



Ethnomedicinal use of Common Garden Species in Arghakhanchi district, Western Nepal

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Abstracts: This study mainly sheds light on the ethnomedicinal uses of plants present in and around home gardens in the western mid-hills of Nepal. The study was conducted in Sandhikharka municipality, Arghakhanchi district during June-July 2020. The primary data was obtained through, semi-structured questionnaire survey, discussion with key informants (n=41) and field visit. The data then was quantitatively analyzed using 3 ethnobotanical indices viz. Informant consensus factor (F_{ic}), Use frequency (UF) and Use value (UV). A total of 52 plant species with ethnomedicinal importance belonging to 32 families and 48 genera were recorded. Out of which Astereceae and Lamiaceae were the dominant families followed by Amaranthaceae, Poaceae and Rosaceae with the whole plant being the most frequently (15 species) used parts. A total of 23 species were used to treat different types of gastrointestinal ailments. Oral route was found to be desirable route of administration (43 species, 82.69%) followed by topical (23 species, 44.23%) and inhalation (1 species, 1.92%). Most informants agreed upon use of reported species with an average F_{ic} value of 0.79 where *Ocimum tenuiflorum* was found to be the most frequently used species with UF= 0.79 and UV= 1.63. This study revealed that local people were mostly familiar with common ailments mainly cough, common cold, fever, skin infections etc and used these reported species to treat those ailments. As this study area harbors high diversity of medicinal plants, and older individuals possessed relatively higher ethnobotanical knowledge than the younger age class. Hence, the emphasis should be given for the documentation of this knowledge and transferring them to the younger generation before they are lost or disappeared. Also, there is need for conservation of valuable medicinal plant species.



यो शोधपत्रले मुख्यतः घरवरिपरीका करेसाबारी, बगैचा र खालीठाउँमा पाइने विभिन्न प्रजातिका बोटविरुवाको प्रयोगको बारेमा वर्णन गर्दछ। अर्घाखाँची जिल्ला, सन्धिखर्क नगरपालिकामा सन् २०२० को जुन र जुलाई महिनामा गरिएको यस अध्ययनको लागि प्राथमिक तथ्यांक ४१ जना जानकारसङ्ग अर्धसंरचित प्रश्नावली सर्वेक्षण र समूह छलफलको माध्यमबाट प्राप्त गरिएको थियो, र आवश्यक सन्दर्भसामग्री अन्यमाध्यमबाट प्राप्त गरिएको थियो। बोटविरुवाको पहिचान गर्न र फोटो लिन अध्ययन क्षेत्र वरिपरि भ्रमणसमेत गरिएको थियो। त्यसपछि आएको तथ्यांकलाई गुणात्मक र मात्रात्मकरूपमा विश्लेषण गरिएको थियो जसकालागी ३ वटा इथ्नोबोटानिकल सूत्रहरू प्रयोग गरिएको थियो।

अध्ययनको क्रममा ३२ परिवारका ५२ वटा इथ्नोमेडिसिनल महत्वका प्रजाति अभिलेख गरिएको थियो। जसमध्ये *Astereaceae*, *Lamiaceae* सबैभन्दा बढि प्रजाति भएका परिवार थिए भने ति पछि *Amaranthaceae*, *Poaceae*, *Rosaceae* थिए। १५ वटा प्रजातिको सम्पूर्ण बोटनै प्राय प्रयोग हुने रहेछ भने २३ प्रजातिहरू पेट सम्बन्धी विकारहरूको विभिन्न प्रकारको उपचार गर्न प्रयोग गरिने गरेको पाईयो। मौखिक मार्ग र छालामा प्रयोग औषधी सेवनको मुख्य मार्ग थियो भने तुलसी (*O. tenuiflorum*) सर्वाधिक प्रयोग हुने गरेको देखियो। यस अध्ययनले पत्ता लगायो कि स्थानीय मानिसहरू प्रायः सामान्य रोगको बारेमा बढी परिचित थिए विशेष गरी पेटको विकार, साधारण रुघाखोकी, ज्वरो, छालाको संक्रमण आदि र यी रिपोर्ट गरिएका प्रजातिहरू ती बिरामीहरूको उपचारका लागि प्रयोग गर्ने देखियो। यस अध्ययन क्षेत्रमा औषधीय गुणयुक्त बोटहरूको उच्च विविधता भएको र वृद्ध उमेर समुहमा तुलनात्मक रूपमा यस्तो ज्ञानको स्वामित्व रहेको अनुसन्धानले देखाउँछ। तसर्थ, यस ज्ञानको दस्तावेजीकरण र प्रजातिहरू हराउनु अघि ज्ञान युवा पुस्तामा हस्तान्तरण गर्न जोड दिनु पर्दछ। साथै, मूल्यवान औषधीय बोटहरूको संरक्षणको आवश्यकता पनि देखिन्छ।

मुख्य शब्दहरू औषधीय बोटविरुवा, एथ्नोबोटानिकल सूचकांक, एथ्नोफार्माकोलोजी, आवृत्ति प्रयोग

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Keywords: Medicinal plants, ethnobotanical indices, ethno-pharmacology, use frequency

INTRODUCTION

Throughout history, humans are known to use various plant parts primarily as a source of food in curative purpose in different ailments (Mall et al., 2015) and they have developed their own systems of knowledge for the use of plants in food, clothing, medicine as well as in spiritual needs (Rajbhandari & Winkler, 2015). The earliest record of the use of plants as medicine is found in *Rigveda*, which was written between 4500 BC and 600 BC describing 67 plants. *Rigveda* is supposed to be the oldest repository of human knowledge of medicinal plants (Malla & Shakya, 1970). After *Rigveda*, *Ayurveda* (the foundation of science of life and art of healing based on Hindu culture) described the medicinal importance of 1200 plants (Kunwar et al., 2006). *Vaidyas* and *kabirajs* achieved the knowledge of these systems by using a large number of plants for medicine. Apart from *Ayurveda*, other traditional health systems like *Homeopathy*, *Aamchi*, and *Folklore* also used a variety of plants containing a large number of spread of pharmacologically active ingredients and each herb has its own unique combination and properties (Kunwar et al., 2006; Mall et al., 2015) which proves the crucial role of the traditional medicines in the healthcare system for a long time (Thorsen & Pouliot, 2016). WHO defines traditional medicine as the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment or physical and mental illness (WHO, 2013), and traditional healthcare systems are directly linked with natural resources and culture (Koirala & Khaniya, 2009; Abbott, 2014). Majority of population throughout the world are using medicinal plants as a chief source of crude drugs for their primary health care needs. Because of its ethnic and biological diversity, the dependence is also widespread in Nepal (Adhikari et al., 2019). The ethnic communities hold the

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significant customary knowledge on utilization of those plant and plant parts. The trend of transferring this indigenous practice from generation to generation also exists till date (Acharya & Acharya, 2009). And for the advantage of the society, ethnobotany plays a crucial role in study, documentation and use of that indigenous knowledge linked with nature (Acharya, 2012). The ethno-botanical knowledge is acquired through observation, experience of older people, folklores, trial and error, and different documents. And highlighting the rural people, the knowledge provides considerable economic as well as medicinal benefits (Bussmann, 2002). Though Nepal occupies only 0.9% of the world's land area, it possesses nearly 7% of the total medicinal herbs of the world (Schippmann et al., 2002; Williams, 2005) and WHO recorded more than 21000 plant species have been used globally for medicinal purpose (WHO, 2002). In Nepal also more than 2000 species of plants with ethno-medicinal value have been regularly used in rural, remote, and suburban area (Rokaya et al., 2010; Kunwar et al., 2013). It is estimated that 17% of urban residents have access to modern medicines and the remaining population still has to depend on traditional medicine systems even for their basic health care (CBS, 2007; Uprety et al., 2010; UNEP, 2012;). There is a general observation that indigenous knowledge on uses of such plants is being degraded severely due to changing lifestyle and perception of the forest dwellers, as well as commercialization and socio-economic transformation on a global scale (Gadgil et al., 1993). The comprehensive works on the ethnobotanical plants of Nepal has been already published in literature (Mall et al., 2015). Despite the fact that there are a handful of ethnomedicinal studies conducted in Arghakhanchi district, none of them focused on species commonly found in the gardens near the residential area. The present study, therefore, aspires to investigate and document the plant-based indigenous knowledge about those species of the local people and explore their ethnomedicinal uses.

MATERIAL AND METHODS

Study area: This study was done in Sandhikharka municipality, ward number -1 of Arghakhanchi district, a western hilly district situated in Province 5, Nepal. It lies in between 27° 45'- 28° 06' N latitude and 80° 54'-83° 23' E longitude with an area of 1193 km² (CBS, 2012). The geographical boundaries of Arghakhanchi district are linked with Palpa and Gulmi in the east, Pyuthan and Dang in the west, some part of Gulmi in the north and Kapilvastu and Rupendehi in the south. The climate of district varies from tropical to temperate while most of the area lies under subtropical region. Mahabharat range covers about 68% of the total and the rest is covered Siwalik Hills (AEPC, 2016). The average maximum and minimum temperature of the study area ranges between 25-27 °C in May-July and 5-7 °C in January (DHM, 2017). The elevation of the district varies from 305m to 2515m above the sea level. Complex topography, climatic variation and other physical characteristics have made this district rich in diverse habitat with useful species like *Pinus roxburghii*, *Castanopsis indica*, *Shorea robusta*, *Schima wallichii* etc with tropical, sub-tropical and temperate forest types. Ethnic groups like Brahmin, Chhetri and other groups inhabit the district with total population of 197,632 (CBS, 2012) and livelihood of majority of inhabitants is based on agriculture and forestry. Besides, elementary occupation, craft and trade also plays an important role in standard living among locals

