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Medico-ethnobotanical inventory of Renukoot forest division of district Sonbhadra, Uttar Pradesh, India

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The present paper synthesizes first report related to medicinal plants used by the tribal communities mainly *Koal*, *Panika*, *Dharkar*, *Bhuriya*, *Kharvar* and *Gaund* of Renukoot forest division of district Sonbhadra. The methods used for ethnobotanical data collection were semi structured interviews, field observation, preference ranking and direct-matrix ranking. It was observed that 105 medicinal plants, used by tribal communities belonging to 44 families, are medicinally very significant. Results of the study were analyzed using two quantitative tools: Informant Consensus Factor (ICF) and The Fidelity Level (FL). The data provided from our informants and analyzed in the present article clearly show that folk knowledge on medicinal plants and plant uses is still alive in the studied region thus documentation of this ethnomedicinal knowledge is important for the evaluation of pharmacological activity and drug development.

Keywords: Medicinal plant, Pharmacology, Herbal drugs, Ethnomedical Knowledge, Renukoot forest, Uttar Pradesh.
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Introduction

In present scenario, developed countries are turning back towards the use of herbal medicines due to side effects of certain drugs[1]. Hence, documentation and conservation of these medicinal plants have become big challenges to scientific community throughout the world. The forest region of eastern Uttar Pradesh is a rich source of medicinal plants due to its geographical and climatic condition. Recently, the practices and status of all herbal medicinal plants has been declined rapidly due to modernization of synthetic drugs which may lead to the loss of valuable information about healing herbs[2]. India is being considered as one of the big mega biodiversity centres in the world. The plants are high in bioactive secondary compound that hold promises for new drug discovery. It has been estimated that only 5 to 10 % of the existing plant species in India have been surveyed for biologically active compounds. Only 25 % of the medical drugs are based on plants sources in the developed countries[3]. This is as a result of the modern health care system expansion and using synthesized medicines. The Indian system of medicine has identified 1500 medicinal plants, of which only 500 species are commonly used in Indian system. More than 150 plant species have been categorized as endangered due to the exploitation. Thus, in present time the medicinal plant sector is not well conserved and needs special attention. This information makes worried about the over harvesting of medicinal plants and highlights the need for conservation and management of medicinal plants[4].

Thus in the way of revitalizations of traditional herbal medicines, it is an effort to record all the medicinal plants of tribal forest areas of Renukoot and also their implementation in modern health care practices. The present study was therefore, initiated with an aim to document all the medicinal plants found in the Renukoot forest division of Sonbhadra district. To fulfill this purpose, ethnobotanical survey of different tribal areas around the Renukoot forest regions were selected to collect the information through tribal practitioners[5].

Attempt was also made to provide the most acceptable scientific, common and local names, ICF and FL values of various medicinal plants found in the study area. Considering the current rate of deforestation, population exploitation with the concurrent loss of biodiversity, there is a need for accurate documentation of the knowledge and experience of the traditional Herbalists in the whole eastern U.P.

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Materials and Methods

Description of the study area

The Renukoot forest falls into the south most part of eastern UP in Sonbhadra district at latitude 23° 45'-24° 38'N and longitude 82° 30'-83° 32' E. The average temperature is 32-46° C in summer and 5-18°C in winter (Figure 1). Currently people have started clearing the forest for agricultural and industrial development and this may affect the natural habitats of medicinal plants.

Collection of Information

The methods used for ethnobotanical data collection were semi structured interviews, field observation, preference ranking and direct-matrix ranking[6]. The interview were based on health problems, their diagnosis, treatment methods, local name of medicinal plants used, source of collection (wild/cultivated), plant parts used, methods of preparation and application.

Data analysis and quantitative ethnobotany

The first step employed in the data analysis calculating was the informant consensus factor (ICF). ICF values will be low (near 0) if plants are chosen randomly, or if informants do not exchange information about their use. Values will be high (near 1) if there is a well-defined selection criterion in the community and/or if information is exchanged between informants.

