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Full Length Research Paper

Ethnobotany and utilization of plant resources in Irula villages (Sigur plateau, Nilgiri Biosphere Reserve, India)

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Several scientific studies are in progress using modern scientific tools based on the lead from the folkloric and herbal uses for formulating new western medicine. The present study involves the identification, enumeration and utilization of medicinal flora in the selected tribal settlements and a record of the endangered medicinal plants in the study area. Plant species were identified in selected study sites from Sigur plateau located in Nilgiri Biosphere Reserve in the Western Ghats. The natural forest in the study area consisted of numerous trees, lianas, shrubs and herbs - the treasure troves of medicines. Due to the degradation of medicinal flora habitats in the recent past, there is a gradual decline in their distribution and abundance. As a consequence of the increase in access to western medicine, the utilization of medicinal plants has reduced and hence the knowledge of its use stands to be lost. In this study, 74 plant species belonging to 42 families used by the Irula tribe as medicine and their reported uses from selected tribal villages were documented. Key points from the data exemplify the healing practices and community interest in the conservation of biodiversity and culture for the promotion of sustainable health traditions.

Key words: Ethnobotany, tribal communities, community based approaches, participatory rural appraisal (PRA), conservation.

INTRODUCTION

The Indian subcontinent is a vast repository of medicinal plants that are used in traditional medicine, which also forms a rich source of knowledge for the medical field (Bagchi et al., 2011). Various indigenous healing systems such as Siddha, Ayurveda, and Unani use several plant species to treat different ailments (Rabe and Staden, 1997). Pharmacological validation on medicinal plants is very limited and large number of plants used in tribal and folklore with enormous potential has to be validated for their therapeutic activity (Kumar et al., 2007). In India, around 20,000 medicinal plant species have been recorded recently (Dev, 1997), while more than 500 traditional communities use about 800 plant species for curing different diseases (Mishra et al., 2011). Currently, 80% of the world population depends on plant-derived medicine for the first line of primary health care for human alleviation because it has negligible side effects (Caniago et al., 1998); hence it is important to have knowledge about this method of holistic healing. Health care providers and nurses can integrate it into the health care for individuals and/or families that choose traditional indigenous healing (Ragupathy and Mahadevan, 1996; Struthers et al., 2004; Termote et al., 2011). It is also relevant in the context of the emerging health/medical tourism in the region (Speier, 2011).

The Western Ghats is very rich in its medicinal wealth. The forests and hills of this region are a treasure house of about 700 medicinal plants, out of which some are used for traditional and folk medicinal practices (Babu et al., 2006). Many are exploited commercially for their

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active principles and their commercial value (Kala, 2005). For example the whole plant of *Aegle marmelos* (Bael) provides coumarins, alkaloids, steroids and essential oils (Singh et al., 2012). Medicinal plant species of Western Ghats represent a variety of life form ranging from algae, fungi, herbs, shrubs, climber and trees, which are annuals to perennials. Moreover, these species are distributed from canopy to under storey and are characterized seasonally (Suja, 2008).

The Sigur plateau lies in Mudumalai Tiger Reserve, Northern Nilgiri Biosphere Reserve (NBR) at an altitude of 700 m above mean sea level (MSL), with an average rainfall of 700 mm. The study site connects the Mudumalai Tiger Reserve to the Sathyamangalam wildlife sanctuary and Reserve forests of Tamilnadu state as well as Biligirirangan Hills Wildlife Sanctuary of Karnataka state. The selected villages are situated at a distance of 30 kms North of Ooty town (Figure 1) towards Masinagudi, a small town North to Mudumalai Tiger Reserve. The two blocks in which the villages are entirely inhabited by the tribes- Irulas, Thaen Kurumbas and Sholigas aS shown in Figure 1. The Irulas, well known for their wealth of knowledge on ethnomedicine (Ragupathy et al., 2008) are living in the study area. Besides, the study sites are located close to each other, with very rich diversity of medicinal plants. The total area of the Nilgiri Biosphere Reserve is 5,520 km². It encompasses parts of Tamil Nadu, Kerala and Karnataka. The topographical diversity of the NBR accounts to a greater extent for the spatial variation in climate. The annual rainfall of the reserve ranges from 500 to 7000 mm with temperature ranging from 0°C during winter to 41°C during summer (Lengerke, 1977). Most of the settlements in the Sigur block consist of Irulas and Thaen Kurumbas. Sigur block (Figure 1) has a higher density of households of irulas in the Gudalur taluk with a population of 610. Irulas with a few sub sects among them are living in Masinagudi area, and in parts of Kotagiri and Coonoor Taluk (http://www.censusindia.gov.in accessed on 7/4/10).

