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Ethnomedicinal Uses of Tree Species by Tharu Tribes in the Himalayan Terai Region of India

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ABSTRACT

The present investigation aimed at documenting medicinally important species of trees used by Tharu tribe in the Himalayan Terai region of India. Out of 204 tree species belonging to 143 genera and 50 families reported in this study, uses of 148 species have been recorded from this region for the first time. Twenty nine leguminous species belonging to 16 genera are most commonly used by tribal people of the region. Eight species of *Ficus* are used in different diseases. About 75% of total tree species of medicinal uses have been found in wild habitat while the remaining species are cultivated. It has been noticed that bark is one of the frequently utilized plant parts by the tribe. In such diseases as diarrhoea, skin problems, dysentery, fever, ulcer, rheumatism, wounds, diabetes, respiratory and gastrointestinal problems, more than one plant species are used. Over all, more than 86 health-related issues are being cured utilizing ethnomedicinally important tree species. It has also been observed that the majority of youth in Tharu tribe are very less aware of their ethnic knowledge and are also not so much interested in such learning. Thus, a precise documentation of these information with traditional knowledge base from the ethnic people has great relevance for the human welfare. The study suggests the need for training local people for sustainable utilization of these plant resources and their proper conservation. The youth should be encouraged learning to sustain their ethnic wisdom which would also help creating employment among local inhabitants.

Key words: Ethnobotany, Himalaya, Terai region, Tharu tribe, trees

INTRODUCTION

Although, the allopathic way of treatment has advanced rapidly, about 64% of world population still depend on the traditional medicine system for health care (Farnsworth, 1994). Major population of traditional users is represented by rural and tribal people of developing countries. These people are using neighbouring plant species for treatment of diseases by choice or due to lack of money or access to allopathic treatment (Prance, 1991; Qureshi *et al.*, 2006). These ethnic people are using plant based remedies since the time of immemorial in different parts of the world. Their knowledge bank is the result of obligation to nature and long-term experience of trials, observations and errors (Sen *et al.*, 2011). The study of such prehistoric knowledge base comes under

ethnobotany or ethnomedicine (Harshberger, 1895; Jain, 1995). It is now well recognised source of knowledge wherein 2500 medicinal plants are introduced to modern world and much more yet to be explored (Huxley, 1984).

In India, about 65% of total (Timmermans, 2003) and 85% of the rural (Jain, 1994) population depend on such traditional knowledge for healthcare. India has a tremendous wealth of medicinal plants due to its unique geography, climate and environmental conditions (Kshirsagar and Singh, 2000). The country has an ancient cultural background and about 300 tribal communities with 53 million population (Reddy *et al.*, 2010). These people are using 7000-7500 plants to overcome different kind of health problems (Matthews, 2005; Mao *et al.*, 2009; Survase and Raut, 2011). The traditional knowledge has been documented time to time in our ancient *Vedic* and *Pauranic* literature which founded the base of the well known Ayurvedic system of medicine (Charak, 1996). Rigveda (~1500 BC), Yajurveda (~1100 BC), Atharvaveda (~1000 BC), Charak Samhita (~700 BC) and Sushrut Samhita (~200 BC) have demarcated about 81, 290, 1100 and 1270 species, respectively for healthcare uses (Uniyal *et al.*, 2002; Das *et al.*, 2009; Singh *et al.*, 2012). Unani, Siddha and Amchi medicine systems also provide a valuable source of knowledge of medicinal plants by prescribing about 700, 600 and 600 species, respectively (Joy *et al.*, 1998; Ahmad *et al.*, 2006; Samy *et al.*, 2008; Sen *et al.*, 2011) for healthcare uses. Although, a number of plants have already been described in the ancient literature, the documentation of these ethnic values is still required to catch-up the incredible traditional wisdom (Sikarwar, 2001; Sikarwar *et al.*, 2008; Rana *et al.*, 2010; De *et al.*, 2010; Sen *et al.*, 2011; Kumar, 2013). Despite the fact that a number of ethnobotanical studies have been conducted throughout the country (Padhye *et al.*, 1992; Chaudhari and Hutke, 2002; Sharma and Mujumdar, 2003; Pattanaik *et al.*, 2006; Reddy *et al.*, 2006; Prasad *et al.*, 2008; Mao *et al.*, 2009; Shukla *et al.*, 2010; Gupta *et al.*, 2010; Narayanan *et al.*, 2011; Mehra *et al.*, 2014), there are a number of missing links which are yet to be explored. Lack of proper documentation and oral communication of such knowledge base from one to another generation are forcing towards a heed for scientific exploration and documentation of medicinal knowledge before it faces the risk of extinction (Sajise, 1995; Murthy, 2012).

The Himalayan Terai region is one of the highly divers and rich eco-regions of India (Bajpai *et al.*, 2012a, b, 2015a). The region spreads along the foothills of the central Himalaya in the north of Indo-Gangetic plain (Uttarakhand, Uttar Pradesh and Bihar). The similar region below the eastern Himalaya is named as 'Dooars' (Bajpai *et al.*, 2015b). It is ethnobotanically rich region due to the presence of 'Tharu' tribal communities since long back (Singh *et al.*, 2012). The population census 2011 reveals about 1,69,209 people in Tharu communities in the country, of which about 50% live in Uttar Pradesh alone, with majority in Maharajganj, Gorakhpur, Siddharthnagar, Balrampur, Shravasti, Baharaich and Lakhimpur-Kheri districts. Recent studies indicate that Tharu population is suffering from rapid cultural degradation due to changing socio-economic conditions (Hamilton, 1995; Kumar *et al.*, 2006; Singh *et al.*, 2012). Thus, there is an urgent need to collect and record the ethnobotanical information from this region before these being vanished completely (Kumar *et al.*, 2006; Ong *et al.*, 2011).

A literature survey reveals that in the Himalayan Terai region of Uttar Pradesh, most of the scattered ethnobotanical studies so far have been concentrated in the eastern (Singh *et al.*, 1987; Singh and Maheshwari, 1992; Kumar *et al.*, 2006, 2012, 2013a) and western regions (Singh *et al.*, 1979; Maheshwari *et al.*, 1981; Maliya, 2011; Mohammad *et al.*, 2011; Kumar *et al.*, 2013b). A

comprehensive documentation from this biodiversity rich area is lacking. The present study was conducted covering the entire Terai region of the state to collect ethnomedical knowledge exclusively about the tree species being considered among the most valuable life forms in the region.

MATERIALS AND METHODS

Study area: The Terai region in Uttar Pradesh spreads from Saharanpur to Deoria covering 21 districts of the State. The region representing 30-50 km wide and ca. 1,670 km long strip with the elevation ranging from 100-300 m, situated between 28°45'-26°15' N and 79°51'-84°24' E. For the safeguard of the biodiversity, one national park and six wildlife sanctuaries have been declared by the government in this region (Fig. 1). The study area witnesses monsoon type of climate with three different seasons; winter (November-February), summer (April-June) and rainy (July-September). Spring (March) and autumn (October) represent transition months. Mean minimum temperature varies from 4-5°C in December-January and maximum 40-45°C in May-June. The average annual rainfall ranges from 1085-1228 mm.

Tribal community: Since the Tharus are the dominant tribal community of the study area, they have been considered for collection of ethnomedical information about the tree species. They are the natural inhabitant in the Himalayan Terai region. Their population spreads from Champaran district of Bihar to Nainital district of Uttarakhand and in the adjacent Terai area of Nepal. According to Singh (1965), they are predominantly Mongoloids with certain non-Mongoloids

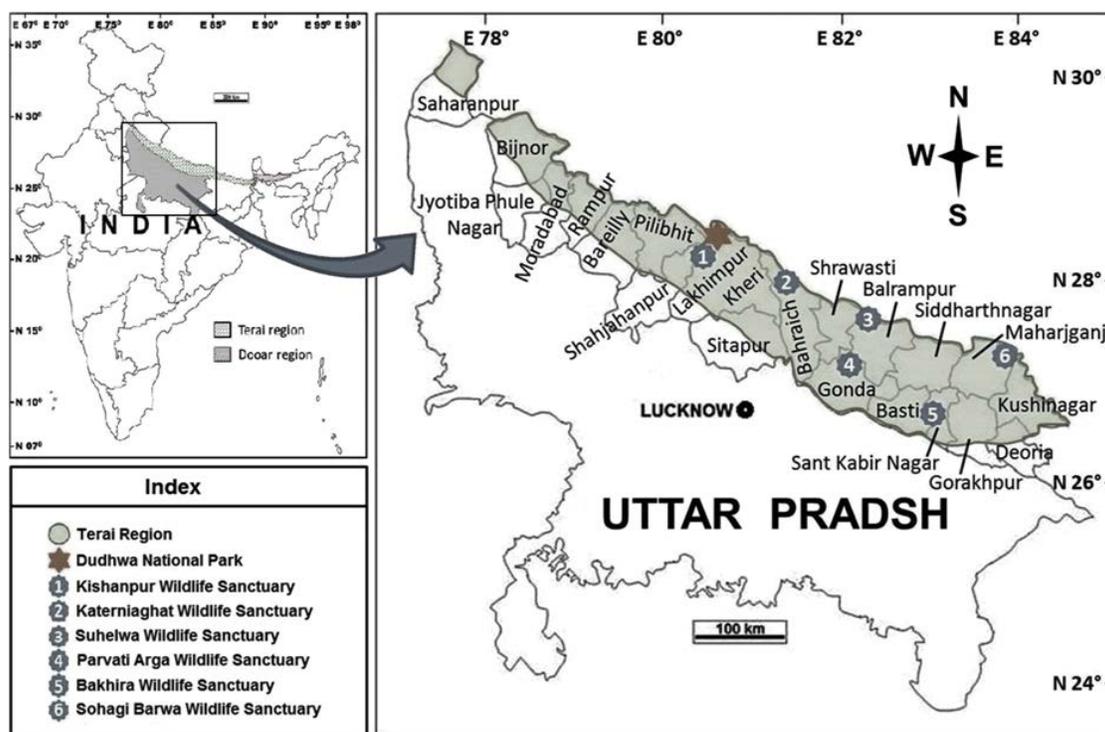


Fig. 1: Location of study area

features. They are endogenously sub-grouped into Badwayak, Battha, Birtiya, Bunka, Buxa, Dahait, Dangauria, Dhangra, Jugia, Kathuria, Kochila, Mahto, Mech, Rajia, Rana, Rawat and Sansa (Singh *et al.*, 2012). Presently, about 90% of the Tharu population is engaged with small-scale agriculture, but still some aboriginal population lives in and around the forests and is dependent on the forest products for daily uses and needs (Singh, 1965; McLean, 1999; Verma, 2011).

