

Demography and Ecological Dynamics of Ethanomedicinal Plants of Mainpuri District, India

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Abstract

With the growing modern civilization, the ever increasing role of plants to human life has placed before us many fold tasks for understanding intimately the world of the plants and their relationships with human being.

Demographic analysis of a plant community is the first and foremost basis for study of any piece of vegetation. The floristic studies based on demography data present a complete picture of the vegetation i. e. distribution pattern and seasonal changes of the plant communities inhabiting a particular area or region. The dependence of man on medicinal plants is next to food for life sustenance. Continuous exploitation of medicinal plants has also been causing extinction of certain species. There is, therefore, need for intensive agricultural studies leading to genetic improvement and cultivation methods for expansion of area under medicinal and aromatic plants.

In the present investigation a fact was established by long observations that the vegetation of a region or a locality, in general, follows a certain well-defined distribution pattern. Authors have studied the vegetation of Mainpuri district of Uttar Pradesh. This area is located in tropical zone between 26° 53' to 27° 31' North latitude and 78° 27' to 79° 26' East longitude and covers an area of nearly 4343 sq. km. The climate of the district is markedly periodic and of semi-arid nature which is characterized by a dry and hot summer, a warm monsoon and a bracing cold winter. The soil of the district is divisible into three types i.e. Matiyar, Bhur and Dumat within this there is a vast area of wasteland known as 'usar' is available, which is not fit for irrigation. Here 66752 hectares of land is usar land therefore the vegetation of this land is scarce and only few restricted plants flourish, therefore, understanding of natural ecosystem is important for their conservation.

During the present ecological investigations it was found that the medicinal herbs viz: *Adhatoda vasica*, *Achyranthes aspera*, *Argemone mexicana*, *Bacopa monniieri*, *Centella asiatica*, *Datura stramonium*, *Calotropis procera*, *Euphorbia hirta*, *Plantago ovata*, *Solanum xanthocarpum*, *Trianthema portulacastrum*, *Tribulus terrestris*, *Withania somnifera* were abundant. Medicinal grasses viz. *Cynodon dactylon*, *Cymbopogon nardus* showed the dynamics regeneration process by suckers and rhizomes and medicinal trees like *Acacia nilotica*, *Pongamia pinnata*, *Syzygium cumini*, *Terminalia arjuna*, *Ficus benghalensis*, were most popular.

Ex-situ conservation of these plants in such wastelands, with extreme ecological conditions, was found to be with the help of natural germplasm sustaining. Few ecological interactions and niche during all seasons were recorded.

Key Words: Demography, Ecological dynamics, Medicinal plants, Wasteland

Introduction

The survival and well being of the present day human population depends on several substances obtained from plants. Economically important plants are over exploited to meet the demand of growing population globally and resulted in drastic decline in their population size. Some species of important plants have already become extinct and there are many facing danger of extinction. Many factors both natural and man-made are responsible for limiting the distribution of species and causing them to become rare or even extinct. Casual factors of threat may be natural or man made.

In view of the large scale exploitation of useful diversity of various plant species from forest and open areas, particularly for medicinal and other economic plants, and the prevalence of fragile ecosystem in many parts of the country and also the existence of diversity in several useful co-existing biological species it becomes

important to conserve these plant species or co-existing species and systems either by way of domestication and cultivation or by ex-situ or in-situ conservation methods for their sustainable use.

People have recognized the medicinal value of plants for thousands of years. Even though our earliest ancestors may not have understood how or why certain plants cured specific ailments they were well aware that plants heal as well as nourish.

In third world countries today the majority of people cannot afford to buy modern drugs and still must rely on herbal medicines. With the concomitant population increases and destruction of the wild environment sources for herbal remedies are getting scarce.

As the loss of biodiversity becomes over apparent there has been a rush to sample plants in the wild for potential cures. Unfortunately, one can only test these plants against a few ailments and we may lose important materials because the plants were not screened against the disease for which they might be effective. Twenty years ago one would not have tested compounds for anti-viral properties that we need today to fight against AIDS, for example. Equally we cannot guess what might be important medical problems in 50 years time. By then we may have lost an important proportion of our botanical heritage and many potential cures.