The dominant vegetation types are grasslands, semi-evergreen forests, moist and dry deciduous forests and dry thorn forests (Scrub jungles). Wet bamboo along the shady region and riverside forests lend great character and diversity to the area's botanical inheritance. *Terminalia crenulata* and *Shorea roxburgi* predominate in the North, while the Southern tip boasts of the strong *Tectona grandis*. Near the Sigur range, short straggly trees like the *Ziziphus* and *Acacia* sp. are found. *Acacia sundra* denotes the interception of deciduous and thorn forests. Along the waterways, *Mangifera indica*, *Terminalia arjuna*, *Syzygium cumuni*, *Dalbergia latifolia* and *Bambusa arundinacea* are observed. *Schleichera oleosa* with bright red leaves, *Ficus* and *Pongamia galabra* are also found near the water bodies (Sukumar et al., 1992). The tribals are generally engaged in collection of minor forest products. This is a seasonal operation and they work as casual agricultural laborers on local estates. Some of them are also engaged in looking after the herds of cattle belonging to others. Some are engaged in agriculture in the patta (Tamil: Vern-for-lease holder) lands conditionally assigned to them, where they cultivate tea, coffee, jack trees, guava etc. However, due to the poor maintenance of the land due to lack of finance, the return from these lands is meager. The general economic condition of these tribes is poor (the average per capita income Rs.15,000 to 22,000 / year) (Keystone Foundation, Kotagiri, personal communication).

The untapped knowledge on the varied use of the medicinal plants, their availability and extent of distribution weakens the efficient use of these resources. Besides, due to the penetration of the market economy, break down of community based institutions, acculturation and rapid degradation of forest resources, there is an imminent danger that the valuable ethnobotanical knowledge accumulated over several generations would be lost forever without proper documentation. This knowledge is invaluable in conserving the medicinal plants and their habitats. Therefore, there is an urgent need to systematically document the ethnobotanical knowledge from various sources so that it can be used by the communities who were the custodians of this knowledge (Goldman 2003).

Conservation of natural resources, including medicinal plants implies the development of local communities and creates a forum for research of the potential uses of natural resources for local purposes (Agarwal and Gibson, 1999). Previous investigations on herbal medicines of Kota tribes in the Nilgri Biosphere reserve (Abraham 1981, Rajan et al., 2002) on various aboriginal tribes in Coimbatore (Umapriya et al., 2011) and on several tribes of Nilgris (Arul et al., 2006) provide basic information on the traditional knowledge of the concerned communities. However, earlier studies did not provide adequate information on the ethnobotanical knowledge of irula tribes inside Nilgiri Biosphere reserve. Hence, the present study was carried out with the objective of documenting medicinal plants used by tribal communities and identification of the endangered medicinal plants and critical habitats in the study area according to the International Union for Conservation of Nature (IUCN) status.

METHODOLOGY

The study was conducted in three overlapping phases: exploratory phase, intensive field work phase and detailed inventories. The first phase (20 days) was exploratory in nature. During this period, extensive surveys were undertaken with the help of field assistant to select the study sites. In the second phase (3 months), an extensive literature survey was done to ascertain the IUCN conservation status of medicinal plants from the selected study areas. Subsequently, in the third phase (30 days), detailed

