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Research Article

Assessing Medicinal Plants Biodiversity in and Around Bhubaneswar, Odisha, India

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ABSTRACT

An assessment of medicinal plants biodiversity in and around Bhubaneswar, Odisha, India, by quadrats methods. The results shows the diversity of 25 most predominant medicinal plant species found near the surveyed area, trees (134 species) were the primary source of medicine followed by shrubs (116), herbs (96), vines (17), climbers (10), grasses (06), twiners (03), creeper (01) and fern (01). Vegetation still posses high demand for its medicinal properties.

Keywords: *Ayurveda, Biodiversity, Ethno-botany, Medicinal plants.*

INTRODUCTION

Man has used plants to alleviate suffering and disease since times immemorial. The use of medicinal plants is as old as human civilization. Medicinal plants have been the subjects of man's curiosity since time immemorial. Almost every civilization has a history of medicinal plant use. Approximately 80% of the people in the world's developing countries rely on traditional medicine for their primary health care, and about 85% of traditional medicine involves the use of plant extracts (Abbink, 1995).

Ethno-botanical information on plants and their uses by indigenous people is useful not only for the conservation of traditional knowledge and biodiversity, but also to promote community health care, and might serve in drug development. The information can provide a guide for drug development, assuming that a plant that has been used by indigenous people over a long period of time may well have an allopathic application.

One fifth of all the plants found in India are used for medicinal purpose. The world average stands at 12.5% while India has 20% plant species of medicinal value and which are in use.

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Although it is difficult to estimate the total number of medicinal plants present worldwide, the fact remains true that India with rich biodiversity ranks first in per cent flora, which contain active medicinal ingredient. With about 1,100 plants species frequently being used in Indian system of healthcare and medicines for preparation of ayurvedic, unani and homeopathic drugs, India is rich in medicinal plant diversity which is distributed in different geographical, environmental conditions and associated tribal & folk knowledge systems. The tribal people mostly depend on forests for their livelihood and up to 70% of the rural population still depends on traditional medicine as a primary healthcare source. India has nearly 67.8 million tribal people belonging to 550 communities of 227 ethnic groups and they lead a nomadic life in about 5000 forested villages. The tribals contribute 8.10% of the total population of India. Each tribal community has its own social and cultural identity. In India, about 116 different dialects and 227 subsidiary dialects are spoken by tribal communities (Bhalla et al., 1996).

In India much literature, relevant to ethnobotany can be traced in the Vedic literature, Charak and Shusruta and Charak samhita appeared as the most important works. A large portion of this country was covered with forests which yielded a number of medicinal plants. These plants were initiated extensively in Ayurvedic system of medicine since many centuries.

Very little organised work had been done in the country till about thirty years ago. Organised field work and other studies in the subject were started in the Botanical Survey of India (BSI). Also there has been a resurgence of interest developed in ethnobotanical research in various institutions. Dr. E.K. Janaki Aromal initiated researches on ethnobotany in BSI. Dr. S.K. Jain from BSI started intensive field work among the tribals of Central India. He devised methodology for ethnobotany particularly in the Indian context. The publications from this group in the early sixties triggered the ethnobotanical activity in many other centres, particularly among botanists, anthropologists and medical practioners etc. in India. During the last four decades similar work has been initiated at various centres Sucn as National Botanical Research Institute (NBRI) at Lucknow, National Bureau of plant Genetic Resources (NBPGR) at Delhi, Central Council of Research in Unani Medicines (CCRUM), Central Council of Research in Ayurveda and Siddha (CCRAS) and in some other institutions. Medicinal plants play a key role in development and advancement of the modern studies by serving a starting point for the development of the novelty the drug (Pramono, 2002). Keeping in view the importance an investigation was carried out Assessing medicinal trees and shrubs biodiversity in and around Bhubaneswar, Odisha, India.

MATERIALS AND METHODS

The study 8 number selected in slum areas of Bhubaneswar, Odisha where some tribes live in patches. They are not native to Bhubaneswar, rather they have migrated here from various other districts of Odisha in search of livelihood and with them have brought their traditional knowledge of plants.

Geographical location and physiography

Bhubaneshwar, the capital city of Odisha, India, lies at an elevation of about 45 meters (148 feet) above the mean sea level (MSL) covering a geographical area of 124.74 sq. km. It is situated in the eastern coastal plains and coordinates at 21° 15' North Latitude and 85° 15' East Longitude south-west of the river Mahanadi and is surrounded by its tributaries like the Daya River and the Kuakhai River in the south and east, respectively.

