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ETHNOBOTANICAL STUDY ON MEDICINAL PLANTS USED BY THE LOCAL COMMUNITIES IN ACHANAKMAR AMARKANTAK BIOSPHERE RESERVE, CENTRAL INDIA

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Abstract

An ethno-botanical survey was conducted in Achanakmar Amarkantak Biosphere Reserve (AABR) of central India to document the indigenous knowledge and utilization pattern of medicinal plants for primary health care by local communities mainly comprised of Baigas, Gonds, Oraons and Pradhans. The communities still rely on herbal medicines for primary health care due to inadequate modern health care facilities. The rich wealth of traditional knowledge and repository of herbal resources are rapidly eroding due to over exploitation in unscientific manner over the last few decades. This has spurred an interest to undertake the present investigation on ethno botanical studies in biosphere reserve. Data collection was done by participatory rural appraisal (PRA) and focus group discussion methods. The different age groups, gender and communities were considered in collecting the data and

gathering information on traditional knowledge. The study revealed that a sum total of 70 plants representing 37 families were identified as potential medicinal values by local communities. Out of which 31 species were trees represented by 18 families, 24 species of shrubs by 19 families, 15 species of herbs by 11 families and 16 species of climbers belonging to 10 families. The highest number individuals were recorded in Fabaceae family. Seventeen (17) plants are used in home remedies by local communities. There are traditional healers popularly known as Baiga Vaidas had rich knowledge of herbal medicines and utilizing almost 48 species belonging to 28 families for preparing crude drugs treating the various ailments like diarrhoea, wounds, fever, cough, cold, jaundice, snake and scorpion bite, infections, malaria, filarial, digestive, gynaecological problems etc. Besides, the local communities were using herbal drugs as home remedies for primary health problems. The study also documented a list of ten rare, endangered and threatened (RET) medicinal flora, which require special attention for their protection and conservation. The study further suggests exploiting potential medicinal flora by detailed pharmacological investigations to design and synthesize novel drugs.

Keywords

Baiga, Conservation, Endangered Species, Indigenous Knowledge, Primary Health Care

1. Introduction

According to the World Health Organization (WHO) about 65-80% of the world's population in developing countries depend on plant based drugs for their primary healthcare (Awoyemi et al., 2012). About 60-80% of the total population in India still rely on plant based crude drugs despite the influx of modern treatments. It has been estimated that folk healers in India use approximately 2500 species of medicinal plants, of which almost 100 species serve as regular sources of medicine (Jain & Patole, 2001; Ved & Goraya, 2008; Sandya & Sandya, 2015; Pandey, 2017).

Chhattisgarh is one among the tribal dominated states of eastern part of Central India, where 1/3rd of population belongs to indigenous communities. The state is endowed with bountiful of natural resources, covered with luxuriant forests in almost 44% of the geographical area. Since immemorial times, herbal resources were exploited for spiritual, socio-cultural and religious purposes by tribal masses. The livelihoods, economy and health security of tribals are intricately linked to herbal resources (Sandya & Sandya, 2015). Due to rich biological and cultural diversity, indigenous practices and immense potential of the

valuable medicinal resources, the Chhattisgarh has been declared as 'Herbal State', with the objectives of conservation and sustainable development of medicinal plants, cultivation of medicinal plants, non-destructive harvesting, and promotion of organized trade so as to generate additional employment opportunities in the state and provide health cover. The rich diversity and traditional knowledge are gradually disappearing by over exploitation and also by influx of modern medicines. Documenting the indigenous knowledge through ethno-botanical studies is important for the conservation and sustainable utilization of biological resources (Shouny et al., 2016). Ethno-botanical survey is key and reliable approaches to development of modern medicines (Kokate et al., 2002; Kushwaha et al., 2013), but neither the issues related to traditional knowledge nor the conservation aspects were properly addressed in the study area. Therefore, the present study was attempted to document the ethno-medicinal flora, utilization and indigenous traditional knowledge of AABR for conservation and their sustainable development.