The ICF is calculated as follows: number of use citations in each category (Nur) minus the number of species used (Nt), divided by the number of use citations in each category minus one:

$$IFC = Nur - Nt/Nur - 1$$

Fig 1— Location of study site district Sonbhadra

where *Nur* is the number of use reports from informants for a particular plant-usage category and *Nt* is the number of taxa or species that are used for that plant usage category for all informants. Values range between 0 and 1, where '1' indicates the highest level of informant consent. For instance, if few taxa are used by informants, then a high degree of consensus is reached and medicinal tradition is thus viewed as well-defined. All citations were placed into 16 categories of disease likes stomach disorder, respiratory problem, eczema, piles, skin infection, diabetes, wound healing, hair loss, jaundice, snake bite, sexual stimulant, nervous disorder, kidney disorder, Urinary problem and pneumonia.

The fidelity level (FL), the percentage of informants claiming the use of a certain plant species for the same major purpose, was calculated for the most frequently reported diseases or ailments as:

$$FL\ (\%) = (Np/N) \times 100$$

where *Np* is the number of informants that claim a use of a plant species to treat a particular disease, and *N* is the number of informants that use the plants as a medicine to treat any given disease.

Plant identification

To collect the information regarding ethnomedicinal plant, regular field trips were made in the study area and collected samples of the plants were brought to the Department for their identification.

Results

Knowledge of informants and medicinal plants

Eighty two percent of informants reported remedies for 24 aliments. Of which 26% are females and 74% are males, which indicated that most people continue to use traditional systems of health care including medicinal plants alone or in combination with modern pharmaceuticals. The males reported (mean = 6.7 ± 2.79) more number of remedies than the females (mean = 2.3 ± 0.9) and there is a significant difference ($p = 0.004$) between female and male. This is because the traditional knowledge in the family or community is passed from male parent to his first-born son. They also reported combination of multiple medicinal plants to treat an illness that usually contain a range of pharmacologically active compounds.

The number of ethnomedicinally important plant species documented in Renukoot tribal areas was 105 belonging to 44 families that are medicinally very important in traditional health care system (Table 1). Among them mainly were herbs (32%),

Table 1— Ethnopharmacological importance of medicinal plants

Botanical name and voucher specimen code	Family	Local name	Frequency of quotation	Claimed medicinal uses
Abrus precatorius Linn. (AS41)	Fabaceae	Gunja	12	10 g seeds are grinded with black pepper and water for unconsciousness.
Abutilon indicum (Linn.) Sweet (AS42)	Malvaceae	Atibala	6	5 ml leaf paste in water is taken orally to cure piles.
Achyranthus aspera Linn. (AS43)	Amaranthaceae	Latjeera	15	The boiled leaves are consumed to relieve internal piles and the roots are used as a brush to relieve pain and clean the teeth.
Acacia arabica (Lamk.) Willd. (AS44)	Mimosaceae	Babul	10	Fruit is applied as coagulant and also bark is used on wounds with the leaf of *bel* for healing.
Acalypha indica Linn. (AS45)	Euphorbiaceae	Kuppaimeni	4	A leaf paste with common salt is used to cure eczema and chest pain.
Aegle marmelos (Linn.) Correa (AS46)	Rutaceae	Bel	22	The fruits of this species are used to treat dysentery, diarrhoea and piles.
Aerva lanata (Linn.) Juss. ex Schultes (AS47)	Amaranthaceae	Kannu	2	The decoction or juice of the whole plant is taken for urinary problems.
Ageratum conyzoides Linn. (AS48)	Asteraceae	Uchunti	11	This plant is used in stomach disorders. Also, an extract of the entire plant is taken as a tonic.
Aloe barbadensis Mill. (AS49)	Liliaceae	Ghritkumari	7	The paste of the leaf with *Trigonella foenum-graecum* Linn. seeds is helpful in preventing hair loss.
Allium sativum Linn. (AS50)	Liliaceae	Lahsun	16	Crushed garlic (Soup) is used against microbial infection, asthma cough and respiratory problem.
Amaranthus spinosus Linn. (AS51)	Amaranthaceae	Kanteli	4	20 g paste of the inflorescence is applied on the affected area externally to get relief from eczema and skin diseases.
Amaranthus viridis Linn. (AS52)	Amaranthaceae	Chaulail	4	Plant is good blood purifier and also used in the treatment of piles.
Anisomeles indica (Linn.) Kuntze (AS53)	Lamiaceae	Ramtulasi	3	Decoction of the whole plant is used as cure for nervous disorders and in chronic fever.
Andrographis paniculata (Burm. f.) Wall. ex Nees (AS54)	Acanthaceae	Kalmegh	2	The extract of leaves with milk is taken to cure snake bites.
Argemone mexicana Linn. (AS55)	Papaveraceae	Bharbanda	2	Whole plant with mustard oil is applied on wounds twice daily for three days.
Aristolochia indica Linn. (AS56)	Aristolochiaceae	Isharmool	5	The paste of the plant with water is applied externally once in a day to treat dandruff.
Artemisia vulgaris Linn. (AS57)	Asteraceae	Dauna	6	Leaf paste applied on cuts and wounds in cattle.
Asparagus racemosus Willd. (AS58)	Liliaceae	Satawari	9	A tonic made from the rhizome used as a sexual stimulant.
Azadirachta indica A. Juss. (AS59)	Meliaceae	Neem	10	The bark, having antifungal properties is used to treat eczema.
Barleria cristata Linn. (AS60)	Acanthaceae	Jhinti	1	Young plants are used in cough and fever.
Bauhinia variegata Linn. (AS61)	Caesalpiniaceae	Kachnaar	12	The bark is an anthelmintic. Since it is astringent used often in tonics.
Boerhavia diffusa Linn. (AS62)	Nyctaginaceae	Punarnava	8	A decoction of the roots is used for gas troubles.
Bombax ceiba Linn. (AS63)	Bombacaceae	Semur	2	Root powder (12 g) with milk is used as a tonic in impotency.
Butea monosperma (Lam.) Taub. (AS64)	Fabaceae	Gulmohar	3	The extract of roots are used in tuberculosis.