Climate and weather

Bhubaneswar lies in the tropical zone and experiences a tropical climate. The three seasons that dominates the city are summer, winter, and monsoons. The summers are hot and the winters are dry. The monsoons are awfully humid. Both heat and cold waves sweep through the city in the summer and winter months every year. Bhubaneswar

experiences summer from the months of March to May when the mercury reaches to a maximum of 40 °C to 45 °C. Monsoons are brought about by the south- east monsoon winds in the month of June and continues till October. July and August receives the maximum rainfall. The average annual rainfall recorded in the city is 1,500 mm. December and January are chilly because of the chilly winds descending from the north and north-east. The average temperature wavers between 15°C to 18°C in the winter.

Soil

Bhubaneswar is topographically divided into western uplands and eastern lowlands with hillocks in the western and northern parts. The soils of Bhubaneswar are 65 per cent laterite, 25 per cent alluvial and 10 per cent sandstone. They belong to the taxonomic order of *Areic propaquepts*. These are acidic in soil reaction (*i.e.,* low pH) and their organic carbon content ranges from low to high. Available nitrogen (N) content is low, whereas available phosphoros (P), potassium (K) and sulfur (S) varies between low to medium.

Sample and sampling procedure

Selection of slums

In Bhubaneswar, those slum areas where some tribals dwell were identified by consulting the office of Bhubaneswar Municipal Corporation. The nearby tribal slums, mostly those close to the forest area (Chandaka Forest), were selected randomly for the study purpose. In this way, 8 slums namely, Patia Jali Munda Sahi; Birsa Nagar; Bhoisahi, Shampur; Behera Basti; Adivasi Basti; Birsha Munda Slum; Nandini Palli Munda Sahi and Jalisahi & Saliasahi, Patia were considered for this study.

Method of plant sample collection for biodiversity assessment

Random points were chosen near the study area *i.e.,* the slums, where vegetation in fair amount was clearly observed. In those selected points quadrats were laid down with the help of ropes and poles. These quadrats were laid in different dimensions depending upon the habit of plants to be identified. For instance, a floral cover of 10m X 10m was created for the identification of tree species. Similarly, for the identification of shrubs and herbs, the floral cover of 5m X 5m dimensions were created. In this way, four quadrats (2 quadrats for counting tree species and another 2 quadrats for counting shrubs and herbs) were laid down in each of the study area. This area was then surveyed by getting a thorough count of the number of plants in it. Any unknown plant species was either photographed or collected in order to get it identified later on. Rest were identified, enumerated and documented. The individual species of plants that come within the enclosed area were counted and noted down (Curtis & Cottom, 1956).

Species diversity calculation

In each quadrat, data was gathered by manually counting the different species of plants – trees, shrubs, herbs, etc. The data were collected, classified and analyzed to calculate diversity index and evenness quotient of the most predominant species found in all the quadrats. Species diversity is defined as the measure of the diversity within an ecological population that includes both species richness (the number of species in a community) and the evenness of species' abundances. Species richness is one of the most important elements in biodiversity, because the number of species existing at a site is a quantitative measure of biodiversity and it allows comparison with other sites.

Shannon-Wiener Index

The Shannon-Weiner Index (H') is calculated by the following formula: (Shannon & Wiener, 1963).

$$\mathbf{H' = -\Sigma\ [(pi)\ x\ (ln\ pi)]} \qquad 0 < H < 5$$

Where, H' = Shannon index of species diversity

ρi = the proportion of total sample belonging to the i^{th} species (ni/N) ln = natural log

ni = No. of individuals of each species N = Total number of species

Species evenness index (Pielou, 1966)

Pielou's evenness index is commonly expressed as:

$$E = \frac{H'}{\log S}$$

Where, E = Evenness index

S = Number of species H' = Shannon's index

RESULTS AND DISCUSSION

Table 1 shows the diversity of 25 most predominant medicinal plant species found near the surveyed area. These species include *Syzizium cuminii, Mangifera indica, Azadirachta indica, Anthocephalus cadamba, Lagerstroemia speciosa, Polyalthia longifolia, Mimusops elengi, Murraya koenigii, Solanum indicum, Ricinus communis, Lantana indica, Alocasia indica, Holarrhena antidysenterica, Colocasia esculenta, Lippia javanica, Glycosmis arborea, Jasminum auriculatum, Curculigo orchioides, Enhydra fluctuans, Wedelia chinensis, Tridax procumbens, Boerhavia diffusa, Mimosa pudica, Acalypha indica* and *Ipomoea reniformis.*

