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INDIGENOUS MEDICINAL PRACTICES OF SHRUB SPECIES IN THE WESTERN PART OF PARSA DISTRICT, NEPAL

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ABSTRACT

This study was focused on documentation of shrub species used to treat various human diseases and to find out the level of awareness among the local people about the conservation of indigenous knowledge as well as biodiversity in the study area. Ethnobotanical data were collected using semi-structured interviews, group discussions, and field visits. Preference index and citation percentage were used to analyze the medicinal importance of the studied plant species. A total of 31 plant species belonging to 28 genera and 16 families were reported for the treatment of 49 diseases in this study. The highest number of plants used for medicinal purposes was from the three families Apocynaceae, Euphorbiaceae, and Oleaceae (13% each) whereas six families Caesalpiniaceae, Fabaceae, Lythraceae, Malvaceae, Rutaceae, and Verbenaceae (6% each) were in the second category. Leaves were (31%), the most frequently utilized plant parts, and then root (28%) for the preparation of traditional herbal medicines. The common method of preparation of medicine was decoction (23%). Local people possess good knowledge of medicinal plants to treat various human diseases; however, agricultural expansion and disinterest of the young generation towards this knowledge has become a major threat to preserve this knowledge and biodiversity conservation. It is, therefore, necessary to do proper documentation and identification of plant species used as herbal medicines in this area.

KEYWORDS: Medicinal plants, Parsa District, Tharu community, Indigenous knowledge, Shrubs.

INTRODUCTION

It is estimated that approximately 265,000 species of vascular plants exist on earth and only less than half of these have been studied for their chemical composition and medicinal value (Cox & Balick, 1994). Nepal is ranked as 9th among the Asian countries for its floral wealth with an estimated 9,000 species of flowering plants (Bhattarai *et al.,* 2011). Plant species have long been the principal ingredients of traditional medicine and their use dates back to the beginning of human civilization (Kunwar *et al.*, 2006). Many such plants also have other domestic uses. It is therefore very important that studies in ethnobotany and ethnopharmacology continue to preserve traditional knowledge (Kurmi & Baral, 2004). The World Health Organization estimates that up to 80 % of the people in developing countries still depend on local medicinal plants to fulfill their primary health care needs (WHO, 2002). About 90 % of the Nepalese people reside in rural areas where access to government health care facilities is lacking (Bhattarai *et al.*, 2006). With increasing acceptance and use of medicinal plants in traditional therapies, and with increasing commercial demands over the years, the consumption and collection of medicinal plants is accelerating and thus endangering the extant populations (Kunwar *et al*., 2006). Due to changing lifestyles, extreme secrecy of traditional healers, and negligence of youngsters towards the traditional healing system the practice and dependence of ethnic societies in folk medicines is in rapid decline globally. Therefore, ethnobotanical documentation of indigenous knowledge about the usefulness of such a vast genetic resource is extremely needed (Bussman & Sharon, 2006). Traditional herbal medicine possesses greater significance in Nepal Himalaya hence interest in herbal medicine has gradually increased in recent years (Burlakoti & Kunwar, 2008). An estimated 25 % of prescribed drugs and 11 % of drugs considered essential by WHO are derived from plants, and a large number of synthetic drugs are obtained from precursor compounds originating from plants (Rates, 2001). So, the priority should be given to the documentation of indigenous knowledge and conservation of the existing species and inhabitants before some of these are eliminated from the area (Joshi *et al*., 2003). Previous studies based on ethnomedicines reported local uses of various medicinal plants (Yadav, 1999; Panthi & Chaudhary, 2003; Dhami, 2008; Burlakoti & Kunwar, 2008; Singh *et al*., 2012; Tamang & Singh, 2014; Rai & Singh, 2015). Identification and documentation of plant species used for the treatment of various diseases in the study areas, and to increase the awareness of the local people about the conservation of such valuable sources of the indigenous knowledge are the main aims of the present study. This area was selected for the present study because it is rich in phyto-diversity and tribal population. Besides other uses of

the plants; herbal health care management is still prevalent in this area as well as documentation of the indigenous medicinal uses of the plant resources found in this area has not been done in past.