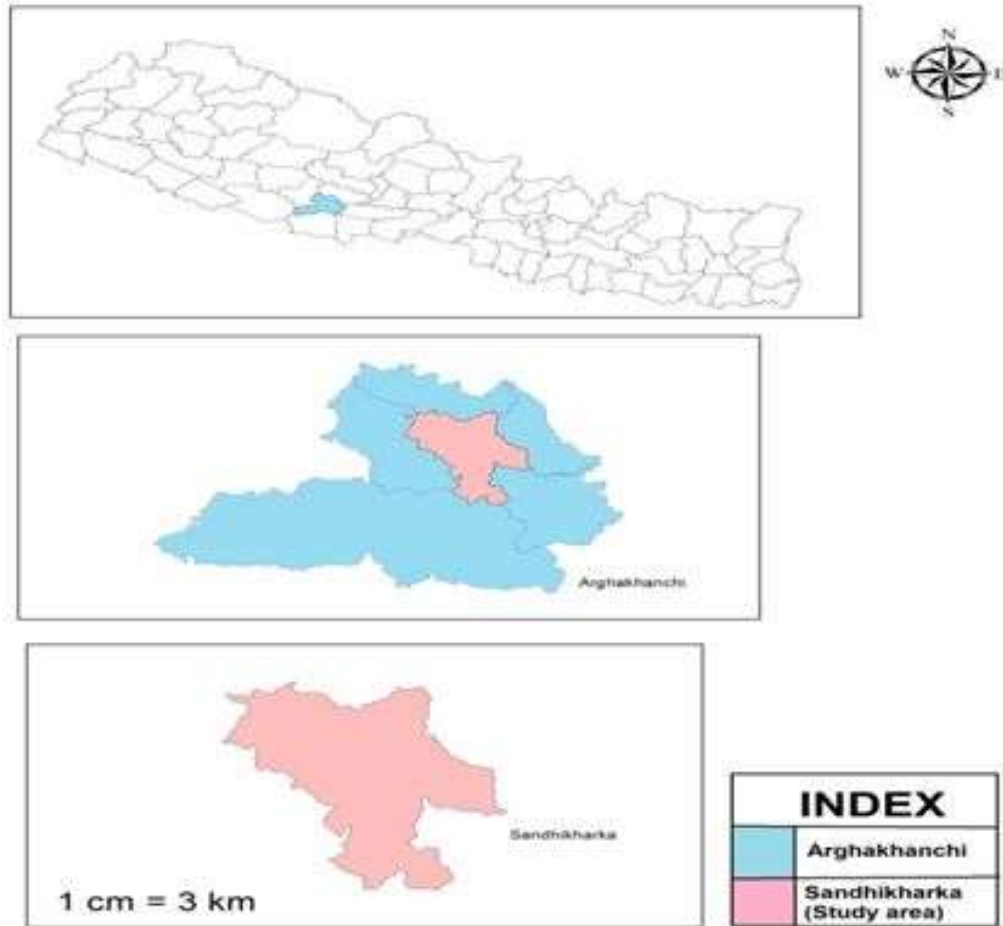


Figure 1. Map showing Sandhikharka Municipality, Arghakhanchi district, Lumbini Province, Nepal

Data collection: The study was done during June and July months of 2020. The primary data about plant parts and their uses were gathered by interviewing key informant (n= 41) using open ended semi-structured questionnaire. Verbal consent was obtained from the respondents prior to the interview. Key informants were of old age group (above 60 years old), school teachers, and local healers who have traditional knowledge of using local plants for the treatment of various diseases for a long time. Direct observation was done around the home garden to gather information about the medicinal herbs which are present within the study area. Plants were identified in the field by informants and researcher using 'home garden sampling' method (Thomas et al., 2007). Further identification was done using standard literature (Polunin & Stainton, 1984; Polunin et al., 1987; Press et al., 2000; Manandhar, 2002; Rajbhandari & Rai, 2017) and expert consultation. For the botanical nomenclature, The Plant List (<http://www.theplantlist.org/>) was followed. Photos



evidence of all the plants with known medicinal uses was taken. To test the reliability of reported plant uses we compared our data with previously published ethnobotanical literatures of Arghakhanchi (Panthi & Singh, 2013; Acharya et al., 2015;) and neighboring district of western Nepal (Ale et al., 2009; Acharya & Acharya, 2009; Gubhaju & Ghimire, 2010; Acharya, 2012; Singh & Kumar, 2017, Singh et al., 2018; Gubhaju & Gaha, 2019; Khanal et al., 2020;). We also consulted review on medicinal plants (Ghimire & Pyakurel, 2008; Uprety et al., 2016; Bhattarai, 2018; Adhikari et al., 2019), and recent studies in various regions of Nepal (Dhami, 2008; Ambu et al., 2020; Gahatraj et al., 2020; Kadel et al., 2020; Bhatt & Kunwar, 2020, Budha-magar et al., 2020). Recently published articles were collected from online portals such as Google scholar and research gate (Timilsina et al., 2020)

Data analysis: The data thus collected were collated in Microsoft Office Excel 2010 to analyze qualitatively about the information regarding plant families, habits, parts used, dosage forms, routes of administration, and the number of ailments treated. Data were expressed in terms of number and percentage. The data were further processed quantitatively using three ethnobotanical indices, Informant consensus factor (F_{ic}), Use Frequency (UF) and Use Values (UV), as followed.

Informant consensus factor (F_{ic}): The F_{ic} was calculated in order to determine the homogeneity of information given by informants. The F_{ic} is calculated by the as follows (Trotter & Logan, 1986; Heinrich et al., 1998; Singh et al., 2012; Bhat et al., 2014).

$$F_{ic} = \frac{Nur - Nt}{Nur - 1}$$

Where, Nur is the number of informants using particular plant species for particular ailment category and Nt is the total number of plant species used by all informants for that particular category. F_{ic} ranges between 0 -1 and, high F_{ic} indicates the agreement among informants on the use of that species for a certain disease category.

Use frequency (UF): Use frequency (UF) was used to determine the frequency of use of particular plant species. UF was calculated using the following formula as used by (Tardio & Santayana, 2008)

$$UF = \frac{U}{n}$$

Where U is the number of informants who cite the use of given plant species and n is the total number of informants interviewed in the survey. It doesn't denote whether a particular species has single or multiple uses. (Budha-Magar et al., 2020)

Use value (UV): The relative importance of each plant species was calculated by using the use value (UV) for each species with given formula (Phillips and Gentry, 1993).

$$UV = \frac{\sum U_c}{n}$$

Where U_c is the number of uses mentioned by each informant for a given species and n is the total number of informants.



RESULTS

Demographic features: A total of 41 (26 male and 15 female) informants aged between 28 and 85 years were interviewed as shown in table 1. Of this 23 belonged to Brahmin followed by Chettri (11), Dalit (5) and others (2). All of them followed the Hindu religion. Informants of age classes above 50 had relatively higher ethnobotanical knowledge than of younger age class (Figure 2) and females (average number of use = 18.87 and average number of plant species reported = 8.73) had more knowledge in comparison to males (average number of use=18.23 and average number of plant species reported=7.69). Among the informants, 5 were illiterate, 7 had primary level of literacy, 18 had secondary and 11 had university level. Average annual income of informants was about \$ 3782 (Table 2). It estimates that 24.39% of them were permanent resident (n=10) of the study area and remaining 75.61% migrated (n=31) there.

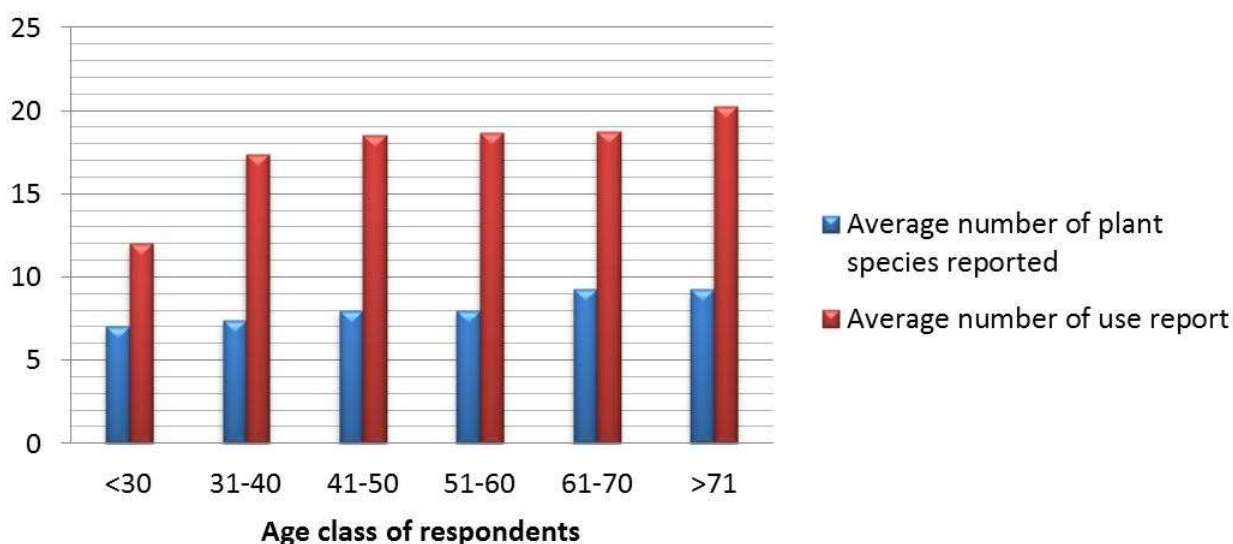


Figure 2 Comparison of ethnobotanical knowledge in different age classes.

