recorded from Kota.

This indicate that the floristic composition of Kota is quite rich as compared to Bhandari (1978) who could record 682 species, 352 genera and 67 families from the entire desert belt of Rajasthan. Higher number of angiospermic taxa (1378 speciea, 721 genera, 126 family) in the south and south

east-Rajasthan as reported by Aery and Tiagi (2007) re due to the humid climate conditions of that area. Flora of Kota shares the elements of eastern desert and south eastern humid zone due to its location in the central eastern region of Aravalli ranges. So far number of angiospermic taxa in Rajasthan are concerned, a total of 1910 species belonging to 779 genera and 153 families have been reported by Shetty and Singh (1987-93). This suggests that Kota district area with 558 species from a sizeable component of the angiiospermic flora of Rajasthan.

The number of Families represented by single species is quite high as compared to Indian desert (23 families) and south and south eastern Rajasthan (26 families) reported by Bhandari (1978) and Aery and Tiagi (2007) respectively. It is interesting to note that Shetty and Singh (1978-93) has enumerated 46 families represented by single species from this state.

Families with single genus and two species are: Oxalidaceae, Ebenaceae, Salvadoraceae, Polygonaceae while the families with two genera & two species are: Bombacaceae, Burseraceae, Papaveraceae, Periplocaeae and Pedaliaceae. Meliaceae and Molluginaceae.

Quite a large number of families have the species between three five are: Anacardiaceae, Brassicaceae, Cleomaceae, Capparaceae, Combretaceae, Caryophyllaceae, Chenopodiaceae, Cuscutaceae, Ehretiaceae, Menispermaceae, Myrtaceae, Moraceae, Nyctaginaceae, Lythraceae, Polygalaceae, Portulacaceae, Rhamnacear, Rubiaceae, Sapotaceae, Sorocharitaceae Sterculiaceae and Zygophyllaceae, and

Families in which the number of species in between six to ten are: Apocynaceae, Boraginaceae, Rutaceae, Prophulariaceae Tiliaceae and Verbenaceae.

Families with number of species eleven and more represented by Kota are: Acanthaceae, Amaranthaceae, Asteraceae, Asclepiadaceae, Cyperaceae,

Caesalpiniaceae, Cucurbitaceae, Euphorbiaceae, Memosaceae, Malvaceae, Papilionaceae, Convolvulaceae, Solanceae, Lamiaceae and Poaceae.

The number of families represent by 3-5 species have been fund to be maximum (except 1 families with 1 genus, 1 species) in the investigated area, the similar results have also been reported by scandari (1978) for India Desert where number of such families is and by Shetty and Singh (1987-93) for Rajasthan (36 families).

15 familes are represented by more than 10 species in the Kota district are while almost similar number (16 families) of these families has been reported by Bhandari(1978). A higher Number of such families (31) is recorded by Aery & Tiagi(2007) for me south and south eastern part of Rajasthan.

There are about 70, tree species including masophanerophytes. They attain a height of 8 to 30 M. and microphanerophytes reaching a height of 8 M. Threr is not a single tall tree or megaphenerophyte in this area of the Kota tehsil, Only 32 families are represented by trees. These are Bombacaceae, Sterculiaceae, Rutaceae, Simaroubaceae, Balanitaceae, Burseraceae, Meliaceae, Celastraceae, Rhamnaceae, Sapindaceae, Mimosaceae, Rosaceae, Myrtaceae, Lythraceae, Rubiaceae, Sapotaceae, Ebenaceae, Oleaceae, Salvadoraceae, Ehretiaceae, Bignoniaceae, Verbenaceae, Santalaceae, Ulmaceae, Moraceae, Arecaeae and Pandanceae.

The percentage of trees in the area under investigation is 16% which is maximum as compared to western Rajasthan, (Bhandari, 1978), North east Rajasthan, 9.21%(Sharma and Tiagi,1979) and Ajmer, 11.34%(Sharma, 1974) but percentage of trees in this area is quite low as compared to the normal spectrum 28% (Raunkaier, 1934).

13 Species, distributed among different families are occurring as perennial climbers in this area.

Papilionaceae is the only family showing all the habit forms trees shrubs, climbers and herbs. Those which are represented herbs, shrubs and trees are:, Caesalpiniaceae, Fmosaceae, Rubiaceae, Tiliaceae and Verbenaceae.

In present investigation the ratio of the total number of genera to species is 1 : 3 which is low in comparison to a corresponding ratio for whole of India (1:7) but it is more or less in conformity with this ratio for the Gangetic plain region (1 : 2.2) Hooker (1907), that of Delhi State (1 : 1.63) Maheshwari (1963) Western Rajasthan (1 : 1.9) Bhandari (1978) and North Eastern Rajasthan (1 : 1.8) as reported by Sharma & Tiagi (1979).

It is also interesting to note that the percentage occurrence of the genera (80.77%) and species (80.82%) of dicotyledons abd monocotyledons (19.23%) genera and 19.18% species) is more or less dentical.

In Flora of south and south eastern Rajasthan (Tiagi & Aery, 2007) the top three families are Leguminosae, Poaceae and Asteraceae. In the adjoining districts/region of the State of Rajasthan , Families Poaceae, Leguminosae, Asteraceae & Cyperaceae abd their places at 1st, 2nd, 3rd and 4th position respectively in the list of dominant families but in Indian desert (Bhandari, 1978) the 4th position occupied by Convolvuaceae while in upper gangetic plains , Cyperaceae & Asteraceae 3rd & 4th position respectively.

The present study revealed that the family Poaceae occupies the top position in the flora of Kota followed by Fabaceae, Asterceae, Cyperaceae, Acanthaceae, Amaranthaceae, Malvaceae,Euphphorbiaceae and Convolvulaceae (Table No.:13) occupy from third to tenth positions respectively. It is more or less similar to Flora of Rajasthan- Hadoti Region (Sharma, 2002) and Flora of Rajasthan (Shetty and Singh, 1987). It may be mentioned here that family

TABLE: - 12

RELATIVE DOMINANCE OF FAMILIES OF KOTA STUDIED WITH OTHER REGIONS OF COUNTRY

S. No.	Flora of Kota (Presented Work)	Flora of Upper Gangetic Plain (Duthie 1907)	Flora of Delhi (Maheshwari,1963)	Flora of NE Rajasthan (Sharma ,1974)	Flora of the Indian Desert (Bhandari,1978)	Flora of Rajasthan (Hadoti) (Sharma ,2002)
1.	POACEAE	POACEAE	POACEAE	POACEAE	POACEAE	POACEAE
2.	FABACEAE	FABACEAE	FABACEAE	FABACEAE	FABACEAE	FABACEAE
3.	ASTERCEAE	CYPERACEAE	ASTERACEAE	ASTERACEAE	ASTERACEAE	ASTERACEAE
4.	CYPERACEAE	ASTERACEAE	CYPERACEAE	CYPERACEAE	CONVOLVULACEAE	CYPERACEAE
5.	ACANTHACEAE	SCROPHULARIACEAE	ACANTHACEAE	CONVOLVILACEAE	MALVACEAE/ CYPERACEAE	EUPHORBIACEAE
6.	AMARANTHACEAE	MALVACEAE	EUPHORBIACEAE	AMARANTHACEAE	CUCURBITACEAE	MALVACEAE ACANTHACEAE
7.	MALVACEAE	ACANTHACEAE	CONVOLVULACEAE	BORAGINACEAE	ACANTHACEAE	CONVOLVULACEAE SCROPHULARIACEAE
8.	EUPHPHORBIACEAE	EUPHORBIACEAE	MALVACEAE	CUCURBITACEAE	EUPHORBIACEAE	CUCURBITACEAE
9.	CONVOLVULACEAE	COVOLVULACEAE	AMARANTHACEAE	EUPHORBIACEAE	SCROPHULARIACEAE	RUBIACEAE
10.	RUBIACEAE	LAMIACEAE	SCROPHULARIACEAE	MALVACEAE	AMARANTHACEAE/ BORAGINACEAE	LAMIACEAE

Poaceae has been reported to occupy first position among the ten dominant families for rest of Rajasthan (Bhadari, 1978, Sharma & Tiagi 1979).

VEGETATION:-

A general survey of vegetation of Kota district was conducted for the following different areas:

i. Plains
ii. Hills and Hillocks
iii. Agriculture fields
iv. Road Sides
v. Aquatic and Water logged areas
vi. Aquatic Wetlands
vii. Urban Area

i. Plains:-

The plain localities are represented by trees like *Prosopis chilensis, Holoptelea integrifolia, Maytenus emarginatus, Butea mpnosperma, Phoenix sylvestris, Acacia leucophloea,* along with the shrubs and bushes like *Capparis decidua, Lantana camara, Capparis sepiaria* and *Zizyphus nummularia.*

During rainy season, the area turns into green carpet of sami xerophytic and meadow herbs. The life cycle of most of the herbs comes to close before the winter sets in. Some of the plant species such as *Crotalaria, Indigophera, Polygala, Tridex, Glossocordia, Convolvulus* and several grasses like *Aristida, Cenchrus, Chloris, and Eragrostis* are common herbaceous taxa of these areas.

ii. Hills and Hillocks:

The majority of hills and hillocks are almost barren but the vegetation comprises of trees like *Anogeissus pendula, Maytenus emerginatus, Boswellia serrata, Diospyros cordifolia, Wrightia tinctoria* and *Acacia nilotica* along with the shrubs like *Dichrostachys cinerea, Euphorbia caudicifolia* and *Grewia tenax.* These areas become lush green during rainy season and shows surface flora full with plants of family asteraceae, poaceae cyperaceae and papilionatae.

iii. Agriculture fields:

The trees of agriculture field are *Ailanthus exelsa, Azardirachta indica, Butea monosperma, Mangifera indica, Dalbergia sissoo, Prosopis cineraria, Moringa oleifera* and *Zizyphus mauritiana.* Shrubs like *Clerodendrum phlomidus, Euphorbia caudicifolia and Lantana camara* are commonly growing as hedge shrubs along the boundries of agricultural fields.

iv. Road Sides:

During the field trip trees and shrubs of agriculture field are *Ailanthus exelsa, Azardirachta indica, Butea monosperma, Mangifera indica, Dalbergia sissoo, Prosopis cineraria, Moringa oleifera* and *Zizyphus mauritiana.* Shrubs like *Clerodendrum phlomidus, Euphorbia caudicifolia and Lantana camara* are commonly growing as hedge shrubs along the boundries of agricultural fields.

v. Aquatic and Water logged areas:

Plant in aquatic and water logged sites like Chambal river, Kalisindh river, Abheda pond, Kishore sagar, Alania dam etc. are mainly *Eichornia crassipes, Fimbristylis ferruginea, Nelumbo nucifera, Hydrilla verticillat, Egeria densa, Ipomoea aquatica, Ipomoea carnia, Nymphaea nauchali, Nymphoides indica Lemna perpusilla, Sagittaria guayanensis,Typha angustifolia, Trapa natans and Ceratophyllum demursum.*

vi. Aquatic Wetlands:

Plant in wetlands near by aquatic vegetation sites are mainly *Fimbristylis ferruginea, Cyperus difformis, C. rotundus Schoenplectus articulates, S. supinus, Monochordia veginalis, Ipomoea carnia, Bacopa monnieri, Sphaeranthus indicus, Polygonum barbata, Grangea maderaspatana,Typha angustifolia,Chinopodium murale, C. album etc.*

vii. Urban Area:

The cities Kota district was surveyed at different times of the year. The tree flora of the areas is represented by *Albizia lebbeck, Azardirachta indica, Cassia fistula, Dalbergia sisoo, Eucalyptus camaldulensis, Ficus religiosa, Ficus bengalensis, F.glomerata, Michelia champaca, Parkinsonia aculeata, Polyalthia longifolia, Phyllanthus emblica, Tamarindus indica* and *Pongamia pinnata*.

