Traditional use of medicinal plants in the Chyangthapu-Phalaicha biological sub-corridor, Panchthar District, Kangchenjunga Landscape, Nepal

Prabin Bhandari, Min B. Gurung, Chandra K. Subedi, Ram P. Chaudhary, Khadga Basnet, Janita Gurung, Yadav Uprety, Ajay Neupane, and Krishna K. Shrestha

Correspondence

Prabin Bhandari[1,2,3*], Min B. Gurung[1,4], Chandra K. Subedi[1], Ram P. Chaudhary[1], Khadga Basnet[1], Janita Gurung[5], Yadav Uprety[1,6], Ajay Neupane[7], Krishna K. Shrestha[1,8]

[1]Research Centre for Applied Science and Technology, Tribhuvan University, Kirtipur, Kathmandu, 1030, Nepal
[2]State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing, 100093, China
[3]University of Chinese Academy of Sciences, Beijing, 100049, China
[4]Small Mammals Conservation and Research Foundation, Kathmandu, Nepal
[5]International Centre for Integrated Mountain Development, Khumaltar, Lalitpur, 3226, Nepal
[6]Central Department of Botany, Tribhuvan University, Kirtipur, Kathmandu, Nepal
[7]Mechi Multiple Campus, Tribhuvan University, Bhadrapur, Jhapa, Nepal
[8]Ethnobotanical Society of Nepal (ESON), Kathmandu, Nepal.

[*]Corresponding Author: prabinkb02@gmail.com

Ethnobotany Research & Applications 22:25 (2021)

Research

Abstract

Background: Chyangthapu-Phalaicha located in the northeastern Panchthar District, is a biodiversity hotspot in the Eastern Himalaya. The present study was conducted to document the knowledge of the ethnomedicinal uses and practices that exist in the area before the associated socio-cultural knowledge on biological diversity is lost.

Methods: Ethnomedicinal data were collected through semi-structured questionnaires. The importance of medicinal plant species was assessed using quantitative indices such as informant consensus factor, relative frequency of citation, relative importance, fidelity level and Rahman's similarity index.

Results: Altogether, 140 medicinal plant species from 68 families and 127 genera were reported, which were used to treat 12 health disorder categories. The dominant families were Asteraceae and Fabaceae which contributed eight species each. Maximum informant consensus factor (0.96) was calculated for gastrointestinal disorders. The highest relative frequency of citation and fidelity level was observed for *Swertia chirayita* (0.83 and 100% respectively). *Artemisia dubia* depicted the highest relative importance (91.67). A thorough review of previous literature and analysis of field data revealed new therapeutic use reports for 41 ailments associated with 52 plant

Manuscript received: 21/06/2021 – Revised manuscript received: 08/10/2021 - Published: 09/10/2021
http://dx.doi.org/10.32859/era.22.25.1-43

species. The Rahman's similarity index showed a high use similarity with the studies in neighbouring areas and a low similarity with the geographically distant studies.

Conclusions: These findings show that the area supports significant medicinal plants and associated traditional knowledge. The varied use of reported medicinal plants in the area indicates the need for phytochemical investigation, especially for those with high ethnobotanical indices.

Keywords: Ailments, East Himalaya, East Nepal, Ethnomedicine, Indigenous knowledge, Quantitative analysis

Background

Mountain people living in remote areas have a sound harmony with nature along with a deep understanding of interacting sustainably with it. They have developed skills, beliefs and practices to maintain a healthy ecosystem (Beltran 2000). They use a variety of plant resources for livelihood security, financial income and more importantly for health care (Hamilton 2004). Considering that about 25% of modern drugs are derived from plants (Robinson & Zhang 2011, Wachtel-Galor & Benzie 2011, Newman & Cragg 2012), the traditional knowledge of indigenous communities is important in the preparation of herbal remedies and in the isolation of bioactive constituents, which may lead to the discovery of novel drugs (Farnsworth 1990, Cox & Balick 1994, Fabricant & Farnsworth 2001). Traditional remedies are cheap, easy and sustainable options over modern drugs, so the existing knowledge of indigenous people on plants and their traditional uses need to be documented systematically (Dilshad *et al.* 2010, Aziz *et al.* 2018). However, socio-economic transformation, land-use change, overexploitation of natural resources and climate change are factors contributing to the worldwide loss of biological resources and the associated traditional knowledge (Ramirez 2007, Slingenberg *et al.* 2009, Santamaría & Mendez 2012, Smith 2018). In addition, the lack of interest among the younger generation in traditional herbal therapies and their preference for modern medicines has made the indigenous knowledge vulnerable (Hussain *et al.* 2018).

More than 2,000 plant species are reported to have medicinal value in Nepal (Manandhar 2002, Baral & Kurmi 2006, Kunwar & Bussmann 2008, Kunwar *et al.* 2013), and 85% of the population is dependent on traditional herbal medicine for primary health care (Manandhar 2002). Regardless of the wide use of herbal medicine, the associated traditional knowledge of medicinal plant species is gradually disappearing with increasing urbanization, out-migration and climate change (Rokaya *et al.* 2010, Luitel *et al.* 2014). The Chyangthapu-Phalaicha biological sub-corridor within the Eastern Nepal Conservation Corridor in the Kangchenjunga Landscape is a human-inhabited landscape of cultural and ecological significance (Baral & Inskipp 2005, Chaudhary *et al.* 2015). While this area is gradually growing towards urbanization, there is still a high incidence of poverty in the area (approximately 10% of the population) and out-migration is also very high (Chaudhary *et al.* 2015). Growing urbanization and increasing youth out-migration for better economic opportunities will affect the transfer of indigenous knowledge to younger generations resulting in the depletion of traditional knowledge. Hence, documenting the local medicinal plant species and the associated traditional knowledge is important. The present study was, therefore, carried out in the Chyangthapu-Phalaicha biological sub-corridor to document the medicinal plant species and their traditional use patterns within the local community. The information generated will potentially contribute to the conservation and sustainable use of local plant resources (Bussmann 2002, Chaudhary *et al.* 2015), along with the preservation of cultural and genetic diversity (Hanazaki *et al.* 2013, Rodrigues *et al.* 2020).

Material and Methods

Study area

The Kangchenjunga Landscape (KL) in the Eastern Himalaya is a transboundary landscape that connects adjoining areas of Nepal, India, and Bhutan (ICIMOD *et al.* 2017). This landscape is connected through seven conservation corridors and exhibits exceptionally rich biodiversity with three Important Bird Areas (IBA) and 18 Important Plant Areas (IPAs) (Baral & Inskipp 2005, Chaudhary *et al.* 2015). This landscape is also a part of the "Himalaya" biodiversity hotspot, one of the 36 global biodiversity hotspots accommodating diverse ecosystems, species, and genetic resources of global importance (Chaudhary *et al.* 2015).

Chyangthapu-Phalaicha biological sub-corridor is a part of the East Nepal Conservation Corridor of Kangchenjunga Landscape. Located in the northeastern part of Yangawarak Rural Municipality (RM), Panchthar District, Eastern Nepal (Figure 1), the sub-corridor borders with Barsey Rhododendron Sanctuary, Sikkim, India in the east, Falelung RM in the south, Hilihang RM in the west, and Taplejung District in the north (Figure 1). The altitude ranges from 1600 m asl (meter above sea level) at Chyangthapu village to 4500 m asl at Timbu Pokhari. The climatic condition

of the area is subtropical at the lower elevations, temperate in the mid-hills, and subalpine and alpine at the higher elevations.

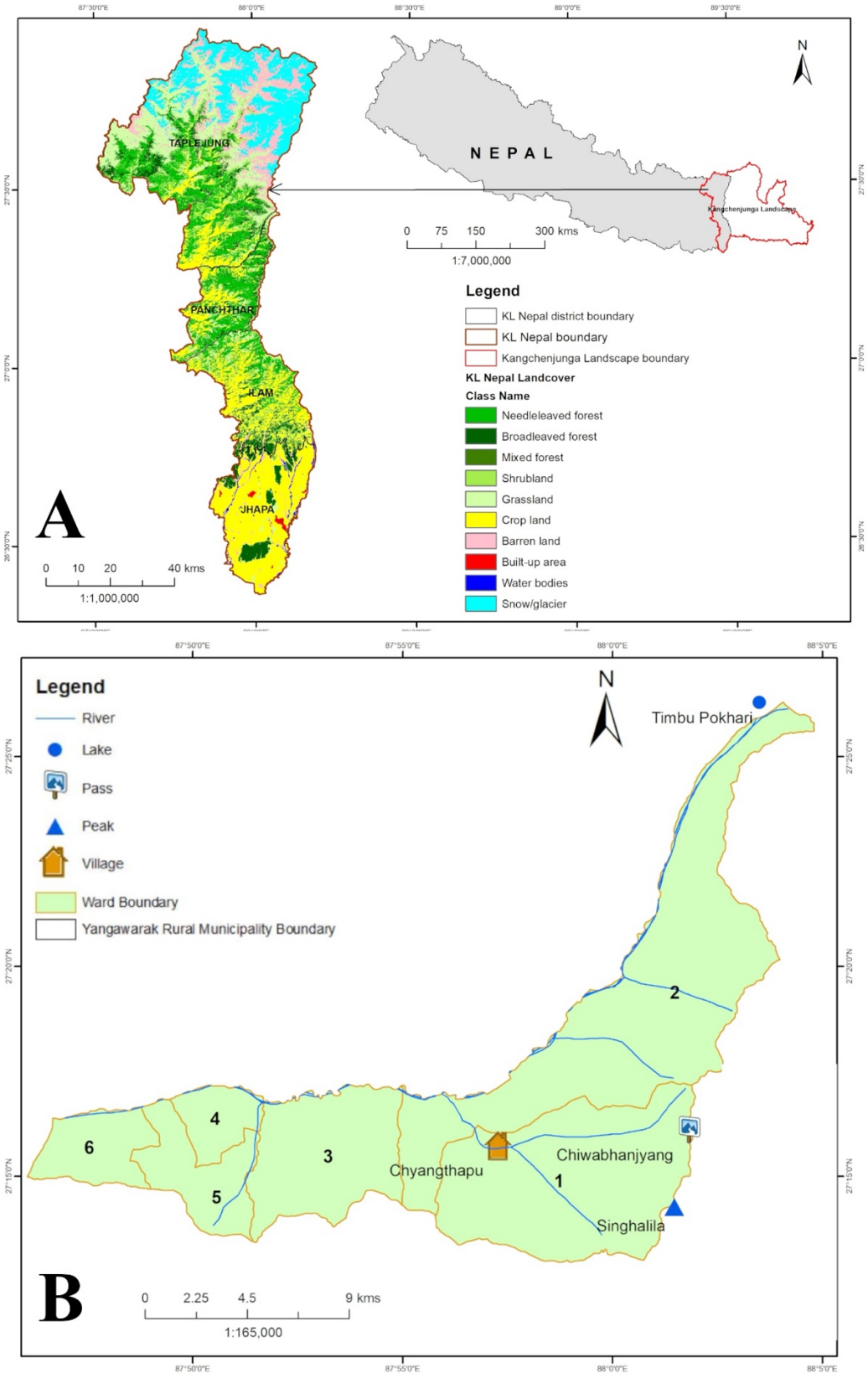

Figure 1. Map of the study area: A. Nepal and Kangchenjunga Landscape (right), Kangchenjunga Landscape, Nepal (left), B. Yangawarak RM

The area is dominated by the indigenous Kirats (Limbu, Rai), followed by Gurungs, Brahmins, Chhetris, and other caste and ethnic groups (Gautam 2011). Livelihood strategies of local communities cover both on-farm and off-farm activities. Agriculture is the major livelihood strategy and includes mixed farming systems of crop production and animal husbandry. The major cultivated crops are paddy, millet, maize, and wheat. Cash crop production of large cardamom is highly significant (Baniya *et al.* 2019). Animal husbandry is an integral part of agriculture systems in the sub-corridor. While stall-fed livestock, including cows, goats, and pigs are kept at the lower elevations, yaks, and yak-crossbreeds (i.e., *Chauri*) are maintained at the higher elevations with some families engaged in transhumance (Oli 2008, Wu *et al.* 2016).

Data collection and plant identification

Ethnobotanical data were collected between September 2016 and October 2017. Information about medicinal plant use was gathered through semi-structured questionnaires with local healers, herders, and other knowledgeable individuals, comprising 50 participants (20 women and 30 men) whose ages ranged from 31 to 80. Before conducting the interviews, information about the Kangchenjunga Landscape was provided and prior informed consent was sought from interviewees who granted it on condition that the collected data would be used only for academic purposes.

The questionnaires were designed to collect data and/ or information on: (i) vernacular names of the traditionally used medicinal plants, (ii) ailments treated by them, (iii) preparation of remedies, and (iv) therapeutic administration.

Plant specimens were collected and identified using floras and taxonomic literature (Hara *et al.* 1978, Hara & Williams 1979, Hara *et al.* 1982, Grierson & Long 1983-1987, Polunin & Stainton 1984, Stainton & Polunin 1988, Grierson & Long 1991-2001, Bridson & Forman 2010, Watson *et al.* 2011, Shresta et al. 2018) and by consulting digital databases of the National Herbarium and Plant Laboratories (KATH), Herbarium of the University of Tokyo (TI), Kew Herbarium (K), Royal Botanic Garden Edinburgh (E) and Natural History Museum (BM). The collected specimens were deposited in the Tribhuvan University Central Herbarium (TUCH). Specimens collected from the Chyangthapu-Phalaicha by other researchers, deposited at BM and KATH and TI are also cited in Table 1 with corresponding voucher numbers. The nomenclature of the family followed APG IV (Chase *et al.* 2016). TROPICOS (Tropicos 2021) and Plant of the World Online (POWO 2019) were consulted for authentication of the species name.

Ethnomedicinal data analysis

The data were analyzed using both qualitative and quantitative approaches. The collected data were generalized qualitatively to document the medicinal plant species, their life forms, habitat and plant parts utilization. The quantitative analysis included calculation of ethnobotanical indices as follows:

Informant consensus factor (ICF)

This quantitative tool is used to test the homogeneity of knowledge among participants; ICF was calculated as (Trotter & Logan 1986)

$$\mathrm{ICF} = \frac{Nur - Nt}{Nur - 1}$$

Where Nur refers to the number of uses reported for a specific use category, and Nt refers to the number of taxa used for a particular use category by all participants. Informant consensus factor (ICF) values are low (near 0) when plants are selected randomly or when there is no exchange of information about their use among participants, and approach one (1) when there is a well-defined selection criterion in the community and/or if the information is exchanged between participants (Gazzaneo *et al.* 2005).

Relative frequency of citation (RFC)

RFC is calculated to identify the plant species most used by the local people (Tardío & Pardo-de-Santayana 2008). The RFC value is '0' when no one refers to the plant as being useful and '1' when all the participants refer to the plant as being useful. RFC is calculated as

$$RFC = \frac{FC}{N}$$

Where, 'FC' denotes the number of participants who mention the use of the species, and N denotes the total number of participants.

Relative importance (RI)

The technique of relative importance was developed by Bennett and Prance (Bennett & Prance 2000). It measures the usefulness of a plant species based on the number of pharmacological properties attributed to it and the number of body systems it affects. It is calculated as:

$$RI = (Rel\ PH + Rel\ BS) \times \frac{100}{2}$$

where *PH* is the number of pharmacological properties for the given plant and *Rel PH* is the relative number of pharmacological properties.

$$Rel\ PH\ = \frac{PH\ of\ a\ given\ plant}{maximum\ PH\ of\ all\ reported\ plant\ species}$$

BS is the number of body systems treated by a single species and *Rel BS* is the relative number of body systems treated by a single species.

$$Rel\ BS\ = \frac{BS\ of\ a\ given\ plant}{maximum\ BS\ of\ all\ reported\ plant\ species}$$

Fidelity level (FL)

The fidelity level (FL) index was calculated to check the most preferred plant species used to cure a particular ailment in the study area (Friedman *et al.* 1986). The FL value is higher for those plant species that are widely used by local people to treat a particular ailment.

$$FL\ (\%) = \left(\frac{Np}{N}\right) \times 100$$

Where 'Np' is the number of participants citing the use of species for a particular ailment and 'N' is the total number of participants citing the use of plant species for any ailments.