The data on biodiversity studies of different medicinal plant species are presented below and six plant species *i.e, Colocasia esculenta, Lippia javanica, Glycosmis arborea, Jasminum auriculatum, Tridax procumbens* and *Mimosa pudica* having Shannon-Wiener's Index (H') value as 2.07, 2.08, 2.07, 2.07, 2.07 and 2.07, respectively with the Evenness (E) 1 in each case, the results are in concerance with the findings of Sahani et al. (2016)

The collected medicinal plants showed different life forms (habit) - tree, shrub, herb, vine, climber, grass, twiner, creeper and fern. In the present study, trees (134 species) were the primary source of medicine followed by shrubs (116), herbs (96), vines (17), climbers (10), grasses (06), twiners (03), creeper (01) and fern (01). Table 1 shows the biodiversity of life forms of different plant species expressed in percentage.

India topographic and climatic diversity has a very rich and diverse flora. Biodiversity Is the most important wealth of our planet and form the foundation upon which human civilization is built. All socio cultural economic and other activates of mankind are directly or indirectly associated with various environmental resources. Assessments of the medicinal plants had been done in various parts around the world (Uprety et al., 2012). It was found that the traditional practioners are hesitant to disclose their knowledge. The indigenous knowledge system of herbal practice is still very rich and available among traditional practioner.

Table 1: Biodiversity studies of predominant medicinal plant species of the study areas

		Number of plants per Quadrat									
Localities / Plant Species	Habit	Jali Munda Sahi, Patia (1)	Birsa Nagar (2)	Bhoisah, Shampur (3)	ehera Basti (4)	ivasi Basti (5)	Birsha Munda Slum (6)	Nandini Palli Munda Sahi (7)	Jalisahi and Saliasahi, Patia (8)	Shannon's Diversity Index (H^I)	Evenness (E)
Syzizium cuminii	Tree	8	5	3	6	7	10	7	13	1.99	0.96
Mangifera indica	Tree	12	9	7	10	9	8	5	11	2.06	0.99
Azadirachta indica	Tree	9	12	10	5	3	5	4	9	2	0.96
Anthocephalus cadamba	Tree	2	6	4	5	4	7	3	4	2.01	0.97
Lagerstroemia speciosa	Tree	5	4	2	8	5	3	4	15	1.91	0.92
Polyalthia longifolia	Tree	7	3	11	6	8	6	7	10	2.01	0.97
Mimusops elengi	Tree	7	8	5	9	3	6	2	12	1.97	0.95
Murraya koenigii	Tree	5	9	13	8	7	9	4	18	1.82	0.94
Solanum indicum	Shrub	33	42	29	47	31	48	26	62	2.03	0.98

Ricinus communis	Shrub	39	27	23	41	56	34	31	58	2.05	0.99
Lantana indica	Shrub	26	34	40	52	55	61	53	47	2.06	0.99
Alocasia indica	Shrub	51	27	34	40	46	53	21	62	2.02	0.97
Holarrhena antidysenterica	Shrub	26	42	37	49	28	31	44	32	2.06	0.99
Colocasia esculenta	Shrub	41	36	29	52	39	22	38	43	2.07	1
Lippia javanica	Shrub	107	96	121	109	87	125	103	124	2.08	1
Glycosmis arborea	Shrub	87	126	106	114	103	98	91	109	2.07	1
Jasminum auriculatum	Herb	108	86	92	112	87	118	113	131	2.07	1
Curculigo orchioides	Herb	94	98	125	92	89	131	97	127	2.03	0.98
Enhydra fluctuans	Herb	113	107	118	93	87	109	99	181	2.04	0.98
Wedelia chinensis	Herb	132	87	99	114	119	132	94	142	2.05	0.99
Tridax procumbens	Herb	89	114	90	109	95	102	91	126	2.07	1
Boerhavia diffusa	Herb	96	156	88	119	71	138	95	162	2.05	0.99
Mimosa pudica	Herb	149	99	113	128	101	87	123	147	2.07	1
Acalypha indica	Herb	128	115	98	83	96	95	131	107	2.05	0.99
Ipomoea reniformis	Herb	95	143	119	98	134	116	89	138	2.06	0.99

CONCLUSION

It was concluded that it is necessary to do documentation of the traditional knowledge and medicinal plants diversity for its sustainable utilization of the resources before it became last forever from the community.

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