Thus a variety of vegetation occurs in Kota district that represents not only deciduous but also aquatic and xerophytic on hilly areas. The natural aquatic boundry prepared by Chambal River and Kali Sindh River around Kota provides rich vegetation areas in through out the district. Even canals and ponds with their wetlands are full with a variety of vegetation.

SYSTEMATIC ENUMERATION OF PLANT:

Floristic survey of Kota district has been taken up to evaluate the angiosoermic species composition. Topographically Kota comprises of hillocks, plain areas and cultivated fields. The vegetation which is edaphically as well as climatically controlled shows much variation from the view point of species composition, density and frequency at various habitat of Kota district were collected during the present investigation is given below:

During the present investigations a total of 623 plant species belonging to 377 genera and 91 families have been collected. Out of 377 genera, 292 are from dicotyledonae and 85 are from monocotyledonae. These 623 plant species were divided into Phanerophytes, Nanophytes, Chamaephytes, Geophytes, Hydrophytes, Therophytes and Parasites. Maximum about 50% were Therophytes those are annual and perennating by seed-embryo and least were Parasites with less than 1%. The total stem parasite as *Cuscuta reflexa* and *Cuscuta hylina* are rootless and leafless and are found on *Zizyphus mauritiana, Z. nummularia, Xanthium indicum, Cassia fistula* and *Calotropis procera*.

Common plants in soil of plains were *Ageratum conyzoides, Cleome viscosa, C. gynandra, Corchorus depressus, Echinops echinatus, Launaea procumbens, Caesulia axillaris, Xanthium indicum, Fagonia cretica, Spergula arvensis* and *Tridex procumbent.*

The characteristic climbers which cover the other plants are *Tinospora cordifolia, Rhynchosia minima* and *Pergularia daemia.*

The ten dominant families occurring in study area. Family Poaceae tops the list, followed by Fabaceae, Asterceae, Cyperaceae, Acanthaceae, Amaranthaceae, Malvaceae, Euphphorbiaceae and Convolvulaceae This relative dominance shows more or less resemblance with Flora with Delhi, Flora of upper Gangetic plains, Flora of North West Rajasthan, Flora of Indian Desert and Flora of Rajasthan (Hadoti region).

Poaceae, Fabaceae and Asteraceae are the top three families which exchange their position in the Flora of different regions related to Rajasthan, Gujrat and Upper gangetic plains.

Aquatic angiosperms were studied as special reference. During the study of 19 aquatic and semi aquatic plants families were identified. Families with maximum plant species were Hydrocharitaceae, Nymphaeaceae,

Convolvulaceae, Pontederiaceae, Cyperaceae, Lemnaceae, Aracaceae, Potamogetonaceae, Najadaceae and Oxalidaceae.

Urbanisation, industrialization and deforestation are the major factors in the study area which determine the growth and development of vegetation. Forest area still a big source of fire wood, charcoal production and grazing of livestock. Cutting of trees and shrubs for livestock and man himself shows adverse effect on vegetation in study area. Animals like Goat, Sheep and Camels are the worst destroyers of natural vegetation.

Second important reason is the urbanization and uncontrolled spreading of metalloid roads that result into wiping off of vegetation. Soil pollution in forests also shows adverse effect on vegetation. Allien plants like such as *Parthenium, Hemalia, Lantana* and *Prosopis juliflora* have also responsible for changing scenario of native vegetation. In aquatic areas uncontrolled growth of *Eichhornia crassipes* is also responsible for threats of native aquatic plant species.

Thus, in the study area Kota abiotic as well as biotic factors are not favourable to vegetation establishment, regeneration and existence.

An attempt has also been made to document wild medicinal and economically important plants of the study area. Plants of timber and firewood value are *Acacia nilotica, Acacia senegal, Azardirachta indica,, Bauhinia variegate, Butea monosperma,Cassia siamea,Dalbergia sissoo, Ficus bengalensis, Ficus religiosa, Pongamia pinnata, Prosopis cineraria,, Prosopis juliflora, Zizyphus mauritiana* and *Zizyphus nummularia.* Major plants to provide fruits, vegetables and edible seeds are *Pheonix sylvestris, Mangifera indica, Capparis decidua, Trapa bispinosa, Zizyphus mauritiana, Ficus glomerata, Tamarindus tinctoria, Moringa oleifera, Chenopodium murale, Prosopis cineraria* and *Butea monosperm*

The plants with spiritual value are *Datura alba, Aegle marmelos, Datura stromonium, Ficus religiosa, Trapa bispinosa, Prosopis cineraria, Ficus*

bengalensis, Cynodon dacytylon, Ocimum sanctum etc. For fodder purpose *Acacia nilotica, Prosopis cineraria, Cynodon dactylon, Ziziphus mauritiana, Capparis sepiaris, Moringa oleifera* and *Azardirachta indica* are the source green fodder.

In urban area many plants were identified for their ornamental value. Some of them are *Ageratum conzoyides, Asparagus officinalis, Baugainvillea sps, Magnolia champaka, Butea monosperma, Catharanthus roseus, Hibiscus rosa -sinensis, Nireum indicum, Rhoeo discolor, Tagetes erecta* and *Thevatia peruviana.*

During the study medicinal plants were also identified and enumerated. Some of them are *Aloe vera, Acacia nilotica, Achyranthes aspera, Ageratum conyzoides, Amaranthus polygamous, Canabis sativa, Ficus glomerata, Argemone maxicana, Azardirachta indica, Bacopa monnieri, Calotropis procera, Cuscuta reflexa, Datura inoxia, Moringa oleifera, Ocimum sanctum, Phoenix dactylifera, Salvadora persica, Withania somnifera, Xanthium strumarium, Adhatoda vasaka, Butea monosperma, Ficus religiosa, Eclipta alba* and *Boerhavia diffusa.*

Important observation during study is that environmental analysis of the study area indicates that rainfall and soil factors favours vegetation to develop, as the soil of the tehsil area is fertile and annual rain fall is sufficient. Many water storage bodies like canals, rivers, ponds and dams also favour vegetation development and establishment. But uncontrolled urbanization, deforestation, high temperature, irregular shower and sometimes long spell of drought are harmful to vegetation. Man him self as biological factor destroying vegetation for firewood, coal formation and fodder for their livestock.

As an importance of the presented study of the flora of Kota district with special reference to aquatic plants, studied and discussed in the light of research

carried out by earlier workers. This study will result in a valuable reference for all those who are concerned with plants in one way or others in general and students of taxonomy in particular. Also, this will be useful to foresters, phytochemists and to those interested in the medicinal and other aspects of plants. The information will also be of use in the revision of the national flora of India and state flora of Rajasthan.

THREATS TO BIODIVERSITY

Kota is unique, incomparable and one of the most unusual areas of the state, because, from Western side Thar Desert started from some distance & eastern the Daccan plateau started. This area is intermediate between these two region. The area also sustain a unique floral composition and harbor a variety of wildlife, characteristic to the area Kota area is facing natural and anthropogenic threats to the extent that if immediate measures are not taken towards forcible implementation of conservation laws, the area will be denuded, converting into the wasteland. Under these circumstances, three will be hardy any other location in the suitable establishing a conservation unit and real forest ecosystem will become historical events. Presently, the biodiversity of Kota is facing mainly threats leading to depletion of floral resources & ecosystem as a whole.

CAUSES OF DEPLETION OF NATURAL VEGETATION:

1. Rural settlement and Population Pressure:

In natural areas of Kota district houses or huts are made of mainly tree, shrubs & under shrubs like *Acacia nilitoca, Apluda mutica, Butea monosperma, Capparis decidua, Dichanthium annulatum, Leptadenia pyrotechnica, Prosopis cineraria, Phoenix sylvesris*, *Sorghum halepense* etc. Increasing population need more and more plant material for houses, food, and land for settlement.

These result into deforestation and shrinking of forest areas that is fatal for natural vegetation.

2. Grazing:

Animals like buffalo, cows, goats, sheep and camels are the main livestock of the tehsil area. Fodder from fields is not sufficient for this livestock as such and therefore, grazing is an unavoidable necessity in tehsil area, in addition to this, a large number of herbs.

3. Military activities

In military training area small decorative parks are developed by army areas but for the training activities and continuous training of fire weapon large area is destroyed that is not recovered. There is a need to recover that area, alternative area should be used periodically.

4. Tourism

Recently, the number of local and foreign visitors to Kota has increased rapidly. The increasing interest in wildlife tourism and the geographical location of the Kota district have made this area internationally popular. Film industry persons for film shooting, development of Television serials, shooting of private albums and TV advertisements are also giving priority to the landscape locations of Kota. It results into increase in the number of visitors to the natural plant sites. Most of the tourists concentrate on their own aims and objective and ignore natural vegetation and wildlife laws. Increasing tourism pressure has resulted into high pressure of transport vehicles, plastic bags, tin cans, waste material, wastages of food, cigarette butts, water and beverages bottles etc. cause ill effects on the natural vegetation. Thus, the tourism is also causing degradation of ecosystem.

5. **Drought and Floods:**

Ramganj Mandi areas and areas near Kali Sindh river are flood prone areas and central areas of Kota drought during fewer rains and high temperature. These drought and floods destroy the vegetation cover in Kota. Although, flow of rivers during whole year can support adjacent vegetation areas but during drought the cattle like goats, sheeps, cows and somewhat camels eat grass, climbers, low height trees. Continuity of this practice in drought period stops the recovery of vegetation wealth.

CONSERVATION AND MANAGEMENT STRATEGIES:

In view of present situation of vegetation deterioration some reforms may be possible. The threats to the biodiversity and ecosystem have badly damaged the ecological system of district upon which entire life support system is based. Unfortunately, the stress on the environment and it's natural living resource is increasing day by day with the development activities and advancement of civilization eradicating the natural ecosystem and biological wealth. District Kota harbours several economic and medicinal plants, wild relatives of crop plants, endemics and other plants facing threats in ecosystem. The importance of biodiversity may be understood, but it is not easy to define the value of biodiversity and very often difficult to estimate. There therefore be prudent to not only conserve the species we already have information about but also the species we have not yet identified and described from economic point of view.

During present study focus has been made on the management programmes and practices being followed at Kota in relation to the local problems. The residents are illiterate and economically poor having no alternative for their livelihood. There is immediate necessity of health and education facilities to be provided to local communities. Further attention should be given to provide alternative sources for the items they depend on

biodiversity. This effort will remove gaps between managers and local communities and develop a hormonal relationship.

Population management of cattle in relation to wildlife health would also a reform. Very scantly scientific information is available on the biology of vegetation and wildlife of Kota and no measures have been adopted to treat their ailment and management of their animals population At last, it's a conclusion that, to get high conservation status, it is necessary to have Annual Action plans with actual working for vegetation based on research data in different fields and their implementation..