Table 1 Demographic characteristics of respondent

Gender	Number of Informant by Gender and Age group (Years)					
	<30	31-40	41-50	51-60	61-70	>71
Men	1	4	11	6	2	2
Women	0	6	5	0	2	2
Total	1	10	16	6	4	4



Table 2 Socio - economic characteristics of respondents

Characteristics	Individual	Percentage (%)
Ethnicity		
Brahmin	23	56.10
Chhetri	11	26.83
Dalit	5	12.20
Others	2	4.7
Education level		
Illiterate	5	12.20
Primary	7	17.07
Secondary	18	43.90
University	11	26.83
Annual Income (in US dollars)		
<1000	4	9.76
1000 - 4000	20	48.78
4000 - 8000	15	36.58
>8000	2	4.88

Plant diversity, growth forms and parts used: The present study revealed the use of total 52 species belonging to 32 families and 48 genera. Out of 32 families, Asteraceae (6 species) and Lamiaceae (5 species) were the dominant families followed by Amaranthaceae, Poaceae and Rosaceae, each with 3 species. Out of remaining 27 families, 5 families had 2 species and other possessed a single species. Regarding life form, herbs (32 species, 61.54%) were the most used followed by shrubs (7 species, 13.46%), trees (5 species, 9.62%), grasses (3 species, 5.77%), climbers (3 species, 5.77%), ferns (1 species, 1.92%) and parasitic plant (1 species 1.92%) (Table 3).

Table 3 List of medicinal plants with their scientific name, family, local name, life form, parts used found in study area.

S.N	Family	Botanical Name	Local Name	Common Name	Use Value UV	Use Frequency UF	Habit	Parts Used
1	Acanthaceae	<i>Justicia adhatoda</i> L.	Asuro	Malabar nut	0.59	0.20	Shrub	Leaf, Stem
2	Acoraceae	<i>Acorus calamus</i> L.	Bojho	Sweet Flag	0.41	0.15	Herb	Rhizomes
3	Amaranthaceae	<i>Chenopodium album</i> L.	Bethe	Lamb's quarter	0.68	0.20	Herb	Whole plant
4	Amaranthaceae	<i>Achyranthes bidentata</i> Blume	Datiwal	Ox Knee	0.54	0.29	Herb	Stem, Leaf
5	Amaranthaceae	<i>Amaranthus viridis</i> L.	Lude sag	Slender amaranth	0.07	0.07	Herb	Whole plant
6	Amaryllidaceae	<i>Zephyranthes carinata</i>	Vui Champa	Pink rain lily	0.10	0.10	Herb	Tuber
7	Anacardiaceae	<i>Mangifera indica</i> L.	Aap	Mango	0.12	0.12	Tree	Bark
8	Apiaceae	<i>Centella asiatica</i> (L.) Urb.	Tapre jhar	Indian pennywort	0.66	0.20	Herb	Whole plant
9	Apocynaceae	<i>Calotropis gigantea</i> (L.) Dryand.	Aank	Giant milkweed	0.83	0.24	Shrub	Flower, Latex ,Stem
10	Apocynaceae	<i>Catharanthus roseus</i> (L.) G.Don	Sadabahr	Rose periwinkle	0.51	0.15	Herb	Leaf

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11	Araceae	<i>Arisaema tortuosum</i> (Wall.) Schott	Sarpako makai	Whipcord cobra lily	0.22	0.22	Herb	Fruits
12	Asparagaceae	<i>Asparagus racemosus</i> Willd.	Kurilo	Asparagus	0.12	0.12	Herb	Stem
13	Asteraceae	<i>Cirsium verutum</i> (D.Don) Spreng.	Sungure	Common Thistle	0.20	0.07	Herb	Root
14	Asteraceae	<i>Acmella oleracea</i>	Ghar marati	Toothache plant	0.61	0.20	Herb	Whole part.
15	Asteraceae	<i>Tagetes erecta</i> L.	Sayapatri	Marigold	0.27	0.15	Herb	Flower, Leaf
16	Asteraceae	<i>Artemisia dubia</i> L. ex B.D.Jacks	Titepati	Mugwort	0.34	0.12	Herb	Leaf
17	Asteraceae	<i>Ageratum conyzoides</i> (L.) L.	Gandhe Jhar	Goat weed	0.17	0.17	Herb	Whole plant
18	Asteraceae	<i>Ageratina adenophora</i> (Spreng.) R.M. King & H. Rob.	Kalo banmara	Crofton weed	0.10	0.10	Shrub	Leaf
19	Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Bhui katahar	Pineapple	0.05	0.05	Shrub	Fruit
20	Cannabaceae	<i>Cannabis sativa</i> L.	Bhang	Hemp	0.07	0.07	Shrub	Leaf, seed
21	Convolvulaceae	<i>Cuscuta reflexa</i> Roxb.	Aakash Beli	Dodder	0.10	0.10	Parasitic plants.	Whole plant
22	Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Patharjhata	Miracle leaf	0.44	0.20	Herb	Leaf
23	Cucurbitaceae	<i>Momordica charantia</i> L.	Tite karelo	Bitter gourd	0.34	0.17	Climber	Fruit
24	Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Githa	Air potatoes	0.20	0.15	Climber	Fruit
25	Equisetaceae	<i>Hippochaete debilis</i> (Roxb. ex Vaucher) Ching	Kurkure	Rough Horsetail	0.27	0.10	Herb	Whole plant
26	Euphorbiaceae	<i>Euphorbia hirta</i> L.	Dudhe jhar	Asthma weed	0.37	0.07	Herb	Whole plant
27	Euphorbiaceae	<i>Euphorbia royleana</i> Boiss.	Siundi	Sullu spurge	0.24	0.15	Shrub	Stem, latex
28	Lamiaceae	<i>Salvia splendens</i> Sellow ex Schult.	Baramase ful	Scarlet sage	0.05	0.05	Shrub	Leaf
29	Lamiaceae	<i>Ocimum basilicum</i> L.	Bamari	Basil	0.49	0.15	Herb	Flower, Leaf
30	Lamiaceae	<i>Mentha Arvensis</i> L.	Pudina	Peppermint	0.41	0.15	Herb	Leaf
31	Lamiaceae	<i>Perilla frutescens</i> (L.) Britton	Silam	Perilla	0.15	0.15	Herb	Seed
32	Lamiaceae	<i>Ocimum tenuiflorum</i> L.	Tulasi	Sacred basil	1.63	0.46	Herb	Whole plant
33	Menispermaceae	<i>Tinospora sinensis</i> (Lour.) Merr.	Gurjo laharo	Giloy	0.15	0.10	Climber	Stem
34	Moraceae	<i>Morus alba</i> L.	Kimbu	Mulberry	0.05	0.02	Tree	Fruit,
35	Myrtaceae	<i>Psidium guajava</i> L.	Belauti	Guava	1.24	0.44	Tree	Leaf,Fruit
36	Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	Jamun	Black plum	0.17	0.17	Tree	Fruit ,Bark
37	Nyctaginaceae	<i>Mirabilis jalapa</i> L.	Malati	4 o' clock plant	0.20	0.12	Herb	Roots
38	Oxalidaceae	<i>Oxalis corniculata</i> L.	Amilo jhar	Indian sorrel	0.24	0.12	Herb	Whole plant
39	Oxalidaceae	<i>Oxalis debilis</i> var. <i>corymbosa</i> (DC.) Lourteig.	Charimlo	Pink sorrel	1.05	0.22	Herb	Whole plant



40	Poaceae	<i>Desmostachya bipinnata</i> (L.) Stapf	Kush	Salt reed grass	0.02	0.02	Grass	Whole plant
41	Poaceae	<i>Cynodon dactylon</i> (L.) Pers.	Dubo	Bermuda grass	0.20	0.10	Grass	Whole plant
42	Poaceae	<i>Dendrocalamus hamiltonii</i>	Dhanu bans	Bamboo	0.12	0.07	Grass	Stem
43	Polygonaceae	<i>Rumex nepalensis</i> Spreng	Halhale sag	Nepal dock	0.07	0.07	Herb	Whole part
44	Rosaceae	<i>Potentilla indica</i> (Andrews) Th. Wolf	Bhui kafal	Mock strawberry	0.17	0.17	Herb	Fruit
45	Rosaceae	<i>Rubus ellipticus</i> Sm.	Ainselu	Golden evergreen raspberry	0.49	0.12	Herb	Leaf, Fruit
46	Rosaceae	<i>Prunus cerasoides</i> Buch.-Ham. ex D. Don	Paiyu	Himalayan cherry	0.02	0.02	Tree	Bark
47	Solanaceae	<i>Solanum nigrum</i> L.	Camai	Blackberry nightshade	0.44	0.24	Herb	Whole plant
48	Solanaceae	<i>Solanum viarum</i> Dunal	Kantakari	Tropical soda apple	0.24	0.24	Herb	Seed
49	Urticaceae	<i>Urtica dioica</i> L.	Sisno	Stinging nettle	0.15	0.12	Herb	Whole Plant
50	Woodsiaceae	<i>Deparia boryana</i> (Willd.) M. Kato	Kali neuro	Fern	0.20	0.15	Fern	Shoot
51	Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	Ghiu kumara	Indian aloe	0.39	0.12	Herb	Leaf
52	Zingiberaceae	<i>Curcuma caesia</i> Roxb.	Kalo haledo	Black Turmeric	0.41	0.22	Herb	Rhizome

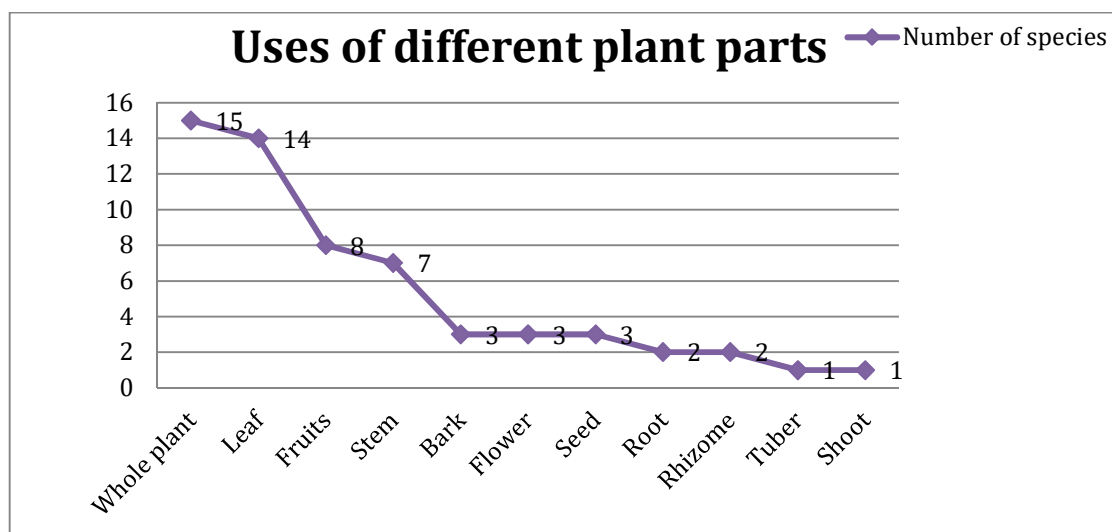


Figure 3 Line graph showing plant parts used



Almost all the plant parts were used for treating different ailments. The most frequently used plant part was whole plant (15 species), followed by leaf (14 species), fruits (8 species), stem (7 species), bark, flower, seed (3 species), root, rhizome (2 species), tuber and shoot (1 species).