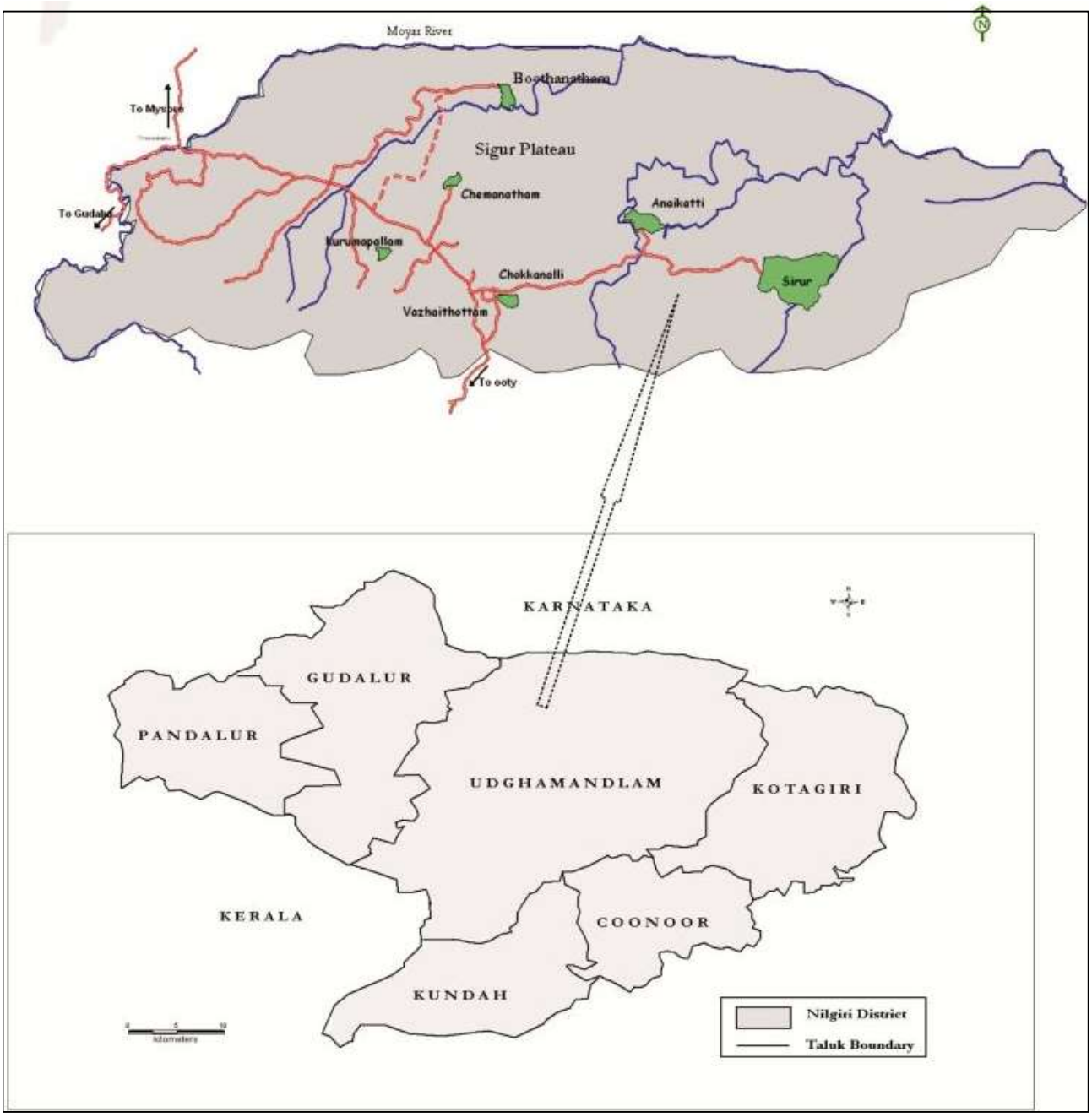

Figure 1. Map of Nilgri District showing Sigur Plateau. Source: Keystone Foundation NGO, Nilgris.

inventories were made and focus group interviews were held with key stake holder groups. Data collection was carried out during the month of June and December in 2009. In the collection of data, semi-structured questionnaire was used. However, the following major questions were kept in mind while collecting the required data:

(i) How do people perceive illness and what are the beliefs and practices influencing the health behavior of people??
(ii) What is the role of indigenous medical practitioners and folk medicine in relation to health and medical care?
(iii) What are the different plant species used for treatment? What are local opinions towards the herbal medicine?

Sampling

Participatory rural appraisal (Chambers, 1994) was employed for collecting data. Stratified random sampling was used to select the knowledgeable individuals based on age as with increasing experience, the respondents accumulates more knowledge as suggested by several workers (Schultes, 1962; Jain and Goel,

Figure 2. (a) Data collection amond the tribal people in Siriyur; (b) interview with a female traditonal healer. (c) dry decidious forest habitat of Sigur.

1995; Idalo et al., 2009; Bernard,1994). In age wise sampling, the population was divided into three groups 20 – 30, 30 – 45 and > 45 (Tongco, 2007). In total, 30 knowledgeable respondents (5% of the population) were carefully selected and interviewed. Among them, 56% were males and 44% females. Selected elders were used as key informants that could provide information on how the knowledge/practice of medicinal plant collection had changed over time. The species list was prepared based on the information collected from the key respondents (Table 1).

Species identification

The plant species were identified using the field guides: The Flora of the Tamilnadu Carnatic Vol I-III K.M. Matthew, Flora of Tamil Nadu, India. Ser. 1: Analysis. vol. 3 (Mathew 1993). Botanical Survey of India, Forest Plants of the Nilgris Eastern and Northern Nilgiri Biosphere Reserve published by Keystone Foundation NGO (Keystone Foundation, 2008; Keystone Foundation, 2010). Photographs from the field guide were shown to the informants and were recorded.