(*Contd*)

Table 1— Ethnopharmacological importance of medicinal plants—(*Contd*)

Botanical name and voucher specimen code	Family	Local name	Frequency of quotation	Claimed medicinal uses
Calotropis procera (Ait.) R. Br. (AS65)	Asclepiadaceae	Madar	5	Castor oil is used to cure hydrocele and is applied over the surface of testis.
Catharanthus roseus (Linn.) G. Don (AS66)	Apocynaceae	Sadabahar	13	Root paste is applied for healing the septic wounds and fresh leaf juice (few drops) mixed with a cup of water and is taken in empty stomach for the treatment of blood dysentery.
Cassia fistula Linn. (AS67)	Caesalpiniaceae	Amaltas	11	Leaves and flowers are used in ringworms.
Cassia tora Linn. (AS468)	Caesalpiniaceae	Chakawad	4	50 g juice of root with 150 ml water is taken orally in empty stomach to get relief from skin diseases.
Carica papaya Linn. (AS69)	Caricaceae	Papeeta	6	Latex of the unripened fruit is taken on cotton and placed on painful tooth.
Cajanus cajan (Linn.) Millsp. (AS70)	Fabaceae	Arhar	3	Leaf juice is applied twice a day in eyes for corneal opacity.
Cannabis sativa Linn. (AS71)	Cannabinaceae	Bhang	7	Paste of fresh leaves is applied over the anus twice daily for 6-7 days for treating piles.
Citrus aurantium Linn. (AS72)	Rutaceae	Khatta nibu	5	Its juice is useful in indigestion and vomiting.
Clerodendrum inerme (Linn.) Gaertn. (AS73)	Verbenaceae	Bharangi	3	The leaf paste is used in psoriasis and other skin affections.
Coccinia grandis (Linn.) Voigt. (AS74)	Cucurbitaceae	Kularu	1	Fresh leaf juice are used in treatment of jaundice.
Convolvulus pluricaulis Choisy (AS75)	Convolvulaceae	Sankhpushpi	4	It is taken to reduce high blood pressure and said to be good brain and hair tonic.
Commelina benghalensis Linn. (AS76)	Commelinaceae	Kanchura	2	The leaf paste is externally applied twice a day to treat scabies. The leaf paste is also applied on the wounds once a day for healing.
Coriandum sativum Linn. (AS77)	Apiaceae	Dhania	8	Leaves are used as appetizer
Cuscuta reflexa Roxb. (AS78)	Convolvulaceae	Amarbel	3	The extract of the plant is applied to get rid of dandruff
Cynodon dactylon (Linn.) Pers. (AS79)	Poaceae	Doob ghass	2	6 ml juice of plant with sugar is used to control bleeding from nose.
Cyprus rotundus Linn. (AS80)	Cyperaceae	Mutha	5	Nut grass is a pungent bitter- sweet herb. They are used internally in the treatment of digestive problems and menstrual complaints.
Cymbopogan citratus DC. (AS81)	Poaceae	Sughandha rihisha	4	The juice of the leave are used to cure the cholera.
Datura innoxia Linn. (AS82)	Solanaceae	Datura	1	Fresh leaf juice is mixed with 50 ml of cow's milk and taken thrice a day for 7 days to cure severe stomachache.
Dalbergia sissoo Roxb. (AS83)	Fabaceae	Shisham	1	The powdered bark of the tree is used in the treatment of gonorrhoea.
Desmodium gangeticum (Desv.) DC. (AS84)	Fabaceae	Shatparni	1	Roots Juice, 50 ml taken twice a day orally to treat the asthma.
Eclipta alba Hassak. (AS85)	Asteraceae	Bhringraj	2	A leaf extract is applied to the head to relieve dandruff and to blacken grey hair.
Emblica officinalis Gaertn. (AS86)	Euphorbiaceae	Awla	4	The fruits are used in the treatment of diabetes, heart disorders, eye problems and diarrhoea.
Euphorbia hirta Linn. (AS87)	Euphorbiaceae	Dudheli	3	The paste of whole the plant with goat's milk is taken for all stomach problem in children.

