ISSN 1996-3351

Asian Journal of Biological Sciences

http://knowledgiascientific.com

Knowledgia SCIENTIFIC
A Place to Publish Outstanding Research

OPEN ACCESS Asian Journal of Biological Sciences

ISSN 1996-3351
DOI: 10.3923/ajbs.2020.318.327

Research Article
Social and Ecological Ranking of Medicinal Plant Species of Majhi Community Forest Users, Nepal

[1]Roshan Kumar Shrivastab, [2]Ajay Bhakta Mathema and [2]Ram Asheshwar Mandal

[1]Department of Forests and Soil Conservation, Kathmandu, Nepal
[2]School of Environmental Science and Management, Nepal

Abstract

Background and Objective: Medicinal use of the plant is effective medicine for the local people like Majhi community, but there are very limited research so far in Nepal. Thus, this research was objectively carried out to explore plant species used for medicinal purposes by Majhi community and to explore the medicinal use of the plant species and their importance and assess the availability of medicinal plant in community forests. **Materials and Methods:** Hence, Durga Mai and Bramha Thakur community forests in Nepal managed by Majhi community were selected for the study. Altogether, 64 samples having 10×10 m for tree and pole, 5×5 m for sapling including shrub and 1×1 m for seedling nested plots were established in the community forest. The basal area, relative density and relative frequency and finally Importance Value Index (IVI) were calculated. **Results:** Altogether, 25 plant species were used by Majhi community to cure 16 diseases. The estimated importance Value index was the highest (166.95) of *Shorea robusta* (tree), it was of *Woodfordia fruticosa* (shrubs) with value 86.16 and *Chromolaena odorata* (herbs) with value 181.84. Total 5 species were used to cure diarrhoea followed by dysentery (4 species), sinus, fishing, cultural use (3 species), throat infection (2 species) and 10 species were used for 1 disease. The correlation between the ranking based on social and ecological importance were very strong and positive. The R^2 values were 0.867 and 0.961 between both variables. **Conclusion:** The traditional knowledge regarding the medicinal value of the plant needs to be explored.

Key words: Medicinal plant, majhi, value, index rank, disease

Citation: Roshan Kumar Shrivastab, Ajay Bhakta Mathema and Ram Asheshwar Mandal, 2020. Social and ecological ranking of medicinal plant species of Majhi community forest users, Nepal. Asian J. Biol. Sci., 13: 318-327.

Corresponding Author: Ram Asheshwar Mandal, School of Environmental Science and Management, Nepal

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The term medicinal plant refers to a variety of plants that have medicinal properties. These plants are a rich source of compounds that can be used to develop drug synthesis. Furthermore, these plants play a vital role in the development of human cultures around the whole world. Infact, more than half million plants have been used to treat different types of diseases in the world, but medicinal use of the most of the plants are still unknown because of limited research work in the world[1]. However, it is fact that around 10% of plants i.e., about 30,000 species are generally used for medicinal purposes throughout the world[2]. Out of these plants, almost 6500 plant species are found in Asia[3].

The plants have high medicinal and nutritional value[4]. Specifically, in Indian sub-continent, plant oriented medicines are used extensively from ancient times. According to a survey conducted by WHO, traditional healers treat 65% patients in Sri Lanka, 60% in Indonesia, 60% in Pakistan, 85% in Myanmar, 80% in India and 90% in Bangladesh. In Nepal, 75% of the population, especially in rural areas is getting health care by traditional practitioners, who prescribe herbal preparations. Nepal is an excellent repository of cultural heritage for diverse ethnic groups and these ethnic people have a long tradition of folk practices for utilization of wild plants especially as medicinal species[5]. These ethnic groups use about 23% of flowering plants for their medicinal properties[6]. It is believed that, the practice of plants to treat the diseases in Nepal is transformed from generation to generation. However, there is very limited literature regarding this. It is fact that, the use of English medicine dominating these and the Ayurveda is overlooked[7]. Recently updated database revealed more than 1950 species of plants used as folk medicine in Nepal[8].

The plant and plant products have augmented human culture since time immemorial[9], but the medicinal value of plants are importantly limit to one few people[7], indeed, it is vital element in our environment. It is myth that, if the knowledge of the medical use of the plant is transferred to other person, this cannot work like a medicine[6]. So, it is essential to carry out the field base research regarding this so that it can contribute to prepare the data base of medicinal plant and their use.

The plants have not only the medicinal value, but it has also other value like cultural and religious. The medicinal, cultural and religious values of these plants are differed according to group of the people. Specifically, these use values have been determined by the ethnic or tribal group, ritual or ceremonial practices, spiritual practices, diet or self-healing practices[10-12]. The ethnic communities like; Majhi peoples have their own strong traditional knowledge which they use plants and their parts to heal different types of diseases. Same myth is applied here too, they generally do not like to transfer their medical knowledge related to plants and their parts to next generation. This is great threat to loss of the traditional knowledge of the medial use of the plants. Though, there are some study regarding the use of medical use of the plants in Nepal. Some examples are, recording of indigenous knowledge of Gurung, Bankariya and Chepang to use the medicinal plant[13]. However, intensive studies related to medicinal use of plants by the Majhi community are not so far explored yet. Majhi people are one of the inhabitants of Chure who lives in river side and fishing for their substance. They used parts of plants to fishing fish in river as a poisonous. In addition to they used plant parts as medicine such as; fever, fracture, diarrhea, dysentery and sinus etc. So, this research was objectively carried out to explore plant species used as medicine by Majhi community, find the medicinal use of the plant species and their importance and assess the availability of medicinal plant in Durga Mai and Bramha Thakur CF.