RESULTS

Medicinal plants used by the tribal people were classified into 3 categories: based on seasonal availability, species locality and the parts of the medicinal plants used. Based on seasonal differences, they are classified as dry (April - September) and wet periods according to the rainfall variability. Hence, the availability of medicinal plants varies according to the season and phenology. The results indicate that those medicines that require the leaves as a major component will not be available during the dry seasons and so is the case of medicinal fruits as their availability is restricted to the fruiting season (June - September). Since wet/winter period is prolonged in the habitat (September-February), most of the species are available in this period of time.

Majority (82%) of the medicinal plants are procured from the forests (Figure 2) (*Raphidophora pertusa*, *Andrographis serphilifolia*, *Pleiospermium alatum*, *Terminalia chebula)* followed by farm lands (25%) (*Amaranthus viridis*, *Amaranthus graecizans*, *Tephrosia purpurea*, *Coccinia indica*, *Mimosa pudica*, *Centella asiatica*) and few plant species (10%) are available in all the places because most of them are weed species (23%) (*Achyranthes aspera*, *Phyllanthus niruri*, *C. indica*, *A. graecizans*).

Enumeration of plants

A total of 74 plant species belonging to 65 genera and 42 families recorded were reported to have medicinal value (Table 1). These include 28 trees (35%), 5 lianas (5%), 17 shrubs (28%) and 24 herbs (32%). The proportion of plant species used for medicinal purpose were classified by plant parts- leaves and leaf paste (34%), fruits (9%), bark and bark paste(23%), root (12%), latex (7%), whole plant (7%), and flower and inflorescence (3%), tubers (3%), seeds and seed oil (2%) (Figure 3). Traditional healers used these plants for curing more than 28 ailments (Table 1), mainly poisonous bites (including snakes, scorpion), sexual disorders such as syphilis, gonorrhea etc., jaundice, typhoid, dysentery, rheumatism, bone fractures, skin diseases, ulcer, child birth, diarrhea, common cold and fever etc. Meanwhile, these tribal women possess a very good knowledge of gynecology. Mostly the medicine prepared as a mixture from different plants also with the help of culinary spices including chilies, pepper, turmeric and cumin.

Conservation status of identified plants

The extensive literature reviews helped in ascertaining the IUCN conservation status for the plants mentioned in the checklist. The present study indicated that from the study area, 2 species were vulnerable, namely *A. marmelos and Curcuma pseudomontana* (Figure 4), 2

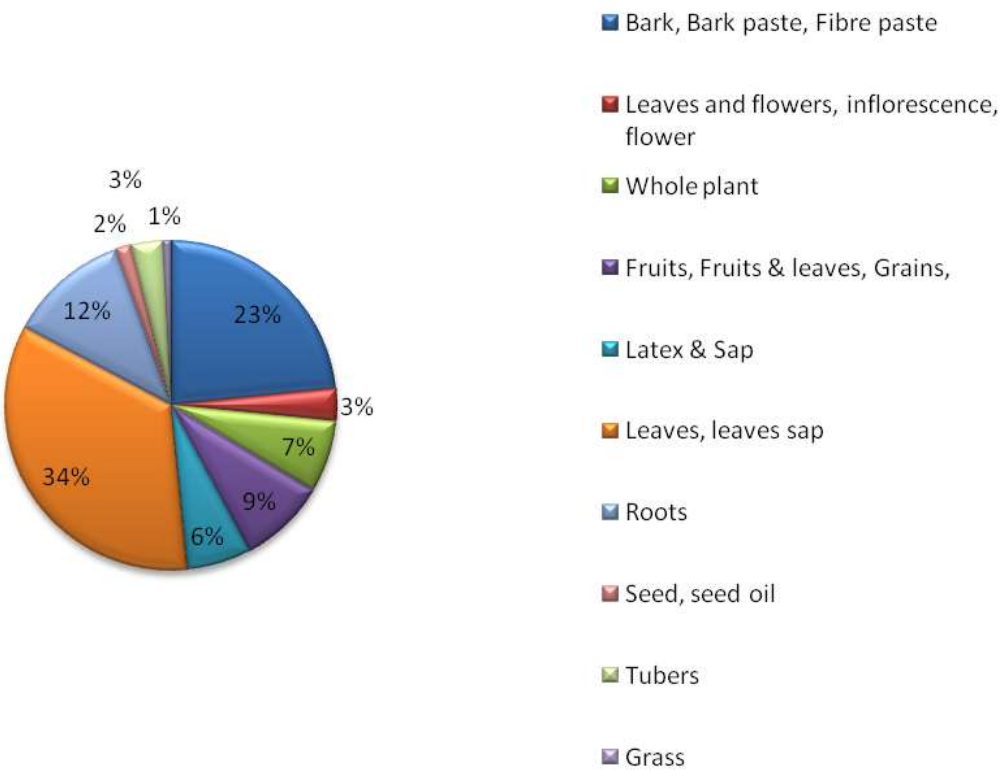

Figure 3. Percentage contribution from different parts of the medicinal plants.

species were at lower risk-least concerned- *Raphidophora pertusa and Moringa concanensis* according to the Indian red data book (FRLHT, 2000), while 2 species *A. serphilifolia* and *Givotia mollucana* that were not available in the nearby locality (personal communication from irula tribal elders) were locally extinct (Olson, 2000; Silva and Tabarelli, 2000).