Data collection: The entire study area was explored comprehensively during the last three years from 2011-2013 to collect and document medicinally important tree species. The ethnomedical information about the tree species of the study area was collected through interviewing the *Vaidhya* (tribal medicine men), *Pujari* (Hindu priests), elderly men and women using a questionnaire following, Jain (1995) and Martin (1995). Since these people believe that disclosing the medicinal values of a plant will demolish the therapeutic property of that plant and will not be able to cure the sickness, they are apprehensive to share their knowledge. To build confidence with these people, the first author lived in the tribal villages for many weeks and organised group discussions with the resource persons to explain them the importance of their cooperation and knowledge sharing for the benefit of the society. The plant materials have been collected along with their ethnic uses and herbarium specimens were prepared following standard herbarium techniques (Lawrence, 1951; Jain and Rao, 1977) and deposited at LWG.

RESULTS AND DISCUSSION

The study enumerates medicinal importance of 204 tree species (under 143 genera and 50 families) being used by the Tharu tribe of Terai region for treatment of various diseases (Table 1). *Acacia catechu* (L. f.) Willd., *Aegle marmelos* (L.) Correa, *Alangium salvifolium* (L.f.) Wang, *Azadirachta indica* A. Juss., *Barringtonia acutangula* (L.) Gaertn., *Breynia vitis-idea* (Burm. f.) C.E. Fischer, *Careya arborea* Roxb., *Carissa carandas* L., *Citrus medica* L., *Cordia dichotoma* G. Forst., *Dalbergia lanceolaria* L. f., *Ficus benghalensis* L., *F. racemosa* L., *Flueggea virosa* (Roxb. ex Willd.) Royle, *Gmelina arborea* Roxb. ex Sm., *Grewia asiatica* L., *Holarrhena pubescens* Wall. ex G. Don, *Holoptelea integrifolia* (Roxb.) Planch., *Kigelia africana* (Lamk.) Benth., *Litsea glutinosa* (Lour.) Rob., *Melia azedarach* L., *Mimusops elengi* L., *Mitragyna parvifolia* (Roxb.) Korth., *Moringa oleifera* Lamk., *Morus alba* L., *Murraya koenigii* (L.) Spreng., *Nyctanthes arbor-tristis* L., *Oroxylum indicum* (L.) Vent., *Ricinus communis* L., *Saraca asoca* (Roxb.) de Wilde, *Schleichera oleosa* (Lour.) Merr., *Semecarpus anacardium* L. f., *Stereospermum chelonoides* (L. f.) DC., *Streblus asper* Lour., *Strychnos nux-vomica* L., *Terminalia arjuna* (Roxb. ex DC.) Wight and Arn., *T. bellirica* (Gaertn.) Roxb., *T. chebula* Retz. and *Wrightia tinctoria* R. Br. are some of the important and highly useful tree species being used by Tharus for different therapeutic purposes (Fig. 2-4). About 72% (148) of total medicinally useful tree species presented in this study are reported from the area for the first time. Fabaceae with 29 species belonging to 16 genera has been found highly used family followed by Malvaceae (18 species and 12 genera), Euphorbiaceae (13 species and 8 genera), Moraceae (12 species and 4 genera) and so on (Fig. 5). Some of the frequently used genera for the treatment of different diseases are *Ficus* (8 species), *Bauhinia* (6 species), *Glochidion* (5 species), *Terminalia* (5 species) and *Grewia* (5 species) (Fig. 6). With respect to different plant parts, bark is mostly used for maximum tree species (110), followed

Table 1: List of medicinal tree species with local name, indigenous uses and source of collection

Botanical name	Local name	Indigenous uses	Source
Anacardiaceae			
# <i>Buchanania cochinchinensis</i> (Lour.) Almeida	Chirongi	Seed oil in skin diseases; Leaves juice in blood purification, biliousness and burning sensation	Wild
<i>Lannea coromandelica</i> (Houtt.) Merr.	Jhingam	Bark in burns*, cuts*, toothache, throat sore, skin eruptions, heart diseases, rheumatism and ulcers	Wild, planted
<i>Mangifera indica</i> L.	Aam	Seed in cold, cough, diarrhoea, dysentery and piles; Bark in rheumatism; Inflorescence in scorpion and snake bite*	Planted, cultivated
# <i>Semecarpus anacardium</i> L. f.	Bhilawa	Fruits in leucoderma, dermatitis, leprosy, poisonous bites, cough, asthma, dyspepsia, dysentery, fever, urinary discharge, ulcers and non-bleeding haemorrhoids	Wild
# <i>Spondias pinnata</i> (J. Koenig ex L. f.) Kurz.	Ambara	Leaves, bark and fruits in burns, sores and wounds; Bark in diabetes, dysentery, rheumatism and vomiting	Planted
Annonaceae			
<i>Annona reticulata</i> L.	Ramphal	Leaves in ulcers; Leaf decoction in diabetes*; Unripe fruit and bark in diarrhoea and dysentery	Cultivated
<i>Annona squamosa</i> L.	Sharifa	Leaves, bark and root in wounds*, epilepsy, spinal cord disorders, diarrhoea and dysentery; Leaves in wounds of cattle*	Cultivated
# <i>Mitusa tomentosa</i> (Roxb.) Sinclair	Kari	Bark in dysentery	Wild
# <i>Mitusa velutina</i> (Dunal) Hook. f. and Thoms.	Bari kari	Fruits in chronic constipation	Wild
# <i>Polyalthia longifolia</i> (Sonner.) Thw.	Ashok	Bark in diabetes, pyorrhoea, ulcers and hypotension	Planted
# <i>Polyalthia suberosa</i> (Roxb.) Thwaites	Barachali	Bark as abortifacient	Planted
Apocynaceae			
<i>Alstonia scholaris</i> (L.) R. Br.	Saptarni	Bark in diarrhoea, dysentery, wounds, ulcers, malarial fever, blood purification* and skin diseases*; Leaf latex in epilepsy*	Planted
<i>Calotropis gigantea</i> (L.) Dryand.	Safed madar	Root in old ulcers; Leaves juice in skin affections and as depilatory; Leaves for easy delivery in women*	Wild, cultivated
# <i>Carissa carandas</i> L.	Karaunda	Leaves in diarrhoea, earache, soreness of mouth and throat; Bark in skin diseases; Root in urinary disorders	Wild, cultivated
<i>Casabela thevetia</i> (L.) Lippold	Pila kaner	Young branches judiciously in toothache and skin sores; Roots in tumour*	Planted, cultivated
<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G. Don	Dudhi	Bark in skin diseases, biliousness, fever, diarrhoea*, dysentery* and urinary troubles; Seeds in bleeding piles, fatigue and hallucinations	Wild
# <i>Wrightia arborea</i> (Dennst.) Mabblerley	Dharauli	Roots in fever; Latex to stop haemorrhoids; Bark in dysentery, menstrual and renal complaints	Wild
# <i>Wrightia tinctoria</i> R. Br.	Kapar	Bark and seeds in bilious infections, psoriasis and non-specific dermatitis; Leaves in toothache, fever and as poultice for mumps and herpes; Bark is orally given to cattle to stop excess saliva secretion	Wild
Araliaceae			
# <i>Heteropanax fragrans</i> (Roxb.) Seem.	Tarla	Dried root and bark in detoxification, detumescence and pain easing	Wild
Bignoniaceae			
# <i>Jacaranda mimosifolia</i> D. Don	Nili gulmohar	Leaves in healing wounds; Root and bark in syphilis	Planted
<i>Kigelia africana</i> (Lamk.) Benth.	Balamkhira	Leaves and bark in kidney disease, wounds, sores, cuts and snake bites; Fruits in judiciously in syphilis and rheumatism; Ripe fruit powder in constipation*	Planted
# <i>Millingtonia hortensis</i> L. f.	Neem-chameli	Flower buds in asthma and sinusitis; Leaves in asthma	Wild, planted

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
<i>Oroxylum indicum</i> (L.) Vent.	Ullu	Root bark in diarrhoea*, dysentery*, vomiting, fever, bronchitis and intestinal worms and as a components of ' <i>Dashmularisf</i> '*	Wild
<i>Spathodea campanulata</i> Beauv.	Rudra palash	Bark in kidney diseases and gastrointestinal disorders	Wild, planted
<i>Stereospermum chelonoides</i> (L. f.) DC.	Padar	Flowers in bleeding disease, throat sore and diarrhoea; Seed pest in throat inflammation*; Root in asthma, cough and excessive thirst and as a components of ' <i>Dashmularisf</i> '	Wild
<i>Tecoma stans</i> (L.) Juss. ex Kunth	Piliya	Leaves in diabetes, syphilis and stomach pain	Planted
Bixaceae			
<i>Bixa orellana</i> L.	Sinduri	Young leaves in gonorrhoea, dysentery, tonsillitis and hepatitis	Cultivated
<i>Cochlospermum religiosum</i> (L.) Alston	Galgal	Gum in syphilis, asthma, tuberculosis, diarrhoea, dysentery, gonorrhoea and leucorrhoea	Wild, planted
Boraginaceae			
<i>Cordia dichotoma</i> G. Forst.	Lassora	Fruits in dry cough, chest diseases, chronic fever, throat burning and its syrup in dysuria and urinary inflammation; leaves in cold* and cough*; Bark in skin diseases*	Wild
<i>Ehretia acuminata</i> R. Br.	Paniya	Bark juice in fever	Wild
<i>Ehretia laevis</i> Roxb.	Chamror	Leaves in muscular pain; Root in syphilis; Bark in diphtheria	Wild
Burseraceae			
<i>Boswellia serrata</i> Roxb. ex Colebr.	Saleh	Gum in arthritis	Wild
<i>Commiphora wightii</i> (Arn.) Bhandari	Guggul	Gum in arthritis, rheumatism, haemorrhoids, urinary disorder, obesity, skin diseases and high cholesterol	Wild
<i>Garuga pinnata</i> Roxb.	Kharpat	Leaves juice in asthma; Root in pulmonary diseases; Stem juice in conjunctiva	Wild
Cannabaceae			
<i>Celtis australis</i> L.	Saliya	Leaves and fruit decoction in amenorrhoea, heavy menstrual, diarrhoea, dysentery, peptic ulcers and colic	Wild
<i>Celtis tetrandra</i> Roxb.	Kakai	Seed juice in indigestion	Wild
Capparaceae			
<i>Crataeva magna</i> (Lour.) DC.	Barna	Bark and leaves in liver disorder, fever, asthma and bronchitis	Wild, planted
Celastraceae			
<i>Cassine glauca</i> (Rottb.) Kuntze.	Jamrasi	Bark in anaemia, blood purification and wound healing	Wild
Combretaceae			
<i>Anogeissus latifolia</i> (Roxb. ex DC.) Wall ex Guill and Perr.	Dhaora	Bark in anaemia and urinary diseases	Wild, cultivated
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight and Arn.	Arjun	Bark in fractures, ulcers, heart diseases, biliousness, asthma, tumours, leucoderma, anaemia and urinary discharges; Bark in appetite loss to cattle*	Wild, planted
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahera	Fruits in inflamed gums, asthma and bronchitis and is one of the ingredient of ' <i>Triphala Churan</i> '	Wild, planted
<i>Terminalia catappa</i> L.	Jangli-Badam	Bark in fever, diarrhoea, thrush, leucorrhoea and gonorrhoea	Wild, planted
<i>Terminalia chebula</i> Retz.	Harad	Fruits in sore throat, bleeding and ulceration of gums and is one of the ingredient of ' <i>Triphala Churan</i> '	Wild, planted
<i>Terminalia elliptica</i> Willd.	Asna	Bark decoction in bone fracture and to wash ulcers	Wild, planted
Cornaceae			
<i>Alangium chinense</i> (Lour.) Harms	Bilayti akohar	Bark in skin diseases and elephantiasis	Wild
<i>Alangium salifolium</i> (L. f.) Wang.	Akohar	Bark and root extract in high blood pressure, fever, diarrhoea and rheumatism; Roots and fruits in rabies	Wild