The study is relevant because the indigenous knowledge regarding the medicinal use of the plants have been threatened in different ways. One of the important point is, people still are not aware about the spreading the knowledge of use of the plants. They believe on the wrong myth so, such research is essential. Moreover, the pharmaceutical medicine is challenging the tradition knowledge of use of the plants for medicinal purpose. So, this research is important.

MATERIALS AND METHODS

Study area: Based on provincial policy, Makawanpur district is under the province number 3. Chure is important geographical region in Nepal, but it is very sensitive and fragile area and expanded in 36 districts and south part of Makawanpur is Chure range. Makawanpur district has been divided into 8 rural municipalities, 1 municipality and 1 sub-metropolitan city. Among 8 rural municipalities, Bakaiya rural municipality is selected for the study. Figure 1 shows the study area. Majhi community do not have their temples as they establish god and goddess at the base of tree near rivers[14]. The population of Majhi is 3115 in Makawanpur district which of them 200 Majhi lives in Bakaiya rural municipality[15].

Table 1 shows the geographical location, total area and total population of Makawanpur district. According to data, the total area of Makwanpur district is 242600.00 ha. The total population of the district is 420477. Out of this, male is 206684 and female is 213793. The total 86127 households are the residence of this district[16].

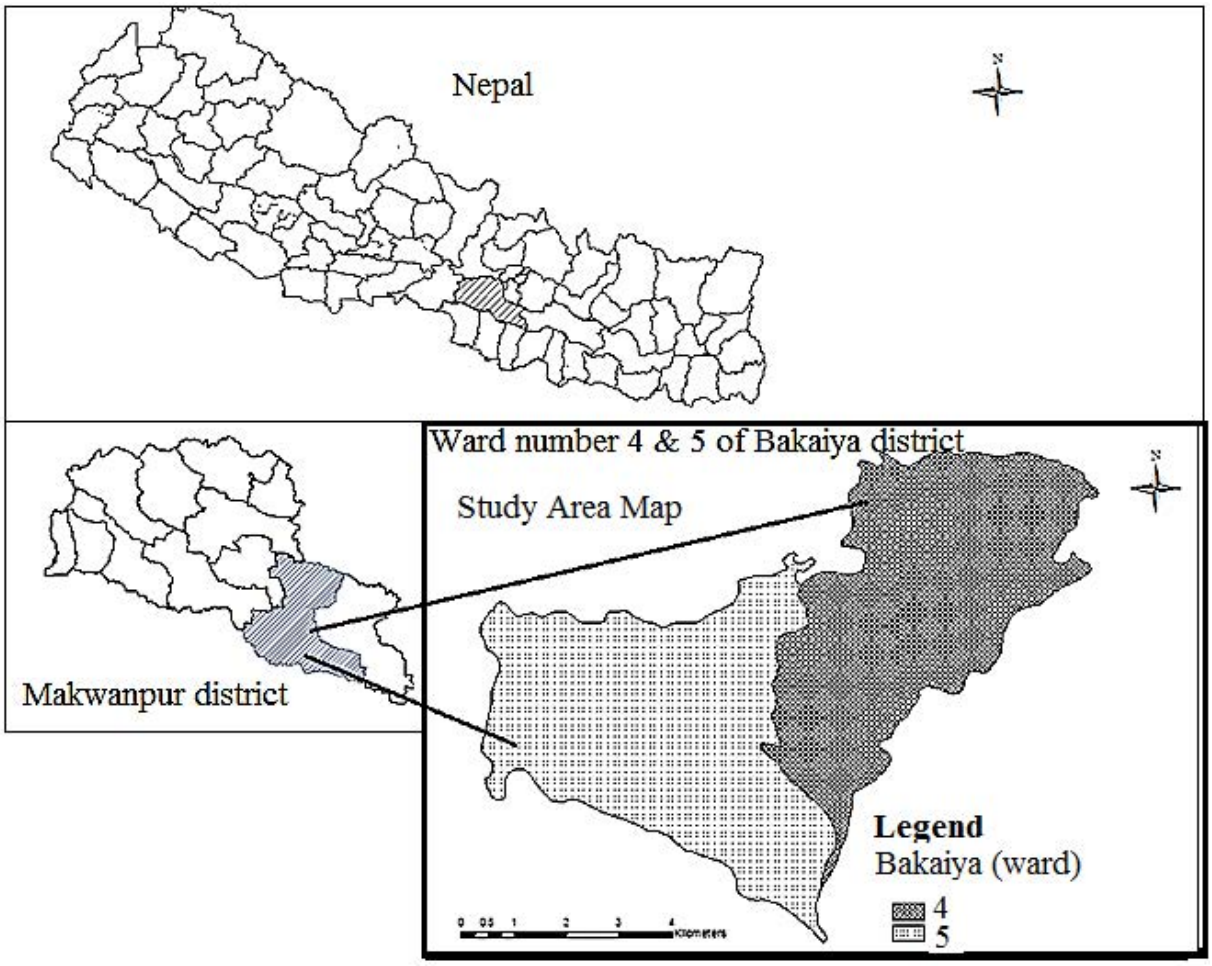

Fig. 1: Map of study area
Source: Field Survey, 2017

Primary data collection: Altogether, 64 samples having 10×10 m for tree and pole, 5×5 m for sapling including shrub and 1×1 m for seedling (herbs and climber) nested plots were established in the community forest. Number of plants were counted, diameter of the plants was measured. A total of 30 respondents were interviewed during HH survey. The semi-structured questionnaire was used for HH survey[17]. In addition, ten key informant intreviews, particularly Amchai (person who uses plants for medicinal purposes), Aurved doctors and senior citizens were done. The data was collected in 10th March-15th April, 2018.