The loss of the medicinal plant species in the specified sites is attributed by the key informants to the natural degradation, besides the changing soil and edaphic factors. According to Rundell and Boonpragob (1995), there is a much better understanding of the interactive nature of nutrient availability and seasonality in soil moisture, which lead to broad patterns of forest dominance by deciduous species.

Perception of illness

The results showed that the elderly people (age group >45years) in the community still believe in the black magic and religious related superstitious /thoughts, and perceived that diseases are caused by supernatural powers. Such attitudes have strong cultural roots and influence their concept of disease, causation and treatment. On the other hand, ages group below 35 years can differentiate the illness due to the awareness about the medical facilities. These findings agree with the perception of illness of Bhils tribe of Southern Rajasthan, India (Jain and Agarwal, 2005).

Knowledgeable age groups

The people aged above 45 were found to be more knowledgeable on medicinal plants (based on the number of plant species) when compared with other age groups. There are variations in the knowledge about the medicinal plant based on age groups- age group >45 (54%), 30 - 45 (32%) and 20 - 30 (14%) as shown in the Figure 5. Thus, knowledge about the medicinal plants increases with increasing age of the people. This finding is in agreement with that of Guimbo et al. (2011) and Sharma and Pegu (2011).

Belief in ethnomedicine

The results indicated that the older age group (>45years) are more knowledgeable and still believe in herbal therapies. In the present study, the percentage of belief was rated as low, moderate, high- the age groups >45(70%), 30 - 45 (25%) and 20 - 30(5%) (Figure 6). The younger generation believes more in the western