(*Contd*)

Table 1— Ethnopharmacological importance of medicinal plants—(*Contd*)

Botanical name and voucher specimen code	Family	Local name	Frequency of quotation	Claimed medicinal uses
Evolvulus alsinoides Linn. (AS88)	Convolvulaceae	Shankpushpi	1	3 spoons of fresh leaf juice taken in morning to cure urinary problem.
Ficus benghalensis Linn. (AS89)	Moraceae	Bargad	8	The latex is used to treat dysentery, diarrhoea, piles, tooth decay, rheumatism and skin diseases.
Ficus religiosa Linn. (AS90)	Moraceae	Peepal	3	Bark powder applied to teeth for strengthening of gums.
Ficus glomerata Roxb. (AS91)	Moraceae	Gular	2	The root powder is used orally to treat diabetes and bark powder is applied to stop bleeding.
Hemidesmus indicus (Linn.) R. Br. var. *indicus* (AS92)	Asclepiadaceae	Anantmul	5	Used in the treatment of fever, diabetes, cough and blood disorders.
Hibiscus rosa-sinensis Linn. (AS93)	Malvaceae	Gurhal	4	Stem bark paste (15g) is given to woman continuously five days for causing abortion
Imperata cylindrica Beauv. (AS94)	Poaceae	Japgrass	1	Extracts of the plant having anticancer activity.
Indigofera tinctoria Linn. (AS95)	Fabaceae	Sarphonk	1	10 ml juice of whole plant with 200 ml goat's milk is taken orally three times to treat leucorrhoea.
Ipomoea pes-tigridis Linn. (AS96)	Convolvulaceae	Besharama	1	The stem latex is applied on to the cracked feet once in a day for a week to heal the cracks.
Ixora coccinea Linn. (AS97)	Rubiaceae	Vajrahi	2	50 g dried flowers are boiled in coconut oil and applied externally twice a day to treat eczema.
Jatropha curcas Linn. (AS98)	Euphorbiaceae	Ratanjot	4	Powder of the seed is dissolved in water and used in the treatment of cholera, dysentery and stomach disorders.
Justicia adhatoda Nees. (AS99)	Acanthaceae	Adusa	3	10 g of leaf decoction is used to relieve fever.
Launaea procumbens Roxb. (AS100)	Asteraceae	Musakani	1	It is used as antidote for poisoning.
Lantana camara Linn. var. *aculeata* (AS101)	Verbenaceae	Putus		Powdered roots (5-10 g) with milk are given in stomach pain.
Leucas aspera (Willd.) Link. (AS102)	Lamiaceae	Gumma	2	The vapours from the boiled leaves are inhaled to relieve coughing and colds.
Mangifera indica Linn. (AS103)	Anacardiaceae	Aam	4	The fruits and seeds are used in the treatment of bleeding piles and skin diseases.
Madhuca latifolia var. *latifolia* Roxb. (AS104)	Sapotaceae	Mahuwa	7	Flower is widely used for making local liquor.
Macuna prurita Hook. (AS105)	Fabaceae	Kevanch	2	Root extract is used to cure mental disorder
Mentha arvensis Linn. (AS106)	Labiatae	Podina	6	Used as carminative and flavouring agent.
Mimosa pudica Linn. (AS107)	Mimosaceae	Lajwanti	2	Root paste mixed with castor oil is applied on measles. Root and leaves are used in piles.
Mirabilis jalapa Linn. (AS108)	Nyctaginaceae	Gulbans	1	It reduces the swelling
Momordica charantia Linn. (AS109)	Curcubitaceae	Karela	3	Fruits mixed with bulb of *Allium cepa* Linn (Onion) are crushed in vinegar to obtain a paste which is applied to the forehead
Moringa oleifera Linn. (AS110)	Moringaceae	Sahjan	2	The boiled leaves and flowers are used orally to increase fertility in male. Juice of the bark is used to cure stomach pain.

