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Status of medicinal plants in tropical forest of eastern Nepal

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Abstract

The present study deals with the medicinal properties of 24 species of plants belonging to 23 genera and 17 families found in tropical moist forest of Sunsari district, eastern Nepal. Among them, 5 species of medicinal plants are threatened according to the IUCN categories and *Rauvolfia serpentina* is included in the appendix II of CITIES.

***Key words*:** Ethno-medicine, chemical constituents, Sunsari district, Chaarkoshe jungle, bhabar region.

Introduction

Humans have used herbal remedies for curing different diseases since prehistoric days. More than 50,000 plants have been used for medicinal purposes throughout the world (Schippmann *et al*., 2002). According to one estimate, about 80% of the developing world depends on traditional medicines (Sheldon *et al.,* 1997). Nepal, geographically one of the most diverse countries in the world, has been regarded traditionally as a secret heaven of potent medicinal plants in Vedas, Samhitas and various folk-lores. It may be due to altitudinal variation, complex topography and monsoon climate. From the various studies it has been estimated that about 700 species of plants are used in the Nepalese traditional system of medical treatment. Nepal also earns approximately 22-70 million US$ from the export of plants annually (Olsen, 1998; 1999).

Tropical forests have played key roles in the livelihood of people residing around them. They are the sources of fresh water and oxygen and provide a diversity of valuable forest products for food and medicine. The continuous exploitation of several medicinal plant species from the wild and substantial loss of their habitats have resulted in population decline of many high value medicinal plant species. The other potential causes for the loss of medicinal plant species are habitat specificity, narrow range of distribution, land use disturbances, introduction of non-natives, habitat alteration, climatic changes, heavy livestock grazing, explosion of human population, fragmentation and degradation of population.

Some of the species assessed in this study are under the threats. Conservation of heavily exploited tropical forest species is possible by the joint effort of Government and the forest user groups. Endangered species can be conserved if their economic values are recognized. One way to do this is to obtain more basic information not only on the biological and ecological features of the species but also their present and potential uses.

Traditional medicinal knowledge like all other traditional knowledge systems is handed down orally from generation to generation and it may disappear because of rapid socioeconomic, environmental and technological changes. Only solution is that it must be documented and

conserved through systematic studies before it is lost forever. Therefore, now-a-days, the documentation of indigenous knowledge is receiving much attention. Nepal Biodiversity Strategy has also highlighted the importance for documentation and proper conservation of traditional knowledge and biodiversity (NBS, 2002; CBD, 2009).

Material and Methods

Study area

The present study was conducted in the tropical moist forest (Charkoshe jungle), located in the bhabar belt of Sunsari district, eastern Nepal (Longitude 86°53'E to 87°21'E and latitude 26°24'N to 26°52'N), within the altitude range of 220 to 370 m above m.s.l. The climate is tropical monsoon type. The average annual rainfall is 1814.9 mm. Topsoil of the study area is loamy (Gautam & Mandal, 2012). The forest is dominated by *Shorea robusta* Gaertn. Other main associates are *Lagerstroemia parviflora* Roxb., *Terminalia alata* Heyne ex Roth., *Adina cordifolia* Benth. & Hook f. ex Bran, *Dillenia pentagyna* Roxb., *Terminalia bellerica*, *Croton roxburghii* N.P. Balakr. The forest is also the habitat of some rare and commercially as well as medicinally important plants.

The present study was based on a field survey made during 2012-2013 A.D. The survey was conducted among local people, farmers, Dhaami, Jhankri, and vaidyas residing around the forest area to know the local names, place of occurrence and medicinal importance of mentioned plants. The plants with medicinal values were collected and herbarium specimens were made. The identification of plant specimens was done with the help of standard taxonomic literature and also matching with the herbaria, housed in the Post Graduate Campus, Biratnagar. The valid names of the species concerned and their distribution are adopted after Press *et al*. (2000). The information on the active chemical compounds of mentioned medicinal plants were taken from available literature (Kirtikar & Basu, 1980; Rastogi & Mehrotra, 1960-1969; 1970-1979; Satyal *et al*., 2012).

Results

The investigation revealed the medicinal properties of 24 species of plants belonging to 23 genera under 17 families. The botanical names, local names, familes, parts used, routes of administration and active chemical compounds are presented in table 1 & 2. Fabaceae is the dominant family (4 species), followed by Apocynaceae (3 species), Lamiaceae and Combretaceae (2 species each). The other 13 families contributed one species each. Among all the habits, trees are found to be more (14) followed by herbs (6), and shrubs (4). Five species of medicinal plants reported in this study are threatened according to the IUCN categories. Moreover, *Rauvolfia serpentina* is included in the appendix II of CITIES (Convention on International trade in Endangered Species of Wild Flora and Fauna) list.