Rahman's similarity index (RSI)

RSI measures the cultural similarities of indigenous knowledge among the communities of different areas based on common plant species with respect to their uses (Rahman *et al.* 2019) and is calculated as:

$$RSI\ = \frac{d}{a\ + b\ + c\ - d}$$

Where 'a' is the number of species unique in area A, 'b' is the number of species unique in area B, 'c' is the number of species common in both A and B areas and, 'd' is the number of common species used for similar ailments in both A and B areas, where a and b ≠ 0 and c and d ≥ 0.

A heatmap showing similarity and dissimilarity value was generated using R-studio (RStudio Team 2020). Heatmap is a graphical representation of data that utilize color-coded systems and allows a viewer towards better visualization of the data (Gehlenborg & Wong 2012).

Results and Discussion

Demography of the participants

A total of 50 participants were interviewed representing different ethnic groups, ages, and gender. The study area is inhabited by the indigenous Kirats, Gurungs, Brahmins, Chhetris and other castes (Baniya *et al.* 2019) making the community heterogeneous. For any particular castes, ayurvedic practitioners or traditional healers seem to be small in number (Reyes-García *et al.* 2007). We have therefore applied a heterogeneous sampling and included different groups of participants consisting of traditional healers, herders, and residents. Such a random and broad selection of participants allows a broader dimension of knowledge of plant use within a population (Etkin *et al.* 1990, Gomez-Beloz 2002). Therefore, the ethnomedicinal knowledge in the study area must have emerged from the interaction of different cultures with the local biophysical environment and biological resources (Turner *et al.* 2000, Reyes-García *et al.* 2007).

Diversity of medicinal plant species and their uses

Altogether 140 medicinal plant species, including three pteridophytes, one gymnosperm and 136 angiosperms belonging to 127 genera and 68 families were reported. Thirty families were represented by two or more species, whereas 38 families were represented by a single species each (see details in Table 1).

Table 1. Medicinal plant species used by the indigenous peoples' and local communities of Chyangthapu-Phalaicha biological sub-corridor

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
PTERIDOPHYTES												
Equisetaceae												
Equisetum diffusum D. Don [P522, TUCH]	Salli bisalli/ Ram baan, Kurkure ९ल्लीबीस ल्ली, राम वाण, कुर्कुरे०	H	W(na)	Whole plant	Ex	O	Jaundice*, Menstrual disorders*		0.12	0.33	0.4	36.67
Nephrolepidaceae												
Nephrolepis cordifolia (L.) C. Presl [P545, TUCH]	Pani amala ९पानी अमला०	H	W(na)	Tuber	Ch, Ex	O	Dehydration, Indigestion	8, 24, 28, 33, 34, 45, 62	0.06	0.33	0.4	36.7
Pteridaceae												
Cheilanthes albomarginata C.B. Clarke [P569, TUCH]	Kali sinka ९काली सिन्का०	H	W(na)	Leaf-petiole	Ra	T	used in ear after piercing against bacterial infection	37	0.1	0.17	0.2	18.3
Pteris biaurita L. [6305123, BM]	Thade Uniyo ९ठाडे उनियू०	H	W(na)	Rhizome	Ex	T	Cuts and wounds	8, 14, 28	0.2	0.17	0.2	18.33
GYMNOSPERMS												
Taxaceae												
Taxus wallichiana Zucc. [D333, TUCH]	Loth salla ९लो सल्ला०	T	W(na)	Bark, Leaf	Ex	O	Body pain*, Jaundice*		0.26	0.33	0.4	36.67
ANGIOSPERMS												
Acanthaceae												
Justicia adhatoda L. [P661, TUCH]	Asuro ९असुरो०	S	W(na)	Leaf, Young shoot	Ex, Va	O, I	Fever, Sinusitis	4, 7, 8, 11, 17, 26, 62, 63, 68	0.1	0.33	0.4	36.67
Thunbergia coccinea Wall. [D208, KATH]	Kag chuche lagara/Kanase ९काग चूच्चे०	C	W(na)	Leaf	Ex, Sq	I, T	Cuts and wounds, Sinusitis*	8, 63	0.06	0.33	0.4	36.67
Acoraceae												
Acorus calamus L. [P562, TUCH]	Bojho ९बोझो०	H	W(na)	Rhizome	Ch, Ex	O, T	Common cold, Fever, Scabies	1, 6, 8, 9, 10, 11, 13, 14, 17, 22, 23, 24, 26, 28, 29, 33, 34, 35, 37, 41, 45, 47, 48, 54, 57, 60, 63, 65, 67, 68	0.44	0.50	0.6	55.00

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Actinidiaceae												
Actinidia strigosa Hook. f. & Thomson [9263245, TI]	Theki phal ९ठेकी फल०	C	W(na)	Root	Ex	T	Bone fracture and dislocation*, Muscular swelling and sprain*		0.1	0.33	0.4	36.67
Saurauia napaulensis DC. [6303066, TI]	Gogan ९गोगन०	T	W(na)	Bark	Ex	O	Fever	8, 43	0.02	0.17	0.2	18.33
Adoxaceae												
Viburnum cylindricum Buch.-Ham. ex D. Don [775333, KATH]	Ghodakhori ९घोडा खोरी०	S	W(na)	Seed	Es. Ol	T	Fungal infection*		0.06	0.17	0.2	18.33
Amaranthaceae												
Achyranthes aspera L. [P561, TUCH]	Rato Akhle/ Datiban ९रातो आख्लेर दतिवन०	H	W(na)	Root, Stem	Ch, Ex	O	Dysentery, Gingivitis, Tonsillitis	8, 17, 24, 33, 41, 45, 48, 52, 64	0.62	0.50	0.6	55.00
Cyathula tomentosa (Roth) Moq. [P600, TUCH]	Bhede kuro ९भेडे कुरो०	S	W(na)	Root	Ex	O	Tonsillitis*		0.1	0.17	0.2	18.33
Iresine herbstii Hook. [6304241, TI]	Aayotin phul ९आयोटिन फुल०	H	C(i)	Leaf	Ex	T	Cuts and wounds*, Ear infection*		0.04	0.33	0.4	36.67
Amaryllidaceae												
Allium sativum L. [KB 0210, KATH]	Lasun ९लसुन०	H	C(i)	Root	Pa	T	Wart	8	0.06	0.17	0.2	18.33
Allium wallichii Kunth [P536, TUCH]	Nara/ Ban lasun ९नारा, बन लसुन०	H	W(na)	Whole plant	Co	O	Body pain, Fatigue	13, 28	0.14	0.33	0.2	26.67
Anacardiaceae												
Rhus javanica L. [P507, TUCH]	Bhakimlo ९भकिम्लो०	T	W(na)	Fruit	Ch	O	Diarrhea	6, 7, 11, 28, 48, 63, 65, 44	0.14	0.17	0.2	18.33
Apiaceae												
Centella asiatica (L.) Urb. [P568, TUCH]	Ghod tapre ९घोड टाप०	H	W(na)	Whole Plant	Ex	O	Dysuria, High blood pressure, Pneumonia, Tonsillitis	8, 12, 14, 27, 30, 35, 44, 45, 49, 51, 54, 57, 63, 64	0.12	0.67	0.6	63.33
Heracleum nepalense D.Don [9240945, TI]	Chimphing ९चिमफिङ्ग०	H	W(na)	Seed	Bu, Ch	I, O	Common cold, Nervousness*, Sneezing	9, 23, 33, 37, 48	0.66	0.50	0.4	45.00
Ligusticopsis wallichiana (DC.) Pimenov & Kljukov [D151, KATH]	Bhutkesh ९भुतकेश०	H	W(na)	Mature shoot, Root	Ex, Ra	I, O	Cold*, Fatigue*, Nervousness	52	0.34	0.50	0.6	55.00

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Apocynaceae												
Plumeria rubra L. [8820113, TI]	Chuwa ९चुवा०	T	C(i)	Bark	Ex	O	Jaundice*		0.4	0.17	0.2	18.33
Araceae												
Remusatia pumila (D. Don) H. Li & A. Hay [P540, TUCH]	Mane ९माने०	H	W(na)	Root	Ex	T	Abscess*, Furunculosis*		0.06	0.17	0.2	18.33
Araliaceae												
Panax pseudo-ginseng Wall. [D147, KATH]	Malagiri/Jinsing ९मालागिरी, जिन्सीङ०	H	W(na)	Root	Ex	O	Intestinal worms	15, 48, 58	0.1	0.17	0.2	18.33
Asparagaceae												
Asparagus racemosus Willd. [P564, TUCH]	Kurilo ९कुरिलो०	H	W(na)	Root	Ch, Ex	O	Fatigue, Pneumonia*	8, 15, 23, 26, 43, 48, 49	0.1	0.33	0.4	36.67
Ophiopogon intermedius D.Don [9241045, TI]	Gademala ९गाडेमाला०	H	W(na)	Root	Ex	O	Intestinal worms*		0.06	0.17	0.2	18.33
Asphodelaceae												
Aloe vera (L.) Burm.f. [P519, TUCH]	Ghuikumari ९घिउकुमारी०	H	C(i)	Leaf-pulp	Ex, Sq	O, T	High blood pressure, Indigestion, Skin burn	8-11, 28, 32, 33-35, 37, 41, 45, 47-49, 54, 57, 60, 62, 63, 68	0.32	0.50	0.6	55.00
Asteraceae												
Ageratina adenophora (Spreng.) R.M.King & H.Rob. [P515, TUCH]	Kali jhar ९काली झार०	H	W(ia)	Leaf	Ex	T	Cuts and wounds	4, 7, 10, 22, 25, 27, 28, 30, 32-34, 37, 41-43, 45, 47-49, 52-54, 57, 62, 63, 65, 68	0.7	0.17	0.2	18.33
Anaphalis triplinervis (Sims) C.B. Clarke [P534, TUCH]	Buki ९बुकी०	H	W(na)	Leaf	Pw	T	Cuts and wounds	8, 43	0.06	0.17	0.2	18.33
Artemisia dubia Wall. ex Besser [P563, TUCH]	Tite Pati ९तिते पाती०	S	W(na)	Leaf	Ex, Wa	O, T	Cuts and wounds, Eye pain*, High blood pressure, Muscular swelling and sprain, Tonsillitis	7, 11, 20, 22-24, 27, 28, 37, 44, 48, 51, 57, 62, 65, 67	0.68	0.83	1	91.67

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Cirsium verutum (D.Don) Spreng. [P523, TUCH]	Sungure kanda ९सुंगुरे काँडा०	H	W(na)	Root, Young shoot	Ex	O	Jaundice, Intestinal worms, Tonsillitis	32, 48	0.36	0.50	0.6	55.00
Eclipta prostrata (L.) L. [6306247, TI]	Bhringee ९भ्रिंगी झार०	H	W(nt)	Whole plant	Ex	T	Cuts and wounds	8, 39, 45, 48, 54, 56, 59, 62-64	0.02	0.17	0.2	18.33
Galinsoga parviflora Cav. [P501, TUCH]	Ilame jhar ९ईलामे झार०	H	W(nt)	Leaf	Ex	T	Cuts and wounds	8	0.14	0.17	0.2	18.33
Saussurea gossypiphora D.Don [9110448, TI]	Mai Kopila ९माई कोपिला०	H	W(na)	Root, Wool	Ex, Ra	O, T	Cuts and wounds, Headache *	20, 46	0.66	0.33	0.4	36.67
Tagetes erecta L. [P527, TUCH]	Saya patri ९सयपत्री०	H	C(i)	Leaf, Flower	Ex	O	Fever, Tonsillitis	9, 59, 32, 45, 48, 64, 68	0.26	0.33	0.4	36.67
Berberidaceae												
Berberis asiatica Roxb. ex DC. [P566, TUCH]	Tinsure/ Chutro ९तिनसुरे, चुत्रो०	S	W(na)	Root	Ex	O	Fever, Jaundice	10, 8, 30, 33, 48, 62	0.06	0.33	0.4	36.67
Mahonia napaulensis DC. [P506, TUCH]	Kesari ९केसरी०	S	W(na)	Root	Ex	O	Polydipsia	26, 45, 47, 48, 68	0.06	0.17	0.2	18.33
Bignoniaceae												
Oroxylum indicum (L.) Kurz [P582, TUCH]	Tatelo ९टटेलो०	T	W(na)	Bark, Leaf, Root	Ex	O	Jaundice	26, 38, 45, 47-49, 60, 68	0.16	0.17	0.2	18.33
Brassicaceae												
Lepidium sativum L. [6303308, TI]	Chamsur ९चम्सुर०	H	C(n)	Whole plant	Co	O	Muscular swelling and sprain	38, 63	0.04	0.17	0.2	18.33
Nasturtium officinale R.Br. [8820061, TI]	Sim sag ९सिम साग०	H	W(nt)	Leaf	Co, Ex	O, T	Cuts and wounds*, Jaundice	51	0.18	0.33	0.4	36.67
Raphanus sativus L. [6303325, TI]	Mula ९मुला०	H	C(i)	Root, Seed	Ch, Ex	O	Gastritis, Jaundice	33, 34	0.08	0.33	0.2	26.67
Campanulaceae												
Lobelia pyramidalis Wall. [P536, TUCH]	Yeklebir ९एक्लेबीर०	H	W(na)	Root	Ch, Ex	O, T	Cuts and wounds, Diarrhea, Dysentery, Jaundice, Pneumonia	32, 37	0.38	1.00	0.8	9.00
Cannabaceae												
Celtis tetrandra Roxb. [10000729, TI]	Khari ९खरी०	T	W(na)	Bark	Ex	O	Gingivitis*		0.06	0.17	0.2	18.33

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Caprifoliaceae												
Nardostachys jatamansi (D.Don) DC. [9015041, KATH]	Jatamasi ९जटामसी०	H	W(na)	Rhizome	Ch	O	Dysentery	2, 20, 35, 48, 68	0.24	0.17	0.2	18.33
Valeriana jatamansi Jones [9945092, TI]	Sugandawal ९सुगन्धवाल०	H	W(na)	Leaf, Rhizome	Ch, Ex	O, T	Body pain, Cuts and wounds, Fever, Tonsillitis	2, 13, 20, 33, 34, 41, 48, 56	0.2	0.67	0.6	63.33
Caryophyllaceae												
Drymaria cordata (L.) Willd. ex Schult. [P528, TUCH]	Ana/Abijalo ९अन्ना, अविजालो०	H	W(na)	Whole Plant	Bu, Ex	I, O	Sinusitis, Tonsillitis	23, 24, 30, 33, 34, 37, 40, 44, 45, 48, 49, 51, 57, 63	0.5	0.33	0.2	26.67
Stellaria monosperma Buch.-Ham. ex D.Don [sn, TI]	Jethimadhu ९जेठिमधु०	H	W(na)	Root	Ch, Ex	O	Dehydration*, Fatigue*		0.04	0.33	0.4	36.67
Convolvulaceae												
Cuscuta reflexa Roxb. [P594, TUCH]	Sun lahara ९सुन लहरा०	H	W(na)	Whole plant	Ex	O	Jaundice	7-10, 17, 23, 24, 26-29, 31-35, 37, 41, 43-45, 47, 49, 54, 59, 62, 63, 67, 68	0.28	0.17	0.2	18.33
Costaceae												
Costus speciosus (J. Koenig) Sm. [P543, TUCH]	Beth lauri ९बेद लौरी०	H	W(na)	Root	Ch, Ex	O	Dizziness*, Dysuria	8, 14, 30, 44, 45, 49, 57	0.1	0.33	0.4	36.67
Cucurbitaceae												
Solena heterophylla Lour. [P768, TUCH]	Golkakri ९गोलकाक्री०	C	W(na)	Root	Ch	O	Tonsillitis	40	0.24	0.17	0.2	18.33
Trichosanthes cucumerina L. [10014433, TI]	Ban ghiraulo ९वन घिरौलो०	C	W(na)	Fruit	Ex	O	Jaundice	32, 63	0.2	0.17	0.2	18.33
Trichosanthes tricuspidata Lour. [9241076, TI]	Indreni ९ईन्द्रेनी०	C	W(na)	Seed	Ex, Ro	O, T	Abscess*, Tonsillitis*		0.16	0.33	0.4	36.67
Ericaceae												
Lyonia ovalifolia (Wall.) Drude [9240946, TI]	Angeri ९अंगेरी०	T	W(na)	Leaf	Ex	T	Scabies	8, 9, 28, 32-35, 43, 47, 54	0.34	0.17	0.2	18.33
Pieris formosa (Wall.) D.Don [775456, TI]	Nalu/Balu ९नालु, बालु०	T	W(na)	Root, Young shoot	Ex	O, T	Fatigue*, Headache*		0.02	0.33	0.4	36.67