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
Dilleniaceae			
# <i>Dillenia aurea</i> Sm.	Aggai	Bark extract is used by the mother after child birth	Wild
# <i>Dillenia indica</i> L.	Karambel	Leaves and bark are used in fever, cough, wound and arthritis	Wild
# <i>Dillenia pentagyna</i> Roxb.	Karmal	Bark in diabetes, diarrhoea, dysentery, cuts, burns and wounds	Wild
Dipterocarpaceae			
# <i>Shorea robusta</i> Gaertn. f.	Sakhu	Resin in diarrhoea, dysentery and skin diseases	Wild, planted
Ebenaceae			
# <i>Diospyros malabarica</i> (Desr.) Kostel.	Gaub	Fruits in blood diseases, gonorrhoea and leprosy	Wild, planted
# <i>Diospyros montana</i> Roxb.	Bistendu	Fruit paste in wounds and boils	Wild
Euphorbiaceae			
# <i>Bischofia javanica</i> Bl.	Kein	Root in rheumatolgia and malaria	Wild
# <i>Croton laevigatus</i> Vahl.	Arjunna	Leaves in malaria fever	Wild
# <i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	Pula	Root in snake bite, syphilis, gonorrhoea, rheumatism and sterility; Bark in diarrhoea and pneumonia	Wild
# <i>Glochidion daltonii</i> (Mull. Arg.) Kurz	Bhumia	Fruits in cough and dysentery	Wild
# <i>Glochidion ellipticum</i> Wight	Bhoma	Bark in inflammation	Wild
# <i>Glochidion heyneanum</i> (Wight and Arn.) Wight	Kalikath	Root in snake bite	Wild
# <i>Glochidion lanceolarium</i> (Roxb.) Voigt	Ghochi	Bark in minor stomach diseases and as antipruritic	Wild
# <i>Glochidion multiboculare</i> (Rottler ex. Willd.) Voigt	Keura	Bark in skin diseases and wounds	Wild
# <i>Jatropha curcas</i> L.	Ratanjot	Latex in wounds, ulcers, elephantiasis and eczema; Seed oil in harpers zoster	Planted
# <i>Mallotus nudiflorus</i> (L.) Kulju and Welzen	Gutel	Leaves in swelling, bile, flatulence, gout and rheumatic afflictions; Fruits in cough*	Wild
# <i>Mallotus philippensis</i> (Lamk.) Muell.-Arg.	Rohini	Fruits in bronchitis, abdominal diseases, spleen enlargement; Seed powder in skin diseases*	Wild
# <i>Ricinus communis</i> L.	Arand	Leaves in intestinal worms, night blindness, earache, increased biliousness, skin diseases*, whitlows, lacteal tumours of mammary gland, corns and moles; Flowers in glandular tumours, anal troubles and vaginal pains; Seed pest as poultice; Seed oil is laxative, used in rheumatic swelling and as eye drop for cattle; Root in inflammation, pains, ascites, fever, asthma and bronchitis	Wild, cultivated
# <i>Triadica sebifera</i> (L.) Small	Pahari shisham	Bark in snake bite	Planted, cultivated
Fabaceae (Caesalpinioideae)			
# <i>Bauhinia acuminata</i> L.	Safed kachnar	Leaves in asthma, throat troubles and skin diseases; Bark in leprosy, gonorrhoea and venereal diseases	Wild, planted
# <i>Bauhinia malabarica</i> Roxb.	Amlosa	Fresh flowers and bark infusion in dysentery	Wild, planted
# <i>Bauhinia purpurea</i> L.	Kachnar	Bark in healing wounds and ulcers	Wild, planted
# <i>Bauhinia racemosa</i> Lamk.	Katmauli	Root bark and juice of young flowers along with pepper and onion in diarrhoea and dysentery	Wild, planted
# <i>Bauhinia tomentosa</i> L.	Gurial	Flowers in diarrhoea and dysentery; Root bark in stomach diseases	Wild, planted
# <i>Bauhinia variegata</i> L.	Kachnar	Bark decoction in diarrhoea, ulcers and skin diseases and also in mouth and foot disease of cattle*	Planted
<i>Cassia fistula</i> L.	Amaltas	Juice of young leaves in ringworm* and burns*; Ripe fruit ash in cough*; Bark decoction in mouth and foot disease of cattle*; Leaves decoction orally in paralysis;	Planted

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
<i>Saraca asoca</i> (Roxb.) de Wilde	Sita Ashok	Bark in dyspepsia, fever, colic, ulcers, pimples and menstrual disorders; Dried flowers in diabetes and haemorrhoids dysentery	Cultivated
<i>Senna auriculata</i> (L.) Roxb.	Tarwa	Root in fevers, diabetes, constipation and diseases of the urinary system	Planted
<i>Tamarindus indica</i> L.	Imli	Bark in sores, ulcers, boils and rashes; Leaves in diabetes and cardiac diseases; Seed powder in diarrhoea and dysentery; Ring of tender twig in left index finger for easy delivery in women*	Wild, planted
Fabaceae (Faboideae)			
<i>Butea monosperma</i> (Lamk.) Taub.	Dhak	Flowers in liver disorders; dry flower soaked water in sunstroke*; Seed oil in leucoderma; Gum in diarrhoea	Planted
<i>Dalbergia lanceolaria</i> L. f.	Sirsa	Bark is astringent and its decoction is used in dyspepsia; Leaves in leprosy and allied skin diseases; Seed oil in rheumatism and skin diseases	Wild
<i>Dalbergia latifolia</i> Roxb.	Sitsal	Tannins from bark in diarrhoea, worms, indigestion and leprosy	Wild
<i>Dalbergia sissoo</i> Roxb. ex DC.	Shisham	Seed oil and wood powder in leprosy and skin diseases; leaves as fodder to cattle	Wild, planted
<i>Desmodium ojeimense</i> (Roxb.) H. Ohashi	Chajan	Bark in fevers, cuts and wounds	Wild
<i>Erythrina arborescens</i> Roxb.	Mandero	Bark in fever, inflammation, rheumatism and promotion of gastrointestinal absorption	Cultivated
<i>Erythrina suberosa</i> Roxb.	Dauldhak	Leaves used against tapeworm, roundworm and threadworms	Cultivated
<i>Erythrina variegata</i> L.	Parijat	Leaves in fever, inflammation, joint pain, toothache, ophthalmia, skin diseases and against tapeworm, roundworm and threadworms	Cultivated
<i>Pongamia pinnata</i> (L.) Pierre	Karanja	Leaves in cattle fever*; Seed oil in rheumatism	Wild, planted
<i>Pterocarpus marsupium</i> Roxb.	Bijasal	Gum in diabetes and inflammation; Leaves in skin diseases, sores and boils	Wild, planted
<i>Sesbania sesban</i> (L.) Merr.	Jait	Leaves in sore throat, gonorrhoea, syphilis, spasmodic fits in children and jaundice during pregnancy; Root and leaves in scorpion bites	Wild, cultivated
Fabaceae (Mimosoideae)			
<i>Acacia catechu</i> (L. f.) Willd.	Khair	Extract of heartwood (kattha) in throat sore, burns* and diarrhoea; Gum in coughs and sore throat; Bark in dysentery, diarrhoea and wounds*	Wild
<i>Acacia nilotica</i> (L.) Del. ssp. <i>indica</i> (Benth.) Brenan	Babul	Bark in haemorrhoids, colds, diarrhoea tuberculosis and leprosy*	Wild, planted
<i>Adenanthera pavonina</i> L.	Rakt chandan	Leaves and bark in diarrhoea, gout and rheumatism	Wild
<i>Albizia lebbek</i> (L.) Benth.	Kala siris	Fruits in night blindness*	Planted
<i>Albizia odoratissima</i> (L. f.) Benth.	Sirisa	Bark in ulcers, leprosy, skin diseases, cough, bronchitis, diabetes and burning	Planted
<i>Albizia procera</i> (Roxb.) Benth.	Safed siris	Bark in rheumatism, haemorrhoids, stomach and backache*	Planted
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Jangal jalebi	Bark in dysentery, fever, dermatitis and eye inflammations; Leaves and root bark decoction in leprosy*	Wild, planted
Lamiaceae			
<i>Calliandra arborea</i> Roxb.	Ghiwala	Bark in skin diseases and scorpion bite	Wild
<i>Clerodendrum phlomidis</i> L. f.	Urui	Leaves in diabetes, body pain and syphilis; Root in gonorrhoea and a constituent of 'Dash moolarishi'	Wild, cultivated
<i>Gmelina arborea</i> Roxb. ex Sm.	Gamari	Root and bark in indigestion, hallucination, piles, abdominal pains, burning sensations, fevers, urinary discharge, snake bite and as galactagogue; Flowers in leprosy and blood diseases	Wild
<i>Gmelina asiatica</i> L.	Badhara	Root and fruits in urinary complaints	Wild, cultivated
<i>Premna barbata</i> Wallich ex Schaeur	Basota	Leaves oil in malarial fever, inflammation, rheumatism, respiratory disorders and as a sedative	Wild, cultivated