Forms of medication preparation and route of admission: The study revealed that different preparations like paste, eaten raw, roasted, cooked, juice, powder, tea, fuming, boiled etc are used to prepare medication. Paste (26 species, 50%) was the most common used followed by eaten raw (19 species, 36.54%), cooked (12 species, 23.08%), juice (11 species, 21.15%), roasted (4 species, 7.69%), tea (3 species, 5.77%), fuming, latex and powder (2 species, 3.85% each) and boiled (1 species, 1.92%). Most species were used in more than one preparation forms. Most of the medication forms were freshly prepared and some of the plants species were used to treat more than one ailment. The diagrammatic representation of different disease categories with number of plants species used to treat them is shown in Figure 4 and the list of plants with their uses and photographs as given in appendix 1.

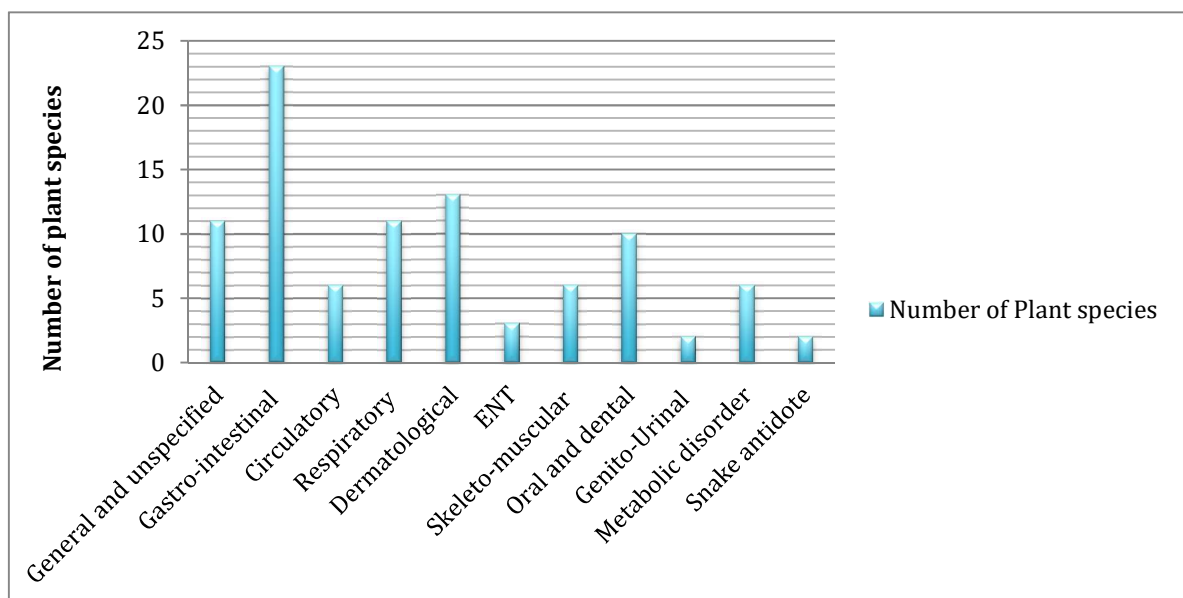


Figure 4 Bar graph showing disease category and number of plant species used

Similarly, oral route was found to be most preferred route of admission (43 species, 82.69%), followed by topical (23 species, 44.23%), inhalation (2 species, 3.85%) and instillation (1 species, 1.92%). Similar observations were reported in numerous study Mall et al., 2015; Bhattarai, 2018; (Adhikari et al., 2019;).

Informant Consensus Factor (F_i), Use Frequency (UF) and Use Value (UV): The Informant Consensus Factor provides quantitative measures to highlight the use of plant species and the degree of agreement of informants about their use in each category of ailments(Ambu et al., 2020). The



different ailments and diseases were classified into 11 categories and a F_{ic} value for each category was calculated. The results of F_{ic} showed that the values ranged from 0.5 to 0.93. Ailment category with problems related to ENT showed highest F_{ic} value (0.93) with 29 use reports of 3 species. It is followed by Genito-Urinary problems (F_{ic} = 0.92). Both general and respiratory disorders had F_{ic} value of 0.91 with 117 use reports and 17 plant species each. The least agreement between informants was recorded in oral and dental problems with F_{ic} value of 0.5 for 19 use reports for 10 species. (Table 4)

Table 4 Informant consensus factor (F_{ic}) by various ailments

Ailment category	Total no. of Use Reports (N_{ur})	Total no. of Plant species (N_s)	F_{ic}
ENT (Ear, Nose , Throat) problems	29	3	0.93
Genito-Urinary problems	14	2	0.92
General (Fever, Headache, Typhoid and unspecified)	117	11	0.91
Respiratory disorders	117	11	0.91
Antidote for Snake bite	12	2	0.91
Dermatological disorders (including cuts and wound)	121	13	0.9
Gastrointestinal disorders	186	23	0.88
Skeleto-muscular disorders	44	6	0.88
Circulatory disorders	39	6	0.87
Metabolic disorders	42	6	0.87
Oral and dental problems	19	10	0.5

In this study, the most frequently used species was *O. tenuiflorum* (UF= 0.46) with 19 informants reporting its use. *P. guajava* (UF= 0.44) was second frequently used species with 18 use reports followed by *A. bidentata* (UF =0.29). *C. gigantea*, *S. nigrum*, *S. viarum* were other frequently used species with UF =0.24 and 10 use reports each. Similarly in terms of Use Value (UV), *O. tenuiflorum* (UV=1.63) was the most important species followed by *P. guajava* (UV = 1.24), *O. debilis* (UV= 1.05). And *D. bipinnata*, *P. cerasoides* possessed the least use value (UV = 0.02). (Table3).

DISCUSSION

From this study we tried to find out knowledge of local people about ethnomedicinal importance of plants species commonly present in home garden around the study area. In terms of plant diversity, plant parts used, life forms the results of our study resembled to other studies on ethnobotany and ethnomedicine conducted in various region of Nepal (Koirala & Khaniya, 2009; Uprety et al., 2010; Bhattarai et al., 2011; Mall et al., 2015). The majority of plants used were herbs; this could be because of abundant presence of them in study sites rather than shrubs and herbs, easy collection and also the high effectiveness of them in the cure of different ailments (Singh et al., 2012). Whole plants and leaves were found to be frequently used plant parts. This is because of the leaves, and other aerial parts contain the higher amount of biologically active substances (Srithi et al., 2009). The knowledge efficiency about plant parts must've been evolved through years of observation, experimentation and knowledge transfer. The results also depicted that informants of



older age group (50 and above) were more knowledgeable than younger ones. Similar findings were reported in previous studies done in Nepal (Luitel et al., 2014; Bhattarai & Tamang, 2017; Bhattarai, 2018;). This may be because they were born and brought up with less or no exposure to modern medicine, and older generation watches over and functions as keeper of traditional knowledge in most societies (Quinlan & Quinlan, 2007). Moreover older individuals may have gathered around more ethnobotanical knowledge with exposure to ailments and their cure than of younger generation. In gender wise comparison, females registered slightly more numbers of plant species and use reports which was similar to previous studies (Luitel et al., 2014; Bhattarai, 2018; Singh et al., 2018), which may be because of females are generally homemakers and have to deal with health of family members.

Comparison of our findings with previously published ethnobotanical studies conducted in Arghakhanchi and other region of Nepal revealed that all the species were already mentioned at least in one use category. This comparison with studies we considered (Appendix 1); showed that *H. debilis*, *S. splendens*, *O. basilicum* and *P. frutescens* had novel use reports. *H. debilis* was used for dermatological purpose and to cure jaundice in poly-herbal preparation but previous study (Acharya, 2012) reported its use to treat high and low body temperature of body. A close species *E. arvense* has been used in cure of rheumatic fever, brittle fingernail, hair loss which showed antibacterial, antifungal, antioxidant, analgesic, anti-inflammatory, anti-diabetic, anti-tumor, cytotoxic and anti-convulsant activities (Asgarpanah & Ruhi, 2012). Also ethyl acetate extract of *H. debilis* was found to be protective against oxidation, melanoma and melanin production (Li et al., 2016) which justifies use of *H. debilis* dermatological cure and polyherbal formulation to treat jaundice. Similarly *S. splendens* was used as remedy for fever in the study area and china (Xu et al., 2018) but it was previously shown for anti-diabetic use (Ranjitkar & Rajbhandari, 2008). Likewise in the study area *O. basilicum* was used as tea to treat cold, cough and sore throat, but study from Kaligandaki watershed of western Nepal, reported its use in dermatological and urinary disorder (Joshi & Joshi, 2000). Both uses can be justified by the presence of essential oil like linalool and possession of analgesic, anti-inflammatory, antimicrobial, antioxidant properties (Bilal et al., 2012). Seeds of *P. frutescens* was used to treat cough and nausea (Uprety et al., 2016) and as spices (Ambu et al., 2020) and but in the study area it was used as blood purifier in polyherbal formulation along with sesame oil which can be attributed to presence of anti-oxidants like phenolic acids, flavonoids, and carotenoids (Ahmed, 2018). Such difference in ethnomedicinal uses of medicinal plants within Nepal is maybe because of geographical and ecological variation. As the claimed medicinal uses were backed by previous ethnomedicinal and phytochemical studies, it is proved that the people of the study possess rich amount of ethnobotanical knowledge.