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Rhododendron arboreum Sm. [P510, TUCH]	Lali Gurans ९लाली गुराँस०	T	W(na)	Bark, Flower	Ch, Ex	O	Bone struck in throat, Diarrhea, Epilepsy*, Jaundice, Tonsillitis	7-10, 13-15, 20, 23, 25, 28, 30, 32, 33, 34, 35, 37, 38, 41, 44, 47, 49, 52, 53, 54, 57, 63, 65	0.18	0.83	0.8	81.67
Euphorbiaceae												
Euphorbia royleana Boiss. [10004956, TI]	Siudi ९सिउडी०	S	W(na)	Latex, Mature shoot	Ch, Ra	O	Anorexia, Toothache*	8, 11, 32, 44	0.1	0.33	0.4	36.67
Fabaceae												
Albizia lebbeck (L.) Benth. [6521, TI]	Kalo siris ९कालो सिरिस०	T	W(na)	Bark	Ex	O	Gingivitis	8	0.06	0.17	0.2	18.33
Albizia procera (Roxb.) Benth. [9555004, TI]	Seto siris ९सेतो सिरिस०	T	W(na)	Bark	Ex	T	Dandruff*		0.18	0.17	0.2	18.33
Cassia fistula L. [8840042, TI]	Rajbrichhe ९राजवृक्ष०	T	W(na)	Fruit	Ch	O	Bone struck in throat*		0.02	0.17	0.2	18.33
Entada rheedei Spreng. [9263005, TI]	Pangra ९पांग्रा०	C	W(na)	Fruit	Ex, Ra	T	Mumps	48	0.18	0.17	0.2	18.33
Macrotyloma uniflorum (Lam.) Verdc. [6301763, TI]	Gahat dal ९गहत दाल०	H	C(i)	Seed	Ex	O	Kidney stone	38, 37	0.12	0.17	0.2	18.33
Mimosa pudica L. [772850, TI]	Lajjawoti jhar/Buhari jhar ९लज्जावती झार, बुहारी झार०	H	W(ia)	Leaf, Root	Ex	O, T	Cuts and wounds, Jaundice, Menstrual disorders	9, 15, 17, 32, 34, 47, 63, 64	0.08	0.50	0.6	55.00
Trigonella foenum-graecum L. [K02, KATH]	Methi ९मेथी०	H	C(i)	Fruit	Ex	O	Cough, Stomachache	8, 35, 38, 45, 54	0.12	0.33	0.4	36.67
Fagaceae												
Quercus lanata Sm. [775346, TI]	Banjh ९बांझ०	T	W(na)	Bark	Ex	O	Gastritis	44, 48	0.04	0.17	0.2	18.33
Gentianaceae												
Gentiana sp. [P517, TUCH]	Page mendo ९पांगे मेन्दो०	H	W(na)	Whole plant	Ch	O	Tonsillitis*		0.1	0.17	0.2	18.33

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Swertia chirayita H.Karst. [P554, TUCH]	Chiraito ९चिराईता०	H	W(na)	Whole Plant	Ex	O	Fever, High blood pressure	1, 8, 10, 14, 15, 22, 24, 25, 30-34, 37, 38, 41, 43, 45, 46, 48, 49, 51, 52, 54, 57, 68	0.86	0.33	0.4	36.67
Swertia multicaulis D.Don [9120353, TI]	Sharma guru ९शर्मा गुरु०	H	W(na)	Root	Pa	T	Cuts and wounds	32, 48	0.18	0.17	0.2	18.33
Iridaceae												
Belamcanda chinensis (L.) Redouté [P544, TUCH]	Tarbare ९तरबारे०	H	W(na)	Root	Ex	O	Anorexia	8	0.3	0.17	0.2	18.33
Juglandaceae												
Engelhardia spicata Lesch. ex Blume [P645, TUCH]	Mauwa ९मौवा०	T	W(na)	Bark	Ex	O	Fatigue*		0.06	0.17	0.2	18.33
Juglans regia L. [186, BM]	Okhar ९ओखर०	T	W(na)	Bark	Ex	O	Body pain	2, 20, 22, 28, 66	0.08	0.17	0.2	18.33
Lamiaceae												
Callicarpa arborea Roxb. [720978, TI]	Ghurbis ९घुर्बिस०	T	W(na)	Bark	Ex	O	Common cold*, Body pain*		0.02	0.33	0.4	36.67
Mentha spicata L. [9161012, TI]	Pudina ९पुदिना०	H	C(n)	Whole Plant	Ex, Pi	O	Anorexia, Cold	5, 6, 49, 51	0.08	0.33	0.4	36.67
Ocimum basilicum L. [P560, TUCH]	Babari ९बाबरी०	H	C(n)	Leaf	Ex	O	Hematuria*		0.02	0.17	0.2	18.33
Ocimum sanctum L. [6306515, TI]	Tulasi ९तुलसी०	H	C(n)	Whole plant	Ch, Ex, Va	I, O	Common cold, Cough, Tonsillitis	9, 33, 47, 59, 60	0.28	0.50	0.2	35.00
Vitex negundo L. [771154, TI]	Simali ९सिमली०	S	W(na)	Young shoot	Ra	I	Sinusitis	8, 23, 28, 32, 35, 43, 47, 48, 63, 66	0.06	0.17	0.2	18.33
Lauraceae												
Lindera neesiana (Wall. ex Nees) Kurz [P504, TUCH]	Siltimur/Bilimse ९सिल टिमुर, बिलिम्से०	T	W(na)	Fruit	Es. Ol, Ex	O, T	Muscular swelling and sprain*, Ringworm*, Tonsillitis	45	0.72	0.50	0.6	55.00
Magnoliaceae												
Magnolia champaca (L.) Baill. ex Pierre [P534, TUCH]	Aaule Chanp ९औले चाँप०	T	W(na)	Bark	Ex	O	Epilepsy*		0.02	0.17	0.2	18.33

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Malvaceae												
Sida acuta Burm. f. [6300761, TI]	Kuro ९कुरो०	H	W(na)	Root	Ex	O	Tonsillitis	63	0.08	0.17	0.2	18.33
Melanthiaceae												
Paris polyphylla Sm. [P524, TUCH]	Satuwa ९सतुवा०	H	W(na)	Rhizome	Ch, Ex	O	Gastritis, Stomach swelling	1, 8, 13, 22, 35, 41, 43, 45, 48, 51, 52	0.46	0.33	0.2	26.67
Meliaceae												
Azadirachta indica A. Juss. [10004656, TI]	Neem ९निम०	T	W(na)	Leaf	Ex	O	Kidney stone	8, 59	0.1	0.17	0.2	18.33
Menispermaceae												
Cissampelos pareira L. [P570, TUCH]	Gujar gano, Batulpate ९गुजर गानो, बटुल पाते०	C	W(na)	Leaf	Ex	O	Dysuria, Hematuria	8, 14	0.06	0.33	0.2	26.67
Tinospora cordifolia (Willd.) Miers ex Hook. f. & Thomson [P559, TUCH]	Gurjjo ९गुर्जो०	C	W(na)	Stem	Ex	O	Stomachache	8, 45	0.02	0.17	0.2	18.33
Moraceae												
Artocarpus lakoocha Wall. ex Roxb. [2016625, KATH]	Badahar ९बडहर०	T	W(na)	Bark, Latex	Ex, Ra	T	Body pain*, Mumps	44, 59	0.08	0.33	0.4	36.67
Ficus benghalensis L. [9755019, TI]	Bar ९वर०	T	W(na)	Bark	Ex	O	Epilepsy*, Hematuria*		0.06	0.33	0.4	36.67
Ficus religiosa L. [9755016, TI]	Peepal ९पीपल०	T	W(na)	Bark, Leaf	Ex, Ra	O	Epilepsy*, Hematuria*, Tonsillitis*		0.08	0.50	0.6	55.00
Ficus sarmentosa Buch.-Ham. ex Sm. [9263098, TI]	Lute Khaniyeu ९लुते खनिउ०	T	W(na)	Latex	Ex	O	Tonsillitis*		0.04	0.17	0.2	18.33
Musaceae												
Musa × paradisiaca. [GP8, KATH]	Kera ९केरा०	H	W(na)	Flower	Ex	O	Dysuria*		0.04	0.17	0.2	18.33
Myricaceae												
Myrica esculenta Buch.-Ham. ex D.Don [P651, TUCH]	Kaphal ९काफल०	T	W(na)	Bark	Ch, Ex, Pw	I, O, T	Muscular swelling and sprain, Sinusitis, Tonsillitis*	3, 8, 37, 48, 68	0.54	0.50	0.4	45.00

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Myrtaceae												
Psidium guajava L. [P516, TUCH]	Ambak (अम्बक०	T	C(i)	Bark, Young shoot	Ch, Ex	O	Diarrhea, Gingivitis, Vomiting	8, 11, 14, 17, 19, 25, 28, 32-35, 38, 44, 47-49, 54, 59, 63	0.16	0.50	0.4	45.00
Oleaceae												
Jasminum humile L. [9240288, TI]	Jai phul/Dhesi phul/Jaisara ९जाई फुल, देसी फुल, जैसरा०	S	W(na)	Young shoot	Ex	O	High blood pressure*, Jaundice*, Tonsillitis*		0.06	0.50	0.6	55.00
Orchidaceae												
Dactylorhiza hatagirea (D. Don) Soó [8890422, KATH]	Panchaule ९पांचऔले०	H	W(na)	Rhizome	Ch, Pa	O, T	Cuts and wounds, Fever	1, 2, 8, 13, 30, 31, 34, 52, 42, 46, 48, 68	0.58	0.33	0.4	36.67
Phyllanthaceae												
Phyllanthus emblica L. [P533, TUCH]	Amala ९अमला०	T	W(na)	Bark	Ch	O	Tonsillitis	17, 33, 41, 48, 62	0.18	0.17	0.2	18.33
Phytolaccaceae												
Phytolacca acinosa Roxb. [8310373, TI]	Jaringo ९जरिंगो०	H	W(na)	Leaf, Root	Ex	O	Anorexia	33, 34, 45, 46	0.18	0.17	0.2	18.33
Piperaceae												
Piper mullesua Buch.-Ham. ex D. Don [P503, TUCH]	Chabo ९चाबो०	C	W(na)	Leaf	Ch	O	Tonsillitis	51	0.04	0.17	0.2	18.33
Plantaginaceae												
Neopicrorhiza scrophulariiflora (Pennell) D.Y. Hong [D134, KATH]	Kudki ९कुड्की०	H	W(na)	Rhizome	Ex	O	Body pain, Fever, Headache, High blood pressure	8, 13, 14, 20, 22, 30, 37, 42, 57, 52, 68	0.84	0.67	0.8	73.33
Plumbaginaceae												
Plumbago zeylanica L. [P621, TUCH]	Chitu ९चितु०	H	W(na)	Root	Pa	T	Body pain, Muscular swelling and sprain	31, 32, 37, 45, 49, 66	0.56	0.33	0.2	26.67
Poaceae												
Cynodon dactylon (L.) Pers. [P511, TUCH]	Dubo ९दुबो०	H	W(na)	Leaf	Ex	O	Jaundice	36, 50	0.04	0.17	0.2	18.33
Eleusine coracana (L.) Gaertn. [6302216, TI]	Kodo ९कोदा०	H	C(i)	Fruit	Po	O	Gingivitis*		0.06	0.17	0.2	18.33

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Imperata cylindrica (L.) Raeusch. [9262037, TI]	Siru ९सिरु०	H	W(na)	Root	Ch, Ex	O	Common cold, Intestinal worms	9, 11, 30, 32, 33, 37, 38, 64, 68	0.2	0.33	0.4	36.67
Saccharum officinarum L. [670580, KATH]	Gyabre ukhu ९ग्याब्रे उखु०	H	C(i)	Mature shoot	Ex	O	Jaundice	25, 32, 37, 38, 44, 54	0.22	0.17	0.2	18.33
Thysanolaena latifolia (Roxb. ex Hornem.) Honda [P548, TUCH]	Amriso ९अम्रिसो०	H	W(na)	Root	Ch, Ex, Pa	O, T	Abscess*, Splinter*, Tonsillitis*		0.08	0.50	0.4	45.00
Zea mays L. [772911, TI]	Makai ९मकै०	H	C(i)	Seed	Ro	O	Altitude sickness*		0.06	0.33	0.2	26.67
Polygonaceae												
Bistorta amplexicaulis (D.Don) Greene [D030, KATH]	Anante ९अनन्ते०	H	W(na)	Root	Ch	O	Diarrhea	61	0.04	0.17	0.2	18.33
Eskemurkerjea megacarpum (H. Hara) H. Hara [20090401, KATH]	Rato tamarke ९रातो तमर्के०	C	C(e)	Root	Pa	T	Cuts and wounds	52	0.08	0.17	0.2	18.33
Rheum australe D.Don [1548, KATH]	Khokim ९खोकिम०	H	W(na)	Root	Ex	O	Body pain, Muscular swelling and sprain	7, 13, 48, 46	0.62	0.33	0.2	26.67
Rheum nobile Hook.f. & Thomson [SH-106]	Padamchal ९पदमचाल०	H	W(na)	Root	Ex, Pa	O, T	Back pain*, Bone fracture and dislocation, Constipation*, Cuts and wounds	46, 48	0.54	0.67	0.6	63.33
Rumex nepalensis Spreng. [P518, TUCH]	Halhale ९हलहले०	H	W(na)	Root	Ex, Pa	O, T	Pneumonia, Cuts and wounds	8, 10, 13, 14, 30, 33, 34, 37, 48, 53, 61, 68	0.08	0.33	0.4	36.67
Ranunculaceae												
Aconitum ferox Wall. ex Ser. [P530, TUCH]	Seto bikhma ९सेतो बिख्मा०	H	W(na)	Rhizome	Ch, Ex	O, T	Anorexia, Cuts and wounds*, Fever	8, 13, 14, 46, 48, 49, 57, 68	0.68	0.50	0.6	55.00
Aconitum heterophylloides (Bruhi) Lauener [D033, TUCH]	Kalo bikhma ९कालो बिख्मा०	H	W(na)	Rhizome	Ch	O	Anorexia*, Fever*, Tonsillitis*		0.82	0.50	0.4	45.00