MATERIALS AND METHODS

Study area

Parsa district lies in between Long. 84^0 8' to 85^0 27'E and Lat. 27^0 to 27^0 26'N at an elevation of 122 to 925 m above the sea level in Province no. 2, Central Nepal. This study was carried out in the Nirmal Basti and Subarnapur villages of the Thori Rural municipality which are situated towards the western part of the district (Fig. 1). In the study area Tharu community is in highest population i.e., 62 % in Nirmal Basti and 65 % in Subarnapur. The typical vegetation of the area is tropical forest types dominated by *Shorea robusta* (Sal) with associated species *Acacia catechu,* (Khayer), *Dalbergia sissoo* (Sisau), *Bombax ceiba* (Simal), *Dalbergia latifolia* (Satisal), and *Terminalia tomentosa* (Asna) according to the report of rural municipality. Monsoon starts in mid-June and ends in September, and about 80 % annual rainfall occurs within this period. The average annual temperature of this area ranges from $7^{\circ C}$ to $40^{\circ C}$ according to the report of district forest.

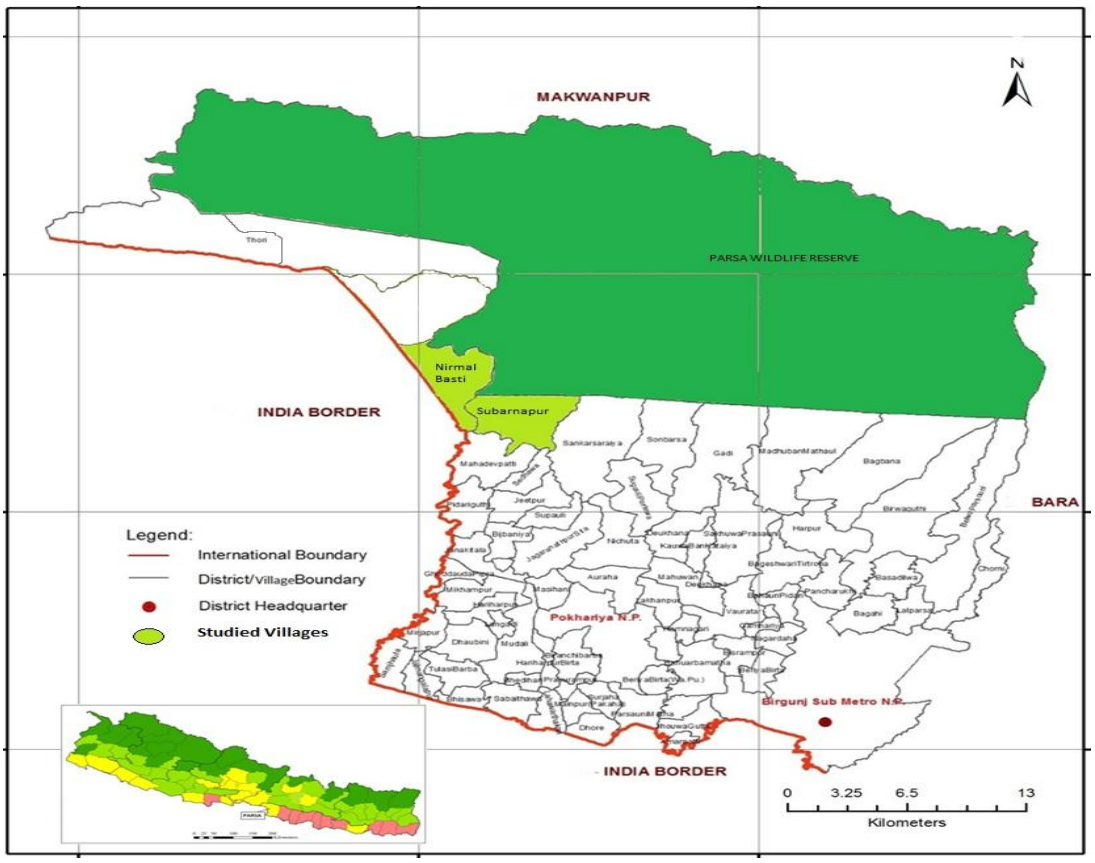

Fig. 1: Location map of the study area.