2. Material and Methods

2.1 Study Area

The study was conducted in part of Surhi Range of Bilaspur Forest Division, Amarkantak Biosphere Reserve of Chhattisgarh, India. The study area is spread between 22°20'6.067"North to 22°32'14.954" North latitudes and 81° 36'24.081E to 81°47'32'30" East longitudes. The biosphere area has a typical monsoon climate, with three distinct seasons- summer from March – June , rainy from July – October and winter from November-February. Generally, May and June are the hottest months whereas December and January are the coolest months of the year. The study area is surrounded by luxuriant Sal and Sal Mixed forests, agriculture lands, water bodies, and human habitations. The Surhi range has forest vegetation mainly covered by different forest type's viz., Sal forest, Sal mixed forest type. Sal and its associates like *saja*, *bija*, *dhaora*, *kasai*, *lendia*, etc. and many species of shrubs, climbers and herbs exist in this type. The dry mixed deciduous forest consists of dry Sal with associates in the top storey like *saja*, *bija*, *dhaora*, *kusum*, *kasai*, *lendia*, *jamun*, *mahua*, *aonla*, *achar*, *baranga*, *amla*, *bel*, *garari*, *kari*, *khamar*, *salai*, *tendu*, *tilwan*, *tinsaand* a few other thorny species in the middle storey, *banrahar*, *chhind*, *dhawai*, *harsingar*, *kurdai*, and *kalabansain* the undergrowth; *chhira*, *kusum*, *bhurbhusi*, and *mushelas* grasses and *mahul*, etc. as common climbers.

2. Methodology

Ethno-botanical survey was conducted in Surhi, Jamunahi and Rajak villages. The forest villages were inhabited by indigenous communities' viz. *Baigas*, *Gonds*, *Oraons* and *Pradhans*. Secondary data was collected from National Informatic Centre Bilaspur, Chhattisgarh. Primary data was collected from representative villages inhabited by indigenous communities. The tribals mostly depend on forests for their livelihoods and health care. Participatory rural appraisal (PRA) and Focused group discussions were employed to document the diversity of medicinal flora and indigenous knowledge for health care among communities. The different age groups, gender and communities were considered in survey and asked questions in groups and also individuals. In each village fifty indigenous communities representing different gender and age groups were participated to collect the data on different aspects. Equal opportunity is given to household members to speak about their perception regarding use of plants for common diseases. The women and elderly men were questioned on available herbal drugs and curing diseases as home remedies. The rate of disappearance of valuable medicinal plants also documented through group discussion with all the respondents. Besides, the alternate strategies were also discussed for highly exploited medicinal species. The problems faced by the local communities in collection and utilization of medicinal plants were also recorded. Survey was conducted by randomly selecting one *Baiga* vaid (Local Healer) from each village. The traditional knowledge on folklore medicine and utilization of crude drugs for curing various ailments were systematically gathered by semi-structured interview and cross checking was done. List of rare, endangered and threatened plants were identified using Red data book of Botanical Survey of India. Field data collected was analysed using appropriate statistical methods under MS-Excel.

3. Results and Discussion

Ethno-Botanical survey indicated that indigenous communities were utilizing a broad spectrum of life forms including trees, shrubs, herbs, grasses, climber etc. as medicinal plants. The study revealed that a sum total of 70 plants representing 37 families were identified as potential source of medicines by local communities (Table 1). The highest number individuals were recorded in Fabaceae family. The families were ranked in the order: Fabaceae (10) < Combretaceae (6) < Rubiaceae (4), < Acanthaceae (3). Of which thirty one (31) species were trees represented by 18 families, twenty four (24) shrubs of 16 families and fifteen (15) herbs corresponding to 12 families (Table 1). However, all these species were seldom utilized by communities. The survey further revealed that only 17 plants are used in home remedies by local