CHAPTER: XI

SUMMARY

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SUMMARY

The present study is a report based on survey of flowering plants of the Kota district during last four years. 57 visits to 28 vegetation sites of different habitats were made. During survey1231 specimens were collected, which is worked to be six hundred and twenty seven species, grouped in to three hundred forty three genera. Nomenclature of two hundred forty one non- aquatic and semi aquatic plants belonging to seventy three families was assigned.

Thirty six aquatic plant species belonging to twenty two families were identified. These were pure aquatic plant species in aquatic sites of the area.

Plant species belonging to Convolvulaceae, Polygonaceae, Cyperaceae and Apiaceae were both in aquatic and terrestrial habitats. So, in exact **Ninety one families** were studies during the survey.

. Family Poaceae tops the list, followed by Fabaceae, Asterceae, Cyperaceae, Acanthaceae, Amaranthaceae, Malvaceae, Euphphorbiaceae and ConvolvulaceaeTwenty-seven families are monotypic, nine mono-generic, and twelve are represented by more than ten species

Maximum plants are therophytes followed by phanerophytes, chamaeophytes and hemicryptophytes.

One hundred and one species carry medicinal importance in Ayurveda; twenty-seven are in use as fodder; six yield timbers and seven are source of fiber, paper-pulp, gum, resin and other miscellaneous products.

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ORAL/POSTER PRESENTATIONS DURING SEMINARS/ CONFERENCES PARTICIPATION

S. No.	Seminar/Conference	Organizing Institute	Title of Presentation	Oral/ Poster
1.	22nd APSI Scientists Meet 2013& National Conference on "Sustainable Utilization of Plants For Millennium Development" (2nd to 4th February 2013)	Modi Institute of Management and Technology, Kota, Raj. And University of Kota, Rajasthan	Systematic Survey on Some Aquatic Angiosperms of Chambal River of Kota, Raj.	Poster Presentation
2.	8th Biyani International Conference (BIOCON-13) on Agro-biodiversity and their Impact on Global Challenges (September 23, 2013)	Faculty of Science and Nursing, Biyani Girl's College, Jaipur, Rajasthan	Some Important Aquatic Angiosperms Of Urpuria village of Kota District Of Rajasthan, India	Paper contribution and Participation
3.	National Conference on "Biodiversity Conservation: Embracing our Future, Preserving our Past."(27-28 September, 2013)	IIS University, Jaipur and Indian Science Congress Association, Jaipur Chapter	Systematic Survey of Some Aquatic angiosperms of Alania River of Kota Rajasthan	Poster Presentation
4	National Seminar on Socio-legal issue and Challenges of Female Foeticide and Infanticide in India (4th -5th October, 2013)	Women Cell, University of Kota, Kota, Rajasthan	----------	Participation only
5.	National Conference on Global Environmental Changes and Disaster Management for Sustainable life on Earth- A burning issue. (21st October , 2013)	Maharshi Arvind College of Engineering and Technology, Ranpur, Kota, Rajasthan	Phyto-Ecological Study On Abheda Pond Aquatic Habitat of Kota, Rajasthan	Poster presentation
6.	National Conference on Ecological Perspective of Rain Water harvesting and Ground water Recharge (3-4 January, 2014)	Department of Zoology, Government College, Ajmer, Rajasthan	Taxonomic Survey of some Angiosperms of Kalisindh River and it's neighbouring wetland of Kota district of Rajsthan, India	Poster Presentation
7.	ENERGY MEET-2013 (December 02, 2013)	Department of Pure and Applied Physics, University of Kota, Rajasthan	Biofuel Yielding Crop and Non Crop Plants of Kota District of Rajasthan, India	Poster Presentation
8.	National Seminar on Environmental Issues and Social Concerns (21-22 March, 2014)	Department of Social Science , University of Kota, Kota, Rajasthan	----------	Participation Only

APPENDIX: I

RESEARCH PAPERS PUBLISHED DURING RESEARCH TANURE

S. No.	Title of Research Paper	Name of Journal	ISSN No. (Print/Online)
1.	Systematic Survey of Some Aquatic Angiosperms of Chambal River of Kota District of Rajasthan, India	International Journal: Advances in Plant Science, Muzaffarnagar, U.P. Vol. 26(II) , 2013: 407-410	ISSN 0970 – 3586 (Print)
2.	Systematic Survey of Some Angiosperms of Family Asteraceae From Kota District of Rajasthan, India	Asian Journal of Advanced Basic Science, Himachal Pradesh Vol. 2(2), 2014, 1-5	ISSN: 2347 - 4114 (Online)
3.	Systematic Survey of Some Angiosperms of Family Asteraceae From Kota District Of Rajasthan, India-II	International Journal of Science and Nature, Dehradun, U.P. Vol.5 (1) 2014: 183-185	ISSN 2278 – 9103 (Print)

INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

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Short Communication

SYSTEMATIC SURVEY OF SOME ANGIOSPERMS OF FAMILY ASTERACEAE FROM KOTA DISTRICT OF RAJASTHAN, INDIA-II

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ABSTRACT
The present systematic survey deals with vegetation of habitats of Kota district of Rajasthan state. Exploration tour was conducted to determine plants of family Asteraceae from various habitats that resulted into occurrences of 08 plant species. Taxonomic position of these plant species is described in various available Floras of different regions of the Rajasthan state.

KEY WORDS: Asteraceae, Angiosperms, Kota.

INTRODUCTION
Previous studies on systematic enumeration of South East Rajasthan especially of Kota district have been contributed by Majumdar (1971, 1976 and 1980) in form of Synoptic flora of Kota division. Sharma and Tiagi (1979), Sharma (2002a, 2002b), Sharma and Siringi (1986) have also made significant contributions. Flora of Rajasthan by N.K. Sharma (Floristic studies on Hadoti region. 2002) provides a vast account of angiosperms. This communication describes systematic survey of some plants of family Asterceae from the study area.

Study Area
Kota district is situated in South of Rajasthan at latitude 30° 39.125' N and longitude 78° 31.156' E. and is located along the eastern bank of the Chambal river, covering an area of approximately 521324 hectare (12,436 km²) and that is 3.63 per cent of the Rajasthan State. Out of which, area of forests is 125379 hectare, non-agriculture land is 60021 hectare and cultivable barren land is 23011 hectare. The Chambal River is natural boundary of Kota district that separates Kota from neighboring Sawai Madhopur, Tonk and Bundi districts by forming the natural district boundary.

Climate
Precipitation from June and September is nearly 80% of the mean annual rainfall (1516 mm) and remaining 20% falls in winter season. Overall climate is moderate. Frost is common during winter season. Mean of minimum monthly temperature ranges from 4.7°C (Jan) to 24.2°C (Jul) and mean of maximum monthly temperature ranged from 21.2°C (Jan) to 33.10°C (Jul) in the year 2011.

METHODOLOGY
The studied plants of family Asteraceae from study area is based on the results obtained from both extensive and intensive studies of the vegetation. 'Quadrat Method' was used for collection of these herbaceous plants. Identification of plant species during field survey was done by compiling different floras available i.e. Flora of Rajasthan by N.K. Sharma that deals with Hadoti region (District Kota, Baran and Jhalawar), Flora of Delhi by J.K. Maheshwari, and Flora of Indian Desert by M.M. Bhandari and authenticated at Herbarium, Department of Botany, University of Rajasthan, Jaipur. The photographs of all the eight plant species were taken during field trip.

RESULTS AND DISCUSSION
Systematic survey of studied plant species is described under (FIG: 1 A-H)-

1. *Launaea procumbens (Roxb.) Ramayya & Rajgopal*

Launaea procumbens (Roxb.) Ramayya & Rajgopal in Kew Bull. 23:465.1969; Bhandari, Fl. Indian Desert 182. 1978; cop; Shetty & Singh Fl. Rajasthan 1: 423. 1987; Mamgain & Rao, in Hazra et al. Fl. India 12:303. 1995; ***Chondrilla nudicaulis*** Linn. Mant. 273.1767; ***Prenanthes procumbens*** Roxb., Fl. India 3: 404. 1832; ***Launaea nudicaulis*** (Linn.) Hook. f., Fl. Brit. India 3: 404.1881; non Less. 1832; Duthie, Fl. Gangetic Plain 1: 494. 1905; Maheshwari, Fl. Delhi. 189, 1963. Maheshwari, Ill. Fl. Delhi. F.99, 1966. Shetty & Singh Fl. Rajasthan 1: 423. 1987. Sharma, Fl. Raj (Hadoti). 108, 2002. Yadav and Meena, Fl. SC Raj. 200, 2011.

Erect, biennial, several flowering stems arise from base, leafy Herb stem 60-80 cm, branched, Leaves sessile, whorled, pinnatified, minutely toothed, acute apex, dentate margin, Inflorescence-head, Flowers bright yellow, ligulate ray florets and tubular disc florets both present, fruits acenes.

Vernacular Name- Jangi Gobi, Gobi
Specimen Examined- SUBHASH/TH /121(GCK)

2. *Blumea mollis (D. Don) Merr. Phillip*

Blumea mollis (D. Don) Merr. Phillip J. Sci (Bot.) 5: 395.1910; Hook. f., Fl. Brit. India 3: 261. 1881; Duthie, Fl. Gangetic Plain 1: 453. 1905; Maheshwari, Fl. Delhi. 195, 1963. Sharma and Tiagi Fl. NE Raj. 199, 1979. Shetty & Singh Fl. Rajasthan 1: 398. 1987. Kumar, in Hazra et al.

Fl. India 13:135-137. F. 41. 1995; Erigeron mollis D. Don. Prodr. Fl. Nepal.192.1825; ***Blumea wightiana*** DC. In Wight, Contrib. Bot. Ind. 14.1834; ***B. neilgherrensis*** Hook.f.l.c.3:261.1881. (Plate 156); DC. In Wight, Contrib. Bot. Ind. 14.1834 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 171, 1996. Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 195, 2011. Erect, annual wooly herb, stem 11-55 cm long, branched at base, Leaves alternate, narrow at base, ovate, covered with soft hairs, dentate margin, obtuse apex, dense spike of heads, unrobed angled achenes.

Vernacular Name - Kakronda, Mridu Chhada (Sanskrit)
Specimen Examined - SUBHASH/TH/122(GCK)

3. *Cotula hemisphaerica (Roxb.)Wall. Ex Benth & Hook.*
Cotula hemisphaerica (Roxb.)Wall. Ex Benth & Hook. Fl. Ind. 3: 447. 1832; Hook. f., Fl. Brit. India 3: 358.1881; Duthie, Fl. Gangetic Plain 1: 480. 1905; Maheshwari, Fl. Delhi. 196, 1963; Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979; Shetty & Singh Fl. Rajasthan 1: 408. 1987; Hajra in Hajra *et al.* Fl. India 13: 178. 1995. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 176, 1996. Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 197, 2011.
Prostrate, annual, many branched diffused herb, stem glabrous, branched, spinulated, Leaves alternate, pinnatified into thin linear segments, heads bisexual, pale yellow, solitary, angled achenes.

