International Journal of Engineering and Applied Sciences (IJEAS)
ISSN: 2394-3661, Volume-8, Issue-12, December 2021
DOI: 10.31873/IJEAS.8.12.11

# A Research Paper on Applied Medical Phytogeography of Shekhawati Region

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*Abstract*— **The area under study i.e. Shekhawati region has a geographical spread of $26^0$ 26' to $29^0$ 20' N latitude and $74^0$ 44' to $76^0$ 34' E longitude which makes 5.6% area of the state's total. It covers partly or fully three districts namely - Churu, Jhunjhunu and Sikar. The area under study consists of 15 tehsils in all, in which 3 falls under Churu district (whereas Churu district it self consists of 7 tehsils among them three are covered by Shekhawati region), six tehsils falls in each district of Jhunjhunu and Sikar, thus make 15 tehsils of Shekhawati region in all. Buhana tehsil emerged out as a new tehsil on the map of Jhunjhunu district in 2001 year, it was no existance earlier i.e. in 1991. It is very interesting as well as surprisingly to mention here on the basis of authors observations that recently some Research research paper were submitted by some researchers 'at the name of Shekhawati region' but they excluded the part and portion of Churu district's three tehsils which fall under the geographical boundary of Shekhawati region as made by Prof. R.L. Singh from geographical boundary or deliniation point of view, is author's opinion it is quite essential for regional demarcation. This left part by some researchers covers nearly 30% are of Shekhawati region's total. But presently here the author has included this part in his research area for study to present complete or overall full informations at the name of Shekhawati region. Thus, actually, at the part of district-wise contribution made by area point of view in Shekhawati region, it is observed that part and portion of Churu district (which fall in the boundary of Shekhawati region with it's partly or fully three tehsils-namely, Churu, Rajgarh and Taranagar) contributes 29%, Jhunjhunu district contributes 31% and Sikar by 40%, respectively.**

**The region under study has three major habitats from plant species phytogeographic pattern of distribution which are first - Sandy Plains and Sand Dunes habitat by covering of about 60% of the total geographic area under study, the habitat of Stony and Rocky formations ranks at second place by covering about 32.5% of the total geographical area under study whereas only 7.5% is covered by the third habitat of Riverine and Aquatic areas, respectively. 23 survey spots are scattered in these three major habitats in which three survey spots fall in Churu district, nine survey spots fall in Jhunjhunu district and remaining eleven in Sikar, respectively. The habitat of Sand Dunes and Sandy plains topography covers the distribution of 65 medicinal plant species out of total 122 for the area under study. It is very interesting to mention here that 80% medicinal plant species are common in both habitats i.e. Sand Dunes and Sandy Plains first habitat and Stony and Rocky the second habitat whereas the 20% medicinal plant species are common in the first habitat of Sand Dunes and Sandy Plains and another third habitat of the Riverine and Aquatic, respectively.**

**The author has attempt his best efforts to trace out the names of medicinal plant species which are found in Rajasthan. The distribution of medicinal plant species (Family-wise) of Rajasthan. The author has traced out 1843 medicinal plant species which are well illustrated with their medicinal plant family-wise distribution. It is very interesting to mention here that the total number of medicinal plant species are not same by their number in different medicinal plant families which are 137 in total.**

**The author has simplified this aspect by making six (A to F) 'contributory groups of medicinal plant families' the six 'contributory groups of medicinal plant families' with their respective percentage of contribution in total number of Rajasthan's medicinal plant families i.e. 137. Contributory group A- (up to 1.0%) covers the maximum percentage of contribution i.e. about 86.4 percent by including maximum number of medicinal plant families which are 118 out of total 137 medicinal plant families of Rajasthan. Whereas, contributory groups-D (3% to 4%) and E ((4% to 5%)) contributes minimum percentage i.e. 0.7 percent by each by covering only one medicinal plant families, respectively.**

**A comparative account of the total number of medicinal plant species and medicinal plant families which are common in both sides that is in Shekhawati Region as well as in Rajasthan. Naturally, it illustrates the medicinal plant family-wise contribution (in percent) of Shekhawati Region with reference to Rajasthan. Those medicinal plant families which are common in Shekhawati Region as well as in Rajasthan (without considering their total number of medicinal plant species) have been considered here as their 100 percent contribution at the part of their availability of phytogeographic distribution for the area under study. In this regard, it is revealed that there are only three medicinal plant families which have their 100 percent contribution viz; Asclepiadace, Balanitaceae and Salvadoraceae. Two medicinal plant families have their 50 percent contribution with reference to Rajasthan are following - Meliaceae and Vahliaceae. Six plant families have their contribution of Shekhawati Region with reference to Rajasthan which is below 25 percent viz; Caryophyuaceae, Najadaceae, Periplocaceae, Rhamnaceae, Rosaceae and Violaceae Where as some plant families have their contribution of Shekhawati Region with reference to Rajasthan which is below 10 percent viz; Acanthaceae, Asclepiadaceae, Asteraceae, Boraginaceae, Caesalpinioideae, Chenopodiaceae, Commelinaceae, Convolvulaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Rubiaceae, Scrophulariaceae, Tiliaceae and Verbenaceae.**

**The author made his best attempt to present a comparatively analysis at the part of total number of plant species of Shekhawati Region with reference to Rajasthan i.e. contribution point of view. It is very interesting to mentioned here from total number of plant species point of view, Shekhawati Region contributes about 8 percent only with reference to Rajasthan.**

**Manuscript received December 09, 2021**.

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**Further in this context that the author made his best attempt to present a comparatively analysis at the part of total number of plant families of Shekhawati Region with reference to Rajasthan i.e. contribution point of view. It is very interesting to mentioned here from total number of plant families point of view, Shekhawati Region contributes about 35 percent with reference to Rajasthan.**

**The phytogeographic pattern of spatial distribution (i.e. rare, frequent, common and abundant) of 15 multipurpose medicinal plant species out of 122 medicinal plant species of Shekhawati region. Each multipurpose medicinal plant species includes following points under it's descriptive account which are - botanical name, local name, vegetational characteristics, phyto-chemicals of applied parts and portion, medicinal applied aspect, phytogeographical distribution at two levels i.e. at global level and at regional level.**

**Among 15 Multipurpose Medicinal Plant Species - 5 Multipurpose Medicinal Plant Species belong to the group of Trees from vegetational groups point of view which are *Acacia senegal, Adhatoda vasica, Azadirachta indica, Butea monosperma and Ficus religiosa,* two Multipurpose Medicinal Plant Species fall under the group of Shrubs which are *Capparis decidua and Commiphora mukul,* four Multipurpose Medicinal Plant Species belong to the group of Undershrubs which are *Asparagus racemosus, Aloe vera, Cassia angustifolia and Withania somnifera*, three Multipurpose Medicinal Plant Species fall under the group of Herbs which are *Boerhavia diffusa, Sida alba and Tribulus terrestris,* and only one Multipurpose Medicinal Plant Species falls under the group of Climbers i.e. *Tinospora cordifolia* from vegetational groups analytic aspect point of view. The author observed that there is not a single species which may be turmed as Multipurpose Medicinal Plant Species at the part of vegetational group of Grasses in Shekhawati region of Rajasthan. It is presumed and the author is hopeful that the phytogeographical descriptive account of fifteen multipurpose medicinal plant species of Shekhawati region may be a unique contribution in the field of applied medical phytogeography which illustrates the location map of favourable habitats of each Multipurpose Medicinal Plant Species which in future open the window of direction to promote the cultivation of there Multipurpose Medicinal Plant Species for the region under study within their suitable habitats. Thus, in future the region under study may be the feed back source area to supply the medicinal plants products wealth to the commercial Drug Industries within country and country abroad.**

***Index Terms*— Phytogeographical, Shekhawati region, Tribulus terrestris, Tinospora cordifolia, Commiphora mukul, Adhatoda vasica, Azadirachta indica, Butea monosperma, Ficus religiosa.**

## I. INTRODUCTION AND IMPORTANCE

It has been felt from last few decades that our knowledge of medicinal plants has mostly inherited traditionally. Use of plants for curing various ailments are not confined to the Doctors only but is known to several households as well. There are many interesting and some times astonishing things to learn from collectors of medicinal herbs. Spreading and preserving this knowledge on medicinal plants and their uses has become important for human existence. There is a growing tendency all over the world to shift from synthetic to natural based products including medicinal plants. It is also timely now to consider neglected and little known medicinal plants. Natural based products are generally collected either from the concerning medicinal plants which have occurrence in their concerning natural habitats, phytogeographical units or wild areas or from the centres of commercial cultivation of plants useful for medicinal purpose. Thus, the present study problem consists overall emphasis of phytogeographic account in between the available medicinal plants of the region and their phytogeographic pattern of distribution within their concerning phytogeographical unit or natural habitat i.e. towards natural based products from the medicinal plants occurrence from natural habitats.

During last two decades considerable changes have taken place in the medicinal system all over the world. Because of the general awareness of the widespread toxicity and harmful after effects associated with the long use of synthetic drugs and antibiotics, the Western society prefer the drugs from natural sources than the synthetics. By taking consideration this conceptual aspect, the present study will deal about the phytogeographical study which naturally covers investigation of the phytogeographic pattern of distribution of available such medicinal plants in their concerning natural habitat, resource potential area or phytogeographical unit of Shekhawati region of the state i.e. Rajasthan. Thus, such type of research study undoubtedly has a strong significant platform of research problem importance and naturally may be very useful, since the study has to give emphasis to the phytogeographical unit or area concerning with its available medicinal plants from the region under study. Due to various phytogeographical units or areas, natural habitats and areas of biodiversity; India is a leading exporter of the medicinal plants in the world trade. The major export of medicinal plant parts or whole plants from India area supplied every year to many countries. Availability of such plants in nature, naturally have their occurrence in concerning phytogeographical unit or natural habitat, such units or areas are natural genes banks in nature. The present study will deal with the valuable contribution in this direction and will explore the phytogeographic pattern of distribution in concerning phytogeographical unit of the available medicinal plants of the region under study. An unpolluted and less disturbed phytogeographic unit or natural habitat will keep generally the concerning medicinal plant in more number by which apart from the medicinal plant parts, India also exports large quantity of phyto-chemicals, by thus, such kind of study is very useful in presentation of spatial distribution and development of potential as well as resource area.

More than hundred medicinal plants are used in modern medicines. Plants used in traditional systems of medicine are over five hundred different types. Most of the raw material for the traditional medicine is collected from their concerning phytogeographical units or natural areas or wild sources. Such kind of study will naturally deal about the better presentation of eco-physiographical conditions of the available plants in nature within their concerning phytogeographical unit, by thus the study will help in providing the natural conditions of the environmental elements of resource area in back ground for commercial cultivation of plants useful for modern medicines.

In India, the use of different parts of several medicinal plants to cure specific aliments has been in vogue from ancient times. The indigenous system of medicine namely Unani, Siddha and Ayurvedic have been inexistance for

several centuries. This system of medicine cater to the needs of nearly seventy percent of our population residing in the villages. Out country is a vast area where wide variations in climate, soil, altitude and latitude is available. Nature has bestowed on us a very rich botanical wealth and a large number of diverse type of plants grove wild in different parts of the country. The present study will deal the phytogeographic account of such wild parts or natural habitat, or phytogeographical unit of the available medicinal plants of Shekhawati region, Rajasthan. Thus, there is a need for conservation of all useful plant species, and also cultivation in their concerning phytogeographical unit or natural habitat, maintenance and assessment of germplasm for future use, since among the most vulnerable plant species in India, the most over-exploited are the medicinal plants, the similar conditions are also expected in the region under study.

Many of the medicinal plants which are widely known for their curative effect of certain diseases may have their specific pattern of phytogeographic distribution for the region under study, hence, naturally the study will deal this aspect by giving more emphasis on pre-expected (which are widely known from generations back for their curative effect of certain diseases) such as, *Adhatoda vasica* as an expectorant and antiasthamic, *Achyranthus aspera* and *Boerhavia diffusa* as diuretic, *Cassia fistula* as catharitic, *Azadirachta indica* as antibiotic activity, anthelmintic and antiseptic, *Commiphora mukul* as on anti-rheumatic and nervous tonic etc., such, kind of study will explore the potentical areas of natural habitats or phytogeographic descriptive account in this aspect.

The plant based drugs, however, have shortened the life-span of the source of material. There is continuous search for more potent and cheaper raw material area to feed the industry. The present study will try to provide the guidelines about a phytogeographic account of spatial distribution of such more potent and cheaper raw material resource area for the available medicinal plants of Shekhawati region with concerted research and development efforts, many medicinal plants could provide raw material in abundance either by their commercial cultivation of plants useful for modern medicines or by explorating the natural habitat or conciding phytogeographic unit which have abundance of occurrence of such kind of plants for the region under study.

The present study will deal an integrated and comprehensive account of all related aspects of the research subject as nomenclature, description, phytogeographic pattern of distribution of available medicinal plants, spatial distribution of nature and type phytogeographical unit, interpretation of eco-physiographical conditions or rather to say natural conditions of environmental elements for providing supportive background for their commercial cultivation, physical and chemical properties of important medicinal plants in a broad sense etc. from phytogeographic study point of view for the region under study. Thus, the time has come by which one can visualize very well the importance of the research problem, that, there is a need to identify the natural plant wealth from phytogeographic study point of view and commercially viable and valuable species in each agro-climatic zones, promote industries to produce phytochemicals, standardise the agrotechniques for cultivation and production of these plants particularly in forest, phytogeographical units, waste lands and orchards as an additional income generating activity, and also strengthen the research and developmental activity for evolving new herbal products and their production technology.

An integrated system of medicine based on natural products of plants from natural habitats and synthetics may yield the most effective and cheap package for WHO's goal of "Health for all by the year-2000."

The present research problem has significance of conceptual platform to all the lovers of green coverage in natural habitats that, many of these valuable and useful group of plants are threatened with extinction, because of over exploitation and habitat distraction, significance endeavour of the research problem here is to make people aware of the potential of medicinal plants from all angles so that these life saving plants can be protected at least from the total destruction from the region under study.

The spectrum of study is, therefore, very large. Arising out of a multitude of factors these problems are studied with cross-fertilization of knowledge between ecologists, botanists, phytogeographers, forest scientists, naturalists, herbalists and practitioner which helps in the accumulation of new data for the presentation of selected problem in a specific region with reference to the applied aspect of the medicinal plants.

## II. REVIEW OF LITERATURE

Numerous large and small books dealing with medicinal plants of India now exist; some of them run into several volumes of hundreds of pages. The useful properties attributed to one and the same plant in different parts of India sometimes greatly vary; this has resulted in vast literature in regional languages too. Workers like U.C. Dutt, G.Watt, R.N. Chopra (and his associates and students) K.M. Nadkarni, K.R. Kirtikar, B.D.Basu, B. Mukherjee, Chandraraj Bhandari, K.Biswas, K.P.Trivedi, the Editors of Wealth of India (Raw Materials) and other have done very laborious work in bringing much of this information together.

Paul Muller in 1976 divided the field of biogeography subject into its six branches which are as Vegetation geography, Zoogeography, Soil sciences, Physical anthropology, Bioclimatology and Geomedicine. The last one e.g. Geomedicine is actually Medical geography which about the geography of medicinal plants to the areas they occupy on this planet.

From time immemorial man has been interested in trying to control disease. The medicine man, the priest, the herbalist and the magician, all undertook in various ways to cure man's diseases and / or to bring relief to the sick. In as almost complete absence of scientific medical knowledge, it would not be fair to say that the early practitioners of medicine contributed nothing to the alleviation of man's suffering disease. By thus one can visualize very well that several types of herbs were used for different kind of diseases. In earlier phase, the herbalist was a true applied phytogeographer of that time who was probably with an adequate knowledge about the phytogeographic distribution of particular medicinal herb of on that time. The importance of curative effect of certain plants to give relief to the sick, actually the birth of applied phytogeography has taken place in early time with the search of distribution of such medicinal plants within their favourable conciding nature habitat.

Under natural sciences, herbs as medicinal plants were explored to some extent as well as systematic presentation was started with the study of Theophrastus (370 - 287 BC) and Discorides (62-128 AD).

If we think over about the historical account of Indian medicine, than we will find the use of several herbs as medicinal plants in preparation of certain kinds of drugs, based on the teachings of Atreya, Charaka compiled his famous treatise on medicines, the 'Charaka Samhita' (200 A.D.). In this volume he mentions some 500 drugs. The Indian snakeroot (Rauwolfia) was employed for conturies by the Indian naturalists or the physicians of on that time, like wise before reserpine was extracted from the root and found spectacularly effective in the treatment of by expert persons in Homoeopathy (1755-1843), it is a system of pharmacodynamics based on 'treatment of disease by the use of small amounts of a drug mostly derived from the herbs i.e. medicinal plants of on that time. Homoeopathy is practised in several countries, but India claims to have the largest number of herbalists of this system int he world. In Indian system of Medicine including Unani-Tibb and Homoeopathy are very much alive in India, and it is very interesting to mention here that they continue to be an important source of medical relief of to the rural population.

Thus, the use of plants for different purposes is perhaps as old as mankind. In India, since the Vedic Period, informations were available on the utility of plants in medicine finds place in different ancient scriptures, and on that ancient times the India was known as Bharat Varsh, and at that time the people of this land was served by sage and saints through Dhanvantri Vedic literature about health, diseases and herbs of this aspects and herbs of this aspect.

As in the country side modern medical facilities either do not exist or are insufficient. This system has been a part of Indian way of life deep rooted in language, culture of the people and easily understood by the common man. This traditional system being an ancient one and well tried under India conditions provides medicines which are taken with locally available foods which act as a nourishing diet to the patient. Ayurvedic medicines can be made popular by even telling the illiterate person the qualities of common medicinal plants and their uses for diseases such as malaria, colds and skin diseases. Examples of plants such as the tulsi (*Ocimum sanctum*) and neem (*Azadirachta indica*) can be cited. The knowledge of the use of such plants for their effective cure for certain diseases can be made available to the people by the Ayurvedic doctor (Vaidya) even through the existing skeleton services. The use of medicines offered by this system is easily accepted by the common man.

The Ebers Papyrus (1150 BC) which was found with a munny on the banks of the Nile, is a unique record of some soon prescriptions based on some 700 drugs which were prepared by herbs, the known medicinal plants of that time. Castor oil, thanic acid, opium, terpentine, gentian, senna and the drugs prepared by plant roots were all uses by the Egyptian-physicians.

Due the vast field of the subject of the research topic, an exhaustive and detail knowledge of the available literature and references of books, magzines etc. of the world, country and state level are listed out under the heading of bibliography/ reference which is placed in the last of this research volume. Hence, presently here the author is giving a historical resume in the following paragraphs which covers the illustration of the work of the authors or researchers who are more related by their significant contribution for the topic under research.

The study of vegetation, forest and of plants from systematic taxonomic descriptive point of view was started in 1753 with Linneaus work of species plantarum. The following paragraph deals about the researchers who gave their valuable contribution on economic and medicinal plants for the areas of our country and country abroad and it was started with the work of a published book on medicinal plants by Bantley and Trimen in 188. Nathawat and Deshpande in 1960 studied on Plants of Economic Importance from Rajasthan but that was for Acacia's species only.

The area under research work i.e. Shekhawati region which covers partly Churu and completely the districts of Sikar and Jhunjhunu was studied for some scattered certain localities by following botanists time to time viz; first of all the Shekhawati region was touched from vegetational study point of view by Mulay and Ratnam in 195, Bikaner and Pilani neighbourhood areas by Joshi in 1956 and 1958, vegetation of Chirawa by Nair in 1956, again Nair and Joshi for Pilani and neighbourhood areas in 1957, vegetation of Harsh Nath in Aravalli's Hills was studied by Nair and Nathawat in 1957, vegetation of Jhunjhunu, Mandrella and neighbourhood by Nair in 1961, vegetation of Ajit Sagar Dam by Nair and Kanodia in 1959; Nair, Kanodia and Thomas in 1961 studied the vegetation of Khetri town and neighbourhood areas and vegetation of Lohargal and it's neighbourhood areas of Sikar district by Nair and Malhotra in 1961.

After the work of Nair and Malhotra in 1961, i.e. four decades ago, the area was again left for any sort of further research work in the field of applied botany. By thus, it is quite obvious that none of them worked on exact head line of applied phytogeography of Shekhawati region as a whole with specific reference to medicinal plant species.

Work on medicinal plants of Southern U.S.A. was presented by Johnston in 1979. Some important plants of Arid and Semi-arid regions of Rajasthan were listed out by the work of Tewari in 1979. In 1980 Sharma presented his work on the area of eastern Rajasthan's medicinal plants, he gave more emphasis in the conservation of these plants by the tribals, respectively. Economic plants of Indian Desert was described by Saxena in 1981. Singh and Pandey in 1983 contributed their work on Economic and Medicinal plants of Indian Desert. Satyavati, Gupta and Tondon combinedly worked in 1987 on Indian Medicinal Plants. A valuable contribution was made by Nayar, Ramamurthy and Agarwal on Economic Plants of India which was published in two volumes by the Botanical survey of India in 1989. Again the same year Gandhi's book was published on Rajasthan Vegetation Index.

A significant, very authentic taxonomic work was contributed in the field of botany by M.M.Bhandari with the publication of a book Flora of the Indian Desert in 1990. From the field of applied phytogeography point of view Charan gave a valuable contribution with a publication of a book on Plant Geography in 1992. Kirtikar and Basu published their work on Medicinal Plants of India in 1994. For understanding of local rural persons of the State, Jethu in 1997 wrote a book on Maru Pradesh Ki Vanaspatiyan. Like wise in 1998 Pandey wrote a book on Chamatkari Zadi Butiyan found in the Sub-continent of India. Agnihotric in 1999 presented a very

valuable contribution on Geomedicinal Environment and Health Case, the study with Indian back ground appraisal.

Besides all of them i.e. earlier mentioned workers some valuable contributions made by some researchers, scientists and authors are of worth to mention here viz; Raunkiaer's work on Life Forms spectrum in 1934, Forest types of Rajasthan with their vegetational series by Mathur in 1960, A revised survey of Forest Types of India by Champion and Seth in 1968, for statistical data collection of plant species i.e. methodological studies paint of view Mishra in 1968 presented his work in a book entitled on Ecology Work Book, Robinson's book on Biogeography in 1978 was highly appreciated in the world by the workers of this field and environment, and Sen in 1982 by his book publication on Environment and plant Life in Indian Desert.

Meilke, H.W. in 1989 wrote a book-patterns of Life in which he illustrated domestication of medicinal plants. In 1990 Rais Akhtar and Yola Varehassett in their book - Disease Ecology and Health published the importance of 'Role of traditional medicine in India'. Charan in 1992 also described about the distribution of important medicinal plants of western Rajasthan in his book- Plant Geography. Dr. G. Pandey wrote an important book namely - Zadi-Butiyan in 1998, than after in 1999 Ranade, S.et al. published a book on - Ayurvedic Treatment on Common Diseases which is a very valuable contribution in this direction. Singh and Pandey in 1999 contributed their comprehensive work on Ethnobotany of Rajasthan. Jain presented work on Medicinal Plants with the publication of his book in 2000. Bhattacharjee in 2000 gave a very valuable authentic contribution through the publication of a book on Handbook of Medicinal Plants in which he presented the medicinal plants of Indian Sub-continental back ground with their coloured photographs also. Bendre and Kumar in 2000 published a book on Economic Botany giving emphasis on commercial values of medicinal plants, same year Kumar, S. Published a valuable contribution for the cultivation aspect of medicinal plants 'Ausdhiya Sugandhit Faslen Wa Fulon ki Kheti'.

From 2001 and onwards following books are here worthwhile to mention from the field of research aspect as Medicinal Plants by S.K.Jain (2001), Ethnobotany by R.K. Sinha (2001), Forestry and Rural Development by S.A.G. Sekar (2001), Health and medical care by N.H. Anita et al. (2001), and Biodiversity by Kumar and Asija (2002).

Being an applied Medical phytogeographer I feel my prime most duty to present here the specific interpretation of the researchers who have carried out the research work of the analytic aspect of the nature, contents and details of available phyto-chemicals which are investigated or traced out within the applied parts and portion of medicinal plant species, with specific reference to my study area i.e. Shekhawati region of Rajasthan.

With the end of third decade of 20$^{th}$ century, the study on analytic aspect of phyto-chemicals of medicinal plants had already been started, during that period in 1929-30 Chopra, R.N. and Chosh, S. studied on "Medicinal Plants Used in Indigenous Medicine", Further in this context in 1984 studied in 1956-58 Chopra,R.N. on "Medicinal Plants" whereas in 1984 Basu, B.D. and Kirtikar, K.R.studied on "Indian medicinal plants", respectively.

It will be very interesting to mention here a descriptive account of certain medicinal plant species analytic aspect of available phyto-chemicals by some researchers, are being illustrated here in the following paragraph which alphabetically covers the medicinal plant.

Phytochemicals of applied parts and portion of medicinal plant - *Albizia lebbeek* (A tree species) was studied by Tripathi, S.N. et al. in 1978, Tripathi, R.M. et al. in 1979, and Das, P.K. et al. in 1983. Another medicinal shrub/ tree species i.e. *Adhatoda vasica* was studied in 1983 by Kanwal, P. et al. *Asparagus species* (Herb species was studied by Inamdar, A.C. and Mahabale, T.S. in 1980. *Azadirachta indica* (Neem tree) a multipurpose medicinal plant species was studied by several researchers but the phyto-chemicals analytic aspect studied by K.C. Sinha et al. in 1984 with specific reference to Neem Oil is worthwhile to mention here.

*Boerhavia diffusa* (herb species) was studied by Srivastava, K. et al. in 1980 for it's phyto-chemicals contents. In 1980 Dennis, T.J. et al. and in 1984 Pachnanda, V.K. et al. studied the phyto-chemicals of *Boswellia serrata* (Medicinal tree species). In 1981, the phyto-chemicals of *Corchorus depressus* (Medicinal herb species) was studied by Vohara, S.B., et al. in 1981. A very important multipurpose medicinal shrub species - *Commiphora mukul* was studied by some researchers from phyto-chemicals analytic aspect point of view which are as - Baldwa, V.S. et al. in 1978, Mester L. in 1978, Bordia, A. and Chuttani, S.K. in 1979 and Kotiyal J.P. in 1979. Sharma, H.K. et al. studied the phyto-chemical of *Cassia species* in 1982.

*Occimum sanctum* - a under shrub medicinal plant species phyto-chemically was studied by Bhargava, K.P. and Singh, N. in 1981. Phyto-chemicals of *Solanum nigrum* in 1982 was studied by Brindha, P. et al. In very early during 1932-33 Pandse, G.P. and Dutt. S. worked out the phyto-chemicals of an important medicinal climber species - *Tinospora cordifolia*.

In earlier studies, Venkataraghavan S. et al. in 1980 traced out the phyto-chemicals which are found in applied parts and portion of two plant species namely - *Boerhavia diffusa* and *Withania somnifera* - a multi-purpose medicinal shrub species was phyto-chemically studied by some researchers which are as - Kuppurajan, S. et al. in 1980, Singh, N. et al. in 1982, and Verma, V. in 1983.

Although all of them as above mentioned researchers, botanists and authors contributed their valuable work from time to time but none of them upto now presented their work on exact lines of applied Biodiversity for the particular area under study i.e. Shekhawati region of Rajasthan state with specific reference to medicinal plants.

## III. AIM AND OBJECTIVES

It is a well known fact that plants are the most precious wealth from eco-climatic consideration point of view as well as the most basic resource on this planet on which ultimately each and every life-form's activity is based, including activity the human beings or human resources also. The aim and objectives of the research work will cover to trace out the fundamental natural or environmental conditions of the medicinal plants in their concerning natural habitat or habitats and their interpretation will be illustrated to support the framing of preparation of better background for commercial cultivation of medicinal plants in pharmaceutical industries or laboratories. Try to maintain and conserve this green cover, is

an ultimate aim of such kind of research study, For this purpose, the knowledge of details of plant cover is necessary element among the expected objectives. It becomes the prime most duty of a phytogeographer to trace out, to identify them for their geographic interpretation from their origin point of view, analytic aspect of applied values of the useful plants will remain one of the main objective of research work, their cartographic presentation from spatial distribution point of view will be an important objective of the study.

The study will give an emphasis to the applied plant species within the existing vegetation cover of the study area i.e. for illustration of applied plant species and location of the sites within their favourable habitat/ habitats for the area under study. By doing so, a phytogeographer ultimately reach to one of the next generations of mankind in that particular habitat or area from environmental conservation as well as protection point of view, specially for medicinal plants through on going plantation programmes in that particular area. The aim and objectives of the study also covers the suggestions which will be conveyed to the public and private sectors like NGO'S for plantation programmes implementation for the applied or useful plant species specially which have their medicinal values for the human beings welfare as well as domestic animals, serving mankind in various ways from centuries back to the people of this land. Illustration of the account of the details of phytogeographic pattern of distribution of plants at global level and regional level for the applied aspect of medicinal plants species is also one of the most significant objective of the study problem.

Scrutinizing of medicinal useful plant species among the plants, vegetation cover as well within forest wealth of Shekhawati region is a preliminary or introductory part of aim and objectives of the present research problem. Further in this context to trace out the 'Multi-purpose Medicinal Plant Species' is also one of the most important aim of this study. To present the detail of each and every (Multipurpose Medicinal Plant Species) during the course of research work will be a prime most duty of the author being as a 'applied phytogeographer'.

For the identification and scrutinizing of plant species, specially medicinal, following botanical collections, notes and materials study is also an important objective of the research viz; Schultes (1960), Altschul (1962), Jain (1967), Chaudhuri et al. (1977, 1980), Charan (1978), and Bhandari (1990).

Being a field of applied phytogeography with specific reference to the study of medicinal plans, naturally it become a significant aim to illustrate the applied parts and portion of medicinal plants which are being used to cure certain disease. Further in this context, the research study objective also covers the illustration of analytic aspect of phyto-chemicals of the applied parts and portion of medicinal plants i.e. in other words to say phyto-chemistry descriptive interpretation due to which the particular medicinal plant has applied values as drug to cure certain kind of diseases for the welfare of healthy environment of human beings.

The interpretation of change detection in vegetational coverage of Shekhawati region during last decade or soon is also one of the objective of the study by using NOVA Satellite imageries.

## IV. HYPOTHESIS AND ASSUMPTIONS

After air and water, plants are the basic important as well as vital resource on this planet on which each and every life form present in its physical framework. Undoubtedly, the description of vegetation, its types distribution has been studied by some workers for either fully of partly many parts of districts of the state of Rajasthan from time to time but it is presumed that none of them touched the exact lines of applied phytogeoraphic aspect for the area under study on the basis of available literature of workers up to now. Being a phytogeographer, a frame work of conceptual curiosity developed about the area, than after for author it becomes very essential to explore, investigate, to present a cartographic illustration at least for those plant species which are medicinally useful or being used from centuries back for the welfare of human beings domestic animals, human societies, tribes or the poor people belonging to the rural background. Due to having some areas under natural habitats life Lohargarl, Harsh Nath, Ajit Sagar Dam it is expected that the existing vegetation cover of the region may have at least more than one-third plants which be termed as 'Useful Plants'. Among these useful plants, is expected that the region under study may have one-forth plants for medicinal uses. Further in this reference as well as study, if a phytogeographer gives further details of the location of space or sites of the favourable conciding habitat according the nature of medicinal plant species than that it may be a very meaningful contribution in the study from environmental conservation point of view. Probably, there are more chances that the region may involve the problem of conservation of some rare, thatened or endangered plant species in which the percentage of medicinal plants should be more, hence for such plant species in future through the on going plantation programmes by the public or private sectors for the area under investigation. By thus, we can protect too much extent to those plant species which have their medicinal applied values for the welfare of human beings inhabiting in that area particular or the area concerned. For this purpose, it is expected from a phytogeographer that he should give an account of the layout maps of that area under study which covers the location of the sites with favourable habitat/ habitats according the nature of that medicinal plant species existing for the particular area under investigation.

Being a phytogeograher, it is my presumption that the neither the useful plants and nor the medicinal plant species should have homogeneous spatial distribution in the region under study but that may be heterogeneous from phytogeographic pattern of distribution point of view. It's my presumption that the Shekhawati region may include at least one-fifth medicinal plant species which may be termed as 'Multi-purpose medicinal plant species' i.e. Multipurpose Medicinal Plant Species. In other words to say the medicinal plant species which are useful as a drug in the cure or treatment of three or more than three diseases of mankind.

I also hope that there may be a marked variation in the percentage of vegetational group of medicinal plants and their families. Naturally, the author presume that all parts of every medicinal plant should not be useful as drug but some specific parts and portion should be useful, it may be traced out during

the course of study of research work details of analytic aspect in this concerned.

The author may find or trace out that the region may include many medicinal plant species which may be useful one side for the cure of one disease particular, and another side many single medicinal plant species which may be useful as drug in the cure of many different kind of diseases.

## V. METHODOLOGY AND ANALYTIC ASPECT

To select only about a fifteen important ones from over 122 medicinal herbs posed considerable difficulty. Generally, plant whose efficacy in medicine has now been tested and recognized, for example, plants which have been included in Indian Pharmaceutical Codex and also in the British Pharmaceutical Codex and / or United States Dispensary have been included. Mostly, only indigenous plants have been taken. Only those few introduced species are included which are very important medicinally or commercially, or which are now regularly cultivated in India. Some such species have even become naturalised now.

The methodology of the research problem will involve the following studies - To explore, to collect, and to prepare the lists of plant species for the area under study which have their applied values for the welfare of human beings of the inhabitants. For this purpose exhaustive field studies on appropriate number field survey spots by covering proportionally all major habitats of the study area will be carried out during the course of research period, collection of the information from the local people inhabiting in that particular habitat, and consultation of the available literature will be exercised in this aspect.

The work of identification of the plant species will be carried out with the help of Watts Dictionary of Economic Plants, Glossary of Medicinal plants by Chopra et al., Medicinal plants by Kirtikar, Basu and Bhandari's book Flora of the Indian Desert, Handbook of Medicinal plants by Bhattacharjee, Botanical Survey of India, and consultation with the supervisor for this research work.

The search of relevant data in ancient or in recent literature, unpublished travel accounts, tour reports, etc., which shows some work of significance have been also covered in this research paper matter during recent years.

Applied categorization of those listed applied plant species will be carried out into their main applied categories viz; plants for fuel purpose, plants for fodder purpose, plant species for medicinal use, plants for edible purpose, and plant species for commercial values (Nayar et al. 1989; Charan, 1992).

The scrutiny of notes on botanical collections in herbaria of Schultes (1960) and elaborated by Altschul (1962) and Jain (1967), Chaudhuri et al. (1977, 1980), Charan (1978), Jain and Dam (1979) and Bhandari (1990) have compiled useful notes and their materials for identification of the plant species.

Use of the landset satellite imageries for the interpretation of decade-wise illustration of the green coverage of the region will be exercised i.e. change detection in vegetation status at least for a past decade to know the present position. District census hand books 1971 onwards of three districts will be used for basic district-wise informations and required data collection to illustrate the variation in vegetation cover as well as the land under forest coverage.

To illustrate the frequency of distribution of particular plant species - the prescribed methods by Mishra's (1967) will be exercised to show whether the particular plant species is rare, frequent, common or abundant for the area under investigation. The nature of habitats and the eco-climatic conditions (Odum, 1996 IBH) will be dealt as a part and portion of the study to support the phyto-climatic account of the research problem for the area under study.

The exhaustive literature study will be traced out to illustrate the analytic aspect of the identification of the specific part and portion of medicinal plants which have applied values from phyto-chemicals point of view. The suitable methodology will be adopted to analyse the number of single medicinal plant species which is being used by native people or Vedh as drug to cure many different diseases where as also may single different plant species are being used as drug to cure a single specific disease, respectively.

From phytogeographic study point of view, a cartographic interpretation of the medicinal plant species will be dealt at two levels i.e. at macro-level (global level) and at meso-level (regional level). The plant species which cover at least three or more than three applied categories of applied categorization are termed here as multi-purpose plant species for the area under study (Charan, 1992).

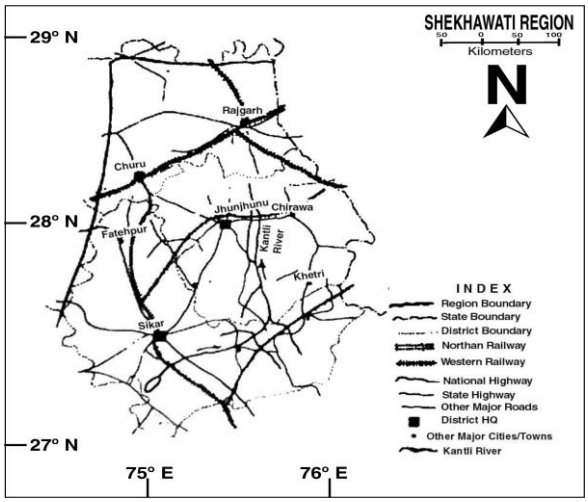
The analytic aspect of each and every applied plant species will be followed after Raunkiaer's methodology proposed in 1934 to give an appropriate shape to the work of research problem, basically it may be dealt in phytogeographic sense viz; leaf-class classification, vegetational groups analytic aspect, xerophytic categorisation, and life-forms classification.

The analytic aspect at last as an end product will cover the preparation of the Vegetation Index Map of the area under study (Gandhi, 1989). To protect or rather to say to conserve the applied plant species from environmental conservation point of view - the author will carried out the aspect of the cartographic interpretation of the allocation for selection of the sites with suitable habitat/ habitats according the nature of applied plant species of the area under study, by thus the state/ district or the block may implement properly its policy of conservation through the public sector or private agencies sector like NGO'S during ongoing schemes of plantation programme on these particular sites for the area under investigation i.e. the Shekhawati region of Rajasthan.

## VI. STUDY AREA

**Figure-1.1** shows the area under study i.e. Shekhawati region which is located in the north-eastern part of Rajasthan state and the region has geographical extension from $26^{o}26'$ to $29^{o}20'$ N latitude and $74^{o}$ 44' to $76^{o}34'$ E longitude on the map of Rajasthan.

**Figure- 1.1 Location Map of Shekhawati Region**




The area under study covers fully or partly three districts, namely Churu, Jhujhunun and Sikar. Churu district's out of 7, only 3 tehsils fall under Shekhawati region (Churu, Rajgarh and Taranagar) whereas Jhunjhunu district as a whole with its six tehsils (Buhana, Chirawa, Khetri, Jhunjhunu, Nawalgarh and Udaipurwati) in which Buhana tehsil emerged out as a new tehsil on the map of Jhunjhunu district (2001), it was no more existence in the year of 1991 and Sikar district also covered fully with it's six tehsils (Data Ramgarh, Fatehpur, Laxmangarh, Neem ka Thana, Sikar and Shri Madhopur). The region has 23 Panchayat Samitis in all. Thus, the region under study has 15 tehsils in total with it's total 15343 sq. km. geographical area which makes 5.6% of the state's total. At the part of district-wise contribution by area point of view in Shekhawati region it is observed that part and portion of Churu district contributes 29%, Jhunjhunu district contributes 31% and Sikar by 40%, respectively.

Among these tehsils area point of view, the tehsil of Churu is largest one and Buhana smallest, respectively. District-wise area point of view Sikar stands at first position which is followed by Jhunjhunu and lowest contribution is made by Churu i.e. 1683 sq. km. only.

At the part of population, Shekhawati region contributes 8.7 percent of the state's total in which sex-ratio is 948 females per thousand males in Total Population whereas it is very low i.e. 887 in Child Population for the area under study. The region obtains high Literacy rate which is about 10% more than that of the state's average. Among tehsils, Buhana ranks at first position while as Neem ka Thana contributes lowest in this aspect. The region obtains high density (244). The region has also Slum population but it is very low or to say negligible i.e. 2.5% only of the urban area's total.

The whole region has distribution of two types of soils; Sandy soil and Red Loamy soil. The former soil type has obvious distribution in Churu district, the areas of sand dunes topography; the later soil group is mostly distributed over the districts of Jhunjhunu and Sikar (classification based on dominancy, availability and agricultural productivity). The distribution of soil type and it's physical as well as chemical nature is a significant aspect from vegetation as well as plant species distribution point of view.

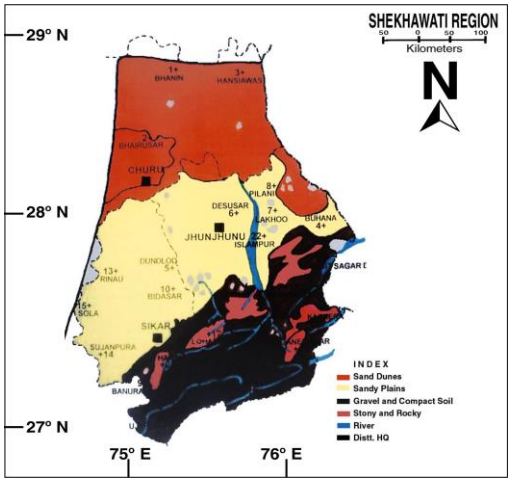
On the basis of another type of soil type classification according Prof. Thorpe and Smith based on the origin of the soil, the observations revealed in this direction that Remosols type of soil has distribution in the areas of sand dunes topography; all three tehsils of Churu districts have, Red sandy soil which is more alkaline in nature. Hilly topography soil and Riverine soil have their distribution according the distribution of habitat of study area.

Here, the author is illustrating the geographical perspective of the area under study in brief with it's significant components from the specific interest of the subject of study point of view. Any way, overall the present research paper's matter is divided into three parts from descriptive account point of view-viz; physiographical characteristics, land use pattern, and demographic aspect.

## VII. PHYSIOGRAPHICAL CHARACTERISTICS

**T**he state of Rajsthan has been divided by Prof. V.C. Mishra (1967) into seven Geographical Regions[1] in which Semi-Arid Region is one of them and our study area i.e. Shekhawati region is situated in the northern part of this region, respectively. After that Prof. R.L.Singh in 1971 divided the state of Rajasthan into four Geographical Regions[2] in which the area under study i.e. Shekhawati region falls under the region of Rajasthan Bangar Pradesh by covering partly or fully three 'sub-division' i.e. B-1 the NE Churu Region which includes nearly 20% portion of Churu district's total, B-2 the Western Sikar-Jhunjhunu plains covers about 70 percent of both districts, and C-1 the Sambhar-Didwana Region which contributes about 10% of the area under study.

**Figure- 1.2 Distribution of Major Physiographical Formations in Shekhawati Region**




It is very interesting and surprising to mention here that author's observations regarding the area, tehsils and districts coverage under the regional boundary of Shekhawati region that recently some researchers have done their research work at the name of Shekhawati Region but they excluded the part of Churu district, which makes nearly 30% area of Shekhawati region's total.

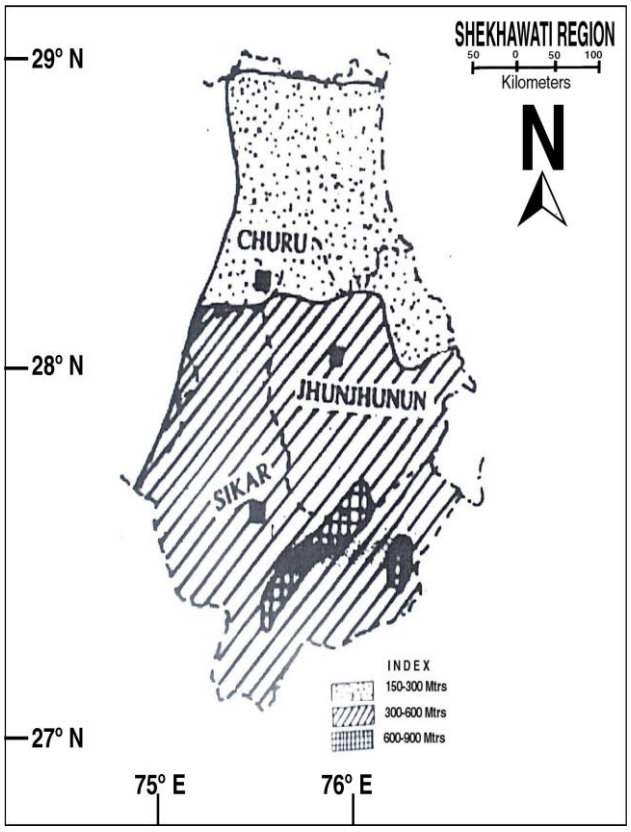
Geological formations of the area under study may be divided into two distinct parts- the first part makes about 85 percent which is covered by Blown Sand, it is recent formations about one Lac years Ago whereas the second part

makes about 15% area which falls under Delhi System formation about 45 Lac. years ago. Which the origin of upper Cambrian period. Delhi system of Aravallis is situated in south-west to north- east in direction.

**Figure-1.2** shows the distribution of major physiographical formations in Shekhawati Region of Rajasthan which includes Sand Dunes, Sandy Plains with loose soil, Gravel and compact soil formations, Stony and Rocky (Hilly patches) topography, and Riverine as well as Aquatic formations, respectively.

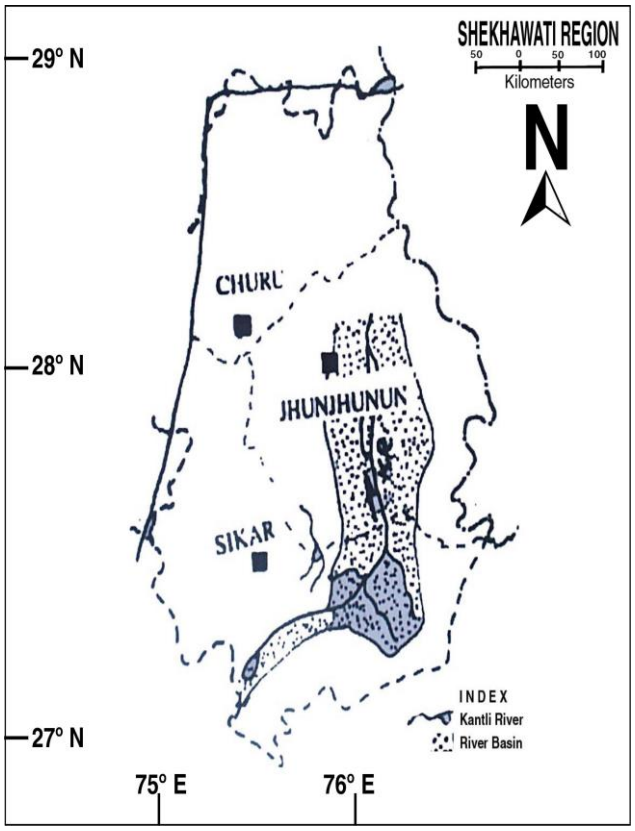
The surface terrain, topographical fluctuation of the area under study is not thoroughly even but the relief decreases as one proceed from south to north in direction. It has three distinct areas of different elevations: (A). High altitudinal areas- between 600 to 900 m. which lye in the southern part Shekhawati region, it covers two mountain ranges-first of Lohargarl range (in south-western site), and-second of Baghor range (in south eastern site of Jhunjhunu district), in Jhunjhunu district, about one-tenth portion of the study area falls in this part, (B). Medium altitudinal areas lye in between 300 to 600 m. and covers maximum area of the region, it covers most of the areas under sandy plains topography, about 60% of the region is covered under this height range whereas the (C). Low altitudinal areas lye in between 151 to 300 m. by height and mostly it covers the areas of sand dunes topography which is situated in northern part of the region under study. **Figure-1.3** illustrates the topographical fluctuation of the area under study from it's topographical fluctuation point of view.

**Figure-1.3 Topographical Fluctuation in Shekhawati Region**




The region under study has four rivers viz; Lohargarl Ki Nadi, Chandrawati, Dohan and Kantli river (**Figure-1.4),** all these rivers have Internal Drainage system, and Kantli river basin is largest among them but covers only 1.4% area of the state's total under "Internal Drainage System." Most of these rivers have their location in southern part of study area. Hence, over all the Kantli Drainage system is significant in this aspect and it covers 4,677.80 sq. km. area.

**Figure-1.4 Drainage System in Shekhawati Region**




## VIII. LAND USE ASPECT

Shekhawati region covers different kind of land use patterns which depend upon several factors and covers varied aspect of consideration. It has been observed by the earlier workers and researchers that it mainly depends upon the availability of soil and water resources in the particular area and the human endeavours to harness them. The region under study consists three districts - namely- Churu, Jhunjhunu and Sikar. These district have their own peculiarities as well as characteristics of type of soil and water combination, hence overall land use for the region as a whole quite distinct in availability of differences.

**T**he District-wise contribution in Land Use Pattern of Shekhawati Region. Due to non-availability of recent data of present years the author has taken the base of available data of 1994. The region understudy broadly consists six major patterns of land use type viz; Forest, Land Not Available for Cultivation, Other uncultivated land, Cultivable Waste, Follow Land and the land under Net area sown. The major patterns are also further divided into their sub-types of land use pattern but each pattern in details is not applicable from the them under study point of view.

The land use pattern under Net Area Sown ranks at first place which is followed by areas Fallow Land. The minimum contribution in this aspect is obtained by Cultivate

waste i.e. only 2.8%. The land under Forest Area contributes 6.8% at the name of Forest cover. Land not available for cultivation and other uncultivated like "Pasture and Grazing" land also contribute at their parts accordingly. The author will not go in details for the descriptive account of each and every type of land use, for the reason the nature and characteristics of habitat type of Shekhawati Region is more significant here from phytogeographic pattern of distribution point of view rather than the land use type, respectively.

## IX. VEGETATION TYPE AND FOREST COVER

This much be know very well that not for only a phytogeographer from study point of view but the green cover wealth in the form of vegetation or forest have a vital role in the daily life living aspects for even a layman i.e. for human kind welfare point of view. From the commencement of daily life activities and at last end of the life - the plants have their applied values in numberless human activities i.e. way of existence of life style. Thus, the green coverage has it's own unique endeavour on this planet and to describe here in the following forth coming paragraphs we can divide in to three parts wise-type of vegetation, distribution of forest types and the forest cover for the area under study i.e. Shekhawati region, Rajasthan.

### 1. VEGETATION TYPES

The area under study has mainly five types of dominant vegetation which are as mentioned below -

**A. Prosopis - Capparis - Zizyphus**

Such type of vegetation namely - *Prosopis cineraria*, *Capparis decidua* and *Zizyphus numularia* has it's dominant distribution mostly in the middle part of Shekhawati region. Eastern part of Shekhawati region and Rajgarh tehsil of Churu district.

**B. Prosopis - Acacia**

*Prosopis cineraria* and *Acacia nilotica* are the dominant tree species which have their mostly distribution in north - western part of Shekhawati region by covering north-western part of - Sikar district and tehsil of Churu as well as Taranagar of Churu district.

**C. Salvadora - Prosopis - Capparis**

This type of vegetation also covers a large area of southern part and portion of Shekhawati region which is shown by empty places or areas. The particular type of vegetation has two tree species *Salvadora oleoides* and *Prosopis cineraria* and combination with a shrub species i.e. *Capparis decidua.*

**D. Anogeissus - Euphorbia - Rhus**

Actually, this type of vegetation is covered by hilly habitat of Shekhawati region. One can find it's dense distribution in southern part of Jhunjhunu district and northern part of Sikar district.

The vegetation type covers one dominant tree species i.e. *Anogeissus pendula*, with combination of two shrub species which are family - *Euphorbia caducifolia* and *Rhus mysorensis*.

**E. Prosopis - Tecomella**

The particular vegetation type has two dominant tree species namely - *Prosopis cineraria* and *Tecomella undulata*. As shown in earlier figure it is quite obvious that the particular type of vegetation has it's dense distribution at two areas - one is located in south - eastern part of Shekhawati region and another mid-southern part, respectively.

### 2. FOREST TYPES

The kind of forest types is naturally based on the climatic characteristics i.e. the type of climate for the area under study. Two types of forest coverage for the area under study which are as mentioned below –

**A. Tropical Dry Deciduous Forest**

As it's name denotes that the forest type is tropical according latitudinal belt but Dry due to desertic conditions and deciduous by nature due to the impact of seasonal changes in which 'leaf fall' take placed in a particular season of the year. Such kind of forest has it's dominant distribution in middle as well as western part of Sikar district.

**B. Tropical Thorn Forest**

It is again tropical due to latitudinal extension but the plant species are mostly thorny and spiny 'by nature hence in other words the forest type is also termed as "Thorny Forest". Such type of forest cover has it's vast coverage and mostly distributed in southern to towards eastern part of Shekhawati Region, Rajasthan. Thus, two types of forest-one by deciduous nature and another by thorny in nature, have their spatial pattern of distribution in the study area.

## X. ECO-CLIMATIC CONDITIONS

As we know environment is a very complex sense coverage word, many Scientists, Climatologists and Environmentalists defined and tried their best to express its meaning, for example - Odum in 1971 defined that, " Environment is the surrounding complex of the nature in which each and every life form presents in its physical frame work". Thus environment has been divided three important parts - physical, climatic and biological. The components of physical factors in other words to say the topographical or physiographical features of the area under study. The present research paper deals about the interpretation of the part of climatic conditions, among climatic conditions - rainfall, temperature and the relative - humidity are the significant as well as dominant components which play their important role in the distribution of life forms on this planet, with specific reference to plant species as well as existing vegetation.