Data collection, identification of plants, and data analysis

A total of 50 participants were selected randomly from the representatives of villages Nirmal Basti and Subarnapur. Fourteen key participants (6 males and 8 females) traditional healers were selected using random and purposive sampling approaches, following Martin (1995). Twenty participants were selected based on the recommendations of knowledgeable elders, local authorities, and local teachers. Women representing this ethnic group of different age groups (25 to 70 years old) and Guruwa (Guru of Tharu people) were also encouraged to participate. Data were collected from February 2018 to April 2019. Altogether five field surveys, roughly 25 days in length, were carried out in different seasons: Spring survey was conducted in March to April 2018; summer survey was conducted in June 2018, and winter survey was conducted in December 2018 to February 2019. Data were generated from both primary and secondary sources. The primary data collection consisted of field visits, semi-structured interviews, group discussions with participants. Most data were collected from primary sources. The secondary sources of data included information from Rural municipality, review of the literature i.e., journals, articles, and books. The plants were identified based on related flora (Stainton, 1988; Bista *et al.*, 2001) and verified by cross-checking with the authentic voucher specimens deposited at the National Herbarium and Plant Laboratory, Godavari, Lalitpur, Nepal. Common names collected during interviews were compared with Shrestha's dictionary of Nepalese Plant Name (1998). Plants were classified according to the Cronquist system of classification (1981). All enumerated plants were categorized based upon their plant parts used as herbal medicines and mode of preparation of medicines. The reported medicinal use of plants in this study was also compared with previously published ethnobotanical literature in Nepal. To compare the efficacy of a particular plant for treating particular disease; frequency of citation was calculated using the fidelity level (FL) formula according to Friedman *et al*. (1986). Digestive problems and venereal diseases are common health problems in this area. So, Preference analysis was conducted taking five important plants used to treat digestive problems and venereal diseases according to Amatya (1996). In this exercise ten participants were selected randomly among total key participants to identify the best preferred medicinal plants for the treatment of digestive problems and venereal diseases.

$$\text{Frequency of citation} = \frac{\text{No. of informants who cited the species}}{\text{Total No. of informants interviewed}} \times 100 \quad (1)$$

$$\text{Preference index} = \frac{\text{Preference level} \times \text{No. of respondents}}{\text{Total No. of respondents}} \quad (2)$$

RESULTS AND DISCUSSION

A total of 31 shrub species belonging to 28 genera and 16 angiosperm families have been recorded for the treatment of 49 ailments from the study area. The recorded plants have been categorized according to their names, family, used in different diseases and mode of preparation of medicines in Table 1. The studied plant species are used for the treatment of various health problems like arthritis, cough, fever, headache, diabetes, high blood pressure, tuberculosis, stomach problems, worm, pox, jaundice, reproductive problem, allergy, pimple, hair fall, abortion, venereal disease, skin problems and digestive system disorders (Table 1).

Table 1: Shrub species with family, uses, mode of medicines administration and citation percentage.

Scientific name	Common name	Tharu name	Family	Diseases/ Ailments	Mode of administration of medicines	Citation (%)
Agava americana L.	American aloe, Century plant	Tari	Agavaceae	Venereal disease	Decoction of the root is used to cure syphilis.	25
				Conjunctivitis	The pulp of the leaves is placed between folds of muslin cloth and applied to the eye to cure conjunctivitis.	40
Caesalpinia bonduc L.	Gray nicker	Karanj	Caesalpiniaceae	Malaria	Seed is ground to powder after removing its shells along with black pepper. 1tsp.of this mixture is used in malarial fever thrice a day.	65
Senna alata (L.) Roxb.	Candle bush	Chakwat	Caesalpiniaceae	Skin disease	Leaves are rubbed over skin in ringworm.	55
				Venereal disease	Leaf decoction is used to cure venereal diseases such as syphilis and gonorrhea.	45
Citrus aurantifolia Christm.	Lemon	Nibuwa	Rutaceae	Jaundice	Infusion of the leaves is given in fever with jaundice.	35
				Venereal disease	The decoction of the root is given to	50