Jain 1987 has defined ethanobotany as the total natural and traditional relationships and the interactions between man and his surrounding plant wealth. Thus Ethanobiology must have been the first knowledge acquired by the early man by sheer necessity intuition, observation and experimentation. Ethanomedicine, a further specialization of the above subject, has received much attention of scientists since last three decades or so. Ethanomedicinal explorations carried out with good scientific base have led to the publication of much useful account of plants with medicinal properties (Jain 1987, Jain and Borethakur 1980, De 1968, Kirtikar and Basu 1933, Bandoni 1976, Alam and Anis 1987, Singh 1983). In India ethanobotanical studies with good scientific base were conducted in last three decades leading to publication of valuable regional accounts of medicinal plants viz. Singh and Khan 1990, Biswas 1940 and 1958, Chopra and Chopra 1956 and Singh *et al.* 1979. Nevertheless, considering the vast size of our country with various agro-climatic conditions there are variety of flora of medicinal value which needs further study.

The purpose of the present work is not to prepare prescriptions for different diseases but only to apprise the people with some common medicinal plants of district Mainpuri where a vast area is a wasteland and only a few plants with medicinal value are flourishing. Therefore, these should be taken care and conserved. A humble attempt is made to explore and gather information about plants pertaining to medicinal resources.

Materials and Methods

Location

The present study was carried out in the Mainpuri district of Uttar Pradesh. This area is located in tropical zone between 26°53" to 27°31" North latitude and 78°27" to 79°26" East longitude and covers an area of nearly 4343 sq. km. The climate of the district is markedly periodic and of semi arid nature which is characterized by a dry and hot summer, a warm monsoon and a bracing cold winter.

Estimation of soil samples

The soil of the district is divisible into three types i.e. Matiyar, Bhur and Dumat within this there is a vast area of wasteland known as 'usar'. The properties of the soil were analyzed by following Standard Methods given by Pandeya *et al.* 1968. The soil samples were collected from the sites of Mainpuri in polythene bags and were brought to the laboratory and then analyzed following Standard Methods (Table 1).

Survey of the Grasslands

Medicinal flora in the grassland was recorded with the help of quadrat. The observations were made frequently in the grassland and depending upon the frequency of occurrence of the medicinal plants a list of all the plants was prepared.

Demographic studies

Demographic studies were made with the help of 100x100 cm² quadrat. Thus five observations were taken. The frequency, relative frequency, density relative density, basal cover, relative dominance and importance value index (IVI) were calculated from the data recorded on the basis of formulae given by Mishra *et al.* 1981 and Raju 1997 (Table 2).

Table 1. Soil properties of Mainpuri District

Sl. No.	Parameters	Unit	Range
1.	pH	(-log)	8.5-10.4
2.	Conductivity	mmhos/cm ²	1.7-3.6
3.	Color	-	dark brown
	Matiyar	-	light brown
	Bhur	-	rich brownish
	Dumat	-	grayish white
	Usar	-	Clay to sandy loam
	Texture	-	Chalky
	Odour	-	

Results and Discussion

The present study was undertaken with a view to explore the medicinal flora flourishing in the grasslands of Mainpuri district. A humble attempt is made to explore and gather information about plants pertaining only to medicinal resources and their establishment under different environmental conditions.

The parent material of the soils of the district is calcareous. The soils of the district is divisible into three types- **Matiyar** is a stiff, unyielding clay of dark colour shrinking and cracking in dry weather into a network of fissures, but expanding when moistened into a sticky clayey mass. **Bhur** is loose and sandy and quite capable of retaining moisture. **Dumat** possesses the characteristics of really good soils. It comprises sand and clay in almost equal proportion. It is of rich brownish colour. The soil of the **wasteland** is grayish white and has chalky odour. The temperature differences of this region reveals that in January the temperature can be as low as 1 °C and as high as 45 °C in June. The pH of the soils varies from 8.5 to 10.4. EC of the soils lie between 1.7 and 3.6 mmhos.

The present study has brought into light demographic information on medicinal herbs (Table 2). Information on medicinal use of a number of herbs and trees has been compiled for the plants found in Mainpuri district (Table 3). The application of various plants' parts is helpful in curing human ailments like: Abscess, Arthritis, Asthma, Cuts and Wounds, Cold, Cough, Constipation, Diabetes, Dysentery, Diarrhea, Discharge from the Ear, Eczema, Headache, Heart diseases, Internal bleeding, Stomachache Insect Bite, leprosy, Malaria, Migraine, Scurvy, Snakebite, Tuberculosis, Urinary infections, Waterman's disease etc. The herbarium specimens of plants were collected, numbered and preserved in the college herbarium as voucher specimens for future reference and study.