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
<i>#Premna mollissima</i> Roth.	Bakar	Leaves in indigestion and flatulence	Wild
<i>#Vitex negundo</i> L.	Nirgundi	Roots and leaves in eczema, skin diseases, liver disorders, spleen enlargement, rheumatic pain, gout, abscess and backache; Leaves are pest repellent and also used in rheumatic swellings of the joints and sprains	Wild
Lauraceae			
<i>#Litsea chinensis</i> Lamk.	Medha	Roots in respiratory problems, fever and throat troubles	Wild
<i>#Litsea glutinosa</i> (Lour.) Rob.	Mardalabri	Essential oil from seeds and roots are used in rheumatism; Leaves in diarrhoea, dysentery and nausea; Bark in sores, scabies and different aches	Wild
<i>#Litsea monopetala</i> (Roxb.) Pers.	Katmara	Essential oil from seeds in rheumatic pain; Bark and leaves in diarrhoea and dysentery	Wild
Lecythidaceae			
<i>Barringtonia acutangula</i> (L.) Gaertn.	Paniha	Leaves in diarrhoea and dysentery; Bark in blood deficiency* and vitality*; Fruits in biliousness, bronchitis, eye sores, gleet, lumber pain, nasal catarrh and hallucinations	Wild
<i>#Careya arborea</i> Roxb.	Kumbhi	Bark in tumours, bronchitis, skin disease, epileptic fits, astringents, antidote to snake bite, abscesses, boil and ulcer; Leaves and flowers in skin diseases; Roots in tuberculosis and skeletal fractures	Wild
Loganiaceae			
<i>#Strychnos nux-vomica</i> L.	Kuchla	Seeds are poisonous and judiciously used in indigestion, vomiting, diarrhoea, cramps, constipation, colds and headaches	Planted, cultivated
Lythraceae			
<i>Lagerstroemia speciosa</i> (L. ex Murray) Pers.	Gulchaman	Bark in diarrhoea and abdominal pains; Leaves in diabetes and urinary problems; Dry flower and leaves in diabetes*	Wild, cultivated
<i>#Punica granatum</i> L.	Anar	Flower juice in bleeding nose; Seeds in syphilis; Fruit juice in jaundice and diarrhoea	Cultivated
<i>Woodfordia fruticosa</i> (L.) Kurz.	Dhaunti	Flowers in acute diarrhoea, haemorrhages, ulcerations ulcers, wounds and skin diseases; Bark in burns*	Wild
Magnoliaceae			
<i>#Magnolia champaca</i> (L.) Baill. ex Pierre	Champa	Flowers in leprosy	Cultivated
<i>#Magnolia grandiflora</i> L.	Him-Champa	Bark in malaria and rheumatism	Cultivated
Malvaceae			
<i>Bombax ceiba</i> L.	Semal	Root and leaves in head, tooth, ear and body pain and bone fracture; leaves in inflammation* and skin eruption*; Bark in haematuria (cattle)*	Wild, cultivated
<i>#Ceiba pentandra</i> (L.) Gaertn.	Kopak	Leaves in malaria, diabetes; Gum in diarrhoea	Planted
<i>#Firmiana colorata</i> (Roxb.) R. Br.	Samari	Bark and root juice in jaundice	Wild
<i>#Firmiana simplex</i> (L.) W.Wight	Kulu	Gum in throat infection; Roots in gonorrhoea	Wild
<i>#Grewia abutilifolia</i> Vent. ex Juss.	Dhaman	Roots in abscesses	Wild
<i>Grewia asiatica</i> L.	Phalsa	Fruit in blood disorders, fever* and diarrhoea; Leaves in malaria and diabetes; Bark in urinary troubles; Root bark in rheumatism	Wild
<i>Grewia hirsute</i> Vahl.	Gursakri	Root in leucorrhoea*	Wild
<i>Grewia optica</i> Dumm. ex Burret	Bhimal	Crushed fruits in fever of kids*	Wild
<i>#Grewia tiliifolia</i> Vahl.	Kakai	Fruits in dyspepsia	Wild, cultivated
<i>#Guazuma ulmifolia</i> Lam.	Rudrakshi	Bark in malaria, elephantiasis, affections of the chest and leprosy	Cultivated

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
<i>Helicteres isora</i> L.	Maror-phali	Fruit, bark and root in stomach ache, diabetes, diarrhoea, dysentery, asthma and skin diseases	Wild
<i>Hibiscus rosa-sinensis</i> L.	Gurhal	Flowers in cosmetic skin care, liver disorders and high blood pressure	Cultivated
<i>Kavalamia urens</i> (Roxb.) Raf.	Kulu	Root in wounds; Gum in dysentery	Wild, Planted
<i>Kydia calycina</i> Roxb.	Bharanga	Leaves, bark and root in saliva increment, inflammation and rheumatism	Wild
<i>Pterospermum acerifolium</i> (L.) Willd.	Kanak-champa	Flower in inflammation, ulcers, small pox, tumours and blood problems	Wild, Planted
<i>Sterculia foetida</i> L.	Jangali badam	Bark and leaves in constipation and urinary problems	Wild
<i>Sterculia villosa</i> Roxb.	Udar	Bark in constipation and hydrocele; Gum in body pain	Wild
<i>Thespesia populnea</i> (L.) Soland. ex Correa	Paras-pipal	Bark in skin diseases, dysentery and haemorrhoids	Planted
Meliaceae			
<i>Aphananixis polystachya</i> (Wall.) R. Parker	Sohaga	Bark in spleen, liver and abdominal complaints and chest pains; Seed oil is non-edible but used in rheumatism; Leaves and fruit extracts as insecticide	Wild
<i>Azadirachta indica</i> A. Juss.	Neem	Extracts from bark, leaves and seeds have the insecticidal, antifungal and antibacterial properties; All plant parts are used in pimples, eye diseases, dysentery*, hepatitis, leprosy*, rheumatism, scrofula, ringworm*, ulcers and wounds*; leaves in cuts* and wounds of cattle*	Wild, cultivated
<i>Heynea trijuga</i> Roxb. ex Sims	Gundira	Leaves, bark and fruit are insect repellent; Leaf extract in chest pain*; Leaves in cuts* and wounds*; Leaves in appetite loss to cattle*;	Wild
<i>Melia azedarach</i> L.	Bakain	Wood extract in asthma; Leaves and flowers as poultice in nervous headache	Planted
<i>Toona ciliata</i> M. Roem.	Maha nim	Bark in dysentery and wounds and as astringent and tonic	Wild, planted
Moraceae			
<i>Artocarpus heterophyllus</i> Lam.	Kathal	Leaves ashes in ulcers, diarrhoea, boils, stomach ache and wounds; latex in wounds*	Cultivated
<i>Artocarpus lakoocha</i> Roxb.	Barhar	Roots in mouth ulcers	Cultivated
<i>Ficus benghalensis</i> L.	Bargad	Latex in piles, nose diseases and gonorrhoea; Aerial root in syphilis, biliousness, dysentery, gonorrhoea and liver inflammation; Bark in diabetes; Fresh new leaves in spermatorrhoea*	Wild
<i>Ficus hispida</i> L. f.	Kath gular	Bark decoction in leucorrhoea*	Wild
<i>Ficus palmata</i> Forssk. subsp. <i>virgata</i> (Roxb.) Browicz	Khemri	Figs in constipation, lungs and bladder diseases; Latex in leucorrhoea*	Wild
<i>Ficus racemosa</i> L.	Goolar	Roots in hydrophobia, dysentery and diabetes; Fresh young leaves in measles*; Figs in hypermetropia* and night blindness*; Figs with fodder to cattle in galactagogue*; Bark in asthma, piles and leucorrhoea*; Ripe figs in blood diseases, biliousness, burning sensations, fatigue, urinary discharges, thirst, leprosy, menorrhagia, nose bleeding, chronic bronchitis, dry cough, loss of voice, kidney and spleen diseases	Wild, planted
<i>Ficus religiosa</i> L.	Pipal	Bark juice in ulcer, liver, spleen and skin diseases	Wild
<i>Ficus retusa</i> L. var. <i>nitida</i> (Thunb.) Miq.	Inger	latex in leprosy* and other skin diseases*	Wild
<i>Ficus rumphii</i> Blume	Gajhar	Fig juice with turmeric, pepper and ghee is used in asthma	Wild
<i>Ficus semicordata</i> Buch. - Ham. ex J. E. Sm.	Khurhur	Root juice in bladder complaints and visceral obstructions	Wild
<i>Morus alba</i> L.	Shahtut	Bark in stomach ache, neuralgic pains and dropsy; Leaves in colds and cough, red eye, insect bites, goitre* and wounds	Cultivated
<i>Streblus asper</i> Lour.	Sihor	Bark and seeds in diarrhoea, dysentery, filarial and fever; Leaves in scabies* and skin itching*; Leaves and latex in dysentery, fissures, sprue and dental problems	Wild

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
Moringaceae			
* <i>Moringa concanensis</i> Nimmo ex Dalz. and Gibb.	Jangali Sehjana	Leaves in diabetes, constipation and jaundice; Flowers in thyroid problems and leucorrhoea	Cultivated
<i>Moringa oleifera</i> Lamk.	Sahjan	Flowers in cold; leaves in night blindness*; Gum in asthma; Ben oil in hysteria, scurvy, prostate problems and bladder problems; Root bark in wounds*	Cultivated
Myrtaceae			
* <i>Psidium guajava</i> L.	Amrood	Leaves in ringworm, wounds, ulcers, hepatitis, gonorrhoea, diarrhoea and skin diseases	Cultivated
<i>Syzygium cumini</i> (L.) Skeels	Jamun	Bark and seeds in diabetes, cholera* and dysentery	Wild, cultivated
<i>Syzygium heyneanum</i> Wall.	Kathjamun	Bark decoction in sunstroke*	Wild
Oleaceae			
<i>Nyctanthes arbor-tristis</i> L.	Harsingar	Leaves in arthritis, fevers*, rheumatism, asthma, dyspepsia, constipation and skin diseases; Flowers in dyspepsia, flatulence and skin spots*; Seeds in piles, baldness and as hair tonic	Planted, cultivated
Oxalidaceae			
* <i>Averrhoa carambola</i> L.	Kamrakh	Fruits and leaves in arthritis, jaundice, fever and skin diseases	Cultivated
Phyllanthaceae			
* <i>Antidesma acidum</i> Retz.	Khotura	Leaves in abdominal swelling, headache and backache; Bark in jaundice	Wild
* <i>Antidesma bunius</i> (L.) Spreng	Mala	Leaves and bark in injuries	Wild
* <i>Antidesma ghaesembilla</i> Gaertn.	Jamharli	Leaves in fever and headache	Wild
* <i>Breynia vitis-idaea</i> (Burm.f.) C.E. Fischer	Oudh	All plant parts are used in tonsillitis, menorrhagia, haemorrhage, leucorrhoea, diabetes and dental problems	Wild
<i>Bridelia retusa</i> (L.) A. Juss.	Khaja	Bark in diarrhoea, earache, wounds* healing and snake bite	Wild
* <i>Phyllanthus acidus</i> (L.) Skeels	Harphareuri	Fruits as blood enhancer; Leaves as poultice in treatment of sciatica, lumbago and rheumatism; Root as purgative	Cultivated
* <i>Phyllanthus emblica</i> L.	Anwala	Fruits in diarrhoea, jaundice and inflammation; Twig in toothache*	Cultivated
Pittosporaceae			
* <i>Pittosporum napaulense</i> (DC.) Rehder and Wilson	Bagh-muta	Bark decoction for cough and fever	Wild
Primulaceae			
* <i>Ardisia solanacea</i> (Poir.) Roxb.	Mujrawa	Roots in diarrhoea and rheumatism	Wild
Putranjivaceae			
* <i>Putranjiva roxburghii</i> Wall.	Patju	Leaves in cold, fever and rheumatism	Wild, planted
Rhamnaceae			
<i>Ziziphus mauritiana</i> Lamk.	Ber	Pounded roots in diarrhoea; leaves in eye sty*	Wild, cultivated
* <i>Ziziphus xylopyrus</i> (Retz.) Willd.	Kathber	Root bark and fruits in bronchial asthma, thirst, diarrhoea and as aphrodisiac	Wild
Rhizophoraceae			
* <i>Carallia brachiata</i> (Lour.) Merr.	Kierpa	Bark in wound	Wild
Rosaceae			
* <i>Eriobotrya japonica</i> (Thunb.) Lindl.	Laukat	Fruits in vomiting and thirst	Wild, cultivated
Rubiaceae			
* <i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mainphal	Leaves in fever; Bark in diarrhoea and dysentery	Wild
* <i>Ceriscoides turgida</i> (Roxb.) Tirveng.	Gudgudi	Roots in dog bite, epilepsy, roundworm and wounds	Wild
* <i>Haldina cordifolia</i> (Roxb.) Ridsdale	Haldu	Bark in wounds	Wild
* <i>Hymenodictyon orixense</i> (Roxb.) Mabblerley	Bhurkul	Leaves in fever and goitre	Wild