					get relief in gonorrhea in the early morning.	
Clerodendrum viscosum Vent.	Kanna	Rajbeli	Verbenaceae	Asthma	The decoction of root and stem bark is given in the dose twice daily in and asthma.	70
				Diarrhea	Fresh leaf juice is given in diarrhea and liver disorders.	25
				Liver diseases		30
Colebrookea oppositifolia Sm.	Indian squirrel tail	Dhursuli	Lamiaceae	Fracture	Paste of leaves is applied on the fractured part as poultice.	70
				Wound	Paste of leaves is applied on the wound.	70
Pleurolobus gangeticus J. St.-Hil	Desmodium	Bhtmase Jhar	Fabaceae	Vomiting	Decoction of fresh root is given to get relief.	40
				Typhoid	Root powder is given twice a day with water.	60
				Alzheimer	One tablespoon root powder is used to improve memory and to cure Alzheimer's disease at night.	40
Euphorbia pulcherrima Willd.	Poinsettia	Lalpata	Euphorbiaceae	Fever	Decoction of few bracts is given in fever.	40
				Stimulation of milk	Warm decoction of 4 to 6 bracts is given to stimulate breast milk to lactating mothers.	45
Euphorbia tirukali L.	Fire stick plant	Thohar	Euphorbiaceae	Snake bite	1tbsp. of latex is taken with milk, it causes vomiting and therefore, is considered to be an antidote in case of snakebite.	50
				Cough	The young branches are roasted and chewed which gives relief in dry cough.	65

Gardenia jasminoides J. Ellis.	Cape jasmine	Indrakamal	Rubiaceae	Eczema	One tablespoon fruit powder is taken orally in case of eczema, jaundice, and painful urinary dysfunction.	50
				Jaundice		60
				Urinary problems		60
Hibiscus rosa-sinensis L.	China rose	Orhul	Malvaceae	Liver disorder	One flower extract is used for liver disorders on an empty stomach in the morning.	70
				Arthritis	Decoction of leaves or root is helpful in the Treatment of arthritis.	45
				Venereal disease	Fresh root juice of the plant is given in gonorrhea in the morning.	
Indigofera Pulchella L.	True indigo	Sajino	Fabaceae	Cough	Decoction of the root is used in the treatment of cough.	50
				Chest pain	The root is dried and ground and applied externally in the treatment of chest pain.	40
Jasminum auriculatum Vahl.	Arabian jasmine	Chameli	Oleaceae	Mouth ulcer	Young leaves are chewed in the treatment of mouth ulcers.	80
				Skin disease	The paste of the root is applied to infected areas in the treatment of ringworms.	60
				Tuberculosis	Infusion of 2 to 3 Flowers is used in the treatment of tuberculosis after meal.	50
Jasminum multiflorum (Burm.) Andrews	Star Jasmine	Thulo Chameli	Oleaceae	Wound & ulcer	Decoction of the leaves is used to cure wounds, ulcers, and skin diseases.	75
				Skin diseases		60
				Digestive problems	Young leaves are chewed to enhance	54

					the absorption of food in the digestive system.	
Lawsonia inermis L.	Heena	Mehdi	Lythraceae	Jaundice	One tablespoon bark powder of stem or root is used for the treatment of jaundice before meal.	35
				Arthritis	Massage of heena oil for a month gives relief in arthritis.	25
				Sore throat	Leaf paste is used against sore throat by applying on throat.	50
				Skin disease	Leaf paste is used for the treatment of etching and burning of foot.	55
Manihot esculenta (Crantz.)	Cassava	Simal Tarul	Euphorbiaceae	Measles	Paste of leaves is used topically in measles, and skin rashes.	70
				Skin rashes		55
				Wound	Fresh root juice is applied to wound or sores.	50
Murraya Koenigii L.	Sweet neem/ Curry leaf tree	Mitha Nim	Rutaceae	Stomach pain	Decoction of root bark is used in the case of stomachic.	65
				Dysentery	One green leaf is eaten raw to cure dysentery.	50
				Snake bite	Decoction of leaves is given in snake bite orally.	40
				Diabetes	Decoction of 2 or 3 leaves are used in diabetes.	60
Nyctanthes arbortristis L.	Coral jasmine	Harisinge	Oleaceae	Fever	Juice of the4 to 5 leaves is used in fever.	80
				Joint pain	One tablespoon powdered stem bark is given in rheumatic joint pain.	75
				cough	The juice of fresh leaves is used in	75