By visualising the studies done by some plant geographers (phyto-geographers) and other authentic workers, Lawrence in 1951 put a frame work of the "principles of plant geography" on the basis of the work of Good (1931) and Mason (1936), he put fourth four groups of principles of plant geography in which Group - A, it deals about the "principles concerning the environment," this set or the group of principles includes total six principles in which the principle first, second sixth here are mentioned as : 1. Climatic control is primary, 2. Climate has varied in the past, 3. The environment is Holocentric. Thus, one can visualize very well the importance of the aspect of part of climatic conditions from phyto-geographic distribution point of view.

Climate is of three types - 1. Eco-climate 2. Bio-climate and 3. General climate. The Eco-climate means, the sum of total of meteorological factors with in a habitat, 2. Bio-climate is the climate in relation to the life forms particularly the plant life because most of the animals live in a special micro climatic conditions and are subject to migration,

3. General climate - It includes the climatic elements in broad sense like the distribution of rainfall, temperatures, etc. The particular research paper deals about the general climatic characteristics for the area under study i.e. Shekhawati Region, Rajasthan. Although the Indian sub continent has over all 'tropical monsoon' type of climate but the area under study has three distinct seasons in a year viz; the summer (March to June), the rainy season (July to September) and winter season (October-November to February).

### A. CLIMATE TYPE

As far as the type of climate of the region under study is concerned, the observations revealed that according Koppens Climatic Classification, the region falls under 'Arid Type of Climate' (BWhw) - the upper part of Shekhawati region which includes three-fourth portion of Churu district) and 'Semi - arid type of Climate' (BShw) - it covers completely both of the districts i.e. Jhunjhunu and Sikar**.** According Thornthwait's Climatic classification point of view, the region under study is distinctly divided into two parts - Upper i.e. DBW Climatic region of Arid climate and Lower i.e. DAW climatic region which obtains Semi-arid Climate.

Commencement of monsoon period i.e. onwards period is very important for the reason that sudden increasement in rainfall as well as moisture percentage in the atmosphere as well as on the surface - numberless plant species specially 'ephemerals' sprout out as green cover. In other words to say arrival and growth of new - ephemerals take placed. This all take placed with the first rainfall of the rainy season i.e. from the month of either last week of June or first week of July.

The distribution of Monsoon Rainfall (June to September) which obviously illustrates that as if one proceeds towards northern part of arid-region for the area under study, the amount of rainfall (in cm) decreases. High rainfall (40 to 50 cm) obtains by the lower hilly terrain portion of Shekhawati region.

### B. IMPORTANT CLIMATIC COMPONENTS

The forthcoming paragraphs of the head line covers the important climatic components which plays a vital role in the growth and development of plant life in Shekhawati Region viz; the rainfall, temperature, relative humidity and winds.

#### 1. RAINFALL

The distribution of average annual rainfall in lower portion of the region under study obtains more rainfall (above 40 cm) rather than the upper part of low (below 30 cm.), respectively.

#### 2. TEMPERATURE

At the part of distribution of Temperatures either in Summer season or in Winter season, the region under study has two distinct parts. In Summer season upper part receives more average monthly temperatures i.e. above 40 $^{o}$C**,** similarly the again in contrast, the upper portion of the region under study obtains low temperatures in Winter season i.e. below 6 $^{o}$C**.**

#### 3. RELATIVE HUMIDITY

Except during the brief south-west monsoon period when the relative humidities are above 60 percent, the air is generally dry. Even during the rainy period, the air is dries in between the rains. The summer is the driest period of the year when the relative humidities, particularly in the afternoons are below 30 per cent.

#### 4. WINDS

Winds is also a prominent factor in nature which directly or in directly become basis or media of gaseous exchange, temperature exchange or to say winds becomes media for accelerating the rate of evapotranspiration in plants, it is the media of exchange the moisture conditions from once habitat to another, winds plays an active role in the phenomena of opening and closing of leaves stomata, it is the factor of wind which plays very vital role in dispersed of plants via their pareschutes like seeds formation, etc.

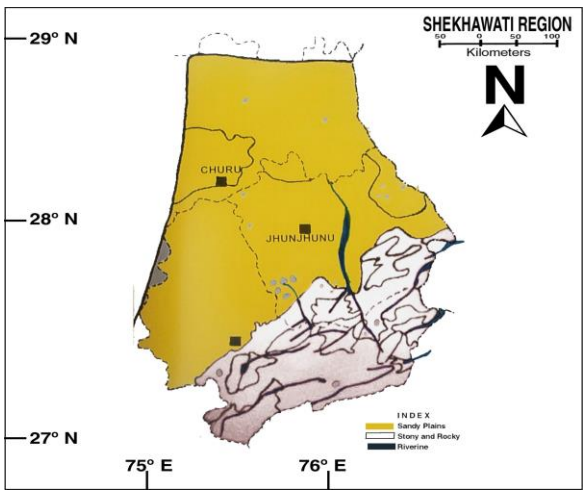
As we know the area under study lies under the system of monsoon winds which blown six months from sea to land surface (summer to rainy season) and remaining six months blows in opposite direction i.e. from land to the sea surface (in winter season) cold winds known as sheet lehar, thary, heel, dawa in winter where as hot winds known as Loo blow in summer season of the area under study.

During summer months wind velocity in creases to much extent and frequency of occurrence of dust storms take place and this phenomena in nature reaches or achieve the climax during the course of rainy season when the area experiences the prevailing of cylones or thunder storms of high wind velocity and results the damage of several trees uprooted and loss of flora and fauna of the area under study. In brief although air is a matter or a natural agent to experience it in directly manner but wind is that phase of air which we experience in a direct manner in the various activities of life system.

## XI. MAJOR HABITAT TYPES

The area under study has Three Major Habitat Types viz; I - Sandy Plains and Sand Dunes Habitat, II - Stony and Rocky Habitat, and III - Riverine and Aquatic Habitat. Sandy plains and sand dunes habitat rank at first place by covering about 60% of the total geographical area under study. The habitat of stony and rocky formations ranks at second place by covering about 32.5% of the total geographical area under study whereas only 7.5% is covered by riverine and aquatic habitat, respectively. **Figure-1.5** obviously shows the distribution of major habitat types of Shekhawati Region, Rajasthan.

**Figure-1.5 Major Habitat Types in Shekhawati Region**



On the basis of the geographical spread of the area under study, the author has selected 23 Survey Spots to conduct the field study in which 16 survey spots fall under the habitat of sand dunes and sandy plains topography, 4 survey spots fall under habitat of stony and rocky formation whereas only 3 survey spot is covered by riverine and aquatic formations as shown in **Figure-1.6.**

**Figure-1.6 Survey Spots/Field Stations in Shekhawati Region**

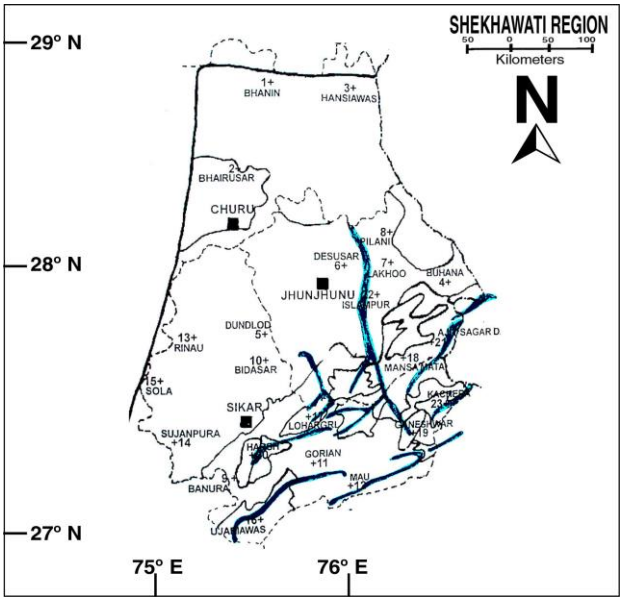



**Table-1.1** deals about the district-wise names of the survey spots /field stations in Shekhawati Region, Rajasthan. By thus, it includes 3 survey spots under Churu district, 9 survey spots covered by Jhunjhunu district and 11 survey spots fall under Sikar, respectively.

**Table 1.1 : District-Wise Name of The Survey Spots/Field Stations in Shekhawati Region**

| S.No. | Name of the Survey Spot | Type of Habitat | Tehsil |
|---|---|---|---|
| 1 | Bhanin | Sand Dunes Habitat | Taranagar |
| 2 | Bhairusar | Sand Dunes Habitat | Churu |
| 3 | Hansiawas | Sand Dunes Habitat | Rajgarh |
| 4 | Ajit Sagar Dam | Riverine and Aquatic Habitat | Khetri |
| 5 | Buhana | Sandy Plains Habitat | Buhana |
| 6 | Dundlod | Sandy Plains Habitat | Nawalgarh |
| 7 | Desusar | Sandy Plains Habitat | Jhunjhunu |
| 8 | Islampur | Riverine and Aquatic Habitat | Jhunjhunu |
| 9 | Lakhoo | Sandy Plains Habitat | Chirawa |
| 10 | Lohargall | Rocky and Stony Habitat | Udaipurwati |
| 11 | Mansamata | Rocky and Stony Habitat | Khetri |
| 12 | Pilani | Sandy Plains Habitat | Chirawa |
| 13 | Banura | Sandy Plains Habitat | Data Ramgarh |
| 14 | Biddsar | Sandy Plains Habitat | Lachmangarh |
| 15 | Ganeshwar | Rocky and Stony Habitat | Nim Ka Thana |
| 16 | Gorian | Sandy Plains Habitat | Sri Madhopur |
| 17 | Kachrera | Riverine and Aquatic Habitat | Nim Ka Thana |
| 18 | Harsh | Rocky and Stony Habitat | Sikar |
| 19 | Mau | Sandy Plains Habitat | Shri Madhopur |
| 20 | Rinau | Sandy Plains Habitat | Fatehpur |
| 21 | Sujanpura | Sandy Plains Habitat | Sikar |
| 22 | Sola | Sandy Plains Habitat | Lachmangarh |
| 23 | Ujariyawas | Sandy Plains Habitat | Data Ramgarh |

Habitat word is a broad in sense by covering two or more than two physiographical formations under them. The distribution of vegetation as well as individual plant species is controlled mainly by dominant the edaphic factor which naturally coincides with the particular type of physiographic formation.

## XII. DISTRIBUTION OF MEDICINAL PLANTS

It is the largest habitat of area under study by covering about two third part and portion, respectively. It includes mostly 'sand dunes physiographic formation' which has spread in northern part of Shekhawati Region and by thus, it covers three tehsils of Churu district and northern tehsil of Jhunjhunu district (Alsisar, Malsisar etc.). Most of the 'sandy plains topography' has it's spread in western tehsils of Jhunjhunu and Sikar districts. Among 16 survey spots 3 fall under 'sand dunes formation' whereas 13 fall under 'sandy plains', respectively - as shown in **Figure-1.6.**

**Plate 1.1 : Sand Dunes Habitat**

The habitat of sand dunes and sandy plains topography covers the distribution of 65 medicinal plant species out of total 122 for the area under study. It is very interesting to mention here that 80% plant species are common in both the habitats i.e. First (sand dunes and sandy plains) as well as Second (stony and rocky) whereas 20% plant species are common in both habitats i.e. First (sand dunes and sandy plains) as well as Third (riverine and aquatic).

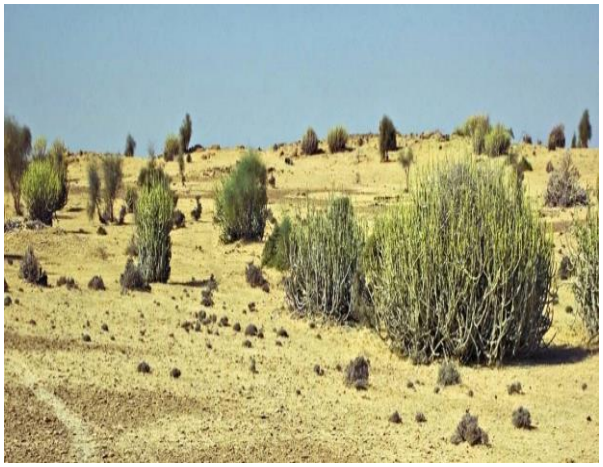


**Plate 1.2 : Sandy Plain Habitat**

**Table-1.2** illustrates the phytogeographical distribution of medicinal plant species in sand dunes and sandy plains habitat, Shekhawati Region, Rajasthan. The phytogeographic pattern of distribution of medicinal plant species is divided into four categories viz; R-Rare, F- Frequent, C-Common and A-Abundant on sand dunes and sandy plains topography covers 16 survey spots scattered through out the area under the particular type of habitat. It is quite obvious from the above mentioned **Table-1.2** that some medicinal plant species have their Rare type category of phytogeographic pattern of spatial distribution (e.g. *Blumea obliqua, Cordia gharaf, Withania somnifera,*etc.) whereas some medicinal plant species are having Abundant type of phytogeographic pattern of spatial distribution (e.g. *Boerhavia diffusa, Mollugo cerviana, Tribulus terrestris, etc.)*

**Table-1.2. Phytogeographical Distribution Of Medicinal Plant Species In Sand Dunes And Sandy Plains Habitat, Shekhawati Region, Rajasthan.**

(R-Rare, F-Frequent, C- Common, A- Abundant) (XC-Xerophytic Categorization)

*(Name of Survey Spot : 1=Bhanin, 2=Bhairusar, 3=Hansiawas,4=Buhana, 5=Dundlod, 6=Desusar, 7=Lakhoo, 8=Pilani, 9=Banura, 10=Biddsar, 11=Gorian, 12=Mau, 13=Rinau, 14=Sujanpura, 15=Sola, 16=Ujariyawas)*

| Plant Species | XC | Name of the Survey Spot | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Churu | | | Jhunjhunu | | | | | Sikar | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Trees | | | | | | | | | | | | | | | | | |
| Adhatoda vasica | TC | R | C | R | C | C | C | C | C | F | C | F | F | C | C | C | F |
| Acacia senegal | ST | R | R | R | F | R | F | F | F | C | R | C | C | R | C | R | F |
| Acacia nilotica | ST | R | F | R | F | A | -- | C | C | F | C | F | F | R | R | R | R |
| Azadirachta indica | RS | R | F | R | F | F | F | F | F | F | F | F | F | F | F | F | F |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albizia lebbeck | TC | -- | R | -- | R | R | -- | R | F | R | F | F | F | R | R | R | R |
| Cordia gharaf | TC | -- | R | -- | R | R | -- | R | F | R | R | R | R | -- | -- | -- | -- |
| Dalbergia sissoo | RS | R | R | R | F | R | -- | R | C | F | F | F | F | R | R | R | R |
| Salvadora oleoides | RS | F | F | F | A | F | A | R | F | F | F | F | F | F | F | F | F |
| Shrubs | | | | | | | | | | | | | | | | | |
| Calotropis procera | LB | C | F | C | F | C | F | C | C | F | F | C | F | C | F | C | C |
| Capparis decidua | ST | F | F | F | R | F | R | C | R | C | F | C | C | F | C | C | A |
| Calligonum polygonoides | LL | C | R | C | -- | -- | -- | -- | -- | -- | -- | -- | -- | F | R | R | R |
| Caesalpinia pulchirrima | TC | -- | R | -- | R | R | R | R | R | R | R | R | R | -- | -- | -- | -- |
| Lycium barbatum | ST | F | F | C | R | -- | R | -- | R | F | F | R | F | F | F | F | F |
| Mimosa hamata | ST | F | R | F | F | R | R | R | R | F | R | F | F | C | F | C | C |
| Opuntia elator | ST | R | -- | R | R | R | -- | -- | -- | R | R | -- | -- | R | R | R | R |
| Peristrophe bivalvis | RS | R | F | R | R | -- | F | F | R | R | F | R | F | R | F | F | F |
| Withania somnifera | TC | R | R | R | R | R | R | R | R | R | R | R | C | R | R | R | R |
| Under-shrubs | | | | | | | | | | | | | | | | | |
| Aloe vera | LB/ST | -- | R | -- | R | R | R | R | R | F | R | F | F | R | R | R | F |
| Aerva persica | TC | C | F | C | F | F | C | C | F | C | C | C | F | F | C | C | C |
| Crotolaria burhia | TC | C | F | C | F | R | F | R | F | C | F | F | F | C | C | C | C |
| Cassia acutifolia | RS | -- | R | -- | F | -- | -- | -- | R | -- | -- | R | R | -- | -- | -- | -- |
| Cassia angustifolia | RS | -- | R | -- | R | R | R | R | R | F | R | F | F | R | R | R | F |
| Echinops echinatus | ST | R | -- | R | -- | R | -- | -- | -- | R | R | -- | R | R | -- | -- | -- |
| Grewia villosa | RS | R | F | R | F | F | F | F | F | F | F | F | F | R | R | R | R |
| Leucas aspera | RS | R | R | -- | R | R | -- | -- | -- | R | R | R | R | R | R | R | R |
| Leucas urticaefolia | TC | R | F | R | -- | R | -- | -- | F | F | F | F | R | F | F | R | R |
| Pulicaria crispa | TC | F | R | F | F | R | F | R | C | F | F | C | F | F | F | F | F |
| Solanum albicaule | ST | R | F | R | -- | R | -- | -- | R | F | F | F | F | R | R | R | R |
| Herbs | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agremone mexicana | TC | R | F | R | F | F | F | F | F | F | F | F | F | R | R | R | R |
| Achyranthus aspera | TC | F | F | F | -- | R | -- | -- | C | F | F | C | F | F | F | F | F |
| Amaranthus spinosus | ST | R | F | R | R | F | -- | -- | F | F | C | C | C | F | F | F | F |
| Blumea obliqua | TC | -- | R | -- | -- | -- | -- | -- | R | C | C | C | F | R | R | R | R |
| Blepharis sindica | RS | -- | R | -- | -- | R | -- | -- | R | C | C | F | F | R | R | R | R |
| Boerhavia diffusa | TC | F | C | F | C | A | A | C | C | F | A | F | F | A | A | A | F |
| Citrullus colocynthus | TC | A | F | A | F | C | -- | -- | F | F | F | F | F | C | C | C | C |
| Convolvulus microphyllus | TC | F | F | F | -- | -- | -- | -- | R | F | F | R | R | F | R | F | R |
| Convolvulus arvensis | TC | F | R | R | R | -- | -- | -- | R | F | F | R | R | F | F | F | F |
| Cleome gynandra | TC | R | F | R | F | C | -- | -- | R | C | C | F | F | C | F | F | F |
| Crotolaria medicaginea | RS | F | F | F | -- | R | -- | -- | R | F | F | R | R | F | F | F | F |
| Corchorus depressus | TC | R | F | R | R | A | F | F | C | C | A | F | F | C | F | F | F |
| Cressa cretica | TC | -- | R | -- | -- | R | -- | -- | F | C | R | F | F | R | F | F | F |
| Digera muricata | TC | R | C | R | F | C | F | F | R | F | F | F | F | F | C | F | F |
| Eclipta prostrata | TC | -- | -- | -- | -- | R | -- | -- | R | F | R | R | R | R | F | R | R |
| Launaea residifolia | TC | F | C | F | R | C | R | R | F | C | C | F | F | C | F | F | F |
| Lindenbergia indica | RS | F | R | F | -- | R | -- | -- | R | F | F | R | R | F | C | F | F |
| Mollugo cerviana | RS | C | C | C | F | A | C | F | F | F | A | F | F | A | F | F | F |
| Mollugo nudicaulis | RS | R | F | R | -- | R | -- | -- | R | F | F | C | C | F | C | F | F |
| Psoralea odorata | RS | -- | -- | -- | -- | -- | -- | -- | R | F | F | F | F | R | F | R | R |
| Polygonum plebium | TC | -- | -- | -- | -- | R | -- | -- | R | F | R | F | F | R | F | -- | -- |
| Phyllanthus fraternus | TC | C | F | C | F | C | C | F | F | C | C | C | C | C | A | A | F |
| Polygala chinensis | RS | -- | -- | -- | -- | -- | -- | -- | R | F | R | F | F | R | F | R | R |
| Portulaca oleracea | RS | R | F | R | -- | -- | -- | -- | -- | F | R | F | F | R | F | R | R |
| Solanum nigrum | ST | -- | -- | -- | -- | R | -- | R | R | F | R | F | F | R | F | R | R |
| Solanum Surrattense | ST | -- | R | -- | R | F | R | F | C | F | F | C | C | F | C | F | F |
| Tribulus terrestris | ST | F | A | F | C | A | C | C | C | C | F | A | F | A | A | A | F |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vernonia cinerea | RS | -- | R | -- | C | -- | C | R | R | C | R | F | F | R | F | R | R |
| Grasses | | | | | | | | | | | | | | | | | |
| Cyperus rotundus | RS | C | C | C | F | F | C | R | R | R | F | F | F | C | C | C | F |
| Cymbopogon flexuasus | TC | F | F | F | -- | -- | -- | -- | -- | -- | R | R | R | F | F | F | R |
| Dactyloctenium aegyptium | RS | C | C | C | F | -- | -- | -- | R | F | F | F | F | C | C | F | F |
| Parthenium hysterophorus | TC | -- | -- | -- | R | -- | R | -- | F | R | R | R | R | -- | R | -- | R |
| Panicum antidotale | TC | F | R | F | -- | -- | -- | -- | R | -- | -- | -- | -- | R | R | R | -- |
| Sehima nervosum | TC | -- | -- | -- | -- | R | -- | -- | R | F | R | F | F | R | R | R | R |
| Climbers | | | | | | | | | | | | | | | | | |
| Ipomoea hederaceae | TC | -- | R | -- | R | C | F | R | R | F | C | C | C | F | A | C | F |
| Pentatropis spiralus | LB | -- | R | -- | F | -- | R | -- | -- | F | -- | F | F | -- | C | F | F |
| Tinospora cordifolia | LL | -- | R | -- | R | R | R | R | R | C | R | C | C | R | R | R | C |

*Source - The Author, based on Field Survey Visits*

## XIII. DISTRIBUTIN OF VEGETATION GROUPS

Further in this context, to simplify the above mentioned aspect, the author gave the distribution of vegetation groups for (sand dunes and sandy plains habitat) in Shekhawati Region, Rajasthan as shown in **Table-1.3.** The observation of above mentioned table revealed that the maximum percentage is covered by "Herbs" vegetation groups i.e. 44.8% by including 29 medicinal plant species (e.g.-*Citrullus colocynthus, Solanum nigrum* etc.) out of total 65 medicinal plants of the particular habitat. It is followed by the vegetation group "Shrubs" i.e. 1.3% by including 10 medicinal plant species (e.g. *Capparis decidua, Mimosa hamata etc.)* for the area under habitat of sand dunes and sandy plains. The minimum percentage is covered by the vegetation group of "Climbers" i.e. 4.6% only by including 3 medicinal plant species as climbers (*Pentatropis spirales, Tinospora cordifolia and Ipomoea hederaceae*) out of 65 total number of medicinal plants within the particular habitat of sand dunes and sandy plains and it is followed by the group of "Grasses" i.e. 9.2% by including 6 Grasses medicinal plant species, respectively (e.g. *Cyperus rotundus, Sehima nervosum* etc.).

**Table 1.3 : Distributin Of Vegetation Groups (Sand Dunes And Sandy Plains Habitat) In Shekhawati Region**

| | Vegetation Groups | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Trees | Shrubs | Under-shrubs | Herbs | Grasses | Climbers | |
| Number | 8 | 10 | 10 | 28 | 6 | 3 | 65 |
| Percentage | 12.3 | 15.3 | 13.8 | 44.8 | 9.2 | 4.6 | 100 |

*Source - The Author, based on Table – 1.2*

## XIV. DISTRIBUTIN OF XEROPHYTIC CATEGORIZATION

This much be know that the region as whole falls under two types of climates i.e. Arid and Semi-arid. For the existence of Medicinal plant species, naturally the characteristics of adoptation in xeric conditions is an important factor for the area under study. Further in this aspect, the author had made 5 Xerophytic categories of 65 total number of medicinal plant species for the area under study as shown in **Table-1.4,** which illustrates. Xerophytic categorization of the medicinal plant species (sand dunes and sandy plains habitat) in Shekhawati Region, Rajasthan.

**Table 1.4 : Xerophytic Categorization Of The Medicinal Plant Species (Sand Dunes And Sandy Plains Habitat) In Shekhawati Region.**

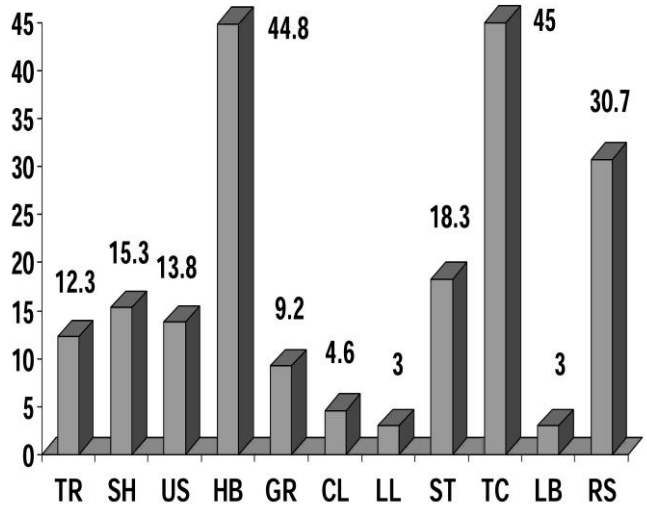
| | Xerophytic Categorization | | | | | Total |
|---|---|---|---|---|---|---|
| | Leaf less | Spiny and Thorny | Trichomes Covering | Lactus Bearing | Rest of the Species | |
| | (LL) | (ST) | (TC) | (LB) | (RS) | |
| Number | 2 | 12 | 29 | 2 | 20 | 65 |
| Percentage | 3 | 18.3 | 45 | 3 | 30.7 | 100 |

*Source - The Author, based on Table – 1.2*

On behalf of the observations illustrated in the above mentioned Table, it is revealed that the maximum percentage (45%) falls in the category of "Tricomes covering" medicinal plant species (e.g. *Aerva persica*, *Pulicaria crispa* etc.) whereas the minimum percentage is covered by two xerophytic categories: "Leafless" (e.g. *Calligonum polygonoides* etc.) which covers 3% only and "Lactus Bearing" Medicinal plant species (e.g. *Calotropis procera*, *Aloe vera* etc.) which covers also 3% out of total 65 medicinal plants of the particular habitat from xerophytic categorization point of view.

The **Figure-1.7** illustrates the phytogeographical characteristics of the medicinal plants of (sand dunes and sandy plains habitat) vegetation. The figure deals vegetation groups (Left Side) and xerophytic categorization (Right Side) of the medicinal plant species with their percentage of contribution among the 65 medicinal plant species of sand dunes and sandy plains habitat of the area under study. The particular **Figure-1.7** is based on the **Table-1.3** and **1.4**, respectively.

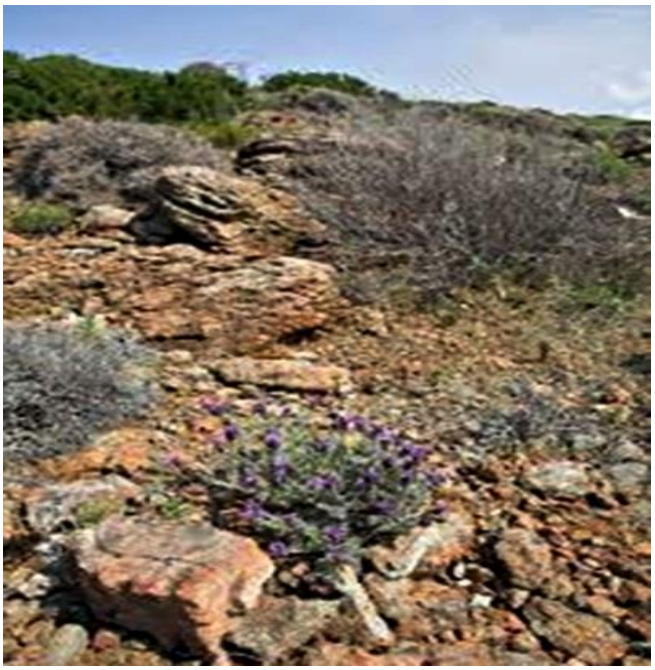
**Figure 1.7 : Phytogeographical Characteristics Of The Medicinal Plants Of (Sand Dunes And Sandy Plains Habitat)**




## XV. DISTRIBUTION OF MEDICINAL PLANTS

It is one of the second major habitat of the area under study by covering physiographical formations of hilly patches **(Photoplate-1.3)** and the gravel as well as compact soil areas. The particular habitat covers about 32.5% of the total geographical area of the study. It includes four survey spots for the details field study to know the phytogeographic pattern of spatial distribution of medicinal plant species within the particular habitat i.e. stony and rocky habitat.

**Plate-1.3 Stony And Rocky Topography**



Although by area coverage point of view it is the second largest habitat but from total coverage of number of medicinal plant species it ranks at First place in Shekhawati Region. Out of total 122 medicinal plants, the particular habitat includes 95 medicinal plant species. It is very interesting to mention here that out of 95 medicinal plant species 70% medicinal plant species are common in both of the habitats i.e. rocky and stony habitat as well as sand dunes and sandy plains habitat whereas 30% medicinal plant species have their mono-climax nature tendency of distribution for a particular habitat i.e. restricted within stony and rocky formations.

**Table 1.5 : Phytogeographical Distribution Of Medicinal Plant Species In Rocky And Stony Habitat, Shekhawati Region**

*(R-Rare, F-Frequent, C-Common, A- Abundant, XC= Xerophytic Categorization, 1=Lohargarl, 2=Mansa Mata, 3=Ganeshwar, 4=Harsh)*

| Plant Species / Vegetation Group | XC | Name of the Survey Spots | | | |
|---|---|---|---|---|---|
| | | Jhunjhunu | | Sikar | |
| | | 1 | 2 | 3 | 4 |
| **(A) Trees** | | | | | |
| Adhatoda vasica | TC | -- | F | -- | -- |
| Acacia senegal | ST | A | A | C | C |
| Acacia nilotica | ST | C | A | F | C |
| Azadirachta indica | RS | F | F | -- | -- |
| Bambusa bambos | ST | C | F | F | F |
| Boswellia serrata | TC | C | C | F | C |
| Butea monosperma | TC | A | F | F | F |
| Cordia gharaf | TC | R | F | F | F |
| Cassia fistula | RS | F | F | F | F |
| Dalbergia sissoo | RS | F | F | F | C |
| Ficus bengalensis | TC | C | C | F | F |
| Ficus religiosa | RS | F | C | F | F |
| Mangifera indica | RS | A | F | F | F |
| Mitragyna parviflora | RS | F | R | R | F |
| Phoenix acaulis | ST | F | F | R | F |
| Salvadora oleoides | RS | F | F | R | F |
| Saraca asoca | RS | R | F | R | R |
| **(B) Shrubs** | | | | | |
| Calotropis procera | LB | F | R | R | R |
| Capparis decidua | ST | R | R | F | R |
| Calligonum polygonoides | LL | R | -- | -- | -- |
| Commiphora mukul | LL | A | C | F | F |
| Caesalpinia pulchirrima | TC | F | C | R | F |
| Coccinia indica | TC | F | C | F | F |
| Clerodendrum indicum | TC | R | F | R | R |
| Lycium barbatum | ST | R | R | R | R |
| Mimosa hamata | ST | R | R | R | R |
| Opuntia elator | ST | R | R | R | F |
| Peristrophe bivalvis | RS | F | R | F | F |
| Rhus coriara | ST | F | F | F | F |
| Surcostemma acidum | LL | F | F | F | C |
| Withania somnifera | TC | R | R | R | R |
| **(C) Under-shrubs** | | | | | |
| Aloe vera | LB/ST | C | F | C | C |
| Aerva persica | TC | F | C | F | F |
| Alysicarpus vaginalis | RS | R | -- | F | R |
| Asparagus racemosus | ST | F | R | F | R |
| Abutilon indicum | RS | F | F | C | F |
| Crotolaria burhia | TC | R | -- | F | R |
| Cassia acutifolia | RS | F | R | R | F |
| Cassia angustifolia | RS | A | F | C | C |

| | | | | | |
|---|---|---|---|---|---|
| Echinops echinatus | ST | F | F | F | F |
| Euphorbia caducifolia | LB | R | C | F | C |
| Grewia villosa | RS | F | C | F | C |
| Leucas aspera | RS | F | R | R | F |
| Leucas urticaefolia | TC | F | R | C | F |
| Malva rotundifolia | RS | R | R | R | F |
| Ocimum americanum | TC | F | C | C | F |
| Sida alba | RS | F | C | F | F |
| Sida acuta | RS | R | R | F | F |
| **(D) Herbs** | | | | | |
| Agremone mexicana | TC | R | R | F | R |
| Achyranthus aspera | TC | R | F | F | R |
| Amaranthus spinosus | ST | R | F | F | R |
| Aristolochia bracteolata | RS | F | F | R | F |
| Adiantum venustum | RS | F | R | F | R |
| Barleria prionitis | ST | F | C | F | C |
| Blumea obliqua | TC | C | R | R | F |
| Blepharis sindica | RS | R | F | F | F |
| Boerhavia diffusa | TC | R | F | R | R |
| Citrullus colocynthis | TC | -- | -- | -- | -- |
| Convolvulus microphyllus | TC | R | -- | F | R |
| Convolvulus arvensis | TC | -- | -- | F | -- |
| Cressa cretica | TC | -- | -- | F | -- |
| Cleome gynandra | TC | C | F | C | C |
| Crotolaria medicaginea | RS | R | R | F | R |
| Corchorus depressus | TC | C | R | F | F |
| Digera muricata | TC | F | R | F | R |
| Dicomo tomentosa | ST | F | R | R | F |
| Eclipta prostrata | TC | C | R | R | F |
| Indigofera oblongifolia | TC | F | F | R | F |
| Launaea residifolia | TC | F | R | F | R |
| Lindenbergia indica | RS | R | -- | F | R |
| Mollugo cerviana | RS | -- | -- | F | -- |
| Mollugo nudicaulis | RS | R | R | R | R |
| Psoralea odorata | RS | C | C | C | C |
| Psoralea corylifolia | RS | R | F | R | R |
| Phyllanthus fraternus | TC | R | R | F | R |
| Polygala chinensis | RS | F | -- | F | R |
| Portulaca oleracea | RS | F | R | F | F |
| Solanum nigrum | ST | R | R | F | R |
| Solanum surrattense | ST | R | F | F | R |
| Tribulus terrestris | ST | -- | F | -- | -- |
| Viola cinerea | RS | R | R | R | R |
| Vernonia anthelmintica | TC | R | R | R | R |
| Vernonia cinerea | RS | F | R | F | R |
| **(E) Grasses** | | | | | |
| Cyperus rotundus | RS | R | -- | F | R |
| Cymbopogon flexuasus | TC | R | -- | R | R |
| Dactyloctenium aegyptium | RS | R | -- | F | -- |

| | | | | | |
|---|---|---|---|---|---|
| Imperata cylindrica | TC | C | R | F | F |
| Panicum antidotale | TC | -- | -- | R | -- |
| Parthenium hysterophorus | TC | -- | -- | F | -- |
| Sehima nervosum | TC | -- | -- | R | R |
| **(F) Climbers** | | | | | |
| Cuscuta chinensis | LL | F | F | F | R |
| Ipomoea hederaceae | TC | F | C | F | C |
| Pentatropis spiralus | LB | F | C | C | F |
| Rivea ornata | TC | C | C | C | C |
| Tinospora cordifolia | LL | F | C | F | F |

*Source - The Author, based on Field Survey Visits*

**Table-1.5** deals the details of the phytogeographical distribution of medicinal plant species in stony and rocky habitat, Shekhawati Region, Rajasthan. The **Table** illustrates the phytogeographic pattern of spatial distribution under four categories viz; R-Rare, F-Frequent, C-Common and A-Abundant. Some plant species have their "Rare Pattern" of phytogeographic spatial distribution, (e.g. *Mimosa hamata, Withania somnifera etc*.) whereas some medicinal plant species have "Abundant Pattern" of phytogeoraphic distribution (e.g. - *Acacia senegal, Butea monosperma etc*.).

## XVI. DISTRIBUTIN OF VEGETATION GROUPS

Further in this context, to simplify the whole matter the author presented **Table-1.6** of the distribution of vegetation groups of stony and rocky habitat in Shekhawati Region, Rajasthan. It is quite obvious from the **Table 1.6** that the vegetation group of "Herbs" ranks at first place (e.g. *Boerhavia diffusa, Tribulus terrestris* etc.)by making about 32% by including 36 medicinal plant species out of total 95 medicinal plants of the area under study which is followed by the vegetation group of "Trees" (about 18%) by covering 17 medicinal plant species of the particular Habitat (e.g. *Azadirachta indica, Saraca asoca* etc.). The minimum percentage of vegetation group is covered by "Climbers" about 5% (e.g. - *Cuscuta chinensis, Tinospora cordifolia* etc.) which is followed by the vegetation group of "Grasses" about 7% by including 7 plant species of grasses (e.g.-*Cymbopogon flexuasus, Panicum antidotale* etc.).

**Table-1.6. Distribution Of Vegetation Groups(Stony And Rocky Habitat) In Shekhawati Region**

| | Vegetation Groups | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Trees | Shrubs | Under-shrubs | Herbs | Grasses | Climbers | |
| Number | 17 | 14 | 17 | 35 | 7 | 5 | 95 |
| Percentage | 17.8 | 14.7 | 16.8 | 38.2 | 7.3 | 5.2 | 100 |

*Source - The Author, based on Table – 1.5*

## XVII. DISTRIBUTIN OF XEROPHYTIC CATEGORIZATION

The author made efforts about the xerophytic categorization of the medicinal plant species of (stony and rocky habitat) in Shekhawati Region, Rajasthan in which he made 5 major categories of xerophytic categorization viz; Leafless (LL) Spiny and Thorny (ST), Trichomes Covering (TC), Lactus Bearing (LB) and Rest of the species (RS). It is quite obvious in the **Table-1.7** that xerophytic category of "Trichomes Covering" medicinal plant species ranks at first place (about 38%) by covering 36 medicinal plant species out of total 95 medicinal plants of the particular habitat (e.g. *Adhatoda vasica, Ficus bengalensis* etc.), it is followed by "Rest of the Species" makes about 36% by covering 34 medicinal plant species out of 95 medicinal plant species within the particular habitat of stony and rocky formations (e.g. *Dalbergia sissoo, Cassia fistula* etc.). The minimum percentage is covered by Xerophytic category of "Lactus Bearing" medicinal plant species i.e. about 3% (e.g. *Calotropis procera, Euphorbia caducifolia* etc.), it is followed by the "Leafless" xerophytic category (about 5%) by covering 5 medicinal plant species out of 95 medicinal plant species of the particular habitat (e.g.- *Calligonum polygonides, Surcostemma acidum, Commiphora mukul* etc.).

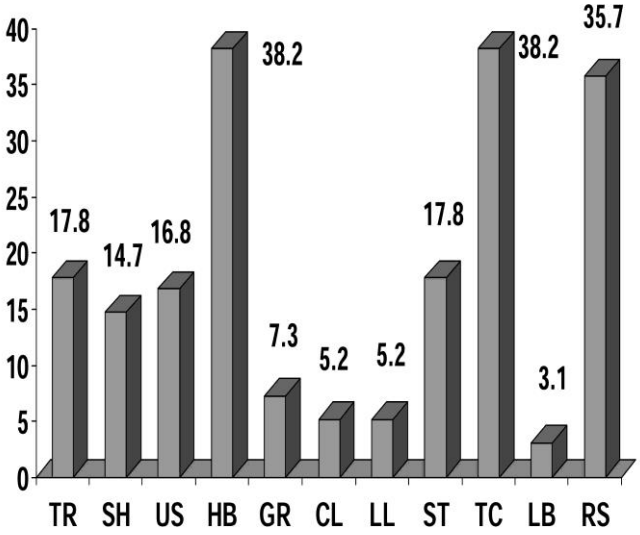
**Table 1.7 : Xerophytic Categorization Of The Medicinal Plant Species (Stony And Rocky Habitat) In Shekhawati Region.**

| | Xerophytic Categorization | | | | | Total |
|---|---|---|---|---|---|---|
| | Leaf less | Spiny and Thorny | Trichomes Covering | Lactus Bearing | Rest of the Species | |
| | (LL) | (ST) | (TC) | (LB) | (RS) | |
| Number | 5 | 17 | 36 | 3 | 34 | 95 |
| Percentage | 5.2 | 17.8 | 38.2 | 3.1 | 35.7 | 100 |

*Source - The Author, based on Table – 1.5*

**Figure-1.8** shows the phytogeographical characteristics of the medicinal plants of stony and rocky habitat vegetation. The above mentioned Figure is based on the **Table-1.6 and 1.7** in which the percentage of contribution of medicinal plant species by their respective vegetation Groups is shown in Left Side in Figure whereas the percentage of contribution of medicinal plant species with their respective xerophytic categories is shown in the Right Side, respectively. By thus, one can visualise very well a comparative account of contribution of medicinal plant species according their classification presented for vegetation groups and xerophytic categorization for the particular habitat i.e. stony and rocky formations for the area under study i.e. Shekhawati Region, Rajasthan.

**Figure-1.8** Phytogeographical Characteristics Of Medicinal Plants Of Stony And Rocky Habitat




**XVIII. DISTRIBUTION OF MEDICINAL PLANTS**

It is one of the smallest habitat from total area coverage point of view, by thus, 7.5% of total geographical area of Shekhawati Region falls under the habitat of riverine and aquatic. As by it's name and nature, it includes the physiographic formations of seasonal streams, rivers, ponds and dams **(Photoplate-1.4)** of the area under study. The habitat covers 3 survey spots out of 23 survey spots of the area under study. The habitat includes 21 medicinal plant species out of 122 medicinal plants of Shekhawati Region. It is very interesting to mention here that 70% plant species are common with other habitats i.e. within first sand dunes and sandy plains and second major habitats of Shekhawati Region whereas 30% medicinal plant species have mono-climax nature tendency of phytogeographic pattern of distribution, which can be considered as the medicinal plant species of riverine and aquatic habitat.

**Plate-1.4. Riverine And Aquatic Topography**


**Table 1.8 : Phytogeographical Distribution Of Medicinal Plant Species In Riverine And Aquatic Habitat, Shekhawati Region**

*(R=Rare, F=Frequent, C=Common, A= Abundant, XC=Xerophytic Categorization, 1=Ajit Sagar Dam, 2=Islampur, 3=Kachrera)*

| Plant Species/ Vegetation Group | XC | Name of the Survey Spots | | |
|---|---|---|---|---|
| | | Jhunjhunu | | Sikar |
| | | 1 | 2 | 3 |
| **(A) Trees** | | | | |
| Acacia senegal | TC | F | F | C |
| Acacia nilotica | ST | A | C | C |
| Ficus bengalensis | TC | F | F | C |
| Ficus religiosa | RS | C | F | C |
| Salvadora oleoides | RS | F | F | F |
| **(B) Shrubs** | | | | |
| Calotropis procera | LB | F | A | F |
| Capparis decidua | ST | R | R | C |
| Withania somnifera | TC | R | C | R |

| | | | | |
|---|---|---|---|---|
| **(C) Herbs** | | | | |
| Agremone mexicana | TC | F | F | R |
| Achyranthus aspera | TC | R | F | F |
| Corchorus depressus | TC | C | R | F |
| Eclipta prostrata | TC | A | R | C |
| Glinus lotoides | TC | A | F | A |
| Launaea residifolia | TC | C | F | F |
| Polygonum plebium | TC | A | R | F |
| Portulaca oleracea | RS | F | R | C |
| **(D) Grasses** | | | | |
| Cyperus rotundus | RS | C | C | F |
| Imperata cylindrica | TC | C | R | F |
| Parthenium hysterophorus | TC | F | R | R |
| Sehima nervosum | TC | R | R | R |
| **(E) Climbers** | | | | |
| Ipomoea hederacea | TC | C | F | C |

*Source - The Author, based on Field Survey Visits*

The **Table-1.8** illustrates the phytogeographical distribution of medicinal plant species in riverine and aquatic habitat, Shekhawati Region, Rajasthan. The table shows 4 categories of phytogeographic pattern of the spatial distribution viz; R-Rare, F-Frequent, C- Common and A-Abundant. Some medicinal plant species of riverine and aquatic habitat show the "Rare" phytogeographic pattern of spatial distribution (e.g. *Capparis decidua, Sehima nervosum* etc.) whereas some medicinal plant species of this habitat shows "Abundant" phytogeographic pattern of spatial distribution (e.g.-*Eclipta prostrata, Glinus lotoides* etc.).

Further in this context to simplify this above mentioned matter the author made attempt about the distribution of vegetation groups in riverine and aquatic habitat in Shekhawati Region, Rajasthan. The vegetation group of "Herbs" ranks at first place by covering about 38% plant species (e.g. *Achyranthus aspera, Corchorus depressus* etc.) out of total 21 medicinal plants of riverine and aquatic habitat which is followed by the vegetation group of "Trees" by covering about 24%, respectively (e.g. *Acacia senegal, Acacia nilotica* etc.), as shown in **Table-1.9.**

## XIX. DISTRIBUTIN OF VEGETATION GROUPS

**Table 1.9 : Distribution Of Vegetation Groups(Riverine And Aquatic Habitat) In Shekhawati Region**

| | Vegetation Groups | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | Trees | Shrubs | Under-shrubs | Herbs | Grasses | Climbers | |
| Number | 5 | 3 | 0 | 8 | 4 | 1 | 21 |
| Percentage | 23.8 | 14.2 | 0 | 38.3 | 19 | 4.7 | 100 |

*Source - The Author, based on Table – 1.8*

## XX. DISTRIBUTIN OF XEROPHYTIC CATEGORIZATION

Due to the Arid and Semi-arid climate conditions of the area under study, the medicinal plants have to adopt the xeric conditions, the author made his best efforts to classify 21 medicinal plant species of riverine and aquatic habitat under 5 xerophytic categories viz; Leafless (LL), Spiny and Thorny (ST), Trichomes covering (TC), Lactus Bearing (LB) and rest of the species (RS) as illustrated in **Table-1.10** of the xerophytic categorization of the medicinal plant species of riverine and aquatic habitat in Shekhawati Region, Rajasthan. It is quite obvious from the particular table that the maximum percentage (about 67%) is covered by the xerophytic category of "Trichomes Covering" medicinal plant species which ranks at first place (e.g. *Acacia senegal, Ficus bengalensis* etc.) it is followed by the category of "Rest of the Species" by covering 19% of the total medicinal plants of the particular habitat. The author observed not a single medicinal plant species at the name of "Leafless" medicinal plant, it is followed by the minimum percentage of the xerophytic category of "Lactus Bearing" medicinal plant species (about 5%) by including only single or one medicinal plant species as a Shrub i.e. *Calotropis procera*.

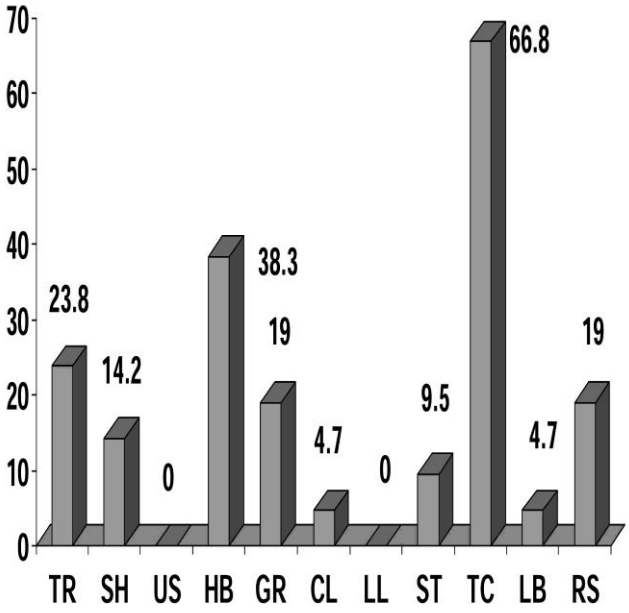
**Table 1.10 : Xerophytic Categorization Of The Medicinal Plant Species (Riverine And Aquatic Habitat) In Shekhawati Region**

| | Xerophytic Categorization | | | | | Total |
|---|---|---|---|---|---|---|
| | Leaf less | Spiny and Thorny | Trichomes Covering | Lactus Bearing | Rest of the Species | |
| | (LL) | (ST) | (TC) | (LB) | (RS) | |
| Number | 0 | 2 | 14 | 1 | 4 | 21 |
| Percentage | 0 | 9.5 | 66.8 | 4.7 | 19 | 100 |

*Source - The Author, based on Table – 1.8*

**Figure-1.9** is based on **Table-1.9 and 1.10** which shows the vegetation groups of medicinal plant species in Left Side and the xerophytic categories in Right Side with their respective percentage of medicinal plant species. By thus, one can visualise very well a comparative account of percentage contribution of medicinal plant species of riverine and aquatic habitat under their respective 6 vegetation groups and 5 xerophytic categories.

**Figure-1.9 Phytogeographical Characteristics Of Medicinal Plants Of Riverine And Aquatic Habitat**




## XXI. DISEASE TYPE-WISE AND MEDICINAL PLANT SPECIES-WISE

Actually, every plant or It's community is useful on the earth surface, in other words to say whatever and wherever the plant on this planet has It's applied value, it is another matter whether that we are not aware or known by It's uses or the mankind yet has unable to find out or trace out It's unseen factor of usefulness. Plants are the precious natural heritage of the earth, a valuable gift of the God on the earth surface in the form of green coverage. At the part of applied aspect of the plants, it cover several in other words to say uncountable multi-dimensional importance, broadly example from environmental, ornamental, folklore in society culture, religious appraisal, biological sense, It's food and fodder values, It's medicinal purpose etc. The uses of plants for different purposes are earlier or perhaps as old as mankind existence. In India, since the 'Vedic Period', information on the utility of plants in medicine finds place in different ancient scriptures. About, a few thousand years ago the utility of plants as medicinal aspect has been dealt in a holly Hindu Grantha -"Ram Charitmanas" at that time quoted in phrase- *"Raghupati Charan Saroj Sarup, Nayuv Aau Sukhan Kaha, Nam Giri Aushadhi, Jahu Pawan Sut Lane"*

In this phrase the importance of 'Sanjeevani Buti' plant was given with an in emphasis as an 'Ausadhi or Medicine' by Sukhen Vedh i.e. at the event of 'Lakshman Murchha" during the war with Meghnath.

From an ancient booklet in Hindi entitled "Pustak Sandesh" about two centuries ago, large number of common plants have been enumerated for traditional uses in which *Ficus religiosa* was considered as a climate purifier as it liberates considerable amount of oxygen than many other species. It is also mentioned that Lotus fruits are used as a good tonic etc. The study of plants in service of mankind remained as a part of human civilisation. Information on the economic aspect of plants have been passed from one generation to the next generation without any published records, in other words to say in some or certain cases these informations are on going heritage from one generation to another. It is in this light, a new branch of Botany has emerged, termed as Ethnobotany and the scientists of world are keen to examine the practical uses of all medicinal plants reported or unreported. (Nayar M.P., et al., 1989).

Ethnobotany in other words to say a synomonus of an inter disciplinary branch of geography here termed as - Applied medical phytogeography. There are large number of examples from Archaeological remains, among them a few can be mentioned. *"Kalpa-Vraksha"* in stone sculptures denotes. *Adansonia digitata* basically a semi arid zone species. They grow in semidry areas where there is scanty vegetation. This plant (*Adansonia digitata*) has augmented the vegetable component besides ensured additional income to villagers derived from It's fruit whose water is tonic and nutritive. The stem fibre is used as cordage. Branches and leaves are considered as a good cattle feed as fodder and flowers are used in medicine. It has been estimated that each tree can fetch about rupees 2000 per year (price index of 1985) and It's span of life is more than few hundred years. Hence, it is called '*Kalp Vraksha'* in ancient literature.

Useful information on plants used in medicine has been recorded rather indirectly by Chemists, Archeologists, Historians, Anthropologists, Sociologists, Folklorists, Travellers, Foresters and Doctors. However, the importance of plants as an antidote to alleviate from pains and sickness was realised by early men alone during the course of their struggle for existence. This experience and experimentation with plants accrued into a body of knowledge which tested by

time grew into an integral part of their culture and passed down orally from one generation to another as no mode for recording events existed in the pre-historic times.

A popular rhyme in hindi telling about the importance of the three myrobalans Emblica *(Phyllanthus emblica),*Belleric *(Terminalia bellerica),* Chebulic *(T.chebuta)* and Majuphal (*Quercus infectoria)* for the care of teeth as narrated by the Herbal Vendors runs as follows-

*"Har, Bahera, Amla; Teeno Namak Patang;*
*Braj Dant Kar Det Hai; Majuphal Ke Sang."*

In English it means that one who regularly uses emblica, belleric, chebulic and quercus can have their teeth strong like stone.