The highest numbers of species were used to treat gastrointestinal and dermatological ailments, which was similar to results of previous studies conducted in Rupendehi (Singh et al., 2012), Palpa (Singh et al., 2018), Ilam (Bhattarai, 2018), Rolpa (Budha-Magar et al., 2020) and Kavrepalanchowk (Ambu et al., 2020) district of Nepal. High number of ethnomedicinal reports regarding those ailments caused by irregular dietary habits, poor sanitation was claimed because of prevalence of those ailments in the study area. People were still using those traditional medicines to treat various ailments may be because of easy availability and extensive ethnomedicinal practices (Kunwar et al., 2014). Freshly harvested plants were used more often because they found it more effective. Many of the reported species like *D. bipinnata*, *O. tenuiflorum*, *C. roses* etc had multiple uses for religious, ornamental and other household purposes which can be attributed to easy accessibility



and usefulness of homgarden. And some plants like *S. acemella*, *C. reflexa*, *P. guajava*, were used mixed with other species in different remedies.

Quantitatively, with an average F_{ic} value of 0.79 for all ailment categories the results of Informant consensus factor (F_{ic}) was similar to previous studies conducted in various region of Nepal (Uprety et al., 2010; Singh et al., 2012; Shrestha et al., 2014; Singh et al., 2018) but differs as reported in Kavrepalanchowk (Ambu et al., 2020) and Humla district (Rokaya et al., 2010). High F_{ic} value shows the high level of consensus among the informants about the usages of plants for intended purpose prevalent in the study area also, it suggests that the ethnomedicinal uses of plants are currently in practice in the study area.

Similarly, *O. tenuiflorum* (UV= 1.63, UF=0.46) was found to be the most used species with high use value and use frequency. *O. tenuiflorum* was cited by 19 informants for 67 uses which indicate the importance and use of that species. An early study also emphasizes the therapeutic properties of *O. tenuiflorum* which contains a wide array of pharmacologically active phytochemicals with broad margin of safety (Joshi, 2017). Furthermore, other species with relatively high importance (high UF and UV) signifies that these species are highly preferred as well contextually and culturally more important (Tardio & Santayana, 2008). Additionally, they may have high level of pharmacologically active compounds, so those species must be tested further for their phytochemical property (Akgul et al., 2018).

Most of the species reported in our study were cultivated for different purposes and some of them were naturally grown. During discussions and in interviews, informants claimed that the numbers of reported species as well as other plant species were decreasing. The lessening of number of the plants was mostly because of anthropogenic activities like urbanization, overgrazing, and introduction of invasive species which needs to be addressed for conservation and efficient use of those species for socio-economical as well as ecological benefits.

CONCLUSION

Present study revealed that the study area is rich in plants with medicinal properties and the elderly people of the community have greater knowledge on utilization of plants available in their gardens. It also showed that wide array of ailments can be treated with plants that are easily available locally. However, their understanding and use of the medicinal plants was mainly based on traditional system with little evidence based on science. So, reported medicinal plants need to be systematically studied for potential bioactive compounds used for designing drugs which will be a great contribution for pharmaceutical and herbal industries in Nepal. Our study also revealed that medicinal use of plants is declining due to the easy availability of modern medicines. Also, the youngsters of the study area showed less interest in traditional practices because of which the practice of using plants and plant parts for medicinal use is decreasing. Hence, the emphasis should be given for the documentation of this knowledge and transferring them to younger generation before they are lost or disappeared. Also, there is a need for conservation of valuable medicinal plants.



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DECLARATION OF CONFLICT OF INTEREST

We have no conflict of interest to declare.

REFERENCES

- Abbott, R (2014) Documenting traditional medical knowledge. World Intellectual Property Organization (March, 2014), Geneva.
- Acharya R, Marasini D, Acharya DP (2015) Traditional knowledge on medicinal plants used for the treatment of domestic cattle in Dhikura village of Arghakhanchi district, Nepal. 2(1):6-16.
- Acharya R (2012) Ethnobotanical study of medicinal plants of Resunga Hill used by Magar community of Badagaun VDC, Gulmi district, Nepal. Sci. World.10(10):54-65.
- Acharya R, Acharya KP (2009) Ethnobotanical study of medicinal plants used by Tharu community of Parroha VDC, Rupandehi district, Nepal. Sci. World. 7(7): 80-84.
- Adhikari M, Thapa R, Kunwar RM, Devkota HP, Poudel P (2019) Ethnomedicinal uses of plant resources in the machhapuchhre rural municipality of kaski district, Nepal. Medicines. 6(2): 69.
- Ahmed HM (2018) Ethnomedicinal, Phytochemical and Pharmacological Investigations of *Perilla frutescens* (L.) Britt. Molecules. 24(102)
- Ale R, Raskoti BB, and Shrestha K (2009) Ethnobotanical Knowledge of Magar Community In Siluwa VDC, Palpa District, Nepal. J. Nat. Hist. Mus. 24: 59-72.
- AEPC (2016) District climate and energy plan of Arghakhanchi District. Alternative Energy Promotion Center. National Rural and Renewable Energy Program. Khumaltar.
- Akgul A, Akgul A, Senol SG, Yildirim H, Secmen O, Dogan Y (2018) An ethnobotanical study in Midyat (Turkey), a city on the silk road where cultures meet. J. Ethnobiol Ethnomed. 14(1): 12.
- Ambu G, Chaudhary RP, Mariotti M, Cornara L (2020) Traditional Uses of Medicinal Plants by Ethnic People in the Kavrepalanchok District, Central Nepal. Plants. 9 (6): 759.
- Asgarpanah J, Roohi E (2012) Phytochemistry and pharmacological properties of *Equisetum arvense* L. J. Med. Plants Res. 6(21): 3689-3693.
- Bilal A, Jahan N, Ahmed A, Bilal SN, Shahida H and Hajra S (2012) Phytochemical and Pharmacological Studies on *Ocimum basilicum* Linn.- A Review. Int. J. Res. Rev. 4(23).
- Bhat P, Hegde GR, Hegde G, Mulgund GS (2014) Ethnomedicinal plants to cure skin diseases—An account of the traditional knowledge in the coastal parts of Central Western Ghats, Karnataka, India. J. Ethnopharmacol.151 (1):493-502.
- Bhatt MD, Kunwar RM (2020) Distribution pattern and ethnomedicinal uses of plants in Kanchanpur district, Far-Western Nepal. Ethnobot. Res. Appl. 20: 1-19.
- Bhattarai KR (2018) Ethnobotanical study of plants used by Thami community in Ilam District, eastern Nepal. Our Nat. 16(1): 55-67.



- Bhattarai KR, Maren IE, Chaudhary RP (2011) Medicinal plant knowledge of the Panchase region in the middle hills of the Nepalese Himalayas. *B.J.* 21(2): 31-33.
- Bhattarai S, Tamang R (2017) Medicinal and aromatic plants: A synopsis of Makawanpur District, central Nepal. *Int. J. Indig. Herbs Drugs.* 2(3): 6-15.
- Budha-Magar S, Bhandari P, Ghimire SK (2020) Ethno-medicinal survey of plants used by Magar (Kham) community, Rolpa district, Western Nepal. *Ethnobot. Res. Appl.* 19:1-29.
- Bussmann RW (2002) *Ethnobotany and Biodiversity Conservation In Modern Trends in Applied Terrestrial Ecology* (ed) Ambasht, R.S., Ambasht, N.K. Kluwer Publishers, Dordrecht, The Netherlands.
- CBS (2007) *Population Profile of Nepal*. Central Bureau of Statistics, Kathmandu, Nepal.
- CBS (2012) *National Population and Housing Census 2011 (National Report)*. Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.
- Dhami NR (2008) Ethnomedicinal uses of plants in the Western Terai of Nepal: a case study of Dekhatbhuli VDC of Kanchanpur district. *Medicinal plants in Nepal: an anthology of contemporary research*. ECOS, Nepal. 165-177
- DHM (2017) *Observed Climate Trend Analysis in the Districts and Physiographic Regions of Nepal (1971-2014)*. Department of Hydrology and Meteorology, Kathmandu.
- Gadgil M, Berkes F, Folke C (1993) Indigenous Knowledge for Biodiversity Conservation. *Ambio.* 22(2):15-156.
- Gahatraj S, Bhusal B, Sapkota K, Dhami B, Gautam D (2020) Common medicinal plants of Nepal: A review of Triphala: Harro (*Terminalia chebula*), Barro (*Terminalia bellirica*), and Amala (*Emblica officinalis*). *Asian J. Pharmacogn.* 4(3), 5-13.
- Ghimire K, Bastakoti RR (2009) Ethnomedicinal knowledge and healthcare practices among the Tharus of Nawalparasi district in central Nepal. *Forest Ecol. Manag.* 257: 2066-2072.
- Ghimire SK, Pyakurel D (2008) *A Manual of NTFPs of Nepal Himalaya (Gair Kastha Ban Paidawar Digdarshan)*. WWF Nepal, Kathmandu, Nepal.
- Gubhaju MR, Ghimire SK (2010) Ethnomedicinal practice in Dovan, Palpa district, Nepal. *J. Nat. Hist. Mus.* 25:140-154.
- Gubhaju MR, Gaha Y (2019) Ethnomedicinal Uses of Plants in Mityal, Palpa, Nepal. *J. Pl. Res.* 17(1):155 -162.
- Heinrich M, Ankli A, Frei B, Weimann C, Sticher O (1998) Medicinal plants in Mexico: Healers' consensus and cultural importance. *Soc. Sci. Med.* 47(11):1859-1871.
- Joshi RK (2017) Phytoconstituents, traditional, medicinal and bioactive uses of Tulsi (*Ocimum sanctum* Linn.): a review. *J. Pharmacogn. Phytochemi.* 6(2): 261-264.
- Joshi AR, Joshi K (2000) Indigenous knowledge and uses of medicinal plants by local communities of the Kali Gandaki Watershed Area, Nepal. *J. of Ethnopharmacol.* 73: 175-183.
- Kandel B, Thakuri BS, Paudel S, Sigdel S, Khanal P, Sapkota K, ... & Ghimire S (2020) Ethnobotanical uses of locally available plants for respiratory diseases by fifteen ethnic groups of Nepal: A. *Asian J. Pharmacogn.* 4(4), 11-21.
- Khanal DP, Raut B, Magar YT (2020) Traditional Healing Practices Using Herbal Dosage Forms and Other Agents by Magar Community of Gulmi District, Nepal. *J.M.M.I.H.S.* 6(1): 24-41.
- Koirala DRR, Khaniya BN (2009) *Present Status of Traditional Medicines and Medicinal & Aromatic Plants Related Resources & Organizations in Nepal (1st ed.)*. Nepal Health Research Council, Ramshah Path, Kathmandu, Nepal.