					dry cough.	
Osmanthus fragrans (Lour.)	Fragnant olive	Siringe	Oleaceae	Immunity	Decoction of few flowers is taken to boost the immune-system after meal.	45
				Skin infection	Decoction of stem bark is taken orally to reduce skin infection.	34
Phoenix acaulis (Roxb.)	Dwarf date palm	Kachurati	Arecaceae	Digestive problem	Two-inch fresh stem juice cures digestive problems.	20
Plumbago zeylanica L.	Plumbago	Chitu	Plumbaginaceae	Skin problems	Paste of root is applied to the skin to treat abscesses and other skin diseases including ulcers and scabies.	67
				Baldness	Bark paste is used to cure baldness.	50
				Obesity	One gram root or leaf powder is useful in obesity.	45
Rauvilfia serpentina L.	Snakeroot plant	Baruwa	Apocynaceae	Intestinal disorders	Extract of 3-inch root is used in the treatment of intestinal disorders like diarrhea and dysentery.	56
				Uterine contraction	Root extract is also used in uterine contraction during childbirth orally.	60
				Malaria	One tablespoon fresh root juice is taken to get relief from malarial fever twice a day.	75
				Nervous system disorders	One tablespoon root juice is used to get relief from various central nervous system disorders like psychosis, insomnia, and epilepsy before bed.	75
Rauvolfia tetraphylla L.	Wild snakeroot	Dharmaruwa	Apocynaceae	High blood pressure	One tablespoon root juice is a	75

					valuable remedy for high blood pressure once a day before a meal.	
				Piles	The root or leaf juice is taken orally to get relief in piles.	34
				Female sterility	Root juice is an effective remedy for sterility in women.	50
Ricinus communis L.	Castor	Andi	Euphorbiaceae	Laxative	One tablespoon castor oil is taken at night before sleep.	80
				Childbirth	Oil is also used to induce labor and stimulate lactation.	56
				Skin problems	Castor oil is applied to the skin for softening calluses and removing warts.	50
				Contraceptive	Castor oil is used by the females as a contraceptive topically.	67
Rosa alba L.	Rose	Gulab	Rosaceae	Abortion	The juice of leaves is taken for abortion.	35
				Piles	Leaf juice is applied to piles.	50
				Dental problems	Tender leaves are used for cleaning teeth. Leaf juice relieves toothache and strengthens gums.	25
Tabernaemontana divaricata L.	Pinwheel flower	Takkar	Apocynaceae	Vermicide	Two-inch long root juice is used as an anthelmintic for ascariasis.	50
				Dental problems	The latex is applied on cotton pellet, to teeth in dental caries.	45
				Diarrhea	Decoction of 3-inch root is used in diarrhea.	50
Thevatia peruviana	Yellow oleander	Kanal	Apocynaceae	Headache	Paste of flowers of oleander and seeds	24

(Pers.) K. Schum.					of *Emblica officinalis* is applied on the forehead to get relief from headache.	
				Joint pain	Pastes of leaves mixed in mustard oil applied on joints to get relief from pain.	50
				Skin disease	Root is boiled in mustard oil and filtrate is used in skin allergy.	45
Urena lobata L.	Caesar weed	Chhippi	Malvaceae	Dysentery	Decoction of 30-60 gm of dried root is taken orally twice a day.	50
				Rheumatism	One tablespoon powder of dry root or decoction of fresh or dry root is taken orally.	60
				Tonsillitis	Gargling is done with warm decoction of fresh root.	55
				Skin problem	Decoction of fresh roots and leaves is used to soften skin.	65
				Poultice	Boiled and pounded leaves are used as poultice for bladder or stomach inflammations.	45
Vitex negundo L.	Chaste tree	Simali	Verbenaceae	Cough	One tablespoon root powder with honey is used.	45
				Diarrhea	The infusion or extract of 3 to 4 flowers is used in diarrhea and dysentery.	60
				Hair tonic	Leaf juice mixed with oil used as a hair tonic.	56
				Poultice	Warm leaves are used as poultice to cure glandular	45

					swelling in any part of the body.	
Withania somnifera (L.) Dunal	Winter cherry	Aswagandha	Solanaceae	Female sterility	One tablespoon root powder is taken before bed to cure female sterility.	60
				Cough	One tablespoon root powder is given with milk.	70
				Immunity	Root powder is mixed with Stem powder of *Tinospora cordifolia* in the ratio of 1:50 with honey to increase the immunity of the body.	75
Woodfordia fruticosa (L.) Kurtz	Fire flame bush	Dhayaro	Lythraceae	Malaria	Decoction of leaf is taken in malarial fever.	70
				Diarrhea	2 to 4 flowers are crushed and mixed with honey and given in diarrhea.	50
				Venereal disease	Decoction of 4 to 5 flowers is used to cure leucorrhoea in an empty stomach.	45
				Dental problems	Decoction made from an equal amount of leaves and fruits are used to gargle to get relief from all dental problems.	50

Different parts of plants like, leaf, root, bark, flower, seed, latex, fruit, and oil are used for the treatment of different ailments (Fig. 2). Leaf (31%) and root (28%) were found to be the most frequently utilized plant parts for the preparation of medicines.