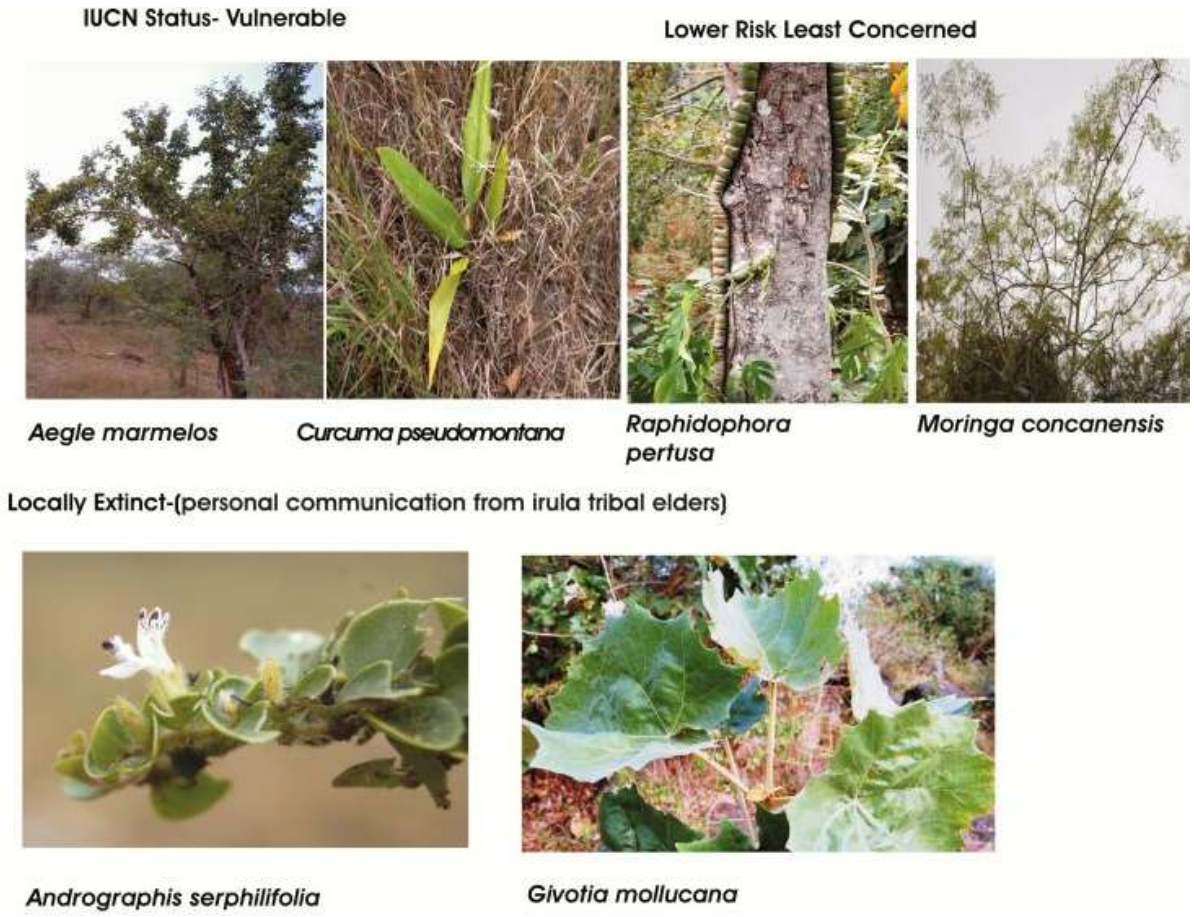

Figure 4. Conservation status of plant species.

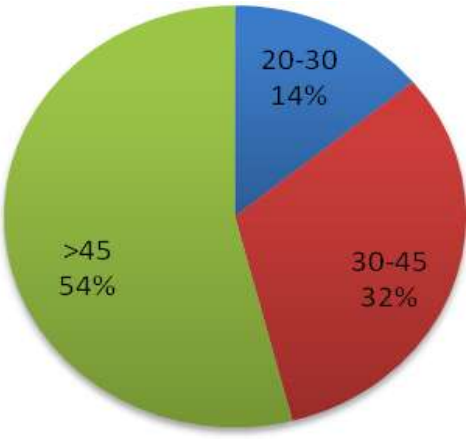

Figure 5. Level of knowledgeable on medicinal palnts as a function of age group.

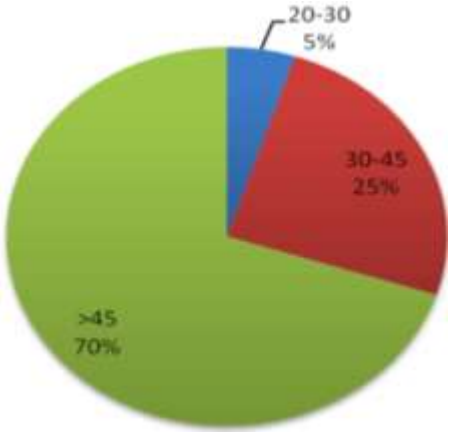

Figure 6. Percentage of belief in Herbal medicine among different age groups.

medicine as they want quick remedies. Several elders mentioned that the impact of new infectious diseases could also be a reason for the decrease in belief. In fact, such new diseases are often associated with changes in lifestyle and food habits (Coyne, 2000). Besides, the penetration of allopathic medicines and acculturation are

Table 1. List of medicinal flora from the forests of Irula villages, indicating parts used and ailments cured.