- Kunwar RM, Kshhetri HB, Rai SK, Bussmann RW (2006) Ethnomedicine in Himalaya: a case study from Dolpa , Humla , Jumla and Mustang districts of Nepal. J. Ethnobiol. Ethnomed. 2(27).
- Kunwar RM, Lamichhane Pandey M, Mahat Kunwar L, Bhandari A (2014) Medicinal plants and ethnomedicine in peril: a case study from Nepal himalaya. Evid-Based. Compl. Alt.
- Kunwar RM, Mahat L, Acharya RP, Bussmann RW (2013) Medicinal plants , traditional medicine , markets and management in far-west Nepal. J. Ethnobiol. Ethnomed. 9(24).
- Li PH, Chiu YP, Shih CC, Wen ZH, Ibeto LK, Huang SH and Wang HMD (2016) Biofunctional activities of *Equisetum ramosissimum* extract: protective effects against oxidation, melanoma, and melanogenesis. Oxid. Med. Cell. Longev. 2016.
- Luitel DR, Rokaya MB, Timsina B, and Münzbergová Z (2014) Medicinal plants used by the Tamang community in the Makwanpur District of Central Nepal. J. Ethnobiol. Ethnomed. 10(5).
- Malla B, Gauchan DP and Chhetri RB (2014) Medico-ethnobotanical investigations in Parbat district of Western Nepal. J. Med. Plants Res. 8(2): 95-108.
- Malla B, Gauchan DP, Chhetri RB (2015) An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of western Nepal. J. Ethnopharmacol. 165:103-117.
- Malla SB, Shaky PR (1970) Medicinal plants of Nepal. His Majesty's Government of Nepal, Ministry of Forests, Department of Medicinal Plants. Kathmandu
- Manandhar NP (2002) Plants and People of Nepal. Timber Press, Portland, Oregon, USA.
- Panthi MP, Singh AG (2013) Ethnobotany of Arghakhanchi District, Nepal: plants used in dermatological and cosmetic disorders. Int. J. Appl. Sci. Biotechnol. 1(2): 27-32.
- Phillips O, Gentry AH (1993) The useful plants of Tambopata, Peru: I. Statistical hypotheses tests with a new quantitative technique. Econ. Bot. 47(1):15-32.
- Polunin O, Stainton A (1984) Flowers of the Himalaya. Oxford University Press, New Delhi, India.
- Polunin O, Stainton A, Farrer A (1987) Concise Flowers of the Himalaya. Oxford University Press.
- Press JR, Shrestha KK, Sutton DA (2000) Annotated Checklist of the Flowering Plants of Nepal. The Natural History Museum, London.
- Quinlan MB, Quinlan RJ (2007) Modernization and medicinal plant knowledge in a Caribbean Horticultural Village. Med. Anthropol. Q. 21(2): 169-192.
- Rajbhandari KR, Rai SK (2017) A Handbook of the Flowering Plants of Nepal Volume 1. Government of Nepal, Ministry of Forests and Soil Conservation, Department of Plant Resources, Kathmandu, Nepal.
- Rajbhandari S, Winkler D (2015) Nepal: An introduction to the natural history, ecology and human environment of the Himalayas. Ethnobotany. 271-285.
- Ranjitkar S, Rajbhandari S (2008) Utilization of Medicinal Plants as Home Herbal-Remedy in some urban areas of Kathamandu. Nep. Jour. Plant Sci. 2: 56-65
- Rokaya MB, Münzbergová Z, Timsina B (2010) Ethnobotanical study of medicinal plants from the Humla district of western Nepal. J. Ethnopharmacol. 130.
- Sapkota PP (2008) Ethno-ecological Observation of Magar of Bukini, Baglung, Western, Nepal. D.J.S.A. 2: 227-252.
- Schippmann U, Leaman DJ, Cunningham AB (2002) Impact of Cultivation and Gathering of Medicinal Plants on
- © 2021, Asian Society of Pharmacognosy. All Rights Reserved.






Biodiversity: Global Trends and Issues.




- Shrestha N, Prasai D, Shrestha KK, Shrestha S, Zhang XC (2014) Ethnomedicinal practices in the highlands of central Nepal: A case study of Syaphru and Langtang village in Rasuwa district. *J. Ethnopharmacol.* 155(2):1204-1213.
- Singh AG, Kumar A (2017) Ethnomedicinal aspects of climbing plants of Palpa district, Nepal. *Trop. Plant. Res.* 4(2): 307-13
- Singh AG, Kumar A, Tewari DD (2012) An ethnobotanical survey of medicinal plants used in Terai forest of western Nepal. *J. Ethnobiol. Ethnomed.* 8(1): 19.
- Singh AG, Kumar A, Tewari DD, Bharati KA (2018). New ethnomedicinal claims from Magar community of Palpa district, Nepal. *Indian J. Tradit. Knowledge.* 17(7) :499–511.
- Srithi K, Balslev H, Wangpakapattanawong P, Srisanga P, Trisonthi C (2009). Medicinal plant knowledge and its erosion among the Mien (Yao) in northern Thailand. *J. Ethnopharmacol.* 123(2): 335-342.
- Tamang R, Thakur CK, Koirala DR, Chapagain N (2017) Ethno-medicinal Plants Used by Chepang Community in Nepal. *J. Plant Res.* 15: 21–30.
- Tardío J, Pardo-de-Santayana M (2008) Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). *Econ. Bot.* 62(1): 24-39.
- Timisina S, Bhattarai R, Miya M, Gautam D (2020) Sissoo, its Pathogenic constraints and their management in Nepal: A review. *Grassroots Journals of Natural resources.* 2020; 3:1-7
- Thorsen RS, Pouliot M (2016) Traditional medicine for the rich and knowledgeable: challenging assumptions about treatment-seeking behaviour in rural and peri-urban Nepal. *Health Policy Plan.* 31(3):314–324.
- Trotter RT, Logan MH (1986) Informant consensus: a new approach for identifying potentially effective medicinal plants. *Plants in indigenous medicine and diet.* Redgrave Publishing Company. Bedford Hill, NY.
- UNEP (2012) Green Economy Sectorial Study: Biotrade-Harnessing the Potential for Transitioning to a Green Economy- The Case of Medicinal and Aromatic Plants in Nepal. United Nations Environment Programme, Nairobi, Kenya.
- Uprety Y, Asselin H, Boon EK, Yadav S, Shrestha KK (2010) Indigenous use and bio-efficacy of medicinal plants in the Rasuwa District, Central Nepal. *J. of Ethnobiol. Ethnomed.* 6(3):1–10.
- Uprety Y, Poudel RC, Gurung J, Chettri N and Chaudhary RP (2016) Traditional use and management of NTFPs in Kangchenjunga Landscape: implications for conservation and livelihoods. *J. Ethnobiol. Ethnomed.* 12(19).
- WHO (2002) WHO Traditional Medicine Strategy 2002-2005. World Health Organization, Geneva
- WHO (2013) WHO Traditional Medicine Strategy 2014-2023. World Health Organization, Geneva.
- Williams N (2005) On the trail of Nepal's flora. *Curr. Biol.* 977-978.
- Xu J, Wei K, Zhang G, Lei L, Yang D, Wang W and Li M (2018) Ethnopharmacology, phytochemistry, and pharmacology of Chinese *Salvia* species: A review. *J. Ethnopharmacol.* 225: 18-30.






Appendix 1

S. N	Plant Name	Ethnomedicinal uses	Uses in earlier reference	Photographic evidence
1	<i>Catharanthus roseus</i> (L.) G. Don	<p>It is used by diabetes and high blood pressure patients.</p> <p>Its paste can be applied on skin to cure skin irritation, pimples and also to treat wasp stings.</p>	Flowers are eaten raw to maintain blood sugar level (Uprety et al., 2016)	
2	<i>Mentha arvensis</i> L.	<p>It is used after meals and also as a juice since it acts as a digestive aid.</p> <p>It can be used as mouth freshener and also for oral infections.</p> <p>It can be applied to the burned area.</p> <p>It has also been used as antifungal or antibacterial protection for crop plants.</p>	It is used as diuretic (Sapkota, 2008; Uprety et al., 2016) and it cures hotness of body, headache (Acharya, 2012) and helps in gastric disorder (Uprety et al., 2016)	
3	<i>Centella asiatica</i> (L.) Urb.	<p>It helps to improve the short-term memory loss and blood circulation also to cool down the body in summer.</p> <p>It contains wound healing properties and is used to reduce scars, including stretch marks.</p>	<p>Cure pneumonia in infants, gastritis, sore throat, fever, and skin diseases (Bhattarai, 2018; Bhatta & Kunwar, 2020; Gubhaju and Ghimire, 2010)</p> <p>enhance memory and act as a brain tonic (Acharaya, 2012)</p>	