communities for treatment of common diseases like cough, cold, vomiting, nausea, headache, wound healing, digestive, stomach disorders etc (Table 2). The various plant parts like leaves, stem, bark, flowers, fruit and roots were used for preparing crude drugs. The paste prepared from various plant parts were applied externally wounds, allergies, swellings, while decoctions were prepared by boiling ingredients in water and consumed for treating cold, cough and fevers. Occasionally the raw forms were chewed for curing toothaches and mouth ulcers. On the other hand, *Baiga* vaidas, are traditional healers with rich indigenous knowledge practicing to cure various chronic diseases. One or two healers were residing in each tribal hamlet and rendering primary health services. The community health centres are too far and almost 80-100 km away from the study area, indigenous communities were mostly rely on treatment of *Baiga Vaidas*. Forty eight plants were utilised by the traditional healers for curing various ailments like diarrhoea, dysentery, sore, skin diseases, burns, wounds, bronchitis, urinary, gynaecological disorders, piles, deworming, jaundice, inflammations, snake bite, scorpion bite, dog bite, asthma, diabetes, joint pains, gastric problems, leprosy, nervous disorders etc. The crude drug formulations were prepared by various processes through grinding, maceration, extraction, distillation, fermentation etc. The preparations were applied externally and administered orally, dosages and combinations were decided on the nature of drug and also disease. Honey, water, milk and sugar candy were commonly used in drug preparations.

The result showed that the tribes of Surhi range possess a very good knowledge about medicinal flora and their uses. Earlier workers were also shown that tribes of Chhattisgarh including Amarkantak Biosphere reserve were well versed with potential use of medicinal plants (Sahu, 2010; Ekka, 2011; Jain et al., 2006; Mishra & Broker, 2009). Sahu (2010) studied the traditional knowledge and indigenous medicines used by the tribal communities of Achanakmar Biosphere Reserve. Total seventy (70) plant species from forty three (43) families, which are therapeutically used against stomach disorders, fever, jaundice, dysentery, skin diseases, piles etc. The present findings are in line with reports of earlier workers (Shukla & Singh, 2009; Singh et al., 2010 ; Sandya & Sandya, 2015). The study also documented a list of 10 rare, endangered and threatened (RET) medicinal flora (Table 3). *Rauvolfia serpentina* was identified as a critically endangered plant warrant special attention for conservation. *Acorus calamus* and *Adiantum lunulatum* were recognized as endangered species, while *Chlorophytum borivilianum*, *Curcuma angustifolia*, *Embllica officinalis*, *Pterocarpus marsupium*, *Sterculia urens*, *Terminalia chebula* etc. as vulnerable species need *ex-situ* and *in-situ* conservation.

4. Conclusion

The study demonstrated that the indigenous communities of Surhi range, AABR in Central India possess rich traditional knowledge about the use of medicinal plants for the primary health care. Promotion and conservation of potential medicinal plants are suggested for securing health cover of communities. The traditional healers (*Baiga vaid*s) need to be encouraged for providing continuous services to societies. The present study yielded an interesting primary data on medicinal plants and created an opportunity to expedite folklore medicines for therapeutic and pharmacological values to synthesize and formulate life saving drugs in future. The precious indigenous knowledge is gradually disappearing with span of time due to lack of documentation and also insurgence of modern healthcare system. Therefore, it becomes imperative to conduct continuous floristic surveys, documentation of wild medicinal plants, their ethno medicinal, pharmaceutical values and preserving indigenous knowledge system, which are necessary for the sustainable development of the societies and forests in the region. The presented study is limited to a part of small range in biosphere reserve as detailed studies are further needed covering a large area with diverse indigenous communities. The findings revealed that there is immense scope for exploiting at least 10-15 medicinal plants for treating chronic diseases through detailed pharmacological investigations to design and synthesize novel drugs.

Contributions & Acknowledgement

The main author drafted MS, second author conducted the field work and third author improved the MS and drawn inferences and conclusions. Authors acknowledge the VC and faculty of Rural Technology GGV and also the CG Forest Department for providing the permission to work in AABR.