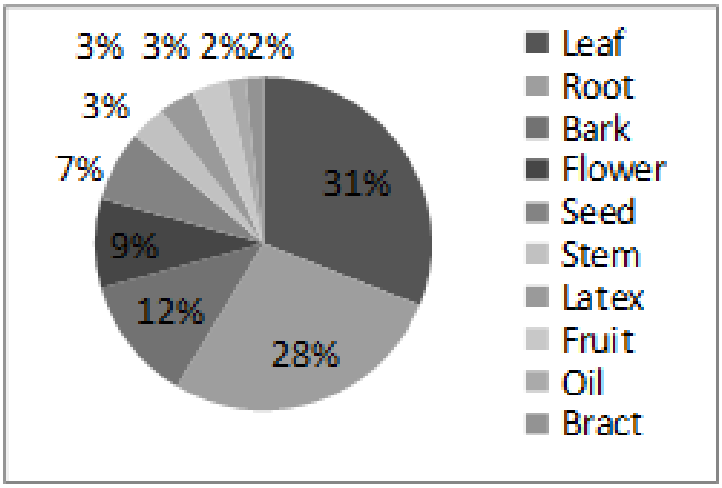

Fig. 2: Percentage of parts used in documented medicinal plants.

Mode of drug preparation

The Tharu people uses different methods of drug preparation such as decoction, paste, powder, juice, infusion, fresh leaf, latex, poultice, and oil. The decoction (23%) is most frequently used mode of preparation of medicines whereas paste (19%) and powder (16%) is in second and third position (Fig. 3). This method of drug preparation has been reported previously (Singh *et al*., 2012; Rai & Singh, 2015; Poudel & Singh, 2016; Singh, 2017; Ambu *et al*., 2020; Jadid *et al.* 2020).

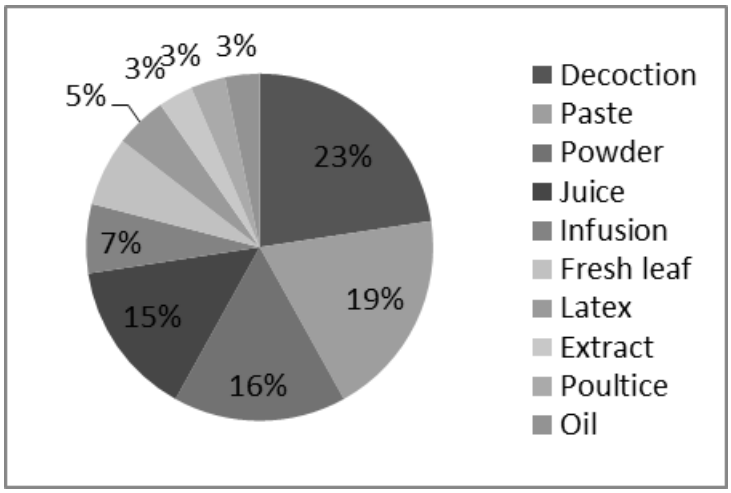

Fig. 3: Mode of preparation of medicine.

The highest number of plants used for medicinal purposes are from the three families Apocynaceae, Euphorbiaceae, and Oleaceae (13% each) whereas six families are in the second category, (6.46% each) and the rest all 7 families consist of single species (Table 2).

Table 2: Taxonomic analysis of drug (family-wise).

Name of families	No. of species	% of richness
Apocynaceae	4	13
Euphorbiaceae	4	13
Oleaceae	4	13
Caesalpiniaceae	2	6.46
Fabaceae	2	6.46
Lythraceae	2	6.46
Malvaceae	2	6.46
Rutaceae	2	6.46
Verbinaceae	2	6.46
Others 7 families	1	22.54

Preference analysis

As diseases related with digestive systems and venereal are common diseases in the study area. The preference analysis results showed that the preference index of *Vitex negundo* is highest for treating digestive problems (Table 3), while *Hibiscus rosa-sinensis* got highest position for treating venereal diseases (Table 4).