By thus, one can visualize very well that, since plants influenced the intellectual and the material culture of men, their references have appeared in ballads, tales, songs, legends, myths, rhymes, riddles and proverbs of ancient times.

The information on 'Drug and their Properties' has been taken as well as traced out from very authentic publications, and only those uses of medicinal herbs are described which have been recognised in the British Pharmaceutical Codex and / or United States Dispensary, or whose properties have shown their recognization experimentally on animals or in clinical tests. For this, the author involved the opportunity of screening some important relevant literature of the last 30 years or so. During this literature hunt, one thing that struck him most is that pharmacological experiments or clinical tests have been carried out on a very small number of medicinal herbs. Intensification of such work should be the first requirement, if we have to exploit and boost up our medicinal plant resources or the wealth.

## XXII. DISEASE TYPE-WISE DISTRIBUTION OF MEDICINAL PLANT SPECIES

Although there are several kind of diseases as well as group of diseases which are found among human beings. The traditional system of medicine in India i.e. Ayurvedic system which has a solid back ground in the cure of different kind of diseases by using the applied values of medicinal plant species in this aspect. The author has attempt here an exercise for the disease type-wise distribution of medicinal plant species. By giving priority to the type of disease, in other words to say that a particular type of disease covers or includes how many medicinal plants species whose applied values have phyto-chemical properties to cure that particular type of disease. In this way any medicinal plants due to it's nature of phyto-chemical applied values may be used in single or several type of diseases. The author on the basis of phyto-chemical properties of 122 medicinal plant species analysed that, "there are 70 disease types in which medicinal plant species have their contribution.

The analysis of 'disease type-wise' contribution with reference to their different medicinal plant species. Further in this context, the study revealed that at the name of 'Tonic' maximum medicinal plant species i.e. 22 are being used from a long period by the native people as prescribed by the Vedhs of concerning locality. At second place one medicinal plant species fall under the head line of 'used in medicines', which naturally have applied values to cure different kind of diseases. Similarly at the third place under the head line of 'native medicines' includes 12 medicinal plant species which have their applied values not specific but become a part for preparation of drugs to cure certain type of diseases.

It is very interesting to mentioned here that the author's study revealed that there are 29 specific diseases which include only one or single medicinal plant species e.g. Abortifaciant, Anthelmintic, Astringent, Abdominal disorders, Antiarthritic, Adaptogenic, Blacking grey hairs, Dysentery, Dyeing, Demulcents, Expectorant, Earache etc., etc.

At the part of cure of male sterility disease three medicinal plants of Shekhawati region are available where as at the part of cure of female sterility disease four plants are available, respectively. Diabetes disease cure, four medicinal plant species are available in Shekhawati region in Rajasthan.

In this way 122 medicinal plant species have their vital role in the cure of 70 certain kind of diseases, hence disease type-wise contribution of medicinal plant species for the area under study i.e. Shekhawati region, Rajasthan.

It is quite obvious that group-A (more than 5 types of diseases) contributes lowest percentage i.e. 5.8 from contribution of total number of diseases in Shekhawati region i.e. 70 in all. Whereas group-C (2 types of diseases) first place by contributing maximum 27.7% group-wise contribution in total number of diseases for area under study.

Group-B stands at second place (26.7%) whereas group-D which include only one type of disease stands at third place at the part of group-wise contribution in total number of diseases which are naturally based on number of medicinal plant species which have their phytogeographic availability from spatial pattern of distribution in different places of Shekhawati region, Rajasthan.

## XXIII. MEDICINAL PLANT SPECIES-WISE DISTRIBUTION OF DISEASES

In the particular head line, the author made his best efforts to classify the medicinal plant species of Shekhawati region according their medicinal uses as drugs to cure the different kind of diseases. In this aspect the author has given priority to individual medicinal plant species rather then It's medicinal uses in different kind of diseases. By doing so a medicinal plant species may have one or single medicinal use for the cure of a single or specific particular disease to several kind of diseases. In this way medicinal plants become a basis for medicinal use in one disease type or more than one disease type. The author in this way illustrated an analytic aspect of 122 medicinal plant species of Shekhawati region which have their medicinal uses in one or more than one as drug to cure single or more than that disease types**.** The analysis of 'medicinal plant species-wise' contribution with reference to their in different disease types. Further in this context one can see many medicinal plant species have single or one medicinal use to cure a single or one disease type are total 47 in numbers e.g.

*Albizia lebbeck, Bambusa bambos, Citrullus colocynthesis, Capparis decidua, Digera muricata, Dectyloctenium aegyptium, Glinus lotoides, Lycium barbatum, Polygala chinensis, Rivea ornata, Solanum albicaule, Acacia nilotica, Calligonum polygonoides Opuntia elato*r etc., etc.

At the part of total number of coverage as drugs to cure different kind of diseases *Withania somnifera* is that

medicinal plant species of Shekhawati region which alone covers 12 different disease types or in other words to say the particular single medicinal plant species covers 12 diseases from medicinal applied aspect point of view, thus it ranks at first place among 122 medicinal plants at Shekhawati region, Rajasthan.

*Aloe vera and Tribulus terrestris*, both medicinal plant species covered separately by their medicinal uses to cure 7 different disease types, in this way these are two medicinal plant species ranks at second place for the area under study. At third place, the author traced out that *Asparagus recemosus* and *Azadirachta indica* are considered by covering their medicinal uses by each medicinal plant species for the cure of 6 different disease types.

To simplify this all above mentioned matter, the author made four groups on the basis of coverage of number of diseases (group-A to group-D). By thus, the number of medicinal plant species-wise (in groups) contribution in percentage (on the basis of number of medicinal plant species in a particular group for the cure of number of diseases). Group-A (which covers more than 10 types of medicinal plants) ranks at forth place by contributing only 7.1% among total 70 types of number of diseases whereas group-D (which covers below 70 types of medicinal plants) ranks at First place by contributing 58.5%, respectively. At the part of group-wise contribution, one can see very well that group-C stands at second place by contributing 23.0% whereas group-B at third place i.e. 11.4%, respectively.

## XXIV. THE PERIOD AND PRESCRIPTION FOR THE CURE OF SOME IMPORTANT DISEASES BY THE HERBAL DRUGS

Prescriptions for the cure of some common ailments which the Herbal Vendors give are obtained from them after much persuation and request. Most of them refused to divulge the professional secret of cure except for verbally mentioning the names of some of the medicinal herbs used. The exact proportion in the combination of the crude herbal drugs used could not be ascertained from them. They confessed that they take a pledge among themselves not to disclose the secrets of their profession to anyone. The following are some of the prescriptions obtained and acquired knowledge from them and from the literature available in this aspect –

***(1) For the use as Tonic*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Aswagandha, Shankpushpi, Brahmi , Harar , Baheda , Amla , Satawar , Gundi , Bophli , Lajwanti , Kala Beejbandh, Gokhru , Talmakhana , Kiwanch , Uttangan , Salbmisri , Salb panja and Banslochan .

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture may be taken two tea -spoon twice a day with a glass of milk.

**C. Precautions** -

To avoid eating spicy and hot foods and also the intoxicating substances. Also desist from sexual contact.

***(2) For the cure of Rheumatism*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Satawar , Kamarkas gond , Gundi , Aswagandha , Sahajana gond , Chobchini , Gokhru , Kiwanch , Shayam Musli , Safed Musli and Kala Beejbandh.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture may be taken two tea -spoon twice a day regularly with milk and honey.

**C. Precautions** -

Strictly avoid the consumption of acidic and cold foods

***(3) For the cure of Skin diseases*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Gawarpatha, Neem fruit , Makoi , Kali Ziri , Chiraita , Kutki , Majistha , Rose petals , Sanai and Triphala.

**B. Methodology of Dose Consumption** -

A decoction of the crude drugs is prepared in water and may be taken two tea-spoon twice daily.

**C. Precautions** -

To avoid eating spicy and hot foods and also the intoxicating food or drinking materials.

***(4) For the cure of Swellings*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Satawar, Aswangandha , Kamarkas gond , Sahajana gond , Chobchini and Sonth.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture is prepared which may be taken two tea -spoon twice a day regularly with milk.

**C. Precautions** -

Strictly avoid the acidic and cold foods contents.

***(5) For the cure of Dysentery*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Belpatra , Dabh , Maror phali , Saunf , Isabgol , Nagkesar and Lodh pathani.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture may be taken two tea -spoon with cold water thrice a day regularly.

**C. Precautions** -

Strictly avoid the hot tea as well as milk, and hot spicy foods.

***(6) For the cure of Blood Purification*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Asgandh , Brahmi buti , Harar , Bahera , Amla , Kutki , Chiraita , Rose petals , Sanai , Lal Chandan , Manjistha , Dhaniya and Safed zira.

**B. Methodology of Dose Consumption** -

A decoction of the drug is made by boiling the crude drugs in water for several hours together till only one-fourth portion rest is left. The decoction is taken two tea-spoon twice daily.

**C. Precautions** -

Strictly avoid Oil, Salt and eating hot, acidic spicy foods (e.g. Samosa, Kachori etc.).

***(7) For the cure of Softening Hairs*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Jufa, Brahmi Buti, Amla, Sikakai, Ritha, Jata manshi, Mehndi and Triphala.

**B. Methodology of Dose Consumption** -

A decoction of the crude drug is prepared in water by boiling and washing hairs.

**C. Precautions** -

To avoid the use of bad Soaps and Shampoos for washing hairs of medicinal plant's parts and portion.

***(8) For the cure of Loss of Strength and Vigour*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Asgandh , Gokhru , Kala Beejbandh , Satawar , Kamarkas gond , Giloy , Harar , Bahera , Amla , Safed Musli , Salb misri , Shyam musli , Semal musli , Vedarikand , Mulethee and Dry Fruits.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture is made in to paste by cooking in pure ghee, milk and Jaggery and these are mixed with Shilajit to prepare the final product. They are to be taken two tea-spoon twice daily with a glass of milk for atleast one month duration.

**C. Precautions** -

Pungent and sour substances (like Chhach, Chatni etc.) are to be avoided during the course of treatment.

***(9) For the cure of Urinary disorders*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Asgandh , Kala beej bandh , Ashok bark , Jinjari , Gokhru , Salb misri , Nagkesar , Satawar , Salparni , Rose petals , Shyam musli , Braham dandi and Punarnava .

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of herbal drugs is prepared, and it may be taken with cold water empty stomach and two times a day. For quick action and relief they recommended it to be taken with glass of fresh carrot Juice.

**C. Precautions** -

To avoid foods which has bad effect on body (heavy diets specially).

***(10) For the cure of Sexual complaints*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Satawar , Palas gond , Banslochan , Jinjari , Gokhru , Giloy , Asgandh , Kiwanch , Safed musli , Shyam musli , Semal musli , Todri , Lajwanti , Uttangan , Kala Beej bandh , Salb panja , Kamal gatta , Chhoti ilayachi and Salab misri.

**B. Methodology of Dose Consumption** -

They are powdered mixed and cooked in pure ghee in earthen utensil adding cow milk and Jaggery. The product is taken with Shilajit two tea-spoon daily in the early morning empty stomach.

**C. Precautions** -

To avoid sexual relations during the course of treatment and also to avoid any intoxicating materials (e.g. wine, opium etc.)

***(11) For the cure of Leucorrhoea*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Bophali , Bar Jata , Pipal Jata , Kala Beej bandh , Asgandh , Lodh pathani , Semal musli , Kutki , Nagkesar , Kaiphal , Safed musli , Salb panja , Gundi , Singhara and Ashok bark.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of the herbal drugs may be taken two tea-spoon twice daily with milk.

**C. Precautions** -

To avoid eating sour and pungent foods (specially the Chhach, Chatni etc.).

***(12) For the cure of Male Sterility*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Satawar , Kala Beej band , Asgandh , Kiwanch , Vidari kand , Todri , Kaiphal , Uttangan , Safed musli , Shyam musli and Salb panja.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of the drugs is prepared and roasted in earthen utensil and taken one tea-spoon twice daily with a glass of milk and honey in the morning empty stomach.

**C. Precautions** -

To avoid eating pungent, sour and intoxicating materials.

***(13) For the cure of Female Sterility*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Satawar , Kamarkas gond , Kala beej bandh , Asgandh , Lodh pathani , Manjuphal , Vidhari kand , Mocharas , Kiwanch , Todri , Kaiphal , Uttangan , Safed musli , Shyam musli and Salb panja.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture is prepared from the herbs which is boiled with milk and sugar till thick substance is left and is taken one tea-spoon daily empty stomach between the menses for atleast 6 months.

**C. Precautions** -

To avoid eating pungent, sour and intoxicating materials.

***(14) For the cure of Haematuria*** - (passing of blood with Urine)

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Chhota Gokhru , Bada Gokhru , Jal jamni , Asgandh , Nagkesar , Lal Chandan and Sital chini.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of drugs is prepared and then it may be taken with water.

**C. Precautions** -

To avoid eating hot, spicy foods, Tabacoo, Alcohal and in taking of intoxicating materials. Also desist from sexual contact.

***(15) For the cure of Asthma*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Arusa , Kaiphal , Kutki , Mulethee , Ratanjot buti , Zufa , Pipal , Kalimirch , Sonth , Khubkalan , Kakrasinghi , Aswagandh , Nagkesar and Tulsi.

**B. Methodology of Dose Consumption** -

A decoction of the drugs is made by boiling the crude drugs in water for several hours together is left. The decoction is taken two tea-spoon twice daily.

**C. Precautions** -

To avoid eating hot, spicy, oily foods, Tobacco, Alcohol and in taking of intoxicating materials.

***(16) For the cure of Gonorrhoea*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Akari Bel , Bhindi root , Shyam musli , Giloy , Mulethee , Talmakhana , Kutki , Panir , Rose petals , Kala Beej bandh , Gorkh mundi and Braham dandi.

**B. Methodology of Dose Consumption** -

A decoction of the crude drugs is prepared in water and may be taken two tea-spoon twice daily.

**C. Precautions** -

To avoid eating hot, spicy, foods, Tobacco, Alcohol, and taking intoxicating materials. Also desist sexual contact.

***(17) For the cure of Whooping cough*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Bharangi , Panihari , Mulethee , Zufa , Pipali , Kali mirch , Sonth , Khubkalan , Banfsha , Kakara singhi , Tulsi , Alsi , Bahera , Oonab , Lisoda , Azawan and Kala namak.

**B. Methodology of Dose Consumption** -

A decoction of the drugs is made by boiling the crude drugs.

**C. Precautions** -

Patients are advised to avoid smoking (Cigarettes, Biddi etc.) cold drinks (Pepsi, Limca etc.) and also taking intoxicating materials.

***(18) For the cure of Gastro-Intestinal Disorders*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Sanai , Kutki , Harar , Baheda , Amla , Pipal , Sonth , Marorphali ,Azwain , Hing , Belptra , Rose petals , Saunf , Safed zira , Pipalamul , Nosadar , Mitha soda , Kala namak and Sandha namak.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of the drugs is prepared and may be taken daily with water two tea-spoon twice or thrice a day.

**C. Precautions** -

Patients are advised to avoid spicy foods (e.g. Samosa, Kachori etc.) and acidic materials (Rice, Potato, Phool gobhi etc.). To advise Drink water after one hour of meal.

***(19) For the cure of Purgative/ Constipation*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Amaltas , Gawarpatha , Ker , Sanai , Kala danha , Kutki , Kiwanch , Choti harar , Bari harar , Amla , Baheda , Pipal , Sonth , Tumba , Azwain , Ajmod , Mitha soda , Kala namak and Sandha namak.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of the crude drugs is prepared and may be taken daily with warm water two tea-spoon twice a day, at least one month regularly.

**C. Precautions** -

Patients are strictly advised to avoid spicy foods (e.g. Samosa, Kachori etc.).

***(20) For the cure of Eradication of Intestinal worms*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Palas seed , Amaltas , Baibirang , Indrajaw , Kamela , Karanj , Harar , Baheda , Amla and Haldi.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture is prepared and may be taken one tea-spoon twice daily with warm water or Honey after meal.

**C. Precautions** -

Patients are strongly advised to avoid polluted foods and water (e.g. Pani Patasi, Golgappa etc.).

***(21) For the cure of Body pain*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Satawar , Asgandh , Sahajana gond , Dikamali , Giloy , Kamarkas gond , Chob chini , Lodh pathani , Nagkesar , Ratanjotbuti ,Saqaqul misri , Azwain , Sonth , Piplamul and Baibirang.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of the crude drugs is prepared and may be taken two tea-spoon twice daily with honey and empty stomach.

**C. Precautions** -

Patients are advised to avoid eating pungent and sour substances(e.g. Pani Patasi, Golgappa etc.).

***(22) For the cure of Toothache*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Harar, Bahera, Amla, Samunder Zhag , Lowng, Sona geru, Leaves of Neem and coats of Badam of ashes.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture, and used as tooth powder.

**C. Precautions** -

Strictly avoid sweats, bad tooth powder and tooth pastes.

***(23) For the cure of Jaundis*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Punarnava, , Kutki, , Gorakh mundi , Kulinjan , Shyam musli , Chiraita and Amla.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture is kept overnight in water in copper utensil and then taken every morning Just before sunrise empty stomach for atleast one month daily for faster recovery fresh juice of Radhish, Carrot, Sugarcane and Adrak is recommended.

**C. Precautions** -

Strictly avoid eating hot, spicy foods, Tabacoo, Alcohol and smoking.

***(24) For the cure of Diabetes*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Gurmarbuti , Giloy , Kiwanch , Gokhru , Asgandh , Kutki , Jamun , Mango seed , Bel patra , Azwain , Methi and Neem Fruit.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture of the herbal drugs is prepared and may be taken regularly with half cup Juice of Karela.

**C. Precautions** -

Strictly avoid eating sweats.

***(25) For the cure of Piles*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Neem fruit, Gawarpatha , Gokhru , Nagakesar , Palas seed , Gorkh mundi , Choti harar , Marorphali , Belpatra , Bakayan fruit , Sonth , Rose petals and Saunf.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture may be taken daily thrice a day with a cup of milk.

**C. Precautions** -

Strictly avoid of eating hot and spicy foods (e.g. Samosa, Namkin etc.).

***(26) For the cure of Leucoderma*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Asgandh , Amerbel , Nirbisi , Manjistha , Harar , Bahera and Amla.

**B. Methodology of Dose Consumption** -

A decoction of the herbal drugs is given for long term use about a year.

**C. Precautions** -

Strictly avoid of eating hot, spicy foods and Acidic foods (Pani Patasi, Golgappa etc.).

***(27) For the cure of Leprosy*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Kaliziri , Asgandh , Giloy , Nirbisi , Harar , Bahera , Amla and Sanai.

**B. Methodology of Dose Consumption** -

They are powdered and then the mixture is prepared of the herbal drugs and may be taken one tea-spoon thrice a day with honey.

**C. Precautions** -

Strictly avoid eating hot and Spicy foods (e.g. Samosa, Kachori, Namkin etc.).

***(28) For the cure of COVID-19 (Mild Stage)*** -

**A. Prescription** -

The following main parts and portion of medicinal plants are indicated to be used with others -

Equal quantity should be taken for the applied use.

Dalchini, Ganjawa, Haldi, Saiuf, Arusa, Bharangi, Aswagandha , Mulethee , Zufa , Pipali , Kali mirch , Sonth , Khubkalan , Banfsha , Kakara singhi , Tulsi , Alsi , Bahera , Oonab , Lisoda , Azawan, Khas-Khas and Kala namak.

**B. Methodology of Dose Consumption** -

A decoction of the drugs is made by boiling the crude drugs.

**C. Precautions** -

Patients are advised to avoid smoking (Cigarettes, Biddi etc.) cold drinks (Pepsi, Limca etc.) taking intoxicating materials and also mantain distance and use mask.

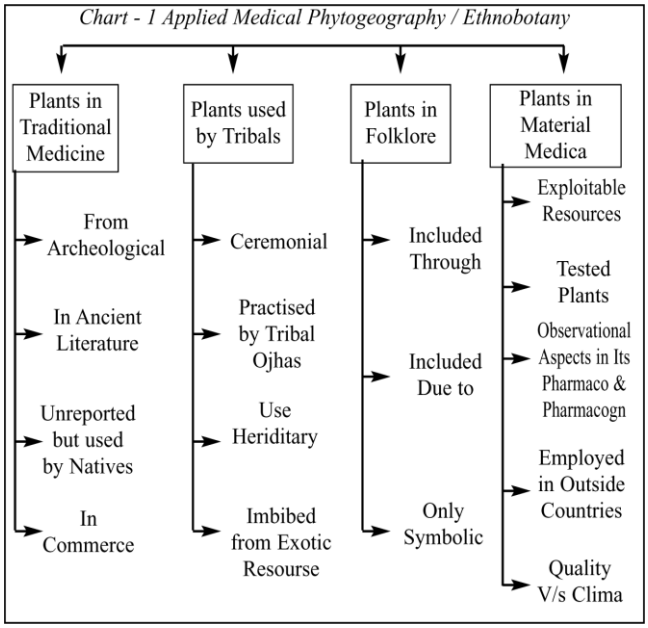
## XXV. USEFUL PLANT SPECIES

Plants are the precious natural heritage of the earth, a valuable gift of the God on the earth surface in the form of green coverage. Actually, every plant or its community is useful on the earth surface, in other words to say whatever and wherevser the plant on this planet has its applied value, it is another matter whether that we are not aware or known by its uses or the mankind yet has unable to find out or trace out its unseen factor of usefulness. At the part of applied aspect of the plants, it cover several in other words to say uncountable multi-dimensional importance, broadly example from environmental, ornamental, folklore in society culture, religious appraisal, biological sense, its food and fodder values, its medicinal purpose etc. The uses of plants for different purposes are earlier or perhaps as old as mankind existence. In India, since the 'vedic period', information on the utility of plants in medicine finds place in different ancient scriptures. About, a few thousand years ago the utility of plants as Phyto-chemical aspect has been dealt in a holly hindu grantha -"Ram Charitmanas".

From an ancient booklet in hindi entitled "pustak sandesh" about two centuries ago, large number of common plants have been enumerated for traditional uses in which Ficus religiosa was considered as a climate purifier as it liberates considerable amount of oxygen than many other species. It is also mentioned that Lotus fruits are used as a good tonic etc. The study of plants in service of mankind remained as a part of human civilisation. Information on the economic aspect of plants have been passed from one generation to the next generation without any published records, in other words to say in some or certain cases these informations are on going heritage from one generation to another. It is in this light, a new branch of Botany has emerged, termed as ethnobotany and the scientists of world are keen to examine the practical uses of all plants reported or unreported.

Ethnobotany in other words to say a synomonus of an inter disciplinary branch of geography here termed as - applied phytogeography. There are large number of examples from archaeological remains, among them a few can be mentioned. "kalpa-vraksha" in stone sculptures denotes. Adansonia digitata basically a semi arid zone species. They grow in semi-dry areas where there is scanty vegetation. This plant has augmented the vegetable component besides ensured additional income to villagers derived from its fruit whose water is tonic and nutritive. The stem fibre is used as cordage. Branches and leaves are considered as a good cattle feed as fodder and flowers are used in medicine. It has been estimated that each tree can fetch about rupees 2000 per year and its span of life is more than few hundred years. Hence it is called 'kalp vraksha' in ancient literature.

The research paper deals with the different aspects of plants and their uses in medicine, as food plants, in socio - religions ceremonies, in abatement of environmental pollution, as an material in industry for extracting dyes, fibre, tannins, oils, fats, gum, latex, narcotics etc. are discussed in this research paper which is followed by different plants names and their uses. The plant names are given in hindi, english, local name and with their botanical names. Thus, it is one of the prime most duty of an applied phyto-geographer or economic botanist to investigates the potentiality of applied values of existing plant resources of a particular region. Further in this context, he must be aware of the traditional wisdom of the native inhabitants which is expressed in their prevailing proverbs and ancient folklore, also in their traditional customs and their believe, and restoring fund of old knowledge from generation after generation about the local trees, shrubs, under-shrubs, herbs, climbers and grasses. These are very important informative sources for obtaining truth of the applied hidden aspect about the uses of the particular plant species viz; fuel, fodder, medicinal, edible and commercial, thus these are major groups or broad categories of applied aspect of plant species **(Chart).**




For applied aspect of plants a chart of ethnobotany or other words to say "applied phytogeography" has been given which is a diagrammatic presentation and it covers the more or less all dominant useful aspects of plants which are welfare for the mankind.

## XXVI. CATEGORY OF USEFUL PLANTS

As far as the 'applied phytogeography in concerned a little work has been done on the exact lines of this aspect. Not exactly on applied phytogeography' but some of the workers have done some sort of work on its allied aspects also that is nearer to the aspect of applied phytogeography which are as mentioned below - Raunkier (1934), Jain (2001) and Sharma (2007).

After collecting the information thoroughly from all of the survey study sites of Shekhawati Region scattered in the different areas of this study region about the uses as well as application of the plant species which are being used by the local people or native inhabitants from centuries back is that, about 71 percent plant species of existing vegetation Shekhawati Region are useful. It has been already mentioned earlier that, in nature each and every plant species on the earth surface is useful, although it is another matter whether we are known to the seen or unseen applied importance of the particular plant species, Similarly, here further in this context

the author is presenting the interpretation of analytic aspect of the plant species which are reported as useful among the existing vegetation of the area under study. All plants of existing vegetation cover of the study area, are not useful or in other words to say we have not reported or known upto now about their applied importance in the existing vegetation of the study area.

According earlier studies, the author has done the 'applied categorisation' of such useful plant species into their five applied categories, further in this context in other word to say the observation revealed that such useful plant can obviously be divided under five major groups or broad categories which are here known as or termed as "applied categories." There are total 122 useful plant species Tab. : 1.12. which are being reported from Shekhawati Region, Rajasthan, based on collection of informations from several survey spots scattered through the area under study. The applied categorisation analysis of

**Table : 1.12 Shekhawati Region : Applied categorization of plant species**

**(FU-Fuel,FO-Fodder,ED-Edible,MD-Medicinal and CO-Commercial)**

| S.No. | Name of the Plant Species/ Vegetation Group | Local Name | Applied Category |
|---|---|---|---|
| **A.** | **TREES :** | | |
| 1 | Adhatoda vasica | Arusa, Ardu | MD, CO |
| 2 | Acacia senegal | Kheri | MD, CO,ED |
| 3 | Acacia nilotica | Desi Babool | MD, CO |
| 4 | Azadirachta indica | Neem, Neemdo | MD, CO,ED |
| 5 | Albezia lebbeck | siris | MD, CO |
| 6 | Anogeissus pendula | Dhau | FO,FU |
| 7 | Boswellia serrata | Salar, Salaran | MD, CO |
| 8 | Butea monosperma | Palas, Tendu | MD, CO,ED |
| 9 | Balanites aegyptica | Hingota | FU, CO |
| 10 | Cordia gharaf | Gundi | MD, CO,ED |
| 11 | Cassia fistula | Amaltas | MD, CO |
| 12 | Dalbergia sissoo | Sisham | MD, CO |
| 13 | Ficus bengalensis | Bargad | MD, CO,ED |
| 14 | Ficus religiosa | Pipal | MD, CO,ED |
| 15 | Mangifera indica | Aam | MD, CO,ED |
| 16 | Moringa oleifera | Sahjana | MD, CO,ED |
| 17 | Maytenus emerginat | Kenkero | FU, FO |
| 18 | Phoenix acaulis | Khajur | MD, CO,ED |
| 19 | Prosopis cineraria | Jhanti | FU, FO |
| 20 | Salvadora oleoides | Pilu, Jal | MD, CO |
| 21 | Saraca asoca | Ashok | MD, CO |
| 22 | Tamarindus indica | Imli | FU, FO |
| 23 | Tecomella undulata | Rohida | FU, FO |
| 24 | Zizyphus nummularia | Borti | FU, FO,ED |
| **B.** | **SHRUBS :** | | |
| 25 | Calligonum polygonoides | Phog | MD, CO |

| | | | |
|---|---|---|---|
| 26 | Calotropis procera | Aak, Aakdo | MD, CO |
| 27 | Capparis decidua | Ker, Kerdo, Teent | MD, CO,ED |
| 28 | Commiphora mukul | Gugal | MD, CO |
| 29 | Caesalpinia pulchirrima | Morpushp, | MD, CO |
| 30 | Coccinia indica | Gol, Golan | MD, CO |
| 31 | Clerodendrum indicum | Bharangi | MD, CO |
| 32 | Lycium barbatum | Morali, Murali | MD, CO |
| 33 | Mimosa hamata | Jinjari | MD, CO,ED |
| 34 | Opuntia elator | Thor, Hatha Thor | MD, CO |
| 35 | Rhus mysorensies | Dansar | MD, CO,ED |
| 36 | Rhus coriara | Mahee Buti | MD, CO |
| 37 | Surcostemma acidum | Khir-Khimp | MD, CO |
| 38 | Withana somnifera | Asgandh, Aswagandh | MD, CO,ED |
| **C.** | **UNDER-SHRUBS :** | | |
| 39 | Aloe vera | Gawarpatha | MD, CO |
| 40 | Aerva persica | Bui, Buvado | MD, CO |
| 41 | Alysicarpus vaginalis | Leel, Leelro | MD, CO |
| 42 | Asparagus racemosus | Satawar | MD, CO,ED |
| 43 | Abutilon indicum | Kangni | MD, CO |
| 44 | Abutilon fruticosa | Imarti | FU, FO,ED |
| 45 | Crotolaria burhia | Shinio, Shinia | MD, CO |
| 46 | Cassia acutifolia | Sarana | MD, CO |
| 47 | Cassia angustifolia | Sanai Mukhi | MD, CO |
| 48 | Echinops echinatus | Looth, Gokaru | MD, CO |
| 49 | Euphorbia caducifolia | Thor, Danda Thor | MD, CO |
| 50 | Grewia villosa | Gangeti | MD, CO |
| 51 | Leucas aspera | Panihari | MD, CO |
| 52 | Leucas urticaefolia | Panihari | MD, CO |
| 53 | Malva rotundifolia | Vilayati Kangni | MD, CO,ED |
| 54 | Ocimum americanum | Bantulsi, Bapji | MD, CO |
| 55 | Peristrophe bivalvis | Kangner | MD, CO |
| 56 | Pulicaria crispa | Sonali | MD, CO |
| 57 | Sida alba | Bala, Kharenti | MD, CO,ED |
| 58 | Sida acuta | Kala Beej Bandh | MD, CO,ED |
| **D.** | **HERBS :** | | |
| 59 | Argemone mexicana | Satyanasi | MD, CO |
| 60 | Achyranthus aspera | Apamarga | MD, CO |
| 61 | Amaranthus spinosus | Chandalio-chatio | MD, CO |
| 62 | Aristolochia bracteolota | Jufa | MD, CO |
| 63 | Adiantum venustum | Hansraj | MD, CO |

| | | | |
|---|---|---|---|
| 64 | Barleria prionitis | Bajaradanti | MD, CO |
| 65 | Blumea obliqua | Chotari Jal-Bhangaro | MD, CO |
| 66 | Blepharis sindica | Cinawari, Bhangari | MD, CO |
| 67 | Boerhavia diffusa | Punarnava | MD, CO,ED |
| 68 | Citrullus colocynthis | Tumba, Indrayan | MD, CO |
| 69 | Convolvulus microphyllus | Chantari, Sanari | MD, CO |
| 70 | Convolvulus arvensis | Hiranpagi | MD, CO |
| 71 | Cressa cretica | Rudravanti | MD, CO |
| 72 | Cleome gynandra | Safed Bangro | MD, CO |
| 73 | Crotolaria medicaginea | Rudhani | MD, CO |
| 74 | Corchorus depressus | Chamkas, Kurand | MD, CO,ED |
| 75 | Chenopolium album | Bathuwa | FU, FO,ED |
| 76 | Corollocarpus epigous | Rakas gaddah | FU, FO |
| 77 | Digera muricata | Vajardanti | MD, CO |
| 78 | Dicomo tomentosa | Vajardanti | MD, CO |
| 79 | Eclipta prostrata | Jal-Bhangaro | MD, CO |
| 80 | Fagonia cretica | Dhamasa | FU, FO |
| 81 | Glinus lotoides | Bakado | MD, CO |
| 82 | Glossnema varians | Doodha | FU, FO |
| 83 | Indigofera oblongifolia | Goilia | MD, CO |
| 84 | Launaea residifolia | Phulavalo-untkantalio | MD, CO |
| 85 | Lindenbergia indica | Pindhru | MD, CO |
| 86 | Mollugo cerviana | Chiriyaro-Khet | MD, CO |
| 87 | Mollugo nudicaulis | Ragatio-Khar | MD, CO |
| 88 | Psoralea odorata | Jhill | MD, CO |
| 89 | Phoralea corylifolia | Babchi | MD, CO |
| 90 | Phyllanthus fraternus | Khajario-Khad | MD, CO |
| 91 | Polygala chinensis | Meradu, Uniragu | MD, CO |
| 92 | Portulaca oleraceae | Luni, Lulfo | MD, CO |
| 93 | Polygonum plebium | Kamali | MD, CO |
| 94 | Polycarpaea corymbosa | Jutaniokhad | FU, FO |
| 95 | Solanum albicule | Nhar-kanto | MD, CO |
| 96 | Solanum nigrum | Makoi | MD, CO |
| 97 | Solanum surrattense | Kantakari | MD, CO |
| 98 | Tribulus terrestris | Chhota Gokharu | MD, CO,ED |
| 99 | Tribulus alatus | Gokhru | FU, FO |
| 100 | Viola cinerea | Mus-Korni | MD, CO |
| 101 | Vernonia anthelmintica | Kaliziri | MD, CO |
| 102 | Vernonia cinerea | Sia-Kanto | MD, CO |
| **E.** | **GRASSES :** | | |

| | | | |
|---|---|---|---|
| 103 | Aristida adsansionis | Lemp | FU, FO |
| 104 | Cenchrus biflorus | Bhurut | FU, FO |
| 105 | Cyndon dactylon | Dab | FU, FO |
| 106 | Cyperus rotundus | Motho | MD, CO |
| 107 | Cymbopogon flexuasus | Buraro | MD, CO |
| 108 | Dectylotenium aegypticum | Ghantaria | MD, CO |
| 109 | Fimbristylis quinqularis | Chirio -ro- khet | FU, FO |
| 110 | Imperata cylindrica | Dabh | MD, CO |
| 111 | Panicum antidotale | Murat | MD, CO |
| 112 | Parthenium hysterophorus | Congress Ghas | MD, CO |
| 113 | Sehima nervasum | Seran | MD, CO |
| **F** | **CLIMBERS :** | | |
| 114 | Cocculus pendulus | Pilwani Bel | FU, FO |
| 115 | Cuscuta hyalina | Ghia Bel | FU, FO |
| 116 | Cuscuta chinensis | Amar Bel | MD, CO |
| 117 | Ipomoea hederaceae | Rota ki Bel | MD, CO |
| 118 | Momordica dioica | Ban Karalo | FU, FO |
| 119 | Momordica balsaminia | Jangali karelo | FU, FO |
| 120 | Pentatropis spiralus | Akari Bel | MD, CO |
| 121 | Rivea ornata | Rota ki Bel | MD, CO |
| 122 | Tinospora cordifolia | Gilo, Giloya | MD, CO |

Source - Based on Field survey visits

the useful plant species according the nature of their utilisation for the welfare of human beings as well as domestic animals has been carried out under five categories namely - A-Fuel, B-Medicinal, C- Fodder, D-Edible, and E-Commercial. Further in this context, the exercise of analytic aspect of the 'applied aspect or importance of the useful plants' revealed some interesting results that among useful plant 17 percent are of fuel purpose species, 81 percent plants have their medicinal importance, 16 percent plants have their fodder values, 18 percent plants have their edible importance where as 83 percent or one-fifth plant species are important from commercial point of view. Among useful plant species, most of them are common in more than one applied category, such plant species make about 81 percent wealth of the useful plants of Shekhawati Region's vegetation.

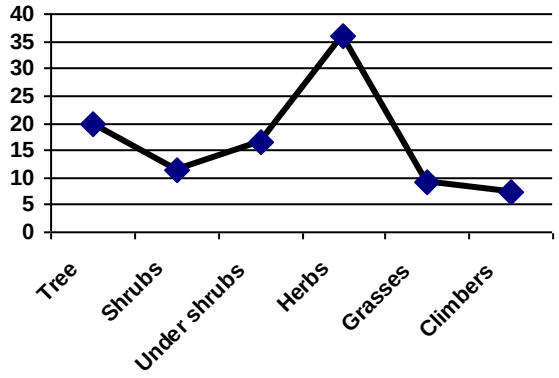
**Table : 1.13 Shekhawati Region : Vegetation Groups of Useful Plants**

| S.No. | Vegetation Groups | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | |
| | Trees | Shrubs | Undershrubs | Herbs | Grasses | Climbers | |
| Number | 24 | 14 | 20 | 44 | 11 | 9 | 122 |
| Percentage | 19.7 | 11.5 | 16.4 | 36 | 9 | 7.4 | 100 |
| Contribution in overall vegetation (in % ) | 80 | 82.3 | 68.9 | 73.3 | 47.8 | 69.2 | 70.9 |

From vegetation groups analytic aspect point of view, among 122 known useful plant species for the area under study observations revealed **(Tab. : 1.13)** that - 19.7 percent are trees, 11.5 percent shrubs, again 16.4 under-shrubs, 36 percent belong to herbs, 9.0 percent are from grasses group whereas 7.4 percent belong to the group of climber **(Fig. : 1.10)**. Further in this context with reference to vegetation groups analytic aspect, if we trace out the

contribution of these useful plant species in overall existing vegetation of Shekhawati Region which has 172 plant species in all, the study revealed some interesting results that among useful plant species 80 percent belong to the group of trees whereas 82.3 percent are shrubs, 68.9 percent belong to the group of under-shrubs whereas 73.3 percent are herbs, 47.8 percent are grasses whereas 69.2 percent percent belong to the group of climbers.

**Figure 1.10 : Contribution of Domesticated Plant Species in Percentage**




## XXVII. UTILITY OF PLANTS FOR THE PEOPLES

The Phytochemical plants of the area surveyed is generally characterised as 'thorny scrub" and sub- tropical decidous forests. The trees are of a rare occurrence. Mostly, the annual vegetation blooms during rainy season. These species are mostly ephemerals, only some which sprout their aerial shoots during the favourable rainy season alone are perennials. The water retaining capacity of the sandy soil is very poor; and the complete absence of humus in the soil results into the poor microbial flora in the area.

Amongest the annuals, most of the species complete their life span between one to three weeks time. The irregular rainfall, the extreme variation (diurnal as well as seasonal) in temperature and the relative humidity are again the adverse factors that deteriorated the vegetation. Moreover, the trees and shrubs are excessively lopped for fodder, fuel and similar other purposes, also for making agricultural and house-hold implements. Due to population-explosion in the area, there is an excessive exploitation resulting into the present poor conditions of the vegetation.

The present work highlights useful Phytochemical information about wild and some important cultivated Phytochemical plants as well as food, fodder, medicine etc. In Shekhawati region, famine food scarcity is not Under such a time, the role of wild Phytochemical plants becomes significant. The rainy season gives a bumper crop of ephememrals that carpet the earth in a region like south-east Rajasthan out of which many Phytochemical plants are of utility for the peoples. Peoples use various Phytochemical plant parts of these wild Phytochemical plants. Although, it is almost correct to say that human life is dependent to a very large extent on the plant life specially the green ones. Besides the general uses, some specific uses to which the Phytochemical plants are put in the area under survey, by the local inhabitants have been recorded under certain sub heads e.g.:

**A. Phytochemical plants utilized for food:**

**1. Cereals and millets:**

**(i) Main Phytochemical crops:** Main crop of the area is *Penniseh americanum* which is a staple food for the villagers. Other cultivated cereals m Sorghum bicolor, *Triticum aestivum* and *Hordeum vulgare*.

**(ii) Supplementary cereals during scarcity periods:** During famine or the period of scarcity of these primary crop plants, the substitutes resorted to as food materials are the grains of *Cenchrus species* viz., *C. biflnrus, C. priewrii, C. Setigerus, Dactyloctenium aegyptium, D. Sindicum, Echinochloa colonum, E. crus-galli; Eleusine indica; Paspalum scrobiculatum* and *Setaria verticillata.* Grains of these are collected for use during this period.

**(iii) Seeds of some local Phytochemical plants mixed with cereals:** The seeds of *Acacia senegal, Indigofera linifolia* and *Holopelea integrifolia* are pounded and mixed with flour obtained from 'Bajra' or other food grains. The seeds of *Citrullus colocynthis* are washed many times with saline water to remove the bitter principles and then these are dried, grounded and mixed with 'Bajra' flour to be made into bread and taken as a supplementary food. Local people also fry them with chillies and eat. The seeds of *Citrullus lanatus* are also fried and eaten.

The bark of *Acacia leucophloea* and *Prosopis cineraria* are pounded and mixed with 'Bajra" flour and taken by poor people during periods of severe famine.

**(iv) Unusual Phytochemical food preparations :** The food-habits of the local people is also variable; for example, 'Bajra' is the daily bread of the people. It is also taken in the form of 'Khichree' (crushed grains, mixed with legume and cooked in water) and 'Rabri' (crushed grains, cooked in butter-milk). The crushed grains of wheat and barley are cooked in water ('Gatha') for eating. The fleshy part of the leaves of *Aloe vera* ('Gwar pattha') is eaten with common salt or used as vegetable. It is also made into 'Ladoos' (special preparation) with 'deshi ghee' and sugar like the seeds of *Sida alba* ('Kharantee').

**2. Pulses :***Cicer arietinum, Lablab purpureus, Pisum sativum,. Vigna aconitifolia, V. anularts and V. ungmculota* are cultivated. some wild species viz., *Vigna trilobus* are also used as their substitutes.

**3. Vegetables:** *Abelmoschus esculentus, Allium cepa, A.sativum, Brassica oleracea var. botrytis, B. oleracea var. capitata, Cucurbita jnaxima, Cucumis sativus, C. melo var. melo, C. melo var. utilissimus, Cyamopsis tetragonoloba, Daucus carota, Lagenaria siceraria, Luffa cylindrica, L. acutanauta, Lycopersicon lycopersicum, Ipomoea batata, Momordica charantia, Solanum melongena, Trigonellafoenum-graecum, Itaphcmus satiuus* etc. are extensively cultivated for their values as vegetables.

The twigs of naturally occurring Phytochemical plants like *Portulaca oleracea, Trianthema portulacastrum, Amaranthus gracilis, Chenopodium album* and leaves of *Brasica campestris var. dichotoma, B. campestris var. toria, B. campestris var. sarson, Lactuca remotiflora, Euphorbia neriibtia* etc. are also used as vegetables. The flower buds of *Calligonum polygonoides* are boiled in water and mixed with curd to be used as 'Rayata. Young fruits of *Capparis decidua* ('Ker'), *Citrus medica, Rnnhinia racemosa,*

*Citrullus fistulosus,C. lanatus, Coccinia grandis, Leptadenia pyrotechnica. Cordia dichotoma,Moringa oleifera, Mangifera mdica, Prosopis cineraria, Momordica balsamina* are cooked as vegetables.

**4. Edible Phytochemical fruits:** The ripe fruits of *Aegle marmelos, Azadirachta indica, Bauhinia racemosa, Capparis decidua, Citrullus lanatus, Cordia dichotoma, Cucumis melo var. melo, C. melo var. usitilissimus, C. sativus, Mangifera indica, Flacourtia indica, Grewia tenax, Phoenix sylvestris, Rhus mysurensis, Salvadora oleiodes, Ziziphus nummularia, Z. xylopyra*, etc. are eaten raw by local people. Both young as well as mature and dried, fruits of Prosopis cineraria are eaten by local people and sometimes mature ones are stored and consumed during scarcity of food. The young fruits of *Ipomoea pesti-gridis, Withania somnifera, Ficus religiosa*, etc. are taken by local children rarely.

**5 Miscellaneous Phytochemical Food:** The flower buds of *Prosopis cineraria, Calligonum polygonoides*, are taken by local children with a great interest. The tubers of *Ceropegia bulbosa*, and *Cyperus rotundus*, sometimes roasted and eaten. Sometimes are also dried and powdered and mixed with the flour of 'Bajra' and Sorghum biocolo. The whole Phytochemical plant of *Trianthema portuiacastrum,Gisekia pharnaceoides* and *Portulaca oleracea* are eaten because of their saline taste, but when taken in excess, they are reported to cause harm paralytic effect etc.

**6. Phytochemical plants in Agriculture: As source of manure:** The dried and fallon leaves of *Prosopis cineraria* and *Ziziphus nummularia* and other leguminous Phytochemical plants decompose in soil, make the land fertile and thus they conserve moisture in the soil.

Amongest the grasses the sand binding and moisture conserving ones are: *Sacchamm bengalense, Acrachne racemosa, Anstida adscensionsis, Cenchrus biflorus, C. cliaris, DesmostacHya bipinnata, Eragrostis ciliaris, Paspatum scrobiculatum, Sorghum halepense*, along with others.

**As source of Fodder:**

**(i). Phytochemical plant twigs as fodder:** The fodder yielding trees in the area are: *Acacia jacquemontii, A. leucophloea, A. ntiotica, A. sengegal, Ailanthus excelsa, Albizia lebbeck, Anogeissus pendula, A.rotundifolia, Azadirachta indica, Balanites aegyptiaca, Bauhinia racemosa, B. variegata, Boswellia serrata, Celerodendrum phlomoides, Cassia fistula, Capons decidua, Dalbergia sissoo, Ficus religiosa, Mallotus philippensis, Maytenus emarginata, Moringa oleifera, Prosopis Cineraria, Leucaena latisiUqua, Tecomella undulata, Salvadora oleiodes, S. persica, Cassia auricula. Crotalana burhia Shrubs, Adhatoda vesica, Leptadenia pyrotechnica, Lycium barbarum, Mimosa hamata, Grewia damine, G. Jlavescens, G. tenax, manly occur*. The fresh leaves of *Calotropis procera* are eaten only be goats.

*Cleome viscosa, Corchorus tridens, C. depressus, C. olitorius, Crotalaria medicaginea, C. juncea, Indigofera cordijolia, I. Imifolla, Gisekia phamaceoides, Boerhavia diffusa, Portulaca oleracea, Polycarpaea corymbosa, Tephrosia purpurea, Trigonella comiculata, Rhynchosia minima, Tribulus terrestris, Hedyotis umbellata, Ipomoea spp., Merremia aegyptta, Physalis minima, Digera muricata, Amaranthus spp., Chenopodium album, Euphorbia hirta, Commelina benghalensis, C.Jorskaelii, Alysicarpus, Desmodium gangeticum, Aristolochia brachiata, Abrus precatorius, Cayratia trifolia, Citrullus lanatus, C. Jistulosus, Momordica dioica, M. balsamina, Cucumis melo, Coccinia grandis, Convolvulus arvensis, Evolvulus alsinoides, Cocculus hirsutus, C. pendulus, Cyperus arenarius, C. rotundus, Bulbostylis barbata, Fimbristylis dichotoma* are chiefly used as fodder. *Alhagi pseudalhagi* is used as a camel fodder is hot season since it bears the leaves when there is not much green vegetable available. *Ephedra foliata* is the only gymnosperm found in sandy plains and is eaten by camels with a great interest.

**(ii) Phytochemical Fodder Grasses :** Important fodder grasses are **:***Acrachne racemosa, Aristida spp., Bothriochloa pertusa, Brachiaria ramosa, B. reptans, Cenchrus bijlorus, C. cillaris, Chloris virgata, Cynodon dactylon, Dactyloctenium aegyptlcum, D. sindicum, Desmostachya bipinnata, Dichcmthuim annulatum, Digitaria pennata, Echinochloa colonum, Enteropogon dolichostachyus, Hackelochloa granulans, Heteropogon contortus, Panicum maximum, Perotis frdica, Sacchamm spontaneum, Setaria glauca, S. veracillatd*, etc. are abundant and also made into they to be used during the dry period of the year.

**(iii) Phytochemical Fuel:** Although every dried twig is used as fuel, yet the Phytochemical plants used specifically for the purpose are *Acacia nilotica, A. leucophloea, A. Jamesiana, A. jacquemontti, A. Senegal, A. tortalis, Adhatoda zeylanica, Ailanthus excelsa, Azadirachta indica, Albizia lebbeck, Balanites aegyptiaca, Bauhinia racemosa, Boswellia serrata, Calligonum polygonoides, Calotropis procera, Capparis decidua, Clerodendrum phlomoides, commiphora wightii, Crotalaria juncea, Cryptostegia grandijlora, Cyamopsis tetragonoloba, Datbergia sissoo, Euphorbia neriifolia, Flacourtia indica, Grewia damine, G. Jlavescens, G. tenax, G. villosa, Helicteres isora, Hibiscus ovalifolius, Leptadenia pyrotechnica, Lycium barbarum, Maytenus emarginata, Morvnga oleifera, Pennisetum, americanum, P.cineraria, Rhus mysorensis, Ricinus communis, Sacchamm bengalense, Salvadora olioedies, Tecomella undulata, Ziziphus persica, Sesamum onentiale, Tecameua mauritiana, Z. nummularia and Z. rugosa*,

The gradual cutting of *Anogeissus pendula, Calligonum polygonoides, Capparis decidua,Adhatoda zeylanica, Clerodendrum phlomoides, Lycium barbarum, Maytenus emarginata, Rhus jnysorensis, Euphorbia neriifolia* is resulting into a decreased frequency of these species in the area.

**(iv) Timber:**

The wood of *Acacia nilotica, Ailanthus excelsa, Azadirachta indica, Balanites aegyptiaca, Dalbergia sissoo, Prosopis cineraria, Tamarindus indica, Tecomella undulata* is considered to be durable and used for manufacturing furnitures. The stem of *Acacia leucophloea, A. Senegal, Anogeissus pendula, Calotropis procera* (main trunk of an old one), *Capparis decidua, Eucalyptus spp., Lycium barbarum, Maytenus emarginata* are very useful for making toys, house-hold and agricultural implements.

**(6). Phytochemical plant carrying Medicinal importance:**

**(i) Phytochemical plants As Tonics:**

The leaf infusion of *Ailanthus excels* is used as a tonic during pregnancy; seeds of *Zaleya redimita* cause abortion; mucilaginous water extract of *Pedalium murex,Trpbullus terretris* and tender roots of *Salmalia malabarica* are used for treating impotency. The excessive smoking of the powdered leaves of *Triumfettaa rhomboidea* causes to make a man impotent(a good medicine for birth control) *Tinospora cordifolia* (stem decoction) *Corchorus depressus, C. olitorius* (root decoction). *Ocimum americanum* (leaves and seeds), *O. sanctum* (leaves and seeds), *Salvia aegypllaca* (leaves and seeds), *Mimosa hamata* (leaves and seeds'), are takenwith boiled buffalo milk as the brain tonic. *Acatypha indtca, Conuobulus microphyllus* and *Euoluulus alsinoides* (Phytochemical plant extract), *Cassia fistula* (pod duIp in water) and *Zziphus nummularia* (powdered root bark) are used as the general tonic or Brain tonic.

**(ii) Phytochemical plants For curing cuts/wounds/ulcers :**

*Acacia nilotica* (bark), *Butea monosperma* (stem-bark), *Derris indica* (seed oil), *Sida ouata* and *Ziziphus nummularia* (leaf-paste), are applied on cuts or wounds to check the bleeding and is believed to bring quick healing. *Ayeratum conyzoides* (dried powder), *Argemone mexicana* (seed), *Cleome gynandra, Cocculus pendulus, Portulaca oleracca* (leaf-extract), *Balanites aeyyphaea* (fruit pulp), *Tamarix sp.* (root and stem bark), and *Plumbago zeylanica* (root-powder) are applied to cure burns, ulcers and many eruptions. The boiled phylloclades of *Opuntia dillenii* (after removing the thorns) are tied over wounds for a speady recovery. An ointment of leaf-juice of Datura spp. Along with turmeric is applied to heal the wounds. The latex of *Calotropis procera* or *Lptadenia pyrotechnica* is applied to help in removing of barbs, thorns etc. from the parts of body. The warmed leaves of former are smeared with 'ghee' and are applied over pimples; its stripped bark is tied over cuts, for healing them; the juice of *Tridax procumbens* serves as an antiseptic on wounds or cuts The wounds or cuts are washed with the water boiled with leaves of *Azadirachta indica*. The leaf paste (ash of the leaves, mixed in 'Deshi ghee' of *Abrus precatorius, Cayratia trijolia* and *Maytenus emarginata* are applied as a disinfectant on the sores on the neck of the cattle or are used for quick healing of the wounds.

**(iii) Phytochemical plants in Skin diseases:***Cassia occidental, C. torn* (leaf extract and seed powder), *Mallotus phillippensis* (fruit) and *Prosopis cineraria* (juice from twigs) are used against ring worm diseases. *Acacia nilotica, Azadirachta indica, Ziziphus spp.* (crushed leaves), *Boswellia seratta* (bark gum. and resin), *Euphorbia neriifolia, Ficus benghnlensis* (latex), *Lycium barbarian* (crushed leaves with 'Deshi ghee') and *Pergularia daemia* (Phytochemical plant-paste) are useful for curing the abscesses.