Table 1: Continue

Botanical name	Local name	In digenous uses	Source
<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Kaim	Leaves in haemorrhoids, colic, flatulence, dyspepsia, inflammations, myalgia, fever, skin diseases*, wounds and ulcers; Bark and roots in fevers, colic, muscular pains, burning sensations in the stomach, poisoning, coughs, oedema and blood diseases	Wild
# <i>Morinda citrifolia</i> L.	Bartundi	Fruit oils in stomach ulcers	Cultivated
# <i>Neolamarkia cadamba</i> (Roxb.) Bosser	Kadanb	Bark in fever and wounds*	Planted
# <i>Tamlinadia uliginosa</i> (Retz.) Tirveng. and Sastre	Pedar	Roots as cooling and diuretic	Wild
Rutaceae			
<i>Aegle marmelos</i> (L.) Correa	Bel	Fruits are antispasmodic and are used in indigestion and asthma; Leaves juice in diabetes and oedema; Leaves in wound of cattle*	Wild, cultivated
# <i>Citrus aurantifolia</i> (Christm.) Swingle	Kaghzi nimbu	Fruits in cough, dyspepsia, nausea, flatulence, colic and anaemia	Wild, cultivated
# <i>Citrus medica</i> L.	Bara Nibu	Fruits in digestion trouble, piles, cough, cold and asthma; Leaves in skin disorders; Seed paste in scorpion bite	Wild, cultivated
# <i>Limonia acidissima</i> L.	Kaitha	Fruits in sore throat, cough, diarrhoea, dysentery, asthma, consumption, tumours, ophthalmia and Leucorrhoea	Wild, cultivated
<i>Murraya koenigii</i> (L.) Spreng.	Kathnim	Leaves in diarrhoea, dysentery and fever*; Bark is antiseptic and used in different skin diseases; Root extract in renal pain	Wild, cultivated
Salicaceae			
# <i>Casearia graveolens</i> Dalz.	Chilla	Roots in diabetes; Fried leaves with 'Desi Ghee' in stomach ache and urinary problems	Wild
# <i>Flacourtia indica</i> (Burm. f.) Merr.	Katia	Roots in snake bite; bark in arthritis	Wild
# <i>Flacourtia jangomas</i> (Lour.) Raeusch.	Talispatri	Fruits in diarrhoea; Leaves in diarrhoea and bronchitis; Roots in toothache	Wild, cultivated
# <i>Guidonia tomentosa</i> (Roxb.) Kurz	Chilla	Roots in leucoderma and diabetes; Leaves in ringworm	Wild
# <i>Salix tetrasperma</i> Roxb.	Bod	Bark in fever; Leaves with sugar in rheumatism, epilepsy, venereal diseases, bladder stone, piles and swellings	Wild
# <i>Xylosma longifolia</i> Clos.	Kantawa	Leaves and bark in ringworm, scabies and acne	Wild, cultivated
Santalaceae			
<i>Santalum album</i> L.	Chandan	Wood powder/pest in migraine*, fever, boils, inflammation, burning sensation and small pox; leaf extract in rheumatism*	Planted
Sapindaceae			
# <i>Lepisanthes rubiginosa</i> (Roxb.) Leenh.	Anga-banga	Roots in cough; Roots and leaves in fever	Wild
<i>Sapindus trifoliatus</i> L.	Ritha	Fruits in leprosy*, asthma, diarrhoea, dysentery, cholera and limbs paralysis	Wild
# <i>Sapindus saponaria</i> L.	Rithi	Fruits in arthritis	Wild, cultivated
<i>Schleichera oleosa</i> (Lour.) Merr.	Kusum	Seed powder/pest in wounds* and ulcers*; Bark in skin diseases, ulcers and malaria	Wild
Sapotaceae			
# <i>Madhuca longifolia</i> (L.) Macbr. var. <i>latifolia</i> (Roxb.) Chev.	Mahua	Bark in itching, pyorrhoea, cyst, ulcers and diabetes	Wild, cultivated
# <i>Manilkara hexandra</i> (Roxb.) Dub.	Khirmi	Bark and fruits in ulcers, dyspepsia, opaque cornea, bronchitis and leprosy	Planted
# <i>Manilkara zapota</i> (L.) P. Royen	Chiku	Seeds as diuretic	Planted
# <i>Mimusops elengi</i> L.	Mulsari	Bark in fever, diarrhoea, dysentery, teeth and gum diseases; Flower extract in leucorrhoea, menorrhagia, asthma and fever	Cultivated
Simaroubaceae			
# <i>Ailanthus excelsa</i> Roxb.	Mahanim	Bark in dysentery, diarrhoea, gonorrhoea, leucorrhoea and fever	Wild, planted

Table 1: Continue

Botanical name	Local name	Indigenous uses	Source
Solanaceae			
# <i>Solanum donianum</i> Walp.	Aseda	Leaves in haemorrhoids, scrofula, piles and skin diseases	Wild
# <i>Solanum erianthum</i> D. Don	Ban-bhanta	Leaves in abortion, haemorrhoids, scrofula, piles and skin diseases; Roots in diarrhoea, dysentery, fever and body pains	Wild
Symplocaceae			
# <i>Symplocos racemosa</i> Roxb.	Lodh	Bark in pyorrhoea, leprosy, uterine disorders, diarrhoea, dysentery and dropsy	Wild
Tamaricaceae			
# <i>Tamarix dioica</i> Roxb. ex Roth	Lal Jhau	Bark in diarrhoea, dysentery, ulcers and leucorrhoea	Wild
# <i>Tamarix gallica</i> L. var. <i>indica</i> (Willd.) Ehrenb.	Jhau	Fruit in hepatitis, spermorrhoea and jaundice	Wild
Ulmaceae			
<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Chilbil	Bark in inflammation, urinary problem, rheumatism, fever and ringworm*; Leaves bud with lime juice in hair loss; Leaves in leprosy* Bark and leaves in coughs, throat sore, asthma, bronchitis, gonorrhoea, fever and toothache	Wild
# <i>Trema orientalis</i> (L.) Bl.	Andia		Wild
Urticaceae			
# <i>Debregeasia longifolia</i> (Burm.f.) Wedd.	Tushiari	Leaves juice in skin diseases	Wild

*Uses of the species recorded in the present work, *Uses known earlier

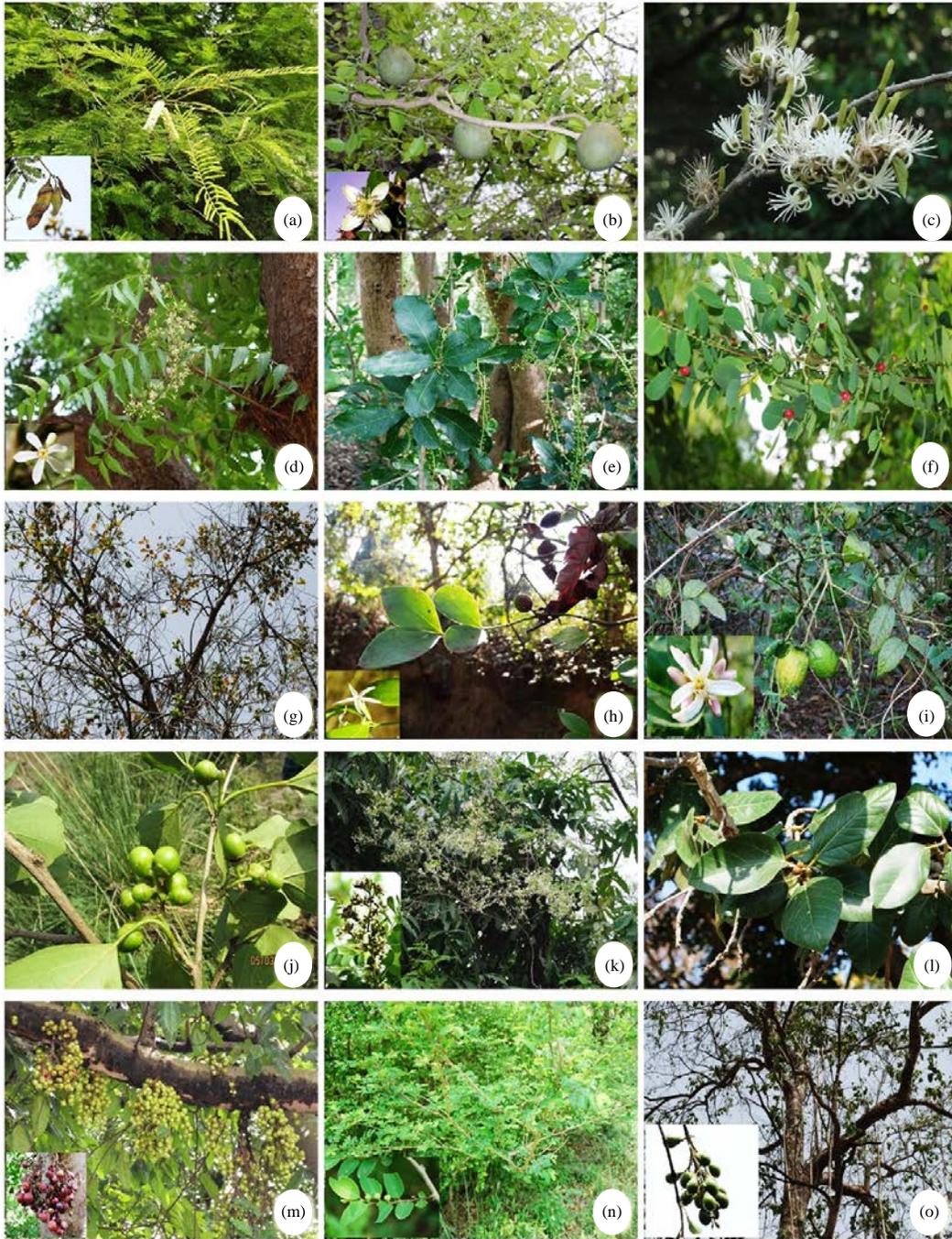


Fig. 2(a-o): Some important medicinal tree species, (a) *Acacia catechu* (L. f.) Willd., (b) *Aegle marmelos* (L.) Correa, (c) *Alangium salvifolium* (L. f.) Wang., (d) *Azadirachta indica* A. Juss., (e) *Barringtonia acutangula* (L.) Gaertn., (f) *Breynea vitis-idea* (Burm. f.) C.E. Fischer, (g) *Careya arborea* Roxb., (h) *Carissa carandas* L., (i) *Citrus medica* L., (j) *Cordia dichotoma* G. Forst., (k) *Dalbergia lanceolaria* L. f., (l) *Ficus benghalensis* L., (m) *F. racemosa* L., (n) *Flueggea virosa* (Roxb. ex Willd.) Royle and (o) *Gmelina arborea* Roxb. ex Sm.