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Clematis buchananiana DC. [P535, TUCH]	Pinase laharo/Phuphumba/ Maha gagri ९पिनासे लहरो, फुफुम्बा, मह गाग्री०	C	W(na)	Root, Stem	Pa, Pw	I, T	Bone fracture and dislocation*, Sinusitis	8, 11, 14, 30, 32, 38, 45, 51, 67, 68	0.34	0.33	0.4	36.67
Rosaceae												
Potentilla lineata Trevir. [P525, TUCH]	Bajradanti ९वज्रदन्ती०	H	W(na)	Root	Ch, Ex	O	Diarrhea, Toothache	3, 9, 28, 30, 33-35, 41, 48, 51, 54	0.16	0.33	0.4	36.67
Prunus cerasoides Buch.-Ham. ex D. Don [P553, TUCH]	Painyu ९पैयु०	T	W(na)	Bark	Ex, Pa	O, T	Bone fracture and dislocation, Gastritis*	8, 10, 14, 24, 28, 42, 62, 65, 68	0.26	0.33	0.4	36.67
Prunus persica (L.) Batsch [9240234, TI]	Aaru ९आरु०	T	C(i)	Young shoot	Ex	O	Toothache*		0.04	0.17	0.2	18.33
Rosa sericea Lindl. [9240965, TI]	Darim ९दारिम०	S	W(na)	Bark	Pa	T	Fungal infection	20, 52	0.06	0.17	0.2	18.33
Pyrus pashia Buch.-Ham. ex D. Don [P722, TUCH]	Mayal ९मयल्०	T	W(na)	Fruit	Ex	O	Dysentery	8, 32, 38, 11, 42, 45	0.3	0.17	0.2	18.33
Rubus ellipticus Sm. [P513, TUCH]	Ainselu ९ऐंसेलु०	S	W(na)	Mature shoot-pith, Root	Ch, Ex	O, T	Muscular swelling and sprain, Stomachache, Tonsillitis	8, 9, 10, 14, 23, 28, 33, 44, 47, 48, 51, 55, 67	0.42	0.50	0.6	55.00
Rubiaceae												
Rubia manjith Roxb. ex Fleming [P508, TUCH]	Majitho ९मजिठो०	C	W(na)	Young shoot	Ex	T	Snake bite	8, 48, 34	0.04	0.17	0.2	18.33
Rutaceae												
Citrus limon (L.) Osbeck [P551, TUCH]	Jyamir ९ज्यामिर०	S	C(i)	Fruit	Ex	O	Diarrhea	9	0.12	0.17	0.2	18.33
Citrus reticulata Blanco [P552, TUCH]	Suntala ९सुन्तला०	T	C(i)	Fruit	Ex	O	Pneumonia, Tonsillitis	14, 37, 48	0.02	0.33	0.4	36.67
Euodia fraxinifolia (D.Don) Hook. f. [9263248, TI]	Khanakpa ९खानक्पा०	T	W(na)	Fruit	Ch	O	Common cold, Fever, Tonsillitis	46, 49, 51, 57	0.66	0.50	0.6	55.00
Zanthoxylum acanthopodium DC. [P531, TUCH]	Boke timur ९बोके टिमुर०	S	W(na)	Fruit	Pw, Ro	O, T	Gastritis, Leech bite	30, 33, 45, 46, 48, 49, 53, 57	0.18	0.33	0.4	36.67
Zanthoxylum armatum DC. [P657, TUCH]	Timur ९टिमुर०	S	W(na)	Fruit	Ch, Pa, Pw	O, T	Asthma, Fever, Headache, Stomachache, Toothache	2, 3, 6-10, 12, 13, 22, 24, 28, 31-34, 37, 41, 42, 46-48, 51, 54, 65	0.14	0.83	1	91.67

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Santalaceae												
Pyrularia edulis (Wall.) A. DC. [9261343, TI]	Amphi ९अम्फी०	H	W(na)	Seed	Es. Ol	T	Cuts and wounds	7, 49	0.04	0.17	0.2	18.33
Viscum articulatum Burm.f. [770396, TI]	Hadchur ९हड्चुर०	S	W(na)	Whole Plant	Ex, Pa	O, T	Body pain, Bone fracture and dislocation, Menstrual disorders	15, 32, 24, 44-46, 49, 51, 62	0.82	0.50	0.4	45.00
Sapotaceae												
Diploknema butyracea (Roxb.) H.J. Lam [P565, TUCH]	Chuiri ९चिउरी०	T	W(na)	Seed	Pa	T	Fungal infection	35, 41	0.06	0.17	0.2	18.33
Saxifragaceae												
Astilbe rivularis Buch.-Ham. ex D. Don [D025, KATH]	Budi hokto ९बुढी होक्तो०	H	W(na)	Rhizome	Ch, Pa	O, T	Body pain, Cough, Fever, Stomachache	7, 8, 20, 30, 33, 34, 38, 45, 46, 49, 51, 68	0.54	0.67	0.8	73.33
Bergenia ciliata Sternb. [P505, TUCH]	Pakhambed ९पाखमबेद०	H	W(na)	Rhizome	Ch, Ex	O	Body pain, Gingivitis, Muscular swelling and sprain	7, 8, 12, 13, 37, 43, 44, 46, 51, 56, 54, 67, 68	0.78	0.50	0.4	45.00
Scrophulariaceae												
Buddleja paniculata Wall. [P592, TUCH]	Bhimsen pati ९भिमसेन पाती०	T	W(na)	Leaf	Ex	T	Allergy*		0.06	0.17	0.2	18.33
Solanaceae												
Capsicum annuum L. [K01, KATH]	Akabare ९अकबरे०	H	C(i)	Fruit	Pa	T	Abscess*		0.08	0.17	0.2	18.33
Solanum viarum Dunal [8860006, TI]	Bhanbheda ९बनभेडा०	H	W(nt)	Fruit	Bu	I	Toothache	5, 28, 47	0.18	0.17	0.2	18.33
Thymelaeaceae												
Daphne bholua Buch.-Ham. ex D. Don [6160, KATH]	Kagte ९कास्ते०	S	W(na)	Root	Ex	O	Anorexia, Sinusitis	8, 10, 41, 46	0.28	0.33	0.4	36.67
Ulmaceae												
Ulmus lanceifolia Roxb. ex Wall. [P512, TUCH]	Chamlayo ९चम्लायो०	T	W(na)	Bark	Pa	T	Bone fracture and dislocation	32	0.58	0.17	0.2	18.33

Taxa (Latin name)	Vernacular name	Habit	Habitat	Part(s) used	Pr. rem.	AR	Ailment(s) cured	Previous use reports	RFC	RelPH	RelBs	RI
Urticaceae												
Boehmeria virgata var. *macrostachya* (Wight) Friis & Wilmot-Dear [P580, TUCH]	Kamle ९काम्ले०	H	W(na)	Bark	Pa	T	Skin burn*		0.04	0.17	0.2	18.33
Girardinia diversifolia (Link) Friis [P689, TUCH]	Allo ९अल्लो०	H	W(na)	Leaf, Root, Stem	Bu, Pa	T	Bone fracture and dislocation, Dog bite*, Skin burn*	8, 13, 41, 43, 65	0.1	0.50	0.6	55.00
Pouzolzia rugulosa (Wedd.) Acharya & Kravtsova [6304689, TI]	Dar ९दार०	T	W(na)	Bark	Ex	T	Muscular swelling and sprain	4	0.02	0.17	0.2	18.33
Pouzolzia zeylanica (L.) Benn. & R.Br. [6304696, TI]	Sano chiple/Bhui chiple ९सानो चिप्ले, भुई चिप्ले०	H	W(na)	Root	Pa, Ex	O, T	Bone fracture and dislocation	32, 48	0.52	0.17	0.2	18.33
Urtica parviflora Roxb. [771562, TI]	Ghariya Sisno ९घरिया सिस्नो०	H	W(na)	Root	Co, Ex, Pa	O, T	Bruise, Dog bite, High blood pressure, Snake bite, Stomachache	2, 7-9, 11, 28, 30, 32, 37, 38, 44, 46, 48, 57	0.56	0.83	1	91.67
Zingiberaceae												
Cardamomum subulatum (Roxb.) Kuntze [438, TI]	Alainchii ९अलैंची०	H	W(na)	Fruit	Ex	O	Dehydration*, Fatigue*		0.08	0.17	0.2	18.33
Curcuma longa L. [P521, TUCH]	Besar ९बेसार०	H	C(i)	Rhizome	Ex, Pa	O, T	Common cold, Fungal infection, Tonsillitis	9, 14, 15, 44, 45, 54, 60, 63	0.18	0.50	0.4	45.00
Kaempferia rotunda L. [P520, TUCH]	Bhui champa ९भुई चम्पा०	H	C(n)	Rhizome	Pa	T	Skin burn, Bone fracture and dislocation	33, 45, 48, 49, 57	0.08	0.33	0.4	36.67
Zingiber officinale Roscoe [86/670, KATH]	Aduwa ९अदुवा०	H	C(i)	Rhizome	Ex	O	Common cold, Tonsillitis	8, 9, 14, 19, 25, 32, 33, 34, 37, 45-48, 54, 58, 59, 60, 66, 68	0.3	0.33	0.2	26.67

The number and letter in parenthesis after the Latin names represent the voucher specimen's number and the housed herbaria (BM: The Natural History Museum, UK; KATH: National Herbarium and Plant Laboratories, Nepal; TI: Herbarium of the University of Tokyo, Japan; TUCH: Tribhuvan University Central Herbarium, Nepal) respectively. The '*' sign after 'Ailments cured' denotes the New Report in this study.

Pr. rem. (Preparation remedies): Bu (burnt), Co (cooked), Ch (chewing) Es. Ol (essential oil), Ex (extract), Pa (paste), Pi (pickled), Po (porridge), Pw (powder), Ra (raw), Ro (roasted), Sq (squeezed), Va (vapour), Wa (warmed)

AR (Administrative route): O (oral), T (topical), I (inhalation)

Habit: C (climber), H (herb), S (shrub), T (tree)

Habitat: C(e) = cultivated-endemic, C(i) = cultivated-introduced, C(n) = cultivated-native, W(ia) = wild-IAPS, W(na) = wild-native, W(nt) = wild-naturalized

References: 1-Manandhar 1986, 2-Bhattarai 1992, 3-Manandhar 1995, 4-Manandhar 1998, 5-Bhatta 1999, 6-Parajuli *et al.* 2000, 7-Chaudhary *et al.* 2002, 8-Manandhar 2002, 9-Rai 2003, 10-Shrestha & Dhillion 2003, 11-Kurmi & Baral 2004, 12-Bhatt & Negi 2006, 13-Kunwar *et al.* 2006, 14-Pradhan & Badola 2008, 15-Rijal 2008, 16-Singh & Lal 2008, 17-Bhattarai *et al.* 2009, 18-Liu *et al.* 2009, 19-Srithi *et al.* 2009, 20-Bhattarai *et al.* 2010, 21-Samuel *et al.* 2010, 22-Uprety *et al.* 2010, 23-Gautam 2011, 24-Joshi *et al.* 2011, 25-Namsa *et al.* 2011, 26-Sigdel & Rokaya 2011, 27-Uprety *et al.* 2011, 28-Acharya 2012, 29-Thapa 2012, 30-Badola & Pradhan 2013, 31-Kunwar *et al.* 2013, 32-Limbu & Rai 2013, 33-Parajuli 2013a, 34-Parajuli 2013b, 35-Luitel *et al.* 2014, 36-Naikade & Meshram 2014, 37-Niraula & Singh 2014, 38-Tamang & Singh 2014, 39-Bhattarai & Acharya 2015, 40-Janbaz *et al.* 2015, 41-Kunwar *et al.* 2015, 42-Malik *et al.* 2015, 43-Malla *et al.* 2015, 44-Rai & Singh 2015, 45-Bhattarai & Khadka 2016, 46-Shrestha *et al.* 2016, 47-Tamang & Sedai 2016, 48-Uprety *et al.* 2016, 49-Bhattarai 2017, 50-Tewari *et al.* 2017, 51-Bhattarai 2018, 52-Ghimire *et al.* 2018, 53-Ong *et al.* 2018, 54-Adhikari *et al.* 2019, 55-Farooq *et al.* 2019, 56-Ijaz *et al.* 2019, 57-Lepcha *et al.* 2019, 58-Nguyen *et al.* 2019, 59-Rajbanshi & Thapa 2019, 60-Pala *et al.* 2019, 61-Wali *et al.* 2019, 62-Ambu *et al.* 2020, 63-Bhattarai 2020, 64-Bhatt & Kunwar 2020, 65-Budha-Magar *et al.* 2020, 66-Hu *et al.* 2020, 67-Pangeni *et al.* 2020, 68-Pradhan *et al.* 2020.

Asteraceae and Fabaceae were the dominant families each comprising eight species, followed by Rosaceae and Poaceae each with six species. The therapeutic dominancy of Asteraceae and Fabaceae is associated with the wide and common distribution of the family in Nepal and adjoining areas (Press *et al.* 2000, Singh & Lal 2008, Badola & Pradhan 2013, Rajbhandari & Rai 2017, Ong *et al.* 2018, Shrestha *et al.* 2018, Ijaz *et al.* 2019, Lepcha *et al.* 2019, Wali *et al.* 2019, Budha-Magar *et al.* 2020).

Fifty-five percent (55%) of the total medicinal plant species constituted the herbaceous life-form followed by trees (25%), shrubs (11%), and climbers (9%) (Figure 2). Such dominance of herbs as medicinal plants is comparable with other research findings from Nepal and neighbouring countries (Bhattarai *et al.* 2010, Uprety *et al.* 2010, Kunwar *et al.* 2015, Ghimire *et al.* 2018, Hu *et al.* 2020). Wide distribution and easy access favour the collection of herbs over other life forms such as shrubs and trees (Abbas *et al.* 2017). The presence of bioactive compounds like alkaloids, phenolic glycosides and cyanogenic glycosides in herbs (Coley *et al.* 1985) makes them able to treat a majority of ailments (Lyon *et al.* 2012).

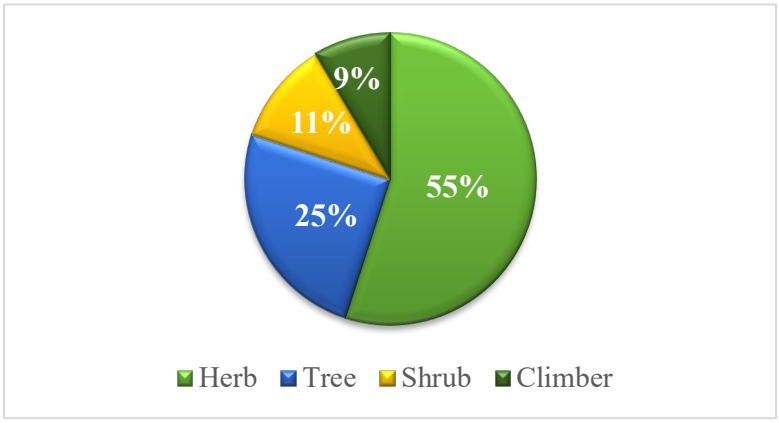

Figure 2. Life forms of medicinal plant species in the study area

A total of 83% (116 species) of medicinal plants were harvested by the local communities from the wild, while the remaining 17% (24 species) were cultivated in home gardens. Similar findings have been reported by independent studies from other parts of the world like West Malaysia (Samuel *et al.* 2010), China (Hong *et al.* 2015), South Africa (Maroyi *et al.* 2017), Eastern Nepal (Rajbanshi & Thapa 2019) and Pakistan (Wali *et al.* 2019). The species harvested from the wild include 110 native species, 2 invasive alien plant species (IAPs) and four naturalized species. The species cultivated in home gardens comprised 18 introduced species and five native species. A wild buckwheat species, *Eskemurkerjea megacarpum* (Polygonaceae), endemic to the west and central Nepal (Hara 1972), was cultivated in the study area for its medicinal value (Ghimire *et al.* 2018). The majority of the IAPs and naturalized species were used for healing cuts and wounds (Uprety *et al.* 2010, Badola & Pradhan 2013, Limbu & Rai 2013, Kunwar *et al.* 2015, Ong *et al.* 2018, Lepcha *et al.* 2019, Bhattarai 2020), while the majority of cultivated-introduced species (for example, *Saccharum officinarum*) were used to treat jaundice (Namsa *et al.* 2011, Limbu & Rai 2013, Tamang & Singh 2014, Adhikari *et al.* 2019) (see Table 1 for details).

The majority of the reported medicinal plant species represented subtropical and temperate elements. *Bergenia ciliata*, *Clematis buchananiana*, *Costus speciosus*, *Oroxylum indicum*, *Swertia chirayita* were the major subtropical and temperate elements. Among them, *Swertia chirayita* is one of the top non-timber forest products exported to neighboring countries, therefore contributing a major role in revenue generation at the local level (Cunningham et al. 2018). This plant is commonly known as a bitter tonic in the traditional medicinal system and is used for the treatment of fever and other ailments (Limbu & Rai 2013, Aleem & Kabir 2018). *Achyranthes aspera*, *Acorus calamus* and *Cassia fistula* represented tropical elements used for treating respiratory and gastrointestinal disorders (Manandhar 2002, Kurmi & Baral 2004, Pradhan & Badola 2008, Bhattarai *et al.* 2009, Thapa 2012, Kunwar *et al.* 2015, Bhattarai & Khadka 2016, Uprety *et al.* 2016, Ghimire *et al.* 2018, Bhattarai 2020, Bhatt & Kunwar 2020). Alpine and subalpine plants growing above 3000 m were also used for treating different human ailments. Timbu Pokhari which is located at an elevation of 4200 m is considered as the prioritized habitat for alpine plant species (Shrestha *et al.* 2008). This area is the habitat of high-altitude medicinal plants like *Aconitum ferox*, *A. heterophylloides*, *Neopicrorhiza scrophulariiflora*, *Rheum australe*, *R. nobile* and *Saussurea gossypiphora*. The *Aconitum* species, *Neopicrorhiza scrophulariiflora*, *Saussurea gossypiphora* were used to treat general disorders like fever, cuts and wounds (Manandhar 2002, Pradhan & Badola 2008, Uprety *et al.* 2010, Badola & Pradhan 2013, Shrestha *et al.* 2016, Uprety *et al.* 2016, Bhattarai 2017, Lepcha *et al.* 2019). A good population of the east Himalayan iconic species '*Rheum nobile*' is found around Timbu Pokhari (Shrestha *et al.* 2008). The root paste of this species was used to fix the dislocated and fractured bones (Shrestha *et al.* 2016, Uprety *et al.* 2016), while the root juice was consumed to treat back pain and constipation.