(*Contd*)

Table 1— Ethnopharmacological importance of medicinal plants—(*Contd*)

Botanical name and voucher specimen code	Family	Local name	Frequency of quotation	Claimed medicinal uses
Nerium oleander Linn. (AS111)	Apocynaceae	Safed Kaner	2	Powdered roots is applied to cure inflammation.
Nicotiana tobacum Linn. (AS112)	Solanaceae	Tambakoo	4	10-12 g flowers are burnt to ash and contained in an air-tight pot and 2 g of this ash is given with *Piper betel* Linn. leaf once a day to cure asthma.
Ocimum sanctum Linn. (AS113)	Lamiaceae	Tulsi	12	Leaves are crushed with common salt and placed on painful tooth.
Ocimum basilicum Linn. (AS114)	Lamiaceae	Kali Tulasi	13	Used in tea to cure the cough.
Oxalis corniculata Linn. (AS115)	Oxalidaceae	Khati Buti	1	The leaves extract are used as antiscorbic, refrigerant, cooling and stomachic.
Peristrophe paniculata (Forssk.) Brummitt (AS116)	Acanthaceae	Nasa bhagal	1	The whole plant, macerated in an infusion of rice, is taken orally in a large quantity as an antidote to snake bite.
Phyllanthus niruri Linn. (AS117)	Euphorbiaceae	Jar amala	3	The whole plant is diuretic and given in jaundice.
Plumbago zeylanica Linn. (AS118)	Plumbaginaceae	Cheetrak	3	About ten grams of leaves made into paste is externally applied twice a day to treat eczema, scabies and the ringworm infection.
Portulaca oleracea Linn. (AS119)	Portulaceae	Kulfa	1	5 g paste of whole plant is used to cure tooth pain.
Polygonum spp. (AS120)	Polygonaceae	Indrani	2	The root and leaves extract (8 ml) in water are used in colic pains and pneumonia.
Prosopis spicigera Linn. (AS121)	Fabaceae	Shami	6	An infusion prepared by boiling the leaves with water is taken internally for the treatment of rheumatism.
Punica granatum Linn. (AS122)	Punicaceae	Annar	8	Fruits are used for improving memory, brain and strength.
Rauvolfia serpentina (Linn.) Benth. ex Kurz (AS123)	Apocynaceae	Sarpgandha	10	Its decoction is given during labour pain to increase uterine contraction.
Ricinus communis Linn. (AS124)	Euphorbiaceae	Redi	10	Seeds used in scorpion sting.
Rosa damascena Mill. (AS125)	Rosaceae	Gulab	5	12 g flowers with 12 g coriander and 18 g sugar is used to treat for stomach problem.
Rumex dentatus Linn. (AS126)	Polygonaceae	Jangli palak	2	Plant decoction is used as a cooling agent against sunstroke.
Saccharum officinarum Linn. (AS127)	Poaceae	Ganna	12	It is very useful in jaundice.
Semecarpus anacardium Linn.f. (AS128)	Anacardiaceae	Bhilwa	3	The fruits are eaten to relieve indigestion. They are also used in the treatment of coughs and piles.
Sida cordifolia Linn. (AS129)	Malvaceae	Bariyara	6	Roots powder, 150-450 mg taken per day or decoction, 50 ml taken twice a day by mouth to treat the asthma.
Shorea robusta Gaertn. f. (AS130)	Dipterocarpaceae	Sakhu	5	The juice of the pericarp has antibacterial properties and is used to wash cuts and wounds.
Solanum xanthocarpum Schard & Wendl. (AS131)	Solanaceae	Bankateli	1	Leaves are very useful in the treatment of gonorrhoea and snake bite.
Solanum nigrum Linn. (AS132)	Solanaceae	Makoi	4	Decoction of leaves, 50 ml per day is used orally to relieve liver and skin diseases
Syzygium cumini Linn. (AS133)	Myrtaceae	Jamun	8	The powder of the bark is given to relieve from stomach problems, indigestion, and diabetes.