Data analysis: The unknown plants were identified at the central herbarium, Godawari Lalitpur, Nepal.

The importance value index was calculated estimating the frequency, density and basal area[18]. The formulae used for the calculation of these attributes are given below:

Table 1: Geographic location, climate and area of study district

Geographical status and population	Status
Latitude	27°10'-27°40' N
Longitude	84°41'-85°31' E
Elevation from MSL	300-3000 m
Climate	Tropical to temperate
Average annual rainfall (mL)	2535
Area (km^2)	2426
Total population	420477
Male	206684
Female	213793
Population density (km^2)	170

Source: CBS[15]

$$\text{Frequency (\%)} = \frac{\text{No. of quadrats in which individual species occurred}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density (trees ha}^{-1}\text{)} = \frac{\text{Total number of individuals of a species}}{\text{Total number of quadrats studied} \times \text{Area of a quadrat}} \times 10000$$

$$\text{Basal area } (m^2) = \frac{\Pi d^2}{4}$$

Moreover, the abundance of shrubs and herbs species were determined[19]. Abundance is the study of the number of individuals of different species in the community per unit area. By quadrats method, samplings will made at random at several places and the number of individuals of each species will be summed up for all the quadrats divided by the total number of quadrats in which the species occurred. It is represented by the equation:

$$\text{Abundance (\%)} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats in which the species occurred}} \times 100$$

$$\text{Relative abundance} = \frac{\text{Abundance of individual species}}{\text{Total abundance of all species}} \times 100$$

Importance Value Index (IVI): Important Value Index (IVI) gives the overall importance of each species in the community structure. It will be calculated as the sum of relative values of density, frequency and basal area for tree. For herb and shrub, it will be calculated as the sum of relative values of density, frequency and relative abundance. The IVI values will be obtained by the following relations:

$$\text{Important value index (IVI)} = \text{Relative frequency+relative density +relative basal area}$$

RESULTS

The Majhi community has been using several plant species to treat various types of diseases. They were by using 47 species as medicinal purposes for different diseases. Some important examples are, they use *Acorus calamus* and *Zingiber officinale* to treat cough while *Nyctanthesar bortristis* and *Ficusben ghalensis* to treat throat infection (Table 2).

Plant species used as medicine by Majhi people from community forest: Community forest are the rich source of medicinal plants. Altogether, 25 plant species were recorded in Durga Mai and Brahma Thakur CFs. *Acacia catechu*, *Aeglemarmelos*, *Asparagus officinalis*, *Curculigo orchioide* and *Xeromphis spinose* are the important species recorded in these community forests which Majhi community uses to treat different diseases (Table 3).

Medicinal use of plant species found inside the CF and their importance to Majhi: There are several uses of medicinal plants by Majhi community and the respondents use frequency and importance of these species was varying in the community forests. The highest respondents use frequency was recorded 30 of *Chromolaena odorata* and the community use the leaf of this species to treat cut wound, while its importance was ranked as 1. Similarly, the community rank other plant species according to their importance (Table 4).

Some diseases are very common in the community so they use different plant species to treat the diseases. Specifically, the respondents shared that 5 plant species were used to treat Diarrhea, 4 plants were used to cure Dysentery, but in most of the case only one species was used to cure different disease like ear pain, skin cleaner and typhoid etc., (Fig. 2).

The social and ecological values of medicinal plants are significant as indigenous knowledge. According to community perception of both community forests, the *Chromolaena odorata* was socially and ecologically ranked as 1st and it was followed by *Shorea robusta* as ranked 2 (Table 5).

Importance value index of Durga Mai CF: Another important aspect of the tree species is the relative frequency, relative density and relative basal area which are parameter use to determine the ecological value. These values were varying according to species so their importance value index was also varying. The highest importance value index was recorded of *Shorea robusta* with 166.95, while it was the lowest of *Psidium guajava* with 3.4 in Durga Mai community forest (Table 6).

The highest importance value index of shrub species was recorded around 86.16 of *Woodfordia fruticose* which was followed by IVI value 71.06 and that was *Millettia extensa* (Table 7). On the other hand, the lowest value of *Calotropis gigantean* with 18.46.

The importance value index of the herb species was also varied according to the plants species. The highest value was 181.84 of *Chromolaena odorata* while it was the lowest 12.5 of 2 species particularly *Drymaria diandra* and *Drymaria diandra* (Table 8).

Table 2: Medicinal plant species and their traditional therapeutic uses outside the study forest area