**(iv) Phytochemical plants as cure for Swellings/body pains/rheumatism:** The leaves of *Calotropis procera, Ricinus communis* and *Vigna unguiculata* are applied on local wellings after warming them for fermentation. *Argemone mexicana* (yellow sap and seed oil) is useful to cure cutaneous diseases and swellings in the joints and muscles, *Flacourtia indica, Boswellia serrata* (bark and leaf decoction) and *Calotropis procera* (root-bark) provide relief from body pains. *Acacia leucophloea, Tanvarindus indica, Withania somnifera* (dried pounded leaves), *Cyamopsis tetragonoloba* (boiled seeds) are applied on the local swellings, *Bacopa monnieri* (fruit seeds), *Citrullus colocynthis* (root extract).

**(v) Phytochemical plants as remedies in Diarrhoea :**

*Allium cepa* (bulb) and *Desmostachya bipinnata* are proved antidiarrhotic and antidysentric medicines. The seeds of *Cucumis melo,* fruits of *foeniculum vulgare* to prepare cold drinks and are useful in dysentery.

**(vi) Phytochemical plants for Curing Abdominal pains and constipation :** *Aegle mormelos* (fruit pulp), *Helicteres isora* (powdered fruits), *Pergularia daemia,Mallotus phillippensis* (tender parts) and *trachyspermum ammi* (fruits) are used in gastro-intestinal disorders. *Amaranthus spinosus* (root decoction), *Citrullus colocynthis* (fruits with common salt), *Cocculus hirsutus* (stem powdere), *Sphaeranthus indicus* (Phytochemical plant extract), *Trigonella foenum-graecum* (seeds) and *Wrightia tinctoria* (root and stem extract) are useful in the stomachache. The fruit powder of *Emblica officinalis* is taken with milk to cure constipation.

**(vii) Phytochemical plants in toothache, asthma, cold and cough:**

*Alhagi pseudoalhagi* (leaves), *Cyamopsis tetragonobba* (dried stems), *Datura spp.*(dried leaves), *Tephrosia struma* (dried roots) and *Wrightia tinctoria* (dried leaves) are smoked for giving a relief in toothache and asthma. The roots of *Tephrosia strigosa* and tender shoots of *Capparis decidua* are also reported to relieve the toothache. The leaves of *Adhatoda zeylanica, barleria prionitis* and *Lindenberaia indica, Ocimum sanctum* and berries of *Solanum swattense* ('Bhoorangni') are chewed for curing cough and toothache.The decoction of *Ephedra foliate* is used to cure asthma.

The root of *Mollugo centana* and *Sotanum nigrum,* root decocaon of *Sdanum surratense, Withania somnifera* (also for asthma), seeds of *Cleome gynondra* and wood of *Grewia tenax* are boiled in water and taken to bring down the body temperature to normal. The leaf extract of *Achyranthes aspera* is used to treat cough, and pods of *Tomarindus indica* are useful against fever which is caused onaccount of sun-stroke ('Loo').

**(viii) Phytochemical plants in Urinary troubles :** The jaundica and urinary troubles are cured by the application of the root extract of *Citrulius colocynthis. Oxystelma secamone;* decoction of *Desmostochya bipinnata, Glinus lotoides* and *Oldenlandia corymbose;* leaf-juice of *Chenopodium album* and, flower and seeds of *Celosia argentea* and *Digera muricata.*

**(ix) Phytochemical plants in Diabets:** The decoction of the fruits of *Momordica charantia* cures the sugar disease.

**(x) Phytochemical plants In Headache:** The leaf-paste of *Anisomelos indicais* applied on the forehead in acute headache.

**(xi) Phytochemical plants As Eye-lotions:***Boerhavia procumbens* (leaf and root extract), *Biitea monosperma* (flower juice) and *Cocculus hirsutus* (stem powder) are used as the eye lotion.

**(xii) Phytochemical plants Ear ailments:** The seed-oil of *Brassica campestris* and *Denis indica* and leaf-extract of *Cardiospermum halicacabum* and *Cleome viscosa* are useful to cure ear ailments.

**(xiii) Phytochemical plants For curing pin-worms:** The leaves of *Clerodendrum phlomoides* and *Lawsonia inermis* are used in a paste-form for curing pin-worm in children.

**(7). Phytochemical plants as sources of raw material for industry:**

**(i) Phytochemical plants as Fibres:** The fibre yielding species: *Calotropis procera* (stem-bark and fruit), *Leptadenia pyrotechnica, Crotalaria burhia, C. juncea, Corchoms olitorius, Abutilon indicum, Cyamopsis tetragonoloba* (stem-bark), *Saccharum bengalense* (leaf-sheath), *Desmostachya bipinnata* (whole Phytochemical plant). *Salmalia malabarica* (seeds), are variously used in small industries viz., cordage and paper industries. Some of them are used in the pillows and for making ropes, etc. The prop roots of *Ficus benghalensis* are twisted into the ropes, used for tying the bundles of fire-wood. *Hibiscus cannabinus* is in cultivation, particularly in Shekhawati region.

**(ii) Phytochemical plants as gums and resins:** The common gum-yielding tree species in the area are *: Acacia nilotica, A. iacauemontii, A. Senegal, Azadirachta indica. Butea monosperma Boswellia serrata, Lannaa coromandelica, Prosopis cineraria Moringa oleifera* and others viz. *Cyamopsis tetragonoloba* which is grown on commercial scale for the sources of gum.

**(iii) Phytochemical plants as Tannin:** Besides the leaves of *Anogeissus pendula* and *Indigofera tinctoria*, the outer bark of trees like *Acacia nilotica, A. leucophloea, Albizia lebbeck, Bauhinia racemosa, Cassia fistula, Lannea cowmandelica, Tamarix dioica, Mallotus phillppensis, Tamarindus indica, Acacia jacquemontii* and shrubs viz., *Cassia auriculata, Rhus mysorensis* and *Ziziphus nummularia* are commonly used for tanning. The stem and root bark of *Acacia nilotica* s. sp. indica, root of *Ziziphus nummularia* and fruits of *Cordia dichotoma* are commonly used to ferment in the local preparation of wine (country liquor).

**(iv) Phytochemical plants as Detergents:** The fruits of *Acacia nilotica, Emblica officinalis, Balanites aegyptica* (Hingota) and *Azadirachta indica* are used for washing clothes and for washing hairs by the women-folk.

**(v) Phytochemical plants as Non-edible oil:** The seeds of *Azadirachta indica, Derris indica* and *Ricinus communis* are used for oil extraction. Seeds of *Argemone mexicana* are adulterated with mustard while extracting oil.

**Miscellaneous uses of Phytochemical plants.**

Phytochemical plants in religious and social spritуals; beliefs and practices:

**(a) Phytochemical plants as During Birth :**

At the time of child birth, the leaves of *Azadirachta indica* (Neem) are hung laciniately at the gate of the abode. A bath is given to the mother with water in which the leaves of this tree have been boiled. A month after child birth the mother offers a 'Ladoo' (an edible local preparation for mother from the gum or Ajwain, deshi ghee and wheat flour) below a *Prosopis cineraria* tree. The local people keep the new born child on a winnowing fan (Soop or Chhajala) made of *Dendrocalamus strictus* (Bamboos) and *Saccharum bengalense* (Moonj) with a belief that child will be blessed with a long and prosperous life.

Just after child birth some grains of *Sorghum bicolor* or *Pennisetum americanum* or *Hordeum vulgare* are kept on a clay disc and placed below a shrub of *Ziziphus nummularia.* This is done to appease evil spirits believed to be harboured on the shrub and the new born would be left alone subsequently. The pods of *Cassia fistula* are kept under the pillow of children with a belief that it will help in preventing the child from getting frightened.

**(b) Phytochemical plants as weather indicators :**

The occurrence of abnormally profuse flowering in *Prosopis cineraria* and *Ziziphus nummularia* indicates a poor harvest in near future. The abundant growth of *Tribulus terrestris* (Bhakhri) and *Argemone mexicana* indicates a rich harvest of *Cicer arietinum* (Gram) and kharif crop respectively, A good fruit setting in *Capparis decidua* also is a sign of good crop and sufficient rains in the forthcoming season.

**(c) Phytochemical plants as Troublesome weeds and poisonous :**

*Acanthospermum hispidum, Argemone mexicana, Artemisia scoparia, Bidens biternata, Croton bonplandianum, Digera muricata, Lantana camara, Sorghum halepense, Verhesina encelioides, Xanthium indicum,* etc., are very troublesome weeds in the cultivated fields or in forests in the area surveyed.

*Tinospora cordifolia* (seeds), *Cleome gynandra, C. viscosa* (seeds and leaves) and *Cardiospermum halicacabum* (leaves) are irritant when these are rubbed on the skin. *Aristolochia bracteolata, Avena sp., Corchorus olitorius, Cryptostegia grandiflora, Eleusine indica* and *Sorghum halepense* are considered to be poisonous during dry season of the year to the livestock. The excessive ingestion of Barley grains, *Portulaca oleracea,* etc. cause pathological effects in the cattle.

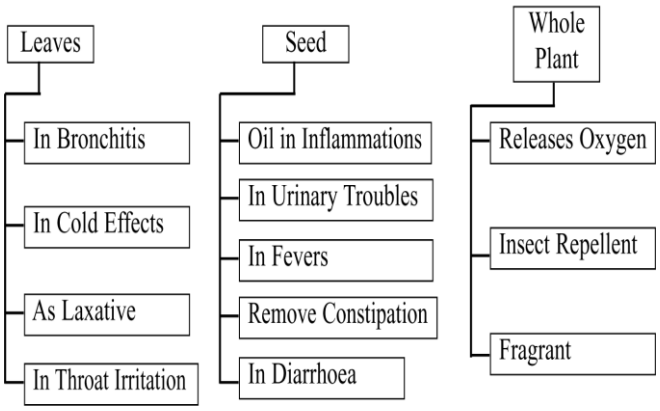
## XXVIII.FAMILY-WISE PHYTO-CHEMICAL PLANTS

The period of rig veda is estimated to be between 3500 and 1800 B.C. after the vedas, there is a wide temporal gape of information on the development of this science in India for a period of about one thousand years. The identity of several plants referred in the suktas of the rig veda can be fixed with reasonable certaintity, e.g. of Butea momosperma, Ficus religiosa etc. But references to such kind of Phyto-chemical plants in the rig veda are very brief. Further in this aspect a more detailed account is available in the atharva veda. Then after, the two most important works on Indian system of medicine, the works of charak and susruta, namely, the charak-samhita and susruta-samhita. The latter deals with about 700 drugs, some of these are not indigenous to India. With the passage of time, more and more plants found their entry into native medicine, taking the number of Indian Phyto-chemical herbs more or less about 1500.

References about miracle herbs or wonder drugs are often found in old literature. voucher specimens of those plants could, of course, not be expected to be preserved by the people of those times; even proper descriptions of plants are wanting. Lack of detailed descriptions has made it practically impossible to decide the identity of those plants. The only

source of reference in such cases, therefore, is the local name for the herb or drug became base in earlier works. The local names are sometimes very misleading. Cases of some local name being used for more than one herb are not infrequent. For example, two or even more than two very different plants are referred to in our literature by the names Punarnava, Brahmi, Bala, Dudhi, etc. Some workers in India are now trying to fix the identity of important drugs mentioned in ancient literature; this may eliminate prevailing much confusion in this aspect.

*Chart : Applied Aspects of Ocimum americanum*




There are numerous such uses of plants some which are mentioned in the forth coming paragraph and have traditional, importance by the tribal as well as native people in order to provide a detailed account of multipurpose uses of some Phyto-chemical plants. Ocimum americanum is also popularly known as ban tulsi, it grows mostly in cold, dry climatic conditions. It is widely used both by tribal and urban people. This species is very strong smelling plant and its essential oil is employed in flavouring cosmetics and edible sauces, soups etc. It leaves are good in flatulence and colic pains as well and seeds are used in kidney pain. The role of Bantulsi as a house hold remedy in Indian families is very common, it's uses are as shown in the following chart.

## XXIX. PHYTOGEOGRAPHICAL ANALYSIS OF MEDICINAL PLANTS

Biogeography is the scientific study of the earth's global patterns of Medicinal Plants and animals. The variety of organisms on the earth is enormous. Current best estimates suggest that the earth may have anywhere from 10 million to over 40 million species of organisms, but the number is not known and only about 1.7 million have actually been described, including over 750,000 insects, about 250,000 flowering plants and 47000 vertebrate animals (Myers 1976, 1979, Wilson 1985). Of the known species about 20,000 plants and slightly over 1,000 animals, including over 270 freshwater vertebrate taxa, are recognised as at risk of extinction (Barney 1980, Wilson 1985).

The diversity of vegetation and wild life is found in abundance in any natural region. In view of biodiversity is prosperous. The world's 40 percent Medicinal Plant diversities are found in India. in India 45000 vegetations are identified yet. The Medicinal Plants is economically very useful. The Medicinal Plant diversity plays an important role in formation and consistency of nature.

Some Medicinal Plants in the Rig Veda appears to be the earliest records of use of Medicinal Plants in several aspects. The identity of several Medicinal Plants referred in the Suktas of the Rig Veda can be fixed with reasonable certaintity, e.g. of Neem, Kheri, Ker, Ber etc. But references to such kind of Medicinal Plants in the Rig Veda are very brief. Further in this aspect a more detailed account is available in the Atharva Veda. The period of Rig Veda is estimated to be between 3500 and 1800 B.C. After the Vedas, there is a wide temporal gape of information on the development of this Medicinal Plant science in India for a period of about one thousand years.

References about miracle Medicinal Plants are often found in old literature. Voucher specimens of those Medicinal Plants could, of course, not be expected to be preserved by the people of those times; even proper descriptions of Medicinal Plants are wanting. Lack of detailed descriptions has made it practically impossible to decide the identity of those Medicinal Plants. The only source of reference in such cases, therefore, is the local name for the Medicinal Plants became base in earlier works. The local names are sometimes very misleading. Cases of some local name being used for more than one Medicinal Plant are not infrequent. For example, two or even more than two very different Medicinal Plants are referred to in our literature by the names Punarnava, Brahmi, Bala, Dudhi, etc. Some workers in India are now trying to fix the identity of important Medicinal Plants mentioned in ancient literature; this may eliminate prevailing much confusion in this regard.

It has been estimated that out of about 2000 drugs that have been used in curing human diseases ailments in India, among them only about 200 are of animal origin and a similar number are of mineral origin (Jain, 2001). The rest, i.e. about 1500, are of plant origin. This number is not very large by considering the vast area of our country, and for the reason that the wide variety of Medicinal Plant wealth occurring therein. The great range of temperature about 49$^{o}$C, rainfall from 100 mm to over 10000 mm and altitude sea-level to over 6000 m in India may account for the occurrence of over 15000 species of higher Medicinal Plants in our country territory.

However, a study of distribution of the whole vegetation of this region is essential for a complete understanding of the relation between Medicinal Plant distribution and external conditions.

The author has also analysed the number of Medicinal Plants of Rajasthan on the basis of several books and available literatures that in conclusion presently - Rajasthan consists 1843 Medicinal Plants in total.

## XXX. MEDICINAL PLANT SPECIES OF SHEKHAWATI REGION

The author has attempt his best efforts to trace out the names of Medicinal Plant species which are found in Shekhawati Region , Rajasthan. Table : 1.14**.** illustrates the distribution of Medicinal Plant species (Family-wise) of Shekhawati Region in Rajasthan. For this purpose the author has gone through the literature available in several books and published research papers - among them Prof. M.M. Bhandari's (1990) book "The Flora of Indian Desert", Dr. Shiv Sharma's Ph.D. Dissertation work (1978), Dr. A.K.Charan's book 'Plant Geography' (1992) and Dr. M. K. Sharma's book 'Medical Plant Geography' (2007) are important in this aspect.

The author has traced out 148 Medicinal Plant species which are well illustrated with their Medicinal Plant family-wise distribution in table : 1.14. It is very interesting to mention here that the total number of Medicinal Plant species are not same by their number in different Medicinal Plant families which are 48 in total.

**Table : 1.14. Family-wise Medicinal Plants of Shekhawati Region**

| Sl. No. | Medicinal Plant Species | Medicinal Plant Family |
|---|---|---|
| 1. | Andrographis echioides | Acanthaceae |
| 2. | Barleria acanthoides | Acanthaceae |
| 3. | Barleria prinoitis | Acanthaceae |
| 4. | Blepharis sindica | Acanthaceae |
| 5. | Justicia vahlii | Acanthaceae |
| 6. | Peristrophe bicalyculata | Acanthaceae |
| 7. | Trianthema govindia | Aizoaceae |
| 8. | Achyranthes aspera | Amaranthaceae |
| 9. | Aerva persica | Amaranthaceae |
| 10. | Aerva pseudotomentosa | Amaranthaceae |
| 11. | Alternanthera sessilis | Amaranthaceae |
| 12. | Amaranthus blitum | Amaranthaceae |
| 13. | Celosia argentea | Amaranthaceae |
| 14. | Digera muricata | Amaranthaceae |
| 15. | Digitaria adscendens | Amaranthaceae |
| 16. | Digitaria ciliris | Amaranthaceae |
| 17. | Pupalia lapacea | Amaranthaceae |
| 18. | Leptadaenia pyrotechnica | Asclepiadace |
| 19. | Leptadaenia spartium | Asclepiadace |
| 20. | Calotropis procera | Asclepiadaceae |
| 21. | Sarcostemma acidum | Asclepiadaceae |
| 22. | Blumea obliqua | Asteraceae |
| 23. | Blumea odorata | Asteraceae |
| 24. | Dicoma tomentosa | Asteraceae |
| 25. | Eclipta prostrata | Asteraceae |
| 26. | Flaveria trinervia | Asteraceae |
| 27. | Glossnema varians | Asteraceae |
| 28. | Launaea nudicaults | Asteraceae |
| 29. | Launaea resedifolia | Asteraceae |
| 30. | Oligochaeta remosa | Asteraceae |
| 31. | Pegolettia senegalensis | Asteraceae |
| 32. | Verbesina enecaliodes | Asteraceae |
| 33. | Balanites aegyptica | Balanitaceae |
| 34. | Balanites roxburghii | Balanitaceae |
| 35. | Tecomella undulata | Bignoniaceae |
| 36. | Heliotropium bacciferum | Boraginaceae |
| 37. | Cassia pumila | Caesalpinioideae |
| 38. | Cassia occidentalis | Caesalpinioideae |
| 39. | Capparis aphylla | Capparaceae |
| 40. | Capparis decidua | Capparaceae |
| 41. | Arehna tomentosa | Caryophyuaceae |
| 42. | Polycarpaea corymbosa | Caryophyuaceae |
| 43. | Maytenus emerginata | Celastraceae |
| 44. | Chenopolium album | Chenopodiaceae |
| 45. | Commelina benghalensis | Commelinaceae |
| 46. | Convolvulus arvensis | Convolvulaceae |
| 47. | Convolvulus microphyllus | Convolvulaceae |
| 48. | Cressa cretica | Convolvulaceae |
| 49. | Seddera cordifolia | Convolvulaceae |
| 50. | Coccinia indica | Cucurbitaceae |
| 51. | Cyperus rotundus | Cyperaceae |
| 52. | Cyperus triceps | Cyperaceae |
| 53. | Bergia odorata | Elatinaceae |
| 54. | Bergia ammanoides | Elatinaceae |
| 55. | Euphorbia caducifolia | Euphorbiaceae |
| 56. | Euphorbia roylena | Euphorbiaceae |
| 57. | Phyllanthus amarus | Euphorbiaceae |
| 58. | Alysicarpus heterophyllus | Fabaceae |
| 59. | Alysicarpus monilifer | Fabaceae |
| 60. | Alysicarpus monilifera | Fabaceae |
| 61. | Alysicarpus tricolor | Fabaceae |
| 62. | Alysicarpus vaginalis | Fabaceae |
| 63. | Crotalaria medicaginea | Fabaceae |
| 64. | Crotolaria burhia | Fabaceae |
| 65. | Dalbergia sissoo | Fabaceae |
| 66. | Indigofera astragalina | Fabaceae |
| 67. | Indigofera oblongifolia | Fabaceae |
| 68. | Indigofera sessiliflora | Fabaceae |
| 69. | Psoralea odorata | Fabaceae |
| 70. | Psoralea plictata | Fabaceae |
| 71. | Tephrosia villosa | Fabaceae |
| 72. | Hydrilla verticillata | Hydrocharitaceae |
| 73. | Acrua tomentosa | Lamiaceae |
| 74. | Lemium indicum | Lemnaceae |
| 75. | Ammania baccifera | Lythraceae |
| 76. | Ammania desitorum | Lythraceae |
| 77. | Azadirechta indica | Meliaceae |
| 78. | Acacia nilotica | Mimosoideae |
| 79. | Acacia senegal | Mimosoideae |
| 80. | Acacia tortilis | Mimosoideae |
| 81. | Prosopis cineraria | Mimosoideae |
| 82. | Prosopis juliflora | Mimosoideae |
| 83. | Prosopis spicigera | Mimosoideae |
| 84. | Glinus lotoides | Molluginaceae |
| 85. | Mollugo cerviana | Molluginaceae |
| 86. | Mollugo nudicaulis | Molluginaceae |
| 87. | Najas graminea | Najadaceae |
| 88. | Oldenlandia aspera | Onagraceae |
| 89. | Cistanche tubulosa | Orobanchaceae |
| 90. | Cryptostegia grandiflora | Periplocaceae |
| 91. | Argemone mexicana | Papaveraceae |
| 92. | Andropogon pertusus | Poaceae |
| 93. | Aristida adscensionis | Poaceae |
| 94. | Aristida funiculata | Poaceae |
| 95. | Aristida histvicula | Poaceae |
| 96. | Aristida mutica | Poaceae |
| 97. | Cenchrus biflorus | Poaceae |
| 98. | Cenchrus catharticus | Poaceae |
| 99. | Cenchrus setigerus | Poaceae |
| 100. | Chloris barbata | Poaceae |
| 101. | Cymbopogon jwarncusa | Poaceae |
| 102. | Cyndon dactylon | Poaceae |
| 103. | Dactyloctenium aegyptium | Poaceae |

| Sl. No. | Medicinal Plant Species | Medicinal Plant Family |
|---|---|---|
| 104. | Dactyloctenium sindicum | Poaceae |
| 105. | Desmostachya bipinnata | Poaceae |
| 106. | Dichathium annulatum | Poaceae |
| 107. | Eleusine compressa | Poaceae |
| 108. | Eleusine flagelifera | Poaceae |
| 109. | Elionurus japonica | Poaceae |
| 110. | Elyonurus royleanus | Poaceae |
| 111. | Eragrostis ciliaris | Poaceae |
| 112. | Heteropogon contortus | Poaceae |
| 113. | Lasiurus sindicus | Poaceae |
| 114. | Latipes senegalensis | Poaceae |
| 115. | Panicum turgidum | Poaceae |
| 116. | Perotis indica | Poaceae |
| 117. | Saccharum bengalense | Poaceae |
| 118. | Saccharum griffithii | Poaceae |
| 119. | Saccharum munja | Poaceae |
| 120. | Sehima nervosum | Poaceae |
| 121. | Sporobolus marginatus | Poaceae |
| 122. | Tragus biflorus | Poaceae |
| 123. | Polygala chinensis | Polygalaceae |
| 124. | Calligonum polygonoides | Polygonaceae |
| 125. | Polygonun plepeium | Polygonaceae |
| 126. | Portulaca oleracea | Portulacaceae |
| 127. | Portulaca quadrifida | Portulacaceae |
| 128. | Ziziphus mauritina | Rhamnaceae |
| 129. | Zizyphus nummularia | Rhamnaceae |
| 130. | Potentila supina | Rosaceae |
| 131. | Borreria hispida | Rubiaceae |
| 132. | Borreria stricta | Rubiaceae |
| 133. | Salvador persica | Salvadoraceae |
| 134. | Salvadora oleoides | Salvadoraceae |
| 135. | Anticharis linearis | Scrophulariaceae |
| 136. | Lindenbergia indicum | Scrophulariaceae |
| 137. | Lycium barbatum | Solanaceae |
| 138. | Lycium europoeum | Solanaceae |
| 139. | Solanum albicuale | Solanaceae |
| 140. | Solanum incanum | Solanaceae |
| 141. | Solanum surattense | Solanaceae |
| 142. | Solanum surrettense | Solanaceae |
| 143. | Grewia tenex | Tiliaceae |
| 144. | Vahelia viscosa | Vahliaceae |
| 145. | Clerodendrun phlomidis | Verbenaceae |
| 146. | Viola cinerea | Violaceae |
| 147. | Tribulus alatus | Zygophyllaceae |
| 148. | Zygophyllum simplex | Zygophyllaceae |

Source : Based on authentic literatures and field surveys

## XXXI. MEDICINAL PLANT FAMILIES OF SHEKHAWATI REGION

The author has attempt his best efforts to trace out the names of Medicinal Plant families which are found in Shekhawati Region, Rajasthan. Table : 1.15**.** illustrates the distribution of Medicinal Plant families (number of Medicinal Plant species-wise) of Shekhawati Region in Rajasthan.

The author has traced out 48 Medicinal Plant families which are well illustrated with their number of Medicinal Plant species-wise distribution in table : 1.15. It is very interesting to mention here that the total number of Medicinal Plant species are not same by their number in different Medicinal Plant families which are 48 in total. As per table : 1.15. the first Medicinal Plant family is Asteraceae which include total 6 Medicinal Plant species whereas the last Medicinal Plant family is Zygophyllaceae which include only single Medicinal Plant species. There are 22 Medicinal Plant families which include only one or single Medicinal Plant species for example Aizoaceae, Boraginaceae, Meliaceae, and Violaceae etc., etc. The maximum number of Medicinal Plants i.e. 31 is covered by Poaceae Medicinal Plant family.

**Table : 1.15. Family-wise Contribution of Medicinal Plants in Shekhawati Region**

| Sl. No. | Medicinal Plant Family | No. of Medicinal Plant Species | Contribution (in %) |
|---|---|---|---|
| 1. | Acanthaceae | 6 | 4.05 |
| 2. | Aizoaceae | 1 | 0.68 |
| 3. | Amaranthaceae | 10 | 6.76 |
| 4. | Asclepiadace | 2 | 1.35 |
| 5. | Asclepiadaceae | 2 | 1.35 |
| 6. | Asteraceae | 11 | 7.43 |
| 7. | Balanitaceae | 2 | 1.35 |
| 8. | Bignoniaceae | 1 | 0.68 |
| 9. | Boraginaceae | 1 | 0.68 |
| 10 | Caesalpinioideae | 2 | 1.35 |
| 11 | Capparaceae | 2 | 1.35 |
| 12 | Caryophyuaceae | 2 | 1.35 |
| 13 | Celastraceae | 1 | 0.68 |
| 14 | Chenopodiaceae | 1 | 0.68 |
| 15 | Commelinaceae | 1 | 0.68 |
| 16 | Convolvulaceae | 4 | 2.7 |
| 17 | Cucurbitaceae | 1 | 0.68 |
| 18 | Cyperaceae | 2 | 1.35 |
| 19 | Elatinaceae | 2 | 1.35 |
| 20 | Euphorbiaceae | 3 | 2.03 |
| 21 | Fabaceae | 14 | 9.46 |
| 22 | Hydrocharitaceae | 1 | 0.68 |
| 23 | Lamiaceae | 1 | 0.68 |
| 24 | Lemnaceae | 1 | 0.68 |
| 25 | Lythraceae | 2 | 1.35 |
| 26 | Meliaceae | 1 | 0.68 |
| 27 | Mimosoideae | 6 | 4.05 |
| 28 | Molluginaceae | 3 | 4.05 |
| 29 | Najadaceae | 1 | 0.68 |
| 30 | Onagraceae | 1 | 0.68 |
| 31 | Orobanchaceae | 1 | 0.68 |
| 32 | Papaveraceae | 1 | 0.68 |
| 33 | Periplocaceae | 1 | 0.68 |
| 34 | Poaceae | 31 | 20.95 |
| 35 | Polygalaceae | 1 | 0.68 |
| 36 | Polygonaceae | 2 | 1.35 |
| 37 | Portulacaceae | 2 | 1.35 |
| 38 | Rhamnaceae | 2 | 1.35 |
| 39 | Rosaceae | 1 | 0.68 |
| 40 | Rubiaceae | 2 | 1.35 |
| 41 | Salvadoraceae | 2 | 1.35 |
| 42 | Scrophulariaceae | 2 | 1.35 |

| Sl. No. | Medicinal Plant Family | No. of Medicinal Plant Species | Contribution (in %) |
|---|---|---|---|
| 43 | Solanaceae | 6 | 4.05 |
| 44 | Tiliaceae | 1 | 0.68 |
| 45 | Vahliaceae | 1 | 0.68 |
| 46 | Verbenaceae | 1 | 0.68 |
| 47 | Violaceae | 1 | 0.68 |
| 48 | Zygophyllaceae | 2 | 1.35 |
| | **Total** | **148** | **100** |

Source : Based on table : 1.14

## XXXII. FAMILY-WISE CONTRIBUTION OF NUMBER OF MEDICINAL PLANT SPECIES OF SHEKHAWATI REGION

Table : 1.16. illustrates the distribution of 'family-wise contribution' of number of Medicinal Plant species of Shekhawati Region. It illustrates the details of all 48 Medicinal Plant families, with their contribution of each Medicinal Plant family separately from 'contribution of Medicinal Plant family in percentage' with regarding total number of Medicinal Plant families i.e. 48 for the area under study.

**Table : 1.16 Family-wise Contribution' of Number of Medicinal Plant Species of Shekhawati Region**

| Contributory Groups of Medicinal Plant Species (In %) | Number of Medicinal Plant Families | Percentage |
|---|---|---|
| A -(upto 1%) | 22 | 46 |
| B -( 1% to 2%) | 16 | 33.3 |
| C -( 2% to 3%) | 2 | 4.1 |
| D -( 3% to 4%) | 0 | 0.0 |
| E -( 4% to 5%) | 4 | 8.3 |
| F -( above 5%) | 4 | 8.3 |
| Total in Percentage | 48 | 100 |

Source : Based on table : 1.15

Further in this context, the author has simplified this aspect by making six (A to F) 'contributory groups of Medicinal Plant families' as shown in table: 1.16. which is naturally based on table: 1.15. The table: 1.16. illustrate the six 'contributory groups of Medicinal Plant families' with their respective percentage of contribution in total number of Shekhawati Region's Medicinal Plant families i.e. 48. Contributory group A - (up to 1.0%) covers the maximum percentage of contribution i.e. about 46% by including maximum number of Medicinal Plant families which are 22 out of total 48 Medicinal Plant families of Shekhawati Region, Rajasthan. Whereas, contributory group-C (2% to 3%) contributes minimum percentage i.e. 4.1% by covering two Medicinal Plant family and contributory group-D (3% to 4%) has no contribution i. e. 0%, respectively.

## XXXIII. MEDICINAL PLANT SPECIES AND MEDICINAL PLANT FAMILIES OF RAJASTHAN - A BRIEF VIEW

The Indian sub continent as a whole more or less covers about 15000 Medicinal Plant species which are turmed as "multipurpose Medicinal Plant species"( Jain in 2001) but for Rajasthan territory the author traced out and has listed out total 1843 Medicinal Plant species which may be turmed as "multipurpose Medicinal Plant species" on the basis of available books as well as literature in this aspect in which following are important: Vol. Ist and IInd Economic Medicinal Plants of India written by Nayar, Ramamurthy and Agrawal published by Botanical Survey of India (BSI), Calcutta in (1994). According the above mentioned literature,

The author has also analysed the number of Medicinal Plants of Rajasthan on the basis of several books and available literatures that in conclusion presently - Rajasthan consists 1843 Medicinal Plants in total which may be considered as 'multipurpose Medicinal Plant species' the author has traced out total 1843 which are available Rajasthan territorial area.

## XXXIV. MEDICINAL PLANT SPECIES OF RAJASTHAN

The author has attempt his best efforts to trace out the names of Medicinal Plant species which are found in Rajasthan. Table : 1.17. illustrates the distribution of Medicinal Plant species (Family-wise) of Rajasthan. The author has traced out 1843 Medicinal Plant species which are well illustrated with their Medicinal Plant family-wise distribution in table : 1.17. It is very interesting to mention here that the total number of Medicinal Plant species are not same by their number in different Medicinal Plant families which are 137 in total.

**Table : 1.17. Family-wise Medicinal Plants of Rajasthan**

| Sl. No | Medicinal Plant Species | Medicinal Plant Family |
|---|---|---|
| 1. | Adhatoda beddomei | Acanthaceae |
| 2. | Adhatoda vasica | Acanthaceae |
| 3. | Adhatoda zeylanica | Acanthaceae |
| 4. | Andrographis echioides | Acanthaceae |
| 5. | Andrographis paniculata | Acanthaceae |
| 6. | Asystacia gangetica | Acanthaceae |
| 7. | Barleria acanthoides | Acanthaceae |
| 8. | Barleria cristata | Acanthaceae |
| 9. | Barleria cuspidata | Acanthaceae |
| 10. | Barleria hochstetteri | Acanthaceae |
| 11. | Barleria pratensis | Acanthaceae |
| 12. | Barleria prinoitis | Acanthaceae |
| 13. | Blepharis lineartaefolia | Acanthaceae |
| 14. | Blepharis maderaspatensis | Acanthaceae |
| 15. | Blepharis repens | Acanthaceae |
| 16. | Blepharis sindica | Acanthaceae |
| 17. | Carvia callosa | Acanthaceae |
| 18. | Crossandra infundibultformis | Acanthaceae |
| 19. | Dicliptera abuensis | Acanthaceae |
| 20. | Dicliptera buplewioides | Acanthaceae |
| 21. | Dicliptera Leonotis | Acanthaceae |

| | | |
|---|---|---|
| 22. | Dicliptera roxburghiana | Acanthaceae |
| 23. | Dicliptera verticillata | Acanthaceae |
| 24. | Diptercanthus patulus | Acanthaceae |
| 25. | Diptercanthus prostratus | Acanthaceae |
| 26. | Dyschoriste depressa | Acanthaceae |
| 27. | Ecbolium viride | Acanthaceae |
| 28. | Elytraria acaulis | Acanthaceae |
| 29. | Eranthemum nervosum | Acanthaceae |
| 30. | Eranthemum purpurascens | Acanthaceae |
| 31. | Eranthemum roseum | Acanthaceae |
| 32. | Gantelbua urens | Acanthaceae |
| 33. | Haplanthodes neilgherryensis | Acanthaceae |
| 34. | Haplanthodes verttciuatus | Acanthaceae |
| 35. | Hemiadelphis polysperma | Acanthaceae |
| 36. | Hemigraphis crenata | Acanthaceae |
| 37. | Hemigraphis crossandra | Acanthaceae |
| 38. | Hemigraphis hirta | Acanthaceae |
| 39. | Hemigraphis latebrosa | Acanthaceae |
| 40. | Hemigraphis rupestris | Acanthaceae |
| 41. | Hygrophila auriculata | Acanthaceae |
| 42. | Hygrophila serpyllum | Acanthaceae |
| 43. | Indoneesiella echioides | Acanthaceae |
| 44. | Justicia betonicia | Acanthaceae |
| 45. | Justicia calconeura | Acanthaceae |
| 46. | Justicia dffusa | Acanthaceae |
| 47. | Justicia gendarussa | Acanthaceae |
| 48. | Justicia heterocarpa | Acanthaceae |
| 49. | Justicia neesii | Acanthaceae |
| 50. | Justicia prostrata | Acanthaceae |
| 51. | Justicia trinervia | Acanthaceae |
| 52. | Justicia vahlii | Acanthaceae |
| 53. | Lepidagathis bandraensis | Acanthaceae |
| 54. | Lepidagathis cristata | Acanthaceae |
| 55. | Lepidagathis cuspidata | Acanthaceae |
| 56. | Lepidagathis hamiltoniana | Acanthaceae |
| 57. | Lepidagathis lutea | Acanthaceae |
| 58. | Lepidagathis mitis | Acanthaceae |
| 59. | Lepidagathis simplex | Acanthaceae |
| 60. | Lepidagathis trinervis | Acanthaceae |
| 61. | Nelsonia canascens | Acanthaceae |
| 62. | Newqcanthus sphaerostachya | Acanthaceae |
| 63. | Nilgirianthus heyneanus | Acanthaceae |
| 64. | Peristrophe bicalyculata | Acanthaceae |
| 65. | Peristtophe panicukita | Acanthaceae |
| 66. | Petalidium barlerioides | Acanthaceae |
| 67. | Rostellularia crinita | Acanthaceae |
| 68. | Rostellularia procumbens | Acanthaceae |
| 69. | Rostellularia quinqueangularis | Acanthaceae |
| 70. | Ruellia tuberosa | Acanthaceae |
| 71. | Rungia elegans | Acanthaceae |
| 72. | Rungia linifolia | Acanthaceae |
| 73. | Rungia parviflora | Acanthaceae |
| 74. | Rungia pectinata | Acanthaceae |
| 75. | Rungia repens | Acanthaceae |
| 76. | Strobilanthus hallbergii | Acanthaceae |
| 77. | Thunbergia alata | Acanthaceae |
| 78. | Thunbergia erecta | Acanthaceae |
| 79. | Thunbergia grandiflora | Acanthaceae |
| 80. | Thunbergia leavis | Acanthaceae |
| 81. | Sesuvium portulacastrum | Aizoaceae |
| 82. | Sesuvium sesuvioides | Aizoaceae |
| 83. | Trianthema govindia | Aizoaceae |
| 84. | Trianthema portulacastrum | Aizoaceae |
| 85. | Trianthema triquetra | Aizoaceae |
| 86. | Zaleya decandra | Aizoaceae |
| 87. | Zaleya govindia | Aizoaceae |
| 88. | Zaleya redimita | Aizoaceae |
| 89. | Alangium salvifolium | Alangiaceae |
| 90. | Limnophyton obtusifollum | Alismataceae |
| 91. | Sagittaria guayensis | Alismataceae |
| 92. | Sagittaria sagittifolta | Alismataceae |
| 93. | Achyranthes aspera | Amaranthaceae |
| 94. | Achyranthes bidentata | Amaranthaceae |
| 95. | Aerva javanica | Amaranthaceae |
| 96. | Aerva lanata | Amaranthaceae |
| 97. | Aerva persica | Amaranthaceae |
| 98. | Aerva pseudotomentosa | Amaranthaceae |
| 99. | Aerva sanguinolenta | Amaranthaceae |
| 100. | Altemanthera bettzickiana | Amaranthaceae |
| 101. | Altemanthera ficoidea | Amaranthaceae |
| 102. | Altemanthera paronychoides | Amaranthaceae |
| 103. | Altemanthera pungens | Amaranthaceae |
| 104. | Altemanthera sessilis | Amaranthaceae |
| 105. | Amaranthus blitum | Amaranthaceae |
| 106. | Amaranthus graecizans | Amaranthaceae |
| 107. | Amaranthus hybridus | Amaranthaceae |
| 108. | Amaranthus palmeri | Amaranthaceae |
| 109. | Amaranthus spinosus | Amaranthaceae |
| 110. | Amaranthus tenulflora | Amaranthaceae |
| 111. | Amaranthus tricolor | Amaranthaceae |
| 112. | Amaranthus viridis | Amaranthaceae |
| 113. | Celosia argentea | Amaranthaceae |
| 114. | Centrostachys aquatica | Amaranthaceae |
| 115. | Digera muricata | Amaranthaceae |
| 116. | Digitaria adscendens | Amaranthaceae |
| 117. | Digitaria ciliris | Amaranthaceae |
| 118. | Gomphrena celosioides | Amaranthaceae |
| 119. | Nothosaerva brachiata | Amaranthaceae |

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| 120. | Pupalia lappacea | Amaranthaceae |
| 121. | Crtnum defixum | Amaryllidaceae |
| 122. | Crtnum pratense | Amaryllidaceae |
| 123. | Buchanania lanzan | Anacardiaceae |
| 124. | Lannea coromandeliana | Anacardiaceae |
| 125. | Mangifera indica | Anacardiaceae |
| 126. | Rhus mysurensis | Anacardiaceae |
| 127. | Semicarpus anacardium | Anacardiaceae |
| 128. | Annona reticulata | Annonaceae |
| 129. | Annona squamosa | Annonaceae |
| 130. | Miliusa tomentosa | Annonaceae |
| 131. | Anethum graveolens | Apiaceae |
| 132. | Angelica glauca | Apiaceae |
| 133. | Bunium macuca | Apiaceae |
| 134. | Centella asiatica | Apiaceae |
| 135. | Oenanthe javanica | Apiaceae |
| 136. | Peucedanium dhana | Apiaceae |
| 137. | Pimpinella acuminata | Apiaceae |
| 138. | Pimpinella heyneana | Apiaceae |
| 139. | Pimpinella involucrata | Apiaceae |
| 140. | Psammogeton canescens | Apiaceae |
| 141. | Seseli diffusum | Apiaceae |
| 142. | Alstonia scholaris | Apocynaceae |
| 143. | Carissa congesta | Apocynaceae |
| 144. | Carissa opaca | Apocynaceae |
| 145. | Catharanthus pusius | Apocynaceae |
| 146. | Holarrhena antidysenterica | Apocynaceae |
| 147. | Ichnocarpus frutescens | Apocynaceae |
| 148. | Rauvolfla serpentina | Apocynaceae |
| 149. | Vallaris solanacea | Apocynaceae |
| 150. | Wrightia arborea | Apocynaceae |
| 151. | Wrightia tinctoria | Apocynaceae |
| 152. | Aponogeton natans | Aponogetonaceae |
| 153. | Arisaema tortuosum | Araceae |
| 154. | Colocasta esculenta | Araceae |
| 155. | Cryptocoryne retrospiralis | Araceae |
| 156. | Pistta stratiotes | Araceae |
| 157. | Plesmonium margaritijerum | Araceae |
| 158. | Remusatta vivipara | Araceae |
| 159. | Sauromatum guttatum | Araceae |
| 160. | Phoenix acaulis | Arecaceae |
| 161. | Phoenix dactylifera | Arecaceae |
| 162. | Phoenix sylvestris | Arecaceae |
| 163. | Aristolochia bracteolata | Aristolochiaceae |
| 164. | Aristolochia indica | Aristolochiaceae |
| 165. | Asclepias curassavica | Asclepiadace |
| 166. | Leptadaenia spartium | Asclepiadace |
| 167. | Calotropis gigantea | Asclepiadaceae |
| 168. | Calotropis procera | Asclepiadaceae |
| 169. | Caralluma edulis | Asclepiadaceae |
| 170. | Ceropegia attenuata | Asclepiadaceae |
| 171. | Ceropegia bulbosa | Asclepiadaceae |
| 172. | Ceropegia candelabrum | Asclepiadaceae |
| 173. | Ceropegia hirsuta | Asclepiadaceae |
| 174. | Gymnema sylvestre | Asclepiadaceae |
| 175. | Holostemma annulare | Asclepiadaceae |
| 176. | Leptadenia pyrotechnica | Asclepiadaceae |
| 177. | Leptadenia reticulata | Asclepiadaceae |
| 178. | Marsdenia tenacissima | Asclepiadaceae |
| 179. | Odanthera varians | Asclepiadaceae |
| 180. | Orthanthera viminea | Asclepiadaceae |
| 181. | Oxystelma secamone | Asclepiadaceae |
| 182. | Pentatropis spiralis | Asclepiadaceae |
| 183. | Pergularia daemia | Asclepiadaceae |
| 184. | Sarcostemma acidum | Asclepiadaceae |
| 185. | Sarcostemma intermedium | Asclepiadaceae |
| 186. | Sarcostemma viminale | Asclepiadaceae |
| 187. | Sarcostemma viminale | Asclepiadaceae |
| 188. | Telosma pallida | Asclepiadaceae |
| 189. | Tylophora hirsuta | Asclepiadaceae |
| 190. | Wattamlca volubilis | Asclepiadaceae |
| 191. | Acanthospermum hispidum | Asteraceae |
| 192. | Adenostemma lavenia | Asteraceae |
| 193. | Ageratum conyzoides | Asteraceae |
| 194. | Ageratum houstonianum | Asteraceae |
| 195. | Anaphalis adnata | Asteraceae |
| 196. | Anthemis cotula | Asteraceae |
| 197. | Artemisia capillaris | Asteraceae |
| 198. | Artemisia nilagirica | Asteraceae |
| 199. | Artemisia parviflora | Asteraceae |
| 200. | Bidens bitemata | Asteraceae |
| 201. | Blainvalea acmella | Asteraceae |
| 202. | Blumea alata | Asteraceae |
| 203. | Blumea aurita | Asteraceae |
| 204. | Blumea bifoliata | Asteraceae |
| 205. | Blumea eriantha | Asteraceae |
| 206. | Blumea flava | Asteraceae |
| 207. | Blumea lacera | Asteraceae |
| 208. | Blumea laciniata | Asteraceae |
| 209. | Blumea membranacea | Asteraceae |
| 210. | Blumea obliqua | Asteraceae |
| 211. | Blumea odorata | Asteraceae |
| 212. | Blumea oxyodonta | Asteraceae |
| 213. | Blumea virens | Asteraceae |
| 214. | Brachyactis pubescens | Asteraceae |
| 215. | Caesulia axillaris | Asteraceae |
| 216. | Carthamus oxyacantha | Asteraceae |
| 217. | Centipeda minima | Asteraceae |
| 218. | Centratherum phyllolaenum | Asteraceae |
| 219. | Centratherum ritchei | Asteraceae |
| 220. | Chromolaena odorata | Asteraceae |
| 221. | Chrysanthellum americanum | Asteraceae |
| 222. | Cichorium endivia | Asteraceae |
| 223. | Cichorium intybus | Asteraceae |
| 224. | Cirsium arvense | Asteraceae |
| 225. | Cirsium wallichii | Asteraceae |

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| 226. | Conyza aegyptiaca | Asteraceae |
| 227. | Conyza bonariensis | Asteraceae |
| 228. | Conyza canadensis | Asteraceae |
| 229. | Conyza leucantha | Asteraceae |
| 230. | Conyza stricta | Asteraceae |
| 231. | Cotula anthemoides | Asteraceae |
| 232. | Cotula hemisphaerica | Asteraceae |
| 233. | Cousinia minuta | Asteraceae |
| 234. | Cyathocline pwpurea | Asteraceae |
| 235. | Dicoma tomentosa | Asteraceae |
| 236. | Echinops echinatus | Asteraceae |
| 237. | Eclipta alba | Asteraceae |
| 238. | Eclipta prostrata | Asteraceae |
| 239. | Elephantopus scaber | Asteraceae |
| 240. | Emilia coccinea | Asteraceae |
| 241. | Emilia sonchifolia | Asteraceae |
| 242. | Epaltes divaricata | Asteraceae |
| 243. | Erigeron multicaulis | Asteraceae |
| 244. | Erigeron sublyratus | Asteraceae |
| 245. | Flaveria trinervia | Asteraceae |
| 246. | Galinsoga parviflora | Asteraceae |
| 247. | Glossnema varians | Asteraceae |
| 248. | Glossocardia bosvallea | Asteraceae |
| 249. | Gnaphalium hypoleucum | Asteraceae |
| 250. | Gnaphalium luteo-album | Asteraceae |
| 251. | Gnaphalium pennsylvanicum | Asteraceae |
| 252. | Gnaphalium polycaulon | Asteraceae |
| 253. | Gnaphalium pulvinatum | Asteraceae |
| 254. | Gonidcaulon glabrum | Asteraceae |
| 255. | Grangea maderaspatana | Asteraceae |
| 256. | Gynura cusimba | Asteraceae |
| 257. | Inula cappa | Asteraceae |
| 258. | Inula grandiflora | Asteraceae |
| 259. | Launaea capitata | Asteraceae |
| 260. | Launaea intybacea | Asteraceae |
| 261. | Lagascea mauis | Asteraceae |
| 262. | Latcuca orientalis | Asteraceae |
| 263. | Latcuca polycephala | Asteraceae |
| 264. | Launaea asplenifolia | Asteraceae |
| 265. | Launaea nudicaults | Asteraceae |
| 266. | Launaea procumbens | Asteraceae |
| 267. | Launaea remotiflora | Asteraceae |
| 268. | Launaea resedifolia | Asteraceae |
| 269. | Launaea sarmentosa | Asteraceae |
| 270. | lfloga spicata | Asteraceae |
| 271. | Oligochaeta remosa | Asteraceae |
| 272. | Parthenium hysterophorus | Asteraceae |
| 273. | Pegolettia senegalensis | Asteraceae |
| 274. | Pentanema cemuum | Asteraceae |
| 275. | Pentanema indicum | Asteraceae |
| 276. | Pentanema vestitum | Asteraceae |
| 277. | Pluchea arguta | Asteraceae |
| 278. | Pluchea lanceolata | Asteraceae |
| 279. | Pluchea tomentosa | Asteraceae |
| 280. | Pluchea wallichiana | Asteraceae |
| 281. | Pulicaria angustifolia | Asteraceae |
| 282. | Pulicaria boissieri | Asteraceae |
| 283. | Pulicaria crispa | Asteraceae |
| 284. | Pulicaria foliosa | Asteraceae |
| 285. | Pulicaria rajputanae | Asteraceae |
| 286. | Pulicaria vulgaris | Asteraceae |
| 287. | Pulicaria wightiana | Asteraceae |
| 288. | Reichardia tingitanum | Asteraceae |
| 289. | Sclerocarpus africanus | Asteraceae |
| 290. | Seigesbeclcia orientalis | Asteraceae |
| 291. | Senecio bombayensis | Asteraceae |
| 292. | Senecio hewrensis | Asteraceae |
| 293. | Senecio lavandulaefolius | Asteraceae |
| 294. | Senecio nudicaulis | Asteraceae |
| 295. | Senecio vestitus | Asteraceae |
| 296. | Senecio wightii | Asteraceae |
| 297. | Soliva anthemifolia | Asteraceae |
| 298. | Sonchus asper | Asteraceae |
| 299. | Sonchus brachyotus | Asteraceae |
| 300. | Sonchus oleraceus | Asteraceae |
| 301. | Sphaeranthus indicus | Asteraceae |
| 302. | Spilanthus calva | Asteraceae |
| 303. | Spilanthus paniculata | Asteraceae |
| 304. | Synedrella nodiflora | Asteraceae |
| 305. | Taraxacum officinale | Asteraceae |
| 306. | Tithonia diversifolia | Asteraceae |
| 307. | Tricholepis glaberrima | Asteraceae |
| 308. | Tricholepis radicans | Asteraceae |
| 309. | Tridax procumbens | Asteraceae |
| 310. | Venidium fastuosum | Asteraceae |
| 311. | Verbesina encelioides | Asteraceae |
| 312. | Vernonia albicans | Asteraceae |
| 313. | Vernonia anceps | Asteraceae |
| 314. | Vernonia anthelmintica | Asteraceae |
| 315. | Vernonia cinerascens | Asteraceae |
| 316. | Vernonia cinerea | Asteraceae |
| 317. | Vernonia conyzoides | Asteraceae |
| 318. | Vernonia eleagnifolia | Asteraceae |
| 319. | Wedelia chinensis | Asteraceae |
| 320. | Wedelia urticaefolia | Asteraceae |
| 321. | Xanthium indicum | Asteraceae |
| 322. | Xanthium spinosum | Asteraceae |
| 323. | Balanites aegyptiaca | Balanitaceae |
| 324. | Balanites roxburghii | Balanitaceae |
| 325. | Impans balsamina | Balsaminaceae |
| 326. | Basella alba | Basellaceae |
| 327. | Begonia trichocarpa | Begoniaceae |
| 328. | Berberis asiatica | Berberidaceae |
| 329. | Dolichandrone atlovirens | Bignoniaceae |
| 330. | Dolichandrone falcata | Bignoniaceae |
| 331. | Oroxylon indicum | Bignoniaceae |
| 332. | Stereospermum colais | Bignoniaceae |
| 333. | Tecoma stans | Bignoniaceae |
| 334. | Tecomella undulata | Bignoniaceae |
| 335. | Adansonia digitata | Bombacaceae |