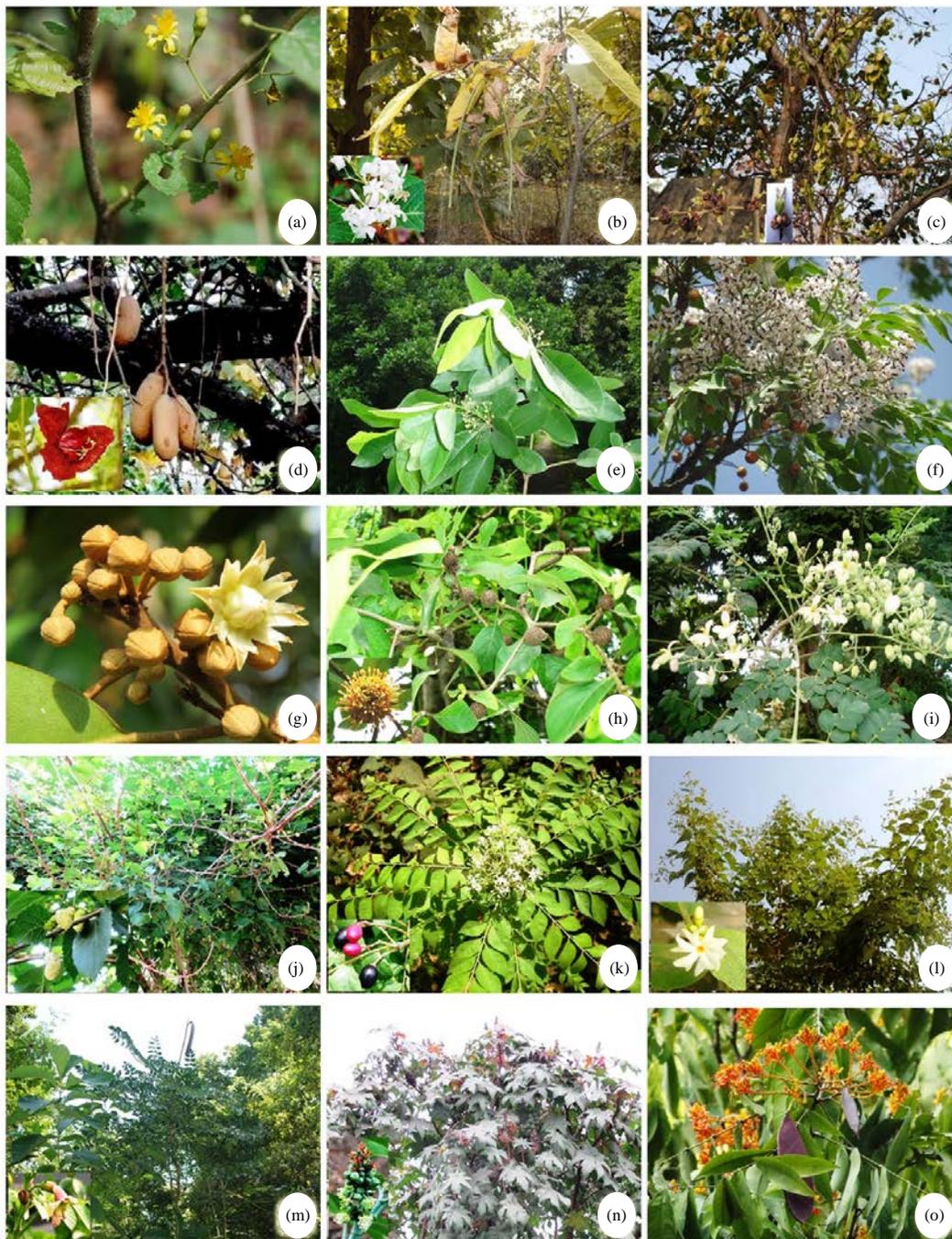


Fig. 3(a-o): Some important medicinal tree species, (a) *Grewia asiatica* L., (b) *Holarrhena pubescens* Wall. ex G. Don, (c) *Holoptelea integrifolia* (Roxb.) Planch., (d) *Kigelia africana* (Lamk.) Benth., (e) *Litsea glutinosa* (Lour.) Rob., (f) *Melia azedarach* L., (g) *Mimusops elengi* L., (h) *Mitragyna parvifolia* (Roxb.) Korth., (i) *Moringa oleifera* Lamk., (j) *Morus alba* L., (k) *Murraya koenigii* (L.) Spreng., (l) *Nyctanthes arbor-tristis* L., (m) *Oroxylum indicum* (L.) Vent., (n) *Ricinus communis* L. and (o) *Saraca asoca* (Roxb.) de Wilde.

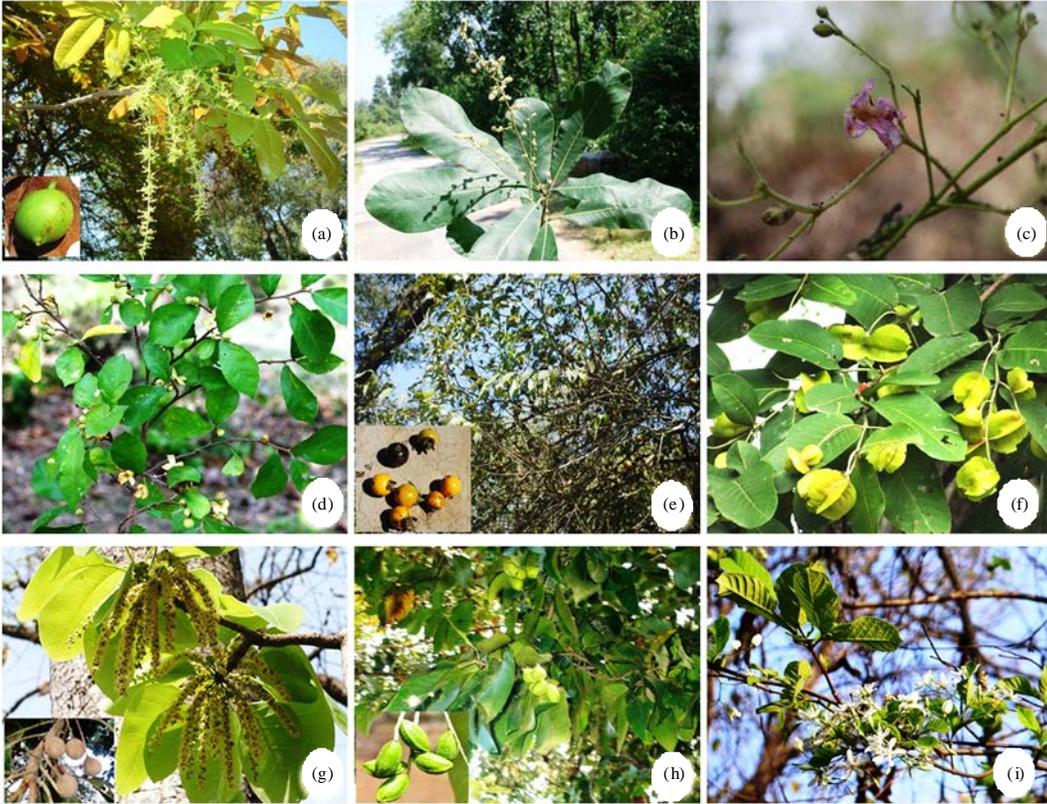


Fig. 4(a-i): Some important medicinal tree species, (a) *Schleichera oleosa* (Lour.) Merr., (b) *Semecarpus anacardium* L. f., (c) *Stereospermum chelonoides* (L. f.) DC., (d) *Streblus asper* Lour., (e) *Strychnos nux-vomica* L., (f) *Terminalia arjuna* (Roxb. ex DC.) Wight and Arn., (g) *T. bellirica* (Gaertn.) Roxb., (h) *T. chebula* Retz. and (i) *Wrightia tinctoria* R. Br.

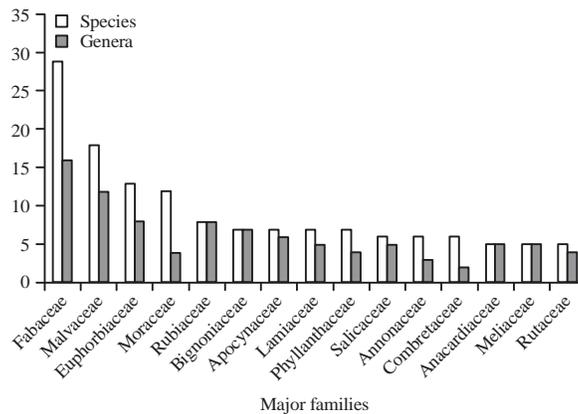


Fig. 5: Some highly used medicinal plant families with number of representing species and genera by leaves, root, fruits, seeds, flowers, gum and latex (Fig. 7). Out of total recorded species, 155 grow in wild habitat, 56 as plantation and 52 as cultivated species (Fig. 8). About 86 health related

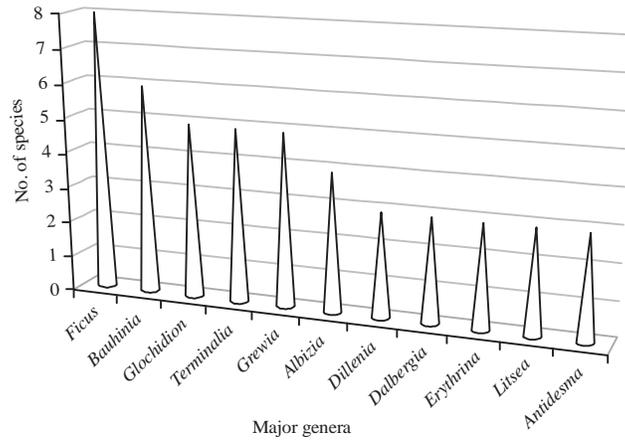


Fig. 6: Some highly used medicinal plant genera with number of representing species