Life on earth never stands still and it is a continuous process of change and flux. Numerous factors influence the growth and establishment of plants. Depending upon the prevailing environment and overlapping of ecological amplitudes, some plant species grow with high ecological importance and some species become less

conspicuous due to unfavorable environment. For instance *Achyranthes aspera* with importance value index (IVI) 30.5 is flourishing very well followed by *Calotropis procera* (IVI-29.9), *Datura stramonium* (IVI-27.2), *Euphorbia hirta* (IVI-24.9) and *Adathida vasica* (IVI-24.1) on the other hand plants like, *Bacopa monnerri* (IVI-5.4), *Plantago ovata* (IVI-11.1) and *Centella asiatica* (IVI-11.4) are less dominant and need extra care for their preservation. Studies on reproductive biology and perpetuation strategies will provide us tools to preserve these medicinally useful plant species for future generations.

Table 2. Demography of medicinal herbs of Mainpuri District.

Name of Species	Total No. of individual of species in 5 quadrat	Total No. of quadrates in which species occurred	Frequency	Basal Cover	Relative Frequency	Relative Density	Relative Dominance	I.V.I
1. <i>Achyranthes aspera</i>	64	5	100	10.0	7.8	15.3	7.4	30.5
2. <i>Euphorbia hirta</i>	52	5	100	6.3	7.8	12.4	4.7	24.9
3. <i>Trianthema portulacastrum</i>	45	5	100	5.1	7.8	10.7	3.8	22.3
4. <i>Argemone mexicana</i>	34	5	100	9.5	7.8	8.1	7.0	22.9
5. <i>Withania somnifera</i>	32	5	100	8.4	7.8	7.6	6.2	21.6
6. <i>Calotropis procera</i>	30	5	100	20.1	7.8	7.1	15.0	29.9
7. <i>Tribulus terrestris</i>	28	5	100	4.4	7.8	6.6	3.2	17.6
8. <i>Datura Stramonium</i>	25	5	100	18.2	7.8	5.9	13.5	27.2
9. <i>Solanum xanthocarpum</i>	22	4	80	7.5	6.2	5.2	5.5	16.9
10. <i>Adathoda vasica</i>	20	4	80	17.7	6.2	4.7	13.2	24.1
11. <i>Centella asiatica</i>	12	3	60	5.4	4.6	2.8	4.0	11.4
12. <i>Plantago Ovata</i>	8	3	60	6.2	4.6	1.9	4.6	11.1
13. <i>Bacopa monnerri</i>	4	2	40	2.0	3.1	0.9	1.4	5.4
14. <i>Cynodon dactylon</i>	30	5	100	5.0	7.8	7.1	3.7	18.6
15. <i>Cymbopogon nardus</i>	12	3	60	8.2	4.6	2.8	6.1	13.5
		418			1280			134