S/N	Scientific name	Family	Part/s used	Ailment/s cured
1.	*Acacia pennata* (L.) Willd.	Mimosaceae	Leaves	Epilepsy, gastric problems
2.	*Acacia leucophloea* (Roxb.) Willd.	Mimosaceae	Bark	Bone Fracture, Cuts and burns
3.	*Acalypha fruticosa* Forsskal	Euphorbiaceae	Whole Plant	To Control worms
4.	*Aegle marmelos* (L.) Corr. Serr.**	Rutaceae	Bark	Diarrhoea
5.	*Alangium salvifolium var.hexapettalum* Wang.	Alangiaceae	Bark	Snake antidote& Paralysis
6.	*Albizia amara* (Roxb.) Boivin ssp amara	Mimosaceae	Leaves, bark	For hair growth, Cuts and burns
7.	*Aloe vera* (L).Burm.f.	Xanthorrhoeaceae	Fruit	Skin disorder
8.	*Amaranthus graecizans* L.ssp. thellungianus (Nevski)	Amaranthaceae	Roots	Ear problem
9.	*Amaranthus spinosus* L.	Amaranthaceae	Whole Plant	Stomach pain
10.	*Amaranthus viridis* L.	Amaranthaceae	Whole Plant	Stomach ache
11.	*Andrographis paniculata* Vahl.	Acanthaceae	Roots	Snake antidote
12.	*Andrographis serphilifolia* Vahl.	Acanthaceae	Roots	Snake antidote
13.	*Anogeissus latifolia* Wallich ex Guill. & Perr.	Combretaceae	Bark	Stomach ache
14.	*Argyreia speciosa* Burm.f	Convolvulaceae	Roots	Fever and headache
15.	*Arisaema leschenaultii* Blume.	Araceae	Roots	Snake antidote
16.	*Azadirachta indica* Adr.Juss.	Meliaceae	Bark, Leaves	To Control worms, Mouth Ulcer
17.	*Barleria buxifolia* L.	Acantaceae	Roots	Stomach pain
18.	*Bauhinia racemosa* L.	Caesalpiniaceae	Bark	Dysentery
19.	*Brassica juncea* L.	Brassicaceae	Leaves	Dysentery
20.	*Calotropis gigantea*(L) R.Br	Asclepiadaceae	Leaves	Foot problems
21.	*Canthium coromandelicum* (Burm.f.) Alston	Rubiaceae	Bark	Fever
22.	*Canthium dicoccum* (Gaertn.)Teys.& Binn.	Rubiaceae	Leaves, Bark	All type of fevers
23.	*Capparis sepiaria* L.	Capparaceae	Leaves	Hip pains, dysentery
24.	*Capparis zeylanica* L.	Capparaceae	Leaves	Breathing problems
25.	*Cardiospermum halicacabum* L.var microcarpum	Sapindaceae	Leaves & roots	Cough and Fever
26.	*Cassia occidentalis* L.	Fabaceae	Roots	Swellings over body
27.	*Celosia argentea* L.var argentea	Amaranthaceae	Roots	Stomach ache
28.	*Celtis philippensis* Blanco var. wightii	Ulmaceae	Bark	Digestion problems
29.	*Centella asiatica* L.	Mackinlayaceae	Leaves	Syphilis
30.	*Chloroxylon swietenia* Roxb.	Rutaceae	Inner bark	Tooth problems
31.	*Cissampelos pareira* L.	Menispermaceae	Leaves	Snake antidote
32.	*Cissus quadrangularis* L.	Vitaceae	Roots	During pregnancy
33.	*Coccinia grandis* (L)J.voigt	Cucurbitaceae	Leaves and tubers	Throat pain
34.	*Coccinia indica*	Cucurbitaceae	Roots	Antidote

Table 1. Contd.

35.	*Cordia monoica* Roxb.	Boragianaceae	Leaves	Chest pains
36.	*Curcuma pseudomontana* J.Graham.**	Zingiberaceae	Gingers	Wounds and cuts
37.	*Cyanodon dactylon* L.	Poaceae	Fibre	Headache
38.	*Datura metel* L.	Solanaceae	Leaves	Pain relief
39.	*Dichrostachys scinerea* Wight et Arn.	Mimosaseae	Fibre paste	Vomiting
40.	*Dioscorea tomentosa* J. Koenig ex Sprengel	Dioscoreaceae	Tubers	Digestion problems
41.	*Diospyros montana* L.	Ebenaceae	Leaves	Paralysis, Joint pains
42.	*Erythroxylon monogynum* Roxb.	Erythroxylaceae	Bark	Skin disorder
43.	*Ficus benghalensis* L.	Moraceae	Leaves	Mouth ulcer
44.	*Givotia mollucana* L.	Euphorbiaceae	Bark	Breathing problems
45.	*Gmelina arborea* Roxb.	Verbenaceae	Leaves	Stomach ache
46.	*Hibiscus micranthus* L.f.	Malvaceae	Roots	Swellings over body
47.	*Ipomea obscura* (L.) Ker Gawl.	Convolvulaceae	Leaves	Sprain, stomach ache
48.	*Jasminum auriculatum* Vahl.	Acanthaceae	Stems& roots	Bone fractures
49.	*Jatropha curcas* L.	Euphorbiaceae	Inner bark	Cold and fever(for children)
50.	*Lantana camera* L.	Verbenaceae	Leaves	Cuts and burns
51.	*Leucas aspera* (Willd.) Link	Lamiaceae	Whole Plant	Typhoid
52.	*Manilkara hexandra*(Roxb.)Dubard.	Sapotaceae	Bark	Hip pains
53.	*Moringa concanensis***	Moringaceae	Bark & leaves	De-worming, Dysentery & fever
54.	*Narinji crenulata* (Roxb.) Nicols.	Rutaceae	Leaves	Leg pains
55.	*Nerium oleander* L.	Apocyanaceae	Leaves	For speech to children
56.	*Oxalis corniculata* L.	Oxalidaceae	Leaves	Syphilis
57.	*Parthenium hysterophorus* L.	Asteraceae	Leaves	Cuts and burns
58.	*Phoenix loureirii var humilis*	Arecaceae	Leaves	Dog bite
59.	*Phyllanthus debilis klein ex wild*	Euphorbiaceae	Leaves	Jaundice
60.	*Pleiospermum alatum* Wight&Arn.	Rutaceae	Bark	Chest pains
61.	*Raphidophora pertusa* Hassk.**	Araceae	Whole Plant	Swellings in groin joints
62.	*Ricinus communis* L.	Euphorbiaceae	Seed oil	Dysentery
63.	*Rivea hypocrateriformis* Choisy.	Convolvulaceae	Leaves	Fever
64.	*Sapindus emarginata* Vahl.	Sapindaceae	Inner bark	Tooth problems
65.	*Solanum nigrum* L.	Solanaceae	Whole Plant, seeds	Stomach ache& fever
66.	*Solanum surattense* Burm.F.	Solanaceae	Fruits, leaves	Vomiting &Tooth paste
67.	*Syzygium cumini* (L.) Skeel.	Myrtaceae	Inner bark	Tooth problems
68.	*Tamarindus indica* L.	Caesalpiniaceae	Bark	Stomach ache
69.	*Tephrosia purpurea* (Linn.)Pers.	Fabaceae	Leaves	STD