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Table 1: Diversity of medicinal plants extracted from different life forms

Tree layer		Shrub layer		Herb layer	
Botanical Name	Family	Botanical Name	Family	Botanical Name	Family
<i>Aegle marmelos</i>	Rutaceae	<i>Alangium salvifolium</i>	Cornaceae	<i>Andrographis paniculata</i>	Acanthaceae
<i>Adina cordifolia</i>	Rubiaceae	<i>Calotropis gigantea</i>	Asclepiadaceae	<i>Achyranthus aspera</i>	Amaranthaceae
<i>Anogeissus latifolia</i>	Combretaceae	<i>Clerodendrum serratum</i>	Capparidaceae	<i>Acorus calamus</i>	Araceae
<i>Baccaurea sapida</i>	Euphorbiaceae	<i>Desmodium laxiflorum</i>	Leguminosae	<i>Adiantum lunulatum</i>	Adiantaceae
<i>Bauhinia racemosa</i>	Caesalpinaceae	<i>Desmodium motorium</i>	Leguminosae	<i>Barleria strigosa</i>	Acanthaceae
<i>Buchanania lanzan</i>	Anacardiaceae	<i>Embelia basaal</i>	Myrsinaceae	<i>Cassia tora</i>	Caesalpiniceae
<i>Butea monosperma</i>	Fabaceae	<i>Embelia robusta</i>	Myrsinaceae	<i>Chlorophytum borivilianum</i>	Asparagaceae
<i>Cassia fistula</i>	Caesalpinaceae	<i>Flacourtia induca</i>	Bixaceae	<i>Combretum nanum</i>	Combretaceae
<i>Cordia myxa</i>	Boraginaceae	<i>Gardenia gummifera</i>	Rubiaceae	<i>Curculigo orchoides</i>	Amaryllidaceae
<i>Dalbergia latifolia</i>	Fabaceae	<i>Gardewa lucida</i>	Rubiaceae	<i>Curcuma aromatica</i>	Zingiberaceae
<i>Dillenia aurea</i>	Convolvulaceae	<i>Gardenia turgida</i>	Rubiaceae	<i>Curcuma angustifolia</i>	Zingiberaceae
<i>Diospyros melanoxylon</i>	Ebenaceae	<i>Gerwia hirsuta</i>	Tiliaceae	<i>Cynoglossum lanceolatum</i>	Boraginaceae
<i>Eugenia jambolana</i>	Myrtaceae	<i>Gymnosporiaspinosa</i>	Celastraceae	<i>Dioscorea bulbifera</i>	Dioscoreaceae
<i>Lagerstroemia parviflora</i>	Lythraceae	<i>Helicter esisora</i>	Sterculiaceae	<i>Imperata cylindrica</i>	Gramineae
<i>Lansea coromendelica</i>	Anacardiaceae	<i>Indigofera arborea</i>	Leguminosae	<i>Ocimum americanum</i>	Lamiaceae
<i>Mallotus philippinensis</i>	Euphorbiaceae	<i>Leeamar crophylla</i>	Vitaceae	<i>Rauvolfia serpentina</i>	Apocynaceae
<i>Madhuca indica</i>	Sapotaceae	<i>Meghania semialata</i>	Leguminosae	<i>Saccharum spontaneum</i>	Zingiberaceae
<i>Milusa tomentosa</i>	Fabaceae	<i>Murraya exotica</i>	Rutaceae		
<i>Moringa oleifera</i>	Moringaceae	<i>Petalidum barleriodes</i>	Acanthaceae		
<i>Oroxylum indicum</i>	Bignoniaceae	<i>Peucamumna gpurense</i>	Umbelitarcae		
<i>Phyllanthus emblica</i>	Euphorbiaceae	<i>Phoenix acaulis</i>	Palmae		
<i>Pimpinellawallichiana</i>	Apiaceae	<i>Pterocarpus marsupium</i>	Fabaceae		
<i>Pterocarpus marsupium</i>	Fabaceae	<i>Woodfordia floribunda</i>	Lythraceae		
<i>Semicarpus anacardium</i>	Anacardiaceae	<i>Zizyphus rugosa</i>	Rhamnaceae		
<i>Shorea robusta</i>	Dipterocarpaceae				
<i>Stereospermum chelonoides</i>	Bignoniaceae				
<i>Terminalia alata</i>	Combretaceae				
<i>Terminalia bellirica</i>	Combretaceae				
<i>Terminalia chebula</i>	Combretaceae				
<i>Terminalia tomentosa</i>	Combretaceae				
<i>Thespesia lampas</i>	Malvaceae				