Utilization of plant parts

Plant parts including the root, rhizome, tuber, stem bark, latex, leaf, aerial shoot, flower, fruit and seed and their exudates were used either singly or in combination with other parts. The most commonly used plant parts were underground parts i.e., root, rhizome and tuber (29%) followed by fruit/seed (16%), bark (13%), leaf (11%), and whole plant (9%). The 'others' in figure 3 includes flower, latex, mature shoot, young shoot, stem, and wool for a collective total of 6% of species. In some cases, multiple parts of a single species were used, which is categorized as 'combined parts' representing 16% of species (Figure 3). The dominant use of underground parts may be linked to the presence of bioactive compounds in these parts (Malik *et al.* 2015, Farooq *et al.* 2019). These results agree with the previous studies (Bhatt & Negi 2006, Pradhan & Badola 2008, Liu *et al.* 2009, Rokaya *et al.* 2010, Uprety *et al.* 2010, Uprety *et al.* 2012, Badola & Pradhan 2013, Rokaya *et al.* 2014, Nguyen *et al.* 2019, Pala *et al.* 2019, Budha-Magar *et al.* 2020). Harvesting of the underground parts must be monitored at regular intervals for the sustainable use of the medicinal plant species (Ghimire & Pyakurel 2008, Rokaya *et al.* 2010).

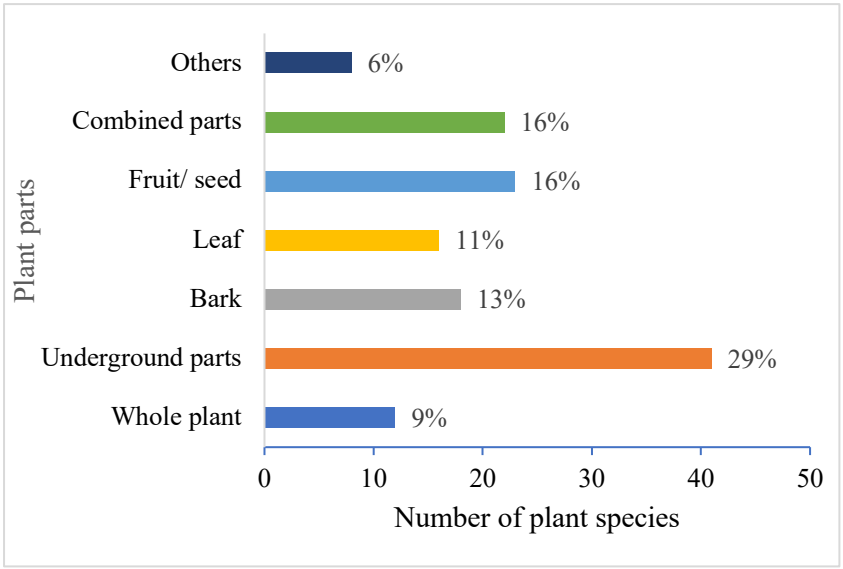

Figure 3. Number of plant species and parts used

Preparation and administration of remedies

The indigenous peoples and local communities in the study area use different preparation methods for administrating the remedies i.e., extract, chewing, paste, raw, powder, burnt, cooked and others. The most common method of preparing remedies was the extract i.e., decoction, juice and infusion (53%), followed by chewing (19%), paste (12%), raw (4%), powder (3%), burnt and cooked (2% each), and others (essential oil, roasted, squeezed, vapor, porridge, pickled, warmed) with a collective total of 5%. Several studies have reported decoction, infusion, and juice as the most common preparation method (Uprety *et al.* 2010, Kunwar *et al.* 2013, Bhattarai 2017, Budha-Magar *et al.* 2020). Oral administration was reported for most remedies (63%), followed by topical administration (32%) and inhalation (5%). Nine species were inhaled either as vapor or as smoke. The hot vapor by boiling young shoots of *Justicia adhatoda* and the smoke from burning aerial parts of *Drymaria cordata* were inhaled twice a day to treat sinusitis (Chhetri 2004, Bantawa & Rai 2009, Singh & Huidrom 2013). The smoke of the burnt fruit of *Solanum viarum* was directed towards an infected tooth to overcome the associated pain. The smoke of burnt seeds of *Heracleum nepalense* was inhaled to treat sneezing and the common cold (Gautam 2011), indicating that the inhalation mode was used to treat respiratory disorders.

In traditional Ayurveda, preparation of remedies demands knowledge of why and how the plant work (Manohar 2012, Nafiu *et al.* 2017). Not all preparations are easy, and methods used are related to preparation efficacy (Parasuraman *et al.* 2014). Therefore, the preparation and administration of herbal remedies should have developed through a practice over many centuries, which have been transmitted over generations mainly by verbal means (Nafiu *et al.* 2017).

Although there was no standardization for remedies administration (Wachtel-Galor & Benzie 2011, Farooq *et al.* 2019), the quantity and concentration of remedies depended on the age, illness, and diagnosis of the disease (Densmore 2012, Mncwangi *et al.* 2012). Children were given a lower dose, while for adults the type of ailments and their severity were the determining factors (Pradhan & Badola 2008, Namsa *et al.* 2011). Most of the remedies were given twice a day until recovery. Similar results have been reported by Asase *et al.* 2010, Wambugu *et al.* 2011 and Manjula *et al.* 2015. The measurement unit was not standardized (Hong *et al.* 2015), instead traditional techniques were used for weighing. The extract was either administered using a teaspoon (~ 5 ml) or diluted in a glass of water. Most of these remedies used water as a solvent for extraction. In some cases, honey, cow milk, chicken egg, rock sugar, salt, and mouse droppings were used as additives. For example, a small piece (1 choito ~ 5-10 gm) of a rhizome of *Nardostachys jatamansi* was chewed twice a day to treat dysentery. A pinch (1 chimti ~

5-10 gm) bark powder of *Psidium guajava*, dissolved in 500 ml water was consumed twice daily to treat diarrhea and vomiting. One handful (1 muthi) leaves of *Taxus wallichiana* was boiled in about 750 ml (1 mana) of water, and the extract was consumed twice a day to treat jaundice. A mixture of powdered *Viscum articulatum*, honey (5 ml), cow milk (10 ml) and an egg were consumed to treat body pain. In the case of hematuria and dysuria, a solution of *Cissampelos pareira*, *Ocimum basilicum*, *Centella asiatica* and rock sugar was left overnight under the open sky and consumed in the early morning. A paste of *Urtica parviflora* (root) and mouse droppings was effective against dog bites. Several wild plants were consumed as fresh fruits (*Cassia fistula*, *Euodia fraxinifolia*, *Heracleum nepalense*, *Rhus javanica*), while other plant parts such as tubers (*Nephrolepis cordifolia*), root/rhizome (*Acorus calamus*, *Costus speciosus*, *Nardostachys jatamansi*) and flowers (*Rhododendron arboreum*) were consumed raw for their nutritional and medicinal value.

Altogether, 48% (68 species) of the total species cured single ailments, while 29% (40 species) cured two ailments and 23% (32 species) cured three or more ailments (Table 1). *Lobelia pyramidalis* cured six ailments, while *Artemisia dubia*, *Astilbe rivularis*, *Rhododendron arboreum*, *Urtica parviflora* and *Zanthoxylum armatum* each cured five ailments. The plant species were used either singly or in combination to treat one or several ailments. For example, *Ficus benghalensis*, *F. religiosa*, *Magnolia champaca,* and *Rhododendron arboreum* were used in combination to treat the epileptic disorder. A mixture of *Astilbe rivularis*, *Rheum australe*, and *Viscum articulatum* was used for body pain and ankle sprain. The paste of *Clematis buchananiana*, *Pouzolzia zeylanica,* and *Ulmus laceifolia* was useful for bone fracture and dislocation. The solution prepared by mixing *Equisetum diffusum*, *Nasturtium officinale* and *Raphanus sativus* was consumed to treat jaundice. The combined action of different species is believed to increase the catalytic activity of the medicinal constituents and accelerates its assimilation within the body (Mahomoodally 2013). The multiple uses of these species for curing different ailments also reflect their widespread adoption of these species (Pala *et al.* 2019).

Medicinal plant species and ailment categories

The reported medicinal plant species were used to treat 59 different ailments in the study area. These ailments were categorized into 12 health disorder categories (Table 2). Most of the plant species were used to treat gastrointestinal disorders (52 species), followed by general disorders (49 species) and respiratory disorders (46 species). The other categories included musculoskeletal disorders (26 species), dermatological disorders (11 species), cardiovascular disorders (7 species), genitourinary disorders (7 species), antidote, gynecological disorders (5 species), neurological and nervous system disorders (5 species), sensorial disorders (2 species) and socio-culture bound syndromes (2 species). The prevalence of treatments for gastrointestinal disorders was likely due to malnutrition, poor hygiene, irregular dietary routine, and contaminated drinking water (Dey & De 2012, Rokaya *et al.* 2014, Miftahussurur *et al.* 2015, Abbas *et al.* 2017). Respiratory disorders can be associated with long-term exposure to indoor air pollution from traditional biomass-based fuelwood burning and tobacco smoking (Joshi *et al.* 2009, MoHP 2010, Bhandari *et al.* 2012, Ranabhat *et al.* 2015). Musculoskeletal disorders could be linked with the region's difficult topography, labor-intensive lifestyle of the local people and the long-term conditions of other pathogenic processes (Abbas *et al.* 2017, Duffield *et al.* 2017).

Quantitative analysis of ethnomedicinal use

Informant consensus factor

Informant consensus factor (ICF) tests the homogeneity of knowledge among participants in the use of plant species to treat particular ailment categories (Trotter & Logan 1986, Gazzaneo *et al.* 2005). In this study, the ICF was calculated for 12 health disorder categories, and the range varied from 0 to 0.96 (Table 2). The highest ICF (0.96) was reported for socio-culture bound syndromes and comprised two species (*Heracleum nepalense* and *Ligusticopsis wallichiana*) with 26 use reports. This indicates that the information related to the use of these two species is well exchanged among members of the community. The ICF of musculoskeletal disorders was 0.92 with 26 species and 305 use reports followed by respiratory disorders (0.9) with 46 species and 432 use reports. The ailment category 'sensorial disorders' has the lowest degree of consensus (0) where only two participants cited two plant species (*Artemisia dubia* and *Iresine herbstii*) suggesting no exchange of information about their uses among the participants. The socio-culture bound syndrome was preferably treated with herbal medicine (Guarnaccia & Rogler 1999) because there is no synthetic treatment available (Andel & Fundiko 2016). These species should be given priority as they represent the cultural identity of the area (Bayles & Katerndahl 2009, Andel & Fundiko 2016). Furthermore, detailed phytochemical screening of species showing high informant consensus can aid in the transfer of local knowledge to the global level (Uprety *et al.* 2010, Rashid *et al.* 2018).

Table 2. Health Disorder categories of plant species with corresponding informant consensus factor values

Health Disorder categories	Ailment/Disease	Latin name	Use Report	Number of taxa	ICF
Socio-culture bound syndrome	Nervousness (**She**)	*Heracleum nepalense, Ligusticopsis wallichiana*	26	2	0.96
Musculoskeletal disorders	Body pain, Bone fracture and dislocation, Muscular swelling, and sprain	*Actinidia strigosa, Allium wallichii, Artemisia dubia, Artocarpus lakoocha, Astilbe rivularis, Bergenia ciliata, Callicarpa arborea, Clematis buchananiana, Artocarpus lakoocha, Girardinia diversifolia, Juglans regia, Kaempferia rotunda, Lepidium sativum, Lindera neesiana, Myrica esculenta, Plumbago zeylanica, Pouzolzia rugulosa, Pouzolzia zeylanica, Prunus cerasoides, Rheum australe, Rheum nobile, Rubus ellipticus, Taxus wallichiana, Ulmus lanceifolia, Valeriana jatamansi, Viscum articulatum*	305	26	0.92
Respiratory diseases	Asthma, Cold, Common cold, Cough, Mumps, Pneumonia, Sinusitis, Sneezing, Tonsillitis	*Achyranthes aspera, Aconitum heterophylloides, Acorus calamus, Artemisia dubia, Artocarpus lakoocha, Asparagus racemosus, Astilbe rivularis, Callicarpa arborea, Centella asiatica, Cirsium verutum, Citrus reticulata, Clematis buchananiana, Curcuma longa, Cyathula tomentosa, Daphne bholua, Drymaria cordata, Entada rheedei, Euodia fraxinifolia, Ficus religiosa, Ficus sarmentosa, Heracleum nepalense, Imperata cylindrica, Jasminum humile, Justicia adhatoda, Ligusticopsis wallichiana, Lindera neesiana, Lobelia pyramidalis, Mentha spicata, Myrica esculenta, Ocimum sanctum, Phyllanthus emblica, Piper mullesua, Rhododendron arboreum, Rubus ellipticus, Rumex nepalensis, Sida acuta, Solena heterophylla, Tagetes patula, Thunbergia coccinea, Thysanolaena latifolia, Trichosanthes tricuspidata, Trigonella foenum-graecum, Valeriana jatamansi, Vitex negundo, Zanthoxylum armatum, Zingiber officinale*	432	46	0.90
Antidotes (e.g., Animal bite)	Allergy, Bacterial infection, Dog bite, Leech bite, Snake bite	*Girardinia diversifolia, Rubia manjith, Solanum viarum, Urtica parviflora, Zanthoxylum acanthopodium*	37	5	0.89