(*Contd*)

Table 1— Ethnopharmacological importance of medicinal plants—(*Contd*)

Botanical name and voucher specimen code	Family	Local name	Frequency of quotation	Claimed medicinal uses
Tamarindus indica Linn. (AS134)	Fabaceae	Imli	7	The dry powder of the bark is used in gastric pain. The fruits are also used to remove dandruff.
Tephrosia purpurea (Linn.) Pers. (AS135)	Fabaceae	Sarphankha	2	The juice of the root bark is taken for stomach pain.
Tectona grandis Linn. (AS136)	Verbenaceae	Sagawn	4	Wood oil is applied on skin diseases.
Terminalia arjuna Wight & Arn. (AS137)	Combretaceae	Arjun	14	12 g bark powder is given with 250 ml milk once daily for 40 days for curing cardiac disorder.
Terminalia bellirica Roxb. (AS138)	Combretaceae	Behera	3	The fruit are used in the Ayurvedic "Triphala Churan" that also contains the fruit of *T. chebula* and *E. officinalis*.
Tinospora cordifolia (Willd.) Miers. (AS139)	Menispermaceae	Giloy	5	1 kg stem is boiled in one litre of water. The decoction (one cup) is taken during delivery pain to induce smooth delivery.
Tribulus terrestris Linn. (AS140)	Zygophyllaceae	Gokhru	4	The plant extract is used to remove kidney stones.
Tridax procumbens Linn. (AS141)	Asteraceae	Masbhari	6	10 g of fresh leaves are made into paste along with a calcium hydroxide that is externally applied on the eczema and on injury made by weapon.
Vanda roxburghii R.Br. (AS142)	Asteraceae	Rasna, Banda	2	This species is useful in the treatment of rheumatism and arthritis.
Vernonia cinerea Less. (AS143)	Asteraceae	Sahdevi	4	The whole plant extract is good in fever
Xanthium indicum Linn. (AS144)	Asteraceae	Chhota datural	2	Root is used in earache and fruits are use in small-pox.
Ziziphus nummularia (Burn.f.) Wight. & Arn. (AS145)	Rhammaceae	Kathber	2	The fruits is used as blood purifier.

shrubs (41%), trees (18 %) and climbers (7%). This data represented that shrubs are dominated in the study sites. The most commonly represented families were Acanthaceae (4), Asteraceae (6), Fabaceae (9) and Liliaceae (5). The most frequently utilized plant part was the leaves (43.3%), root and leaves (17.2%) and root bark (10.2%) whereas root, leaves, seed, fruit and oil combindly occupies only 0.6%. This data proves that medicinal plants mostly used in drug preparation with one or two species not more than three species. The largest number of remedies was used to treat stomach disorder and respiratory problems followed by skin infection, diabetes and wound healing. The proportion of remedies used for treatment of stomach disorder occupies high percentage.