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| 336. | Kydia ealyeina | Bombacaceae |
| 337. | Amebia hispidissima | Boraginaceae |
| 338. | Coldenia procumbens | Boraginaceae |
| 339. | Cynoglossum glochidiatum | Boraginaceae |
| 340. | Cynoglossum wallichii | Boraginaceae |
| 341. | Cynoglossum zeylanicum | Boraginaceae |
| 342. | Gastrocotyle hispida | Boraginaceae |
| 343. | Heliotropium bacciferum | Boraginaceae |
| 344. | Heliotropium crispum | Boraginaceae |
| 345. | Heliotropium curassavicum | Boraginaceae |
| 346. | Heliotropium europaeum | Boraginaceae |
| 347. | Heliotropium indicum | Boraginaceae |
| 348. | Heliotropium marifolium | Boraginaceae |
| 349. | Heliotropium ovalifolium | Boraginaceae |
| 350. | Heliotropium paniculatum | Boraginaceae |
| 351. | Heliotropium rarifolium | Boraginaceae |
| 352. | Heliotropium strigosum | Boraginaceae |
| 353. | Heliotropium subulatum | Boraginaceae |
| 354. | Heliotropium supinum | Boraginaceae |
| 355. | Heliotropium zeylanicum | Boraginaceae |
| 356. | Nonnea pulla | Boraginaceae |
| 357. | Sericostoma pauciflorum | Boraginaceae |
| 358. | Trichodesma indica | Boraginaceae |
| 359. | Trichodesma sedgewickianum | Boraginaceae |
| 360. | Trichodesma zeylanica | Boraginaceae |
| 361. | Brassica toumejortu | Brassicaceae |
| 362. | Capsella bursa-pastoris | Brassicaceae |
| 363. | Cardamine hirsuta | Brassicaceae |
| 364. | Cardamine impatiens | Brassicaceae |
| 365. | Cardamine scutata | Brassicaceae |
| 366. | Cochlearia cochlearioides | Brassicaceae |
| 367. | Coronopus didymusbeen | Brassicaceae |
| 368. | Dilophia salsa | Brassicaceae |
| 369. | Eruca sativa | Brassicaceae |
| 370. | Farsetia hamiltonii | Brassicaceae |
| 371. | Farsetia heliophila | Brassicaceae |
| 372. | Farsetia jacquemontii | Brassicaceae |
| 373. | Lepidium sativum | Brassicaceae |
| 374. | Lepidium virginicum | Brassicaceae |
| 375. | Malcolmia africana | Brassicaceae |
| 376. | Rorippa indica | Brassicaceae |
| 377. | Rorippa montana | Brassicaceae |
| 378. | Burmannia coelistis | Bunnanniaceae |
| 379. | Boswellia serrata | Burseraceae |
| 380. | Tenagocharis latifolta | Butomaceae |
| 381. | Opuntia dillenii | Cactaceae |
| 382. | Opuntia elatior | Cactaceae |
| 383. | Opuntia monacantha | Cactaceae |
| 384. | Bauhinia purpurea | Caesalpinioideae |
| 385. | Bauhinia racemosa | Caesalpinioideae |
| 386. | Bauhinia semla | Caesalpinioideae |
| 387. | Bauhinia tomentosa | Caesalpinioideae |
| 388. | Cassia auriculata | Caesalpinioideae |
| 389. | Cassia fIstula | Caesalpinioideae |
| 390. | Cassia hochstetteri | Caesalpinioideae |
| 391. | Cassia italica | Caesalpinioideae |
| 392. | Caesalpinia bonduc | Caesalpinioideae |
| 393. | Caesalpinia decapetala | Caesalpinioideae |
| 394. | Caesalpinia mimosoides | Caesalpinioideae |
| 395. | Caesalpinia mimosoides | Caesalpinioideae |
| 396. | Cassia pumila | Caesalpinioideae |
| 397. | Cassia absus | Caesalpinioideae |
| 398. | Cassia obtusifolia | Caesalpinioideae |
| 399. | Cassia occidentalis | Caesalpinioideae |
| 400. | Cassia purpurea | Caesalpinioideae |
| 401. | Cassia renigera | Caesalpinioideae |
| 402. | Cassia sophera | Caesalpinioideae |
| 403. | Cassia tora | Caesalpinioideae |
| 404. | Moullava spicata | Caesalpinioideae |
| 405. | Piliostigma malabarica | Caesalpinioideae |
| 406. | Tamarindus indica | Caesalpinioideae |
| 407. | Campanula canescens | Campanulaceae |
| 408. | Campanula colorata | Campanulaceae |
| 409. | Campanula fulgens | Campanulaceae |
| 410. | Wahlenbergia erecta | Campanulaceae |
| 411. | Cannabis sativa | Cannabinaceae |
| 412. | Canna coccinea | Cannaceae |
| 413. | Cadaba farinosa | Capparaceae |
| 414. | Cadaba fruticosa | Capparaceae |
| 415. | Capparis aphylla | Capparaceae |
| 416. | Capparis decidua | Capparaceae |
| 417. | Capparis grandis | Capparaceae |
| 418. | Capparis pedunculosa | Capparaceae |
| 419. | Capparis sepiaria | Capparaceae |
| 420. | Capparis spinosa | Capparaceae |
| 421. | Capparis zeylanica | Capparaceae |
| 422. | Crateva adansonii | Capparaceae |
| 423. | Crateva nurvala | Capparaceae |
| 424. | Dipterygium glaucum | Capparaceae |
| 425. | Maerua oblongifolia | Capparaceae |
| 426. | Arehna tomentosa | Caryophyllaceae |
| 427. | Arenarta serpyuifolia | Caryophyllaceae |
| 428. | Lychnis indica | Caryophyllaceae |
| 429. | Polycarpaea aurea | Caryophyllaceae |
| 430. | Polycarpaea corymbosa | Caryophyllaceae |
| 431. | Polycarpon prostratum | Caryophyllaceae |
| 432. | Spergularia rubra | Caryophyllaceae |
| 433. | Vaccaria pyramidata | Caryophyllaceae |
| 434. | Cassine glauca | Celastraceae |
| 435. | Celastrus paniculatus | Celastraceae |

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| 436. | Maytenus emerginata | Celastraceae |
| 437. | Ceratophyllum demersum | Ceratophyllaceae |
| 438. | Atriplex crassifolia | Chenopodiaceae |
| 439. | Chenopodium album | Chenopodiaceae |
| 440. | Chenopodium ambrosoides | Chenopodiaceae |
| 441. | Chenopodium bollys | Chenopodiaceae |
| 442. | Chenopodium glaucum | Chenopodiaceae |
| 443. | Chenopodium hybridum | Chenopodiaceae |
| 444. | Chenopodium murale | Chenopodiaceae |
| 445. | Haloxylon multiflorum | Chenopodiaceae |
| 446. | Haloxylon recurvum | Chenopodiaceae |
| 447. | Haloxylon salicornicum | Chenopodiaceae |
| 448. | Kochia indica | Chenopodiaceae |
| 449. | Salsola bmyosma | Chenopodiaceae |
| 450. | Salsola maritima | Chenopodiaceae |
| 451. | Salsola nudiflora | Chenopodiaceae |
| 452. | Cleome brachycarpa | Cleomaceae |
| 453. | Cleome chelidonii | Cleomaceae |
| 454. | Cleome funbriata | Cleomaceae |
| 455. | Cleome gynandra | Cleomaceae |
| 456. | Cleome monophylla | Cleomaceae |
| 457. | Cleome scaposa | Cleomaceae |
| 458. | Cleome simplicifolia | Cleomaceae |
| 459. | Cleome viscosa | Cleomaceae |
| 460. | Cochleospeiiflum religiosum | Cochleospermaceae |
| 461. | Anogeissus acuminata | Combretaceae |
| 462. | Anogeissus coronata | Combretaceae |
| 463. | Anogeissus latifolia | Combretaceae |
| 464. | Anogeissus pendula | Combretaceae |
| 465. | Anogeissus sericea | Combretaceae |
| 466. | Combretum ovalifolium | Combretaceae |
| 467. | Terminalta alifuna | Combretaceae |
| 468. | Terminalta beuerica | Combretaceae |
| 469. | Terminalta chebula | Combretaceae |
| 470. | Terminalta crenulata | Combretaceae |
| 471. | Amischophacelus axillaris | Commelinaceae |
| 472. | Amischophacelus cucullata | Commelinaceae |
| 473. | Commelina albescens | Commelinaceae |
| 474. | Commelina attenuata | Commelinaceae |
| 475. | Commelina benghalensis | Commelinaceae |
| 476. | Commelina diffusa | Commelinaceae |
| 477. | Commelina ensifolia | Commelinaceae |
| 478. | Commelina erecta | Commelinaceae |
| 479. | Commelina forssicalaei | Commelinaceae |
| 480. | Commelina hassicarlii | Commelinaceae |
| 481. | Commelina longifolia | Commelinaceae |
| 482. | Commelina paludosa | Commelinaceae |
| 483. | Commelina suifruticosa | Commelinaceae |
| 484. | Commelina wightii | Commelinaceae |
| 485. | Cyanotis cristata | Commelinaceae |
| 486. | Cyanotis fasciculata | Commelinaceae |
| 487. | Cyanotis obtusa | Commelinaceae |
| 488. | Murdannia nudiflora | Commelinaceae |
| 489. | Murdannia spirata | Commelinaceae |
| 490. | Murdannia vaginata | Commelinaceae |
| 491. | Argyreia nervosa | Convolvulaceae |
| 492. | Argyreia sericea | Convolvulaceae |
| 493. | Argyreia strigosa | Convolvulaceae |
| 494. | Convolvulus arvensis | Convolvulaceae |
| 495. | Convolvulus auricomus | Convolvulaceae |
| 496. | Convolvulus deserti | Convolvulaceae |
| 497. | Convolvulus microphyllus | Convolvulaceae |
| 498. | Convolvulus prosiraius | Convolvulaceae |
| 499. | Convolvulus rhyniospemms | Convolvulaceae |
| 500. | Convolvulus rottlelianus | Convolvulaceae |
| 501. | Convolvulus scindicus | Convolvulaceae |
| 502. | Convolvulus stocksii | Convolvulaceae |
| 503. | Cressa cretica | Convolvulaceae |
| 504. | Evovulus alsinoides | Convolvulaceae |
| 505. | Ipomoea alba | Convolvulaceae |
| 506. | Ipomoea angulata | Convolvulaceae |
| 507. | Ipomoea aquatica | Convolvulaceae |
| 508. | Ipomoea cairica | Convolvulaceae |
| 509. | Ipomoea carnea | Convolvulaceae |
| 510. | Ipomoea coptica | Convolvulaceae |
| 511. | Ipomoea eriocarpa | Convolvulaceae |
| 512. | Ipomoea hederifolia | Convolvulaceae |
| 513. | Ipomoea indica | Convolvulaceae |
| 514. | Ipomoea mauritiana | Convolvulaceae |
| 515. | Ipomoea nil | Convolvulaceae |
| 516. | Ipomoea obscura | Convolvulaceae |
| 517. | Ipomoea pallida | Convolvulaceae |
| 518. | Ipomoea pes-caprae | Convolvulaceae |
| 519. | Ipomoea pes-tiglidis | Convolvulaceae |
| 520. | Ipomoea pilosa | Convolvulaceae |
| 521. | Ipomoea pulchella | Convolvulaceae |
| 522. | Ipomoea quamodit | Convolvulaceae |
| 523. | Ipomoea sepiaria | Convolvulaceae |
| 524. | Ipomoea sindica | Convolvulaceae |
| 525. | Ipomoea sinensis | Convolvulaceae |
| 526. | Ipomoea stocksii | Convolvulaceae |
| 527. | Ipomoea triloba | Convolvulaceae |
| 528. | Ipomoea turbinata | Convolvulaceae |
| 529. | Ipomoea verticillata | Convolvulaceae |
| 530. | Ipomoea wightii | Convolvulaceae |
| 531. | Jacquemontia paniculata | Convolvulaceae |
| 532. | Merremia aegyptiaca | Convolvulaceae |
| 533. | Merremia dissecta | Convolvulaceae |
| 534. | Merremia emarginata | Convolvulaceae |
| 535. | Merremia hederacea | Convolvulaceae |
| 536. | Merremia quinquefolia | Convolvulaceae |
| 537. | Merremia tridentata | Convolvulaceae |
| 538. | Merremia tridentata | Convolvulaceae |
| 539. | Merremia vitifolia | Convolvulaceae |

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| 540. | Operculina turpethum | Convolvulaceae |
| 541. | Porana paniculata | Convolvulaceae |
| 542. | Rivea hypocraterifolmis | Convolvulaceae |
| 543. | Rivea ornata | Convolvulaceae |
| 544. | Seddera cordifolia | Convolvulaceae |
| 545. | Seddera latifolia | Convolvulaceae |
| 546. | Kalanchoe pinnata | Crassulaceae |
| 547. | Blastania fimbristipula | Cucurbitaceae |
| 548. | Blastania garcinii | Cucurbitaceae |
| 549. | Bryonopsis laciniosa | Cucurbitaceae |
| 550. | Citrullus colocynthis | Cucurbitaceae |
| 551. | Citrullus lanatus | Cucurbitaceae |
| 552. | Coccinia grandis | Cucurbitaceae |
| 553. | Coccinia indica | Cucurbitaceae |
| 554. | Corallocarpus conocarpus | Cucurbitaceae |
| 555. | Corallocarpus epigaeus | Cucurbitaceae |
| 556. | Cucumis callosus | Cucurbitaceae |
| 557. | Cucumis melo | Cucurbitaceae |
| 558. | Cucumis prophetarum | Cucurbitaceae |
| 559. | Cucumis setosus | Cucurbitaceae |
| 560. | Cucurbita maxima | Cucurbitaceae |
| 561. | Dactyliandra welwitschii | Cucurbitaceae |
| 562. | Dicaelospermum ritchei | Cucurbitaceae |
| 563. | Diplocyclos palmatus | Cucurbitaceae |
| 564. | Luifa acutangula | Cucurbitaceae |
| 565. | Luifa cylindrica | Cucurbitaceae |
| 566. | Luifa echinata | Cucurbitaceae |
| 567. | Luifa umbellata | Cucurbitaceae |
| 568. | Melothria heterophylla | Cucurbitaceae |
| 569. | Melothria leiosperma | Cucurbitaceae |
| 570. | Melothria maderaspatana | Cucurbitaceae |
| 571. | Melothria perpusilla | Cucurbitaceae |
| 572. | Momordica balsamina | Cucurbitaceae |
| 573. | Momordica charantia | Cucurbitaceae |
| 574. | Momordica cochinchinensis | Cucurbitaceae |
| 575. | Momordica dioica | Cucurbitaceae |
| 576. | Trichosanthes anguina | Cucurbitaceae |
| 577. | Trichosanthes bracteata | Cucurbitaceae |
| 578. | Trichosanthes cordata | Cucurbitaceae |
| 579. | Trichosanthes cucumerina | Cucurbitaceae |
| 580. | Trichosanthes dioica | Cucurbitaceae |
| 581. | Cuscuta capitata | Cuscutaceae |
| 582. | Cuscuta chinensis | Cuscutaceae |
| 583. | Cuscuta europaea | Cuscutaceae |
| 584. | Cuscuta hyalina | Cuscutaceae |
| 585. | Cuscuta reflexa | Cuscutaceae |
| 586. | Bulboschoenus maritimus | Cyperaceae |
| 587. | Bulbostylis barbata | Cyperaceae |
| 588. | Bulbostylis densa | Cyperaceae |
| 589. | Bulbostylis subspinescens | Cyperaceae |
| 590. | Carex cruciata | Cyperaceae |
| 591. | Carex fedia | Cyperaceae |
| 592. | Carex heterostachya | Cyperaceae |
| 593. | Carex myosurus | Cyperaceae |
| 594. | Cyperus alulatus | Cyperaceae |
| 595. | Cyperus arenarius | Cyperaceae |
| 596. | Cyperus articulatus | Cyperaceae |
| 597. | Cyperus atkinsonii | Cyperaceae |
| 598. | Cyperus bulbosus | Cyperaceae |
| 599. | Cyperus compressus | Cyperaceae |
| 600. | Cyperus conglomeratus | Cyperaceae |
| 601. | Cyperus corymbosus | Cyperaceae |
| 602. | Cyperus cuspidatus | Cyperaceae |
| 603. | Cyperus difformis | Cyperaceae |
| 604. | Cyperus digitatus | Cyperaceae |
| 605. | Cyperus distans | Cyperaceae |
| 606. | Cyperus esculentus | Cyperaceae |
| 607. | Cyperus exaltatus | Cyperaceae |
| 608. | Cyperus fuscus | Cyperaceae |
| 609. | Cyperus halpan | Cyperaceae |
| 610. | Cyperus imbricatus | Cyperaceae |
| 611. | Cyperus iria | Cyperaceae |
| 612. | Cyperus longus | Cyperaceae |
| 613. | Cyperus meeboldii | Cyperaceae |
| 614. | Cyperus niveus | Cyperaceae |
| 615. | Cyperus nutans | Cyperaceae |
| 616. | Cyperus pangorei | Cyperaceae |
| 617. | Cyperus pilosus | Cyperaceae |
| 618. | Cyperus platysty | Cyperaceae |
| 619. | Cyperus rotundus | Cyperaceae |
| 620. | Cyperus stoloniferus | Cyperaceae |
| 621. | Cyperus tenuispica | Cyperaceae |
| 622. | Cyperus triceps | Cyperaceae |
| 623. | Eleocharis acutangula | Cyperaceae |
| 624. | Eleocharis atropurpurea | Cyperaceae |
| 625. | Eleocharis congesta | Cyperaceae |
| 626. | Eleocharis dulcis | Cyperaceae |
| 627. | Eleocharis geniculata | Cyperaceae |
| 628. | Eleocharis palustris | Cyperaceae |
| 629. | Eriophorum comosum | Cyperaceae |
| 630. | Fimbristylis aestivalis | Cyperaceae |
| 631. | Fimbristylis argentea | Cyperaceae |
| 632. | Fimbristylis bisumbellata | Cyperaceae |
| 633. | Fimbristylis complanata | Cyperaceae |
| 634. | Fimbristylis cymosa | Cyperaceae |
| 635. | Fimbristylis dichotoma | Cyperaceae |
| 636. | Fimbristylis falcata | Cyperaceae |
| 637. | Fimbristylis ferruginea | Cyperaceae |
| 638. | Fimbristylis milcea | Cyperaceae |
| 639. | Fimbristylis ovata | Cyperaceae |
| 640. | Fimbristylis pierotti | Cyperaceae |
| 641. | Fimbristylis quinquangularis | Cyperaceae |
| 642. | Fimbristylis sieberiana | Cyperaceae |

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| 643. | Fimbristylis squarrosa | Cyperaceae |
| 644. | Fimbristylis tenera | Cyperaceae |
| 645. | Fimbristylis tetragona | Cyperaceae |
| 646. | Fimbristylis woodrowii | Cyperaceae |
| 647. | Fuirena ciliaris | Cyperaceae |
| 648. | Fuirena wallichiana | Cyperaceae |
| 649. | Indocowtoisia cyperoides | Cyperaceae |
| 650. | Juncellus alopecuroides | Cyperaceae |
| 651. | Juncellus laevigatus | Cyperaceae |
| 652. | Juncellus pygmaeus | Cyperaceae |
| 653. | Kyllinga brevifolia | Cyperaceae |
| 654. | Kyllinga nemoralis | Cyperaceae |
| 655. | Kyllinga squamulata | Cyperaceae |
| 656. | Kyllinga tenuifolia | Cyperaceae |
| 657. | Lipocarpha chinensis | Cyperaceae |
| 658. | Lipocarpha sphacelata | Cyperaceae |
| 659. | Mariscus clarlcei | Cyperaceae |
| 660. | Mariscus compactus | Cyperaceae |
| 661. | Mariscus paniceus | Cyperaceae |
| 662. | Mariscus squarrosus | Cyperaceae |
| 663. | Mariscus sumatrensis | Cyperaceae |
| 664. | Pycreus diaphanus | Cyperaceae |
| 665. | Pycreus favidus | Cyperaceae |
| 666. | Pycreus malabaricus | Cyperaceae |
| 667. | Pycreus polystachyos | Cyperaceae |
| 668. | Pycreus pumilus | Cyperaceae |
| 669. | Pycreus sanguinolentus | Cyperaceae |
| 670. | Rikliella squarrosa | Cyperaceae |
| 671. | Schoenoplectus articulatus | Cyperaceae |
| 672. | Schoenoplectus corymbosus | Cyperaceae |
| 673. | Schoenoplectus grossus | Cyperaceae |
| 674. | Schoenoplectus juncoides | Cyperaceae |
| 675. | Schoenoplectus lacustris | Cyperaceae |
| 676. | Schoenoplectus littoralis | Cyperaceae |
| 677. | Schoenoplectus mucronatus | Cyperaceae |
| 678. | Schoenoplectus roylei | Cyperaceae |
| 679. | Schoenoplectus supinus | Cyperaceae |
| 680. | Scirpus tuberosus | Cyperaceae |
| 681. | Scleria parvula | Cyperaceae |
| 682. | Scleria stocksiana | Cyperaceae |
| 683. | Dioscorea bulbifera | Dioscoreaceae |
| 684. | Dioscorea esculenta | Dioscoreaceae |
| 685. | Dioscorea hispida | Dioscoreaceae |
| 686. | Dioscorea pentaphylla | Dioscoreaceae |
| 687. | Diospyros cordifolia | Ebenaceae |
| 688. | Diospyros malabarica | Ebenaceae |
| 689. | Diospyros melanoxylon | Ebenaceae |
| 690. | Diospyros montana | Ebenaceae |

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| 691. | Cordia crenata | Ehretiaceae |
| 692. | Cordia dichotoma | Ehretiaceae |
| 693. | Cordia gharaf | Ehretiaceae |
| 694. | Cordia macleoidii | Ehretiaceae |
| 695. | Cordia obliqua | Ehretiaceae |
| 696. | Cordia vestita | Ehretiaceae |
| 697. | Ehretia aspera | Ehretiaceae |
| 698. | Ehretia laevis | Ehretiaceae |
| 699. | Ehretia pubescens | Ehretiaceae |
| 700. | Ehretia serrata | Ehretiaceae |
| 701. | Rotula aquatica | Ehretiaceae |
| 702. | Bergia odorata | Elatinaceae |
| 703. | Bergia ammanoides | Elatinaceae |
| 704. | Bergia capensis | Elatinaceae |
| 705. | Bergia polyanthcl | Elatinaceae |
| 706. | Bergia suifruticosa | Elatinaceae |
| 707. | Bergin aestiva | Elatinaceae |
| 708. | Eliocaulon cinereum | Eriocaulaceae |
| 709. | Eliocaulon diane | Eriocaulaceae |
| 710. | Eliocaulon eleanorae | Eriocaulaceae |
| 711. | Eliocaulon minutum | Eriocaulaceae |
| 712. | Eliocaulon polycephalum | Eriocaulaceae |
| 713. | Eliocaulon quinquangulare | Eriocaulaceae |
| 714. | Eliocaulon solyanum | Eriocaulaceae |
| 715. | Acalypha ciliata | Euphorbiaceae |
| 716. | Acalypha indica | Euphorbiaceae |
| 717. | Acalypha lanceolata | Euphorbiaceae |
| 718. | Acalypha malabarica | Euphorbiaceae |
| 719. | Andrachne telephoides | Euphorbiaceae |
| 720. | Bailiospermum montanum | Euphorbiaceae |
| 721. | Breynia squamosa | Euphorbiaceae |
| 722. | Breynia stipularis | Euphorbiaceae |
| 723. | Breynia vitis-idaea | Euphorbiaceae |
| 724. | Bridelia retusa | Euphorbiaceae |
| 725. | Chrozophora heirosolymitana | Euphorbiaceae |
| 726. | Chrozophora oblongifolia | Euphorbiaceae |
| 727. | Chrozophora prostrata | Euphorbiaceae |
| 728. | Chrozophora rottleri | Euphorbiaceae |
| 729. | Chrozophora verbascifolia | Euphorbiaceae |
| 730. | Croton bonplandianum | Euphorbiaceae |
| 731. | Dalechampia scandens | Euphorbiaceae |
| 732. | Drypetes roxburghii | Euphorbiaceae |
| 733. | Euphorbia caducifolia | Euphorbiaceae |
| 734. | Euphorbia chamaesyce | Euphorbiaceae |
| 735. | Euphorbia clarkeana | Euphorbiaceae |
| 736. | Euphorbia dracunculoides | Euphorbiaceae |
| 737. | Euphorbia elegans | Euphorbiaceae |
| 738. | Euphorbia geniculata | Euphorbiaceae |
| 739. | Euphorbia granulata | Euphorbiaceae |
| 740. | Euphorbia helioscopica | Euphorbiaceae |
| 741. | Euphorbia heyneana | Euphorbiaceae |
| 742. | Euphorbia indica | Euphorbiaceae |

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| 743. | Euphorbia jodhpurensis | Euphorbiaceae |
| 744. | Euphorbia Jusiformis | Euphorbiaceae |
| 745. | Euphorbia mita | Euphorbiaceae |
| 746. | Euphorbia neriifolia | Euphorbiaceae |
| 747. | Euphorbia nivulia | Euphorbiaceae |
| 748. | Euphorbia pycnostegia | Euphorbiaceae |
| 749. | Euphorbia royleana | Euphorbiaceae |
| 750. | Euphorbia thomsoniana | Euphorbiaceae |
| 751. | Euphorbia thymifolia | Euphorbiaceae |
| 752. | Euphorbia tirucalli | Euphorbiaceae |
| 753. | Jatropha curcas | Euphorbiaceae |
| 754. | Jatropha gossypifolia | Euphorbiaceae |
| 755. | Kirganella reticulata | Euphorbiaceae |
| 756. | Mauotus philippensis | Euphorbiaceae |
| 757. | Micrococca mercurialis | Euphorbiaceae |
| 758. | Phyllanthus amarus | Euphorbiaceae |
| 759. | Phyllanthus debilis | Euphorbiaceae |
| 760. | Phyllanthus emblica | Euphorbiaceae |
| 761. | Phyllanthus Jmtemus | Euphorbiaceae |
| 762. | Phyllanthus maderaspatensis | Euphorbiaceae |
| 763. | Phyllanthus pinnatus | Euphorbiaceae |
| 764. | Phyllanthus scabrifolius | Euphorbiaceae |
| 765. | Phyllanthus urinarius | Euphorbiaceae |
| 766. | Phyllanthus virgatus | Euphorbiaceae |
| 767. | Ricinus communis | Euphorbiaceae |
| 768. | Securinega leucopyrus | Euphorbiaceae |
| 769. | Securinega virosa | Euphorbiaceae |
| 770. | Tragia involucrata | Euphorbiaceae |
| 771. | Tragia plukenettii | Euphorbiaceae |
| 772. | Abrus fruticulosus | Fabaceae |
| 773. | Aeschynomene indica | Fabaceae |
| 774. | Alhagi maurorum | Fabaceae |
| 775. | Alysicarpus heterophyllus | Fabaceae |
| 776. | Alysicarpus bupleurtfolius | Fabaceae |
| 777. | Alysicarpus hamosus | Fabaceae |
| 778. | Alysicarpus longifous | Fabaceae |
| 779. | Alysicarpus monilifer | Fabaceae |
| 780. | Alysicarpus monilifera | Fabaceae |
| 781. | Alysicarpus precatortus | Fabaceae |
| 782. | Alysicarpus roxburghianus | Fabaceae |
| 783. | Alysicarpus rugosus | Fabaceae |
| 784. | Alysicarpus tetragonolobus | Fabaceae |
| 785. | Alysicarpus tricolor | Fabaceae |
| 786. | Alysicarpus vaginalis | Fabaceae |
| 787. | Astragalus scorpiurus | Fabaceae |
| 788. | Astragalus tribuloides | Fabaceae |
| 789. | Atylosia albicans | Fabaceae |
| 790. | Atylosia platycarpa | Fabaceae |
| 791. | Atylosia scarabaeoides | Fabaceae |
| 792. | Atylosia sericea | Fabaceae |
| 793. | Atylosia volubilis | Fabaceae |
| 794. | Butea monosperma | Fabaceae |
| 795. | Butea parviflora | Fabaceae |
| 796. | Butea superba | Fabaceae |
| 797. | Canavalia gladiata | Fabaceae |
| 798. | Canavalia virosa | Fabaceae |
| 799. | Clitoria biflora | Fabaceae |
| 800. | Crotalaria medicaginea | Fabaceae |
| 801. | Crotolaria albida | Fabaceae |
| 802. | Crotolaria bifaria | Fabaceae |
| 803. | Crotolaria burhia | Fabaceae |
| 804. | Crotolaria evolvuloides | Fabaceae |
| 805. | Crotolaria ftlipes | Fabaceae |
| 806. | Crotolaria globosa | Fabaceae |
| 807. | Crotolaria hirsuta | Fabaceae |
| 808. | Crotolaria hirta | Fabaceae |
| 809. | Crotolaria humifusa | Fabaceae |
| 810. | Crotolaria jeltuginea | Fabaceae |
| 811. | Crotolaria Juncea | Fabaceae |
| 812. | Crotolaria linifolia | Fabaceae |
| 813. | Crotolaria mysorensis | Fabaceae |
| 814. | Crotolaria nana | Fabaceae |
| 815. | Crotolaria olixensis | Fabaceae |
| 816. | Crotolaria prostrata | Fabaceae |
| 817. | Crotolaria pusilla | Fabaceae |
| 818. | Crotolaria retusa | Fabaceae |
| 819. | Crotolaria senegalensis | Fabaceae |
| 820. | Crotolaria spectabilis | Fabaceae |
| 821. | Crotolaria tematea | Fabaceae |
| 822. | Crotolaria trifoliastrum | Fabaceae |
| 823. | Crotolaria triquetra | Fabaceae |
| 824. | Cylista scariosa | Fabaceae |
| 825. | Dalbergia lanceolaria | Fabaceae |
| 826. | Dalbergia latifolia | Fabaceae |
| 827. | Dalbergia paniculata | Fabaceae |
| 828. | Dalbergia sericea | Fabaceae |
| 829. | Dalbergia sissoo | Fabaceae |
| 830. | Dalbergia volubilis | Fabaceae |
| 831. | Derris robusta | Fabaceae |
| 832. | Desmodium alysicarpoides | Fabaceae |
| 833. | Desmodium dichotomum | Fabaceae |
| 834. | Desmodium gangeticum | Fabaceae |
| 835. | Desmodium laxiflorum | Fabaceae |
| 836. | Desmodium neomexicanum | Fabaceae |
| 837. | Desmodium procumbens | Fabaceae |
| 838. | Desmodium repandum | Fabaceae |
| 839. | Desmodium ritchiei | Fabaceae |
| 840. | Desmodium triangulare | Fabaceae |
| 841. | Desmodium triflorum | Fabaceae |
| 842. | Desmodium velutinum | Fabaceae |
| 843. | Dolichos lobatus | Fabaceae |
| 844. | Dumasia viuosa | Fabaceae |
| 845. | Eleiotis monophylla | Fabaceae |

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| 846. | Erythrina arborescens | Fabaceae |
| 847. | Erythrina stricta | Fabaceae |
| 848. | Erythrina suberosa | Fabaceae |
| 849. | Erythrina subumbrans | Fabaceae |
| 850. | Erythrina variegata | Fabaceae |
| 851. | Flemingia bracteata | Fabaceae |
| 852. | Flemingia macrophylla | Fabaceae |
| 853. | Flemingia nana | Fabaceae |
| 854. | Flemingia strobilifera | Fabaceae |
| 855. | Galactia oxyophyua | Fabaceae |
| 856. | Galactia tenuiflora | Fabaceae |
| 857. | Indigofera angulosa | Fabaceae |
| 858. | Indigofera argentea | Fabaceae |
| 859. | Indigofera astragalina | Fabaceae |
| 860. | Indigofera atropurpurea | Fabaceae |
| 861. | Indigofera caerulea | Fabaceae |
| 862. | Indigofera casioides | Fabaceae |
| 863. | Indigofera colutea | Fabaceae |
| 864. | Indigofera constricta | Fabaceae |
| 865. | Indigofera cordifolia | Fabaceae |
| 866. | Indigofera dalzeuii | Fabaceae |
| 867. | Indigofera glabra | Fabaceae |
| 868. | Indigofera glandulosa | Fabaceae |
| 869. | Indigofera hochstetteri | Fabaceae |
| 870. | Indigofera kamataka | Fabaceae |
| 871. | Indigofera linifolia | Fabaceae |
| 872. | Indigofera linnaei | Fabaceae |
| 873. | Indigofera oblongifolia | Fabaceae |
| 874. | Indigofera sessiliflora | Fabaceae |
| 875. | Indigofera spicata | Fabaceae |
| 876. | Indigofera tinctoria | Fabaceae |
| 877. | Indigofera trifoliata | Fabaceae |
| 878. | Indigofera trita | Fabaceae |
| 879. | Lathyrus aphaca | Fabaceae |
| 880. | Lathyrus sativus | Fabaceae |
| 881. | Lespedeza juncea | Fabaceae |
| 882. | Lotus corniculatus | Fabaceae |
| 883. | Macroptylium lathyroides | Fabaceae |
| 884. | Macroptyloma uniflorum | Fabaceae |
| 885. | Medicago laciniata | Fabaceae |
| 886. | Medicago lupulina | Fabaceae |
| 887. | Medicago polymorpha | Fabaceae |
| 888. | Melilotus alba | Fabaceae |
| 889. | Melilotus indica | Fabaceae |
| 890. | Millettia extensa | Fabaceae |
| 891. | Millettia peguensis | Fabaceae |
| 892. | Mucuna pruriens | Fabaceae |
| 893. | Ougeinia oogeinsis | Fabaceae |
| 894. | Pongamia pinnata | Fabaceae |
| 895. | Psoralea odorata | Fabaceae |
| 896. | Psoralea plictata | Fabaceae |
| 897. | Psoralia corylifolia | Fabaceae |
| 898. | Pterocarpus marsupium | Fabaceae |
| 899. | Pueraria tuberosa | Fabaceae |
| 900. | Puerariastracheyi | Fabaceae |
| 901. | Rhynchosia bracteata | Fabaceae |
| 902. | Rhynchosia capitata | Fabaceae |
| 903. | Rhynchosia minima | Fabaceae |
| 904. | Rhynchosia pulvellenta | Fabaceae |
| 905. | Rhynchosia rothii | Fabaceae |
| 906. | Rhynchosia schimperi | Fabaceae |
| 907. | Rhynchosia viscosa | Fabaceae |
| 908. | Sesbania bispinosa | Fabaceae |
| 909. | Sesbania grandiflora | Fabaceae |
| 910. | Sesbania procumbens | Fabaceae |
| 911. | Sesbania sesban | Fabaceae |
| 912. | Shuteria involucrata | Fabaceae |
| 913. | Smithia bigemina | Fabaceae |
| 914. | Smithia blandha | Fabaceae |
| 915. | Smithia capitata | Fabaceae |
| 916. | Smithia conferta | Fabaceae |
| 917. | Smithia pycnantha | Fabaceae |
| 918. | Smithia salsuginea | Fabaceae |
| 919. | Smithia sensitiva | Fabaceae |
| 920. | Sophora mouis | Fabaceae |
| 921. | Sophora secundiflora | Fabaceae |
| 922. | Tavemiera cuneifolia | Fabaceae |
| 923. | Tephrosia apollinea | Fabaceae |
| 924. | Tephrosia candida | Fabaceae |
| 925. | Tephrosia coccinea | Fabaceae |
| 926. | Tephrosia hamiltonii | Fabaceae |
| 927. | Tephrosia Jalciformis | Fabaceae |
| 928. | Tephrosia leptostachya | Fabaceae |
| 929. | Tephrosia pumila | Fabaceae |
| 930. | Tephrosia purpurea | Fabaceae |
| 931. | Tephrosia strigosa | Fabaceae |
| 932. | Tephrosia subtrlflora | Fabaceae |
| 933. | Tephrosia uniflora | Fabaceae |
| 934. | Tephrosia villosa | Fabaceae |
| 935. | Tephrosia wauichii | Fabaceae |
| 936. | Teramnus labialis | Fabaceae |
| 937. | Trifolium repens | Fabaceae |
| 938. | Trifolium resupinatum | Fabaceae |
| 939. | Trigonella comiculaia | Fabaceae |
| 940. | Trigonella hamosa | Fabaceae |
| 941. | Trigonella monantha | Fabaceae |
| 942. | Trigonella ooculta | Fabaceae |
| 943. | Trigonella pubescens | Fabaceae |
| 944. | Uvaria picta | Fabaceae |
| 945. | Viccia hirsuta | Fabaceae |
| 946. | Viccia monantha | Fabaceae |
| 947. | Viccia peregrina | Fabaceae |
| 948. | Viccia sativa | Fabaceae |
| 949. | Viccia tetrasperma | Fabaceae |
| 950. | Vigna acontifolia | Fabaceae |
| 951. | Vigna dalzeuiana | Fabaceae |
| 952. | Vigna radiaia | Fabaceae |
| 953. | Vigna trilobata | Fabaceae |
| 954. | Vigna umbellata | Fabaceae |
| 955. | Vigna vexillata | Fabaceae |
| 956. | Zomia gibbosa | Fabaceae |
| 957. | Caesaria euiptica | Flacourtiaceae |
| 958. | Ftacourtia indica | Flacourtiaceae |
| 959. | Fumaria indica | Fumariaceae |

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| 960. | Canscora decurrens | Gentianaceae |
| 961. | Canscora decussata | Gentianaceae |
| 962. | Canscora diffusa | Gentianaceae |
| 963. | Canscora heteroclita | Gentianaceae |
| 964. | Canscora pauciflora | Gentianaceae |
| 965. | Centaurium centaurioides | Gentianaceae |
| 966. | Enicostemma hyssopifolium | Gentianaceae |
| 967. | Exacum lawii | Gentianaceae |
| 968. | Exacum pedunculatum | Gentianaceae |
| 969. | Exacum pumilum | Gentianaceae |
| 970. | Hoppea dichotoma | Gentianaceae |
| 971. | Swertia minor | Gentianaceae |
| 972. | Erodium cicutarium | Geraniaceae |
| 973. | Monsonia heliotropioides | Geraniaceae |
| 974. | Monsonia senegalensts | Geraniaceae |
| 975. | Didymocwpus pygmaea | Gesneriaceae |
| 976. | Myriophyllum spathulatum | Haloragaceae |
| 977. | Myriophyllum spicatum | Haloragaceae |
| 978. | Myriophyllum tuberculatum | Haloragaceae |
| 979. | Blyxa echinosperma | Hydrocharitaceae |
| 980. | Hydrilla polyspemm | Hydrocharitaceae |
| 981. | Hydrilla verticillata | Hydrocharitaceae |
| 982. | Nechamandra altemifolia | Hydrocharitaceae |
| 983. | Ottelia alismoides | Hydrocharitaceae |
| 984. | Vallisneria spiralis | Hydrocharitaceae |
| 985. | Hydrolea zeylanica | Hydrophyllaceae |
| 986. | Curculigo orchioides | Hypoxidaceae |
| 987. | Hypoxis aurea | Hypoxidaceae |
| 988. | Juncus bufonius | Juncaceae |
| 989. | Acrocephalus hispidus | Lamiaceae |
| 990. | Acrua tomentosa | Lamiaceae |
| 991. | Anisochilus camosus | Lamiaceae |
| 992. | Anisochilus carnosus | Lamiaceae |
| 993. | Anisomeles indica | Lamiaceae |
| 994. | Anisomeles malabarica | Lamiaceae |
| 995. | Basilicum polystachyum | Lamiaceae |
| 996. | Colebrooicia oppositifolia | Lamiaceae |
| 997. | Hyptis sauveolens | Lamiaceae |
| 998. | Lavandula bipinnata | Lamiaceae |
| 999. | Lavandula gibsonii | Lamiaceae |
| 1000. | Leonotis nepetifolia | Lamiaceae |
| 1001. | Leueas aspera | Lamiaceae |
| 1002. | Leueas biflora | Lamiaceae |
| 1003. | Leueas cephalotes | Lamiaceae |
| 1004. | Leueas eiliata | Lamiaceae |
| 1005. | Leueas flaeeida | Lamiaceae |
| 1006. | Leueas lanata | Lamiaceae |
| 1007. | Leueas maerantha | Lamiaceae |
| 1008. | Leueas martinicensis | Lamiaceae |
| 1009. | Leueas mollisima | Lamiaceae |
| 1010. | Leueas montana | Lamiaceae |
| 1011. | Leueas nutans | Lamiaceae |
| 1012. | Leueas stricta | Lamiaceae |
| 1013. | Leueas suiftuticosa | Lamiaceae |
| 1014. | Leueas urticaefolia | Lamiaceae |
| 1015. | Leueas zeylanica | Lamiaceae |
| 1016. | Nepeta bombaiensis | Lamiaceae |
| 1017. | Nepeta hindostana | Lamiaceae |
| 1018. | Ocimum basilicum | Lamiaceae |
| 1019. | Ocimum canum | Lamiaceae |
| 1020. | Ocimum gratissimum | Lamiaceae |
| 1021. | Ocimum tenuiflorum | Lamiaceae |
| 1022. | Orthosiphon pallidus | Lamiaceae |
| 1023. | Orthosiphon thymifIorus | Lamiaceae |
| 1024. | Plectranthus mollis | Lamiaceae |
| 1025. | Plectranthus rugosus | Lamiaceae |
| 1026. | Pogostemon benghalense | Lamiaceae |
| 1027. | Pogostemon heyneanus | Lamiaceae |
| 1028. | Pogostemon parvifIorus | Lamiaceae |
| 1029. | Salvia aegyptiaca | Lamiaceae |
| 1030. | Salvia plebeia | Lamiaceae |
| 1031. | Salvia santolinaefolia | Lamiaceae |
| 1032. | Thymus serpyllum | Lamiaceae |
| 1033. | Peperomia pellucida | Lauraceae |
| 1034. | Leea edgeworthii | Leeaceae |
| 1035. | Leea indicum | Leeaceae |
| 1036. | Lemium indicum | Lemnaceae |
| 1037. | Lemna minor | Lemnaceae |
| 1038. | Lemna pepusilla | Lemnaceae |
| 1039. | Lemna trisulca | Lemnaceae |
| 1040. | Spirodela polyrhiza | Lemnaceae |
| 1041. | Utricularia aurea | Lentibulariaceae |
| 1042. | Utricularia australis | Lentibulariaceae |
| 1043. | Utricularia exoleta | Lentibulariaceae |
| 1044. | Utricularia stellaris | Lentibulariaceae |
| 1045. | Utricularia striatula | Lentibulariaceae |
| 1046. | Aloe vera | Liliaceae |
| 1047. | Asparagus racemosus | Liliaceae |
| 1048. | Asparagus royleanus | Liliaceae |
| 1049. | Asphodelus tenuifolius | Liliaceae |
| 1050. | Chlorophytum laxum | Liliaceae |
| 1051. | Chlorophytum tuberosum | Liliaceae |
| 1052. | Dipcadi erythraeum | Liliaceae |
| 1053. | Dipcadi serotinum | Liliaceae |
| 1054. | Dracaena elliptica | Liliaceae |
| 1055. | Drimia indica | Liliaceae |
| 1056. | Gloriosa superba | Liliaceae |
| 1057. | Iphegenia indica | Liliaceae |
| 1058. | Scilla hyacinthina | Liliaceae |
| 1059. | Linum mysorense | Linaceae |
| 1060. | Linum usitatissimum | Linaceae |
| 1061. | Reinwardtia indica | Linaceae |
| 1062. | Cassytha filiformis | Loranthaceae |
| 1063. | Ammania auriculata | Lythraceae |

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| 1064. | Ammania baccifera | Lythraceae |
| 1065. | Ammania desertorum | Lythraceae |
| 1066. | Ammania desitorum | Lythraceae |
| 1067. | Ammania multiflora | Lythraceae |
| 1068. | Ammania octandra | Lythraceae |
| 1069. | Lagerstroemia parviflora | Lythraceae |
| 1070. | Nesaea lanceolata | Lythraceae |
| 1071. | Rotala densiflora | Lythraceae |
| 1072. | Rotala indica | Lythraceae |
| 1073. | Rotala mexicana | Lythraceae |
| 1074. | Rotala rotundifolia | Lythraceae |
| 1075. | Rotala serpylhfoha | Lythraceae |
| 1076. | Rotala verticillaris | Lythraceae |
| 1077. | Woodjordia fruticosa | Lythraceae |
| 1078. | Aspidopteris cordata | Malpighiaceae |
| 1079. | Abelmoschus crinitus | Malvaceae |
| 1080. | Abelmoschus esculentus | Malvaceae |
| 1081. | Abelmoschus ficulneus | Malvaceae |
| 1082. | Abelmoschus manihot | Malvaceae |
| 1083. | Abelmoschus moschatus | Malvaceae |
| 1084. | Abelmoschus tuberculatus | Malvaceae |
| 1085. | Abutilon bidentatum | Malvaceae |
| 1086. | Abutilon fruticosum | Malvaceae |
| 1087. | Abutilon fruticosum | Malvaceae |
| 1088. | Abutilon hirtum | Malvaceae |
| 1089. | Abutilon indicum | Malvaceae |
| 1090. | Abutilon pakistanicum | Malvaceae |
| 1091. | Abutilon pannosum | Malvaceae |
| 1092. | Abutilon persicum | Malvaceae |
| 1093. | Abutilon ramosum | Malvaceae |
| 1094. | Althaea ludwigii | Malvaceae |
| 1095. | Fioria vitifolius | Malvaceae |
| 1096. | Hibiscus beddomei | Malvaceae |
| 1097. | Hibiscus amblyocarpus | Malvaceae |
| 1098. | Hibiscus caesius | Malvaceae |
| 1099. | Hibiscus lobatus | Malvaceae |
| 1100. | Hibiscus micranthus | Malvaceae |
| 1101. | Hibiscus palmatus | Malvaceae |
| 1102. | Hibiscus panduraeformis | Malvaceae |
| 1103. | Hibiscus trionum | Malvaceae |
| 1104. | Malva parviflora | Malvaceae |
| 1105. | Malva rotundifolia | Malvaceae |
| 1106. | Malva sylvestris | Malvaceae |
| 1107. | Malva verticulata | Malvaceae |
| 1108. | Malvastrum coromandelianum | Malvaceae |
| 1109. | Pavonia arabica | Malvaceae |
| 1110. | Pavonia glechomifolia | Malvaceae |
| 1111. | Pavonia odorata | Malvaceae |
| 1112. | Pavonia procumbens | Malvaceae |
| 1113. | Pavonia zeylanica | Malvaceae |
| 1114. | Sida acuta | Malvaceae |
| 1115. | Sida cordifolia | Malvaceae |
| 1116. | Sida mysorensis | Malvaceae |
| 1117. | Sida ordata | Malvaceae |
| 1118. | Sida ovata | Malvaceae |
| 1119. | Sida rhombifolia | Malvaceae |
| 1120. | Sida spinosa | Malvaceae |
| 1121. | Sida tiagii | Malvaceae |
| 1122. | Thespesia lampas | Malvaceae |
| 1123. | Thespesia populnea | Malvaceae |
| 1124. | Urena labata | Malvaceae |
| 1125. | Urena lobata | Malvaceae |
| 1126. | Martynia annua | Martyniaceae |
| 1127. | Aglaia odoratissima | Meliaceae |
| 1128. | Azadirachta indica | Meliaceae |
| 1129. | Clssampelos pariera | Menispennaceae |
| 1130. | Cocculus hirsutus | Menispennaceae |
| 1131. | Cocculus pendulus | Menispennaceae |
| 1132. | Cyclea peltata | Menispennaceae |
| 1133. | Tiliacora acuminata | Menispennaceae |
| 1134. | Tinospora cordifolia | Menispennaceae |
| 1135. | Nymphoides hydrophylla | Menyanthaceae |
| 1136. | Nymphoides indica | Menyanthaceae |
| 1137. | Nymphoides parviflora | Menyanthaceae |
| 1138. | Acacia catechu | Mimosoideae |
| 1139. | Acacia chundra | Mimosoideae |
| 1140. | Acacia ebumea | Mimosoideae |
| 1141. | Acacia farnesiana | Mimosoideae |
| 1142. | Acacia jacquemontii | Mimosoideae |
| 1143. | Acacia latronum | Mimosoideae |
| 1144. | Acacia leucophloea | Mimosoideae |
| 1145. | Acacia megaladena | Mimosoideae |
| 1146. | Acacia modesta | Mimosoideae |
| 1147. | Acacia nilotica | Mimosoideae |
| 1148. | Acacia pennata | Mimosoideae |
| 1149. | Acacia senegal | Mimosoideae |
| 1150. | Acacia sinuata | Mimosoideae |
| 1151. | Acacia torta | Mimosoideae |
| 1152. | Acacia tortilis | Mimosoideae |
| 1153. | Albizia lebbeck | Mimosoideae |
| 1154. | Albizia odoratissima | Mimosoideae |
| 1155. | Albizia procera | Mimosoideae |
| 1156. | Dichrostachys cinerea | Mimosoideae |
| 1157. | Leucaena latisiliqua | Mimosoideae |
| 1158. | Mimosa hamata | Mimosoideae |
| 1159. | Mimosa himalayana | Mimosoideae |
| 1160. | Mimosa pudica | Mimosoideae |
| 1161. | Neptlinia oleracea | Mimosoideae |
| 1162. | Neptlinia plena | Mimosoideae |
| 1163. | Neptlinia triquetra | Mimosoideae |
| 1164. | Pithecellobium dulce | Mimosoideae |
| 1165. | Prosopis chilensis | Mimosoideae |
| 1166. | Prosopis cineraria | Mimosoideae |
| 1167. | Prosopis glandulosa | Mimosoideae |
| 1168. | Prosopis juliflora | Mimosoideae |
| 1169. | Prosopis spicigera | Mimosoideae |
| 1170. | Corbichonia decumbens | Molluginaceae |
| 1171. | Gisekia phamacoides | Molluginaceae |
| 1172. | Gisekia pharnacoides | Molluginaceae |
| 1173. | Glinus lotoides | Molluginaceae |
| 1174. | Glinus oppositifolius | Molluginaceae |

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| 1175. | Limeum indicum | Molluginaceae |
| 1176. | Mollugo cerviana | Molluginaceae |
| 1177. | Mollugo nudicaulis | Molluginaceae |
| 1178. | Mollugo pentaphylla | Molluginaceae |
| 1179. | Ficus amottiana | Moraceae |
| 1180. | Ficus amplissima | Moraceae |
| 1181. | Ficus benghalensis | Moraceae |
| 1182. | Ficus drupacea | Moraceae |
| 1183. | Ficus hispida | Moraceae |
| 1184. | Ficus microcarpa | Moraceae |
| 1185. | Ficus mollis | Moraceae |
| 1186. | Ficus palmata | Moraceae |
| 1187. | Ficus racemosa | Moraceae |
| 1188. | Ficus religiosa | Moraceae |
| 1189. | Ficus rumphii | Moraceae |
| 1190. | Ficus tsjahela | Moraceae |
| 1191. | Ficus virens | Moraceae |
| 1192. | Moringa concanensis | Moringaceae |
| 1193. | Moringa oleifera | Moringaceae |
| 1194. | Syzygium cumini | Myrtaceae |
| 1195. | Syzygium heyneanum | Myrtaceae |
| 1196. | Syzygium jambos | Myrtaceae |
| 1197. | Najas graminea | Najadaceae |
| 1198. | Najas indica | Najadaceae |
| 1199. | Najas marina | Najadaceae |
| 1200. | Najas welwitschii | Najadaceae |
| 1201. | Boerhavia diandra | Nyctaginaceae |
| 1202. | Boerhavia diffusa | Nyctaginaceae |
| 1203. | Boerhavia elegans | Nyctaginaceae |
| 1204. | Boerhavia erecta | Nyctaginaceae |
| 1205. | Boerhavia procumbens | Nyctaginaceae |
| 1206. | Boerhavia repens | Nyctaginaceae |
| 1207. | Collunicarpus chinensis | Nyctaginaceae |
| 1208. | Collunicarpus derlicillatus | Nyctaginaceae |
| 1209. | Euryalejerox salisb | Nymphaeaceae |
| 1210. | Nelumbo nucifera | Nymphaeaceae |
| 1211. | Nymphaea nauchali | Nymphaeaceae |
| 1212. | Nymphaea pubescens | Nymphaeaceae |
| 1213. | Jasminum arborescens | Oleaceae |
| 1214. | Jasminum flexile | Oleaceae |
| 1215. | Jasminum humile | Oleaceae |
| 1216. | Jasminum rottlerianum | Oleaceae |
| 1217. | Jasminum roxburghianum | Oleaceae |
| 1218. | Jasminum sambac | Oleaceae |
| 1219. | Nyctanthes arbor-tristis | Oleaceae |
| 1220. | Schrebera swietenioides | Oleaceae |
| 1221. | Epilobium hirsutum | Onagraceae |
| 1222. | Ludwigia adscendens | Onagraceae |
| 1223. | Ludwigia hyssopifolia | Onagraceae |
| 1224. | Ludwigia octovalvis | Onagraceae |
| 1225. | Ludwigia perennis | Onagraceae |
| 1226. | Ludwigia prostrata | Onagraceae |
| 1227. | Oenothera rosea | Onagraceae |
| 1228. | Oldenlandia aspera | Onagraceae |