Nepali name	Species	Family	Case	Traditional use
Bojho	*Acorus calamus*	Araceae	Cough	Chewing
Ghiukumari	*Aloe vera*	Liliaceae	Burn	Leaf juice apply externally
Aduwa	*Zingiber officinale*	Zingiberaceae	Cough	Burn and chewing
Kera	*Musa paradisiaca*	Musaceae	Diarrhea/dysentery	Juice take orally
Parijat	*Nyctanthes arbor-tristis*	Oleaceae	Throat infection	Boil with water and drink
Neem	*Azadirachta indica*	Meliaceae	Fever	Drink leaf juice after boil
Marich	*Piper nigrum*	Piperaceae	Cough	Chewing
Harro	*Terminalia chebula*	Combretaceae	Diarrhoea/dysentery	Juice take orally
Gurjo	*Tinospora sinensis*	Menispermaceae	weakness	Powder of stem use as energetic
Sisno	*Urtica dioica*	Urticaceae	fracture	Paste applied on fracture area
Titepati	*Artemisia indica*	Asteraceae	Cuts	Juice apply externally
Tatelo	*Oroxylum indicum*	Bignoniaceae	Jaundice/wound	Boil with water and drink
Pipla	*Piper longum*	Piperaceae	Cough	Chewing
Bayer	*Ziziphus jujube*	Rhamnaceae	Measles	Eating
Maraithi	*Blainvillea acmella*	Asteraceae	For fishing	Mix in river
Siru	*Imperata cylindrical*	Poaceae	wound/skin disease	Grinding
Mewa	*Carica papaya*	Caricaceae	Wrinkle	Rubbing
Kaphal	*Myric aesculenta*	Myricaceae	Diarrhea/dysentery	Juice take orally
Aaru	*Prunus persica*	Rosaceae	Wound	Grinding
Simali	*Vitexn egundo*	Verbenaceae	Burn	Apply externally
Lahsun	*Allium sativum*	Amaryllidaceae	Skin infection	Rubbing
Kavro	*Ficus lacor*	Moraceae	Throat infection	Rubbing
Dumri	*Ficus racemose*	Moraceae	Throat infection	Rubbing
Pipal	*Ficus religiosa*	Moraceae	Throat infection	Rubbing
Golbheda	*Lycopersicon esculentum*	Solanaceae	Burn	Apply externally
Bhuikathar	*Ananas comosus*	Bromeliaceae	warmness	Cooling agent
Aamp	*Mangifera indica*	Anacardiaceae	Diarrhea/dysentery	Juice take orally
Kantakari	*Solanum surattense*	Solanaceae	Tooth pain	Chewing
SayalPhusre	*Grewia optiva*	Malvaceae	Skin disease	Grinding and rubbing
Aiselu	*Rubus ellipticus*	Rosaceae	Fever	Paste take orally
ChiniJhar	*Scoparia dulcis*	Scrophulariaceae	Throat infection	Boil with water and drink
Gittha	*Dioscorea bulbifera*	Dioscoreaceae	Urine infection	Boil with water and drink
AnkhaChepuwa	*Equisetum diffusum*	Equisetaceae	Fever	Paste take orally
Tanki	*Bauhinia purpurea*	Fabaceae	Diarrhea/dysentery	Juice take orally
Sadan	*Desmodium oojeinense*	Fabaceae	For fishing	Mix in river
Angeri	*Lyonia ovalifolia*	Ericaceae	Scabies	Rubbing
Simi	*Vigna cylindrical*	Fabaceae	wrinkle	Leaf juice apply externally
Gandhe	*Ageratum conyzoides*	Asteraceae	Cuts	Juice apply externally
Bar	*Ficus benghalensis*	Moraceae	Throat infection	Rubbing
Pirre	*Persicaria barbata*	Polygonaceae	For fishing	Mix in river
Khirro	*Sapium insigne*	Euphorbiaceae	For fishing	Mix in river
Bihi	*Solanum nigrum*	Solanaceae	Headache	Eating
Rani sinka	*Aleuritopteris bicolor*	Pteridaceae	gastritis	Juice of plant take orally
BaluJhar	*Corchorus aestuans*	Malvaceae	Skin disease	Put its leaf around the infected area
AkashBeli	*Cuscuta reflexa*	Convolvulaceae	Jaundice/pressure	Boil with water and drink
Vringaraj	*Eclipta prostate*	Amaranthaceae	Cuts	Juice apply externally
Pangro	*Entada rheedei*	Fabaceae	Crack	Making dust and rub it on crack

Vegetation analysis of Brahma Thakur CF: The importance value of index were varying according to tree species found in Brahma Thakur CF. This was the highest of *Shorea robusta* with 195.44 which was followed *Cleistocaly xoperculatus* by with 36.29. This was the lowest 2.53 of *Psidium guajava* (Table 9).

The different shrub species possess the importance value index. It was the highest 89.35 of *Millettia extensa* and followed by *Woodfordia fruticose* with 88.62, a slight low value. This was the lowest around 24.66 of *Calotropis gigantean* (Table 10).

Table 3: List of plant species used by Manji communities in study area

Nepali name	Species	Family	Habit	Durga Mai CF	Brahma Thakur CF
Khair	*Acacia catechu*	Fabaceae	Tree	√	√
Bel	*Aegle marmelos*	Rutaceae	Tree	√	
Van Kurilo	*Asparagus officinalis*	Liliaceae	Herb	√	√
Aank	*Calotropis gigantean*	Apocynaceae	Shrub	√	√
Banmara	*Chromolaena odorata*	Asteraceae	Herb	√	√
Kyamuna	*Cleistocalyx operculatus*	Myrtaceae	Tree	√	√
Dhusure	*Colebrookea oppositifolia*	Lamiaceae	Shrub	√	√
SyalDhote	*Curculigo orchioides*	Hypoxidaceae	Herb	√	√
Avijalo	*Drymaria diandra*	Caryophyllaceae	Herb	√	
Asuro	*Justica adhatoda*	Acanthaceae	Shrub	√	
Gaujo	*Millettia extensa*	Fabaceae	Shrub	√	√
Lajjawati	*Mimosa pudica*	Fabaceae	Herb	√	
Rudilo	*Pogostemon benghalensis*	Lamiaceae	Herb	√	√
Amba	*Psidium guajava*	Myrtaceae	Tree	√	√
Chilaune	*Schima wallichii*	Theaceae	Tree	√	√
Sal	*Shorea robusta*	Dipterocarpaceae	Tree	√	√
KukurDiyno	*Smilex aspera*	Smilacaceae	Herb	√	√
Jamun	*Syzygium cumini*	Myrtaceae	Tree	√	√
Saj	*Terminalia alata*	Combretaceae	Tree	√	√
Barro	*Terminalia bellirica*	Combretaceae	Tree	√	
Dhayero	*Woodfordia fruticose*	Lythraceae	Shrub	√	√
Khasreto	*Ficushispida*	Moraceae	Tree		√
Khanyao	*Ficusse micordata*	Moraceae	Tree		√
Maidel	*Xeromphis spinose*	Rubiaceae	Tree		√
Dhobini	*Mussaenda macrophylla*	Rubiaceae	Shrub		√
	Total			21	20