Specimen Examined: - SUBHASH/TH/123(GCK)

4. *Tridex procumbens Linn.*
Tridex procumbens Linn. Sp. Pl. 900.1753; Hook. f., Fl. Brit. India 3: 311.1881; Duthie, Fl. Gangetic Plain 1: 475.1905; Maheshwari, Fl. Delhi. 199, 1963; Bhandari, Fl. Indian Desert 190. 1978 Sharma and Tiagi Fl. NE Raj. 220, 1979. Shetty & Singh Fl. Rajasthan 1: 439. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 192, 1996. Sharma, Fl. Raj (Hadoti). 111, 2002. Yadav and Meena, Fl. SC Raj. 204, 2011.
Prostrate, annual, diffused herb, stem erect/ prostrate 40-60 cm long, nodes show rooting, branched, Leaves simple opposite, sub sessile, ovate/ elliptical, hairy surface, acute apex, petiole and young branches densely hairy, Solitary apical heads, 5/6 toothed ligulate ray floret, Many tubular disc florets, silky black cypsela.

Vernacular Name- Ghamraj (Hindi), Jayanti veda (Sanskrit)
Specimen Examined - SUBHASH/TH/124(GCK)
Local uses- Leaves are used for stone querries, leaf juice used for first aid dressing on wounds.

5. *Gnaphalium luteo-album Linn.*
Gnaphalium luteo-album Linn. Sp. Pl. 185. 1753; Hook. f., Fl. Brit. India 3: 288.1881; Duthie, Fl. Gangetic Plain 1: 461. 1905; Maheshwari, Fl. Delhi. 194, 1963. Bhandari, Fl. Indian Desert 180. 1978; Sharma and Tiagi Fl. NE Raj. 208, 1979. Shetty & Singh Fl. Rajasthan 1: 415. 1987. Pant in Hajra *et al.* Fl. India 13: 87. 1995. ***Gnaphalium luteo-album*** Linn. var. pollidium Hook. f., l.e. 3: 288.1881; ***G. luteo-album*** Linn. subsp. pollidium (Lam.) Mahesh. Bombay Nat. Hist. Soc. 57. (2). 377. 1960; Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 178, 1996. Sharma, Fl. Raj (Hadoti). 106, 2002. Yadav and Meena, Fl. SC Raj. 199, 2011
Erect/Semi prostrate, annual, white wooly herb. stem 15-30 cm long, branched, Leaves alternate, sessile, oblong linear, wooly surface, 4mm long, corymb heads white pale, heterogenous, axillary, sessile, florets light yellow, fruits flat cypsela.
Specimen Examined: - SUBHASH/TH/125(GCK)

6. *Parthenium hysterophorus Linn.*
Parthenium hysterophorus Linn. Sp. Pl. 988. 1753; Rao, in J. Bombay Nat. Hist. Soc. 54: 218. 1956; Raizada, Suppl. Duthie, Fl. Gangetic Plain 127. 1976; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 189. 1978; Shetty & Singh Fl. Rajasthan 1: 425. 1987. Choudhary in Hajra *et al.* Fl. India 12: 403. f. 113. 1995; Sharma, Fl. Raj (Hadoti). 108, 2002. Yadav and Meena, Fl. SC Raj. 201, 2011.
Erect, annual, herb, stem 40-150 cm long, much branched, Leaves alternate, lanceolate, corymb heads, terminal and axillary, pale white, heterogenous, ray florets 5, many tubular disc florets, flat achenes,
Vernacular Name- Wild carrot weed (English), Gajar Ghaas and Jhilmil (Hindi)
Specimen Examined- SUBHASH/TH/125(GCK)

7. *Vernonia cinerascens Sch.-Bip.*
Vernonia cinerascens Sch.-Bip. In Sch.-Bip. In Schwweinf. Beitr.Aethiop. 162. 1867; Fl. Ind. 3.610. 1832; Uniyal in Hajra *et al.* Fl. India 13: 364. f. 115. 1995; Hook. f., Fl. Brit. India 3: 237.1881; Duthie, Fl. Gangetic Plain 1: 441. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 190. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 443. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 193, 1996. Sharma, Fl. Raj (Hadoti). 111, 2002. Yadav and Meena, Fl. SC Raj. 204, 2011.
Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, petiolate, sphathulate,, 3-5 lobed, acute apex, narrow, corymbose head, purple coloured, homogenous, 3-5 bracts in involucre, fruits acenes.
Vernacular Name- Sandri, Vishvadeva (Sanskrit)
Specimen Examined - SUBHASH/TH/127(GCK)

8. *Pulicaria angustifolia DC.*
Pulicaria angustifolia DC. Prodr. 5: 479.1836; Hook. f., Fl. Brit. India 3: 299.1881; Duthie, Fl. Gangetic Plain 1: 465. 1905; Bhandari, Fl. Indian Desert 187. 1978; Sharma and Tiagi Fl. NE Raj. 215, 1979. Shetty & Singh Fl. Rajasthan 1: 429. 1987. Sharma, Fl. Raj (Hadoti). 109, 2002. Yadav and Meena, Fl. SC Raj. 201, 2011.
Erect, annual, herb, woolly, stem 50-60 cm high, branched at base, Leaves sessile, linear, abovate, acute base, solitary terminal heads, yellow, heterogenous, ligulate ray florets, 6-8 mm, hairy acenes,
Specimen Examined: - SUBHASH/TH/127(GCK)

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Systematic survey of some angiosperms of family Asteraceae from Kota District of Rajasthan, India

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ABSTRACT: The present study deals with vegetation of habitats of Kota district of Rajasthan state. Plant exploration was conducted to determine plants of family Asteraceae from various habitats revealed occurrences of 10 plant species. Taxonomic position of these plant species is described in various available Floras of different regions of the Rajasthan state.

Key words: Asteraceae, Angiosperms, Kota.

INTRODUCTION

Earlier works on systematic enumeration of South East Rajasthan especially of Kota district have been contributed by Majumdar (1971, 1976 and 1980) in form of Synoptic flora of Kota division. Sharma and Tiagi (1979), Sharma (2002a, 2002b), Sharma and Siringi (1986) are also have made significant contributions. Flora of Rajasthan by N.K. Sharma (Floristic studies on Hadoti region. 2002) provides a vast account of angiosperms. This paper describes systematic survey of some plants of family Asterceae from the study area.

Study Area: Kota district is situated in South of Rajasthan at latitude 30° 39.125' N and longitude 78° 31.156' E. and is located along the eastern bank of the Chambal river. It covers an area of approximately 521324 hectare (12,436 km²) and it is 3.63 per cent of the Rajasthan State. Out of which, forests are 125379 hectare, non agriculture land is 60021 hectare and cultivable barren land is 23011 hectare. The Chambal River is natural boundary of Kota district that separates Kota from neighboring Sawai Madhopur, Tonk and Bundi districts by forming the natural district boundary.

Climate: Precipitation in Kota is nearly 80% of the mean annual rainfall (1516 mm) occurs during monsoon season between June and September and remaining 20% falls in winter season. Temperature remains cool and pleasant round the year. Overall climate is moderate. Frost is common during winter season. Mean of minimum monthly temperature ranges from 4.7°C (Jan) to 24.2°C (Jul) and mean of maximum monthly temperature ranged from 21.2°C (Jan) to 33.10°C (Jul) in the year 2011.

MATERIAL AND METHODS

The study on angiosperms of family Asteraceae from Kota district of Rajasthan, India is based on the results obtained from both extensive and intensive studies of the vegetation of area under study. Field survey was carried out for collection of plants. Identification of plant species during field work was done by compiling different floras available i.e. Flora of Rajasthan by N.K. Sharma that deals with Hadoti region (District Kota, Baran and Jhalawar), Flora of Delhi by J. K. Maheshwari, and Flora of Indian Desert by M. M. Bhandari and authenticated at Herbarium, Department of Botany, University of Rajasthan, Jaipur. The photographs of all the ten plant species were taken during field trip.

RESULTS AND DISCUSSION

Systematic survey of studied plant species is described under (Figure1: (A-J)):

1. *Cirsium arvense* (Linn.) Scop: ***Cirsium arvense*** (Linn.) Scop; Fl. Carn. 2: 126, 1772. Fl. Brit. India 3: 362.1881; Duthie, Fl. Gangetic Plain 1: 481. 1905; Maheshwari, Fl. Delhi. 201, 1963. Maheshwari, Fl. Delhi. 113, 1966. Shetty & Singh Fl. Rajasthan 1: 404. 1987.

Erect, annual, leafy Herb stem 60-100 cm long, branched, Leaves alternate, obovate, acute base, serrate margin tipped with spines, Flowers pink- purple, corolla 5, tubular, bisexual heads ovoidal, covered by bristles, basal placentation, fruits acenes.

Vernacular Name	:	Brahm dandi, Rissa
Specimen Examined	:	SUBHASH/TH /111(GCK)
Local uses	:	Stalks are used because of their propensity to induce flatulence in some people. The taproot is considered the most nutritious. The leaves are also edible.

2. *Grangea maderaspatana* (Linn.) Poir: ***Grangea maderaspatana*** (Linn.) Poir in Lam. Encycl. Suppl. 2: 825. 1812. ***Artimisia maderaspatana*** L. Sp. Pl. 849.1753. Hook. f., Fl. Brit. India 3: 247. 1881; Duthie, Fl. Gangetic Plain 1: 446. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 181. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 417. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 182, 1996. Sharma, Fl. Raj (Hadoti). 107, 2002. Yadav and Meena, Fl. SC Raj. 200, 2011. .

Prostrate, annual herb, stem 11-65 cm long, branched, Leaves alternate, sessile, pinnatified broadly ovate to cordate, 3-5 lobed, acute base, serrate- dentate margin, Heads globose, yellow, solitary or paired, involucre bracts, outer ray florets pistillate and filiform, central disc florets bisexual, basal placentation, fruits acenes 2 mm long.

Vernacular Name	:	Madras carpet
Specimen Examined	:	SUBHASH/TH/112(GCK)

3. *Echinops echinatus Roxb.*: *Echinops echinatus* Roxb. Fl. Ind. 3: 447. 1832; Hook. f., Fl. Brit. India 3: 358.1881; Duthie, Fl. Gangetic Plain 1: 480. 1905; Maheshwari, Fl. Delhi. 196, 1963; Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979; Shetty & Singh Fl. Rajasthan 1: 408. 1987; Hajra in Hajra *et al.* Fl. India 13: 178. 1995. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 176, 1996. Sharma, Fl. Raj (Hadoti). 104, 2002. Yadav and Meena, Fl. SC Raj. 197, 2011.

Erect, annual, herb, stem erect, branched, spinulated, Leaves alternate, pinnatified, lobed, covered with yellow spines, White homogenous heads, globose, solitary, numerous spinulate crowed florets, florets bisexual disc florets only, packed in scales, corolla 5, tubular, covered by bristles, corolla tube white, basal placentation, fruits acenes 4 mm.

Vernacular Name	:	Oont katili
Specimen Examined	:	SUBHASH/TH/113(GCK)

4. *Eclipta prostrata (Linn.) Linn.*: *Eclipta prostrata* (Linn.) Linn. Mant. Pl. 2:286.1771; Choudhary *et al.* Fl. India 12: 381. f. 103. 1995. ***Verbesina prostrata*** L. Sp. Pl. 902. 1753; ***Verbesina alba*** L. Sp. Pl. 902. 1753. ***Eclipta erecta*** Linn. Mant. Pl. 2:286.1771; Hook. f., Fl. Brit. India 3: 304.1881; Duthie, Fl. Gangetic Plain 1: 468.1905; Maheshwari, Fl. Delhi. 196, 1963. Sharma and Tiagi Fl. NE Raj. 202, 1979. Shetty & Singh Fl. Rajasthan 1: 409. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 177, 1996. Sharma, Fl. Raj (Hadoti). 105, 2002. Yadav and Meena, Fl. SC Raj. 198, 2011.