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| 1229. | Aerides crispum | Orchidaceae |
| 1230. | Aerides maculosum | Orchidaceae |
| 1231. | Aerides multiflorum | Orchidaceae |
| 1232. | Epipactis vematrifolia | Orchidaceae |
| 1233. | Eulophia ochreata | Orchidaceae |
| 1234. | Habenaria digitata | Orchidaceae |
| 1235. | Habenaria marginata | Orchidaceae |
| 1236. | Vanda tessellata | Orchidaceae |
| 1237. | Vanda testacea | Orchidaceae |
| 1238. | Zeuxine strateumatica | Orchidaceae |
| 1239. | Cistanche tubulosa | Orobanchaceae |
| 1240. | Orobanche aegyptiaca | Orobanchaceae |
| 1241. | Orobanche cemua | Orobanchaceae |
| 1242. | Bidphytum sensitivwn | Oxalidaceae |
| 1243. | Oxalts acetoceua | Oxalidaceae |
| 1244. | Oxalts comiculata | Oxalidaceae |
| 1245. | Oxalts corymbosa | Oxalidaceae |
| 1246. | Oxalts dehradunensts | Oxalidaceae |
| 1247. | Pandanus fascicularis | Pandanaceae |
| 1248. | Argemone mexicana | Papaveraceae |
| 1249. | Argemone ochroleuca | Papaveraceae |
| 1250. | Argemone subjusiformis | Papaveraceae |
| 1251. | Passljlora joetida | Passunoraceae |
| 1252. | Pedalium murex | Pedaliaceae |
| 1253. | Sesamum orientale | Pedaliaceae |
| 1254. | Cryptolepis buchananii | Periplocaceae |
| 1255. | Cryptostegia grandiflora | Periplocaceae |
| 1256. | Hemidesmus indicus | Periplocaceae |
| 1257. | Periploca aphylla | Periplocaceae |
| 1258. | Rivinia humilis | Phytolacaceae |
| 1259. | Dendrophthoe falcata | Piperaceae |
| 1260. | Helixanthera obtusata | Piperaceae |
| 1261. | Viscum nepalensis | Piperaceae |
| 1262. | Plantago amplexicaulis | Plantaginaceae |
| 1263. | Plantago erosa | Plantaginaceae |
| 1264. | Plantago exigua | Plantaginaceae |
| 1265. | Plantago lanceolata | Plantaginaceae |
| 1266. | Plantago ovata | Plantaginaceae |
| 1267. | Dyerophytum indicum | Plumbaginaceae |
| 1268. | Plumbago indica | Plumbaginaceae |
| 1269. | Plumbago zeylanica | Plumbaginaceae |
| 1270. | Acrachne racemosa | Poaceae |
| 1271. | Aeluropus lagopoides | Poaceae |
| 1272. | Alloteropsis cimicina | Poaceae |
| 1273. | Andropogon pertusus | Poaceae |
| 1274. | Andropogon pumilus | Poaceae |
| 1275. | Apluda blatteri | Poaceae |
| 1276. | Apluda mutica | Poaceae |
| 1277. | Aristida adscensionis | Poaceae |
| 1278. | Aristida funiculata | Poaceae |
| 1279. | Aristida histvicula | Poaceae |
| 1280. | Aristida hystricula | Poaceae |
| 1281. | Aristida hystrix | Poaceae |
| 1282. | Aristida mutabilis | Poaceae |
| 1283. | Aristida mutica | Poaceae |
| 1284. | Aristida redacta | Poaceae |
| 1285. | Aristida setacea | Poaceae |

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| 1286. | Arthraxon hispidus | Poaceae |
| 1287. | Arthraxon lanceolatus | Poaceae |
| 1288. | Arthraxon lancifolius | Poaceae |
| 1289. | Arundinella leptochloa | Poaceae |
| 1290. | Arundinella pumila | Poaceae |
| 1291. | Arundinella setosa | Poaceae |
| 1292. | Arundinella spicata | Poaceae |
| 1293. | Arundinella tuberculata | Poaceae |
| 1294. | Arundo donax | Poaceae |
| 1295. | Avena sterilis | Poaceae |
| 1296. | Bambusa arundinacea | Poaceae |
| 1297. | Bambusa vulgaris | Poaceae |
| 1298. | Bothriochloa bladhii | Poaceae |
| 1299. | Bothriochloa ischaemum | Poaceae |
| 1300. | Bothriochloa kuntzeana | Poaceae |
| 1301. | Bothriochloa pertusa | Poaceae |
| 1302. | Brachiaria decumbens | Poaceae |
| 1303. | Brachiaria distachya | Poaceae |
| 1304. | Brachiaria erucifolmis | Poaceae |
| 1305. | Brachiaria kurzii | Poaceae |
| 1306. | Brachiaria lala | Poaceae |
| 1307. | Brachiaria ramosa | Poaceae |
| 1308. | Brachiaria replans | Poaceae |
| 1309. | Brachiaria setigera | Poaceae |
| 1310. | Brachiaria villosa | Poaceae |
| 1311. | Calabrosa aquatica | Poaceae |
| 1312. | Capillipedium assimile | Poaceae |
| 1313. | Capillipedium filiculme | Poaceae |
| 1314. | Capillipedium heugelli | Poaceae |
| 1315. | Capillipedium parviflorum | Poaceae |
| 1316. | Cenchrus biflorus | Poaceae |
| 1317. | Cenchrus catharticus | Poaceae |
| 1318. | Cenchrus ciliaris | Poaceae |
| 1319. | Cenchrus prieurii | Poaceae |
| 1320. | Cenchrus rajasthanensis | Poaceae |
| 1321. | Cenchrus setigerus | Poaceae |
| 1322. | Centotheca lappacea | Poaceae |
| 1323. | Chionachne koenigii | Poaceae |
| 1324. | Chloris barbata | Poaceae |
| 1325. | Chloris dolichostachya | Poaceae |
| 1326. | Chloris gayana | Poaceae |
| 1327. | Chloris montana | Poaceae |
| 1328. | Chloris quinquesetica | Poaceae |
| 1329. | Chloris roxburghiana | Poaceae |
| 1330. | Chloris virgata | Poaceae |
| 1331. | Chrysopogon acicuatus | Poaceae |
| 1332. | Chrysopogon aucheri | Poaceae |
| 1333. | Chrysopogon fulvus | Poaceae |
| 1334. | Chrysopogon glyllus | Poaceae |
| 1335. | Chrysopogon hackelli | Poaceae |
| 1336. | Chrysopogon polyphyllus | Poaceae |
| 1337. | Chrysopogon serrulatus | Poaceae |
| 1338. | Coix aquatica | Poaceae |
| 1339. | Coix gigantea | Poaceae |
| 1340. | Coix lacryma | Poaceae |
| 1341. | Crypsis schoenoides | Poaceae |
| 1342. | Cymbopogon citratus | Poaceae |
| 1343. | Cymbopogon commutatus | Poaceae |
| 1344. | Cymbopogon jiwarancusa | Poaceae |
| 1345. | Cymbopogon martinii | Poaceae |
| 1346. | Cyndon barberi | Poaceae |
| 1347. | Cyndon dactylon | Poaceae |
| 1348. | Cynodon arcuatus | Poaceae |
| 1349. | Dactyloctenium aegyptium | Poaceae |
| 1350. | Dactyloctenium aristatum | Poaceae |
| 1351. | Dactyloctenium sindicum | Poaceae |
| 1352. | Dendrocalamus strictus | Poaceae |
| 1353. | Desmostachya bipinnata | Poaceae |
| 1354. | Dichanthium annulatum | Poaceae |
| 1355. | Dichanthium caricosum | Poaceae |
| 1356. | Diectomis jastigata | Poaceae |
| 1357. | Digitaria abludens | Poaceae |
| 1358. | Digitaria bicomis | Poaceae |
| 1359. | Digitaria cilimis | Poaceae |
| 1360. | Digitaria cruciata | Poaceae |
| 1361. | Digitaria longiflora | Poaceae |
| 1362. | Digitaria pennata | Poaceae |
| 1363. | Digitaria radicosa | Poaceae |
| 1364. | Dignathia hirtell | Poaceae |
| 1365. | Dimera connivens | Poaceae |
| 1366. | Dimera ornithopoda | Poaceae |
| 1367. | Dinebra retroflexa | Poaceae |
| 1368. | Diplachne fusca | Poaceae |
| 1369. | Echinochloa colona | Poaceae |
| 1370. | Echinochloa crus-pavonis | Poaceae |
| 1371. | Echinochloa frumentacea | Poaceae |
| 1372. | Echinochloa stagnina | Poaceae |
| 1373. | Eleusine compressa | Poaceae |
| 1374. | Eleusine coracona | Poaceae |
| 1375. | Eleusine flagelifera | Poaceae |
| 1376. | Eleusine indica | Poaceae |
| 1377. | Elionurus japonica | Poaceae |
| 1378. | Elyonurus royleanus | Poaceae |
| 1379. | Elytrophorus spicatus | Poaceae |
| 1380. | Enneapogon cenchroides | Poaceae |
| 1381. | Enneapogon desvauxii | Poaceae |
| 1382. | Enneapogon persicus | Poaceae |
| 1383. | Enneapogon schimperanus | Poaceae |
| 1384. | Enteropogon prieurii | Poaceae |

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| 1385. | Eragrostiella bifaria | Poaceae |
| 1386. | Eragrostiella brachyphylla | Poaceae |
| 1387. | Eragrostiella nardoides | Poaceae |
| 1388. | Eremopogon foveolatus | Poaceae |
| 1389. | Ergrostis aspera | Poaceae |
| 1390. | Ergrostis atrovirens | Poaceae |
| 1391. | Ergrostis cilianensis | Poaceae |
| 1392. | Ergrostis ciliaris | Poaceae |
| 1393. | Ergrostis coarctata | Poaceae |
| 1394. | Ergrostis curvala | Poaceae |
| 1395. | Ergrostis gangetica | Poaceae |
| 1396. | Ergrostis japonica | Poaceae |
| 1397. | Ergrostis minor | Poaceae |
| 1398. | Ergrostis multicaulis | Poaceae |
| 1399. | Ergrostis nigra | Poaceae |
| 1400. | Ergrostis nutans | Poaceae |
| 1401. | Ergrostis papposa | Poaceae |
| 1402. | Ergrostis pilosa | Poaceae |
| 1403. | Ergrostis riparia | Poaceae |
| 1404. | Ergrostis tef | Poaceae |
| 1405. | Ergrostis tenella | Poaceae |
| 1406. | Ergrostis tenuifolia | Poaceae |
| 1407. | Ergrostis tremula | Poaceae |
| 1408. | Ergrostis unioloides | Poaceae |
| 1409. | Ergrostis viscosa | Poaceae |
| 1410. | Eriochloa fatmensis | Poaceae |
| 1411. | Eriochloa procera | Poaceae |
| 1412. | Euclasta clarkei | Poaceae |
| 1413. | Eulalia fimbriata | Poaceae |
| 1414. | Eulalia trispicala | Poaceae |
| 1415. | Eulaliopsis binata | Poaceae |
| 1416. | Halopyrum mucronatum | Poaceae |
| 1417. | Hemarthria compressa | Poaceae |
| 1418. | Hemarthria proteusa | Poaceae |
| 1419. | Heteropogon contortus | Poaceae |
| 1420. | Heteropogon melanocarpus | Poaceae |
| 1421. | Heteropogon ritchiei | Poaceae |
| 1422. | Hygroryza aristata | Poaceae |
| 1423. | Hymenachne acutigluma | Poaceae |
| 1424. | Isachne globosa | Poaceae |
| 1425. | Isachne miliacea | Poaceae |
| 1426. | Ischaemum diplopogon | Poaceae |
| 1427. | Ischaemum impressum | Poaceae |
| 1428. | Ischaemum indicum | Poaceae |
| 1429. | Ischaemum laxum | Poaceae |
| 1430. | Ischaemum pilosum | Poaceae |
| 1431. | Ischaemum prostratum | Poaceae |
| 1432. | Ischaemum rugosum | Poaceae |
| 1433. | Koeleria argentea | Poaceae |
| 1434. | Koeleria macrantha | Poaceae |
| 1435. | Lalium temulentum | Poaceae |
| 1436. | Lasiuris scindicus | Poaceae |
| 1437. | Latipes senegalensis | Poaceae |
| 1438. | Leersia hexandra | Poaceae |
| 1439. | Leptochloa panicea | Poaceae |
| 1440. | Leptothrium senegalense | Poaceae |
| 1441. | lmperata cylindlica | Poaceae |
| 1442. | lndopoa paupercula | Poaceae |
| 1443. | lsachne elegans | Poaceae |
| 1444. | lschaemum bombaiense | Poaceae |
| 1445. | lseilema anthephoroides | Poaceae |
| 1446. | Melanocenchris abyssinica | Poaceae |
| 1447. | Melanocenchris jacquemontii | Poaceae |
| 1448. | Miscanthes nepalensis | Poaceae |
| 1449. | Mnesithia granularis | Poaceae |
| 1450. | Mnesithia laevis | Poaceae |
| 1451. | Ochlhochlosa compressa | Poaceae |
| 1452. | Ophiuros exaltatus | Poaceae |
| 1453. | Oplismenus bunnannii | Poaceae |
| 1454. | Oplismenus compositus | Poaceae |
| 1455. | Oropetium roxburghianus | Poaceae |
| 1456. | Oropetium rufrpogon | Poaceae |
| 1457. | Oropetium thomaeum | Poaceae |
| 1458. | Oropetium villosulum | Poaceae |
| 1459. | Panicum antidotale | Poaceae |
| 1460. | Panicum atrosanguineum | Poaceae |
| 1461. | Panicum hippothrix | Poaceae |
| 1462. | Panicum maxicum | Poaceae |
| 1463. | Panicum miliaceum | Poaceae |
| 1464. | Panicum nehruense | Poaceae |
| 1465. | Panicum notatum | Poaceae |
| 1466. | Panicum paludosum | Poaceae |
| 1467. | Panicum psilopodium | Poaceae |
| 1468. | Panicum repens | Poaceae |
| 1469. | Panicum sumatrense | Poaceae |
| 1470. | Panicum trypheron | Poaceae |
| 1471. | Panicum turgidum | Poaceae |
| 1472. | Panicum walens | Poaceae |
| 1473. | paspalidium flavidum | Poaceae |
| 1474. | paspalidium geminatum | Poaceae |
| 1475. | Paspalum canarae | Poaceae |
| 1476. | Paspalum dilatatum | Poaceae |
| 1477. | Paspalum paspaloides | Poaceae |
| 1478. | Paspalum scrobiculatum | Poaceae |
| 1479. | Paspalum vaginatum | Poaceae |
| 1480. | Pennisetum glaucum | Poaceae |
| 1481. | Pennisetum hohenackeri | Poaceae |
| 1482. | Pennisetum hordeoides | Poaceae |
| 1483. | Pennisetum orietale | Poaceae |
| 1484. | Pennisetum pedicellatum | Poaceae |

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| 1485. | Pennisetum polystachion | Poaceae |
| 1486. | Pennisetum purpureum | Poaceae |
| 1487. | Perotis hordeifonnis | Poaceae |
| 1488. | Perotis indica | Poaceae |
| 1489. | Phalaris minor | Poaceae |
| 1490. | Phragmites australis | Poaceae |
| 1491. | Phragmites karka | Poaceae |
| 1492. | Piptatherum aequiglume | Poaceae |
| 1493. | Poa annua | Poaceae |
| 1494. | Polypogon monspeliensis | Poaceae |
| 1495. | Pseudobrachiaria deflexa | Poaceae |
| 1496. | Pseudoraphis spinescens | Poaceae |
| 1497. | Rhynchelytrum repens | Poaceae |
| 1498. | Rostraria cristata | Poaceae |
| 1499. | Rostraria pumila | Poaceae |
| 1500. | Rottboellia cochinchinensis | Poaceae |
| 1501. | Saccharum bengalense | Poaceae |
| 1502. | Saccharum griffithii | Poaceae |
| 1503. | Saccharum munja | Poaceae |
| 1504. | Saccharum ravennae | Poaceae |
| 1505. | Saccharum spontaneum | Poaceae |
| 1506. | Sacciolepis myosuroides | Poaceae |
| 1507. | Schizachyrium brevifolium | Poaceae |
| 1508. | Schizachyrium exile | Poaceae |
| 1509. | Schoenefeldia gracilis | Poaceae |
| 1510. | Sehima nervosum | Poaceae |
| 1511. | Sehima sulcatum | Poaceae |
| 1512. | Sehima ischaemoides | Poaceae |
| 1513. | Setaria barbata | Poaceae |
| 1514. | Setaria geniculata | Poaceae |
| 1515. | Setaria homonyma | Poaceae |
| 1516. | Setaria intermedia | Poaceae |
| 1517. | Setaria italica | Poaceae |
| 1518. | Setaria pumila | Poaceae |
| 1519. | Setaria verticillata | Poaceae |
| 1520. | Sorghum arundinaceum | Poaceae |
| 1521. | Sorghum deccanense | Poaceae |
| 1522. | Sorghum halepense | Poaceae |
| 1523. | Sorghum purpureo-sericeum | Poaceae |
| 1524. | Spodiopogon rhizophorus | Poaceae |
| 1525. | Sporobolus arabicus | Poaceae |
| 1526. | Sporobolus capillaris | Poaceae |
| 1527. | Sporobolus coromandelianus | Poaceae |
| 1528. | Sporobolus helvolus | Poaceae |
| 1529. | Sporobolus indicus | Poaceae |
| 1530. | Sporobolus maderaspatanus | Poaceae |
| 1531. | Sporobolus marginatus | Poaceae |
| 1532. | Sporobolus puiferus | Poaceae |
| 1533. | Sporobolus tenuissimus | Poaceae |
| 1534. | Sporobolus toumeuxii | Poaceae |
| 1535. | Sporobolus tremulus | Poaceae |
| 1536. | Sporobolus virginicus | Poaceae |
| 1537. | Stipagrostis hirtigluma | Poaceae |
| 1538. | Stipagrostis paradiscea | Poaceae |
| 1539. | Stipagrostis plumosa | Poaceae |
| 1540. | Tragus biflorus | Poaceae |
| 1541. | Tragus roxburghii | Poaceae |
| 1542. | Tripogon bromoides | Poaceae |
| 1543. | Tripogon jacquemontii | Poaceae |
| 1544. | Tripogon lisboae | Poaceae |
| 1545. | Tripogon purpurascens | Poaceae |
| 1546. | Urochloa mosambilensis | Poaceae |
| 1547. | Urochloa paniloides | Poaceae |
| 1548. | Urochloa setigera | Poaceae |
| 1549. | Urochondra setulosa | Poaceae |
| 1550. | Vetiveria lawsonii | Poaceae |
| 1551. | Vetiveria zizanioides | Poaceae |
| 1552. | Polygala abyssinica | Polygalaceae |
| 1553. | Polygala arvensis | Polygalaceae |
| 1554. | Polygala chinensis | Polygalaceae |
| 1555. | Polygala elongata | Polygalaceae |
| 1556. | Polygala erioptera | Polygalaceae |
| 1557. | Polygala irregularis | Polygalaceae |
| 1558. | Polygala persicariaefolia | Polygalaceae |
| 1559. | Calligonum polygonoides | Polygonaceae |
| 1560. | Corculus leplopus | Polygonaceae |
| 1561. | Emex spinosus | Polygonaceae |
| 1562. | Polygonum amphibium | Polygonaceae |
| 1563. | Polygonum barbarum | Polygonaceae |
| 1564. | Polygonum glabrum | Polygonaceae |
| 1565. | Polygonum hydropiper | Polygonaceae |
| 1566. | Polygonum lapathifolium | Polygonaceae |
| 1567. | Polygonum limbatum | Polygonaceae |
| 1568. | Polygonum nepalensis | Polygonaceae |
| 1569. | Polygonum stagninum | Polygonaceae |
| 1570. | Polygonun plebeium | Polygonaceae |
| 1571. | Rumex crispus | Polygonaceae |
| 1572. | Rumex dentatus | Polygonaceae |
| 1573. | Rumex nepalensis | Polygonaceae |
| 1574. | Eichhornia crassipes | Pontederiaceae |
| 1575. | Monochoria hastata | Pontederiaceae |
| 1576. | Monochoria vaginalis | Pontederiaceae |
| 1577. | Portulaca oleracea | Portulacaceae |
| 1578. | Portulaca pilosa | Portulacaceae |
| 1579. | Portulaca quadrifida | Portulacaceae |
| 1580. | Potamogeton clispus | Potamogetonaceae |
| 1581. | Potamogeton pectinatus | Potamogetonaceae |
| 1582. | Potamogeton | Potamogetonacea |

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| | peifoltatus | e |
| 1583. | Anagallis arvensis | Primulaceae |
| 1584. | Anagallis pumila | Primulaceae |
| 1585. | Primula umbellata | Primulaceae |
| 1586. | Samolus valerandii | Primulaceae |
| 1587. | Rananculus cantoniensis | Ranunculaceae |
| 1588. | Oligomeris linifolia | Resedaceae |
| 1589. | Venttlago denttlculata | Rhamnaceae |
| 1590. | Zizyphus glabrata | Rhamnaceae |
| 1591. | Zizyphus hysudrica | Rhamnaceae |
| 1592. | Zizyphus mauritina | Rhamnaceae |
| 1593. | Zizyphus nummularia | Rhamnaceae |
| 1594. | Zizyphus rugosa | Rhamnaceae |
| 1595. | Zizyphus truncata | Rhamnaceae |
| 1596. | Zizyphus xylopyrus | Rhamnaceae |
| 1597. | Newada procumbens | Rosaceae |
| 1598. | Potentila desertorum | Rosaceae |
| 1599. | Potentila supina | Rosaceae |
| 1600. | Rosa involucrata | Rosaceae |
| 1601. | Antlwcephalus chinensis | Rubiaceae |
| 1602. | Borreria articularis | Rubiaceae |
| 1603. | Borreria hispida | Rubiaceae |
| 1604. | Borreria pusilla | Rubiaceae |
| 1605. | Borreria stricta | Rubiaceae |
| 1606. | Canthium dicoccum | Rubiaceae |
| 1607. | Dentella repens | Rubiaceae |
| 1608. | Fergusonia tetracarpa | Rubiaceae |
| 1609. | Gaillonia calycoptera | Rubiaceae |
| 1610. | Galium aparine | Rubiaceae |
| 1611. | Galium asperifolium | Rubiaceae |
| 1612. | Gardenia turgida | Rubiaceae |
| 1613. | Haldinia cordifolia | Rubiaceae |
| 1614. | Hedyotis aspera | Rubiaceae |
| 1615. | Hedyotis biflora | Rubiaceae |
| 1616. | Hedyotis brachiata | Rubiaceae |
| 1617. | Hedyotis corymbosa | Rubiaceae |
| 1618. | Hedyotis gracilis | Rubiaceae |
| 1619. | Hedyotis herbacea | Rubiaceae |
| 1620. | Hedyotis nagporensis | Rubiaceae |
| 1621. | Hedyotis pumila | Rubiaceae |
| 1622. | Hedyotis umbellata | Rubiaceae |
| 1623. | Hedyotis verticillata | Rubiaceae |
| 1624. | Hymenodictyon excelsum | Rubiaceae |
| 1625. | Ixora arborea | Rubiaceae |
| 1626. | Ixora brachiata | Rubiaceae |
| 1627. | Ixora polyantha | Rubiaceae |
| 1628. | Knoxia sumatrensis | Rubiaceae |
| 1629. | Mitragyna parviflora | Rubiaceae |
| 1630. | Morinda tomentosa | Rubiaceae |
| 1631. | Neanotis calycina | Rubiaceae |
| 1632. | Neanotis lancifolia | Rubiaceae |
| 1633. | Neanotis montholoni | Rubiaceae |
| 1634. | Neanotis rheedei | Rubiaceae |
| 1635. | Oldenlandia clausa | Rubiaceae |
| 1636. | Oldenlandia diifusa | Rubiaceae |
| 1637. | Paederia foetida | Rubiaceae |
| 1638. | Randia fasciculata | Rubiaceae |
| 1639. | Randia tetrasperma | Rubiaceae |
| 1640. | Richardia brasiliensis | Rubiaceae |
| 1641. | Spermadictyon sauveolens | Rubiaceae |
| 1642. | Xeromphis spinosa | Rubiaceae |
| 1643. | Xeromphis uliginosa | Rubiaceae |
| 1644. | Aegle marmelos | Rutaceae |
| 1645. | Clausena pentaphyua | Rutaceae |
| 1646. | Feronia limonia | Rutaceae |
| 1647. | Murraya koenigii | Rutaceae |
| 1648. | Nartngi crenulata | Rutaceae |
| 1649. | Salix acmophyua | Salicaceae |
| 1650. | Salix tetrasperma | Salicaceae |
| 1651. | Salvador persica | Salvadoraceae |
| 1652. | Salvadora oleoides | Salvadoraceae |
| 1653. | Santalum album | Santalaceae |
| 1654. | Cardiospermum halicacabum | Sapindaceae |
| 1655. | Sapindus emarginatus | Sapindaceae |
| 1656. | Schleichera oleosa | Sapindaceae |
| 1657. | Madhuca longifolia | Sapotaceae |
| 1658. | Manilkara hexandra | Sapotaceae |
| 1659. | Mimusops elengi | Sapotaceae |
| 1660. | Anticharis glandulosa | Scrophulariaceae |
| 1661. | Anticharis linearis | Scrophulariaceae |
| 1662. | Anticharis senegalensis | Scrophulariaceae |
| 1663. | Antirrhinum orontium | Scrophulariaceae |
| 1664. | Buchnera hamiltonii | Scrophulariaceae |
| 1665. | Buchnera hispida | Scrophulariaceae |
| 1666. | Buchnera monnieri | Scrophulariaceae |
| 1667. | Buchnera procumbens | Scrophulariaceae |
| 1668. | Centrathera nepalensis | Scrophulariaceae |
| 1669. | Craterostigma plantaginea | Scrophulariaceae |
| 1670. | Glossostigma diandra | Scrophulariaceae |
| 1671. | Kickxia incana | Scrophulariaceae |
| 1672. | Kickxia ramosissima | Scrophulariaceae |
| 1673. | Limnophila heterophylla | Scrophulariaceae |
| 1674. | Limnophila indica | Scrophulariaceae |
| 1675. | Limnophila rugosa | Scrophulariaceae |
| 1676. | Limnophila sessiliflora | Scrophulariaceae |
| 1677. | Lindenbergia indicum | Scrophulariaceae |
| 1678. | Lindenbergia macrostachya | Scrophulariaceae |
| 1679. | Lindernia anagallis | Scrophulariaceae |
| 1680. | Lindernia antipoda | Scrophulariaceae |
| 1681. | Lindernia bractioides | Scrophulariaceae |
| 1682. | Lindernia ciliata | Scrophulariaceae |
| 1683. | Lindernia cruciata | Scrophulariaceae |
| 1684. | Lindernia hyssopioides | Scrophulariaceae |
| 1685. | Lindernia micrantha | Scrophulariaceae |
| 1686. | Lindernia multiflora | Scrophulariaceae |
| 1687. | Lindernia nummularifolia | Scrophulariaceae |
| 1688. | Lindernia parviflora | Scrophulariaceae |
| 1689. | Lindernia procumben | Scrophulariaceae |
| 1690. | Mazus pumilus | Scrophulariaceae |
| 1691. | Microcarpaea minima | Scrophulariaceae |

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| 1692. | Mimulus strictus | Scrophulariaceae |
| 1693. | Peplidium maritimum | Scrophulariaceae |
| 1694. | Scoparia dulcis | Scrophulariaceae |
| 1695. | Sopubia delphillifolia | Scrophulariaceae |
| 1696. | Stemodia viscosa | Scrophulariaceae |
| 1697. | Striga angustifolia | Scrophulariaceae |
| 1698. | Striga asiatica | Scrophulariaceae |
| 1699. | Striga densiflora | Scrophulariaceae |
| 1700. | Striga gesneroides | Scrophulariaceae |
| 1701. | Suteria involucrata | Scrophulariaceae |
| 1702. | Torenia aerinea | Scrophulariaceae |
| 1703. | Verbascum chinensis | Scrophulariaceae |
| 1704. | Verbascum thapsus | Scrophulariaceae |
| 1705. | Veronica agrestis | Scrophulariaceae |
| 1706. | Veronica anagallis-aquatica | Scrophulariaceae |
| 1707. | Veronica beccabunga | Scrophulariaceae |
| 1708. | Auanthus exelsa | Simaroubaceae |
| 1709. | Smilax zeylanica | Smilacaceae |
| 1710. | Datura fastuosa | Solanaceae |
| 1711. | Datura ferox | Solanaceae |
| 1712. | Datura innoxia | Solanaceae |
| 1713. | Datura stramonium | Solanaceae |
| 1714. | Lycium barbarum | Solanaceae |
| 1715. | Lycium edgeworthii | Solanaceae |
| 1716. | Lycium europoeum | Solanaceae |
| 1717. | Nicandra physaloides | Solanaceae |
| 1718. | Nicotiana alata | Solanaceae |
| 1719. | Nicotiana plumbaginifolia | Solanaceae |
| 1720. | Physalis angulata | Solanaceae |
| 1721. | Physalis micrantha | Solanaceae |
| 1722. | Physalis minima | Solanaceae |
| 1723. | Physalis peruviana | Solanaceae |
| 1724. | Solamun albicaule | Solanaceae |
| 1725. | Solanum anguivi | Solanaceae |
| 1726. | Solanum ferox | Solanaceae |
| 1727. | Solanum incanum | Solanaceae |
| 1728. | Solanum nigrum | Solanaceae |
| 1729. | Solanum surrettense | Solanaceae |
| 1730. | Solanum torvum | Solanaceae |
| 1731. | Solanum trilobatum | Solanaceae |
| 1732. | Solanum virginianum | Solanaceae |
| 1733. | Solanum viuosum | Solanaceae |
| 1734. | Withania coagulans | Solanaceae |
| 1735. | Withania somnifera | Solanaceae |
| 1736. | Sphenoclea zeylanica | Sphenocleaceae |
| 1737. | Mitreolap etiolata | Spigellaceae |
| 1738. | Eriolaena hookeriana | Sterculiaceae |
| 1739. | Eriolaena quinqueloeularis | Sterculiaceae |
| 1740. | Finniana eolorata | Sterculiaceae |
| 1741. | Guazuma ulmifolia | Sterculiaceae |
| 1742. | Helicteres isora | Sterculiaceae |
| 1743. | Melhania denhamii | Sterculiaceae |
| 1744. | Melhania futteyporensis | Sterculiaceae |
| 1745. | Melhania hamutoniana | Sterculiaceae |
| 1746. | Melochia eorehorifolia | Sterculiaceae |
| 1747. | Melochia magnifolia | Sterculiaceae |
| 1748. | Pterospermum aeerifolium | Sterculiaceae |
| 1749. | Stereulia foetida | Sterculiaceae |
| 1750. | Stereulia guttata | Sterculiaceae |
| 1751. | Stereulia urens | Sterculiaceae |
| 1752. | Stereulia villosa | Sterculiaceae |
| 1753. | Waltheria indica | Sterculiaceae |
| 1754. | Tamarix aphylla | Tamaricaceae |
| 1755. | Tamarix dioica | Tamaricaceae |
| 1756. | Tamarix ericoides | Tamaricaceae |
| 1757. | Tamarix indica | Tamaricaceae |
| 1758. | Corehorus aestuans | Tiliaceae |
| 1759. | Corehorus depressus | Tiliaceae |
| 1760. | Corehorus eapsularis | Tiliaceae |
| 1761. | Corehorus faseicularis | Tiliaceae |
| 1762. | Corehorus olitorius | Tiliaceae |
| 1763. | Corehorus tridens | Tiliaceae |
| 1764. | Corehorus triloeularis | Tiliaceae |
| 1765. | Corehorus urticifolius | Tiliaceae |
| 1766. | Grewia abutilifolia | Tiliaceae |
| 1767. | Grewia damine | Tiliaceae |
| 1768. | Grewia disperma | Tiliaceae |
| 1769. | Grewia elastica | Tiliaceae |
| 1770. | Grewia flaveseens | Tiliaceae |
| 1771. | Grewia hirsuta | Tiliaceae |
| 1772. | Grewia oppositifolia | Tiliaceae |
| 1773. | Grewia orbiculata | Tiliaceae |
| 1774. | Grewia orientalis | Tiliaceae |
| 1775. | Grewia polygama | Tiliaceae |
| 1776. | Grewia sclerophylla | Tiliaceae |
| 1777. | Grewia subinequalis | Tiliaceae |
| 1778. | Grewia tenex | Tiliaceae |
| 1779. | Grewia tuiaefolia | Tiliaceae |
| 1780. | Grewia vulosa | Tiliaceae |
| 1781. | Triumfetta annua | Tiliaceae |
| 1782. | Triumfetta pentandra | Tiliaceae |
| 1783. | Triumfetta puosa | Tiliaceae |
| 1784. | Triumfetta rhomboidea | Tiliaceae |
| 1785. | Triumfetta rotundifolia | Tiliaceae |
| 1786. | Trapa natans | Trapaceae |
| 1787. | Typha angustata | Typhaceae |
| 1788. | Typha elephantina | Typhaceae |
| 1789. | Celtis tetrandra | Ulmaceae |
| 1790. | Holoptelea integrifolia | Ulmaceae |
| 1791. | Trema orientalis | Ulmaceae |
| 1792. | Trema politolia | Ulmaceae |
| 1793. | Girardinia zeylanica | Urticaceae |
| 1794. | Laportea interrupta | Urticaceae |
| 1795. | Lecanthus pedicularis | Urticaceae |
| 1796. | Neodistemon indicum | Urticaceae |
| 1797. | Pilea microphyua | Urticaceae |
| 1798. | Pilea zeylanica | Urticaceae |
| 1799. | Pouzolzia pentandra | Urticaceae |
| 1800. | Urtica dioica | Urticaceae |
| 1801. | Villebrunia frutescens | Urticaceae |
| 1802. | Vahelia digyna | Vahliaceae |
| 1803. | Vahelia viscosa | Vahliaceae |
| 1804. | Chascanum | Verbenaceae |

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| | marrubifolium | |
| 1805. | Clearodendrum aculeatum | Verbenaceae |
| 1806. | Clearodendrum indicum | Verbenaceae |
| 1807. | Clearodendrum serratum | Verbenaceae |
| 1808. | Clerodendrun phlomidis | Verbenaceae |
| 1809. | Duranta repens | Verbenaceae |
| 1810. | Gmelina arborea | Verbenaceae |
| 1811. | Gmelina asiatica | Verbenaceae |
| 1812. | Holmskiolda sanguinea | Verbenaceae |
| 1813. | Lantana camara | Verbenaceae |
| 1814. | Lantana indica | Verbenaceae |
| 1815. | Tectona grandis | Verbenaceae |
| 1816. | Verbena bonariensis | Verbenaceae |
| 1817. | Verbena oiflcirullis | Verbenaceae |
| 1818. | Vitex agnus-castus | Verbenaceae |
| 1819. | Vitex negundo | Verbenaceae |
| 1820. | Hybanthes enneaspermus | Violaceae |
| 1821. | Viola betonicifolid | Violaceae |
| 1822. | Viola cinerea | Violaceae |
| 1823. | Viola odorata | Violaceae |
| 1824. | Ampelocissus lattfolia | Vitaceae |
| 1825. | Cayratia trifolia | Vitaceae |
| 1826. | Cissus heyneana | Vitaceae |
| 1827. | Cissus repanda | Vitaceae |
| 1828. | Zanichellta palustris | Zanichelliaceae |
| 1829. | Curcuma amada | Zingiberaceae |
| 1830. | Curcuma angustifolia | Zingiberaceae |
| 1831. | Curcuma aromatica | Zingiberaceae |
| 1832. | Curcuma inadora | Zingiberaceae |
| 1833. | Curcuma pseudomontana | Zingiberaceae |
| 1834. | Fagonia bruguieri | Zygophyllaceae |
| 1835. | Fagonia cretica | Zygophyllaceae |
| 1836. | Fagonia schweinfurthii | Zygophyllaceae |
| 1837. | Peganum harmala | Zygophyllaceae |
| 1838. | Seetzellia lanata | Zygophyllaceae |
| 1839. | Tribulus alatus | Zygophyllaceae |
| 1840. | Tribulus pentandrus | Zygophyllaceae |
| 1841. | Tribulus rajasthanensis. | Zygophyllaceae |
| 1842. | Tribulus terrestris | Zygophyllaceae |
| 1843. | Zygophyllum simplex | Zygophyllaceae |

Source : Based on authentic literatures and field surveys

## XXXV. MEDICINAL PLANT FAMILIES OF RAJASTHAN

The author has attempt his best efforts to trace out the names of Medicinal Plant families which are found in Rajasthan. Table : 1.18**.** illustrates the distribution of Medicinal Plant families (number of Medicinal Plant species-wise) of Rajasthan.

The author has traced out 137 Medicinal Plant families which are well illustrated with their number of Medicinal Plant species-wise distribution in table : 1.18. It is very interesting to mention here that the total number of Medicinal Plant species are not same by their number in different Medicinal Plant families which are 137 in total. As per table : 1.18. the first Medicinal Plant family is Acanthaceae which include total 80 Medicinal Plant species whereas the last Medicinal Plant family is Zygophyllaceae which include 10 Medicinal Plant species also. There are 19 Medicinal Plant families which include only single species for example Balsaminaceae, Crassulaceae, Fumariaceae, and Zanichelliaceae etc., etc. The maximum number of Medicinal Plants i.e. 282 is covered by Poaceae Medicinal Plant family.

**Table : 1.18. Family-wise Contribution of Medicinal Plants in Rajasthan**

| Sl. No | Medicinal Plant Family | No. of Medicinal Plant Species | Contribution (in %) |
|---|---|---|---|
| 1. | Acanthaceae | 80 | 4.34 |
| 2. | Aizoaceae | 8 | 0.43 |
| 3. | Alangiaceae | 4 | 0.22 |
| 4. | Amaranthaceae | 29 | 1.57 |
| 5. | Amaryllidaceae | 2 | 0.11 |
| 6. | Anacardiaceae | 5 | 0.27 |
| 7. | Annonaceae | 3 | 0.16 |
| 8. | Apiaceae | 11 | 0.6 |
| 9. | Apocynaceae | 11 | 0.6 |
| 10. | Araceae | 7 | 0.38 |
| 11. | Arecaceae | 3 | 0.16 |
| 12. | Aristolochiaceae | 2 | 0.11 |
| 13. | Asclepiadace | 2 | 0.11 |
| 14. | Asclepiadaceae | 24 | 1.36 |
| 15. | Asteraceae | 132 | 7.16 |
| 16. | Balanitaceae | 2 | 0.11 |
| 17. | Balsaminaceae | 1 | 0.05 |
| 18. | Basellaceae | 1 | 0.05 |
| 19. | Begoniaceae | 1 | 0.05 |
| 20. | Berberidaceae | 1 | 0.05 |
| 21. | Bignoniaceae | 6 | 0.33 |
| 22. | Bombacaceae | 2 | 0.11 |
| 23. | Boraginaceae | 24 | 1.3 |
| 24. | Brassicaceae | 17 | 0.92 |
| 25. | Bunnanniaceae | 1 | 0.05 |
| 26. | Burseraceae | 1 | 0.05 |
| 27. | Butomaceae | 1 | 0.05 |
| 28. | Cactaceae | 3 | 0.16 |
| 29. | Caesalpinioideae | 23 | 1.25 |
| 30. | Campanulaceae | 4 | 0.22 |
| 31. | Cannabinaceae | 1 | 0.05 |
| 32. | Cannaceae | 1 | 0.05 |
| 33. | Capparaceae | 13 | 0.71 |
| 34. | Caryophyllaceae | 8 | 0.43 |
| 35. | Celastraceae | 3 | 0.16 |
| 36. | Ceratophyllaceae | 1 | 0.05 |
| 37. | Chenopodiaceae | 14 | 0.76 |
| 38. | Cleomaceae | 8 | 0.43 |
| 39. | Cochleospermaceae | 1 | 0.05 |

| Sl. No | Medicinal Plant Family | No. of Medicinal Plant Species | Contribution (in %) |
|---|---|---|---|
| 40. | Combretaceae | 10 | 0.54 |
| 41. | Commelinaceae | 20 | 1.09 |
| 42. | Convolvulaceae | 55 | 2.98 |
| 43. | Crassulaceae | 1 | 0.05 |
| 44. | Cucurbitaceae | 34 | 1.84 |
| 45. | Cuscutaceae | 5 | 0.27 |
| 46. | Cyperaceae | 97 | 5.26 |
| 47. | Dioscoreaceae | 4 | 0.22 |
| 48. | Ebenaceae | 4 | 0.22 |
| 49. | Ehretiaceae | 11 | 0.6 |
| 50. | Elatinaceae | 6 | 0.33 |
| 51. | Eriocaulaceae | 7 | 0.38 |
| 52. | Euphorbiaceae | 57 | 3.09 |
| 53. | Fabaceae | 185 | 10.04 |
| 54. | Flacourtiaceae | 2 | 0.11 |
| 55. | Fumariaceae | 1 | 0.05 |
| 56. | Gentianaceae | 12 | 0.65 |
| 57. | Geraniaceae | 3 | 0.16 |
| 58. | Gesneriaceae | 1 | 0.05 |
| 59. | Haloragaceae | 3 | 0.16 |
| 60. | Hydrocharitaceae | 7 | 0.38 |
| 61. | Hypoxidaceae | 2 | 0.11 |
| 62. | Juncaceae | 1 | 0.05 |
| 63. | Lamiaceae | 44 | 2.39 |
| 64. | Lauraceae | 1 | 0.05 |
| 65. | Leeaceae | 2 | 0.11 |
| 66. | Lemnaceae | 5 | 0.27 |
| 67. | Lentibulariaceae | 5 | 0.27 |
| 68. | Liliaceae | 13 | 0.71 |
| 69. | Linaceae | 3 | 0.16 |
| 70. | Loranthaceae | 1 | 0.05 |
| 71. | Lythraceae | 15 | 8.19 |
| 72. | Malpighiaceae | 1 | 0.05 |
| 73. | Malvaceae | 46 | 2.5 |
| 74. | Martyniaceae | 1 | 0.05 |
| 75. | Meliaceae | 2 | 0.11 |
| 76. | Menispennaceae | 6 | 0.33 |
| 77. | Menyanthaceae | 3 | 0.16 |
| 78. | Mimosoideae | 32 | 1.74 |
| 79. | Molluginaceae | 9 | 0.49 |
| 80. | Moraceae | 13 | 0.71 |
| 81. | Moringaceae | 2 | 0.11 |
| 82. | Myrtaceae | 3 | 0.16 |
| 83. | Najadaceae | 4 | 0.22 |
| 84. | Nyctaginaceae | 8 | 0.43 |
| 85. | Nymphaeaceae | 4 | 0.22 |
| 86. | Oleaceae | 8 | 0.43 |
| 87. | Onagraceae | 8 | 0.43 |
| 88. | Orchidaceae | 10 | 0.54 |
| 89. | Orobanchaceae | 3 | 0.16 |
| 90. | Oxalidaceae | 5 | 0.27 |
| 91. | Pandanaceae | 1 | 0.05 |
| 92. | Papaveraceae | 3 | 0.16 |
| 93. | Passunoraceae | 1 | 0.05 |
| 94. | Pedaliaceae | 2 | 0.11 |
| 95. | Periplocaceae | 4 | 0.22 |
| 96. | Phytolacaceae | 1 | 0.05 |
| 97. | Piperaceae | 3 | 0.16 |
| 98. | Plantaginaceae | 5 | 0.27 |
| 99. | Plumbaginaceae | 3 | 0.16 |
| 100. | Poaceae | 282 | 15.3 |
| 101. | Polygalaceae | 7 | 0.38 |
| 102. | Polygonaceae | 15 | 0.81 |
| 103. | Pontederiaceae | 3 | 0.16 |
| 104. | Portulacaceae | 3 | 0.16 |
| 105. | Potamogetonaceae | 3 | 0.16 |
| 106. | Primulaceae | 4 | 0.22 |
| 107. | Ranunculaceae | 1 | 0.05 |
| 108. | Resedaceae | 1 | 0.05 |
| 109. | Rhamnaceae | 8 | 0.43 |
| 110. | Rosaceae | 4 | 0.22 |
| 111. | Rubiaceae | 43 | 2.33 |
| 112. | Rutaceae | 5 | 0.27 |
| 113. | Salicaceae | 2 | 0.11 |
| 114. | Salvadoraceae | 2 | 0.11 |
| 115. | Santalaceae | 1 | 0.05 |
| 116. | Sapindaceae | 3 | 0.16 |
| 117. | Sapotaceae | 3 | 0.16 |
| 118. | Scrophulariaceae | 48 | 2.6 |
| 119. | Simaroubaceae | 1 | 0.05 |
| 120. | Smilacaceae | 1 | 0.05 |
| 121. | Solanaceae | 26 | 1.41 |
| 122. | Sphenocleaceae | 1 | 0.05 |
| 123. | Spigellaceae | 1 | 0.05 |
| 124. | Sterculiaceae | 16 | 0.87 |
| 125. | Tamaricaceae | 4 | 0.22 |
| 126. | Tiliaceae | 28 | 1.52 |
| 127. | Trapaceae | 1 | 0.05 |
| 128. | Typhaceae | 2 | 0.11 |
| 129. | Ulmaceae | 4 | 0.22 |
| 130. | Urticaceae | 9 | 0.49 |
| 131. | Vahliaceae | 2 | 0.11 |
| 132. | Verbenaceae | 16 | 0.87 |
| 133. | Violaceae | 4 | 0.22 |
| 134. | Vitaceae | 4 | 0.22 |
| 135. | Zanichelliaceae | 1 | 0.05 |
| 136. | Zingiberaceae | 5 | 0.27 |
| 137. | Zygophyllaceae | 10 | 0.54 |
| | Total | 1843 | 100 |

Source : Based on table : 1.17

## XXXVI. FAMILY-WISE CONTRIBUTION OF NUMBER OF MEDICINAL PLANT SPECIES OF RAJASTHAN

Table :1.19. illustrates the distribution of 'family-wise contribution' of number of Medicinal Plant species of Shekhawati Region. It illustrates the details of all 137

Medicinal Plant families, with their contribution of each Medicinal Plant family separately from 'contribution of Medicinal Plant family in percentage' with regarding total number of Medicinal Plant families i.e. 137 for the area under study.

**Table : 1.19 Family-wise Contribution' of Number of Medicinal Plant Species of Rajasthan**

| Contributory Groups of Medicinal Plant Species (In %) | Number of Medicinal Plant Families | Percentage |
|---|---|---|
| A - ( upto 1%) | 118 | 86.4 |
| B - ( 1% to 2%) | 9 | 6.5 |
| C - (2% to 3%) | 3 | 2.1 |
| D - (3% to 4%) | 1 | 0.7 |
| E - (4%to 5%) | 1 | 0.7 |
| F - ( above 5%) | 5 | 3.6 |
| Total in Percentage | 137 | 100 |

Source : Based on table :1.18

Further in this context, the author has simplified this aspect by making six (A to F) 'contributory groups of Medicinal Plant families' as shown table:1.19. which is naturally based on table:1.19. The table:1.19. illustrate the six 'contributory groups of Medicinal Plant families' with their respective percentage of contribution in total number of Rajasthan's Medicinal Plant families i.e. 137. Contributory group A- (up to 1.0%) covers the maximum percentage of contribution i.e. about 86.4 percent by including maximum number of Medicinal Plant families which are 118 out of total 137 Medicinal Plant families of Rajasthan. Whereas, contributory groups-D (3% to 4%) and E ((4% to 5%)) contributes minimum percentage i.e. 0.7 percent by each by covering only one Medicinal Plant families, respectively.

## XXXVII. COMPARATIVE ANALYSIS

One can visualise very well that when the author is presenting the total number of Medicinal Plant species and total number of Medicinal Plant families for the area under study i.e. Shekhawati Region, then naturally it becomes a curiosity of an applied phytogeographer that on behalf of this all above mentioned paragraphs as well as description that, what will be the position of contribution of Shekhawati Region with reference to Rajasthan's total number of Medicinal Plant species as well as Medicinal Plant families.

**Table : 1.20. Family-wise Contribution of Number of Medicinal Plant Species**

| Sl. No. | Medicinal Plant Family | No. of Medicinal Plant Species | | Contribution (in %) |
|---|---|---|---|---|
| | | Rajasthan | Shekhawati Region | |
| 1. | Acanthaceae | 80 | 6 | 7.5 |
| 2. | Aizoaceae | 8 | 1 | 12.5 |
| 3. | Amaranthaceae | 29 | 10 | 34.48 |
| 4. | Asclepiadace | 2 | 2 | 100 |
| 5. | Asclepiadaceae | 24 | 2 | 8.33 |
| 6. | Asteraceae | 132 | 11 | 8.33 |
| 7. | Balanitaceae | 2 | 2 | 100 |
| 8. | Bignoniaceae | 6 | 1 | 16.67 |
| 9. | Boraginaceae | 24 | 1 | 4.17 |
| 10. | Caesalpinioideae | 23 | 2 | 8.7 |
| 11. | Capparaceae | 13 | 2 | 15.38 |
| 12. | Caryophyuaceae | 8 | 2 | 25 |
| 13. | Celastraceae | 3 | 1 | 33.33 |
| 14. | Chenopodiaceae | 14 | 1 | 7.14 |
| 15. | Commelinaceae | 20 | 1 | 5 |
| 16. | Convolvulaceae | 55 | 4 | 7.27 |
| 17. | Cucurbitaceae | 34 | 1 | 2.94 |
| 18. | Cyperaceae | 97 | 2 | 2.06 |
| 19. | Elatinaceae | 6 | 2 | 33.33 |
| 20. | Euphorbiaceae | 57 | 3 | 5.26 |
| 21. | Fabaceae | 185 | 14 | 7.57 |
| 22. | Hydrocharitaceae | 7 | 1 | 14.29 |
| 23. | Lamiaceae | 44 | 1 | 2.27 |
| 24. | Lemnaceae | 5 | 1 | 20 |
| 25. | Lythraceae | 15 | 2 | 13.33 |
| 26. | Meliaceae | 2 | 1 | 50 |
| 27. | Mimosoideae | 32 | 6 | 18.75 |
| 28. | Molluginaceae | 9 | 3 | 33.33 |
| 29. | Najadaceae | 4 | 1 | 25 |
| 30. | Onagraceae | 8 | 1 | 12.5 |

| Sl. No. | Medicinal Plant Family | No. of Medicinal Plant Species | | Contribution |
|---|---|---|---|---|
| 31. | Orobanchaceae | 3 | 1 | 33.33 |
| 32. | Papaveraceae | 3 | 1 | 33.33 |
| 33. | Periplocaceae | 4 | 1 | 25 |
| 34. | Poaceae | 282 | 31 | 10.99 |
| 35. | Polygalaceae | 7 | 1 | 14.29 |
| 36. | Polygonaceae | 15 | 2 | 13.33 |
| 37. | Portulacaceae | 3 | 2 | 66.67 |
| 38. | Rhamnaceae | 8 | 2 | 25 |
| 39. | Rosaceae | 4 | 1 | 25 |
| 40. | Rubiaceae | 43 | 2 | 4.65 |
| 41. | Salvadoraceae | 2 | 2 | 100 |
| 42. | Scrophulariaceae | 48 | 2 | 4.17 |
| 43. | Solanaceae | 26 | 6 | 23.08 |
| 44. | Tiliaceae | 28 | 1 | 3.57 |
| 45. | Vahliaceae | 2 | 1 | 50 |
| 46. | Verbenaceae | 16 | 1 | 6.25 |
| 47. | Violaceae | 4 | 1 | 25 |
| 48. | Zygophyllaceae | 10 | 2 | 20 |
| | **Total** | **1456** | **148** | **10.16** |

Source : Based on table : 1.1.15 and 1.18 Source : Based on table : 1.1.14 and 1.1.17

Table:1.1.20. is presenting a comparative account of the total number of Medicinal Plant species and Medicinal Plant families which are common in both sides that is in Shekhawati Region as well as in Rajasthan. Naturally, it illustrates the Medicinal Plant family-wise contribution (in percent) of Shekhawati Region with reference to Rajasthan. Those Medicinal Plant families which are common in Shekhawati Region as well as in Rajasthan (without considering their total number of Medicinal Plant species) have been considered here as their 100 percent contribution at the part of their availability of phytogeographic distribution for the area under study. In this regard, it is revealed from the above mentioned table that there are only three Medicinal Plant families which have their 100 percent contribution viz; Asclepiadace, Balanitaceae and Salvadoraceae. Two Medicinal Plant families have their 50 percent contribution with reference to Rajasthan are following - Meliaceae and Vahliaceae. Six Medicinal Plant families have their contribution of Shekhawati Region with reference to Rajasthan which is below 25 percent viz; Caryophyuaceae, Najadaceae, Periplocaceae, Rhamnaceae, Rosaceae and Violaceae Where as some Medicinal Plant families have their contribution of Shekhawati Region with reference to Rajasthan which is below 10 percent viz; Acanthaceae, Asclepiadaceae, Asteraceae, Boraginaceae, Caesalpinioideae, Chenopodiaceae, Commelinaceae, Convolvulaceae, Cucurbitaceae, Cyperaceae, Euphorbiaceae, Fabaceae, Lamiaceae, Rubiaceae, Scrophulariaceae, Tiliaceae and Verbenaceae.

**Table : 1.21. Comparative Analysis of Total Number of Medicinal Plant Species**

| S.No. | Number of Medicinal Plant Species | | Contribution (In %) |
|---|---|---|---|
| | In Rajasthan | In Shekhawati Region | |
| Number | 1843 | 148 | 8 |
| Percentage | 100 | 100 | |

Further in this context that the author made his best attempt to present a comparatively analysis at the part of total number of Medicinal Plant species of Shekhawati Region with reference to Rajasthan i.e. contribution point of view. It is very interesting to mentioned here from total number of Medicinal Plant species point of view, Shekhawati Region contributes about 8 percent only with reference to Rajasthan as shown in table:1.21.