Table 4: Medicinal use of plant species used by Majhi found inside CF

				Durga Mai CF		Brahma Thakur CF	
Scientific name	Part used	Case (disease)	Medicinal use method by Majhi (Ethnic use)	Respondents use frequency	Importance (Rank)	Respondents use frequency	Importance (Rank)
Acacia catechu	Bark, heart-wood	Fracture	Paste applied on fracture area	11	20	13	18
Calotropis gigantean	Latex	Wound/fever	Rubbing	17	14	20	11
Psidium guajava	Bark	Diarrhea	Juice take orally	10	21	11	20
Justica adhatoda	Leaf	Pneumonia	Boil with water and drink	20	11	0	0
Drymaria diandra	Whole plant	Sinus	Burn and take smell	16	15	0	0
Chromolaena odorata	Leaf	Cut/ wrinkle	Juice apply externally	30	1	30	1
Terminalia bellirica	Fruit	Cough	Chewing	18	13	0	0
Aegle marmelos	Fruit, bark	Diarrhea	Juice take orally	12	19	0	0
Schima wallichii	Bark	For fishing/gastric	Mix in river/mix in water and drink	13	18	16	15
Woodfordia fruticosa	Flower	Diarrhea/dysentery	Juice take orally	28	3	28	3
Colebrookea oppositifolia	Leaf	Sinus	Smell	21	10	25	6
Millettia extensa	Climber/ Root	For fishing	Mix in river	26	5	27	4
Syzygium cumini	Bark	Diarrhea/dysentery	Juice take orally	15	16	17	14
Smilex aspera	Stem	Cultural use	Hanging on door	14	17	23	8
Cleistocalyx operculatus	Leaf	Sinus	Smell	22	9	21	10
Mimosa pudica	Root	Crying baby	Paste take orally	25	6	0	0
Pogostemon benghalensis	Leaf	Throat infection	Boil with water and drink	19	12	26	5
Terminalia alata	Bark, latex	Dysentery	Juice take orally	24	7	14	17
Shorea robusta	Bark, latex	Diarrhea/dysentery	Juice take orally	29	2	29	2
Curculigo orchioides	Root	skin cleaner	Rubbing	27	4	22	9
Asparagus officinalis	Stem	Cultural use	Lactation promoter	23	8	18	13
Mussaenda macrophylla	Root	Typhoid	Grinding	0	0	24	7
Ficus semicordata	Latex	Throat infection	Rubbing	0	0	19	12
Ficus hispida	Latex	Ear pain	Put drop of branch juice internally	0	0	12	19
Xeromphis spinose	Bark	For fishing	Mix in river	0	0	15	16

Table 5: Social and ecological ranking of species in the community forests

	Durga Mai CF		Bramhathakur CF	
Scientific name	Social ranking	Ecological ranking	Social ranking	Ecological ranking
Chromolaena odorata	1	1	1	2
Shorea robusta	2	2	2	1
Woodfordia fruticose	3	3	3	4
Millettia extensa	5	4	4	3
Colebrookea oppositifolia	10	5	6	6
Justica adhatoda	11	6	0	0
Terminalia alata	7	7	17	18
Cleistocalyx operculatus	9	8	10	10
Curculigo orchioides	4	9	9	9
Mimosa pudica	6	10	0	0
Asparagus officinalis	8	11	13	11
Pogostemon benghalensis	12	12	5	5
Calotropis gigantean	14	13	11	12
Terminalia bellirica	13	14	0	0
Drymaria diandra	15	15	0	0
Smilex aspera	17	16	8	8
Syzygium cumini	16	17	14	13
Schima wallichii	18	18	15	15
Aegle marmelos	19	19	0	0
Acacia catechu	20	20	18	19
Psidium guajava	21	21	20	20
Mussaenda macrophylla			7	7
Ficus semicordata			12	14
Ficus hispida			19	16
Xeromphis spinose			16	17

"0" indicates that the species not found in that CF

Table 6: Importance value index of tree species of Durga Mai CF

Nepali name	Species	RF	RD	RBA	IVI	IVI rank
Sal	*Shorea robusta*	27.78	65.24	73.93	166.95	1
Saj	*Terminalia alata*	22.22	10.16	17.06	49.44	2
Kyamuna	*Cleistocalyx operculatus*	19.44	17.11	0.02	36.58	3
Barro	*Terminalia bellirica*	8.33	1.60	6.95	16.89	4
Jamun	*Syzygium cumini*	8.33	2.67	0.91	11.91	5
Chilaune	*Schima wallichii*	5.56	1.60	0.54	7.70	6
Bel	*Aegle marmelos*	2.78	0.53	0.26	3.58	7
Khair	*Acacia catechu*	2.78	0.53	0.25	3.56	8
Amba	*Psidium guajava*	2.78	0.53	0.09	3.40	9