General disorders	Altitude sickness, Back pain, Bone struck in throat, Bruise, Cuts and wounds, Dehydration, Fatigue, Fever, Headache, Polydipsia, Skin burn, Splinter	*Aconitum ferox, Aconitum heterophylloides, Acorus calamus, Ageratina adenophora, Allium wallichii, Aloe vera, Anaphalis triplinervis, Artemisia dubia, Asparagus racemosus, Astilbe rivularis, Berberis asiatica, Bergenia ciliata, Boehmeria virgata var. macrostachya, Cassia fistula, Cheilanthes albomarginata, Dactylorhiza hatagirea, Eclipta prostrata, Engelhardia spicata, Eskemurkerjea megacarpum, Euodia fraxinifolia, Galinsoga parviflora, Girardinia diversifolia, Iresine herbstii, Justicia adhatoda, Kaempferia rotunda, Ligusticopsis wallichiana, Lobelia pyramidalis, Mimosa pudica, Neopicrorhiza scrophulariiflora, Nephrolepis cordifolia, Nasturtium officinale, Pieris formosa, Pteris biaurita, Pyrularia edulis, Rheum nobile, Rhododendron arboreum, Rumex nepalensis, Saurauia napaulensis, Saussurea gossypiphora, Stellaria monosperma, Swertia chirayita, Swertia multicaulis, Tagetes erecta, Thunbergia coccinea, Thysanolaena latifolia, Urtica parviflora, Valeriana jatamansi, Zanthoxylum armatum, Zea mays*	414	49	0.88
Gastro-intestinal disorders	Anorexia, Constipation, Diarrhea, Dysentery, Gastritis, Gingivitis, Indigestion, Intestinal worms, Jaundice, Stomachache, Stomach swelling, Toothache, Vomiting	*Achyranthes aspera, Aconitum ferox, Aconitum heterophylloides, Albizia lebbeck, Aloe vera, Astilbe rivularis, Belamcanda chinensis, Berberis asiatica, Bergenia ciliata, Bistorta amplexicaulis, Celtis tetrandra, Cirsium verutum, Citrus limon, Cuscuta reflexa, Cynodon dactylon, Eleusine coracana, Equisetum diffusum, Euphorbia royleana, Imperata cylindrica, Jasminum humile, Lobelia pyramidalis, Mentha spicata, Mimosa pudica, Nardostachys jatamansi, Nephrolepis cordifolia, Nasturtium officinale, Ophiopogon intermedius, Oroxylum indicum, Panax pseudo-ginseng, Paris polyphylla, Phytolacca acinosa, Plumeria rubra, Potentilla lineata, Prunus cerasoides, Prunus persica, Psidium guajava, Pyrus pashia, Quercus lanata, Raphanus sativus, Rheum nobile, Rhododendron arboreum, Rhus javanica, Rubus ellipticus, Saccharum officinarum, Solanum viarum, Taxus wallichiana, Tinospora cordifolia, Trichosanthes cucumerina, Trigonella foenum-graecum, Urtica parviflora, Zanthoxylum acanthopodium, Zanthoxylum armatum*	409	52	0.88
Dermatological diseases	Abscess, Dandruff, Fungal infection, Furunculosis, Ringworm, Scabies, Wart	*Albizia procera, Allium sativum, Buddleja paniculata, Capsicum annuum, Cheilanthes albomarginata, Curcuma longa, Remusatia*	80	11	0.87

		pumila, Lyonia ovalifolia, Rosa sericea, Thysanolaena latifolia, Viburnum cylindricum			
Genitourinary disorders	Dysuria, Hematuria, Kidney stone	*Cissampelos pareira, Costus speciosus, Ficus benghalensis, Ficus religiosa, Macrotyloma uniflorum, Musa × paradisiaca, Ocimum basilicum*	27	7	0.78
Cardio-vascular disorder	High blood pressure	*Aloe vera, Artemisia dubia, Centella asiatica, Jasminum humile, Neopicrorhiza scrophulariiflora, Swertia chirayita, Urtica parviflora*	19	7	0.67
Gynecological disorder	Menstrual disorders	*Centella asiatica, Equisetum diffusum, Lobelia pyramidalis, Mimosa pudica, Viscum articulatum*	8	5	0.43
Neurological and Nervous system disorders	Dizziness, Epilepsy	*Costus speciosus, Ficus benghalensis, Ficus religiosa, Magnolia champaca, Rhododendron arboreum*	8	5	0.43
Sensorial diseases	Ear infection, Eye pain	*Artemisia dubia, Iresine herbstii*	2	2	0.00

Relative frequency of citation

The RFC value showed a wide range varying from 2% to 86%. The most commonly mentioned medicinal plant species was *Swertia chirayita* (43 citations, 86% RFC), which was primarily used for the treatment of fever. Earlier studies (Pradhan & Badola 2008, Badola & Pradhan 2013, Limbu & Rai 2013) have also reported similar use for this species. The other most cited species were *Neopicrorhiza scrophulariiflora* (42 citations, 84% RFC), followed by *Aconitum heterophylloides* and *Viscum articulatum* each with 41 citations (RFC 83%), used for the treatment of multiple disorders (Manandhar 2002, Uprety *et al.* 2010, Ghimire *et al.* 2018, Bhattarai *et al.* 2020, Budha-Magar *et al.* 2020). These plants have high antimicrobial, antiseptic and anti-inflammatory properties, and were being used for similar therapeutic purposes in different localities (Manandhar 2002, Baral & Kurmi 2006, Pradhan & Badola 2008, Limbu & Rai 2013, Patel & Singh 2018). The high use value of these species may be attributed to easy availability, common distribution, and widespread information about their therapeutic uses within the community (Bhatt & Kunwar 2020). The RFC of the reported medicinal plant species was 21% on average and only 16.4% species (23 species) have over 25 citations. This indicates that only a few species are popular among the local communities, and immediate action is needed to preserve and document the plant species, especially those with high citations and the associated ethnomedicinal knowledge (Badola & Pradhan 2013). The RFC of all the reported species is shown in Table 1.

Relative importance

The RI measures the usefulness of the plant species and is derived from several indicators, such as pharmacological properties of the plant species (ailments treated in our case) and the number of body systems treated (Bennett & Prance 2000). The most useful species in our study area were *Artemisia dubia*, *Zanthoxylum armatum* and *Urtica parviflora* (92 each) followed by *Rhododendron arboreum* (82), *Neopicrorhiza scrophulariiflora* and *Astilbe rivularis* (73 each) (Table 1). The high RI of these species shows their potential to cure various ailments, possesses strong pharmacological properties, and their wide use by the local communities (Bennett & Prance 2000, Farooq *et al.* 2019).

Fidelity level

The FL index denotes the most preferred plant species used in the study area to cure a particular ailment (Friedman *et al.* 1986). Of the 140 medicinal plant species in total, 36 species were cited by 15 participants or more (Table 3). The major ailment was chosen based on the number of citations. The FL index ranged from 79.49% to 100%. The most prioritized medicinal plant species was *Swertia chirayita* which was used to treat fever (100%, 43 citations), followed by *Ageratina adenophora* used to treat cuts and wounds (100%, 35 citations), *Aconitum ferox* used to treat fever (100%, 34 citations), *Saussurea gossypiphora* used to treat cuts and wounds (100%, 33 citations), *Rheum australe* used to treat body pain (100%, 31 citations), *Ulmus lanceifolia* used to treat the bone fracture and dislocation (100%, 29 citations) and others (Table 3). The high popularity of these plant species could be attributed to their high healing potential for a particular ailment and the widespread knowledge among the participants about their uses (Farooq *et al.* 2019). However, the plants with low FL or RI values should not be deemed of minor importance. The low value could mean that the traditional knowledge associated with those plant species is not being exchanged or transmitted and is on the brink of extinction (Srithi *et al.* 2009). For example, the leaves of *Artemisia dubia* were heated over fire and applied around the eyes to reduce the pain, but only a single participant cited this therapeutic use. The single citation for this therapeutic use may be because other participant did not share the information, or synthetic drugs replaced its traditional use.

Reliability of indigenous use reports

Indigenous knowledge on traditional medicine is an important part of the health care system for a majority of the population living in developing countries (Alves & Rosa 2007). In addition to its potential to discover new therapies (Iwu 2002, Lewis 2003, Lahlou 2013), indigenous knowledge of medicinal plants is known for its socio-economic, conservative and cultural values (Alves & Rosa 2007). However, the indigenous knowledge on medicinal plants varies with socio-economic, demographic, historical and ecological status (Ladio *et al.* 2007, Weckmüller *et al.* 2019). Using a certain quantitative index, indigenous knowledge on medicinal plants in one area can be compared with others. A new ethnobiological similarity index, 'Rahman's similarity index (RSI)' (Rahman *et al.* 2019) has recently been proposed, which compares the present study with published data from an allied, regional, national, and global sources.

Table 3. Fidelity level of most important plant species in the study area

Latin name	Major ailment	N	Np	FL
Swertia chirayita	Fever	43	43	100
Neopicrorhiza scrophulariiflora	Fever	42	40	95.24
Viscum articulatum	Bone dislocation and fracture	41	38	92.68
Aconitum heterophylloides	Anorexia	41	35	85.37
Lindera neesiana	Tonsillitis	36	35	97.22
Ageratina adenophora	Cuts and wounds	35	35	100
Aconitum ferox	Fever	34	34	100
Artemisia dubia	Cuts and wounds	34	33	97.06
Saussurea gossypiphora	Cuts and wounds	33	33	100
Euodia fraxinifolia	Common cold	33	32	96.97
Heracleum nepalense	Nervousness	33	32	96.97
Bergenia ciliata	Muscular swelling and sprain	39	31	79.49
Rheum australe	Body pain	31	31	100
Achyranthes aspera	Dysentery	31	30	96.77
Ulmus lanceifolia	Bone fracture and dislocation	29	29	100
Dactylorhiza hatagirea	Wounds	29	29	100
Plumbago zeylanica	Muscular swelling and sprain	28	27	96.43
Urtica parviflora	High blood pressure	28	27	96.43
Rheum nobile	Bone fracture and dislocation	27	27	100
Astilbe rivularis	Body pain	27	27	100
Myrica esculenta	Sinusitis	27	26	96.30
Pouzolzia zeylanica	Bone fracture and dislocation	26	26	100
Drymaria cordata	Sinusitis	25	22	88.00
Paris polyphylla	Gastritis	23	21	91.30
Acorus calamus	Common cold	22	20	90.91
Rubus ellipticus	Tonsillitis	21	20	95.24
Plumeria rubra	Jaundice	20	20	100
Lobelia pyramidalis	Jaundice	19	18	94.74
Cirsium verutum	Jaundice	18	18	100
Lyonia ovalifolia	Scabies	17	17	100
Ligusticopsis wallichiana	Nervousness	17	17	100
Clematis buchananiana	Sinusitis	17	15	88.24
Aloe vera	Skin burns	16	15	93.75
Belamcanda chinensis	Anorexia	15	15	100
Pyrus pashia	Dysentery	15	15	100
Zingiber officinale	Tonsillitis	15	15	100

N = the total number of participants citing the plant species for any ailments, Np = number of participants citing the plant species for a particular ailment. The species are arranged based on the value of 'N' in descending order.

Comparative analysis of this study with 68 published works (Manandhar 1986, Bhattarai 1992, Manandhar 1995, Manandhar 1998, Bhatta 1999, Parajuli *et al.* 2000, Chaudhary *et al.* 2002, Rai 2003, Shrestha & Dhillion 2003, Kurmi & Baral 2004, Bhatt *et al.* 2006, Kunwar *et al.* 2006, Pradhan & Badola 2008, Rijal 2008, Singh & Lal 2008, Bhattarai *et al.* 2009, Liu *et al.* 2009, Srithi *et al.* 2009, Bhattarai *et al.* 2010, Samuel *et al.* 2010, Uprety *et al.* 2010, Gautam 2011, Joshi *et al.* 2011, Namsa *et al.* 2011, Sigdel & Rokaya 2011, Uprety *et al.* 2011, Acharya 2012, Thapa 2012, Badola & Pradhan 2013, Kunwar *et al.* 2013, Limbu & Rai 2013, Parajuli 2013a, Parajuli 2013b, Luitel *et al.* 2014, Naikade & Meshram 2014, Niraula & Singh 2014, Tamang & Singh 2014, Bhattarai & Acharya 2015, Janbaz *et al.* 2015, Kunwar *et al.* 2015, Malik *et al.* 2015, Malla *et al.* 2015, Rai & Singh 2015, Bhattarai & Khadka 2016, Shrestha *et al.* 2016, Tamang & Sedai 2016, Uprety *et al.* 2016, Bhattarai 2017, Tewari *et al.* 2017, Bhattarai 2018, Ghimire *et al.* 2018, Ong *et al.* 2018, Adhikari *et al.* 2019, Farooq *et al.* 2019, Ijaz *et al.* 2019, Lepcha *et al.* 2019, Nguyen *et al.* 2019, Pala *et al.* 2019, Rajbanshi & Thapa 2019, Wali *et al.* 2019, Ambu *et al.* 2020, Bhatt & Kunwar 2020, Bhattarai 2020, Budha-Magar *et al.* 2020, Hu *et al.* 2020, Pangeni *et al.* 2020, Pradhan *et al.* 2020) revealed novel therapeutic uses for 41 ailments associated with 52 plant species (Table 1 & 4). The newly documented use reports need further phytochemical research to validate the traditionally used system (Subba *et al.* 2016), which can provide new insights into medical sciences (Iwu 2002).

Table 4. New therapeutic uses, reported in this study

Family	Latin name	Ailment(s) cured	Uses detail
Acanthaceae	*Thunbergia coccinea*	Sinusitis	The leaf was squeezed on hand and the odor was inhaled in case of sinusitis.
Actinidiaceae	*Actinidia strigosa*	Bone fracture and dislocation, Muscular swelling, and sprain	Root decoction was applied in muscular swelling, sprain and bone dislocation, and covered by bamboo flanks until recovery.
Adoxaceae	*Viburnum cylindricum*	Fungal infection	Essential oil extracted from seeds was used to treat fungal infection in toes.
Amaranthaceae	*Cyathula tomentosa*	Tonsillitis	A glass, root juice was taken twice a day to treat tonsillitis.
Amaranthaceae	*Iresine herbstii*	Cuts and wounds, Ear infection	Plant decoction was applied in wounded parts. Juice was dropped in ear during ear infection.
Apiaceae	*Heracleum nepalense*	Nervousness	Fruits were consumed raw in case of nervousness (**She**).
Apiaceae	*Ligusticopsis wallichiana*	Cold, Fatigue	Small piece of root was crushed, diluted in one glass water to overcome cold and fatigue.
Apocynaceae	*Plumeria rubra*	Jaundice	A glass of bark juice was taken during jaundice, twice a day until recovery.
Araceae	*Remusatia pumila*	Abscess, Furunculosis	Corm decoction was applied to treat abscess and furunculosis, thrice a day for 3 days.
Asparagaceae	*Asparagus racemosus*	Pneumonia	Small piece of root was chewed to treat pneumonia.
Asparagaceae	*Ophiopogon intermedius*	Intestinal worms	One to two teaspoon root juice was taken twice a day in case of intestinal worms.
Asteraceae	*Artemisia dubia*	Eye pain	Warmed leaves were applied around the eyes several times a day to reduce eye pain.
Asteraceae	*Saussurea gossypiphora*	Headache	Root juice was taken in case of headache.
Brassicaceae	*Nasturtium officinale*	Cuts and wounds	Leaf decoction was applied in case of wounds.
Cannabaceae	*Celtis australis*	Gingivitis	Small piece of bark was crushed, and the juice was consumed twice a day in case of gingivitis.
Caryophyllaceae	*Stellaria monosperma*	Dehydration, Fatigue	Root tubers were chewed to quench thirst. Root juice was given to delivered women to overcome fatigue.
Costaceae	*Costus speciosus*	Dizziness	Root was chewed raw, during dizziness.
Cucurbitaceae	*Trichosanthes tricuspidata*	Abscess, Tonsillitis	Seed decoction was applied in case of abscess. Roasted seeds were consumed to treat tonsillitis.
Equisetaceae	*Equisetum diffusum*	Jaundice, Menstrual disorders	A glass juice mixed with leaves of *Raphanus sativus* and *Nasturtium officinale* was taken twice a day in case of jaundice, until recovery. A glass of plant juice was taken during menstrual disorders for 3 days.
Ericaceae	*Pieris formosa*	Fatigue, Headache	Root was boiled and the juice was taken to overcome fatigue. Young shoot was crushed, and the juice was applied in forehead in case of headache.
Ericaceae	*Rhododendron arboreum*	Epilepsy	A mixture of bark juice of *Rhododendron arboreum, Magnolia champaca, Ficus religiosa* and *Ficus benghalensis* was consumed twice a day to treat epilepsy.