Erect or prostrate, annual, hirsute herb, stem erect/ prostrate 40-60 cm long, branched, Leaves simple opposite, sub sessile, lanceolate, entire , solitary heads, peripheral ray florets 2/3 whorls, ligulate, pistillate, disc florets bisexual, tubular, style branched, basal placentation, Fruits brown acenes.

Vernacular Name	:	Bhringraj
Specimen Examined	:	SUBHASH/TH/114(GCK)
Local uses	:	Leaves are used as hair tonic.

5. *Caesulia axillaris Roxb.: Caesulia axillaris* Roxb. Fl. Cor.1:64. t. 93.1798; Pant in Hajra *et al.* Fl. India 13: 2. f. 1. 1995; Hook. f., Fl. Brit. India 3: 291.1881; Duthie, Fl. Gangetic Plain 1: 462. 1905; Maheshwari, Fl. Delhi. 192, 1963. Bhandari, Fl. Indian Desert 174. 1978; Sharma and Tiagi Fl. NE Raj. 199, 1979. Shetty & Singh Fl. Rajasthan 1: 400. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 173, 1996. Sharma, Fl. Raj (Hadoti). 102, 2002. Yadav and Meena, Fl. SC Raj. 195, 2011.

Erect, annual, marshy herb. stem 40-100 cm long, branched, Leaves alternate,4-10 cm long, lanceolate, acute base, entire margin, heads homogenous, axillary, sessile, florets white, numerous crowed florets, florets packed in scales, corolla 5, tubular, staminate; basal placentation, fruits flat acenes.

Specimen Examined : SUBHASH/TH/115(GCK)

6. *Sphaeranthus indicus Linn.: Sphaeranthus indicus* Linn. Sp. Pl. 927. 1753; Hook. f., Fl. Brit. India 3: 275.1881; Duthie, Fl. Gangetic Plain 1: 459. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 436. 1987. Kumar in Hajra *et al.* Fl. India 13: 160. f. 117. 1995. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 191, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 203, 2011.

Prostrate, Erect, annual, stem 10-60 cm long, much branched, Leaves alternate, lanceolate, covered with glandular hairs, acute base, wavy margin, heads spherical globose, compound, pink/pinkish, homogenous, disc florets only, bisexual, corolla 5, tubular, basal placentation, fruits acenes.

Specimen Examined : SUBHASH/TH/116(GCK)

7. *Xanthium indicum Koen.ex Roxb.*: *Xanthium indicum* Koen. Ex. Roxb., Fl. Ind. 3.610. 1832; Choudhary in Hajra *et al.* Fl. India 12: 427. f. 123. 1995. ***Xanthium stumarium*** L. Sp. Pl. 987. 1753, *pro parte*; Hook. f., Fl. Brit. India 3: 309.1881; Duthie, Fl. Gangetic Plain 1: 472. 1905; Maheshwari, Fl. Delhi. 196, 1963. Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 224, 1979. Shetty & Singh Fl. Rajasthan 1: 443. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 195, 1996. Sharma, Fl. Raj (Hadoti). 112, 2002. Yadav and Meena, Fl. SC Raj. 205, 2011.

Erect, annual, stem 20-100 cm long, branched, Leaves alternate, broadly ovate to cordate, 3-5 lobed, acute base, serrate margin, Male heads globose, numerous crowed florets, florets packed in scales, corolla 5, tubular, staminate; Female heads ovoidal , covered by bristles, florets 2, corolla absent, pistillate, basal placentation, fruits acenes.

Vernacular Name : Adhasisi, Chirchitta
Specimen Examined : SUBHASH/TH/117(GCK)
Local uses : Fruits smoked through stem of *Calotropis procera* for treatment of *"Adhasisi.*

8. *Gnaphalium pulvinatum Delile: Gnaphalium pulvinatum* Delile. Fl. Aegypt. 122. t. 44. f. 1812. Hook. f., Fl. Brit. India 3: 289.1881; Duthie, Fl. Gangetic Plain 1: 462. 1905; Bhandari, Fl. Indian Desert 180. 1978; Sharma and Tiagi Fl. NE Raj. 209, 1979. Shetty & Singh Fl. Rajasthan 1: 416. 1987. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 180, 1996. Sharma, Fl. Raj (Hadoti). 106, 2002. Yadav and Meena, Fl. SC Raj. 200, 2011.

Prostrate, annual, herb, woolly, stem 20-30 cm long, branched, Leaves alternate, abovate, acute base, obtuse apex, entire margin, heads crowded, sub-globose, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, Fruits acenes.

Specimen Examined : SUBHASH/TH/118(GCK)

9. *Sonchus asper (*L) Hill.*: Sonchus asper* (L) Hill. Herbs. Brit. 1:47. 1769; Hook. f., Fl. Brit. India 3: 414.1881; Duthie, Fl. Gangetic Plain 1: 493. 1905; Maheshwari, Fl. Delhi. 191, 1963. Bhandari, Fl. Indian Desert 189. 1978; Sharma and Tiagi Fl. NE Raj. 217, 1979. Shetty & Singh Fl. Rajasthan 1: 435. 1987. Rao in Hajra *et al.* Fl. India 12: 318. f. 82. 1995 Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 189, 1996. Sharma, Fl. Raj (Hadoti). 110, 2002. Yadav and Meena, Fl. SC Raj. 202, 2011.

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Vernacular Name : Peeli doodhi

Specimen Examined : SUBHASH/TH/119(GCK)

10. ***Ageratum conyzoides Linn.: Ageratum conyzoides*** Linn. Sp. Pl. 1753; Hook. f., Fl. Brit. India 3: 309.1881; Duthie, Fl. Gangetic Plain 1: 99. 1905; Maheshwari, Fl. Delhi. 190, 1963. Bhandari, Fl. Indian Desert 214. 1978; Sharma and Tiagi Fl. NE Raj. 194. 1979. Shetty & Singh Fl. Rajasthan 1: 390. 1987. Uniyal in Hajra *et al.* Fl. India 12: 248.1995. Prashad, Mason, Marburger and Kumar, Ill. Fl. Keoladev NP Bharatpur, 166, 1996. Sharma, Fl. Raj (Hadoti). 100, 2002. Yadav and Meena, Fl. SC Raj. 192, 2011.
Erect, annual, herb, stem 20-80 cm long, much branched, Leaves opposite, petiolated, ovate to cordate, acute base, acute apex, serrate margin, heads purple/ blue, small terminal corymb, based by involucre, globose, numerous crowed florets, florets packed with scales, corolla 5, tubular, basal placentation, fruits linear acenes.(Cysels)

Specimen Examined : SUBHASH/TH/120(GCK)

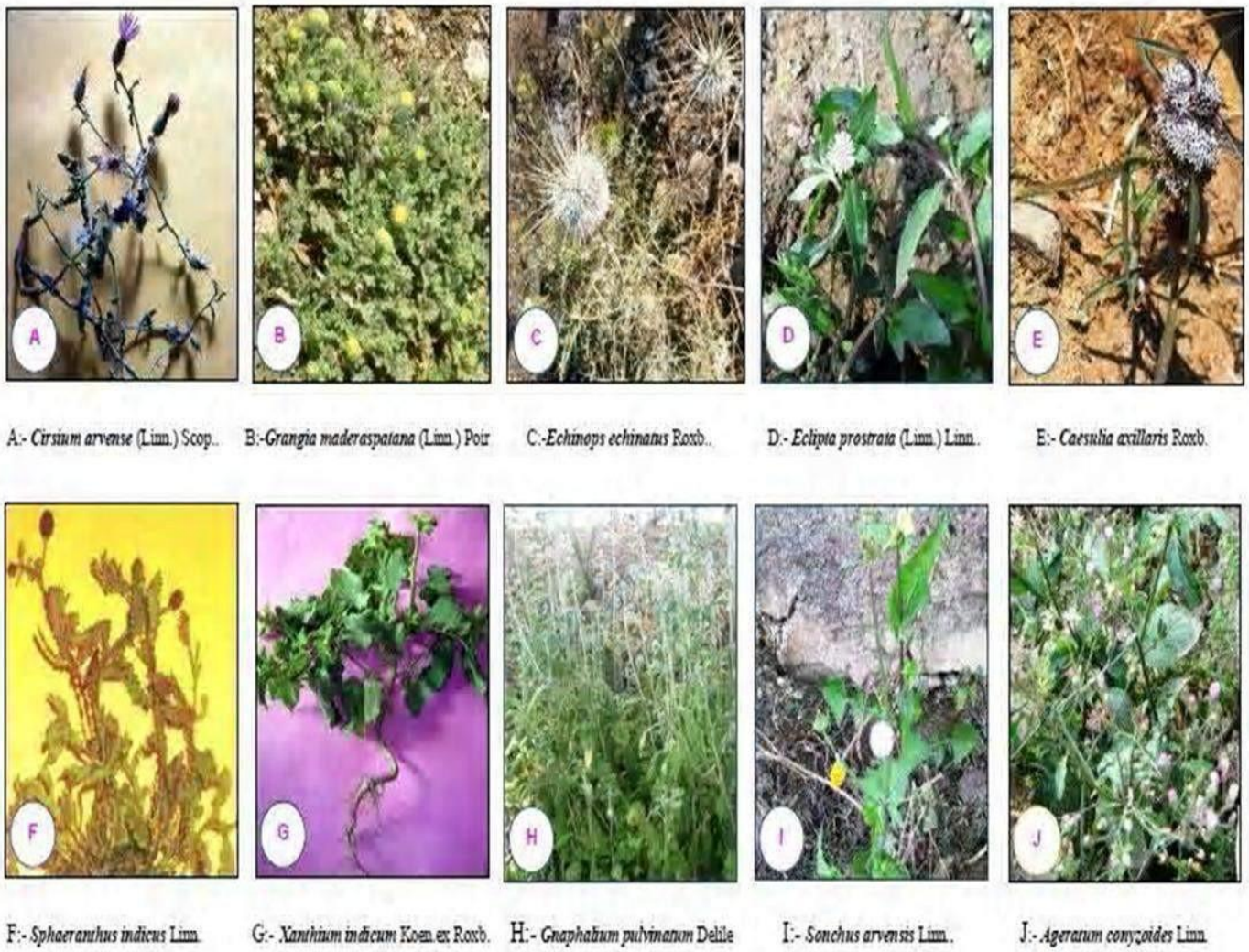

Figure 1(A-J): Asteraceae

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Special gratitude is expressed to University Grants Commission for granting FIP-TRF; to Department of Botany, Government College, Kota to make laboratory facilities available and CSWCRTI (ICAR), Regional Centre- Kota for issuing rainfall, annual temperature and humidity related data. At last but not least rural people of Kota district for the valuable information about local uses and names of plants collected.