Table 1. Medicinal plants found in the tropical forest of eastern Nepal

SN	Botanical name (Family)	Common name/s	Habit	Distribution in Nepal (m)	IUCN Status
1	*Acacia catechu* (L.F.) Willd. (Fabaceae)	Khayer	Tree	200-1400	T
2	*Achyranthes aspera* L. (Amaranthaceae)	Datiwan, Ultekuro	Herb	100-2900	-

3	*Aegle marmelos* (L.) Correa (Rutaceae)	Bel	Tree	60-1000	-
4	*Alstonia scholaris* (L.) R.Br. (Apocynaceae)	Chaatiwan	Tree	60-500	R
5	*Asparagus racemosus* Willd. (Liliaceae)	Kurilo	Herb	60-1600	-
6	*Bombax ceiba* L. (Bombacaceae)	Simal	Tree	200-900	-
7	*Calotropis gigantia* (L.) (Asclepediaceae)	Aank	Shrub	100-1000	-
8	*Cassia fistula* L. (Fabaceae)	Raajbriksha	Tree	60-1500	-
9	*Colebrookea oppositifolia* Sm. (Lamiaceae)	Dhursul	Shrub	250-1700	-
10	*Dalbergia latifolia* Roxb. (Fabaceae)	Satisaal	Tree	300-1000	V
11	*Eclipta prostata* L. (Asteraceae)	Bhringaraaj	Herb	200-2400	-
12	*Holarrhena pubescence* (Buch.-Ham.) ex G.Don (Apocynaceae)	Musabar	Tree	100-1500	-
13	*Hydrocotyl asiatica* L.(Apiaceae)	Ghodtapre	Herb	60-2100	-
14	*Mimosa pudica* L. (Fabaceae)	Lazawati	Herb	200-1200	-
15	*Oroxylum indicum* (L.) Kurz (Bignoniaceae)	Totalo	Tree	400-1400	V
16	*Phyllanthus emblica* L. (Euphorbiaceae)	Amalaa	Tree	150-1400	-
17	*Pogostemon benghalensis* (Brum. f.) Kuntze (Lamiaceae)	Rudilo	Shrub	150-1300	-
18	*Rauvolfia serpentina* (L.) Benth. ex Kurz (Apocynaceae)	Sarpagandhaa, Chandmaruwa	Shrub	150-900	E
19	*Scoparia dulcis* L. (Scrophulariaceae)	Mithojhaar	Herb	100-1200	-
20	*Shorea robusta* Gaertn. (Dipterocarpaceae)	Sal, Sakhuwa	Tree	60-1500	-
21	*Syzygium cumini* (L.) Skeels (Myrtaceae)	Jamunu	Tree	70-1200	-
22	*Terminalia bellerica* (Gaertn.) Roxb. (Combretaceae)	Barro	Tree	100-1100	-
23	*Terminalia chebula* Retz. (Combretaceae)	Harro	Tree	150-1100	-
24	*Zizyphus mauritiana* Lam. (Rhamnaceae)	Bayer	Tree	200-1200	-

(IUCN status: E= endangered, V= vulnerable, R= rare, T= threatened)

Table 2. Medicinal plants with their uses, parts used routes of administration and active chemicals.

Ailments ***Botanical name***	**Part(s) used**	**Form of use**	**Routes**	**Active constituents**
Removal of dead foetus				
Achyranthes aspera	Whole plant	Decoction	Oral	Betaine, ecdysone, ecdysterone, oleanolic acid.
Snake and scorpion bite				
Achyranthes aspera	Root	Paste	Topical	-
Hydrocotyl asiatica	Whole plant	Decoction	Oral	-
Diarrhoea and dysentery				
Aegle marmelos	Unripe fruit	Pulp	Oral	Marmin, ageline, marmesin.
Bombax ceiba	Stem	Latex	Oral	Arabinose, galactose etc.
Dalbergia latifolia	Stem	Latex	Oral	-
Holarrhena pubescence	Stem bark	Decoction	Oral	Conessine, norconessine
Mimosa pudica	Root	Paste	Oral	-
Oroxylum indicum	Stem bark	Decoction	Oral	Oroxylin A, chrysin etc.
Pogostemon benghalensis	Leaf	Decoction	Oral	Essential oils like terpinene, caryophyllene, cardinene.
Shorea robusta	Stem bark, resin	Decoction	Oral	Corilagin, ellagic, gallic, shorbic acids etc.