Family	Latin name	Ailment(s) cured	Uses detail
Euphorbiaceae	*Euphorbia royleana*	Toothache	One or two latex drops was applied to overcome toothache.
Fabaceae	*Albizia procera*	Dandruff	Bark juice was used to wash hairs to get rid of dandruff.
Fabaceae	*Cassia fistula*	Bone struck in throat	Fruit pulp was taken in case of a fish bone struck in the throat with a believe that it dissolves the fish bone.
Gentianaceae	*Gentiana* sp.	Tonsillitis	Plant was chewed to treat tonsillitis.
Juglandaceae	*Engelhardia spicata*	Fatigue	Bark decoction was taken to overcome fatigue.
Lamiaceae	*Callicarpa arborea*	Common cold, Body pain	Bark juice was taken during common cold and body pain.
Lamiaceae	*Ocimum basilicum*	Hematuria	A solution of *Ocimum basilicum* and *Cissampelos pareira* was left overnight under the open sky and consumed in the early morning to treat hematuria.
Lauraceae	*Lindera neesiana*	Muscular swelling and sprain, Ringworm	Oil from seeds was applied during muscular swelling and sprain. Oil extracted from seed was applied in case of ringworm around the infected parts, 4-5 times a day until recovery.
Magnoliaceae	*Magnolia champaca*	Epilepsy	A mixture of bark juice of *Magnolia champaca, Rhododendron arboreum, Ficus religiosa* and *F. benghalensis* was taken to treat epilepsy.
Moraceae	*Artocarpus lakoocha*	Body pain	Juice of bark powder was used to treat body pain.
Moraceae	*Ficus benghalensis*	Epilepsy, Hematuria	A mixture of bark juice of *Ficus benghalensis, Magnolia champaca, Rhododendron arboreum* and *Ficus religiosa* was consumed twice a day to treat epilepsy. One tea poon bark juice was given to children twice a day to treat hematuria.
Moraceae	*Ficus religiosa*	Epilepsy, Hematuria, Tonsillitis	A mixture bark juice of *Ficus religiosa, F. benghalensis, Magnolia champaca* and *Rhododendron arboreum* was consumed to treat epilepsy. The bark juice was given to children during hematuria. Leaves were chewed during tonsillitis.
Moraceae	*Ficus sarmentosa*	Tonsillitis	Two drops latex was diluted in 2 teaspoon water, consumed to treat tonsillitis in the early morning.
Musaceae	*Musa × paradisiaca*	Dysuria	The floral stem of banana was boiled in a Copper vessel and the juice was consumed twice a day in case of dysuria.
Myricaceae	*Myrica esculenta*	Tonsillitis	Small piece of bark was chewed in case of tonsillitis.
Oleaceae	*Jasminum humile*	Tonsillitis, Jaundice, High blood pressure	Young twigs were crushed, and the juice was taken to treat tonsillitis, jaundice and to reduce high blood pressure.
Poaceae	*Eleusine coracana*	Gingivitis	Porridge (**Khole**) was served during gingivitis.
Poaceae	*Thysanolaena latifolia*	Abscess, Splinter, Tonsillitis	Root decoction (1 glass, twice a day, until recovery) was applied in abscess. Root paste was applied to get rid of small splinter. Small pieces of roots were chewed to treat tonsillitis.
Poaceae	*Zea mays*	Altitude sickness	Roasted maize was consumed to avoid altitude sickness.

Family	Latin name	Ailment(s) cured	Uses detail
Polygonaceae	*Rheum nobile*	Back pain, Constipation	Root juice was taken to reveal back pain and constipation.
Ranunculaceae	*Aconitum ferox*	Cuts and wounds	The rhizome decoction was applied for quick healing of wounds.
Ranunculaceae	*Aconitum heterophylloides*	Anorexia, Fever, Tonsillitis	Small piece of rhizome was chewed early morning in case of anorexia. Sour food should be strictly avoided. A piece of rhizome was also chewed in case of fever and tonsillitis. Rhizome more than 2 years is fatal/ poisonous.
Ranunculaceae	*Clematis buchananiana*	Bone fracture and dislocation	Root paste of *Clematis buchananiana, Pouzolzia zeulanica* and bark paste of *Ulmus laceifolia* and *Prunus cerasoides* was applied in case of bone fracture and dislocation. After applying the mixture, the affected part was covered by bamboo flanks until recovery (locally, the administrative process was known as '**kamlo badhne**).
Rosaceae	*Prunus cerasoides*	Gastritis	Root juice was taken during gastritis.
Rosaceae	*Prunus persica*	Toothache	Young shoot juice was consumed twice a day to treat toothache.
Scrophulariaceae	*Buddleja paniculata*	Allergy	Leaf decoction was applied and was considered as antidote against allergic effect of *Rhus* species (**Bhalayo**)
Solanaceae	*Capsicum annuum*	Abscess	The fruit was crushed and rubbed around the mouth of abscess twice a day until recovery, it helps to heal fast.
Taxaceae	*Taxus wallichiana*	Body pain, Jaundice	Leaf and bark juice was taken in case of body pain and jaundice. One-hand full leaves was boiled in about 750 ml (**1 mana**) of water. One glass solution was drunk twice a day until recovery.
Urticaceae	*Boehmeria virgata* var. *macrostachya*	Skin burn	Bark paste was applied in burnt skin, twice a day until recovery.
Urticaceae	*Girardinia diversifolia*	Dog bite, Skin burn	The root paste was applied in case of dog bite. Ashes of leaves and stem was applied in burnt skin.
Zingiberaceae	*Cardamomum subulatum*	Dehydration	Fruit juice was taken during dehydration.

Table 5. Rahman's similarity index comparing the present study with previous studies

Study area	NRSAA	TSCBA	SEOAA	SEOOA	CSSU	CSDU	% PSU	% PDU	RSI	RSI %	References
West Himalaya											
Kedarnath WLS, India	97	20	77	120	6	14	6.2	14.4	0.03	2.84	Malik *et al.* 2015
Jaunsar, Garhwal, India	66	12	54	128	3	9	4.5	13.6	0.02	1.57	Bhatt & Negi 2006
Neehum valley	41	4	37	136	2	2	4.9	4.9	0.01	1.14	Ijaz *et al.* 2019
Gilgit Baltistan, Pakistan	90	7	83	133	2	5	2.2	5.6	0.01	0.90	Wali *et al.* 2019
Jammu & Kashmir, Pakistan	140	5	135	135	1	4	0.7	2.9	0.00	0.36	Farooq *et al.* 2019
Lahaul-Spiti, India	58	2	56	138	0	2	0.0	3.4	0.00	0.00	Singh & Lal 2008
West Nepal											
Dolpa, Humla, Jumla & Mustang	84	22	62	118	13	9	15.5	10.7	0.07	6.88	Kunwar *et al.* 2006
Salyan	76	28	48	112	11	17	14.5	22.4	0.06	6.21	Kurmi & Baral 2004
Bajhang, Baitadi, Dadeldhura & Darchula	258	49	209	91	16	33	6.2	12.8	0.05	4.80	Kunwar *et al.* 2015
Rolpa	82	22	60	118	9	13	11.0	15.9	0.05	4.71	Budha-Magar *et al.* 2020
Darchula	70	18	52	122	8	10	11.4	14.3	0.04	4.35	Ghimire *et al.* 2018
Karnali	61	21	40	119	6	15	9.8	24.6	0.03	3.45	Bhattarai 1992
Kanchanpur	74	7	67	133	5	2	6.8	2.7	0.02	2.48	Bhatt & Kunwar 2020
Dang	85	15	70	125	5	10	5.9	11.8	0.02	2.44	Sigdel & Rokaya 2011
Jumla	61	15	46	125	4	11	6.6	18.0	0.02	2.20	Manandhar 1986
Dadeldhura	47	9	38	131	3	6	6.4	12.8	0.02	1.71	Manandhar 1998
Jajarkot	60	14	46	126	3	11	5.0	18.3	0.02	1.64	Manandhar 1995
Surkhet	9	8	1	132	2	6	22.2	66.7	0.01	1.44	Thapa 2012
Dadeldhura, Baitadi & Darchula	238	20	218	120	5	15	2.1	6.3	0.01	1.42	Kunwar *et al.* 2013
Rukum	18	8	10	132	2	6	11.1	33.3	0.01	1.35	Bhatta 1999
Kailali	39	7	32	133	1	6	2.6	15.4	0.01	0.58	Bhattarai & Acharya 2015

Central Nepal											
Ramechhap	136	50	86	90	20	30	14.7	22.1	0.10	9.71	Pradhan *et al.* 2020
Gulmi	161	52	109	88	22	30	13.7	18.6	0.10	9.69	Acharya 2012
Kaski	105	41	64	99	17	24	16.2	22.9	0.09	9.09	Adhikari *et al.* 2019
Gorkha	80	30	50	110	15	15	18.8	18.8	0.09	8.57	Tamang & Sedai 2016
Dolakha	58	26	32	114	13	13	22.4	22.4	0.08	8.18	Shrestha & Dhillion 2003
Makwanpur	161	46	115	94	15	31	9.3	19.3	0.06	6.25	Luitel *et al.* 2014
Kavrepalanchok	116	33	83	107	13	20	11.2	17.2	0.06	6.19	Ambu *et al.* 2020
Kathmandu	87	28	59	112	10	18	11.5	20.7	0.05	5.29	Joshi *et al.* 2011
Rasuwa	56	25	31	115	8	17	14.3	30.4	0.05	4.91	Uprety *et al.* 2010
Palpa	40	18	22	122	7	11	17.5	27.5	0.05	4.52	Pangeni 2020
Parbat	132	17	115	123	10	7	7.6	5.3	0.04	4.08	Malla *et al.* 2015
Mustang	121	16	105	124	9	7	7.4	5.8	0.04	3.81	Bhattarai *et al.* 2010
Nawalparasi	94	22	72	118	7	15	7.4	16.0	0.03	3.41	Bhattarai *et al.* 2009
Tanahu	54	15	39	125	4	11	7.4	20.4	0.02	2.29	Uprety *et al.* 2011
Chitwan	115	25	90	115	5	20	4.3	17.4	0.02	2.22	Rijal 2008
East Nepal											
Ilam	84	52	32	88	28	24	33.3	28.6	0.19	19.44	Parajuli 2013a
Ilam	102	48	54	92	28	20	27.5	19.6	0.17	16.87	Bhattarai & Khadka 2016
Taplejung	64	38	26	102	22	16	34.4	25.0	0.15	15.28	Niraula & Singh 2014
Ilam	92	52	40	88	23	29	25.0	31.5	0.15	14.65	Parajuli 2013b
Ilam	90	42	48	98	21	21	23.3	23.3	0.13	12.57	Bhattarai 2017
Ilam	30	21	9	119	15	6	50.0	20.0	0.11	11.19	Bhattarai 2018
Tinjure-Milke-Jaljale	48	22	26	118	16	6	33.3	12.5	0.11	10.67	Shrestha *et al.* 2016
Bhojpur	87	44	43	96	17	27	19.5	31.0	0.10	10.24	Rai & Singh 2015
Limbuwan (Taplejung, Panchthar, Ilam, Jhapa, Tehrathum, Dhankuta, Sunsari, Morang, Sankhuwasabha)	225	63	162	77	28	35	12.4	15.6	0.10	10.22	Limbu & Rai 2013
Tehrathum	105	45	60	95	18	27	17.1	25.7	0.10	9.89	Rai 2003

Fikal, Ilam	61	34	27	106	13	21	21.3	34.4	0.08	8.44	Tamang & Singh 2014
Makalu-Barun Region	60	24	36	116	13	11	21.7	18.3	0.08	7.98	Chaudhary *et al.* 2002
Panchthar	87	27	60	113	10	17	11.5	19.5	0.05	5.26	Gautam 2011
Jhapa	40	14	26	126	7	7	17.5	17.5	0.04	4.40	Rajbanshi & Thapa 2019
Sankhuwasabha	29	11	18	129	4	7	13.8	24.1	0.03	2.60	Parajuli *et al.* 2000
East Himalaya											
Sikkim, India	35	23	12	117	15	8	42.9	22.9	0.11	10.95	Lepcha *et al.* 2019
Sikkim, India	118	38	80	102	17	21	14.4	17.8	0.08	8.37	Pradhan & Badola 2008
Sikkim, India	124	42	82	98	16	26	12.9	21.0	0.08	7.77	Badola & Pradhan 2013
Kangchenjunga Landscape	739	82	657	58	42	40	5.7	5.4	0.06	5.56	Uprety *et al.* 2016
West Bengal, India	53	11	42	129	6	5	11.3	9.4	0.03	3.41	Pala *et al.* 2019
Arunachal Pradesh, India	50	12	38	128	4	8	8.0	16.0	0.02	2.30	Namsa *et al.* 2011
East Asia & Tibetan Plateau											
Natma Taung NP, Myanmar	75	15	60	125	4	11	5.3	14.7	0.02	2.04	Ong *et al.* 2018
Mien, Thailand	50	5	45	135	2	3	4.0	6.0	0.01	1.09	Srithi *et al.* 2009
Guangxi Zhuang AR, China	456	22	434	118	5	17	1.1	3.7	0.01	0.88	Hu *et al.* 2020
Son La province, Vietnam	99	8	91	132	2	6	2.0	6.1	0.01	0.87	Nguyen *et al.* 2019
Yunnan, China	68	3	65	137	0	3	0.0	4.4	0.00	0.00	Liu *et al.* 2009
Perak, Malaysia	62	2	60	138	0	2	0.0	3.2	0.00	0.00	Samuel *et al.* 2010

NRSAA: number of recorded plants species of aligned areas, TSCBA: Total species common in both area, SEOAA: Species enlisted only in aligned areas, SEOOA: Species enlisted only in our study area, CSSU: Common species with similar uses, % PSU: % of plant with similar uses, % PDU: % of plant with dissimilar uses

The Rahman similarity index was calculated comparing the present findings with the published works carried out in different parts of Nepal, the Himalayan region, the Tibetan Plateau and East Asia (see details in Table 5). The similarity percentage ranged from 50 to 0 while the dissimilarity percentage ranged from 66.7 to 2.7. The percentage of Rahman similarity varied between 0 and 19.44 among the allied area (Table 5). The highest RSI value (0.19, 19.44%) corresponds to the studies in Ilam District, East Nepal (Parajuli 2013a), followed by the studies in neighboring districts of Nepal (Parajuli 2013b, Niraula & Singh 2014, Bhattarai & Khadka 2016) and adjacent areas of the Eastern Himalaya (Pradhan & Badola 2008, Lepcha *et al.* 2019). The similarity index gradually decreased from East to West Nepal and reached zero with the Western Himalaya (Singh & Lal 2008) and East Asian studies (Liu *et al.* 2009, Samuel *et al.* 2010).

A two-dimensional color chart called 'heat map' was generated utilizing the similarities and dissimilarities values in R-studio (RStudio Team 2020). The dark blue color denotes low similarities while the dark red color denotes high similarities (Figure 4). The high degree of similarity with the studies in East Nepal and surrounding areas can be attributed to the similar type of vegetation, geography and culture shared among each other (Malik *et al.* 2015, Wali *et al.* 2019). Distantly related culture and geographical barriers are likely to be the reason for less similarity (Shaheen *et al.* 2017) with the geographically distant studies.

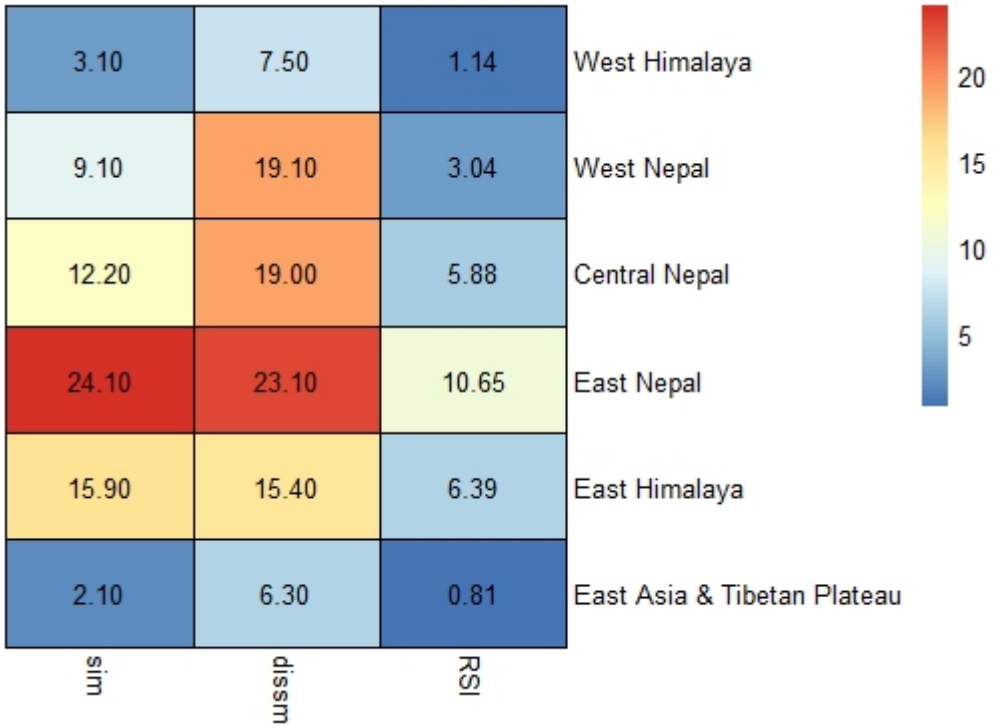

Figure 4. Heat map showing percentage similarity, dissimilarity, and Rahman's similarity index of Chyangthapu-Phalaicha biological sub-corridor with neighboring areas

Conclusions

A total of 140 plant species used to treat various human ailments were documented, which were used to treat 12 health disorder categories. *Swertia chirayita* was observed as the most prioritized species, which is used to treat fever, while *Artemisia dubia* showed high relative importance. The varied use of reported medicinal plants in the area indicates the need for phytochemical research for the scientific validation of the traditional uses, which can provide new insights into medical sciences.