Table 2: Utilization of Medicinal plants by Indigenous communities and traditional healers

Indigenous Communities			Tribal Healers (Baiga Vaid)		
Botanical Name	Parts used	Purpose	Botanical Name	Parts used	Purpose
<i>Embllica officinalis</i>	Fruit	Digestive	<i>Acacia catechu</i>	Bark, wood	Diarrhea, sore, skin diseases
<i>Aegle marmelos</i>	Leaf, pulp	Digestive	<i>Aegle marmelos</i>	Leaf, pulp	Leaves – wound healing , Pulp of ripe fruit Diarrhea
<i>Anogeissus latifolia</i>	Bark	Digestive	<i>Acorus calamus</i>	Rhizome	Bronchitis, rheumatism
<i>Terminalia chebula</i>	Fruit	Cough	<i>Anogeissus latifolia</i>	Leaf,bark	Skin disease, fever, obesity,
<i>Psidium guvajava</i>	Leaf,Bark	Bark- jaundice	<i>Anthocephalus kadamba</i>	Leaf, Bark, Fruit.	Bark: Rectifying defects of semen, to cure urinary troubles;
<i>Semecarpus anacardium</i>	Seed,leaf	Diarrhea	<i>Azadirachata indica</i>	Rhizome	Sedative, analgesic, epilepsy, hypertensive.
<i>Tinospera cordifolia</i>	Whole shoot	Fever, Ulcer	<i>Bombax malabaricum</i>	Bark, fruit	Diarrhea, dysentery
<i>Azadirachata indica</i>	Rhizome	Skin problem	<i>Buchanania lanzan</i>	Leavs	Paste of young leaves applied to cure fresh wounds and eczema.
<i>Abrus precatorlus</i>	Bark	Wound	<i>Butea monosperma</i>	Leaves and flower	Inflammation, Sprain, Swelling due to any reason
<i>Achyranthes aspera</i>	Leaves	Scorpion bites,	<i>Bryonopsis laciniosa</i>	Seeds	Promoting female sterility
<i>Curcuma angustifolia</i>	Rhizome	Digestive	<i>Cassia fistula</i>	Stem and bark	Snake bite - Paste of stem bark applied on bitten place
<i>Abutilon indicum</i>	Bark	Stomach problem, ulcer	<i>Chlorophytum borivilianum</i>	Rhizome	Diabetes, dysentery
<i>Curcuma longa</i>	Rhizome	Wound healing	<i>Embllica officinalis caerten</i>	Fruit	Vitamin - C, Cough , Diabetes, cold, Laxative, hyper acidity
<i>Magnifera indica</i>	Bark	Jaundice	<i>Ficus bengalensis</i>	Milky latex	Milky latex is to prevent loss of hair.
<i>Acacia catechu</i>	Bark, wood	Diarrhea, sore, skin diseases	<i>Ficus religiosa</i>	Leaves	Asthma, diabetes, gastric problems .
<i>Ocimum americamum</i>	Leaf	Headache	<i>Ficus glomerata</i>	Fruits	Asthma - Decoction of young fruits are taken
<i>Pterocarpus marsupium</i>	leaves, flowers	Diarrhea, leucoderma,	<i>Madhuca indica</i>	Bark, Oil	Prevention of Hair loss
			<i>Magnifera indica</i>	Fruit , bark	Jaundice
			<i>Nyctanthes arbor-tristis</i>	Leaf	Sciatica - A decoction of the leaves
			<i>Pterocarpus marsupium</i>	heartwood, leaves, flowers	Elephantiasis, diarrhea, leucoderma,
			<i>Abutilon indicum</i>	Bark	Stomach problem, ulcer
			<i>Schleichera oleosa</i>	Oil	Skin disease,. Hair care - Oil is used .
			<i>Sterculia urens</i>	Twig	Toothache and wound healing
			<i>Terminalia chebula</i>	Fruit	Cough and nausea
			<i>Terminalia bellirica</i>	Fruit	Black , Piles - Fruits bark
			<i>Zizyphus mauritiana</i>	Fruit	Cooled decoction of dried fruits is given during cold and cough.
			<i>Semecarpus anacardium</i>	Nuts	The nut oil is used to