**Table : 1.22. Comparative Analysis of Total Number of Medicinal Plant Families**

| S.No. | Number of Medicinal Plant Families | | Contribution (In %) |
|---|---|---|---|
| | In Rajasthan | In Shekhawati Region | |
| Number | 137 | 48 | |
| Percentage | 100 | 100 | 35 |

Source : Based on table : 1.15 and 1.18

Further in this context that the author made his best attempt to present a comparatively analysis at the part of total number of Medicinal Plant families of Shekhawati Region with reference to Rajasthan i.e. contribution point of view. It is very interesting to mentioned here from total number of Medicinal Plant families point of view, Shekhawati Region contributes about 35 percent with reference to Rajasthan as shown in table:1.22.

On the basis of table: 1.21 and table: 1.22 the author, it is quite obvious by the above mentioned tables about the present position of contribution of Shekhawati Region with reference to Rajasthan at the part of number of Medicinal Plant species as well as Medicinal Plant families. In brief, one can visualise very well the Shekhawati Region contributed more by percentage at the part of Medicinal Plant families about 35 percent rather then at the part of number of Medicinal Plant species about 8 percent, respectively.

## XXXVIII. DOMINANT MULTI-PURPOSE MEDICINAL PLANT SPECIES

Apart from the written complete or incomplete records about ancient medicinal herbs, some knowledge on the subject has also descended through generations, and has survived through times among the present-day primitive societies, i.e. among the aboriginal tribes living in remote forest areas. This knowledge has come through oral folklore. These studies are now classed as a specialised branch of Botany i.e. Ethnobotany. Some years ago, initial or earlier researches on this subject among the aborigines of central India numerous reports of medicinal uses of plants, so far unknown in literature, where recorded; and interesting observations on certain plants have been included in the present work.

The question of subjecting medicinal herbs to modern scientific tests has often been raised. Clinical and pharmacological tests on alkaloids extracted from well-known and reputed medicinal herbs sometimes show distinctly negative results whereas, such observations should prompt us to careful and critical reassessment of these herbs, there is yet another aspect of the problem. It is possible that the efficacy of the herb depended on the total effect of the plant contents rather than the one or few chemical fractions separated from the herb. Moreover, the time of collection, stage of growth of plant (e.g. opened or unopened flowers, young or mature leaves, pre-or post-flowering stage), locality of natural occurrence i.e. habitat point of view or place of cultivation, all influence overall the properties of the drug.

A short description of the plant is provided by covering the characteristics which should help the reader in visualising the general structure or habit of the plant and it's parts. As far as practicable, technical terms and details are avoided. It was realised that certain technical terms may be excluded only at the risk of inaccuracy of statements; these have been retained. It is conventional to use 'telegraphic' language in botanical descriptions; the same has been done here. The descriptions have been based on a fairly wide range of plant specimens which are placed in herbaria.

Actually, there is no plant species on this planet which may be termed as useless indeed, whether it is another matter that mankind have acquire knowledge of the uses or applications of the particular plant species. One can visualize very well the uncountable uses at the part of applied aspect of plant kingdom which left no activity of daily life of human beings requirements without any sort of their impact of usefulness by quantitative or qualitative point of view. The green cover on the earth surface whatever in the form of vegetation or forest wealth is an essential component as well as part and portion of the surrounding complex of the nature of which man is an important biological elements. Hence, generally the plant species whose uses are known to the human beings in applied sense for the mankind welfare as well as for domestic animals are termed as useful plant species - at the part of his knowledge.

The applied sense of plant species is very old at the part of human knowledge which has been acquired by him partly from the part literature, traditional use of particular plant species by the native people or community with specific reference to the tribes which are living in forest areas from centuries back, also from the proverbs used from generation after generation in their folklore which includes the phrases of applied sense of many plant species which have applied values with specific reference to the medicinal applied part. In other words to say the use of plant species as native or indigenous medicines in the folklore of the tribal society and in the literature of Vedhs system to cure different kind of diseases at the part of welfare of mankind as well as domestic animal also.

The research paper matter has already been covered by the analytic part of scrutinizing of the plant species which are medicinally useful for the welfare of human beings from the existing vegetation as well as forest wealth of Shekhawati Region, Rajasthan. The particular research paper is presently concerned with those medicinal plant species which have at least three or more than three medicinal uses in the cure of different kind of diseases or pains, such kind of medicinal plant species are here termed as Multi-purpose Medicinal Plant Species. Out of total 122 medicinal plant species of Shekhawati Region, the author investigated that among them 15% medicinal plant species fall under the group of Multi-purpose Medicinal Plant Species, as illustrated in the **Table-1.23**. It includes a list of 15 Multi-purpose Medicinal Plant Species of Shekhawati Region, Rajasthan.

**Table-1.23 Applied Dominant Multi-Purpose Medicinal Plant Species**

| S.No. | Botanical Name | Local Name | Vegetational Group |
|---|---|---|---|
| 1. | Acacia senegal | Kheri | Tree |
| 2. | Adhatoda vasica | Arusa | Tree as well as Shrub |
| 3 | Asparagus racemosus | Satawar | Under Shrub |
| 4. | Aloe vera | Gawarpatha | Under Shrub |
| 5. | Azadirachta indica | Neem | Tree |
| 6. | Boerhavia diffusa | Punarnva | Herb |
| 7. | Butea monosperma | Plash | Tree |
| 8. | Capparis decidua | Ker | Shrub as well as Tree |
| 9. | Cassia angustifolia | Sanai | Under Shrub |
| 10. | Commiphora mukul | Guggal | Shrub |
| 11. | Ficus religiosa | Pipal | Tree |
| 12. | Sida alba | Kharenti | Herb |
| 13. | Tinospora cordifolia | Giloya | Climber |

| | | | |
|---|---|---|---|
| 14. | Tribulus terrestris | Chhota Gokharu | Herb |
| 15. | Withania somnifera | Asgandha | Under Shrub |

Among 15 Multipurpose Medicinal Plant Species, five plant species belong to the group of "Trees" from vegetational group s point of view (*Acacia senegal, Adhatoda vasica, Azadirachta indica, Butea monosperma and Ficus religiosa)*; two plant species falls under the group of "Shrubs" (*Capparis decidua* and *Commiphora mukul*, four plant species belongs to the group of "Under Shrubs" *(Asparagus recemosus, Aloe vera, Cassia angustifolia* and *Withania somnifera*), three plant species falls under the group of "Herbs" (*Boerhavia diffusa, Sida alba* and *Tribulus terrestris*), and only one plant species falls under the group of "Climbers" (*Tinospora cordifolia*) from vegetational groups analytic aspect point of view. The author observed that there is not a single species which may be termed as Multipurpose Medicinal Plant Species at the part of group of "Grasses" in Shekhawati Region, Rajasthan.

The observations based on scattered 23 survey spots through out the area under study revealed that seven plant species were found mostly on sandy plains habitat and also frequent on gravel habitat as - *Adhatoda vasica, Azadirachta indica, Boerhavia diffusa Capparis decidua, Sida alba, Tribulus terrestris and Withania somnifera*; the author observed that again seven another plant species were observed mostly on stony and rocky habitat and also some places frequent on gravel habitat also which are as - *Acacia senegal, Asparagus recemosus, Aloe vera, Butea monosperma, Cassia angustifolia, Commiphora mukul and Tinospora cordifolia*; only one plant species i.e. *Ficus religiosa* was observed as a "poly-climax" by nature due to it's occurrence in many habitats like sandy plains, gravel formations, riverine and aquatic habitat, and stony and rocky habitat.

From analytic aspect of these above mentioned 15 Multipurpose Medicinal Plant Species for the cure of different kind of diseases for the welfare of human beings, the descriptive account of observations is as mentioned below in the forth coming paragraphs of this research paper.

Among 15 Multipurpose Medicinal Plant Species, the author found that 5 plant species are being used as Body /Health Tonic as well as to recover the Loss of Strength and Vigour *(Acacia senegal, Asparagus recemosus, Butea monosperma, Tribulus terrestris and Withania somnifera)*; Four Multipurpose Medicinal Plant Species are being used for the cure of Piles (*Azadirachta indica, Aloe vera, Butea monosperma and Tribulus terrestris*); again four another Multipurpose Medicinal Plant Species are being used in the cure of Rheumatism *(Capparis decidua, Commiphora mukul, Ficus religiosa and Withania somnifera)*; three Multipurpose Medicinal Plant Species are being used for the cure of Diabetes disease (*Tinospora cordifolia, Tribulus terrestris and Withania somnifera*); three plant species of another Multipurpose Medicinal Plant Species are Purgative by nature and are used in Stomach and Gastro-Intestinal Problems (*Butea monosperma, Cassia angustifolia* and Aloe vera); another three Multipurpose Medicinal Plant Species are being used in the cure of Eye - complaints ( *Aloe vera, Boerhavia diffusa and Tinospora cordifolia)*; another three Multipurpose Medicinal Plant Species are used in the cure of Toothache (*Azadirachta indica, Aloe vera and Capparis decidua )*; another three Multipurpose Medicinal Plant Species are being used in the cure of Leucorrhoea disease (*Ficus religiosa, Sida alba and Withania somnifera)*; and two Multipurpose Medicinal Plant Species are being used against following diseases Asthma, Bronchitis and Cough (*Adhatoda vasica and Boerhavia diffusa)*.

Among 15 Multipurpose Medicinal Plant Species two plant species are being used to remove Male and Female Sterility (*Sida alba and Withania somnifera)*; another two Multipurpose Medicinal Plant Species are being used against Ulcer (*Acacia senegal and Aloe vera)*; at the part of cure of Skin disease among Multipurpose Medicinal Plant Species *Azadirachta indica* is important one; in the cure of Pneumonia disease *Adhatoda vasica* Multipurpose Medicinal Plant Species is important one; *Boerhavia diffusa* is one of the important Multipurpose Medicinal Plant Species is being used against the removal of Kidney Stone; and *Capparis decidua* is one of the significant shrub species of Multipurpose Medicinal Plant Species which is being used in the cure of Affection of Liver, Spleen and Tubercular glands and it has importance for the cure against Paralysis disease and it plays a vital role in the decreasement of fats or over weight in human body.

## XXXIX. DOMINANT MULTI-PURPOSE MEDICINAL PLANT SPECIES

By thus, one can visualize that these above mentioned 15 Multi-purpose Medicinal Plant Species have their varied applied values in the cure of different kind of diseases for the welfare of human beings which naturally show their importance that these Multipurpose Medicinal Plant Species are really may be termed as "Medicinal Plant Wealth" of Shekhawati Region, Rajasthan.

Now, the author will deal the details of each and every Multi-purpose Medicinal Plant Species separately in the forth coming paragraphs of this research paper.

**1. *Acacia senegal***

Local Name - Kumat, Kumatio, Kheri.

### VEGETATIONAL CHARACTERISTICS

The plant species belongs to the family-*Mimosaceae*. It is a medium sized prickly tree. It's height varies in study area according to the change of habitat from 3 to 10 m., canopy appearance is like an umbrella which is very unique and distinct in the photographs of it's favourite habitat. The trunk of the tree has distinct creamy colour. From life-forms point of view, the tree falls under "micro-phanerophytes" whereas the leaves are compound and bipinnate. From leaf - classes point of view, the plant falls under class of "leptophylls". Xerophytic - categorisation revealed that the tree by nature comes under the category of "spiny and thorny", thus, the stipules modified into spines which works for the trees as the organs of defence and reduce the rate of transpiration **(Photoplate -1.5).**

**Photoplate -1.5 Acacia senegal**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

Observations based on the selected study sites scattered throughout the area under study revealed that it's spatial distribution is unequal. It has rare or no occurrence specially over the following habitats, on pure saline soil habitat, pure gravel and compact soil formations, and over the top of the huge sand dunes.

Although it shows frequent occurrence some times over the slope of the dunes but not over the creast and top of the dunes. It has frequent, common, abundant, and rare occurrence. The area under study has lack of pure association of plants of these tree species. In Shekhawati Region, trees community of *Acacia senegal* has frequent to common occurrence over sand dunes habitat as well as on hilly habitat.

As far as the rainfall distribution range is concerned it has occurrence in between 25 cm. to 750cm. rain fall , thus, it is found in arid (rare), semi arid (frequent), sub-humid (common) and also humid climate type (abundant), specially in Rajasthan.

## MEDICINAL APPLIED ASPECT

Trees dried barks and gums are used at the name of applied parts and portion. At the name of morphology of applied part and portion one can observe that, the tears are rounded or ovoid and about 5-40 mm. in diameter. Tears are yellowish white in colour.

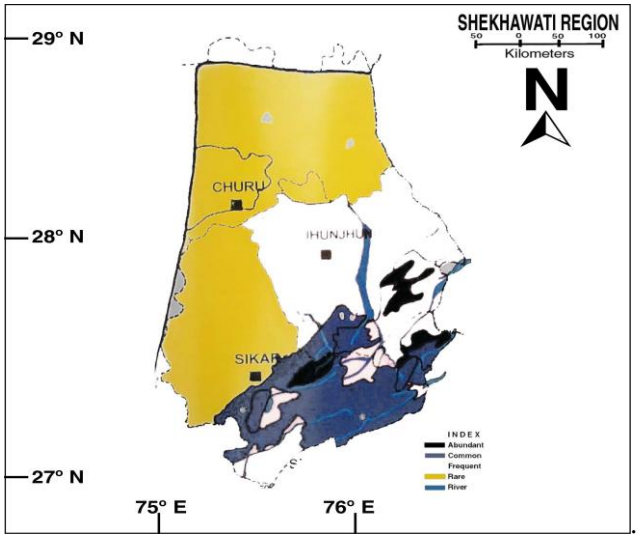
From medicinal uses point of view for the cure of diseases, it is used as a protective colloid, a binding and disintegrating agent, better and bulk laxative appetite depressant and pectic ulcer, therapy and it is a good health tonic for body. Thus, the tree is generally useful in native medicines by the local people and by thus, has commercial value. Due to finest quality of tears or gum production it has a commercial importance and it is sold at market value worth of rupees 100 per Kg.

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** -The tree covers a large portion of the earth's surface which geographically extends from tropical Africa to Arabia and than to western India. It has a west ward extension at global level which includes the country sites like Saudi Arabia, Iraq, Iran, Persia Afganistan, Baluchistan, Sindh (Pakistan) and India. In India, the area mainly covered by the following states - Rajasthan, Punjab, Saurastra and Delhi**.**

**B. At Regional Level -** The particular tree has a vast distribution throughout the area under study on hills, hilly surface, stony and rocky areas as an abundant phytogeographic pattern of distribution where as on foot hill areas it is found in common occurrence. It shows uneven distribution on it's favourable habitat of hilly areas which are located in southern part of the region. Tree community shows it's common phytogeographic pattern of occurrence on south-western hilly areas of Lohargarl range where as it abundant occurrence in south-eastern hilly areas of Bagore range **(Figure – 1.11)**. Thus, it has more spatial distribution in eastern portion of the region under study rather than western, respectively

**Figure-1.11 Phyto-Geographical Distribution of Acacia senegal**




If one goes through the map reading of phytogeographic pattern of spatial distribution of *Acacia senegal* **(Figure-1.11)** than he may find rare distribution in north-western part of Sikar district and also within three tehsils of Churu district. Most of Jhunjhunu district specially western and northern parts - it shows frequent occurrence. It is quite obvious through the map that it has common occurrence over gravel and compact soil surface of southern part of Jhunjhunu district and also on most of the eastern part of Sikar district. It forms pure association in the localities of abundant patches located in Jhunjhunu district (Khetri and Udaipurwati tehsil), and in Sikar district (Shri Madhopur and Sikar tehsil) situated in middle and central part, respectively.

It has no occurrence in riverine areas of the region but it stretches throughout frequently on the slope of sand dunes and rarely on sandy plains habitats of old alluvial plain - in northern western part of the region as shown in (**Figure -1.11)**

**2. *Adhatoda vasica***

Local name - Arusa, Ardoo, Ardusa

## VEGETATIONAL CHARACTERISTICS

The plant belongs to the family - *Acanthaceae*. From vegetational group point of view, the plant belongs to the group of "Tree", it is a medium sized tree, in nature some times it is also observed in the form of shrub. It is tall, much branched (branches are terete) and mostly evergreen tree. The leaves of the plant are lanceolate, large and dark green in colour. From leaf-class classification point of view the plant falls in 'Micro-phylls' class (i.e. 12 to 20 cm. long and 2.5 to 0.5 cm in width).

The leaves have some characteristic odour and bitter in taste. Leaves margins are crenate and apex is acuminate with glabrous surface and smooth texture. From life-forms point of view, the plant falls in the group of "micro-phanerophytes". It's flowers are dense and white in colour with purplish markings. It's fruit's are capsular **(Photoplate -1.6).**

**Photoplate -1.6 Adhatoda vasica**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The plant has favourable annual average rainfall condition in between 40 cm. to 150 cm.. From temperatures variation point of view-it's favourable range lies in between $10^{o}$c mean monthly minimum to $40^{o}$c mean monthly maximum, respectively. The plant needs good moisture conditions, dry winds are harmful for it's growth and development. Plant's favourable habitats are sandy plains, gravel formation with compact soil, and also some times the rocky places. Thus, it is observed frequently in semi-arid climate, it is quite common in sub-humid climate and humid climate. It's plantation is very common on both sides of routes of roads at may places, it is also observed frequent to common on the places which fall under waste - lands in Shekhawati region.

## MEDICINAL APPLIED ASPECT

The plant has some significant medicinal applied aspect in the cure of some disease viz; in Asthma, in Bronchitis, in Cough, normal Fever, Pneumonia, Orthodex as a native medicine. The plants parts are boiled in water and used for bath in the treatment of body inflammation and bodyache. The leaves decoction is administered in cough and chronic bronchitis.

Thus, it is used as an expactorant, bronchodilator and as mild bronchial antispasmodic, vesicine is reported to possess oxytocic action. Vasicine is reported to be bronchoconstrictor, whereas it's autooxidised from vasicinone is a bronchodilator.

## PHYTO-CHEMICAL ANALYSIS OF PARTS AND PORTION

The plant's phyto-chemicals are also studied by Kanwal et al. In 1983 on seasonal variation of alkaloids.

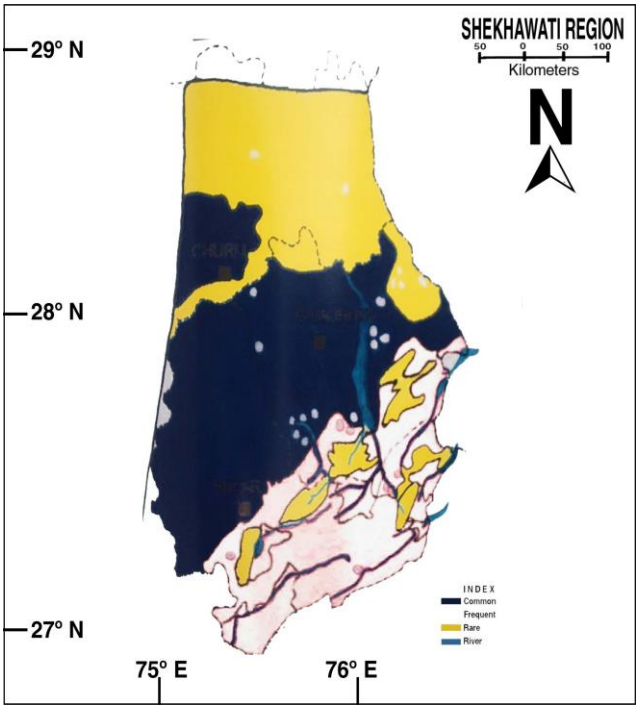
**Plate1.7 : Adhatoda vasica Leaves**

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - At global level, the plant is native to Oriental floristic region by covering following countries in the world - Ceylon, Burma, Malaysia, and throughout India. In India, it is commonly found in Chhindwara district of Madhya pradesh, at Chhindi and Chimtipur and also occurs throughout the plain and sub-mountaneous regions of India **.**

**B. At Regional Level** -As shown in **figure-1.12.** that the plant has rare phytogeographic pattern of distribution in Rajgarh and Taranagar tehsils of Churu district. Besides this, the plant has rare distribution in the areas under hilly patches of Shekhawati region.

**Figure-1.12 Phyto-Geographical Distribution of Adhatoda vasica**




Churu tehsil of Churu district; Fatehpur, Lachhmangarh, Sikar tehsils of Sikar district i.e. western portion of Sikar district, and most of the tehsil of Jhunhunu and Chirawa, Buhana tehsil and Nawalgarh tehsil of Jhunjhunu district it shows common occurrence, respectively. Whereas the plant shows frequent occurrence of phytogeographic pattern of distribution in the eastern parts tehsils of Sikar district, and most of the parts and portion of south-easternly located tehsils of Jhunjhunu district i.e. Khetri and Udaipurwati, respectively. No where an study area it was observed as an abundant locality, thus, no pure association of this plant was observed; although on road side plantation, the plant shows it's frequent occurrence at many places of Shekhawati region. The plant also shows no occurrence on the top of sand dunes habitat as well as on hilly habitat.

### 3. Asparagus racemosus

Local Name - Satavari, Satawar, Narkanto, Bhuttni

## VEGETATIONAL CHARACTERISTICS

The plant belongs to the family-*Liliaceae*. It is a perennial foliage plant, it is an extensively scandent, much branched under shrub with spines. It's roots are tuberous and many in numbers. In nature, mostly it is observed as herb but at favourable habitat conditions - the plant may be observed as "under shrub" stage from vegetational group point of view. From leaf-class classification point of view, the plant belongs to the "nanophylls" leaf-class. From xerophytic categorization point of view- the plant falls under the category of "spiny and thorny". It bears white flowers, it's fruit's are as globose berry and show red colour when ripe. The plants have their propagation by seeds. The flowers are very fragrant. The parienth lobes are white but change to copper tinge at length. Anthers are **(Photoplate -1.8).**

**Photoplate -1.8 Asparagus racemosus**

## LECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The plant in nature mostly occurs on stony and rocky habitat i.e. in hilly patches of Shekhawati region, which is it's favourable habitat. The plant bears climatic limitation of rainfall condition in between 30 cm. to 100 cm. average annual rainfall amount but from temperatures variation it experiences $10^{o}$C mean monthly maximum, respectively. The plant generally favours shades habitat, in other words to say in open places it is not observed but it shows it's occurrence in the shades of some shrubs on stony and rocky habitat like-Euphorbias, *Rhus coriara* etc. Thus, it prefers somewhat comparatively more moist vegetation cover, in other words to say it avoids direct bright sun-shine insdation. The plant use to disappear from the surface when the relative humidity falls below 30 percent in atmosphere. The plant also prefer sandy-loam soil habitat and it requires sunny position in initial stage fruit's growth; after full development it requires shade conditions.

## MEDICINAL APPLIED ASPECT

The dried roots about 700 gm. are burnt and fumes are inhaled under a blanket for curing in normal fever. In brief, the plant is reported as tonic, swellings, loss in strength and vigour.

*Asparagus racemosus* is a very common and popular herbal drug prevailing from centuries back and prescribed by the Vedh's as a traditional medicine. It is used with several combination but primarily for the treatment of sexual impotency and general debility. It is very nutritive and good health tonic with cooling and soothing effects on body. They also use it for the promotion of urination. Some of them also indicated about it's possible role in the treatment of epilepsy.

**PHYTO-CHEMICAL ANALYSIS OF APPLIED PARTS AND PORTION**

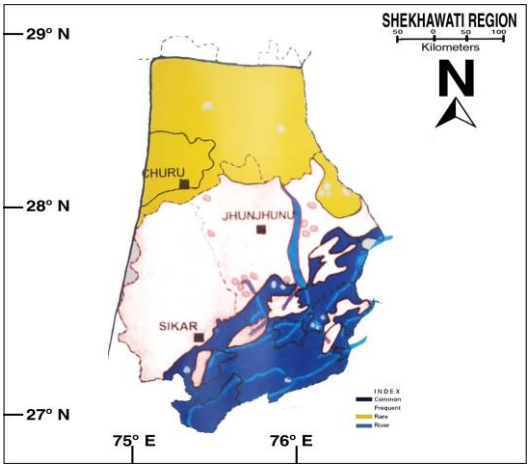
Dried fleshy roots are the applied parts and portion of the particular perennial herb species. Spindle shaped structures, 5 to 15 cm., thick, cream yellow externally but white internally with longitudinal wrinkles, without any smell. From phyto-chemicals point of view- the biologically active chemicals reported are the saponins- shatavarin I,II,III and IV; the steroids and sitosterol; rich amount of engymes amylase and lipase, some glycosoides and sapogenins are also traced out from this plant. Inamdar and Mahabale in 1980 presented phyto-chemicals comparative study between Shatawar and *Asparagus species*.

**Plate 1.9 : Asparagus racemosus Root**

**PHYTO-GEOGRAPHICAL DISTRIBUTION**

**A. At Global Level -** The plant has wide range of geographical distribution at global level, by thus, it covers - Tropical Africa, Australia, Ceylon, Pakistan (Sind), and in India (throughout the tropical and sub-tropical regions). In India, it has common occurrence in Chhindwara district of Madhya Pradesh.

**Figure-1.13 Phyto-Geographical Distribution of Asparagus racemosus**




**B. At Regional Level - Figure -1.13** shows the phytogeographic pattern of spatial distribution, which obviously divided the region under study into three distrinct parts. It has rare phytogeographic pattern of distribution by covering 3 tehsils of Churu district and north-eastern part of Malsisar locality of Jhunjhunu district. Most of the part and portion of western Sikar district and north-western portion of Jhunjhunu district show frequent pattern of phytogeographic distribution of this plant over the sandy-loam formation habitat of Shekhawati region. It has common occurrence in Khetri and Udaipurwati tehsil (Jhunjhunu district) and Neemkathana, eastern part of Danta Ramgarh, Shri Madhopur and Sikar tehsil it'self (Sikar district) over the stony and rocky habitat i.e. hilly patches of the area under study i.e. Shekhawati region, Rajasthan. On riverine and aquatic habitat, the plant shows frequent occurrence from phytogeographic spatial distribution pattern point of view. It has rare or no occurrence within human settlements of the area under study as shown in **Figure-1.13.**

**4 *Aloe vera***

Local Name - Ganwarpatha, Grithkumari, Ghigwar. Curacad or Barbados Aloe

**VEGETATIONAL CHARACTERISTICS**

The plant belongs to the family - *Liliaceae*. From vegetational group point of view, it falls under the group of 'under shrubs', and from life-forms point of view, the plant belongs to the life form class of 'nano-phanerophytes.' The stem is short and forming offsets. It is a perennial plant, generally observed 1 to 2 feet tall but under favourable climatic conditions and suitable habitat, it is observed upto 1 meter height. It's leaves are generally 50 cm. in length and 8 cm. or 3 to 4 inches in width. Leaves are fleshy and leaves margins are with small spines. Thus, xerophytic categorization point of view - the plant falls in the category of spiny and thorny and also as latex bearing species. Flowers are cylindrical and yellow in colour. The plant at fruiting stage bears the pods of light yellow in colour **(Photoplate -1.10).**

**Photoplate -1.10 Aloe vera**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

Semi-arid climate (frequent), sub-humid climate (common) and humid climate is favourable for the growth and development of this under-shrub. It's rainfall requirement lies in between 40 cm. to 150 cm. whereas the temperatures in broad range i.e. above 10°C mean monthly minimum to 50°C as mean monthly maximum, respectively. Thus in brief, warm but moist type of climatic characteristics favours it's growth and development. It can be planted both in irrigated and non irrigated land. Gravel formation with compact soil, and stony as well as rocky habitat is the most favourable habitat for *Aloe vera* growth and development. Although it is also observed in sandy plains habitat as fencing boundary purpose for the cultivated fields in certain places of Shekhawati region.

## MEDICINAL APPLIED ASPECT

The plant leaves dried powdered latex and mucilaginous pulp in the form of gelly of the leaves are used in the pharmaceutical and cosmetic industries. It is used as stomachic tonic and it is purgative by nature. The fresh latex is taken in a very small does as purgative.

The mucilaginous pulp is said to possess biogenic wounds. The peeled fresh gel is used to treat inflamed eyes, skin and piles. The pulp is taken internally for curing ulcers. With the help of Gavarpata, 'bhasm' is prepared for metallic and non-metallic precious elements which are used in several Ayurvedic drugs, e.g. in the cure of cough, cuts, burns, stomache ulcers, teethache, wounds on body parts etc. There is a big demand of dry powder and get at the world market level in many countries.

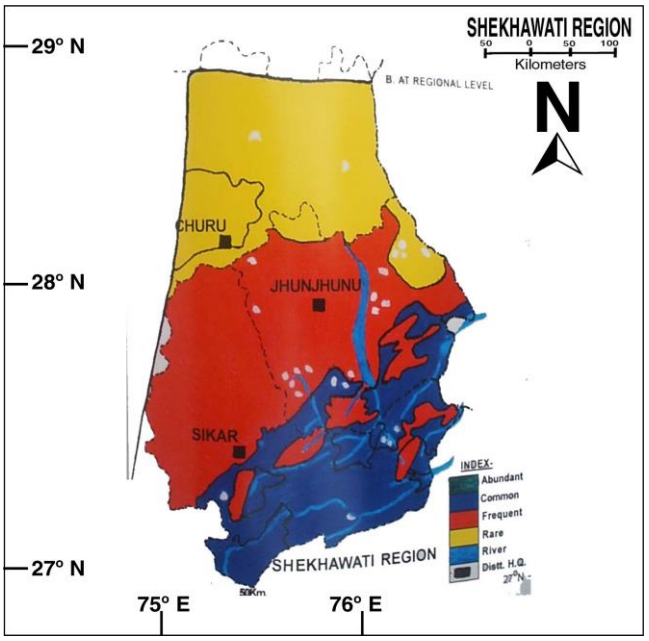
## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - The plant covers wide range at global level by covering Tropical America, West Indies, Egypt, Netherlands, Southern Mediterranean region, Cape verde Islands, Canary Islands etc. In India it has specific distribution by covering Madhya Pradesh, Uttar Pradesh, Rajasthan i.e. in western and central India and the species is naturalised in India.

**B. At Regional Level** - If we go through the map of Shekhawati Region **Figure-1.14**. than we find that there is no abundant locality of phytogeographic distribution. Although it's favourable habitat is stony and rocky areas - i.e. hilly patches of area under study, on such habitat it has common occurrence from phytogeographic pattern of spatial distribution, such areas are located in south-eastern portion of hilly patches, respectively.

Surrounding these hilly patches a wide distribution of gravel formation habitat with compact soil formation, on such type of habitat the under-shrub shows it's frequent-eastern portion of the area under study, it covers Khetri and Udaipurwati tehsils (Jhunjhunu district) and Neem ka Thana, Shri Madhopur, Danta Ramgarh and north-eastern Sikar Tehsil (Sikar district).

**Figure-1.14 Phyto-Geographical Distribution of Aloe vera**




This is very interesting to mention here that three -fourth part and portion of middle and northern has rare pattern of phytogeographic distribution in which Rajgarh and Taranagar tehsil of sand dunes habitat even no occurrence of this under shrub where as Churu tehsil falls under rare occurrence (Churu district). Riverine habitat is also not found favourable for the particular under shrub species. The aquatic habitat which lies in hilly patches show their frequent to common occurrence for example Ajit Sagar Dam locality in Khetri tehsil (Jhunjhunu district). One can observed the community of *Aloe vera* as a fancing boundary of cultivated fields at certain places in sandy plains habitat of Shekhawati Region, Rajasthan, **(Figure 1.14)**. It has no or rare occurrence in human settlement areas, hence, it is naturalised in the area under study.

**5. *Azadirachta indica***
Local Name - Neem, Margosa, Nimba

## VEGETATIONAL CHARACTERISTICS

*Azadirachta indica* is generally found as a full sized tree, and it belongs to the family - *Meliaceae*. It belongs to the vegetational group of 'Tree,' from life-form point of view if falls in the life- form group of 'Meso-phanerophyte', and from leaf-class point of view it falls under the leaf-class of 'Microphylls', it is deciduous nature of tree species. From xerophytic categorization point of view it's leaves are with waxy coated (neem oil) surface and has more sunkum stomata.

Leaves - Imparipinnate 20-37 cm. In length. Leaf-lets are apposite or alternate, obliquely falcate - lanceolate, serrate, dark green to greenish yellow in colour and bitter in test. Flowers -White scented 5 mm. Long pentamerous, stominal tube dentate anthers inserted inside. Fruit's -Drupe 1.2 to 1.8 cm. Long, oblong, 1-Seeded smooth greenish yellow in colour. Intensely bitter in taste. Bark - Rough greyish to brownish in colour channelled in shape about 10 mm. In

thickness - with scally to fissured surface. Internally yellowish in colour caminated and fibrous**(Photoplate -1.11).**

**Photoplate -1.11 Azadirachta indica**

## ECOCLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

It has 'poly-climax' distribution in nature, or in other words to say - the may be observed in more than one habitat i.e. sandy plains habitat, gravel formations, stony and rocky habitat and also on riverine habitat. It has no occurrence over the tops of sand dunes as well as on hills top surface. It has wide range of rainfall distribution i.e. from 25 cm. to 150 cm. (total of average annual). Similarly it has occurrence in wide range of temperatures' i.e. 10$^{o}$C (average mean monthly minimum temperature) and 50$^{o}$C (average mean monthly maximum temperature). As soil type is concerned - it shows common occurrence on sandy plains, gravel formations, and stony and rocky, soil, also an marginal areas of riverine habitat soil formation. Thus, the tree bears arid, semi-arid, sub-humid and humid climate - as observed for the area under study. In nature, mostly it is observed with it's occurrence from plantation point of view more rather than it's natural growth distribution in phytogeographic pattern. Thus, it's tolerance limit of ecoclimatic conditions is broad weather it may be soil type, rainfall amount, temperature variations, relative humidity and heat waves or cold waves.

## MEDICINAL APPLIED ASPECT

The tree as a whole by it's each and every part and portion (except it's roots) is medicinally useful. From medicinal applied aspect point of view, it is used for blood purification, in skin diseases, in fever, it's twigs are best known from centuries back for the cure in toothache, in the cure of piles, and it is a strong antiallergic. It is used as a better natural determinant to protect costly garments from various types of insects.

At the name of parts and portion of the Neem tree's medicinal uses for the cure of diseases, the neem fruit's and leaves are used mainly as anti septics and insectisides. Neem oil, nimbin and nimbidin are active against various fungi. The anti-insect principles have been commercialised in the form of vapaside and margosides. The drug is also attributed antifertility and anti-viral properties, and is being screened for efficacy in treatment of AIDS.

**Plate 1.12 : Azadirachta indica Fruits**

*Chart : Applied aspect of Neem Tree*

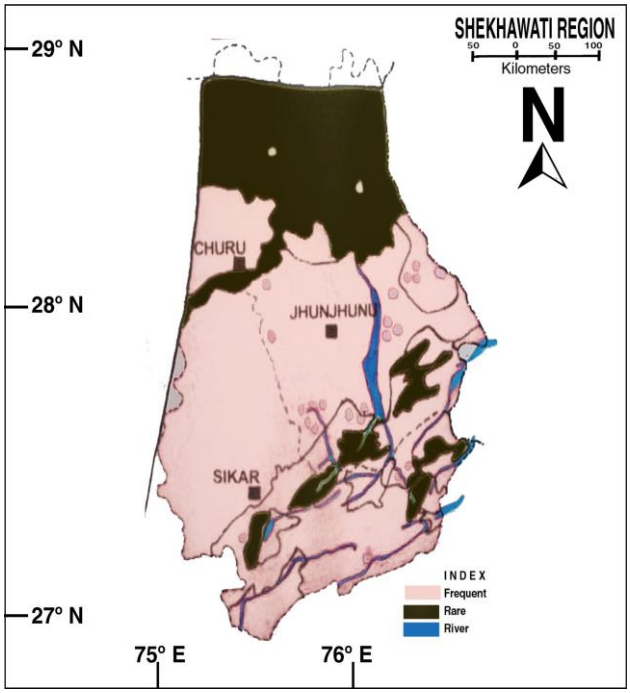
| | |
|---|---|
| Wood | Idols, Toys, Wooden Bases as Bathing Tubs, Washing Pots, Wall items etc. Frames, Fencing Trnks and other misc. Items. |
| Bark | Dye for colouring fine cloths, Silk etc. and Making deep colour of various textile fabrics |
| Gum | (Amber Coloured) Used as stimulant in medicine |
| Seeds | Fibre for making Cheap Ropes |
| | Gives better deep yellowise oil uses as antiseptic and for (Neem-Toothpaste |
| | Insecticides are also prepared from seed oil for making soaps and seed cake as cattle feed to increase the milk |
| Flowers | Stomachic & Tonic |
| Leaves | Tender leaves eaten in curries mature as cattle feed air purifier |
| Fruit | Ripe fruits eatan for stomach woorms |
| | Young fruits-tonic in fevers and anthelmintic |
| | Fermented ad today prepared used in medicine nutrient as refrigrant in small dose |

The statistics of commercial evaluation of folklore of *Neem* trees covers the importance (as an antiseptic - whole life worship)., Production - seed oil 10 kg./ tree/ year which has evaluation of Rs. 20/- kg., barkgum 2 kg./ tree/ tree year which has evaluation of Rs. 20/- per kg., leaf condiment 10 kg./ tree/ year which has evaluation of Rs. 10/- kg., and flower Essence - 1 kg./tree/year which has evaluation worth of Rs. 2000/- kg.

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - Although, Neem tree is native to the Indian sub-continent, but it is planted and now very much naturalised in tropical and sub-tropical countries.

**Figure-1.15 Phyto-Geographical Distribution of Azadirachta indica**




**B. At Regional Level** - Just a glance, if we go through the reading of **Figure-1.15** of Shekhawati region, than one can observe very well the phytogeographic pattern of it's distribution in four categories of spatial distribution. Churu district ( with it's three tehsils) more or less as a whole (except frequent at Churu tehsil it self shows it's rare distribution, the tree shows it's frequent occurrence over most of the part of Jhunjhunu district (63 percent) and Sikar district (about 80 percent). In Jhunjhunu district, near Baggar locality it is found in pure association for a limited area. The tree shows rare or no occurrence over the slopes and tops of the hilly patches of Shekhawati region. Similarly, it is most observed on the top of sand dunes habitat. In brief, the tree has more area of Shekhawati region under frequent pattern of phytogeographic distribution.

Among human settlements, the tree is commonly planted by the people within the areas of village, town or city. It has also frequent occurrence on the marginal area of both sides of riverine habitat.

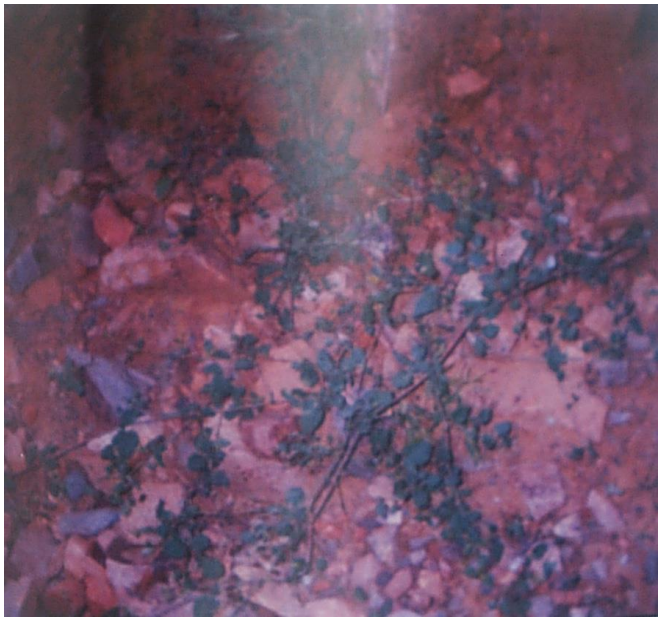
**6. *Boerhavia diffusa***

Local Name - Punerva, Punarnava, Chihawari, Santti

## VEGETATIONAL CHARACTERISTICS

It is a deep rooted perennial spreading herb and by thus it falls under the group of life-forms of 'Crytophytes'. It belongs to the family - *Nyctaginaceae*. Two leaves are appear at one node in which one smaller than other, and upper surface green while lower surface whitish. Flowers sproute in short clusters which are very small in size and reddish in colour and upper part pink. Fruit's are glandular with fine ridges. It's stem is greenish - purple in colour. The plant is odourless with bitter taste. Leaves size are 25 to 30 mm long belt smaller leaves are 12 to 20 cm in length, by thus, from leaf-class classification point of view it falls under 'Nanophylls'. Stems of the plant are cylindrical, stiff and thick at the nodes. The plant spreads by it's branches which are generally one meter in length. It's roots are elongated, topering and somewhat tuberous. Roots grow vertically downwards deep into the soil, they are cream or light brownish-yellow in colour. From vegetational group point of view, the plant falls in the group of 'Herbs'**(Photoplate -1.13).**

**Photoplate -1.13 Boerhavia diffusa**



## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The herbs is widely distributed in all types of habitat in the area under study except the saline soil areas and top of the hills. Sandy plains habitat is one of the most favourable for it's occurrence, although it is generally observed throughout the other habitats like sand dunes topography, gravel and compact soil formations, stony and rocky habitat, riverine and aquatic habitat also.

The herb has wide range of climatic conditions, it is observed in arid climate, semi-arid climate, sub-humid climate and also in humid climate. It shows it's occurrence from 10 to 150 cm average annual rainfall amount but during summer season when temperature reaches above 42$^{o}$C it disappears from the surface, by thus, it's temperature range lies between 10$^{o}$C mean monthly minimum temperature to 42$^{o}$ C mean monthly maximum, respectively. It survives very well in very

low moisture condition i.e. relatively humidity even below 10 percent.

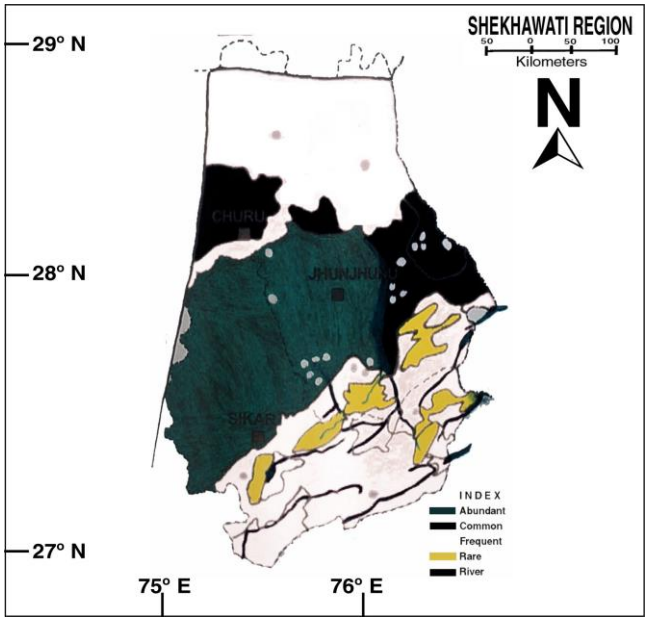
## MEDICINAL APPLIED ASPECT

The herb is useful as medicine for the cure of certain diseases. Due to it's nature as diuretic and laxative, it is also used to treat asthma, dropsy, jaundice, intestinal inflammation and gonorrhoea. Tender shoots are eaten as potherb. The root powder preparation is used in eye diseases. The plain juice of the herb is antidote to rat-poisoning. The herb is used as diuretic and as an expectorant, punarnava is stomachic and is prescribed in the treatment of Jaundice. It is also given in the loss of digestive power, enlargement of spleen and for abdominal pains.

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - The plant has wide distribution in the world. It covers the countries fall under Tropical and Sub-tropical belt, specially in Asia, Africa and America. It is found throughout in Indian Sub-continent except the Himalayan Region.

**Figure-1.16 Phyto-Geographical Distribution of Boerhavia diffusa**




**B. At Regional Level** - More or less in Shekhawati Region it has wide as well as thorough out distribution. If we go through the map of Shekhawati Region as shown in **Figure-1.16** then one can visualize that plant has been observed in each and every type of habitat. From phytogeographic pattern of spatial distribution then it covers abundant area of it's distribution in which following tehsils are covered - Nawalgarh, Jhunjhunu and northern part of Udaipurwati (Jhunjhunu district), Fatehpur, Lacchmangarh and Sikar tehsils (Sikar district). It has been observed as common pattern of phytogeographic spatial distribution by covering Churu tehsil (Churu district), Malsisar locality, Chirawa and Buhana tehsil (Jhunjhunu district). It is observed frequent phytogeographic pattern of spatial distribution by covering following areas - Taranagar and Rajgarh tehsil (Churu district), sandy plains habitat of Khetri and Udaipurwati tehsils (Jhunjhunu district) and sandy plains of Neem ka thana Shri Madhopur and Danta Ramgarh tehsils (Sikar district). The plant shows it's rare distribution on the stony and rocky habitats through out the area under study, specially located as hilly topography specially in Khetri and Udaipurwati tehsil (Jhunjhunu district), and Neem ka thana, Shri Madhopur and Danta Ramgarh tehsil (Sikar district) as shown in the above mentioned figure respectively. It shows rare or no occurrence in pure to aquatic habitat but it shows rare common occurrence on riverine habitat, all three rivers (Kantli River, Lohargarl ki Nadi and Chandrawati river) are seasonal rivers, hence, most of the period of the year the river beds remain dry respectively. Among human settlements here, the author has not shown any kind of interpretation from phytogeographic study point of view.

### 7. *Butea monosperma*

Local Name - Palas, Falas, Dhak

## VEGETATIONAL CHARACTERISTICS

It the world of Forest, it is popular by name 'Flame of the Forest'. The plant belongs to the family - *Leguminosae*. Mostly, it is observed as suitable ecoclimatic conditions and nature of habit, it may be observed as a tall as well as large tree. From life - forms classification point of view, it belongs, to the 'Micro-phanerophyte' group i.e. under the group of 'Trees' from vegetational group point of view. It is deciduous by nature, untidy in growth and ragged in shape, with twisted trunk. Leaves are rough in texture and 10 to 15 cm. long and broad, by thus, from leaf - class classification point of view, the tree falls in the class of 'Macrophylls'. In February - May the tree becomes leafless and in blooming stage, flowers are bright flaming scarlet orange with black calyces. It's fruit's are in the form of pods, ripe pods are light and found scattered far and wide by hot winds in the month of June. It's pods have deep red, thin button shaped seeds, generally of the size 2 cm. in diameter **(Photoplate -1.14).**

**Photoplate -1.14 Butea monosperma**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

Although the tree can be grown in types of soil and also in low rainfall area, it's plants and hardy and frost resistant but in nature for the area under study, the trees are generally observed in stony and rocky areas i.e. hilly habitat, respectively. The tree is reported with stands in frost and drought very well and also does well in saline soils (Bhattacharjee, 2000) but neither I have observed any tree of *Butea monosperma* in saline soil areas of Shekhawati region nor in any other habitat except stony and rocky, respectively. It is also not observed in the drought prone areas of arid climate of Churu district. It requires good rainfall conditions i.e. atleast more than 40 cm. annual average to 150 cm., respectively. The plants propagated by seeds and also by roof suckers. Viability of the seed is poor. The trees are observed in aquatic and riverine areas such places are located within stony and rocky habitat e.g. Ajit Sagar Dam locality in Khetri tehsil (Jhunjhunu district). The association of *Butea spp*. requires at least 30 percent relative humidity in the atmosphere.

## MEDICINAL APPLIED ASPECT

The tree has good medicinal uses for the cure of some diseases. This is another herbal drug of choice for them for the eradication of intestinal worms and which also improve the function of stomach and intestine. They also use it in other combination to treat sexual impotency. Some of them indicated that it can restore the proper menstrual cycle in women and also prevent pregnancy if taken regularly.

The flowers (popularly called as 'Kesula') and leaves this tree species are used against boils and pimples, and are also prescribed to take internally in flatulent colic, worms and piles. Red coloured gum, root, bark and seeds of the tree also possess medicinal propertics. Gum is contains tannins. The flowers and seeds are mixed in a diarrhoea and used as wormicide against tapeworms and ring worms. When several leaves are stiched together, it sorves as dinning plates and the leaves are also used in beedi factories. Lack- insects can be reared on the twings. Bark flowers yield a yellow die and are used in textiles. Bark is used for tanning.

## PHYTO-CHEMICAL ANALYSIS OF APPLIED PARTS AND PORTION

The tree has it's seeds and secretion products at the name of applied parts and portion. The biologically active chemicals reported, they are - Glycosides, Butrin, Isobutrin, Coreoposin, Isocoreoposin, Sulphurein; besides this all, the tree has property of contents of monospermoside and Isomonospermoside. The flowers and leaves of *Butea monosperma* have characteristic values due to it's nature of phyto-chemicals which are astringent.

Flower - Triterpene, several flavonoids butein, glucose, fructose, histidine, aspartic acid, alanine and phenylalanine, Gum -Tannins, mucilaginous material, pyrocatechin.

**Plate 1.15 : Butea monosperma Flower**

Seed - Oil (yellow, tasteless), proteolytic and lypolytic enzymes, plant proteinase and polypeptidase. (Similar to yeast tripsin). A nitrogenous acidic compound, along with palasonin is present in seeds . It also contains monospermoside (butein3-e-D-glucoside) and somonospermoside. Allophanic acid, several flavonoids (5, 6, 7, 4'-tetrahydroxy-8-methoxyisoflavone 6-O-rhamnopyranoside. Butin a-Amyrin, (3-sitosterol, (3-sitosterol-p-D-glucoside, sucrose, Fatty acids such as myristic, palmitic, stearic, arachidic, behenic, lignoceric, oleic, linoleic and linolenic, Monospermin. And an acid imide. 15-Hydroxypentacosanoic acid nheneicosanoic acid **5**-lactone. 16-dihydroxyhexadecanoic acid Phosphatidylcholine, phosphatidylethanolamine and phosphatidylinositol.

**Plate 1.16 : Butea monosperma Seeds**

Root- The root of *Butea monosperma* contains glucose, glycine, a glycoside and an aromatic hydroxy compound. Stem- 3-Z-hydroxyeuph-25-ene and 2,14-dihydroxy-1 1,12-dimethyl-8-oxo-octadec-11-enylcyclohexane

Stigmasterol-e-D-glucopyranoside and nonacosanoic acid Flavonoid 8-C-prenylquercetin 7,4'-di- O-methyl-3-O-a-L-rhamnopyranosyl(1-4)-a-L-rhamnopyranoside. 3-hydroxy-9 methoxypterocarpan(-)-medicarpin. Lupenone, lupeol and sitosterol. Two iso-flavones 5-methoxygenistein and prunetin. In addition to stigmasterol-3-a-L- arabinopyranoside, four compounds isolated from the stem of Butea monosperma have been characterized as 3-methoxy-8,9-methylenedioxypterocarp-6-ene, 21-methylene-22-hydroxy-24-oxooctacosanoic acid Me ester, 4-pentacosanylphenol and pentacosanyl-(3-D-glucopyranoside.

Bark - Kino-tannic acid, Gallic acid, pyrocatechin. Also contains palasitrin, and major glycosides as butrin, alanind, allophanic acid, butolic acid, cyanidin, histidine, lupenone, lupeol, (-)-medicarpin, miroestrol, palasimide and shellolic acid. Two compounds, 3, 9-dimethoxypterocarpan, and triterpenoid ester, 3a- hydroxyeuph-25-enyl heptacosanoate.

Leaves - Glucoside, Kino-oil containing oleic and linoleic acid, palmitic and lignoceric acid.

Resin - Jalaric esters I, II and laccijalaric esters III, IV.; Z-amyrin, e-sitosterone and its glucoside, sucrose, lactone-nheneicosanoic acid-lactone Sap - Chalcones, butein , butin, colourless isomeric flavanone and its glucosides, butrin.

**Plate 1.17 : Butea monosperma Resin**

The anti-inflammatory activity of methanolic extract of *Butea monosperma* evaluated by carrageenin induced paw edema and cotten pellet granuloma. In carrageenin induced paw edema at 600 and 800 mg/kg inhibition of paw edema.

SOD, GPx, and xanthine oxidase, which are important phase II enzymes Anticonvulsive activity.

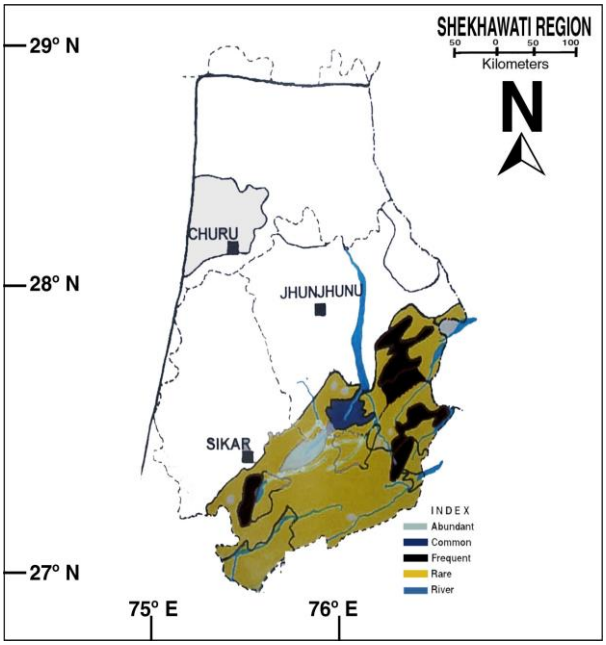
## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** -The tree species is native to Indo-Malayan region by including Ceylon. In India it is mostly observed in states of central and western India, it grows as the wild in West Bengal, Bihar and also cultivated in gardens and road side plantation. In Rajasthan, the tree has dominant distribution in Mewar region i.e. in southern Aravallis, and throughout the state but on stony and rocky habitat.