Terminalia bellerica	Fruit	Powder	Oral	-
Lactation				
Asparagus racemosus	Root	Decoction	Oral	-
Diabetes				
Aegle marmelos	Leaf	Powder	Oral	Limonene, β-ocimene etc.
Asparagus racemosus	Leaf	Infusion	Oral	Quercetin-3- glucunoride.
Syzygium cumini	Seed	Decoction	Oral	-
Tonic				
Asparagus racemosus	Root	Decoction	Oral	-
Sprains				
Calotropis gigantia	Stem	Latex	Topical	-
Diuretic				
Cassia fistula	Fruit	Pulp	Oral	Glucose, sucrose, fructose
Scoparia dulcis	Leaf	Decoction	Oral	-
Cuts and wounds				
Colebrookea oppositifolia	Leaf	Latex	Topical	-
Eclipta prostata	Leaf	Latex	Topical	Polyacetylenic thiophenes.
Hydrocotyl asiatica	Leaf	Latex	Topical	-
Leprosy				
Dalbergia latifolia	Stem bark	Decoction	Oral	-
Anthelmintic				
Acacia catechu	Stem bark	Decoction	Oral	-
Holarrhena pubescence	Seed	Decoction	Oral	-
Improve memory power				
Hydrocotyl asiatica	Whole plant	Decoction	Oral	Brahmic, thankunic acids
Syphilis				
Hydrocotyl asiatica	Leaf	Latex	Topical	-
Burns and boils				
Oroxylum indicum	Stem bark	Ash	Topical	-
Gastric troubles				
Phyllanthus emblica	Stem bark	Decoction	Oral	Tannin, lelucodelphinidin, procyanidin, prodelphinidin
Scabies and ringworms				
Pogostemon benghalensis	Leaf	Latex	Topical	-
Fever				
Alstonia scholaris	Bark	Decoction	Oral	HCl of echitamine
Rauvolfia serpentina	Stem, root, leaf	Decoction	Oral	Alkaloids: reserpine, ajmaline, serpentine in root.
Sedative and hypnotic				
Rauvolfia serpentina	Root		Oral	Alkaloid reserpine.
Measles				
Zizyphus mauritiana	Root, seed	Decoction, ash (Seed)	Topica, oral	Alkaloids hysodricanine A, mauritine H, yuziphine etc.
Tonsil				
Scoparia dulcis	Leaf	Latex	Oral	-
Cough				
Terminalia chebula	Fruit	Decoction	Oral	-

These plants are being used in 20 ailments (Fig. 1). The major ailments on the basis of number of species used are diarrhoea and dysentery (9 species); diabetes and cuts plus wounds (3 species each).

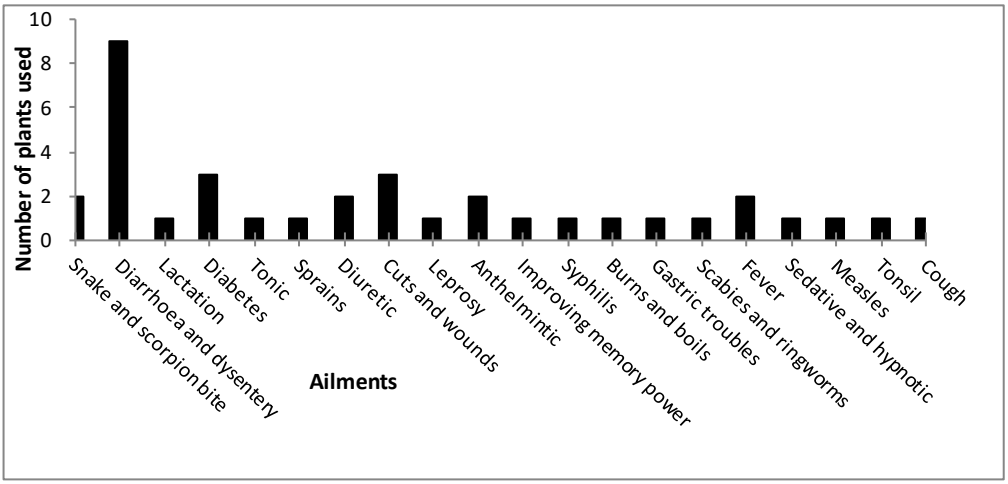

Figure 1. Different ailments and number of plants used in the surrounding of tropical forest, eastern Nepal.