4	<p><i>Oxalis debilis</i> var. <i>corymbosa</i> (DC.) Lourteig.</p>	<p>Whole plant is used as an antidote for snake bites and datura poisoning. Also it is applied on skin to cure warts, and used to do gargle. It is also used in infants to get rid of hookworm.</p>	<p>Used for Constipation (Khanal et al.,2020)</p>	
5	<p><i>Artemisia dubia</i> L. ex B.D.Jacks.</p>	<p>It is used to treat abdominal pain and diarrhea. Leaf juice is used to cure eye irritation and scabies. It is also used as a repellent against leeches and moths from the garden.</p>	<p>Used as insecticide and to treat skin diseases (Acharya et al., 2015; Budha-magar et al., 2020; Khanal et al.,2020; Uprety et al., 2016)</p>	
6	<p><i>Euphorbia hirta</i> L.</p>	<p>It helps in improving appetite and immunity power also in rehydrating. Its tea is used as a gargling agent to heal oral wounds as it kills bacteria. Paste of <i>Ocimum</i> leaves and asthma weed is used to cure pimples and its milk sap is applied on cracked lips. It is also used to cure kidney stones and diabetes.</p>	<p>Used in cataract (Gubhaju & Gaha, 2019) skin diseases and wounds (Bhatt & Kunwar,2020) diarrhea, dysentery, bronchial problems, fever, earache and snake bite(Dhami,2008)</p>	

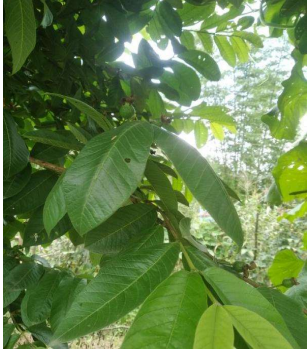




7	<i>Hippochaete debilis</i> (Roxb. ex Vaucher) Ching	Its mixture with <i>Allium sativum</i> , <i>Trigonella foenumgraecum</i> , and <i>Eryngium foetidum</i> is used to cure jaundice. It also has dermatological uses like to prevent hair fall, making nails strong and skin care.	Used for balancing hotness and coldness in the body(Acharya,2012)	
8	<i>Bryophyllum pinnatum</i> (Lam.) Oken	It has those properties that break the stone present in the kidney. It also helps to cure constipation, stomach ache, diarrhea and vomiting. It helps to enhance sleep and relief shortness of breathing	Dermatological uses (Gubhaju & Gaha, 2019; Uprety et al., 2016), cure of kidney stones (Ambu et al., 2020)	
9	<i>Calotropis gigantea</i> (L.) Dryand.	An extracted material from its bark is endowed for wound rejuvenating activities. Also it is used to cure skin diseases like white leprosy. Its anti-inflammatory property helps to obviate joint pain, burn and swelling. Its smoke is inhale to treat sinusitis. It acts as repellents for mosquitoes and several instars of larvae.	Dermatological uses, and to treat diarrhea, dysentery and respiratory diseases (Dhami,2008) sprains, headache, conjunctivitis (Gubhaju & Ghimire, 2010) Sinusitis(Acharya,2012),	

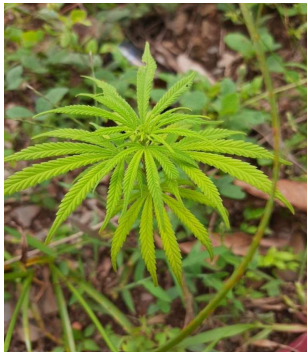




10	<i>Cuscuta reflexa</i> Roxb.	Mixture of <i>Centella asiatica</i> , <i>Equisetum hyemale</i> and <i>Cuscuta reflexa</i> is used to cure jaundice. It acts as a blood purifier also it is far said to be useful in skin disorders, joints pains.	Used to treat jaundice, constipation, bronchitis, fever and it is antihypertensive, cardio-tonic, antiviral and antibacterial. (Singh & Kumar, 2017) Used in joint pain and rheumatism (Ghimire & Bastakoti, 2009)	
11	<i>Justicia adhatoda</i> L.	Leaves are used for the preparation of herbal remedies used to treat cough, fever, asthma and dysentery. Seven young shoots are taken raw 2 or 3 times per day to cure from severe stomach pain.	Used to cure fever, cough (Gubhaju & Gaha, 2019) asthma and bronchitis (Malla et al., 2014) Leaf is smoked to cure sinusitis, treat cuts and wounds (Bhattarai, 2018), gastritis (Khanal et al, 2020) Urinary problems (Ambu et al., 2020)	
12	<i>Dendrocalamus hamiltonii</i> Nees & Arn. Ex Munro	It promotes human health healing cell damage and also treats certain forms of cancer. Paste of internodes has dermatological uses.	Paste of stem node is applied on boils (Singh et al., 2012) Used as vegetable (Uprety et al., 2016)	






13	<i>Psidium guajava</i> L.	<p>Leaf and bark extract is taken to cure cough, fever, diarrhea and also for constipation. Its raw roasted fruit is used to cure cough. Mixture of guava leaves, ajwain, sacred basil and lemon leaf is boiled and thus obtained liquid is taken 2 times per day to cure from throat pain, common cold. It is also used to treat constipation. Due to its antioxidants properties, it helps in healing cell damage. It is also used to treat problems related to gums and bad breath.</p>	<p>It is used with bark juice of <i>magnifera indica</i> and <i>Bombax ceiba</i> to cure abdominal pain, stomach worm, dysentery, intestinal spasm and diarrhea. (Adhikari et al., 2019; Ghimire & Bastakoti, 2009),vomiting and boiled fruit is taken during indigestion(Acharaya,2012)</p>	
14	<i>Salvia splendens</i> Sellow ex Schult.	<p>Boiled leaf is taken two times in a day until cured from fever.</p>	<p>Flowers are used in the case of diabetes (Ranjitkar & Rajbhandari, 2008)</p>	
15	<i>Chenopodium album</i> L.	<p>Whole plant is used in muscular pain and sprain and rheumatic fever. People also drink it as tea to get relief from stomach disorder</p>	<p>It is used in stomach disorder and muscular pain (Uprety et al., 2016 Adhikari et al., 2019) used to kill round worms (Dhami, 2008)</p>	






16	<i>Cannabis sativa</i> L.	Used for both man and animal to prevent from cold. Seed is used as spices	Used in insomnia ,swelling (Gubhaju & Gaha, 2019), digestive disorders (Bhattarai, 2018; Ghimire & Bastakoti, 2009; Uprety et al., 2016) fruit and leaf is used to cure cough asthma (Malla et al., 2014)	
17	<i>Potentilla indica</i> (Andrews) Th. Wolf	Fruit is consumed to avoid from severe heat, to make body cool.	Plant paste mixed with the paste of <i>C. asiatica</i> and applied on forehead to get relief from headache (Acharaya,2012),excessive bleeding during menstrual, cough and cold (Sapkota ,2008)	
18	<i>Acorus calamus</i> L.	Its rhizome is used during cold, cough and also to clear throat; it can be used either raw or roasted.	Rhizome juice is used to treat sore throat (Budhmagar et al.,2020) gout, epilepsy, cold, cough(Acharaya,2012; Gubhaju & Ghimire, 2010)	






19	<i>Achyranthes bidentata</i> Blume	It can be used as a cure for toothache and oral infections. Also it is used to brush teeth and for ritual purpose	Anorexia and marasmus (Gubhaju & Ghimire, 2010) lower abdomen pain in women, urinary and digestive disorder (Bhatta & Kunwar, 2020), fever (Singh et al., 2018), oral infections (Malla et al., 2014) and in rheumatic fever (Uprety et al., 2016)	
20	<i>Arisaema tortuosum</i> (Wall.) Schott	It acts as the antidote for snake bites.	Used to cure wounds and blisters and also as insecticides. (Acharaya, 2012), antidote in scorpion sting (Singh et al., 2018)	
21	<i>Tinospora sinensis</i> (Lour.) Merr.	Stem is eaten raw to treat gastritis and as tonic to improve immunity.	Used as anti-biotic, anti-malarial, anti-pyretic, hepatic-protective also in rheumatism, stomach disorders (Ambu et al., 2020; Ghimire & Bastakoti 2009; Singh & Kumar, 2017)	






22	<i>Ocimum basilicum</i> L.	Its flower and leaf is used in tea to get relief from common cold, throat pain, cough and fever.	Seeds and leaves are used to treat urinary and dermatological disorders (Joshi & Joshi, 2000).	
23	<i>Aloe vera</i> (L.) Burm.f.	<p>Its viscous fluid from the leaf is applied in the burned area and also used to cure diabetes and piles.</p> <p>Its gel is also used in the face to cure from Skin diseases</p>	Juice for rheumatic pains, constipation, fever, jaundice, menstrual disorder, suppression and gonorrhoea (Bhatta & Kunwar, 2020), cure ascariasis (Acharaya,2012), Skin burns, irritation (Adhikari et al., 2019; Ambu et al., 2020; Dhami, 2008; Panthi & Singh, 2013;Uprety et al., 2016)	
24	<i>Acmella oleracea</i>	<p>It is used to cure ailments related to the stomach.</p> <p>It's broth cooked with <i>Trachyspermum ammi</i>, <i>Allium sativum</i>, <i>Psidium guajava</i> leaf to cure sore throat pain and common cold.</p> <p>It 's mixture with other plants is also used to treat rheumatic fever(mixture of <i>Zanthoxylum piperitum</i>, <i>Paris polyphylla</i>, <i>Acorus calamus</i> with toothache plant is taken 2 times per day)</p>	Root juice is used to treat cough and cold (Ambu et al., 2020)	