Table 3. Plants of medicinal value found in wastelands of Mainpuri district

Sl. No.	Botanical Name	Local Name	Part(s) used	Name of diseases(s)
1.	<i>Adhatoda vasica</i> (Acanthaceae)	Adusa	Roots, leaves	Chronic Bronchitis, Asthma, Cough, Catarrh, Rheumatism
2.	<i>Achyranthes aspera</i> (Amaranthaceae)	Latjeera	Root, leaf juice, seeds	Stop Bleeding stomachache & skin eruption, snake bites, itching and hydrophobia.
3.	<i>Argemone mexicana</i> (Papaveraceae)	Peelikateli	Root, seed, whole plant	Urinary trouble leprosy, venereal diseases cuts & wounds, dropsy, jaundice and eye troubles.
4.	<i>Bacopa monnerri</i> (Scrophulariaceae)	Satyanasi	lazez	Nervous disorders, mental disease, as diuretic in bronchitis to infants, blood purifier.
5.	<i>Centella asiatica</i> (Umbelliferae)	Brahmi	Leaves, whole plant, stem root & seeds	Leprosy, certain kind of Tuberculosis Memory tonic
6.	<i>Datura stramonium</i> (Solanaceae)	Dhatura	Leaves, flowering tops, seeds	Bronchitis, asthma, narcotic and antispasmodic.
7.	<i>Calotropis procure</i> (Asclepiadaceae)	Madar aak	Root bark root juice flowers milky juice latex, leaf juice+animal fat	Dysentery, malaria cholera, epidemic piles colds, cough, asthma & indigestion, eczema & ring worm, arthritis, migraine pain.
8.	<i>Euphorbia hirta</i> (Euphorbiaceae)	Lal dudhi	Entire plant in flowering, fruiting stage Roots	Relaxation of bronchioles, removing worms in children, asthma, cough, urinogenitry complaints, snake bite.
9.	<i>Plantago ovata</i> (Plantaginaceae)	Ishabgul	Seeds and dried seed coat	Chronic dysentery, (amoebic & bacillary) chronic diarrhoeas, constipation
10.	<i>Solanum xanthocarpum</i> (Solanaceae)	Bhatkataiya	Roots, leaves & fruits	Fever, catarrh and vomiting, cough, asthma, diuretic, sorethroat, bronchitis muscular pains, fevers etc
11.	<i>Trianthema portulacastrum</i> (Aizoaceae)	Bishkhopra	Leaves	Diuretic, dropsy, swellings of body caused by disorders of liver and kidney
12.	<i>Tribulus terrestris</i> (Zygophyllaceae)	Gokhru	Fruit	Urinary complaints, gout, diseases of kidney, promotes urination
13.	<i>Withania somnifera</i> (Solanaceae)	Ashvagandha	Roots	Weakness, rheumatism, diuretic, promotes urination, narcotic, applied to ulcers and inflammations.
14.	<i>Cynodon dactylon</i> (Poaceae)	Dubghas	Whole plant juice roots	Hysteria, epilepsy, diarrhoeas, dropsy catarrhal ophthalmia, abortion, gonorrhea, complaints of urogenital tract, ulcers & cuts to check bleeding

Table 3. continue

15.	<i>Cymbopogon nardus</i> (Poaceae)	Ganjni	Whole plant	Insect repellent in ointments, soap perfume
16.	<i>Acacia nilotica</i> (Mimosaceae)	Babul Kikar	Bark, gum, flower, leaves paste	Astringent, diarrhea & dysentery, diabetes, earache, discharge from ear headache
17.	<i>Aegle marmelos</i> (Rutaceae)	Bel	Fruit, roots, stem, bark	Astringent, digestive and stomachache diarrhea & dysentery, intermittent fever
18.	<i>Azadirachta indica</i> (Meliaceae)	Neem	Leaves & Bark	Skin diseases, wound blood purification, septic, gums, pyorrhea, ulcers and eczema.
19.	<i>Emblica officinalis</i> (Euphorbiaceae)	Aonla	Fresh + dried fruits Preparation Triphala	Good liver tonic, indigestion, anaemia, jaundice, certain heart complaints, very rich source of vitamin C, scurvy, dysentery diarrhea, asthma, stomach disorders. Laxative and in treatment of enlarged liver piles, stomach, pain in eyes etc. inks, dyes, oil shampoo improvement of alkali soils.
20.	<i>Mangifera indica</i> (Anacardiaceae)	Aam	Fruit	Astringent, as stimulant, tonic in debility of stomach, astringent in diarrhea and tonic in fever.
21.	<i>Pongamia pinnata</i> (Fabaceae)	Karanj	Seeds, seed oil Seeds & roots Bark Leaves	Skin disease, cutaneous affection scabies, rheumatism.
22.	<i>Syzygium cumini</i> (Myrtaceae)	Jamun	Seed, stem leaf bark	Diabetes, diarrhea, toothache, bleeding gums sore throats, bronchitis, asthma, ulcers, dysentery
23.	<i>Terminalia arjuna</i> (Combretaceae)	Arjun	Bark	Is astringent, fevers, fractures, cardiac tonic
24.	<i>Ficus religiosa</i> (Moraceae)	Peepal	Bark, roots	In sugar for chicken pox, Malaria, snake bite women sterility
25.	<i>Ficus benghalensis</i> (Moraceae)	Bargad	Leaves Latex Adv roots	Poultice to abscesses Gonorrhoea decaying of 'finger's nail bed. (Washer women's disease).

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