					raise blister on skin rheumatism and leprosy.
			<i>Achyranthes aspera</i>	Leaves	Insect bites, Snake bites, eruption of the skin.
			<i>Andrographis paniculata</i>	Leaf	Intermittent fever
			<i>Asparagus racemosus</i>	Rhizome	Fresh tuberous roots considered good tonic.
			<i>Curcuma angustifolia</i>	Rhizome	Diarrhea, dysentery and colitis
			<i>Curcuma longa</i>	Rhizome	Carminative, stomachic
			<i>Curcuma amada</i>	Rhizome	Mouth ulcers
			<i>Embelia robusta</i>	Dried fruits	Anthelmintic
			<i>Ocimum americanum</i>	Leaf	Headache
			<i>Rauwolfia serpentina</i>	Root	Hyper tension, Insomnia
			<i>Woodfordia fruticosa</i>	Bark	Bark paste mixed with coconut oil for wound healing.
			<i>Abrus precatorius</i>	Bark	Wound healing
			<i>Bauhinia vahlii</i>	Fruit, seed	Dysentery,, stomachache
			<i>Mucuna prurita</i>	Seed, Root	Nervous system, disorder
			<i>Barleria strigosa</i>	Leaves	The root decoction to cure bile and gastric trouble.
			<i>Tinospora cordifolia</i>	Whole shoot	Fever, Ulcer
			<i>Pimpinella wallichiana</i>	Root	Scorpion sting
			<i>Adiantum lunulatum</i>	Leaf	Muscular pain, hair problem
			<i>Curculigo orchioides</i>	root	Piles, jaundice, asthma
			<i>Cyperus scariosus</i>	tuber	Abdominal, urogenital infections
			<i>Centella asiatica</i>	Whole part	The whole plant decoction mixed with cow's milk, treat madness .
			<i>Plumbago zeylanica L.</i>	Root	Root paste with coconut oil applied on leucodermic spot.

Table 3: Rare, Threatened and Endangered Medicinal plants of study area

Botanical name	Common name	Family	Status
<i>Acorus calamus</i>	Buch	Araceae	EN
<i>Adiantum lunulatum</i>	Hansraj	Adiantaceae	EN
<i>Chlorophytum borivilianum</i>	Safedmusli	Asperegaceae	VU
<i>Curcuma angustifolia</i>	Tikhur	Zingiberaceae	VU
<i>Embllica officinalis</i>	Aonla	Euphorbiaceae	VU
<i>Plumbago zeylanica</i> .	Chitrak	Plumbaginaceae	VU
<i>Pterocarpus marsupium</i>	Bija	Leguminosae	VU
<i>Rauvolfia serpentina</i>	Sarpagandha	Apocynaceae	CR
<i>Sterculia urens</i>	Kulu	Sterculiaceae	VU
<i>Terminalia chebula</i>	Harra	Combretaceae	VU

Note : EN – Endangered, VU- Vulnerable, CR – Critical Endangered.