Table 1. Contd.

70.	*Terminalia chebula* Retz.	Combretaceae	Fruits	Cough and Fever
71.	*Wattakaka volubilis* (Linn.F)stapf.	Asclepiadaceae	Leaves	Dysentery
72.	*Xanthium indicum* J. Koenig ex Roxb.	Asteraceae	Leaves	Dog bite
73.	*Ziziphus mauritiana* Lamk	Rhamnaceae	Bark	Dysentery
74.	*Ziziphus rugosa* Lamk	Rhamnaceae	Bark	Dysentery

**Conservation status: Vulnerable- *Aegle marmelos* and *Curcuma pseudomontana*; Lower Risk Near Threatened- *Moringa concanensis* and *Raphidophora pertusa*–Ref: FRLHT RED DATA BOOK, Ravikumar and Ved, 2000. Source: Interviews with key knowledgeable respondents from the study area, based on their historical beliefs and cultural traditions.

posing serious challenges to the ethnobotanical knowledge of the younger generation (Guedes and Sampaio, 2004).

DISCUSSION

The traditional health care practices of tribals and system of treating diseases are based on their deep observation and belief in nature. Therefore, they rely more on the indigenous system of curing disease and on herbal medicines that are easily available around their settlements for treating many common diseases. However, with the development of education, the advent of modern health care facilities and Government health measures, the people are becoming more interested in taking modern medicine instead of traditional herbal medicine. This is in agreement with the findings of the earlier workers (Banerjee, 2002; Kala et al., 2005). The growing disinterest in the use of the folk medicinal plants and its significance among the younger generation (20-30 years; 20%) of the tribes may lead to the disappearance of this practice as it was reported by several previous workers (Das et al., 2008). Educated younger generation of the tribes should be encouraged to protect and cultivate these valuable herbal plants before they get lost due to the urbanization and deforestation. The older age group (>45years; 70%) believe in herbal medicine and indigenous methods of treatment.

Those who have the knowledge of traditional medicine are involved in collection of medicinal plants throughout the year but the amount of collection is based on immediate requirements only. All of them believe that spells and black magic are obligatory for the medicine to work and the traditional remedies are useless without them (Sharma and Pegu, 2011). The study revealed 60% of the tribals interviewed, mentioned that 40% of the species have become increasingly rare and are no longer available locally and sometimes this makes them to travel up to 20 – 30 km deep into the forest for collection. The availability of plants varies greatly due to climatic and edaphic factors that determine their density and abundance (personal communication from irula tribal elders).

Currently, there are no measures taken specifically to conserve the various species of medicinal plants. The tribal's suggest that cultivation of commonly used species in herbal gardens would be a good idea as then they would not have to collect them from wild. Besides that, we can protect and revive this knowledge ideally by people's biodiversity registers (PBR) under the National Biodiversity Strategy Action Programme (NBSAP) of Government of India (Gadgil et al., 2000; Anand, 2006) as suggested by several workers (Subedi et al., 1998; Rodrigues et al., 2003; Ragupathy et al., 2008). Moreover, we can also identify potential sites where such rare and valuable medicinal plants were once found and/ or still available as community conserved areas or more specifically medicinal-plant conservation areas (Margules and Pressey, 2000; Sinclair et al., 2000; Bhagwat et al., 2005; Kala, 2005, Singh et al., 2012). Likewise the awareness about conservation of the ethnic knowledge can be created in the younger minds through employment opportunities in the herbal gardens in their own villages. There is an urgent need for conservation of these species as many of them may hold the key to unknown cures for modern day diseases. More importantly, as the knowledge of these plants and their practices are important to the culture of Irula community, the preservation of these practices is in many ways a preservation of their identity.

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