RF: Relative frequency, RD: Relative density, RBA: Relative basal area, IVI: Important value index

Table 7: Importance value index of shrub species of Durga Mai CF

Species	Nepali name	RBA	RF	RD	IVI	Rank
Woodfordia fruticose	Dhayero	21.02	30.77	34.38	86.16	1
Millettia extensa	Gaujo	15.29	30.77	25.00	71.06	2
Colebrooke aoppositifolia	Dhusure	17.83	23.08	21.88	62.79	3
Justica adhatoda	Asuro	38.22	7.69	15.63	61.53	4
Calotropis gigantean	Aank	7.64	7.69	3.13	18.46	5

RF: Relative frequency, RD: Relative density, IVI: Important value index, RBA: Relative basal area

Table 8: Importance value index of herb species of Durga Mai CF

Species	Family	Nepali name	RBA	RF	RD	IVI	Rank
Chromolaena odorata	Asteraceae	Banmara	45.12	52.63	84.09	181.84	1
Curculigo orchioides	Hypoxidaceae	Syal Dhote	12.20	10.53	4.55	27.27	2
Mimosa pudica	Fabaceae	Lajjawati	12.20	10.53	4.55	27.27	3
Asparagus officinalis	Liliaceae	Van Kurilo	12.20	5.26	2.27	19.73	4
Pogostemon benghalensis	Lamiaceae	Rudilo	6.10	10.53	2.27	18.90	5
Drymaria diandra	Caryophyllaceae	Avijalo	6.10	5.26	1.14	12.50	6
Smilex aspera	Smilacaceae	Kukur Diyno	6.10	5.26	1.14	12.50	7

RF: Relative frequency, RD: Relative density, IVI: Important value index, RBA: Relative basal area

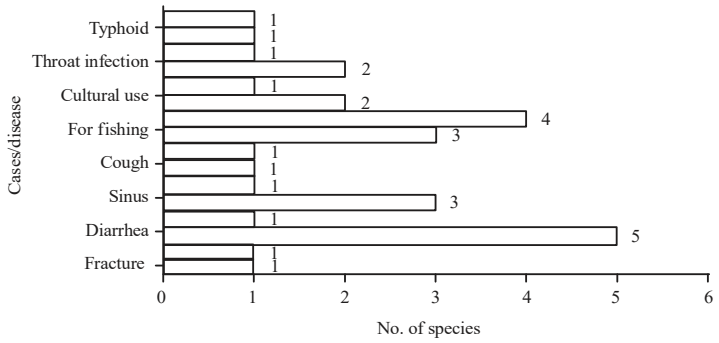

Fig. 2: Species used as medicine in different cases/disease

Table 9: Importance value index of tree species of Bramhathakur CF

Species	Nepali name	RF	RD	RBA	IVI	Rank
Shorea robusta	Sal	23.26	75.33	96.85	195.44	1
Cleistocalyx operculatus	Kyamuna	18.60	17.33	0.36	36.29	2
Syzygium cumini	Jamun	16.28	1.33	0.12	17.73	3
Xeromphis spinose	Maidel	11.63	2.17	0.04	13.83	4
Schima wallichii	Chilaune	11.63	1.83	0.04	13.50	5
Ficus hispida	Khasreto	4.65	0.83	0.73	6.21	6
Ficus semicordata	Khanyao	4.65	0.33	0.66	5.64	7
Terminalia alata	Saj	4.65	0.50	0.46	5.62	8
Acacia catechu	Khair	2.33	0.17	0.73	3.22	9
Psidium guajava	Amba	2.33	0.17	0.04	2.53	10

RF: Relative frequency, RD: Relative density, RBA: Relative basal area, IVI: Important value index

Table 10: Importance value index of shrub species of Bramhathakur CF

Species	Family	Nepali name	RA	RF	RD	IVI	Rank
Millettia extensa	Fabaceae	Gaujo	37.84	18.18	33.33	89.35	1
Woodfordia fruticose	Lythraceae	Dhayero	18.92	36.36	33.33	88.62	2
Colebrookea oppositifolia	Lamiaceae	Dhusure	16.22	18.18	14.29	48.68	3
Mussaenda macrophylla	Rubiaceae	Dhobini	16.22	18.18	14.29	48.68	4
Calotropis gigantean	Apocynaceae	Aank	10.81	9.09	4.76	24.66	5

RF: Relative frequency, RD: Relative density, IVI: Important value index, RBA: Relative basal area

Table 11: Importance value index of herb species of Bramhathakur CF

Species	Nepali name	RBA	RF	RD	IVI	Rank
Chromolaena odorata	Banmara	34.78	33.33	53.85	121.96	1
Pogostemon benghalensis	Rudilo	15.53	26.67	19.23	61.43	2
Smilex aspera	Kukur diyno	12.42	20.00	11.54	43.96	3
Curculigo orchioides	Syal dhote	24.84	6.67	7.69	39.20	4
Asparagus officinalis	Van Kurilo	12.42	13.33	7.69	33.45	5

RF: Relative frequency, RD: Relative density, IVI: Important value index, RBA: Relative basal area

The herb species are also ecologically very important which the Majhi community use to treat different diseases. The highest importance value index was 121.96 of *Chromolaen aodorata* which was followed by *Pogostemon benghalensis* with 61.43. The lowest value was recorded of *Asparagus officinalis* that was 33.45 (Table 11).