25	<i>Rumex nepalensis</i> Spreng.	Root paste is used to treat various skin diseases. It is used to cure headache and also as vegetable	Dermatological uses (Bhattarai, 2018; Adhikari et al., 2019) Raw or juice of roots mixed with <i>Potenrilla</i> and <i>Plantago</i> roots is taken before meal to treat gastritis and diarrhea (Budha-magar et al., 2020), paste of rhizome is applied to cure swelling (Acharaya, 2012)	
26	<i>Deparia boryana</i> (Willd.) M. Kato	It is used as a vegetable also used to cure headache and fever	It is used to cure dysentery. (Tamang et al., 2017), headache, fever (Sapkota, 2008)	
27	<i>Desmostachya bipinnata</i> (L.) Stapf	Paste of its leaf and aloe is used in burned areas. Juice of root is used in jaundice	Root paste is applied to treat toothache while juice is used in case of stomach disorder. (Acharaya, 2012) It is Astringent and galactagogue (Upreti et al., 2016)	






28	<i>Amaranthus viridis</i> L.	It is used as a vegetable and used to cure constipation	Used in stomach disorder (Upreti et al., 2016), fever (Ambu et al., 2020) , boils and wounds (Tamang et al., 2017)	
29	<i>Asparagus racemosus</i> Willd.	Root juice is used to cure typhoid.	Used to cure diabetes (Upreti et al., 2016; Adhikari et al., 2019) jaundice (Ambu et al., 2020) and also for stomach disorder (Ghimire & Bastakoti, 2009; Dhama, 2008) Tender shoots are used as vegetable also root is used as antidote (Budha-magar et al., 2020) Galactagogue, urinary trouble, nervous debility, bronchitis, dysentery and throat infection. (Singh & Kumar, 2017)	
30	<i>Tagetes erecta</i> L.	Paste of flower is applied on injured and swollen skin.	Used in body pain ,cut wounds and Skin disease (Ambu et al., 2020; Dhama ,2008)	






31	<i>Cirsium verutum</i> (D.Don) Spreng.	Root is used as medicine for hookworm and also used to cure constipation and hotness of the body	It is taken by the fever patient and piece of roots is hung on the neck as necklace to prevent from marasmus. (Budha-magar et al.,2020), Used to treat sore throat, diabetes, typhoid (Adhikari et al., 2019)	
32	<i>Perilla frutescens</i> (L.) Britton	In order to purify blood it is taken with sesame seed oil.	Seeds used to treat cough and nausea (Uprety et al., 2016), also used as spices (Ambu et al., 2020)	
33	<i>Ageratina adenophora</i> (Spreng.) R.M. King & H. Rob.	Leaf paste is used to clot blood.	Leaf juice and paste applied on cuts and wound (Adhikari et al., 2019; Budha-magar et al.,2020; Gubhaju &Gaha, 2019;)	






34	<i>Ocimum tenuiflorum</i> L.	Its leaves are mixed in tea to get relief from cold, cough. Leaf juice also can be used to treat anorexia, toothache, skin diseases, bronchitis, and typhoid. It also has religious value.	Used to treat toothache ,skin diseases, bronchitis ,typhoid (Malla et al.,2014) ,diarrhea (Ambu et al., 2020; Dhama,2008) Also used as cardiac stimulant (Adhikari et al.,2019),	
35	<i>Mirabilis jalapa</i> L.	Mixture of its root with garlic is used to cure epilepsy. Roots are used to treat the urinary disorder	It is used to cure urinary problems for cattle, (Ale et al.,2009), diabetes, gastritis and flatulence (Adhikari et al., 2019)	
36	<i>Ageratum conyzoides</i> (L.) L.	Paste of <i>Areca catechu</i> , <i>Myristica fragrans</i> and <i>Ageratum conyzoides</i> is used to cure cough. It is also used to clot blood.	Plant juice is applied in cut and wounds. (Dhama,2008) (Acharya,2012) use to stop bleeding as antiseptic (Bhatta & Kunwar, 2020)Antiseptic in piles.(Singh et al.,2018),	






<p>37</p>	<p><i>Cynodon dactylon</i> (L.) Pers.</p>	<p>It is used in the form of juice to cure blood pressure.</p> <p>Fresh leaves are applied externally to stop bleeding in cut wounds</p>	<p>Paste of whole plant is applied in fracture (Dhami, 2008). Juice is applied in cuts and wounds. (Bhatta & Kunwar, 2020; Panthi & Singh, 2013; Uprety et al., 2016). Also in stomachic disorders (Adhikari et al., 2019)</p>	
<p>38</p>	<p><i>Solanum nigrum</i> L.</p>	<p>Its fruit is used for babies to cure cough, stomach ache.</p> <p>It is also used as a vegetable also used to keep black magic away from home.</p>	<p>Root juice is used to treat gastritis (Gubhaju & Ghimire, 2010) Used to treat piles and tongue infection (Ambu et al., 2020)</p>	
<p>39</p>	<p><i>Urtica dioica</i> L.</p>	<p>Diabetic patients use it to control blood sugar level.</p> <p>Mixture of its root with white rose is taken two times in a day to prevent from Malaria</p>	<p>Used to treat dermatological, hematological, digestive and mental disorder (Budha-magar et al., 2020; Malla et al.,2014; Gubhaju & Gaha, 2019; Dhami, 2008) Also used to treat diabetes, fever (Acharya et al., 2015) juice is used during dog bite.(Singh et al.,2018) Paste is used in fractures (Ambu et al., 2020; Uprety et al.. 2016)</p>	






40	<i>Euphorbia royleana</i> Boiss.	It 's burnt stem can be used 3 times a day to treat flatulence It is also applied to the burned part in such a way that its latex doesn't touch the skin directly, for that mustard oil is first applied in burned skin.	Used in dermatological disorders like burn, wounds, and against worm infestation ,insecticide, jaundice (Bhatt & Kunwar, 2020; Gubhaju & Gaha, 2019) Burning stem is given to treat gastritis and anorexia ,sprains(Gubhaju & Ghimire, 2010; Ambu et al., 2020)	
41	<i>Solanum viarum</i> Dunal	Fruit paste is used to cure toothache.	Burned seed is kept on teeth to treat toothache(Gubhaju & Ghimire, 2010)	
42	<i>Zephyranthes carinata</i> Herb.	Its tuber paste is applied to the broken joint inside the splint.	Used to cure back pain, joint pain and bone fracture.(Acharaya,2012)	






43	<i>Rubus ellipticus</i> Sm.	<p>To mitigate sudden stomach ache its young shoot is chewed raw.</p> <p>Its ripe fruit are used in case of constipation. It is also good for sore throats, colic, cough. Root paste is utilized as poultice for the treatments of bone fracture additionally applied on forehead during rigorous headache</p>	<p>Used to treat digestive disorders, sore throat and wounds (Bhattarai, 2018; Malla et al., 2014; Singh et al., 2018; Uprety et al., 2016), rhinitis and sinusitis (Ambu et al., 2020) and diabetes (Adhikari et al., 2019)</p> <p>Used in eradication of worms from wound in Animal. (Acharaya et al., 2015)</p>	
44	<i>Syzygium cumini</i> (L.) Skeels	<p>Powered bark and fruits are taken with water two times in a day to cure diabetes.</p> <p>Fruits are edible and leaves can also be used as fodder.</p>	<p>Its bark is used to cure from asthma, digestive ailments, wounds, dysentery, sore throat and diarrhea (Dhami 2008; Malla et al., 2014) and fever (Gubhaju & Ghimire, 2010)</p> <p>Fruits are edible and good for indigestion and constipation. (Bhatta & Kunwar, 2020)</p>	
45	<i>Curcuma caesia</i> Roxb.	<p>It is used to cure gastritis.</p> <p>Roots are crushed and used at the time of pain in the body with water</p>	<p>Tuber juice is use to treat gastritis, anorexia, stomach ache (Ghubhaju & Ghimire, 2010) fever, sore throat, common cold (Adhikari et al., 2019)</p> <p>Root juice used to cure post partum bleeding (Ambu et al., 2020)</p>	




46	<i>Dioscorea bulbifera</i> L.	It helps indigestion and also helps to kill stomach worms. It is used to make pickles	Boiled bulb is used to cure from fever ,abdominal pain and burning sensation of sole and palm in summer (Dhami,2008), Used against worms (Gubhaju & Gaha, 2019)	
47	<i>Prunus cerasoides</i> Buch.-Ham. ex D.Don	Bark decoction used at the time of back pain.	Barks are used to cure form swelling (Malla et al.,2014) It is used for spiritual purpose fodder. (Budha-magar et al.,2020) Used to treat fever and back pain (Uprety et al.,2016) Bark paste is applied over the sprain or fracture (Acharya et al., 2015)	
48	<i>Mangifera indica</i> L.	Raw bark is mixed with turmeric to cure gastric. Fruit is edible.	Its juice is mixed with bark juice of <i>B.ceiba</i> and <i>P.guajava</i> for abdominal pain, dysentery, intestinal spasm and diarrhea, hepatitis and also used for skin diseases (Ghimire & Bastakoti, 2009; Ambu et al., 2020)	
49	<i>Momordica charantia</i> L.	Juice of bitter gourd is taken to control the pressure. It is also used by diabetes patients.	Used to cure high blood pressure (Khanal et al.,2020) peptic ulcer, also as anti-diabetic, anti helminthic, antipyretic, purgative (Singh & Kumar, 2017)	



				
50	<i>Morus alba</i> L.	Fruits are used to cure fever, cough, and sore throat.	Cure for toothache (Adhikari et al., 2019) Bark is used to treat sore throat (Singh et al., 2018; Uprety et al., 2016)	
51	<i>Ananas comosus</i> (L.) Merr.	It helps to reduce Constipation and aids in indigestion.	Used in constipation and skin diseases .(Singh et al.,2018; Ghimire & Bastakoti, 2009), hotness of body (Gubhaju & Gaha, 2019)	



52	<i>Oxalis corniculata</i> L.	Its leaves are used as tonic and used to cure problems related to stomach ache. It is also used to treat scurvy diseases.	It is used to treat abdominal pain and headache (Gubhaju & Gaha, 2019), cut wound (Bhatta & Kunwar, 2020; Dhami, 2008; Panthi & Singh, 2013) Also used for cough, cold and its juice along with <i>C. asiatica</i> is used for muscular pain vomiting and swelling. (Ghimire & Bastakoti, 2009).	
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