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TAXONOMIC SURVEY OF SOME ANGIOSPERMS OF ALANIA DAM OF KOTA DISTRICT OF RAJASTHAN, INDIA

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ABSTRACT

The present communication represents the vegetation of aquatic habitats of Kota i.e. is situated in south of Rajasthan at latitude 30° 39.125' N and longitude 78° 31.156' E. It covers an area of approximately 521324 hectare (12,436 km²) and it is 3.63 per cent of the Rajasthan State. Out of which forests are 125379 hectare, nonagricultural land is 60021 hectare and cultivable barren land is 23011 hectare. The Alaniya Dam is major aquatic habitat present in Ladpura tehsil of Kota. It is about 17 Km away from Kota city on National Highway no. 17. Coordinates of Alania pond are 25°0'3"N 75°52'50"E. In Kota nearly 80% of the mean annual rainfall (1516 mm) occurred in the monsoon season between June and September and 20% fells as snow in winter season. Mean minimum monthly temperature ranges from 9.7°C (Jan) to 24.2°C (Jul) and mean maximum monthly temperature ranged from 21.2°C (Jan) to 33.10°C (Jul) in the year 2009. Plant exploration during rainy season was conducted to determine the plants with aquatic habitat resulted in 23 plant species of 19 genera belonging to 17 families. Major plants are related to Hydrocharitaceae, Pontederiaceae, Lamnaceae, Convolvulaceae, Nymphaeaceae, Cyperaceae and Onagraceae plant families..

Key words: Alania, Aquatic Plants Flora, Families.

OBJECTIVES

(i) Collection of aquatic plants for Herbarium preparation and general study of the vegetation.

(ii) To find out the relative dominance of hydrophyte families.

(iii) To find out the medicinal, economic and ecological potential of angiosperm plants occurring in the study area.

CONCLUSIONS

Taxonomic survey of some of the aquatic plants of Alania is:-

1. *Otellia alismoides* (L.)Pers.

In Sp. Pl.2:400,1805;FBI.5:662;FUGP.3:177.1928.
Submerged or partly floating,. Aquatic herb, fibrous rooted, occurs in low wet areas ,ponds and marshes. Plant approx.3 feet in height, rooted transparent leaves on unbranched very short stems, ovate/ sub orbicular, Inflorescence solitary terminal sessile, peduncle 20-30 cm long, 3 petals, white, stemens-6,

Family:- **Hydrocharitaceae**
Specimen Examined:- SUBHASH/AQ/111(GCK)

2. *Utricullaria aurea* Lour.

In Fl.Cochinch. 26,1790; FBI.4:329.1884; FUGP.2:166.1911;
Slender aquatic herb, submerged, much branched, dichotomously branched leaves, suborbicular traps , paduncles without floats, Inflorescence recesse, cayix lobes two, yellow corolla, two lips of corolla seen, lower lip enlarged.

Family:- **Lentibulariaceae**
Specimen Examined:- SUBHASH/AQ/112(GCK)

3. *Spirodella polyrhiza* (Linn) Scheild.

In Linnaea 13:392.t.5,6.1839; Engler in. Engl.Prantl. Pflanzenf. 2(3):154. f.101A .1877; Subramanyam,Bot Mong. Counc. Sci. Industr. Res. 377.1963; *Lemna polyrhiza* Linn.Sp.Pl.970.1753; Hook.f.FBI. 6:557. 1893; FPB.3:3;
Free floating, herbaceous, roots fibrous and many, green and flat frond, beneath purplish, not tailed, opaque and thick.

Family:- **Lemnaceae**
Vernacular Name:- Duckmeal
Specimen Examined:- SUBHASH/AQ/113(GCK)

4. *Wolffia arriza* (Linn.)Horkel ex Wimmer

Fl.Schles.ed.3:140.1857,Hortog. and Plesin Blumea 18:367.1970;
Lemna arrhiza Linn.Mant.Alt.294.1771.
Minute, free floating,annual herb, fronds opaque,ovate oblong,not tailed, rootless, young frond solitory but older may show budding, pocket at base.

Family:- **Lemnaceae**
Vernacular Name:- Waterneal
Specimen Examined:- SUBHASH/AQ/114(GCK)

5. *Lemna perpussila* Torry

In Fl.N.Y. 2:245.1843; Hartog in Blumea 18:363.1970;t.L.paucicostata Hegelm.Lemnaceae. 139t.8.1868; Hook.f.FBI.6.556.1893; McCann in Journ.Bomb.Nat.Hist. Soc.43.153.1942; Bhandari, Fl.Ind.Des.360.1978.
Minute,aquatic, herb, fronds suborbicular/obovate not single root fiber, cylindrical root.

Family:- **Lemnaceae**
Vernacular Name:- Duckweed
Specimen Examined:- SUBHASH/AQ/115(GCK)

6. *Eichhornia crassipes var. major* (Mart.) Solms

In DC. Mon.Phan.4.527.1882;Haines,Bot.Bih.& Or.1102.1825; *Potenderia crassipes* Mart.Nov. Gen. Sp.Pl.1:9 t. 4. 1823
Free floating/amphibious, herb, thick long stem, Leaves swollen in middle, Flowers spike,perianth tube1.5cm long, stemens 6 attached to perianth tube, Trilocular ovary, numerous ovule,

Family:- **Pontederiaceae**
Vernacular Name:- Chhoti Jalkumbhi
Specimen Examined:- SUBHASH/AQ/116(GCK)

7. *Ipomoea aquatica*. Forsk.

In Fl.Aegypt-Arab.44.1775;Clarke in FBI.4:210.1883;FBP.2:315;BH.26 (2):546.1919; Van Oostririn I.Males.ser.1.4:473.f.48.1953; *Convolvulus repans* Vahl,Symb.Bot. 1:17.1790 (non Linn.1753); *Ipomoea reptans* Poir.inLamk.Encycl.Meth.Suppl.3:460.1814
Free floating/amphibious, Herb, Perennial,Stem thick and hollow, nodal rooting, leaves 4-8 cm, ovate, triangular/cordate, Inflorescence Axillary solitary, minute,calyx 7-8 mm long, Corolla 3-5 cm long, funnel shaped, pink with purple colour, fruit capsule,globose,seed 4.

Family:- **Convolvulaceae**
Vernacular Name:- Nari
Specimen Examined:- SUBHASH/AQ/117(GCK)

8. *Monochordia veginalis* (Burm.f.) K.Presl.

In Rel. Haenk. 1:128.1827; FBI.6:363.1892; FUGP 3:270.1920; Fl.Raj.2:848.1991.
Annual, Herb, Erect, Small root stalk, Leaves ovate oblong, Erect recesse, perianth 6 , violet/blue, stemen 6, fruit capsule, seeds many.

Family:- **Pontederiaceae**
Specimen Examined:- SUBHASH/AQ/118(GCK)

9. *Nymphoides indica* (L.) O. Kuntz

In Rev.Gen.Pl.2:4299.1891; FBI.4:131.1883;; FUGP.2:79.1911. Fl.RAJ. 2:429.1999. *Menyanthes indica* L.Sp. 1:145.1753; *Limnanthes indicum*l (L.)Griseb.Gen.Sp.Gent.343.1839.
Aquatic floating herb, horizontal rhizome, Ovate leaf blades, very short petiole, Flowers many, clustered, pentamerous, Corolla white, fimbricate corolla margins, at base yellow, monolocular ovary,

Family:- **Menyanthaceae**
Vernacular Name:- Kumudani
Specimen Examined:- SUBHASH/AQ/119(GCK)

10. *Utricullaria stellaris* L.f.

In L. f. Suppl.86. 1781; Fl.Cochinch. 26,1790; FBI.4:329.1884; FUGP.2:166.1911;
Slender aquatic herb, submerged, much branched, dichotomously branched leaves, suborbicular traps , paduncles with whorl floats, Inflorescence recesse, cayix lobes two, yellow corolla, two lips of corolla seen, lower lip enlarged.

Family:- **Lentibulariaceae**
Specimen Examined:- SUBHASH/AQ/120(GCK)

11. *Nymphaea nauchelli Burns. Willd.*

In Fl. Indica 120.1768; FBI.1:114.1872; FUGP.1:34. 1930; Fl SC Raj. 37.2011.
Perennial aquatic herb, unbranched erect rhizome, leaves blade elliptic orbitular, 10-30 petals, white slightly purple, petals lanceolate, stemens many, 10-30 stigma, elliptical seed.

Family:- **Nymphaeaceae**
Vernacular Name:- Kumudani
Specimen Examined:- SUBHASH/AQ/121(GCK)

12. *Potamogeton nodosus* Poir.

In Lam. Encyclo. Meth.Bot.Suppl.4:535; Sp. Pl.2:447,1799;FBI.6:565; FUGP.3:314.
An Erect perennial herb from rhizomes, occurs in low wet areas ,ponds and marshes. Plant approx.3 feet in height, alternate leaves on unbranched stems, oval/ lanceolate, Inflorescence Erect recesses, A membranous sheath called an ochrea surrounds the stem at the base of each leaf. Flowers are pink to rose-colored and occur as 1- to 3-inch spikes at the ends of stems.

Family:- **Potamogetonaceae**
Specimen Examined:- SUBHASH/AQ/122(GCK

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SYSTEMATIC SURVEY OF SOME AQUATIC PLANTS OF CHAMBAL RIVER OF KOTA DISTRICT OF RAJASTHAN, INDIA

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ABSTRACT

The present work deals with vegetation of aquatic habitats of Kota district of Rajasthan state. Kota district is situated in south of Rajasthan at latitude 30° 39.125' N and longitude 78° 31.156' E. and is located along the eastern bank of the Chambal river. It covers an area of approximately 521324 hectare (12,436 km²) and it is 3.63 per cent of the Rajasthan State. Out of which forests are 125379 hectare, non agriculture land is 60021 hectare and cultivable barren land is 23011 hectare. The Chambal River is major aquatic habitat of Kota district separates Kota from neighboring Sawai Madhopur, Tonk and Bundi districts. Kota district, forming the natural district boundary, shows nearly 80% of the mean annual rainfall (1516 mm) occurred in the monsoon season between June and September and remaining 20% falls in winter season. Temperature remains cool and pleasant round the year. Frost is common during winter season. Mean minimum monthly temperature ranges from 4.7°C (Jan) to 24.2°C (Jul) and mean maximum monthly temperature ranged from 21.2°C (Jan) to 33.10°C (Jul) in the year 2011. Plant exploration conducted to determine the plants with aquatic habitat resulted in 27 plant species. Taxonomic position of these plant species is described in various available Flora of different regions of Rajasthan state. Mainly these are related to Convolvulaceae, Lemnaceae, Pontederiaceae, Cyperaceae and Hydrocharitaceae plant families.

OBJECTIVES

(i) To study the topography, climate and edaphic factors of Kota district for the evaluation of overall nature of local environment and its effects on plants.

(ii) To collect plants for Herbarium preparation and general study of the vegetation.

(iv) To make an enumeration of Aquatic Angiosperm as well as other plant groups like Pteridophytes and Bryophytes occurring in Kota district area and to find out the relative dominance of hydrophyte families.

(v) To find out the medicinal, economic and ecological potential of angiosperm plants occurring in the study area.

CONCLUSIONS

Systematic survey of some of the aquatic plants of Chambal river is:-

1. *Azolla pinnata* R.Br.

Small fern, free floating, triangular frond measuring 2.5 cm length, frond of many rounded /angular overlapping leaves each of 1-2 mm length and green, blue-green, or dark red in color and coated with tiny hairs giving velvety appearance. Leaves contain the symbiotic cyanobacterium *Anabaena azollae*

Vernacular Name-Mosquito fern, duckweed fern, Fairy moss, water fern

Family:-	**Azollaceae** (Pteridophyte)
Specimen Examined:-	SUBHASH/AQ/101(GCK)

2. *Spirodella polyrhiza* (Linn) Scheild.