Interrelation between social ranking and ecological ranking of species used by Majhi community in both CF: The correlation between the ranking based on social and ecological importance were very strong and positive in both community forests. The R^2 values were 0.867 and 0.0961 between bot variables. It indicated that the species used for medicinal purpose by Majhi community (Fig. 3, 4).

DISCUSSION

The total number of species used for medicinal purpose by Majhi community of Bakaiya rural municipality was many species. It was found lower than Brahmin community which has been using 84 species for medicinal purpose[20] and Tamang community has been using 161 species for medicinal purpose[21,22]. It indicated that the medicinal use of plant species in present study is lower than other community. It is

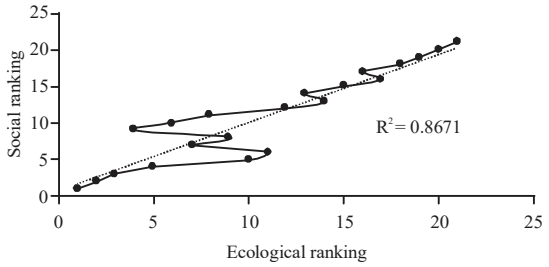

Fig. 3: Interrelation between social and ecological ranking of Durga Mai CF

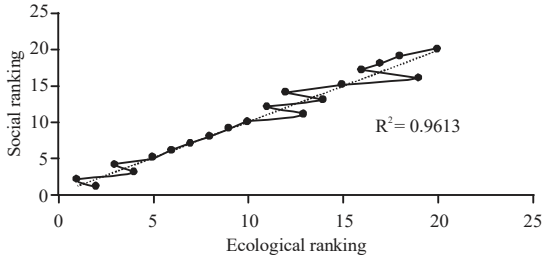

Fig. 4: Inter relation between social and ecological ranking of Bramhathakur CF

probably because the study was focused only in Bakiya Rural Municipality. The Brahmin community is more literate than Majhi so, they use more medicinal plant with the help of studying many books[23]. As well as the Tamang community lives different geographical location such as; hilly area where the medicinal plant found much more than the Bakaiya rural municipality. The ethnobotany knowledge is source of medicinal use of plants[24,25]. Thus, the result were different. The further study will be carried out in other geographical region and area for evaluate the Majhi knowledge on medicinal plant.

In Nepal, 305 species of tree, shrub and herbs are used as medicinal purpose[26]. Among them only 25 species were used by Majhi people. Majhi were used the identified medicinal plant only in few purpose such as; for fishing, diarrhea, dysentery, cough, throat infection, burn, cuts and cracks.

In Durga Mai CF, the social ranking of *Chromolaena odorata* was 1 followed by *Shorea robusta* 2 and so on as shown in Table 5. This indicated that in both CF *Chromolaena odorata, Shorea robusta* and *Woodfordia fruticose* were highly preferred in study area. It was probably because these species were found easily and frequently in forest. These species are generally use in cuts, diarrhea and dysentery. The Majhi community live in river side in study area and due to use of running water for drinking they face problem of diarrhea and dysentery. To cure these disease they use these species thus, these species probably were highly preferred by Majhi.

The IVI of species indicated the availability of plant species. *Shroea robusta* has high IVI value 166.95 in Durga Mai CF and 195.44 in Brahma Thakur CF. Study area was located in tropical region where Sal was dominant species thus, probably its IVI value was higher than other species. Majhi community also socially ranked this species as ranked 2. It means this species is highly preferred and used by them probably due to it was frequently available. Similarly, *Psidium guajava* has lower IVI value (3.40) in Durga Mai CF and 2.53 in Brahma Thakur CF. Study area was located in tropical region near the human surrounding where people planted *Psidium guajava* in their garden and probably it was germinated through seed dispersal and found thus probably its IVI value was lower than other species. *Psidium guajava* is not specially forest species so its availability in forest is rare thus, its IVI is lower and also Majhi community less prefer this species. The traditional knowledge of medicinal purpose is very old concept, but its use is still valid[27-29]. The major limitations of the study are sharing of the medical use of the plants and people's belief. In addition, the research can contribute to record use of medicinal plants for different purposes.

CONCLUSION

Majhi communities have knowledge about medicinal use of plant but they only use their knowledge for their own community and personal use not in professional way and not for trade. In Durga Mai CF in tree species *Shroea robusta* showed the highest importance value index. In shrub species *Woodfordia fruticosa* has highest the importance value index. In herb species *Chromolaena odorata* (Banmra) showed the highest importance value index. These species are very valuable. In Brahma Thakur CF in tree species *Shroea robusta* (Sal) possessed the highest IVI value. In shrub species *Millettia extensa* (Gaujo) showed the highest importance value index. In herb species *Chromolaena odorata* (Banmra) possessed the highest importance value index. It showed that Sal, Gaujo and Banmara species are very valuable. The indigenous knowledge regarding medicinal use should be transferred to young generation to conserve the practice.

SIGNIFICANCE STATEMENT

The local knowledge is believed as the ornament of the society. The medicinal use of the plant to treat the different types of disease is traditional transferred from experienced senior citizen to new young generation. The knowledge of use of medicinal plants not only save the cost of treatment, but also the ethnobotanical importance of the plant. Some plant

species are very valuable in the society and they have been used for different purpose. Local people believe on local experts, so medicinal use of different species to treat different diseases need to explore. Therefore, this study is very significant.