**B. At Regional Level** - If we go through the reading of the phytogeographic pattern of spatial distribution for *Butea monosperma* map of Shekhawati Region than it is quite obvious that the tree and it's association with Salar and Kheri is restricted up to south eastern part and portion of the area under study. It is all due to the stony and rocky habitat has it's distribution up to south eastern part, respectively out of 23 survey field spots ten can falls under the distribution of particular tree species. Two third part and portion of northern and western Shekhawati Region is free from it's occurrence which covers thirteen survey spots, respectively.

Out of fifteen tehsils of Shekhawati Region six tehsils of south eastern part of Shekhawati Region is covered by the trees of *Butea monosperma*. **Figure 1.17**. shows that there is only one survey spot of Lohargarl has abundant phytogeographic pattern of distribution where as we can find one common locality situated in Udaipurwati tehsil from occurrence point of view. There are three large patches of *Butea monosperma* frequent phytogeographic pattern of spatial distribution inwhich two are located in Jhunjhunu district and one in Sikar tehsil, Sikar - Danta Ramgarh tehsil, through out one-third part of Shekhawati Region located in south-eastern portion has rare phytogeographic pattern of distribution. It shows frequent to common occurrence in riverine and aquatic habitat which have stony and rocky formation.

**Figure-1.17 Phyto-Geographical Distribution of Butea monosperma**




**8. *Capparis decidua***

Local Name - Ker, Kair, Kerdo, Teent

## VEGETATIONAL CHARACTERISTICS

The plant species belongs to the family-*Capparaceae* and it is a much branched straggling, glabrous shrub. It is leafless, except in young shoots only and these fall down at very early stage, otherwise most of the year it remains leafless. The twigs are smooth, green with nearly straight paired spines which serve as organ of defence and also reduced the rate of transpiration. Generally, it is observed in the form of shrub of 1 to 2.5 m. height but some times it attained the form and shape of a medium sized tree when protected properly. It is the tree which have efficiency also to grow on very deep soils

on the gravel plains and may attain the full growth in the areas of good rainfall and moisture holding soils. In arid zone Shekhawati Region above 80 percent of the total plants are observed as in the form-shrub but below 20 percent are found as in the stage of tree in different habitats where it reached to height from 3 to 10 m. or above.

Plant belongs to the class of 'Leafless and Spiny as well as Thorny' under the xerophytic-categorisation for the flora of desert, and also from leaf-classes point of view. Due to more shruby by nature it falls under the group of 'Nanophanerophyte' but sometimes it comes under the group of 'Micro-phanerophytes' when it attained the size as well as shape of a tree flowering and fruiting - both take placed in the period of March to June months. The rhythem of flowering and fruiting of the species is biannual, i.e. first flowering period remains from April to May followed by first fruiting period from May to June where as second flowering period runs from September to October which is followed by the second fruiting period from October to November. The unripe raw fruit's are green but the ripe matured fruit's are known as berry and locally called 'Dhallu' usually brick red or pinkish red in colour, by shape and it's average size lies in between.7 to 1.5 cm. in diameter **(Photoplate -1.18).**

**Photoplate -1.18 Capparis decidua**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The observations over the study sites scattered throughout the arid and Semi-arid area of Shekhawati Region in different habitats which show the nature of it's distribution. This is one of the most common plant as found throughout the area under study. Thus, by nature of it's plant growth as well as for survival the shrub species is characterised by 'polyclimax' tendency of succession. Due to it's strong drought resistant character it's development coincides in most of the habitats with the prevailing desertic conditions. The plant species generally (about 80 percent) is observed at the stage of shrub (below 3 m) but at some places it reaches to the height as well as in the form of a tree (above 3 m). It is also observed that *Capparis decidua* as a tree found on very deep soils on the alluvial plains and may attains a full growth on the areas of good rainfall and moisture holding soils.

Altitudinally, the plant is found between 150 to 500 m MSL in Shekhawati Region. It's occurrence is divided mainly into three physiographic formations; 1. Gravel and compact soil sandy plains which cover about 86% of the distribution, 2. Small isolated undulating hilly patches surrounded by the above mentioned physiographic formation which occupy approximately 17% area, and 3. Seasonal depressions, gullies, rivulets, and natural water tanks which cover approximately 7% area of the total.

## MEDICINAL APPLIED ASPECT

It is a multipurpose medicinal shrub species and therefore out of five it covers four categories of applications or rather to say uses, which are; fuel, medicinal, edible, and commercial. But we are here concerned with medicinal uses or medicinal aspect of this plant species.

At the name of medicinal uses for the cure of diseases, the caper buds as well as the fruit's are considered useful in scurvy. It is an evergreen shrub, low trailing or prostrate in habit with close heavy foliage flowers are white in colour. The flower buds are pickled and sold as capers. The bark and root of this plant is slightly bitter and tart.

It's wood is tough but light, bitter in taste hence not eaten even by the white ants. So it's tender shoots give relief from toothache and protect from pyorea disease. It's one of the most useful character is that unripe but dried raw green fruit's from the plant are consumed against increasing fats and flesh in body, thus it is treated as anti-doses to control and avoid the unwanted increasing flesh and weight of human body. Hence, it is said to the protective against rheumatism. The bruised leaves are used as a poultice in gout. The bark and root of this plant is slightly bitter and tart. It is aparitive, diuretic, resolvent and tonic. It facilitates digestion, and stimulates appetite. It is used in medicine as a refrigerant and an tiscorbutic.

For treatment of rheumatism, paralysis, toothache, and affection of liver and spleen and tubercular glands. It is used capers are used for flavouring pickles sauce, salads and other cooked food.

## PHYTO-CHEMICAL ANALYSIS OF APPLIED PART AND PORTION

The flowers contain a glycoside and rutin. Flower buds rutic acid, pectic acid, a volatile emetic constituent and saponin. The seeds yield 30 – 35 percent pale yellow oil. The root bark contains rutic acid and a volatile substance.

**Plate 1.19 : Capparis decidua Fruits**

All parts of the plant are used in traditional medicine for a variety of purposes in the regions where it grows. The fruits of the plant are astringent and useful in cardiac troubles and biliousness. The blanched fruits have a significant hypocholesteraemic effect on the serum and liver cholesterol. The root bark is alexiteric, anthelmintic and useful in cough, asthma and inflammations. Its aqueous extract possesses purgative activity. This genus is also known to be a rich source of flavonoids, alkaloids, glucosinolates.

Fruits of *Capparis moonii* contain L-stachydrine, rutin and β-sitosterol. The aqueous extract of the rind of the immature fruits contains a chestnut-red pigment, hajiacyn, which is used as an anti-trachoma drug. The fruits are also used in weakness and cough.

*Capparis spinosa* contains α- and β-amyrin, taraxasterol, erythrodiol, betulin and β-sitosterol. The presence of amino acids and phenolic acids has also been reported in this specie. The plant is credited with antipyretic and antiseptic property, and is useful in skin-diseases. The juice of inner bark of the root is used in scabies and eczema.

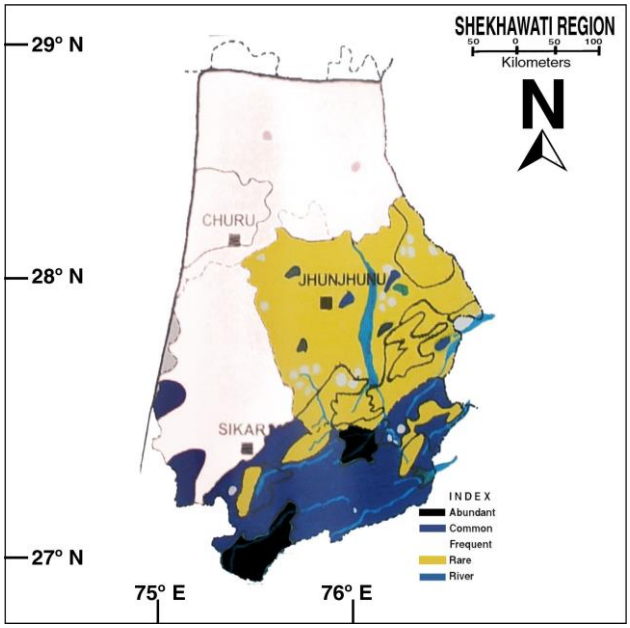
The ripe fruits of *Capparis micracantha* have a sweet aromatic flavour and are edible.

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level**- It covers the Afro-Asian region which falls under the tropical belt of the globe. The country sites which fall in this westward extension are; Tropical African countries specially NE-Africa, Arabia, Upper Egypt, Iraq, South Iran, Baluchistan and Pakistan, and western India but has no more eastward extension in India. In India, the areas which fall under distribution of Kair are Punjab, Haryana, U.P., M.P., Gujarat, Rajasthan and some southern parts of Deccan plateau.

**B. At Regional Level** -This is a very common plant, generally as observed throughout the Region of Shekhawati and it is found on different habitats viz; sandy plains, gravel and compact soil formation, on foot hill areas of stony and hilly patches also. It gives the picture of different landscape when it some times occurs as a shrub or at tree in sand dunes topography. Most of the areas of Shekhawati Region, the shrub has frequent occurrence but only at one place i.e. at Lakhoo locality it's community is found in abundant category from phytogeographic pattern of distribution point of view. The locality has 80 percent plants in the form of shrubs whereas 20 percent in the form of tree. The shrub shows common occurrence all three Jal Bani localities of Malsisar and Desusar (Jhunjhunu tehsil), and Buhana (Buhana tehsil). Besides these, it has common occurrence inbetween Dada Fatehpura locality to upto the boarder of Haryana State in south-eastern portion of Shekhawati Region, i.e. towards Nizampur site, in between Singhana to Chirawa at some places it has common occurrence, western side of Chirawa it shows common occurrence and at Dundlod locality it also shows common occurrence. Remaining areas of the Region fall under it's frequent category of occurrence, otherwise rarely it covers each and every habitat of the area under study except the steep slope and tops of the Sand dunes as well as on the hilly patches, respectively**(Figure-1.18).**

**Figure-1.18 Phyto-Geographical Distribution of Capparis decidua**




As a whole, if one goes through the map reading of Shekhawati Region **(Figure-1.18)** about phytogeographic pattern of spatial distribution of *Capparis decidua* than it is quite obvious from the map that Churu district's three tehsils fall under frequent occurrence , most of the north-western part also falls under frequent occurrence but most of the eastern and north eastern part of Sikar district has common occurrence, in which the northern part of Shri Madhopur locality and most of the southern part of Danta Ramgarh locality the shrub community was observed with an abundant category of occurrence. In brief, one can visualize very well that about 50% of the area under study i.e. Shekhawati Region has frequent occurrence, about 20% common occurrence, 20% rare occurrence (Specially in Jhunjhunu district after leaving one abundant and six common patches of occurrence )

and about 10% area overall falls under abundant occurrence, respectively **(Figure – 1.18)**.

**9. *Cassia angustifolia***

Local Name - Sona Mukhi, Kesudo, Anwal, Anwali, Sanai

**VEGETATIONAL CHARACTERISTICS**

The plant belongs to the family-*Caesalpiniaceae* (*Leguminosae*). From vegetational group point of view, it falls under the group of small perennial 'under shrub' with pale sub- erect, ascending branches. The leaves are large, compound and pinnate, thus, from leaf-class classification point of view - the plant belongs to the class of 'microphylls'. It has no spines or thorns, it generally achieves the height in between 50 to 130 cm. It has many flowers which are bright yellow in colour. Seeds are abovate and compressed, and flowers come in succession and remain for a longer duration. The plant bears no specific characteristics which falls under the categorization for xerophytes categories. Due to senosides phyto-chemicals the plant is also known as 'Senna'.

**Photoplate -1.20 Cassia angustifolia**

Immediately after flowerings pods appear on the under-shrub. Pods are slightly curved, 3-6 cm long and upto 1.5 cm. in width. On maturity pods turn to dark brown, and each pod contains 5 to 7 dark brown, ovate seeds. Mostly, the plants shed leaves at the commencement of winter season **(Photoplate -1.20).**

**ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS**

Generally, the plants grow well in warm arid-region, in other words to say that the plant, requires low rain fall conditions, for it's better growth and development from economic field as rainfed crop, it requires on an average rainfall in between 25 to 40 cm. Thus, the plant prefers semi-arid eco-climatic conditions rather than arid, respectively.

From temperature conditions point of view. The plant bears $4^{o}$C mean monthly minimum temperatures and $50^{o}$C as mean monthly maximum, respectively.

The plants are observed during the course of the field visit's on 23 survey spots, sandy loam soil found as one of the most favourable habitat, after this, the plant prefer stony and rocky habitat in Shekhawati Region. On pure sand dunes habitat hardly any plant can be observed in other words to say sand dunes habitat areas are not favourable for the growth and development, like-wise the saline areas and water logged soil areas are not suitable for the particular plant species. In brief, one can say that pH range in between 6 to 8-5 is found suitable for it's growth and development for the area under study i.e. Shekhawati Region, Rajasthan.

**MEDICINAL APPLIED ASPECT**

Being under shrub the plant has medicinal uses as herbal drugs for the cure of certain diseases. The plant as herbal drug is found of choice commonly available with all of them for the treatment of Gastro-intestinal disorders. It works wonder in restoring the proper function of stomach and intestine, it improves digestion and removes constipation.

In brief, we can say the plant parts and portions are useful as herbal drugs in medicinal uses for the cure of some diseases - Purgative, Cough, Gargles, Gastro-intestinal disorders, Eradication of Intestinal worms, uses in external application in skin diseases and native medicines.

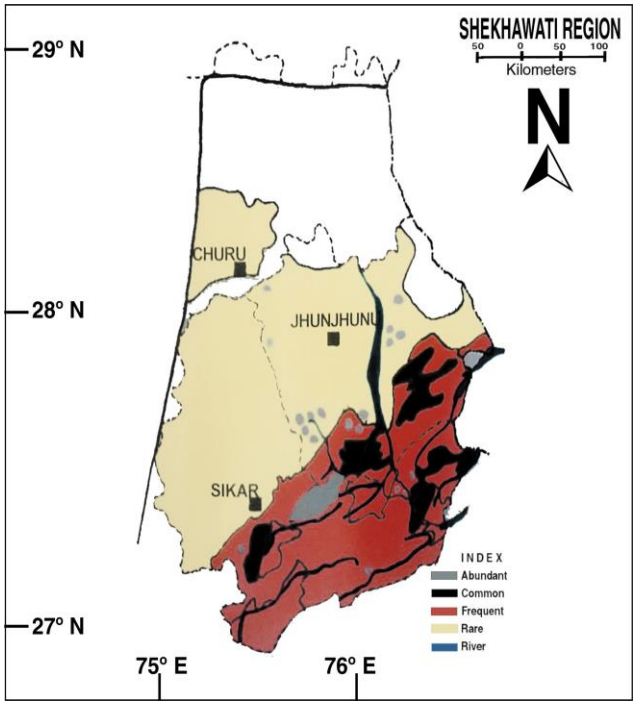
**PHYTO-GEOGRAPHICAL DISTRIBUTION**

**A. At Global Level** -The plant has wide distribution at global level. By thus, it covers the Tropics (through out) including Tropical America, Tropical Africa and Tropical countries of Asia, continent. India ranks at first place in the production of *Cassia species* in the world. Indian Senna is cultivated all of first in south-western arid - tracts of Tamil Nadu in marginal lands. Alexandrinian, Senna is obtained, from wild growth in Sudan in Tamil Nadu it is cultivated has irrigated crop, the crop is shown during February - March.

**B. At Regional Level** -In Rajasthan, it is cultivated as rainfed crop, seeds are sown in September - October with the onset of rain. It can how ever, we sown with pre-monsoon, rain in other parts of India where the system of irrigation is available.

In Rajasthan, it is being cultivated more or less from a decade, manly among the districts of Jodhpur, Pali, Barmer, Jaisalmer, Bikaner, Jalor, Nagor, Ganganagar and Churu as well as Sikar in Shekhawati Region of Rajasthan.

**Figure-1.19 Phyto-Geographical Distribution of Cassia angustifolia**




If we go through the map reading of **Figure – 1.19-** then one can visualize very well that the plant has no occurrence in Rajgarh and Taranagar tehsils and Malsisar locality (Sand Dunes habitat). In Churu tehsil (Churu district), Chirawa, Jhunjhunu and Nawalgarh tehsils (Jhunjhunu district), Fatehpur, Lacchmangarh and north-western Sikar tehsil (Sikar district), the plant species shows the rare phytogeographic pattern of spatial distribution. One can observe the frequent pattern of phytogeographic occurrence in South-eastern part and portion of Shekhawati Region which covers sandy loam soil formation areas. Most of the stony and rocky areas habitat formation fall under the common occurrence of phytogeographic pattern of spatial distribution as shown in **Figure-1.19**- which covers southern part of Buhana tehsil, Khetri and Udaipurwati tehsil (Jhunjhunu district), Neem ka Thana and north-western part of Danta Ramgarh tehsil, respectively. One can find only one abundant locality of C*assia angustifolia* with abundant, phytogeographic pattern of spatial distribution by covering the Lohargarl locality (stony and rocky habitat) situated in northern part of Sikar tehsil (Sikar district).

It shows the under shrub species shows frequent phytogeographic pattern of spatial distribution in riverine and aquatic habitat for the area under study i.e. Shekhawati Region, Rajasthan.

**10. *Commiphora mukul***
Local Name - Gugal, Gugalani, Guggul

**VEGETATIONAL CHARACTERISTICS**

The plant is a member of family, *Bursaraceae*. It is a much branched shrub with a height of 1 to 2.5 m. It's branches are with silvery, semi-transparent, paper like bark peelings. It's appearance is like a stunted bush with trunk spreading branches ending into sharp spines. Except for a little period, the shrubs are generally found leafless in their life cycle. Flowering and fruiting - Flowering of the shrub take placed twice in a year i.e. in March - April and also in September - October which is followed by the period of fruiting process i.e. in May-June and also in October-November. Life-form classes point of view the shrub falls in the group of 'Nanophanerophytes'. It is a drought resistant species and from xerophytic-categorization point of view, in falls in the category of 'spiny and thorny' whereas under leaf-classes analysis the shrub falls in the class of leafless which is actually a characteristic xerophytic class for the plants of Rajasthan desert as well as for the area under study i.e. Shekhawati region, Rajasthan.

**Photoplate -1.21 Commiphora mukul**

Thus, it is a shrub with corked and knotty branches some times of 4 m height. The branches end in sharps spines. Leaves are 1-3 foliolate, alternate or fascicled but most of the year it is found leafless. Plants are dimorphic. Fruit's are drupe, about 1 cm long, red when ripe **(Photoplate -1.21).**

**ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS**

The shrubs of *Commiphora spp*. have more or less, on and average frequent distribution over the hilly patches of Shekhawati Region, Rajasthan. These hilly patches have their south-west to north-east pattern of geographic location in south-eastern part of area under study. The shrub shows no occurrence over all types of habitat but it shows 'mono-climax' nature by covering only stony and rocky areas of Shekhawati Region. Thus, by nature it exhibit's obviously the 'mono-climax' tendency of plant succession.

It is very interesting to mention here that although the shrub shows it's distribution in different climate types i.e. extrem arid region (Jaisalmer locality), in arid climate (Rani Gaon locality, Barmer), and semi-arid region (Kailana locality, Jodhpur), and semi-arid climate of Khetri and Mansa Mata locality (Jhunjhunu district, and sub-humid region (Lohargarl and Harsh locality, Sikar district) but it's habitat type is throughout same i.e. stony and rocky, respectively. By thus, the shrubs bear a wide range of rain fall distribution which lies in between 25 cm. to 75 cm. annual average rainfall. Here, in it's distribution it is concluded that the nature of habitat is

rather more important than that of rainfall factor. Altitude is an another essential factor in the phytogeographical distribution of these plants, so generally the community has occurrence over the areas having height of 400 m MSL or above. An average value of salt contents for the growth of these plants on stony and hilly habitat in Rajasthan desert ranges from 1000 to 10000 ppm, pH from 8.5 to 8.6, and electrical conductivity from 0.1 to 0.7 mmhos. Upto 1m depth, the percentage of soil moisture plays a vital role in the growth of the plant but only upto their younger stage and than after it effects little in development phase for the reason that it's tap root penetrates more deep in the underground substratum.

After all, the percentage of soil moisture increases from pre- to post - monsoonal period at different depths i.e. about 20 times at surface, 4 times at 20 cm and 3 times at 50 cm depth. The plant species frequently forms an association with other communities in desert, as *Commiphora + Euhorbia+Sarcostema*, and also at some places like *Commiphora+ Salvadora+Acacia*.

## MEDICINAL APPLIED ASPECT

It is used as anti-inflammatory, anti-rheumatic, hypolipi-demic and hypo-cholesteremic drug. The oleo-gum resin of this plant is used in the treatment of arthritis and obesity. At the part of medicinal applied aspect in brief, it is mentioned by some taxonomist as - Astringent, Aphrodisiac, Rheumatism, Tonic as an indigenous medicines.

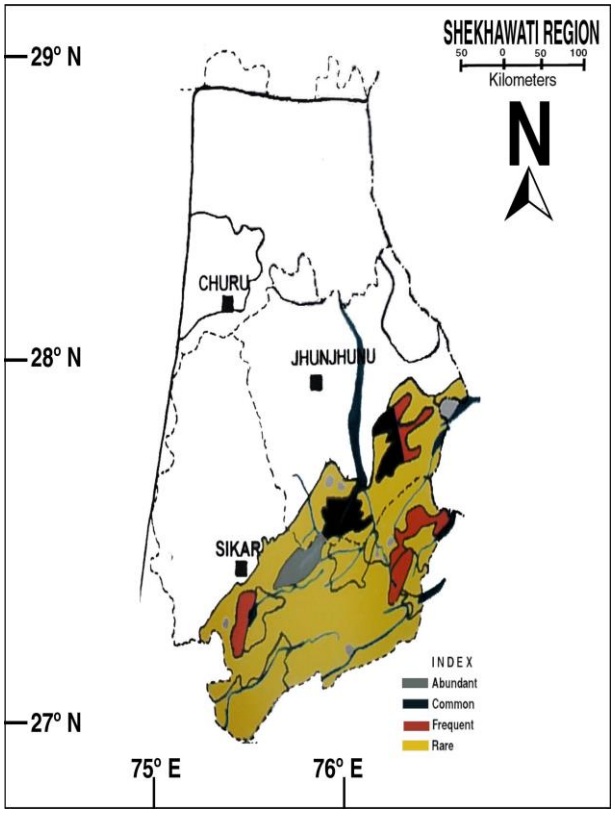
The shrub is much valued by the people for local medicines. The resin from the shrubs trunk or twigs is used as an antiseptic on old wounds, it is also used as a urine stimulant, also used on the ulcers in the form of lotion, and as for gargling purpose for weak and spongy gums also even in pyorrhoea. Generally, it's young bronchlets are used directly as tooth brushes by the local inhabitants. Inhalation of the burnt guggal is used in the cure of chronic disease of bronchoities.

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - The shrub spp. has wide distribution at global level, it covers Tropical Africa, Asia, Madagascar, Austria (Europe) and in many Pacific Island. In Indian sub-continent it's spreads westerly by covering Baluchistan, Sindh (Pakistan), and in Arabian countries. In India, it occurs in the tracts of a western India, by thus, in India it covers a large area which includes the states of Gujarat, M.P., Mysore and Rajasthan, also in the states of Maharastra and Karnataka**.**

**B. At Regional Level** - Besides the Shekhawati Region, in Rajasthan the shrub has occurrence in many districts viz.;Udaipur, Jaisalmer, Barmer, Sirohi, Jalore, Jodhpur, Pali, Alwar, Nagour, Ajmer, Bharatpur, Jhalawar, Sawai Madhopur, Tonk and in Sariska forest. It is worthwhine to mention here that a Public Guggal Farm has been established by Govt. of Rajasthan near Mangaliawas (Ajmer district) for it's conservation point of view.

**Figure-1.20 Phyto-Geographical Distribution of Commiphora mukul**




In Shekhawati Region it is found abundant pattern of phytogeographic distribution in Lohargarl locality (Sikar tehsil, Sikar district), on the stony and rocky habitat of hilly patches of Khetri and Udaipurwati tehsil (Jhunjhunu district) the shrub shows it's common phytogeographic pattern of spatial distribution. In many hilly patches scattered in south-eastern part of Jhunjhunu district and eastern part of Sikar district the shrub shows frequent phytogeographic pattern of spatial distribution.

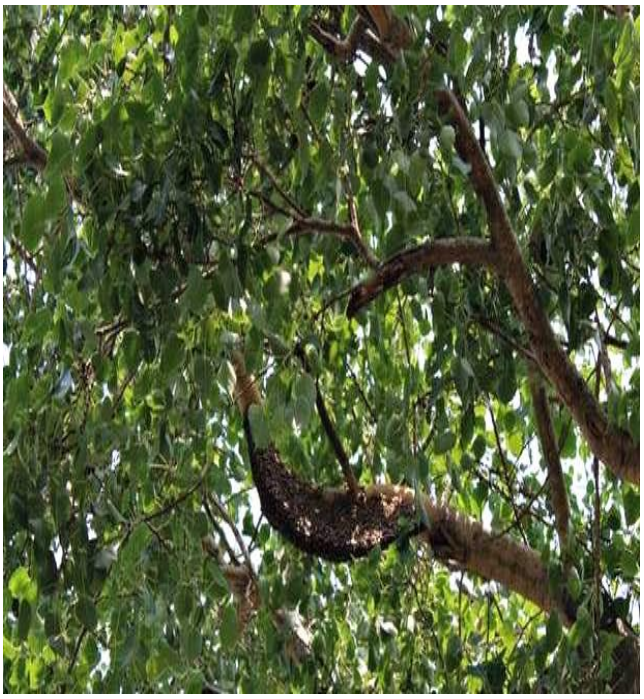
Besides the above mentioned areas, it has rare phytogeographic pattern of spatial distribution in the localities which are scattered near by Stony and Rocky habitat. The shrub shows no occurrence in riverine and aquatic habitat of the area under study, as shown in **Figure-1.20.** The three tehsils of Churu district have no occurrence of the shrub spp. i.e. *Commiphora mukul*.

**11. *Ficus religiosa***
Local Name - Pipal, Pipali, Lac, Kiranja, Peepal

## VEGETATIONAL CHARACTERISTICS

It is a full sized tree, thus, it falls under the group of 'Tree' from vegetational group point of view. It belongs to the family - *Moraceae*. It is a religious plant for Hindus from centuries back, hence, it's species is known as *Ficus religiosa*. From leaf-class classification point of view-the tree falls to the class of 'macrophylls'

**Photoplate -1.22 Ficus religiosa**



From xerophytic categorization point of view, the upper surface of leaves are coated with waxy substances. From life-forms classification point of view - the tree falls in the group of 'phanerophytes'. Being, it's importance from religious point of view, it is protected from cutting and it is being worshipped throughout the Indian sub-continent wherever Hindus population is dominant **(Photoplate -1.22).**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

In northern India, it is observed with it's 'poly-climax' nature, hence, it is observed in sand dunes habitat as rare, frequent in sandy plains habitat and commonly observed on stony and rocky habitat of hilly patches for the area under study. The tree shows it's frequent to common occurrence on riverine and aquatic habitat. Thus, the tree has been observed in arid climate (rare) semi-arid climate (frequent) and common in sub-humid and abundant in humid climate of Rajasthan. Thus, one can visualize very well it's favourable habitat in Shekhawati Region, Rajasthan. The 40 cm. Annual rainfall to150 cm. Annual rainfall as favourable climatic condition for this tree species whereas at the part of temperature conditions $10^{o}$C mean monthly minimum and $40^{o}$C mean monthly maximum condition are favourable climatic conditions for this tree. More percentage of relative humidity places make favourable climatic conditions of this plant. It has no occurrence on top of the sand dunes but it's plantation favours the stony and rocky habitat of the area under study. It is a tropical climate tree - favours warm but moist habitat conditions. Such condition are found in Khetri and Udaipurwati tehsils (Jhunjhunu district) and in Danta Ramgarh, Shri Madhopur and Sikar tehsils (Sikar district).

## MEDICINAL APPLIED ASPECT

The scientists mentioned it's following medicinal applied aspects - as a tonic, in the cure of Leucorrhoea, it prevent bleeding, in Rheumatism pain, thus used as a indigenous medicine by the Vedhs in Ayurvedic traditional medicine. It's wood is used in sacrificial fires.

Further in this context, at the part of medicinal uses for the cure of diseases, the native persons and Vedhs - they consider it as a very useful in conditions where blood comes out of body in unnatural way. The condition may be Haematuria (Passing of blood with urine) or bleeding piles, Even sometimes when a women bleeds irregularly due to disorder in menustuaral cycle. In all such conditions it helps to check the unnecessary flow of blood.

*Ficus religiosa* and *F. bengalensis* both are religious plants, the scientists studied their comparative importance in the aspect of check the pollution in surrounding atmosphere.

## PHYTO-CHEMICAL ANALYSIS OF APPLIED PARTS AND PORTION :

It's secretion products are parts and portion of the tree, which are important from phyto-chemicals study point of the tree, which are important from phyto-chemicals study point of view. It is a resinous substance dull red, rough, amorphous with granular fractures on the surface. It is exuded from an inset thriving an peepal tree.

It contains essential volatile oil, some Glycosides Enzymes and some minerals.

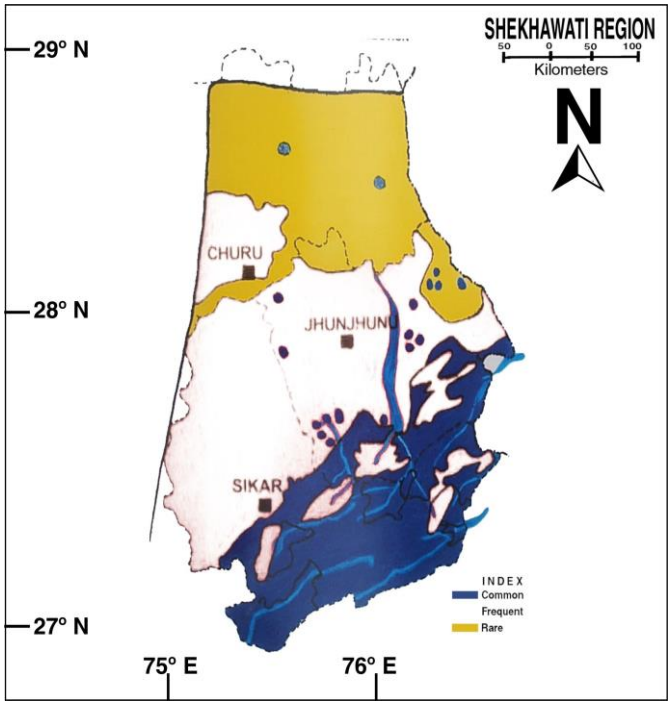
**Plate 1.23 : Ficus religiosa Fruits**

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - It has Oriental distribution at global level i.e. it has through distribution throughout India, but it depends on plantation. In India-sub-continent it may be observed throughly, in other words to say that it is native to Indian sub-continent. In India it has distribution in Sub-Himalayan forest, Bengal, Maharastra, Haryana, Punjab, Gujrat, Uttar Pradesh, Madhya Pradesh and Rajasthan**.**

**B. At Regional Level -** Due to it's 'poly-climax' nature, the distribution of tree covers different climate types - Arid (rare), Semi-arid (frequent), Sub-Humid (common) and Humid (abundant).

**Figure-1.21 Phyto-Geographical Distribution of Ficus religiosa**




In Shekhawati region, it shows rare phytogeographic pattern of distribution in two tehsils of Churu district (Rajgarh and Taranagar) whereas in Churu tehsil it has frequent occurrence. Like-wise it is rare in the north-western part (Malsisar locality) of Jhunjhunu district. Most of the western, and central part of Jhunjhunu district is shows frequent occurrence, it also shows frequent phytogeographic pattern of distribution in most of the western part of Sikar district. On stony and rocky habitat of hilly patches of Shekhawati region, it shows again frequent occurrence but in the south-eastern part of Jhunjhunu district (Udaipurwati and Khetri tehsils) and eastern part of Sikar district (Neem ka Thana, Shri Madhopur, Danta Ramgarh and northern part of Sikar tehsil) - the tree species shows common occurrence from phytogeographic pattern of spatial distribution, as shown in **Figure – 1.21.** At riverine and aquatic habitat, and at holly places of Hindus - it shows frequent to common occurrence which is also obvious from the map of study region i.e. **Figure-1.21.**

The tree has common occurrence within human settlements, it may be village, town or city due to more plantation, specially where Hindu's population is more - as observed during the course of field visit's on selected survey spots in Shekhawati region.

**12. *Sida alba***

Local Name - Kharenti, Bala, Kala Beej Bandh, Kantio bal

## VEGETATIONAL CHARACTERISTICS

The plant belongs to the Family - *Malvaceae*. It is an erect under shrub or a small shrub. It achieves 1 to 2 meter tall. Minute star-shaped hairs are present all over the plant, the base of plant usually woody. Thus, from vegetational group point of view. The plant in nature falls under both groups i.e. under shrub as well as small shrub. Leaves are 5 cm. long and 3 cm. in width, thus from leaf-class classification point of view. The plant belongs to 'Microphylls'. Flowers are small and yellow in colour. The seeds of the plant are generally 1.5 cm. long, smooth, dark brown, rounded at back, trigonous and glabrous **(Photoplate -1.24).**

**Photoplate -1.24 Sida alba**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The plant has been observed not in a specific habitat, it covers sandy plains, sandy loam soils, in gravel formation and, stony and rocky habitat. The plants avoids generally the habitat of pure sand dunes topography. It shows, it's occurrence in more than one climate i.e. in semi-arid, sub-humid and also in humid climate. From rainfall distribution point of view, It is observed from 30 cm. to 100 cm. average annual rainfall.

At the part of temperature variations, the plant may survive from 5$^{o}$C mean monthly minimum temperatures to 50$^{o}$C mean monthly maximum temperatures. In brief, one can say that the plant shows poly-climax nature of occurrence in Shekhawati Region. It is a common weed of the gardens in open places.

## MEDICINAL APPLIED ASPECT

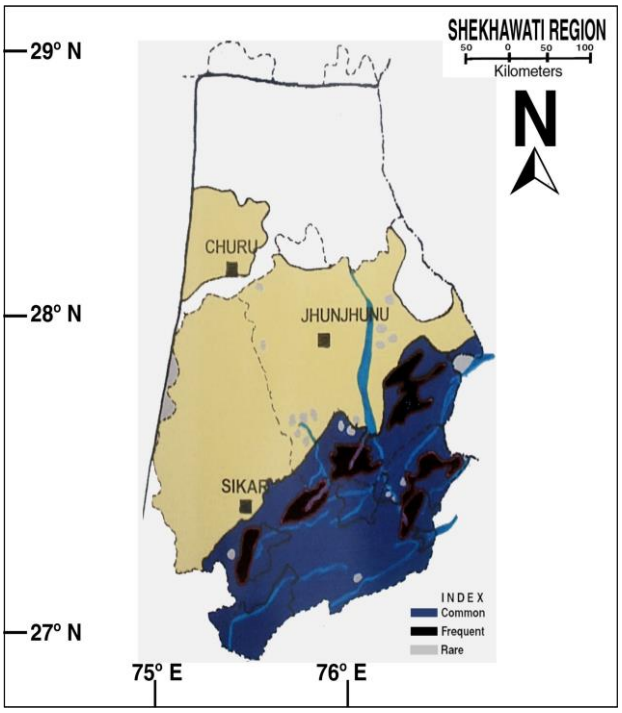
The brooms are prepared from the branches of *Sida spp*. The seeds make general tonic for improving sexual strength. It is used to improve sex power and also for the treatment of "Gonorrhoea" and for "Asthma" in other combinations. The decoction of fruit's is administered in Fever. Thus in brief, we can say the plant part and portion has medicinal uses for the cure of some diseases - viz; Tonic, Urinary problems, Leucorrhoea, in male and female sterility.

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level -** The plant has wide range of phytogeographical distribution at the part of global level. It covers tropical and sub tropical regions of both hemispheres. In India it is found through out in hotter parts. It has wide

distribution through out India, specially in waste places and it is found as a common weed of the gardens in open places, as well as in open scrub forest areas.

**Figure-1.22 Phyto-Geographical Distribution of Sida alba**




**B. At Regional Level** - It is quite clear from the map, **Figure – 1.22**. By going through the reading of the area under study, it has no occurrence in Rajgarh and , it has no occurrence in Rajgarh and Taranagar tehsils of Churu districts but it has rare occurrence in Churu tehsil it'self **(Figure-1.22)**.

The plant shows frequent to common occurrence over the habitat of stony and rocky formations i.e. hilly habitat in this way the plant has frequent to common occurrence in Khetri and Udaipurwati tehsils (Jhunjhunu district), Eastern part of Sikar tehsil, Danta Ramgarh, Shri Madhopur and Neem ka Thana tehsils of Sikar district. The plant shows no locality of abundant phytogeographic pattern of spatial distribution, Shekhawati Region, Rajasthan,. As shown in **Figure 1.22**. It is distributed throughout in Rajasthan specially in waste places and open scrub forest.

**13. *Tinospora cordifolia***
Local Name - Neem-giloy, Giloy, Amrita, Gilo

## VEGETATIONAL CHARACTERISTICS

It is a vigorous, perennial climber. It belongs to the *Menispermaceae* plant family. Thus, from vegetational group point of view, it falls under the group of 'climbers'. Stems are succulant which are generally 2 cm. in diam. and produces aerial roots.

**Photoplate -1.25 Tinospora cordifolia**

Leaves are ovate or roundish which are generally equal from length and width point of view, They are generally 10 cm. long (8-20 length x 8-20 cm. in width). Flowers are small (5-10 mm. Long), yellow in colour, Female flowers are usually solitary, while male flowers are grouped in axils. Thus, male and female flowers are separate. It's fruit's are drupes in appearance, red in colour, thus, in size of a large pea.

From life - forms point of view the plant falls under the group of "Climbing Phanerophytes". From leaf-class classification point of view it falls under the class of 'Microphylls'. From xerophytic categorization point of view, it bears more sunken stomata on leaf surface and stems are succulent in nature **(Photoplate -1.25).**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

Generally, the climber prefers rocky habitat, in other words to say the stony and rocky habitat is one of the most suitable habitat from it's occurrence point of view, where the plant is found in truly wild state. The climber is also found on the habitat at gravel formations. Thus in brief, it competitively requires dense vegetation or forest area which bears more moisture as well as shaded of canopy coverage.

It is hardly observed over sand dunes habitat as well as sandy plains habitat. It is also rarely found in riverine habitat but in aquatic habitat it may be observed if it has topography of hilly formations. Humid and Sub-humid climate favours it's occurrence, Semi-arid climate with stony and rocky habitat is also suitable for it's occurrence, respectively. It's annual rainfall limit ranges from 40 to 100 cm., temperatures conditions ranges from 10$^{o}$C (mean monthly minimum) to 40$^{o}$C (mean monthly maximum). It requires at least 30% relative humidity in atmospheric conditions.

## MEDICINAL APPLIED ASPECT

The starch of roots and a stems are nutritious by nature, hence, it is used as tonic, and are used to cure diarrhoea. Besides this all above mentioned medicinally uses for the cure of different diseases, the herbal vendors use it very commonly

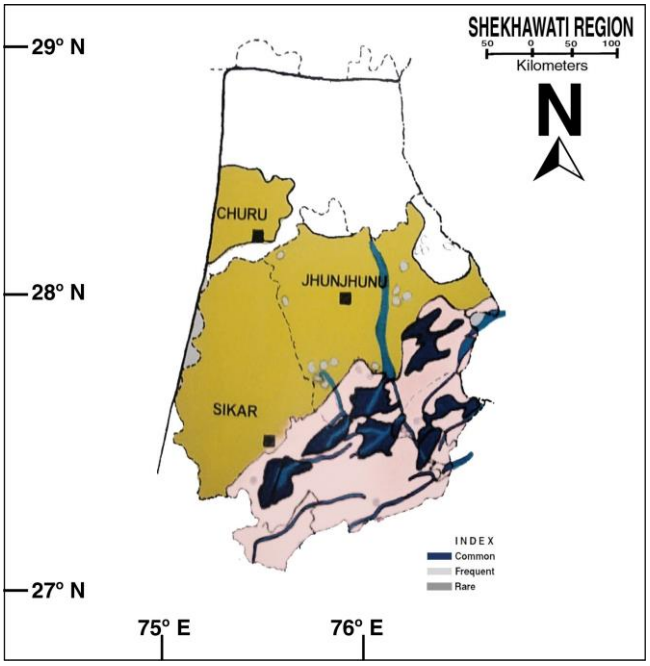
in several combinations. Hence many botanists as well as Vedhs call it as a great "gift of nature" because it can be conveniantly used against several diseases.

They use it against all kinds of fever and for urinary diseases specially to promote urination and for the treatment of dyspepsia and flatulence. They also prescribe it in the treatment of general debility, sexual impotency, syphilis, gonorrhoea, Jaundice, piles and intestinal worms. Several of them indicated about it's important role in the treatment of diabetes next only to Gurmar buti *(Gymnema sylvestre*).

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - The climber species is restricted up to Indian sub continent by excluding Himalayan Region. Thus, the species is distributed in the Tropical parts of India, specially in the north-western Region, respectively.

**Figure-1.23 Phyto-Geographical Distribution of Tinospora cordifolia**




**B. At Regional Level** - From phytogeographic pattern of occurrence point of view, it is quit obvious from the **figure – 1.23** that there is no abundant locality in this aspect but the Region under study shows many scattered areas of common occurrence from phytogeographic pattern of distribution point of view - Khetri and Udaipurwati tehsil (Jhunjhunu district); and tehsil of Sikar district - Neem ka thana, Shri Madhopur northern part of Shri Madhopur and Sikar, respectively. These are all hilly patches with stony and rocky habitat areas.

Frequent occurrence had been observed during the course of field surveys in the localities which are surroundings of the hilly patches, mostly these are located in south-eastern part of the area under study.

The climber rarely observed in middle part of Shekhawati Region only where it is probably it has been introduced, but not found in wild state as it was observed in hilly patches, respectively.

Rajgarh and Taranagar tehsil (Churu district); and northern part of Jhunjhunu tehsil i.e. Malsisar locality and north eastern part of Chirawa tehsil (Jhunjhunu district) are free from it's occurrence from phytogeographic pattern of distribution point of view, as shown in **Figure-1.23.**

**14. *Tribulus terrestris***
Local Name - Chhota Gokhru, Kanti, Bhankri

## VEGETATIONAL CHARACTERISTICS

The plant belongs to the family of *Zygophyllaceae*. It is an annual herb, by thus, belongs to the 'Herb' group from vegetational group classification point of view. It is a trailing and spreading herb, the plant is densely covered by trichomes with minute hairs. Leaves are compound, in opposite pairs, by thus, from leaf-class classification point of view, the plant belongs to the 'Leptophylls.' It's flowers are usually silky, mostly yellow in colour. Fruit's are globose, spinous, each with two pairs of hard sharp spines, in which one pair of spines is longer than another pair. Thus, from xerophytic categorization point of view, the herb falls under the category of 'spiny and thorny'**(Photoplate -1.26).**

**Photoplate -1.26 Tribulus terrestris**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The herb species is very common on the habitats of loose sandy plains and also on compact as well as gravel formations, it has also occurrence on sand dunes habitat but comparatively show less occurrence than loose sandy plains areas. It is also found on stony and rocky areas but show, rare or frequent, occurrence. By thus, it is a herb species may be termed as multi habitat species.

Plant is widely distributed in different parts in India as well as Rajasthan up to three thousand meters altitude. It is a xerophytic species which has wide tolerance limit's of eco-climatic conditions. The plant bears 50$^{o}$C temperatures as mean maximum temperatures conditions and survives very well in the total annual rain fall below ten inches. By thus, it is

a drought bearing plant species of western Rajasthan which requires no moisture conditions.

## MEDICINAL APPLIED ASPECT

This plant is a most important ingredient of an Ayurvedic preparation. The drug is diuretic, tonic, aphrodisiac. The decoction of leaves is useful as a gargle for mouth trouble, painful gum and to reduce inflammation. The leaves in creases the menstrual flow, cure, gonorrhoea. The fruit's are useful in urinary complaints painful micturition and impotence. Fruit's are also used to treat coughs, scabies and anexemia. The roots are said to be stomachic, appetiser, diuretic and carminative.

Besides this some researchers also stated that the plant is very common herbal drug and is a drug of choice for the treatment of urinary diseases specially Haematuria, for which they assert that it is a boon. It has great cooling effect and are also used for promotion of urination and as a nervine tonic.

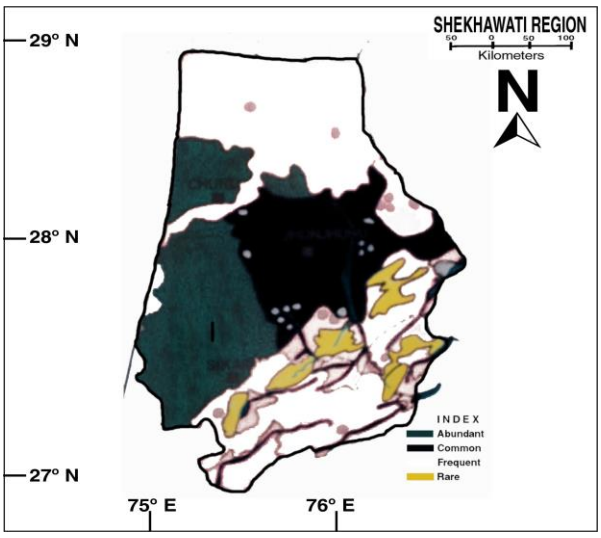
## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level** - It is a cosmopolitan herb species as a weed which is more or less found through out the countries which fall under the tropical belt. It is also observed from it's occurrence point of view that it is found throughout the Indian sub-continent by excluding the Himalayan Region**.**

**B. At Regional Level** - It has abundant occurrence from phytogeographic pattern of distribution in following tehsils of Shekhawati Region - Churu tehsil (Churu district; northern part of Jhunjhunu tehsil (Jhunjhunu district; Fatehpur, Lachhamangarh, Sikar tehsils (Sikar ditrict). It is common more or less through out the northern Jhunjhunu district by leaving the northern part of Chirawa and Jhunjhunu tehsils as shown in **Figure-1.24.**

The herb has frequent occurrence from phytogeographic distribution point of view among following tehsils - Taranagar and Rajgarh (Churu district), Danta Ramgarh, Shri Madhopur and Neem ka thana (Sikar district), and Khetri as well as Udaipurwati tehsil in the district of Jhunjhunu, respectively.

**Figure-1.24 Phyto-Geographical Distribution of Tribulus terrestris**




The herb species is rarely observed on stony and rocky habitat of Shekhawati Region; and also within the habitat of riverine and aquatic areas the herb species again shows it's rare occurrence, respectively.

**15. *Withania somnifera***
Local Name - Asgandh, Aswagandha

## VEGETATIONAL CHARACTERISTICS

It belongs to the family - *Solanaceae.* A much branched, erect, perennial under shrub, 9-12 dm high, plant with more or less tuberous root. Leaves 5-10x3-6 cm, ovate, obviate or oblong, sub acute or rarely obtuse, entire rounded or somewhat produced at base and thus, it belongs to the leaf - class of 'Nanophylls'.

Flowering and Fruiting - It is that under shrub in which flowering and fruiting period remains almost throughout the year, hence, there is no specific period in this aspect **(Photoplate -1.27).**

**Photoplate -1.27 Withania somnifera**

## ECO-CLIMATIC CONDITIONS AND HABITAT CHARACTERISTICS

The under shrub shows 'poly-climax' nature in phytogeographic distribution by covering different habitats like sand dunes, sandy plains, riverine habitat etc. It has wide range of it's rainfall distribution (between 25 cm. to 100 cm.) and temperature variations ($30^{o}$c to $50^{o}$c monthly average). It is common in waste places and in dry soils near garden but throughout the area under study, it show wide distribution and at certain places form a dense association.

Mostly, these under shrubs prefer the waste sandy plains with surface of compact soil formation. The observations based on field study sites revealed that the plant community also prefer the areas fall under the land use under human settlement.

Thus, the under shrub shows unique as well as specific nature of habitat occurrence point of view i.e. within villages, towns and cities.

## MEDICINAL APPLIED ASPECT

Out of five categories of applied categorisation of the useful plant species of the area under study, it covers three categories viz; fuel, fodder and medicinal. We are here concerned with the details of the under shrub as a medicinal plant.

It is a very useful under shrub for Medicinal purpose. The plant is reported in the "Vaidic" books as an ancient Indian Medicine. It's dried roots after grinding and bruised leaves are applied to painful swellings.

Further in this context, at the part of medicinal uses of the particular plant species for the cure of some diseases is mentioned here that this is 'very common and popular herbal drug' and the expert mentioned it invariably in all prescriptions calling it as a "divine gift".

They use it in several combinations, for the treatment of several diseases such as sexual impotency, general debility, male sterility, respiratory and urino-genital disorders, leucoderma, promotion of urination and for purification of blood. They assert that all parts of the plant is useful and it has the capacity to combat many human ailments. Some of them have also been prescribing it for the removal of general tumours from body. They also claim that if Asvangadha root powder is taken regularly with milk it can promote growth in children and retard again the process in older people.

## PHYTO-CHEMICAL ANALYSIS OF APPLIED PARTS AND PORTION

Several biologically active elements and compounds are reported-

1. Alkaloides - Withasome, Nicotine, Tropine, Anahygrene, cuscohygrine, Recently a new alkaloid "Visamine" was reported from USSR.

2. Glycosides - Withaniol.

3. Misc. compounds - Reducing sugars amino acides - Glycine, Aspartic acid Glutamic acid, cystine, proline, Tryptophan, Alanine, Tyrosine are reported. Recently J.R. Chowdhary (1988) reported about "Withanolide D" a steroidal lactona and "Withaferin A" from leaves. They have anti-tumor effects.

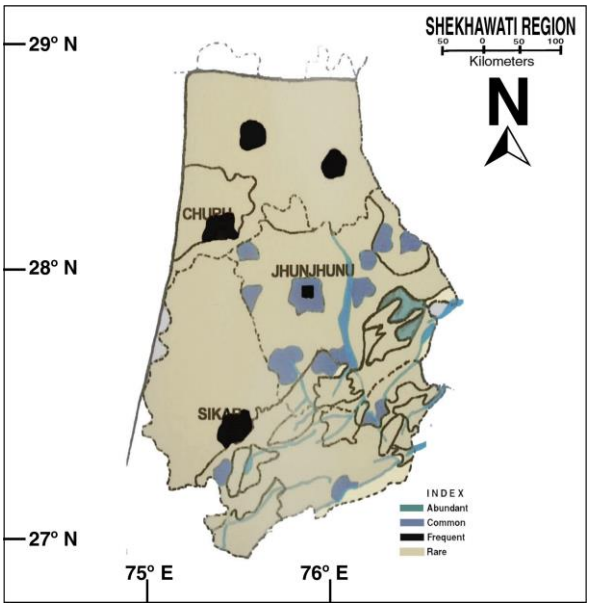
Some workers have carried out their research study on effect of Aswagandha on the process of ageing factor in human volunteers (Kuppura Jan, 1980). The under shrub also studied as a rejuvenating herbal drug (Singh, 1982). The effect of Aswagandha in mice also studied by Verma in 1983. Further in this context a comparative study of Aswagandha and Punarnava was done by Venkataraghavan 1980.

**Plate 1.28 : Withania somnifera roots**

## PHYTO-GEOGRAPHICAL DISTRIBUTION

**A. At Global Level -** At global level distribution the plant covers a wide range of occurrence that is Mediterranean Region, Cape of Good Hope, Canaries, Ceylone, Pakistan (Sindh) India (throughout the drier regions)**.**

**Figure-1.25 Phyto-Geographical Distribution of Withania somnifera**




**B. At Regional Level -** Although, the under shrub plant species observed at rare distribution through out the area under study. At four places, it is observed with frequent distribution in which three localities are situated in Churu district and one in Sikar, respectively. At several places the shrub community shows common occurrence i.e. on twelve places in which three are situated in Sikar district and nine places are located in Jhunjhunu, respectively.

There are two abundant patches observed as pure association in middle eastern part of Shekhawati Region, these two abundant patches are observed in between Singhana to Khetri locality as shown in **(Figure 1.25).**

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