In Linnaea 13:392.t.5.6.1839; Engler in Engl.Prantl. Pflanzenf. 2(3):154. f.101A .1877; Subramanyam, Bot.Mong. Counc. Sci. Industr. Res. 377.1963.

Lemna polyrhiza Linn.Sp.Pl.970.1753; Hook.f.FBI. 6:557. 1893; FPB.3:3; Bhandari Fl. Indian Desert 326. 1995; Yadav & Meena FI.SC Raj.355, 2011.

Free floating, herbaceous, roots fibrous and many, green and flat frond, beneath purplish, not tailed, opaque and thick.

Family:-	**Lemnaceae**
Vernacular Name:-	Duckmeal
Specimen Examined:-	SUBHASH/AQ/102(GCK)

3. *Wolffia arriza* (Linn.)Horkel ex Wimmer

Fl.Schles.ed.3:140.1857;Hortog. and Plasin Blumea 18:367.1970;

Lemna arrhiza Linn.Mant.Alt.294.1771. Bhandari Fl. Indian Desert 326. 1995; Yadav & Meena FI.SC Raj.355, 2011.

Minute, free floating,annual herb, fronds opaque,ovate oblong,not tailed, rootless, young frond solitory but older may show budding, pocket at base.

Family:-	**Lemnaceae**
Vernacular Name:-	Watermeal
Specimen Examined:-	SUBHASH/AQ/103(GCK)

4. *Lemna perpussila* Torry

In Fl.N.Y. 2:245.1843; Hartog in Blumea 18:363.1970;L.paucicostata Hegelm.Lemnaceae 139t.8 1868; Hook.f.FBI.6.556.1893; McCann in Journ.Bomb.Nat.Hist. Soc.43.153.1942; Bhandari, Fl.Ind.Des.360.1978. Bhandari Fl. Indian Desert 326. 1995; Yadav & Meena FI.SC Raj.354, 2011.

Minute,aquatic, herb, fronds suborbicular/obovate not single root fiber, cylindrical root.

Family:-	**Lemnaceae**
Vernacular Name:-	Duckweed
Specimen Examined:-	SUBHASH/AQ/104(GCK)

5. *Eichhornia crassipes var. minor* (Mart.) Solms

In DC. Mon.Phan.4:527.1882;Haines,Bot.Bih.& Or.1102.1825; *Potenderia crassipes* Mart.Nov. Gen. Sp.Pl.1:9 t. 4. 1823. Bhandari Fl. Indian Desert 319. 1995; Yadav & Meena FI.SC Raj.347, 2011.

Free floating/amphibious, herb, thick long stem, Leaves swollen in middle, Flowers spike,perianth tube1.5cm long, stemens 6 attached to perianth tube, Trilocular ovary, numerous ovule,

Family:-	**Pontederiaceae**
Vernacular Name:-	Chhoti Jalkumbhi
Specimen Examined:-	SUBHASH/AQ/105(GCK)

6. *Eichhornia crassipes var. major* (Mart.) Solms

In DC. Mon.Phan.4:527.1882;Haines,Bot.Bih.& Or.1102.1825;Potenderia crassipes Mart.Nov. Gen. Sp.Pl.1:9 t. 4. 1823. Bhandari Fl. Indian Desert 319. 1995; Yadav & Meena FI.SC Raj.347, 2011.

Free floating/amphibious, herb, thick long stem, Leaves swollen in middle, Flowers spike,perianth tube1.5cm long, stemens 6 attached to perianth tube, Trilocular ovary, numerous ovule,

Family:-	**Pontederiaceae**
Vernacular Name:-	Badi Jalkumbhi
Specimen Examined:-	SUBHASH/AQ/106(GCK)

7. *Typha angusifolia* L.

In Sp.Pl. 971.1753*Typha angustata* Bory and Chamb. Exp.Sc.Mor.3(2) : 33, 1832; FBI.6:489,araebu.in Pfirich.2:14,E4F;Santapau in RBSI.16(1): 328, 1953 .*T.elephantina* Gr.227,1839(non Roxb.). Bhandari Fl. Indian Desert 325. 1995; Yadav & Meena FI.SC Raj.354, 2011.

Shrub,perennial,1-3 meter high, Leaves usually expending the flowering stems, Inflorescence Spike, dioecious, male flowers mixed with pistilloids, female flowers brown.

Family:-	**Typhaceae**
Vernacular Name:-	Kanro, Patera
Specimen Examined:-	SUBHASH/AQ/107(GCK)

8. *Ipomoea aquatica* Forsk.

In Fl.aegypt-Arab.44.1775;Clarke in FBI.4:210.1883;FBP.2:315;BH.26 (2):546.1919; Van Oostetrin I.Males.ser.1.4:473.f.48.1953; *Convolvulus repans* Vahl,Symb.Bot. 1:17.1790 (non Linn.1753); *Ipomoea reptans* Poir.inLamk.Encycl.Meth.Suppl.3:460.1814

Free floating/amphibious, Herb, Perennial,Stem thick and hollow, nodal rooting, leaves 4-8 cm, ovate, triangular/cordate, Inflorescence Axillary solitary, minute,calyx 7-8 mm long, Corolla 3-5 cm long, funnel shaped, pink with purple colour, fruit capsule,globose,seed 4.

Family:-	**Convolvulaceae**
Vernacular Name:-	Nari
Specimen Examined:-	SUBHASH/AQ/108(GCK)

9. *Hydrilla verticellata* (Linn.f.)Royle,

In Ill. Bot. Himl.t.376.1839;Hook.f. FBI.5: 659.1888; *Serpicula verticillata* Linn. f. Suppl.416.1781; Roxb. Pl. Corom.2.33.t.164.1798 et in F.Ind. 3: 578. 1852; *Vallisnaria verticillata* Roxb.Fl.Ind.3:751.1832 (*Sphalm.,verticillata*). Bhandari Fl. Indian Desert 315. 1995; Yadav & Meena FI.SC Raj.339, 2011.

Submerged, herb. Stem much branched filamentus, leaves whorled. Linear, flowers dioecious, male flower solitary, bell shaped spathe, short stalked , trimerous, white, petals three, stemens three.

Female flowers: spathe, long narrow tubular,Sepals 3 oblong, petals 3,slightly smaller than sepals, white, ovary cylindrical, styles three, seeds many

Family:-	**Hydrocharitaceae**
Specimen Examined:-	SUBHASH/AQ/109(GCK)

10. *Polygonum glabrum Willd.*

In Sp. Pl.2:447,1799;FBI.5:34,in part,FUGP3:35,Merr.loc.cit. Maheshwari Fl. Delhi,305,1963.

An Erect perennial herb from rhizomes, occurs in low wet areas ,ponds and marshes. Plant approx.3 feet in height, alternate leaves on unbranched stems, oval/ lanceolate, Inflorescence Erect recemes, A membranous sheath called an ochrea surrounds the stem at the base of each leaf. Flowers are pink to rose-colored and occur as 1- to 3-inch spikes at the ends of stems.

Family:-	**Polygonaceae**
Vernacular Name:-	Nail, Water Smart weed
Specimen Examined:-	SUBHASH/AQ/110(GCK)

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BIO-FUEL YEILDING CROP AND NON- CROP PLANTS OF KOTA DISTRICT OF RAJASTHAN, INDIA

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ABSTRACT

Biofuel is a fuel that contains energy from geologically recent carbon fixation, produced from living organisms. This fuel is made by a biomass conversion using in three different ways: thermal conversion, chemical conversion, and biochemical conversion. The present communication deals with survey of some crop and non-crop plants valuable for biofuel production from Kota district. Kota is one of the 32 districts of Rajasthan, situated in south of Rajasthan between 24° 25'N to 25° 51' N latitude and 75° 17' E to 76° N 30°N longitude. Exploration was conducted to determine some plants during rainy season (June to September) and after the rainy season (October to December) for their collection and plant taxonomic study that resulted into 14 plant species from 14 genera related to Asteraceae, Euphorbiaceae, Brassicaceae, Fabaceae, Agavaceae, Cucurbitaceae, Moringaceae, Poaceae and Simoraubaceae plant families. Taxonomic position of these plant species is described in various available Flora of different regions of Rajasthan state

Key words:- Biofuel Plants, Flora, Families.

OBJECTIVES

- Survey of crop plants and non crop plants for Herbarium preparation and general study of the vegetation.
- To identify and to study the occurrence and distribution of biofuel yielding plants through out the study area.
- To find out present and future possibilities in biodiesel plants by the literature survey on on-going research in India and world..

CONCLUSIONS

(Source: District Agriculture profile of Kota; Rajasthan Agriculture Data 2008-09)

S. No.	Botanical Name of plant	Vernacular Name	Family	Biofuel Category (Bio-alcohol/ Biodiesel)	Products from Plant	Remarks as Biofuel Product	Remarks
				CROP PLANTS			
1	*Oryza sativa*	Rice	Poaceae	Bio-alcohol	Starch, Cellulose, Silica from Husk	Starch from seeds and big amount of agriculture waste is source of Bio-alcohol	22.4(.000 tons) production per year in Kota
2	*Brassica napus*	Rapeseed and Mustard	Brassicaceae	Biodiesel	Seed Oil, Oil Cake	Oils releases less carbon monoxide than diesel fuel	175.2(.000 tons) production per year in Kota
3	*Glycine max*	Soybeans	Fabaceae	Bio-diesel	Seed Oil, Oil cake	Oil content is 20% of the plant. one bushel of soybeans yields 5.68 liters of biodiesel	164.5 (.000 tons) production per year in Kota
4	*Triticum aestivum*	Wheat	Poaceae	Bio-alcohol	Starch, Cellulose	Starch from seeds and big amount of agriculture waste is source of Bio-alcohol	263.2(.000 tons) production per year in Kota
5	*Zeya mays*	Corn	Poaceae	Bio-alcohol	Starch, Cellulose	Starch from seeds and big amount of agriculture waste is source of Bio-alcohol	12.4(.000 tons) production per year in Kota
6	*Saccharum officinarum*	Sugarcane	Poaceae	Bio-alcohol	Sucrose, Cellulose	Sugarcane waste with big amount of Cellulose and Stem Juice is sourse of Bio-alcoho;	Production near Chambal River Banks
7	*Helianthus annuus*	Sunflower	Asteraceae	Biodiesel	Seed Oil, Oil cake	1 acre of sunflowers can produce 272.1 kg of oil	Production in Agriculture Farms
				NON – CROP PLANTS			
1	*Agave americana*	Century Plant, American Aloe	Agavaceae	Bio-alcohol	Agave nectar, Fiber	Juice of leaves contains high content of Fructose that can be used for Ethanol Production (Bio-alcohol category)	Wild Plant and sometimes Ornamental
2	*Citrullus colocynthis*	Gavakshi Indarvaruni Bitter cucumber, Desert gourd	Cucurbitaceae	Biodiesel	Seed Oil, Vitamins and minerals, Calcium and Niacin	Seeds yield is about 6.7-10 t/ha oil profit of 31-47% The oil obtained from the seeds (47%) can also be used for medicinal and soap production	Wild Plant In Raw Land and near Agriculture Fields
3	*Jatropha curcas*	Danti , Katri, Pratyanshrani	Euphorbiaceae	Biodiesel	HCN. Rotanone, Red oil or Jatropha Oil, Poison Toxalbumin and Curcin.	The seeds contain 27-40% oil (average: 34.4%) that can be processed to produce a high-quality biodiesel fuel, usable in a standard diesel engine. The seeds are also a source of the highly poisonous	Wild as well as Ornamental
4	*Moringa oleifera*	Drumstick tree	Moringaceae	Biodiesel	B vitamins, vitamin C, Beta-carotene, Vitamin K, Manganese, Protein in Mature seeds, Edible Oil (Ben oil) with Behenic Acid	Mature seeds yield 38–40% oil can be used for biofuel production	Wild as well as Ornamental
5	*Pongamia pinnata*	Karanj	Fabaceae	Biodiesel	Karanja oil/Pongamia oil from seeds	Seeds of 25–40% lipid content of which nearly half is oleic acid.	Wild as well as Ornamental in Gardens
6	*Ricinus communis*	Arandi	Euphorbiaceae	Biodiesel	Castor oil rich in Triglycerides, mainly Ricinolein. The seed contains Ricin, a toxin,	Castor seed is the source of castor oil, which has a wide variety of uses. The seeds contain between 40% and 60% oil that is used as Biofuel	Wild and also Grown in Agriculture fields
7	*Simmondsia chinensis*	Jojoba	Simmoraubaceae	Biodiesel	Jojoba oil, Simmondsin (Poison), The residual meal contains 30–35% protein	The oil makes up approximately 50% of the jojoba seed by weight.	Domesticated plant in Agriculture Stations