REFERENCES

1. Rijal, A., 2011. Surviving on knowledge: Ethnobotany of Chepang community from mid-hills of Nepal. Ethnobotany Res. Applic., 9: 181-215.
2. Hasan, M.K., P. Gatto and P.K. Jha, 2013. Traditional uses of wild medicinal plants and their management practices in Nepal-A study in Makawanpur district. Int. J. Med. Aromat. Plants, 3: 102-112.
3. Karki, L., 2001. Documentation of indigenous knowledge on the utilization of plant resources by the Chepang community of Dhusa VDC Dhading, Central Nepal. Kathmandu, Nepal, pp: 1-106.
4. Akerele, O., 1992. Importance of Medicinal Plants: WHO's Programme. In: Natural Resources and Human Health: Plants of Medicinal and Nutritional Value, Baba, S., O. Akerele and Y. Kawaguchi (Eds.)., Elsevier, Amserdam, Netherlands, pp: 63-77.
5. Manandhar, N.P., 1989. Medicinal plants used by Chepang tribes of Makawanpur district, Nepal. Fitoterapia, 60: 61-68.
6. Shrestha, J.R. and K.K. Sutton, 2000. Annotated Checklist of the Flowering Plants of Nepal. The Natural History Museum, London, UK.
7. Singh, R., 2015. Medicinal plants: A review. J. Plant Sci., 3: 50-55.
8. Ghimire, S.K., 2008. Medicinal Plants in the Nepal Himalaya: Current Issues, Sustainable Harvesting, Knowledge Gaps and Research Priorities. In: Medicinal Plants in Nepal: An Anthology of Contemporary Research, Jha, P.K., S.B. Karmacharya, M.K. Chettri, C.B. Thapa and B.B. Shrestha (Eds.)., Ecological Society, Kathmandu, Nepal, pp: 25-42.
9. Rao, B.R.R. and D.K. Rajput, 2015. Global scenario of medicinal plants. Proceedings of the National Conference on Conservation of Medicinal Plants-Herbal Products and Their Uses, Volume 1, November 25-26, 2015, At Arts and Science College for Women, Andhra Mahila Sabha, Hyderabad, India.
10. Dangol, D.R., 2008. Traditional uses of plants of commonland habitats in Western Chitwan, Nepal. J. Inst. Agric. Anim. Sci., 29: 71-78.
11. Koirala, R.R. and B.N. Khaniya, 2009. Present status of traditional medicines and medicinal & aromatic pants related resources & organizations in Nepal. Technical Report. Nepal Health Research Council, Kathmandu, Nepal.
12. Singh, S., 2015. Ethnobotanical study of indigenous knowledge on some wild plants in Parsa district, Nepal. J. Nat. Hist. Mus., 29: 103-121.
13. Gurung, K., 2016. Revision of genus *Dioscorea* L. (Dioscoreaceae) in Nepal. M.Sc. Thesis, Central Department of Botany, Tribhuvan University, Kathmandu, Nepal.
14. Malla, B., D.P. Gauchan and R.B. Chhetri, 2015. An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of Western Nepal. J. Ethnopharmacol., 165: 103-117.
15. CBS., 2011. Statistical census report, Nepal. Centre Bureau of Statistics, Nepal.
16. DPR., 2017. Plant Diversity in Central Chure Region, Nepal. Ministry of Soil and Forest Conservation, Makwanpur.
17. Aryal, K.P., 2007. Uncultivated Plants: An option for livelihood support of the people in mid-hills of Nepal. M.S. Thesis, Swedish Biodiversity Centre, Upsala.
18. Burlakoti, C. and S.B. Karmacharya, 2004. Quantitative analysis of macrophytes of Beeshazar Tal, Chitwan, Nepal. Himalayan J. Sci., 2: 37-41.
19. Devi, L.S. and P.S. Yadava, 2006. Floristic diversity assessment and vegetation analysis of tropical semievergreen forest of Manipur, North East India. Trop. Ecol., 47: 89-98.
20. Chapagain, N.H. and R. Tamang, 2017. Ethnobotany on Chepang Community in Nepal. District Plant Resources Office, Makawanpur, Nepal.
21. Luitel, D.R., M.B. Rokaya, B. Timsina and Z. Münzbergová, 2014. Medicinal plants used by the Tamang community in the Makawanpur district of central Nepal. J. Ethnobiol. Ethnomed., Vol. 10. 10.1186/1746-4269-10-5
22. Tamang, R. and D.R. Sedai, 2016. Documentation of ethnomedicinal knowledge on plant resources used by baram community in Arupokhari VDC, Gorkha district, Central Nepal. Bull. Dept. Plant Resourc., 38: 60-64.
23. Chapagain, N.H., R.K. Pandit and R. Tamang, 2016. Flowering Plants of Makawanpur. District Plant Resources Office, Makawanpur, Nepal.
24. Harshberger, J.W., 1896. The purposes of ethno-botany. Bot. Gazette, 21: 146-154.
25. Martin, G.J., 1995. Ethnobotany: A Methods Manual. Chapman and Hall, London.
26. DFRS., 2014. Churia forests of Nepal. Forest Resource Assessment Nepal Project. Department of Forest Research and Survey, Babarmahal, Kathmandu, Nepal.
27. Napit, R., 2016. Species diversity, forest community structure and regeneration in Banke national park. Nepal J. Sci. Technol., 16: 17-30.
28. Faulks, P.J., 1958. An Introduction of Ethnobotany. Moredale Publication, London.
29. Sharma, L. and R. Bastakoti, 2009. Ethnobotany of *Dioscorea* L. with emphasis on food value in Chepang communities in Dhading district, central Nepal. Bot. Orientalis: J. Plant Sci., 6: 12-17.