The most frequently used medicines are derived from stems and barks (31%), followed by leaves (25%), roots (18%), fruits (10%), seeds (8%) and whole plants (8%) (Fig. 2). The maximum use of stem and barks indicates that these parts may have strong medicinal properties. Among the dosage forms, the most frequently used dosage was decoction (61%) followed by latex (juice) (27%), powder (6%), and paste (6%) (Fig. 3). The routes of administration were oral (76%) and topical (24%) (Table 2).

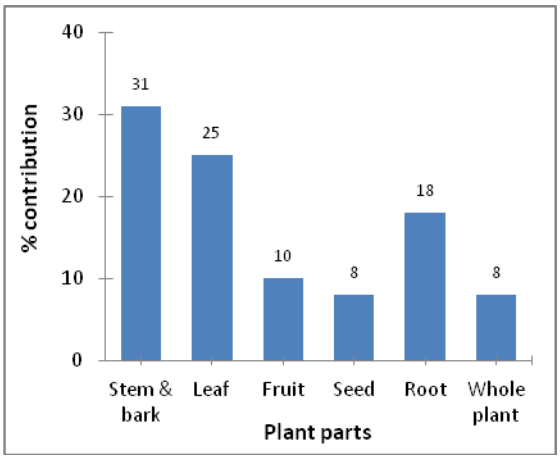

Figure 2. Plant parts and their % contribution.

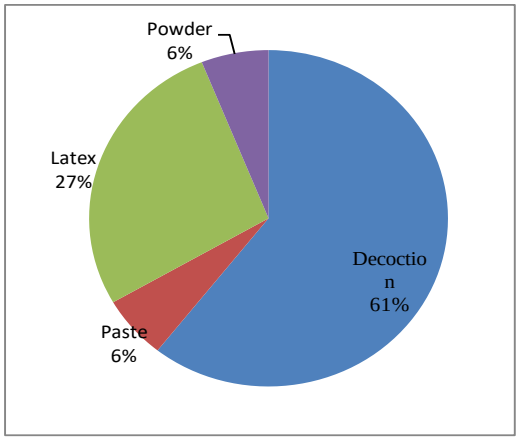

Figure 3. Forms of use of medicinal plants.

Discussion

This study revealed that the use of medicinal plants differs not only from region to region but also among and within communities. For example, *Achyranthes aspera* was used in two different ailments (for the removal of dead foetus and snake and scorpion bites) at two places. It may be due to the difference in the active alkaloids or steroids in the same plant growing in different habitats. The second possibility may be that the plant possesses that activity but that this beneficial therapeutic effect has just not been discovered. In spite of this, few such examples were met that some plants were used for the same purpose in different regions.

The local people residing around the forest area used some medicinal plant species as a source of food, fodder, timber as well as various other ethnobotanical purposes. For example, apart from the use of *Aegle marmelos, Syzygium cumini, Phyllanthus emblica, Zizyphus mauritiana* and *Terminalia bellirica* as medicines, the fruits of these species are edible, the leaves of some species are used for fodder and the wood is used for fuel. Some species like *Aegle marmelos* and *Oroxylum indicum* are used for medicinal as well as religious purposes by the Hindus. The Buddhist community regards *Terminalia chebula* as an important medicine as well as sacred fruit. *Shorea robusta* and *Dalbergia latifolia* are not only the sources of medicine but also used as valuable and high priced timber.

The present study showed that, the older persons have greater knowledge regarding the utilization of medicinal plants in comparison to younger generation. Same result was also observed by previous workers (Acharya & Acharya, 2010; Gautam, 2011). It might be due to poor recognition of traditional healers and availability of modern health facilities. However, strong emphasis should be given for the documentation of indigenous uses, traditional knowledge and practices before their loss. The present and past studies showed that the plant medicines are less suitable to control and treat epidemic and endemic infectious diseases and acute life-threatening infections. For these problems, modern drugs might be the best choice. But for common diseases such as colds, skin diseases, worms, wounds etc. medicinal plants are the best alternatives to costly imported drugs.

Conclusions

The tropical forests are the potential sources of medicinal plants. But they are under destruction due to human activities, climate change etc. The sustainable use of the medicinal plants will certainly improve the economic condition of this region. The traditional knowledge of the forest plants should be documented before their loss. But the indigenous practices need to be validated before they can be widely promoted. They can be the starting point for drug and technology development. Proper conservation, management and utilization of medicinal plants also help to maintain biodiversity. Furthermore, a detail survey should be carried out by the government to assess the status of medicinal plants in the tropical forests of Nepal.

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