Route and dosage of administration

Focus was given mainly on plant parts used, methods of preparation, administration, dosage and duration in drug preparation. Medicines were prepared in the form of paste (32%), decoction (20%), powder (12%) and juice (8%). The most commonly used plant parts for herbal preparations in the area were leaves (43.3%), root and leaves (17.2%), root bark (10.2), seeds (7%) and fruits (2.5%) (Table 2). The administration routes are oral (56.7%), external (34.5%) and nasal (7.9%).

Table 2—Medicinal plant parts used by traditional healers for remedy preparation

Plant part used	No of species	Per cent
Leaves	68	43.3
Root and leaves	27	17.2
Root bark	16	10.2
Seeds	11	7.0
Stem bark	7	4.4
Stem bark, Root bark	5	3.2
Fruits	4	2.5
Stem wood	2	1.3
Root, stem and leaves	2	1.3
Stem and leaves	2	1.3
Root and stem	2	1.3
Leaf, fruit and root	2	1.3
Leaves, seed and stem	2	1.3
Root and fruit	2	1.3
Leaves and stem bark	2	1.3
Latex	1	0.6
Fruit and leaves	1	0.6
Root, leaves, seeds, fruit and oil	1	0.6
Total	157	100.00

The remedies are taken with water, milk and honey. Children are given less than adults, such as, one fourth of a cup (3 to 5 ml), whereas, an adult is given up to one glass (approximately 250 ml) depending on the type of illness and treatment. The quantity of plant part used is measured by number of leaves, seeds and fruits and length of root. For example, five young leaves of *Justicia adhatoda* are used to treat ascaris, three seeds of *Syzygium cuminii* are used to treat diabetes and about 3 cm of root paste of *Catharanthus roseus* is used to treat cancer.

ICF and FL values of medicinal plants

The medicinal plants that are presumed to be effective in treating a certain disease have higher ICF values. Wound healing secured the highest ICF value (0.78). The ICF values of each aliment were represented in Table 3.

This report presents that high incidence of these types of diseases in the region, possibly due to the poor socio-economic and sanitary conditions of the people. The medicinal plants that are widely used by the local people have higher FL values than those that are less popular. On the other hand, medicinal plants that are known as remedies of a single aliment have 100% fidelity level than those that are used as remedies for more than one type of aliment. For example *Aegle marmelos* secured 100% fidelity level.

Table 3— ICF value of category of aliments

Category	Species (Nt)	Use Citations (Nur)	ICF (Fic) Value
Stomach disorder 16 42 0.63	16	42	0.63
Respiratory problem 13 38 0.67	13	38	0.67
Eczema 9 28 0.70	9	28	0.70
Piles 8 13 0.41	8	13	4.01
Skin infection	7	19	0.66
Diabetes	6	22	0.7
Wound healing	6	24	0.78
Hair loss	5	17	0.75
Jaundice	4	6	0.4
Snake bite	4	7	0.5
Sexual stimulant	3	4	0.33
Urinary problem	3	2	0.5
Kidney disorder	2	5	0.75
Nervous disorder	1	8	1
Pneumonia	1	4	1
Tuberculosis	1	7	1

Discussion

Pharmacological importance of medicinal plants

The plants recorded from the study sites have a significant role for commercial production of natural compounds and also in the development of chemical compounds, which perform a variety of functions including pharmaceuticals, flavours, fragrance, colours and insecticides. Any plants become medicinally rich when therapeutic use was discovered for them. Some medicinal plants have been reported with their active compounds that make responsible them for their traditional uses.