Table 3: Preference analysis of the plants used for digestive system disorder.

Plant species	Number of respondents per preference level			Preference index	Rating
	1	2	3		
Vitex negundo	5	4	0	1.3	I
Urena lobata	5	4	1	1.6	II
Tabernaemontana divaricata	3	5	2	1.9	III
Woodfordia fruticosa	4	2	4	2	IV
Murraya koenigii	4	3	3	2.3	V

Table 4: Preference analysis of the plants used in venereal disease.

Plant species	Number of respondents per preference level			Preference index	Rating
	1	2	3		
Hibiscus rosasinensis	4	5	1	1.7	I
Citrus aurantifolia	4	4	2	1.8	II
Woodfordia fruticosa	4	0	5	1.9	III
Cassia alata	3	4	3	2.0	IV
Agave Americana	2	3	4	2.2	V

Citation % analysis

These results showed the most commonly used plants for treating various diseases are as; *E. tirucali* in cough, *J. auriculatum* for mouth ulcer, *M. esculenta* for measles, *N. arbortristis* for fever and joint pain, *R. serpentina* in malaria, *W. somnifera* for immunity, *R. communis* as laxative, *P. zeylanica* in skin diseases and baldness, *U. lobata* in rheumatism, and *W. fruticosa* in dental problems based on the citation % (Table 1).

The present study identified many medicinal uses of the studied shrub species viz., *Hibiscus rosa-sinensis* in arthritis, *Indigofera pulchella in chest pain, Jasminum multiflorum* in tuberculosis, *Jasminum multiflorum* in digestive problems, *Desmodium gangeticum* in vomiting, *Caesalpinia bonduc* in malaria, *Vitex negundo* as poultice and hair tonic *Clerodendrum viscosum* in liver disease and fever, *Tabernaemontana divaricata* as a vermicide, *Rosa alba* in piles, *Urena lobata* in tonsillitis, *Woodfordia fruticosa* in dental problems *Thevatia peruviana* in skin disease, *Ricinus communis* during delivery, *Plumbago zeylanica* in baldness, *Osmanthus fragrans* to boost immunity, *Lawsonia inermis* in arthritis, *Gardenia jasminoides* in eczema, *Manihot esculenta* in wound, *Colebrookia oppositifolia* in bone fracture, *Euphorbia tirukali* in snake bite, *Nyctanthes arbortristis* in spleen enlargement, *Rauvolfia serpentina* in uterine contraction, *Citrus aurintifolia* in gonorrhea, *Rauvolfia tetraphylla* in piles, *Agave mericana* in conjunctivitis and *Euphorbia pulcherrima* in stimulation of milk in lactating mother. As far as availability of medicinal plants is concerned most of the plants are easily available except *Tabernaemontana divaricata, Withania somnifera, Rauvolfia serpentina,* and *Rauvolfia tetraphylla* which are not common and needs to be conserved for future use. There is no serious effort for the conservation of medicinal plants in the study area. Therefore, it is an urgent need to create awareness among the local people of the study area about sustainable collection and conservation of the plants. Local people should be encouraged by the local government for the domestication of these valuable plants both small scale (for personal use) and large scale (for trade). This will improve the socio-economic level of the inhabitants and economic growth of the country.

CONCLUSION

Parsa district lies in the tropical region of the Terai region is rich in medicinal plant resources. From this district very little information regarding the ethnomedicinal use of local plants is available. Particularly, from the study area this type of study has not been done in past. The present study revealed that the Tharu community of the villages Subarnapur and

Nirmal Basti of Parsa district, Nepal is rich in ethnomedicinal knowledge and the majority of people rely on plant-based remedies for common health problems. But, easy availability of modern medicine is another cause of declining the use of plants for medicine. As a result, there is a great chance of disappearing valuable ethnomedicinal knowledge in the younger generation. Therefore, there is an urgent need to document the ethnomedicinal knowledge of the Tharus of this district before they disappear forever. It is also essential to analyze the phytochemical properties of these medicinal shrub species for the confirmation of usage and discovery of new pharmaceutical drugs as well.

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