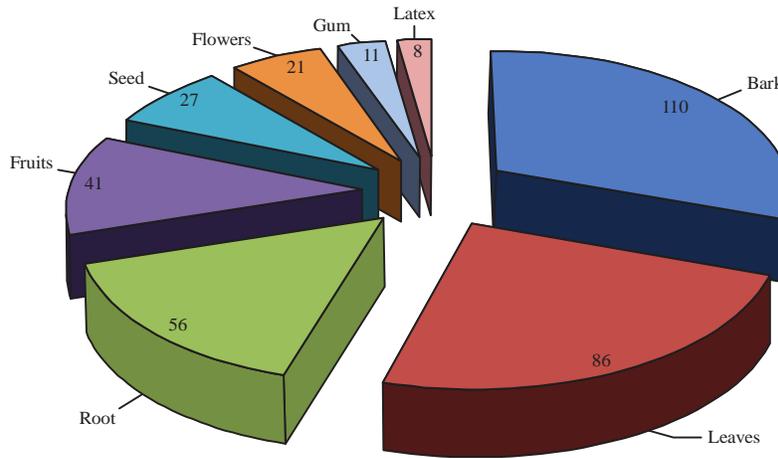


Fig. 7: Plant parts of the species used in ethnomedical practices

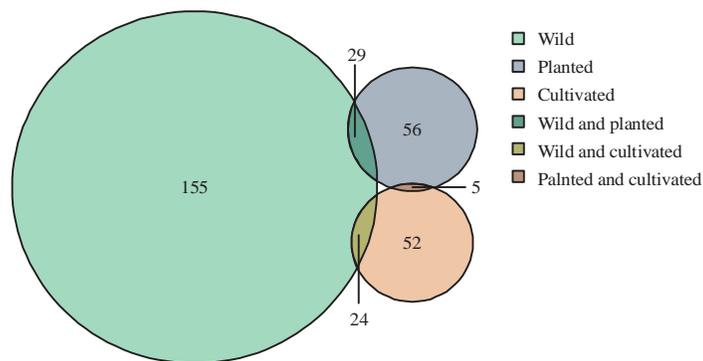


Fig. 8: Different sources of medicinal tree species

problems are treated by using different parts of these tree species. Majority of the diseases are effectively treated by more than two species (Table 2). Diarrhoea is treated with maximum 52 tree

Table 2: Number of tree species used in different health related problems

Illness	No. of trees species used	Illness	No. of trees species used
Abscesses	2	Hydrocele	1
Amenorrhoea	1	Hydrophobia	1
Anaemia	3	Hypotension	1
Arthritis	7	Indigestion	6
As abortifacient	2	Inflammation	15
As antibacterial	1	Jaundice	7
As antifungal	1	Leucorrhoea	4
As insecticide	2	Liver related problems	7
Bladder related diseases	4	Malaria	9
Blood related diseases	12	Menstrual difficulties	6
Bronchitis	13	Nose related problems	3
Burns	13	Obesity	1
Cholera	2	Oedema	1
Cold	8	Paralysis	2
Conjunctiva	1	Piles	10
Constipation	8	Pimples	2
Cough	19	Pneumonia	1
Cramps	1	Poisonous bits	14
Dental problems	12	Ophthalmic diseases	2
Depilatory	1	Prostate problems	1
Diabetes	24	Rabies	2
Diarrhoea	52	Renal (Kidney) problems	5
Diphtheria	1	Respiratory problems	22
Dropsy	2	Rheumatism	27
Dysentery	44	Ringworm	6
Dyspepsia	8	Roundworm	3
Ear ache	4	Scrofula	3
Eczema	2	Skin diseases	46
Epilepsy	4	Smallpox	2
Eye problems	8	Sores	15
Fever	43	Spleen enlargement	5
Filaria	4	Syphilis	10
Flatulence	5	Tapeworm	2
Fractures	4	Threadworm	2
Gastro problems	20	Throat related diseases	12
Goitre	2	Thyroid problems	1
Gonorrhoea	12	Tonsillitis	2
Haemorrhoids	10	Tuberculosis	3
Hair problems	2	Tumours	4
Hallucinations	3	Ulcer	30
Hepatitis	4	Urinary difficulties	16
Harpers	1	Vomiting	16
Heart problems	5	Wounds	27

species followed by skin diseases (46 species), dysentery (44 species), fever (43 species), ulcer (30 species), rheumatism (27 species), wounds (27 species), diabetes (24 species), respiratory and gastro-intestinal problems (20 species) (Fig. 9).

Family Fabaceae and genus *Ficus* appeared highly useful plant groups by tribes in the study area. Highest number of medicinally useful plants from family Fabaceae has also been reported in other studies (Hawkes, 1970; Purugganan and Fuller, 2009) and the importance of genus *Ficus* has also been mentioned by other authors (Cottee-Jones *et al.*, 2015). The study witness tropical climate wherein barks of the trees are enormously used for their therapeutic properties (Zschocke *et al.*, 2000). Similar ethnomedicinal uses of these plants have been recorded either from the same area or adjacent areas (Singh and Maheshwari, 1992; Saini, 1996; Kumar *et al.*, 2006, 2013a). Most of the collections for medicinal uses from ~75% of the tree species are made from their wild sources as also observed in other studies throughout the world (Hamilton, 2004). Such indiscriminate

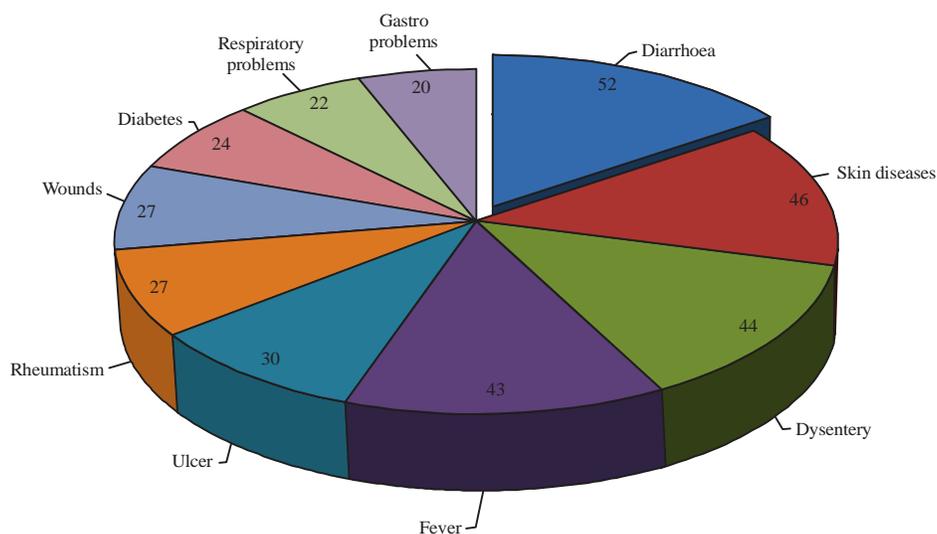


Fig. 9: Tree species used for treatment of different diseases

exploitation of plant materials from natural resources could stress the natural population of these medicinal plants. While data collection from the tribes, it was noticed that the ethnic knowledge is restricted mainly with the old age person (men and women) because the younger generation is not much interested in these valuable knowledge base. It has also been observed that the people who migrate to urban and suburban areas tend to de-link them from such a valuable knowledge base. Such kind of problems has also been reported from the other ethnic groups of India and other countries (Begossi *et al.*, 2002; Ong *et al.*, 2011; Uniyal *et al.*, 2011).

CONCLUSION

The study clearly indicates that the Himalayan Terai region has an enormous wealth of medicinally important tree species (204 species) commonly used by Tharu tribes for healthcare. Uses of 148 tree species for different medicinal practices have been listed from the study area for the first time. The list of tree species provided here with their medicinal uses is a great source for the researchers of pharmacology, pharmaceuticals and other related fields. These resources can be used to find out bioactive compounds responsible for healing and cure. The study suggest the need for providing training to these ethnic people to make them aware about the sustainable utilisation of medicinal plants and their conservation through nursery, gardening and other methods. The youths, in particular, need to be encouraged and promoted by the government for sustainable use and conservation of these valuable resources.

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REFERENCES

- Ahmad, I., F. Aqil, F. Ahmad and M. Owais, 2006. Herbal Medicines: Prospects and Constraints. In: Modern Phytomedicine: Turning Medicinal Plants in to Drugs, Ahmad, I., F. Aqil and M. Owais (Eds.). John Wiley and Sons, New York, USA., ISBN-13: 9783527609536, pp: 59-75.
- Bajpai, O., A. Kumar, A.K. Mishra, N. Sahu, J. Pandey, S.K. Behera and L.B. Chaudhary, 2012a. Recongregation of tree species of Katerniaghat wildlife sanctuary, Uttar Pradesh, India. J. Biodivers. Environ. Sci., 2: 24-40.
- Bajpai, O., A. Kumar, A.K. Mishra, N. Sahu, S.K. Behera and L.B. Chaudhary, 2012b. Phenological study of two dominant tree species in tropical moist deciduous forest from the Northern India. Int. J. Bot., 8: 66-72.
- Bajpai, O., A. Kumar, A.K. Srivastava, A.K. Kushwaha, J. Pandey and L.B. Chaudhary, 2015a. Tree species of the Himalayan Terai region of Uttar Pradesh, India: A checklist. Check List, Vol. 11. 10.15560/11.4.1718
- Bajpai, O., A.K. Kushwaha, A.K. Srivastava, J. Pandey and L.B. Chaudhary, 2015b. Phytosociological status of a monotypic genus *Indopiptadenia*: A near threatened tree from the Terai-Bhabar region of central Himalaya. Res. J. For., 9: 35-47.
- Begossi, A., N. Hanazaki and J.Y. Tamashiro, 2002. Medicinal plants in the Atlantic forest (Brazil): knowledge, use and conservation. Hum. Ecol., 30: 281-299.
- Charak, D., 1996. The Charak Samhita Explained by K. Sastri and G.N. Chaturvedi. 22nd Rev. Edn., Chaukhamba Bharti Academy, Varanasi.
- Chaudhari, U.S. and V. Hutke, 2002. Ethno-medico-botanical information on some plants used by Melghat tribes of Amaravati district, Maharashtra. Ethnobotany, 14: 100-102.
- Cottee-Jones, H.E.W., O. Bajpai, L.B. Chaudhary and R.J. Whittaker, 2015. Isolated *Ficus* trees deliver dual conservation and development benefits in a rural landscape. Ambio, 44: 678-684.
- Das, S., M.L. Khan, A. Rabha and D.K. Bhattacharjya, 2009. Ethnomedicinal plants of Manas national Park, Assam, Northeast India. Indian J. Tradit. Knowle., 8: 514-517.
- De, B., T. Debbarma, S. Sen and R. Chakraborty, 2010. Tribal life in the environment and biodiversity of Tripura, India. Curr. World Environ., 5: 59-66.
- Farnsworth, N.R., 1994. Ethnopharmacology and Drug Development. In: Ethnobotany and the Search for New Drugs, Ciba Foundation Symposium 185, Prance, G.T. and J. Marsh (Eds.). John Wiley and Sons, Chichester, pp: 42-59.
- Gupta, R., M.G. Vairale, R.R. Deshmukh, P.R. Chaudhary and S.R. Wate, 2010. Ethnomedicinal uses of some plants used by *Gond* tribe of Bhandara district, Maharashtra. J. Traditi. Knowle., 9: 713-717.
- Hamilton, A., 1995. The People and Plants Initiative. In: Ethnobotany: A Methods Manual, Martin, G.J. (Ed.). WWF International, Chapman and Hall, London, UK., ISBN-13: 9780412483707, pp: 10-11.
- Hamilton, A.C., 2004. Medicinal plants, conservation and livelihoods. Biodivers. Conserv., 13: 1477-1517.
- Harshberger, J.W., 1895. Some new ideas; the plants cultivated by aboriginal people and used in primitive commerce. The Evening Telegraph (Daily), Philadelphia, Volume 63, pp: 2.
- Hawkes, J.G., 1970. The origins of agriculture. Econ. Bot., 24: 131-133.
- Huxley, A., 1984. Green Inheritance: The World Wildlife Fund Book of India. Harvell and Collins, PA., London, UK.