The ethnomedicinal plants have been recorded from the tribal forest of eastern U P provides outstanding contribution to modern therapeutics for example- serpentine isolated from the root of *Rauwolfia serpentina*[7] that are used in the treatment of hypertension and lowering of blood pressure. Vinblastine isolated from the *Catharanthus rosesus* is used for the treatment of cancer[8]. Some ethnomedicinal plants have been found to possess significant antibacterial properties such as *Achyranthus aspera*[9], *Boerhavia diffusa*[10], and *Tribulus terrestris* and also antidiabetic properties of several medicinal plants have been reported, viz. *Catharanthus roseus*[11,12]. Some plants reported for antiodotes activity in viper and cobra snake venom, viz. the root extract of Indian sarsaparilla, *Hemidesmus indicus* R. Br.[13]. It has been reported that an active compound from the *Strychnus nux-vomica* seed extract, inhibited viper venom induced lipid peroxidation in animals.

Traditional medicine and modern medicine

Medicinal plants are an integral part of the ethnobotanical aspects of the people of Asia. There is no doubt that the modern medicine system has evolved from folk medicine and traditional system only after through chemical and pharmaceutical screening[14]. If we compare the modern medicine system to the traditional system which is based only on plant derived products, then we will observe that the advance modern medicine system can synthesize medicinal and aromatic compounds by the help of microbial and chemical methods but in many cases it is very expensive. So it is not possible to provide modern health care system to all the people at affordable cost[15]. Whereas in the traditional system of medicine, the main source of the drugs are directly plants based that naturally grow in field and is very cheaper.

The use of synthetic compound led to a decline in the use of plants in modern medicine. However, Synthetic medicine can cause side effects and as a result people are more favourable to use natural compounds obtained from plants. Plants based traditional drugs are totally cost-effectiveness with no side effects. Based on a World Health Organization survey and more recent review articles searches for drugs of natural plant product origin, there are 121 pharmaceutical compounds used as medicine worldwide that are derived from plants. Of these, 101 plant species are the primary sources for 119 of these compounds. Thus plants remain a major source of medicinal compound.

During survey it has been demonstrated that natural habitats of medicinal plants are diminishing day by day in the tribal areas of eastern U.P. due to the uncontrolled population, ecological instabilities, and pollution and also due to the lack of financial resources that is offered by government. In an urban area, the percentages of using the plant based medicine are very less in comparison to the rural areas. In recent time, plants are rapidly exploited for commercial production of synthetic products. In India large number of pharmaceutical industries is based on forest for medicinal plants to evaluate their pharmacological significance[16]. Several medicinal plants have been over-exploited and endangered. Although different Ministries and Department in the Government sector and NGO's and individuals in the private sector are making effort in different direction to conserve and document the traditional knowledge of medicinal plants at the national and international level in both rural and an urban environment.

Protected areas management recommendations

In the Conservation Assessment and Management Plan (CAMP) of rare and endangered medicinal plant (REMP) species several government agencies such as NMPB (National Medicinal Plant Board, Delhi), AYUSH, Delhi and private NGO are involved in eastern Uttar Pradesh. Establishment of Medicinal Plant Conservation Areas (MPCA) could be a step forward in the conservation of medicinal plants including REMP species. In addition to the specific needs of MPCAs, a number of thoughts emerge from the present study:

1. To conserve the medicinal plants, ethnomedical survey of the study sites should be undertaken so that we can explore medicinally and commercially rich flora in tribal areas and particular emphasis should be given to the monitoring of REMP species.
2. Tribal practitioners (known as Vaidhya) should be aware from the coming challenges in future that could arise from commercial exploitation.
3. Some areas in Eastern UP such as Mirzapur, Chandauli and Sonbhadra that are situated near to the hills of Vindhya regions are rich in REMP species and tribal forest.
4. The REMP species should enjoy special care and priority in conservation and management plans.

Conclusion

This work moreover is part of an on-going effort at the gradual build up of strong data bank and traditional knowledge of the medicinal plants. Hopefully, this information will help to reawaken efforts at the development of ethnomedicine and its eventual integration into the formal health care system for the greater benefit of mankind.

The traditional people still depend on herbal medicines. There is need of training on cultivation and conservation of medicinal plants for the students and innovators. There is a greater need to develop a garden of medicinal plants on a large scale in an urban environment of developing cities for their conservation. The nearby tribal people can also be encouraged to take up this job as an income generation activity.

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