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SYSTEMATIC SURVEY OF SOME ANGIOSPERMS OF FAMILY ASTERACEAE FROM KOTA DISTRICT OF RAJASTHAN, INDIA : I

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ABSTRACT

The present study deals with vegetation of habitats of Kota district of Rajasthan state. Plant exploration was conducted to determine plants of family Asteraceae from various habitats revealed occurrences of 10 plant species. Taxonomic position of these plant species is described in various available Floras of different regions of the Rajasthan state.

Key words: Asteraceae, Angiosperms, Kota.

OBJECTIVES

(i) Collection of aquatic plants for Herbarium preparation and general study of the vegetation.

(ii) To find out the relative dominance of hydrophyte families.

(iii) To find out the medicinal, economic and ecological potential of angiosperm plants occurring in the study area.

CONCLUSIONS

Taxonomic survey of some angiosperms of family Asteraceae is:-

1. *Cirsium arvense* (Linn.) Scop.

Cirsium arvense (Linn.) Scop; Fl. Carn. 2: 126, 1772. FIBI.3: 362.1881; FUGP1: 481. 1905; FD. 201, 1963; III .FD.113, 1966.FR .1: 404. 1987.

Erect, annual, leafy Herb stem 60-100 cm long, branched, Leaves alternate, obovate, acute base, serrate margin tipped with spines, Flowers pink- purple, corolla 5, tubular, bisexual heads ovoidal, covered by bristles, basal placentation, fruits acenes.

Vernacular Name: - Brahm dandi, Rissa

Specimen Examined: - SUBHASH/TH/111(GCK)

Local uses: - Stalks are used because of their propensity to induce flatulence in some people. The taproot is considered the most nutritious.

The leaves are also edible.

2. *Grangea maderaspatana* (Linn.) Poir

Grangea maderaspatana (Linn.) Poir in Lam. Encycl. Suppl. 2: 825. 1812. ***Artimisia maderaspatana*** L. Sp. Pl. 849.1753. Hook. f., FBI.3: 247. 1881; FUGP.1: 446. 1905; FD.196, 1963. FID.181. 1978; FNER. 224, 1979. FR 1: 417. 1987. FKNPB.182, 1996. Sharma, FRH.107, 2002. FSCR. 200, 2011..

Prostrate, annual herb, stem 11-65 cm long, branched, Leaves alternate, sessile, pinnatified broadly ovate to cordate, 3-5 lobed, acute base, serrate- dentate margin, Heads globose, yellow, solitary or paired, involucre bracts, outer ray florets pistillate and filiform, central disc florets bisexual, basal placentation, fruits acenes 2 mm long.

Vernacular Name: - Madras carpet

Specimen Examined: -SUBHASH/TH/112(GCK)

3. *Echinops echinatus Roxb...*

Echinops echinatus Roxb. Fl. Ind. 3: 447. 1832; FBI. 3: 358.1881; FUGP 1: 480. 1905; FD.196, 1963; FID. 214. 1978; FNER. 224, 1979; FR1: 408. 1987; Hajra in Hajra *et al*. Fl. India 13: 178. 1995. FKNPB.176, 1996. FRH.104, 2002. FSCR. 197, 2011.

Erect, annual, herb, stem erect, branched, spinulated, Leaves alternate, pinnatified, lobed, covered with yellow spines, White homogenous heads, globose, solitary, numerous spinulate crowed florets, florets bisexual disc florets only, packed in scales, corolla 5, tubular, covered by bristles, corolla tube white, basal placentation, fruits acenes 4 mm.

Vernacular Name: - Oont katili

Specimen Examined: -SUBHASH/TH/113(GCK)

4. *Eclipta prostrata (Linn.) Linn.*

Eclipta prostrata (Linn.) Linn. Mant. Pl. 2:286.1771; Choudhary *et al*. Fl. India 12: 381. f. 103. 1995. ***Verbesina prostrata*** L. Sp. Pl. 902. 1753; ***Verbesina alba*** L. Sp. Pl. 902. 1753. ***Eclipta erecta*** Linn. Mant. Pl. 2:286.1771; FBI 3: 304.1881; FUGP1: 468.1905; FD 196, 1963. FNER. 202, 1979. FR1: 409. 1987. FKNPB 177, 1996. FRH105, 2002. FSCR198, 2011.

Erect or prostrate, annual, hirsute herb, stem erect/ prostrate 40-60 cm long, branched, Leaves simple opposite, sub sessile, lanceolate, entire , solitary heads, peripheral ray florets 2/3 whorls, ligulate, pistillate, disc florets bisexual, tubular, style branched, basal placentation, Fruits brown acenes.

Vernacular Name: - Bhringraj

Specimen Examined: -SUBHASH/TH/114(GCK)

Local uses: - Leaves are used as hair tonic.

5. *Caesulia axillaris Roxb.*

Caesulia axillaris Roxb. Fl. Cor.1:64. t. 93.1798; Pant in Hajra *et al*. Fl. India 13: 2. f. 1. 1995; FBI 3: 291.1881; FUGP 1: 462. 1905; FD192, 1963. FID 174. 1978; FNER 199, 1979. FR1: 400. 1987. FKNPB 173, 1996.FRH 102, 2002. FSCR 195, 2011.

Erect, annual, marshy herb. stem 40-100 cm long, branched, Leaves alternate,4-10 cm long, lanceolate, acute base, entire margin, heads homogenous, axillary, sessile, florets white, numerous crowed florets, florets packed in scales, corolla 5, tubular, staminate; basal placentation, fruits flat acenes.

Specimen Examined: - SUBHASH/TH/115(GCK)

6. *Sphaeranthus indicus Linn.*

Sphaeranthus indicus Linn. Sp. Pl. 927. 1753; FBI 3: 275.1881; FUGP1: 459. 1905; FD 196, 1963. FID 189. 1978; FNER 224, 1979. FR 1: 436. 1987. Kumar in Hajra *et al*. Fl. India 13: 160. f. 117. 1995. FKNPB 191, 1996. FRH 110, 2002. FSCR 203, 2011.

Prostrate, Erect, annual, stem 10-60 cm long, much branched, Leaves alternate, lanceolate, covered with glandular hairs, acute base, wavy margin, heads spherical globose, compound, pink/pinkish, homogenous, disc florets only, bisexual, corolla 5, tubular, basal placentation, fruits acenes.

Specimen Examined: SUBHASH/TH/116(GCK)

7. *Xanthium indicum Koen.ex Roxb.*

Xanthium indicum Koen. Ex. Roxb., Fl. Ind. 3.610. 1832; Choudhary in Hajra *et al*. Fl. India 12: 427. f. 123. 1995. ***Xanthium stumarium*** L. Sp. Pl. 987. 1753, *pro parte*; FBI 3: 309.1881; FUGP 1: 472. 1905; FD 196, 1963. FID 214. 1978; FNER 224, 1979. FR 1: 443. 1987. FKNPB 195, 1996. FRH 112, 2002. FSCR 205, 2011.

Erect, annual, stem 20-100 cm long, branched, Leaves alternate, broadly ovate to cordate, 3-5 lobed, acute base, serrate margin, Male heads globose, numerous crowed florets, florets packed in scales, corolla 5, tubular, staminate; Female heads ovoidal , covered by bristles, florets 2, corolla absent, pistillate, basal placentation, fruits acenes.

Vernacular Name: - Adhasisi, Chirchitta

Specimen Examined: SUBHASH/TH/117(GCK)

Local uses: - Fruits smoked through stem of *Calotropis procera* for treatment of *"Adhasisi*.

8. *Gnaphalium pulvinatum Delile*

Gnaphalium pulvinatum Delile. Fl. Aegypt. 122. t. 44. f. 1812. FBI 3: 289.1881; FUGP 1: 462. 1905; FID 180. 1978; FNER 209, 1979. FR 1: 416. 1987. FKNPB 180, 1996. FRH 106, 2002. FSCR 200, 2011.

Prostrate, annual, herb, woolly, stem 20-30 cm long, branched, Leaves alternate, abovate, acute base, obtuse apex, entire margin, heads crowded, sub-globose, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, Fruits acenes.

Specimen Examined: SUBHASH/TH/118(GCK)

09. *Sonchus asper* (L) Hill.

Sonchus asper (L.) Hill. Herbs. Brit. 1:47. 1769; FBI 3: 414.1881; FUGP 1: 493. 1905; FD 191, 1963. FID 189. 1978; FNER 217, 1979. FR 1: 435. 1987. Rao in Hajra *et al*. Fl. India 12: 318. f. 82. 1995; FKNPB189, 1996; FRH 110, 2002.FSCR 202, 2011.

Erect, annual, herb, stem 20-80 cm long, branched, Leaves alternate, pinnatified, articulated base, acute apex, sharply spinous dentate, Cymose heads, umbrella like, elongated, numerous florets, florets packed by involucre, yellow, ray florets female, ligulate, disc florets bisexual, florets packed in scales, corolla 5, tubular, basal placentation, fruits acenes.

Vernacular Name: - Peeli doodhi

Specimen Examined: - SUBHASH/TH/119(GCK)

10. *Ageratum conyzoides Linn.*

Ageratum conyzoides Linn. Sp. Pl. 1753; FBI 3: 309.1881; FUGP 1: 99. 1905; FD 190.1963; FID 214. 1978; FNER 194. 1979; FR 1: 390. 1987; Uniyal in Hajra *et al*. Fl. India 12: 248.1995; FKNPB 66, 1996; FRH 100, 2002; FSCR 192, 2011.

Erect, annual, herb, stem 20-80 cm long, much branched, Leaves opposite, petiolated, ovate to cordate, acute base, acute apex, serrate margin, heads purple/ blue, small terminal corymb, based by involucre, globose, numerous crowed florets, florets packed with scales, corolla 5, tubular, basal placentation, fruits linear acenes.(Cysels)

Specimen Examined: - SUBHASH/TH/120(GCK)

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