- Jain, S.K. and R.R. Rao, 1977. A Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers, New Delhi, India, ISBN-13: 9788170191308, Pages: 107.
- Jain, S.K., 1994. Ethnopharmacology and Drug Development. In: Ethnobotany and Search for New Drugs, Chadwick, D.J. and U. March (Eds.). John Wiley and Sons, New York, USA., ISBN-13: 978-0471950240, pp: 153.
- Jain, S.K., 1995. Manual for Ethnobotany. 2nd Edn., Scientific Publishers, Jodhpur, India.
- Joy, P.P., J. Thomas, S. Mathew and B.P. Skaria, 1998. Medicinal Plants. Kerala Agricultural University, Ernakulam, India, pp: 3-20.
- Kshirsagar, R.D. and N.P. Singh, 2000. Less-known ethnomedicinal uses of plants in Coorg district of Karnataka state, Southern India. *Ethnobotany*, 12: 12-16.
- Kumar, A., D.D. Tewari and J.P. Tewari, 2006. Ethnomedicinal knowledge among Tharu tribe of Devipatan division. *Indian J. Tradit. Knowle.*, 5: 310-313.
- Kumar, A., V.C. Pandey and D.D. Tewari, 2012. Documentation and determination of consensus about phytotherapeutic veterinary practices among the Tharu tribal community of Uttar Pradesh, India. *Trop. Anim. Health Prod.*, 44: 863-872.
- Kumar, A., 2013. Ethnobotanical study of wild vegetables used by rural communities of Kannauj district, Uttar Pradesh, India. *Emir. J. Food Agric.*, 25: 760-766.
- Kumar, A., V.C. Pandey, A.G. Singh and D.D. Tewari, 2013a. Traditional uses of medicinal plants for dermatological healthcare management practices by the Tharu tribal community of Uttar Pradesh, India. *Genet. Resour. Crop. Eval.*, 60: 203-224.
- Kumar, R., M.K. Singh and K.A. Bharati, 2013b. Ethnobotany of Tharus of Dudhwa national park, India. *Mintage J. Pharmaceut. Med. Sci.*, 2: 6-11.
- Lawrence, G.H.M., 1951. Taxonomy of Vascular Plants. Macmillan Co., New Delhi, India, pp: 823.
- Maheshwari, J.K., K.K. Singh and S. Saha, 1981. The Ethnobotany of the Tharus of Kheri District, Uttar Pradesh. National Botanical Research Institute, Lucknow, India, Pages: 48.
- Maliya, S.D., 2011. Ethnobotanical significance of flora of Katarniaghat wildlife sanctuary, district Bahraich, Uttar Pradesh. *J. Econ. Taxon. Bot.*, 35: 39-55.
- Mao, A.A., T.M. Hynniewta and M. Sanjappa, 2009. Plant wealth of northeast India with reference to ethnobotany. *Indian J. Tradit. Knowle.*, 8: 96-103.
- Martin, G.J., 1995. Ethnobotany: A Methods Manual. Chapman and Hall, London Pages: 268.
- Matthews, S., 2005. Ayurveda. In: An Introduction to Complementary Medicine, Robson, T. (Ed.). Allen and Unwin, Crows Nest, NSW., pp: 15-32.
- McLean, J., 1999. Conservation and the impact of relocation on the Tharus of Chitwan, Nepal. *Himalaya J. Assoc. Nepal Himalayan Stud.*, 19: 38-44.
- Mehra, A., O. Bajpai and H. Joshi, 2014. Diversity, utilization and sacred values of ethno-medicinal plants of Kumaun Himalaya. *Trop. Plant Res.*, 1: 80-86.
- Mohammad, I., V. Malik and Pranitta, 2011. Enumeration of ethnomedicinal plants of Shakumbari Devi region of district Saharanpur (U.P.). *J. Econ. Taxon. Bot.*, 35: 837-845.
- Murthy, E.N., 2012. Ethno medicinal plants used by gond of Adilabad district, Andhra Pradesh, India. *Int. J. Pharm. Life Sci.*, 3: 2034-2043.
- Narayanan, M.K.R., S. Mithunlal, P. Sujanalal, N.A. Kumar, M. Sivadasan, A.H. Alfarhan and A.A. Alatar, 2011. Ethnobotanically important trees and their uses by Kattunaikka tribe in Wayanad Wildlife Sanctuary, Kerala, India. *J. Med. Plants Res.*, 5: 604-612.
- Ong, H.C., N. Ahmad and P. Milow, 2011. Traditional medicinal plants used by the Temuan villagers in Kampung Tering, Negeri Sembilan, Malaysia. *Ethno. Med.*, 5: 169-173.

- Padhye, M.D., V.K. Deshmukh and V.J. Tiwari, 1992. Ethnobotanical study of the korku tribe of amravati district, maharashtra state, India. *Int. J. Pharmacog*, 30: 17-20.
- Pattanaik, C., C.S. Reddy, M.S.R. Murthy and P.M. Reddy, 2006. Ethnomedicinal observations among the Tribal People of Koraput District, Orissa, India. *Res. J. Bot.*, 1: 125-128.
- Prance, G.T., 1991. What is ethnobotany today? *J. Ethnopharmacol.*, 32: 209-216.
- Prasad, P.R.C., C.S. Reddy, S.H. Raza and C.B.S. Dutt, 2008. Folklore medicinal plants of North Andaman Islands, India. *Fitoterapia*, 79: 458-464.
- Purugganan, M.D. and D.Q. Fuller, 2009. The nature of selection during plant domestication. *Nature*, 457: 843-848.
- Qureshi, R.A., I. Ahmad and M. Ishtiaq, 2006. Ethnobotanical and phytosociological studies of tehsil gujar khan district Rawalpindi. *Asian J. Plant Sci.*, 5: 890-893.
- Rana, M.P., M.S.I. Sohel, S. Akhter and M.J. Islam, 2010. Ethno-medicinal plants use by the *Manipuri* tribal community in Bangladesh. *J. For. Res.*, 21: 85-92.
- Reddy, K.N., G.V. Subbaraju, C.S. Reddy and V.S. Raju, 2006. Ethnoveterinary medicine for livestock in Eastern Ghats of Andhra Pradesh. *Indian J. Tradit. Knowl.*, 5: 368-372.
- Reddy, K.N., G. Trimurthulu and C.S. Reddy, 2010. Medicinal plants used by ethnic people of Medak district, Andhra Pradesh. *Indian J. Tradit. Knowl.*, 9: 184-190.
- Saini, D.C., 1996. Ethnobotany of Tharus of Basti district, Uttar Pradesh. *J. Econ. Tax. Bot.*, 12: 138-153.
- Sajise, P., 1995. *Regional Study on Biodiversity: Concepts, Frameworks and Methods*. Yunnan University Press, China, ISBN-13: 9787810255080, Pages: 295.
- Samy, R.P., P.N. Pushparaj and P. Gopalakrishnakone, 2008. A compilation of bioactive compounds from ayurveda. *Bioinformation*, 3: 100-110.
- Sen, S., R. Chakraborty, B. De and N. Devanna, 2011. An ethnobotanical survey of medicinal plants used by ethnic people in West and South district of Tripura, India. *J. For. Res.*, 22: 417-426.
- Sharma, P.P. and A.M. Mujumdar, 2003. Traditional knowledge on plants from Toranmal Plateau of Maharashtra. *Indian J. Tradit. Knowle.*, 2: 292-296.
- Shukla, A.N., S. Srivastava and A.K.S. Rawat, 2010. An ethnobotanical study of medicinal plants of Rewa district, Madhya Pradesh. *Indian J. Tradit. Knowl.*, 9: 191-202.
- Sikarwar, R.L.S., 2001. Ethnobotany of Madhya Pradesh (review article). *Applied Bot. Abst.*, 21: 133-147.
- Sikarwar, R.L.S., B. Pathak and A. Jaiswal, 2008. Some unique ethnomedicinal perceptions of tribal communities of Chitrakoot, Madhya Pradesh. *Indian J. Trad. Knowl.*, 7: 613-617.
- Singh, K.K., H.S. Bhati and J.K. Maheshwari, 1979. Survey and Biological activity of economic plants of Kheri forests, Uttar Pradesh. *Indian For.*, 105: 534-545.
- Singh, A.K., R.N. Singh and S.K. Singh, 1987. Some ethnobotanical plants of Tarai region of Gorakhpur district-I. *J. Econ. Tax. Bot.*, 9: 407-410.
- Singh, K.K. and J.K. Maheshwari, 1992. Folk medicinal uses of some plants among the Tharus of Gorakhpur district, Uttar Pradesh, India. *Ethnobotany*, 4: 39-43.
- Singh, A.A., A. Kumar and D.D. Tewari, 2012. An ethnobotanical survey of medicinal plants used in Terai forest of Western Nepal. *J. Ethnobiol. Ethnomed.*, Vol. 8. 10.1186/1746-4269-8-19
- Singh, L.R., 1965. *The Tarai Region of U.P.: A study in Human Geography*. Ram Narain Lal Beni Prasad, Allahabad, India, Pages: 145.
- Survase, S.A. and S.D. Raut, 2011. Ethnobotanical study of some tree medicinal plants in Marathwada, Maharashtra. *J. Ecobiotechnol.*, 3: 17-21.

- Timmermans, K., 2003. Intellectual Property Rights and Traditional Medicine: Policy Dilemma at the Interface. World Health Organization, Geneva, Switzerland.
- Uniyal, S.K., A. Awasthi and G.S. Rawat, 2002. Traditional and ethnobotanical uses of plants in Bhagirathi Valley (Western Himalaya). *Indian J. Tradit. Knowl.*, 1: 7-19.
- Uniyal, S.K., S. Sharma and P. Jamwal, 2011. Folk medicinal practices in Kangra District of Himachal Pradesh, Western Himalaya. *Hum. Ecol.*, 39: 479-488.
- Verma, S.C., 2011. The struggling Tharu youth study of awareness among the Tharu tribe of India. *J. Anthropol.*, 7: 213-225.
- Zschocke, S., T. Rabe, J.L.S. Taylor, A.K. Jager and J. van Staden, 2000. Plant part substitution-a way to conserve endangered medicinal plants? *J. Ethnopharmacol.*, 71: 281-292.