Declarations

List of Abbreviation: Not applicable

Disclaimer: The views and interpretation in this publication are those of the authors and should not be ascribed to their respective institutions.

Ethics approval and consent to participate:
Permission for the data collection was obtained from the local authorities. Prior informed consent was sought from interviewees who granted it on the condition that the collected data would be used only for academic purposes.
Consent of publication: Not applicable.
Availability of data and materials: All relevant data are within the manuscript.
Competing interests: The authors declare that they have no competing interests.
Funding: This study was partially supported by core funds of ICIMOD contributed by the governments of Afghanistan, Australia, Austria, Bangladesh, Bhutan, China, India, Myanmar, Nepal, Norway, Pakistan, Switzerland, and the United Kingdom. In particular it was supported by the Austrian Development Agency and the German Federal Ministry for Economic Cooperation and Development through its German Agency for International Cooperation.
Author's contributions: All authors have read and approved the manuscript. PB conducted field survey, gathered, and analyzed data, and prepared the manuscript's first draft. MBG, CKS, KB, RPC, JG, YU, AN and KKS contributed to research design, field survey, and revision of the drafts.

Acknowledgements

This study was supported by Kangchenjunga Landscape Conservation and Development Initiative (KLCDI) Nepal, a collaborative programme between Ministry of Forests and Environment, Government of Nepal, Research Centre for Applied Science and Technology, Tribhuvan University, and International Centre for Integrated Mountain Development. The authors would like to acknowledge the local people for sharing their knowledge, cooperation, and warm hospitality during the research. We are grateful to Mr. Sunil Thapa, ICIMOD, for preparing the maps of the study area.

Literature cited

Abbas Z, Khan SM, Alam J, Khan SW, Abbasi AM. 2017. Medicinal plants used by inhabitants of the Shigar Valley, Baltistan region of Karakorum range-Pakistan. Journal of Ethnobiology and Ethnomedicine 13:53. doi: 10.1186/s13002-017-0172-9.

Acharya R. 2012. Ethnobotanical study of medicinal plants of Resunga Hill used by Magar community of Badagaun VDC, Gulmi district, Nepal. Scientific World 10(10):54-65. doi: 10.3126/sw.v10i10.6863.

Adhikari M, Thapa R, Kunwar RM, Devkota HP, Poudel P. 2019. Ethnomedicinal uses of plant resources in the Machhapuchchhre rural municipality of Kaski district, Nepal. Medicines 6:69. doi: 10.3390/medicines6020069.

Aleem A, Kabir H. 2018. Review on swertia chirata as traditional uses to its pyhtochemistry and phrmacological activity. Journal of Drug Delivery and Therapeutics 8:73-78. doi: 10.22270/jddt.v8i5-s.1957.

Alves RR, Rosa IM. 2007. Biodiversity, traditional medicine and public health: where do they meet?. Journal of Ethnobiology and Ethnomedicine 3(1):1-9. doi: 10.1186/1746-4269-3-14.

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. doi: 10.3390/plants9060759.

Andel T, Fundiko M-CC. 2016. The trade in African medicinal plants in Motonge-Ixelles, Brussels (Belgium). Economic Botany 70:405-415. doi: 10.1007/s12231-016-9365-8.

Asase A, Akwetey, GA, Achel DG. 2010. Ethnopharmacological use of herbal remedies for the treatment of malaria in the Dangme West District of Ghana. Journal of Ethnopharmacology 129:367-376. doi: 10.1016/j.jep.2010.04.001.

Aziz MA, Khan AH, Adnan M, Ullah H. 2018. Traditional uses of medicinal plants used by indigenous communities for veterinary practices at Bajaur Agency, Pakistan. Journal of Ethnobiology and Ethnomedicine 14(1): 11. doi: 10.1186/s13002-018-0212-0.

Badola HK, Pradhan BK. 2013. Plants used in healthcare practices by limboo tribe in south-west of Khangchendzonga biosphere reserve, Sikkim, India. Indian Journal of Traditional Knowledge 12(3):355-369.

Baniya A, Karki S, Dhungana S, Rizal G. 2019. Economic Analysis on the Production of Large Cardamom in Panchathar. Nepal Journal of Agriculture and Environment 20:117-1128. doi: 10.3126/aej.v20i0.25038.

Bantawa P, Rai R. 2009. Studies on ethnomedicinal plants used by traditional practitioners, Jhankri, Bijuwa and Phedangma in Darjeeling Himalaya. Natural Product Radiance 8(5):537-541.

Baral HS, Inskipp C. 2005. Important Bird Areas in Nepal. Bird Conservation Nepal, Kathmandu.

Baral SR, Kurmi PP. 2006. A Compendium of Medicinal Plants in Nepal. Mrs. Rachana Sharma, Kathmandu.

Bayles BP, Katerndahl DA. 2009. Culture-bound syndromes in Hispanic primary care patients. The International Journal of Psychiatry in Medicine 39(1):15-31. doi: 10.2190/PM.39.1.b.

Beltrán J. 2000. Indigenous and traditional peoples and protected areas: principles, guidelines and case studies. IUCN-The World Conservation Union.

Bennett BC, Prance GT. 2000. Introduced plants in the indigenous pharmacopoeia of Northern South America. Economic Botany 54(1):90-102. doi: 10.1007/BF02866603.

Bhandari R, Sharma R. 2012. Epidemiology of chronic obstructive pulmonary disease: a descriptive study in the mid-western region of Nepal. International Journal of Chronic Obstructive Pulmonary Disease 7:253-257. doi: 10.2147/COPD.S28602.

Bhatt MD, Kunwar RM. 2020. Distribution pattern and ethnomedicinal uses of plants in Kanchanpur district, Far-Western Nepal. Ethnobotany Research and Applications 20:1-21. doi: 10.32859/era.20.14.1-21.

Bhatt V, Negi G. 2006. Ethnomedicinal plant resources of Jaunsari tribe of Garhwal Himalaya, Uttaranchal. Indian Journal of Traditional Knowledge 5(3):331-335.

Bhatta LR. 1999. Ethnobotanical study in a village at Rukum district, Nepal. Banko Janakari 9(2):40-43. doi: 10.3126/banko.v9i2.17665.

Bhattarai KR. 2017. Ethnomedicinal practices of the Lepcha community in Ilam, east Nepal. Journal of Plant Resources 15:31-44.

Bhattarai KR. 2018. Ethnobotanical study of plants used by Thami community in Ilam District, eastern Nepal. Our Nature 16(1):55-67. doi: 10.3126/on.v16i1.22123.

Bhattarai KR. 2020. Ethnobotanical survey on plants used in Mai Municipality of Ilam district, eastern Nepal. Banko Janakari 30(2):11-35. doi: 10.3126/banko.v30i2.33476.

Bhattarai KR, Acharya SK. 2015. Documentation of ethnobotanical knowledge of Tharu people on the utilization of plant resources in Gadariya and Phulwari VDCs of Kailali District, West Nepal. Bulletin of Department of Plant Resources 37:41-50.

Bhattarai KR, Khadka MK. 2016. Ethnobotanical survey of medicinal plants from Ilam District, East Nepal. Our Nature 14(1):78-91. doi: 10.3126/on.v14i1.16444.

Bhattarai NK. 1992. Medical ethnobotany in the Karnali zone, Nepal. Economic Botany 46(3):257-261. doi: 10.1007/BF02866624.

Bhattarai S, Chaudhary RP, Taylor RS. 2009. Ethno-medicinal plants used by the people of Nawalparasi District, Central Nepal. Our Nature 7(1):82-99. doi: 10.3126/on.v7i1.2555.

Bhattarai S, Chaudhary RP, Quave CL, Taylor RS. 2010. The use of medicinal plants in the trans-himalayan arid zone of Mustang district, Nepal. Journal of Ethnobiology and Ethnomedicine 6(1):14. doi: 10.1186/1746-4269-6-14.

Bridson D, Forman L. 2010. The Herbarium Handbook. Royal Botanic Gardens, Kew, Kew Publishing, London.

Budha-Magar S, Bhandari P, Ghimire SK. 2020. Ethno-medicinal survey of plants used by Magar (Kham) community, Rolpa district, Western Nepal. Ethnobotany Research and Applications 19:1-29. doi: 10.32859/era.19.18.1-29.

Bussmann RW. 2002. Ethnobotany and biodiversity conservation. In Modern trends in applied terrestrial ecology. Edited by RS Ambasht, NK Ambasht. Springer, Boston, Pp. 343-360.

Chase MW, Christenhusz M, Fay M, Byng J, Judd WS, Soltis D, Mabberley D, Sennikov A, Soltis PS, Stevens PF. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnean Society 181(1):1-20. doi: 10.1111/boj.12385.

Chaudhary RP, Nepal M, Gupta VNP, Byng J, Judd WS, Soltis D, Mabberley D, Sennikov A, Soltis PS, Stevens PF. 2002. Traditional use of plants by the indigenous peoples of Makalu-Barun Region, Eastern Nepal. In Vegetation and Society: Their interaction in the Himalayas. Edited by RP Chaudhary, BP Subedi, OR Vetaas, TH Aase. Tribhuvan University, Nepal and University of Bergen, Norway, Pp. 83-97.

Chaudhary RP, Uprety Y, Joshi SP, Shrestha KK, Basnet KB, Shrestha KR, Bhatta KP, Acharya KP, Chettri N. 2015. Kangchenjunga Landscape Nepal: from conservation and development perspectives. MoFSC, Government of Nepal, RECAST, Tribhuvan University and ICIMOD, Kathmandu.

Chhetri DR. 2004. Medicinal plants used as antipyretic agents by the traditional healers of Darjeeling Himalayas. Indian Journal of Traditional Knowledge 3(3):271-275.

Coley PD, Bryant JP, Chapin FS. 1985. Resource availability and plant antiherbivore defense. Science 230(4728):895-899. doi: 10.1126/science.230.4728.895.

Cox PA, Balick MJ. 1994. The ethnobotanical approach to drug discovery. Scientific American 270(6):82-87.

Cunningham AB, Brinckmann JA, Schippmann U, Pyakurel D. 2018. Production from both wild harvest and cultivation: The cross-border Swertia chirayita (Gentianaceae) trade. Journal of Ethnopharmacology 225 42-52.

Densmore F. 2012. How Indians use wild plants, for food, medicine, and crafts. Dover Publications, New York.

Dey A, De JN. 2012. Ethnobotanical survey of Purulia district, West Bengal, India for medicinal plants used against gastrointestinal disorders. Journal of Ethnopharmacology 143:68-80. doi: 10.1016/j.jep.2012.05.064.

Dilshad SMR, Rehman NU, Ahmad N, Iqbal A. 2010. Documentation of ethnoveterinary practices for mastitis in dairy animals in Pakistan. Pakistan Veterinary Journal 30(3):167-171.

Duffield SJ, Ellis BM, Goodson N, Walker-Bone K, Conaghan PG, Margham T, Loftis T. 2017. The contribution of musculoskeletal disorders in multimorbidity: implications for practice and policy. Best Practice & Research Clinical Rheumatology 31(2):129-144. doi: 10.1016/j.berh.2017.09.004.

Etkin NL, Ross PJ, Muazzamu I. 1990. The indigenization of pharmaceuticals: therapeutic transitions in rural Hausaland. Social Science & Medicine 30(8):919-928.

Fabricant DS, Farnsworth NR. 2001. The value of plants used in traditional medicine for drug discovery. Environental Health Perspectives 109(Suppl)1:69-75. doi: 10.1289/ehp.01109s169.

Farnsworth NR. 1990. The role of ethnopharmacology in drug development. Ciba Foundation Symposium 154:2-21. doi: 10.1002/9780470514009.ch2.

Farooq A, Amjad MS, Ahmad K, Altaf M, Umair M, Abbasi AM. 2019. Ethnomedicinal knowledge of the rural communities of Dhirkot, Azad Jammu and Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 15:45. doi: 10.1186/s13002-019-0323-2.

Friedman J, Yaniv Z, Dafni A, Palewitch D. 1986. A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. Journal of Ethnopharmacology 16(2-3):275-287. doi: 10.1016/0378-8741(86)90094-2.

Gautam TP. 2011. Indigenous uses of some medicinal plants in Panchthar district, Nepal. Nepalese Journal of Biosciences 1:125-130. doi: 10.3126/njbs.v1i0.7479.

Gazzaneo LRS, De Lucena RFP, de Albuquerque UP. 2005. Knowledge and use of medicinal plants by local specialists in an region of Atlantic Forest in the state of Pernambuco (Northeastern Brazil). Journal of Ethnobiology and Ethnomedicine 1(1):9. doi: 10.1186/1746-4269-1-9.

Gehlenborg N, Wong B. 2012. Heat maps. Nature Methods 9(3):213. doi: 10.1038/nmeth.1902.

Ghimire K, Adhikari M, Uprety Y, Chaudhary RP. 2018. Ethnomedicinal use of plants by the highland communities of Kailash Sacred Landscape, Far-west Nepal. Academia Journal of Medicinal Plants 6(11):365-378.

Ghimire SK, Pyakurel D. 2008. A Manual of NTFPs of Nepal Himalaya (Gair Kastha Ban Paidawar Digdarshan). WWF Nepal, Kathmandu.

Gomez-Beloz A. 2002. Plant use knowledge of the Winikina Warao: the case for questionnaires in ethnobotany. Economic Botany 56(3):231-241. doi: 10.1663/0013-0001(2002)056[0231:PUKOTW]2.0.CO;2.

Grierson AJ, Long DG. 1983-1987. Flora of Bhutan, including a record of plants from Sikkim, Volume 1 parts 1, 2 and 3. Royal Botanic Garden, Edinburgh.

Grierson AJ, Long DG. 1991-2001. Flora of Bhutan, Volume 2 part 1, 2 and 3 and Volume 3 part 1. Royal Botanic Garden, Edinburgh.

Guarnaccia PJ, Rogler LH. 1999. Research on culture-bound syndromes: New directions. American Journal of Psychiatry 156(9):1322-1327. doi: 10.1176/ajp.156.9.1322.

Gurib-Fakim A. 2006. Medicinal plants: traditions of yesterday and drugs of tomorrow. Molecular Aspects of Medicine 27(1):1-93. doi: 10.1016/j.mam.2005.07.008.

Hamilton AC. 2004. Medicinal plants, conservation, and livelihoods. Biodiversity Conservation 13:1477-517. doi: 10.1023/B:BIOC.0000021333.23413.42.

Hanazaki N, Nakamura EM, Lindner B, Boef S. 2013. Opportunities for ethnobotany to contribute to community biodiversity management. In Community biodiversity management (Promoting resilience and the conservation of plant genetic resources). Edited by WS de Boef, A Subedi, N Peroni, M Thijssen, E O'Keefee. Routledge, Pp. 141-144.

Hara H. 1972. New or noteworthy flowering plants from eastern Himalaya. 10. Journal of Japanese Botany 47(5):137-143.

Hara H, Stearn WT, Williams LHJ. 1978. An enumeration of the flowering plants of Nepal, volume 1. British Museum (Natural History), London.

Hara H, Stearn WT, Williams LHJ. 1982. An enumeration of the flowering plants of Nepal, volume 3. British Museum (Natural History), London.

Hara H, Williams L. 1979. An enumeration of the flowering plants of Nepal, volume 2. British Museum (Natural History), London.

Hong L, Guo Z, Huang K, Wei S, Liu B, Meng S, Long C. 2015. Ethnobotanical study on medicinal plants used by Maonan people in China. Journal of Ethnobiology and Ethnomedicine 11:32. doi: 10.1186/s13002-015-0019-1.

Hu R, Lin C, Xu W, Liu Y, Long C. 2020. Ethnobotanical study on medicinal plants used by Mulam people in Guangxi, China. Journal of Ethnobiology and Ethnomedicine 16(1):1-50. doi: 10.1186/s13002-020-00387-z.

Hussain W, Badshah L, Ullah M, Ali A, Hussain F. 2018. Quantitative study of medicinal plants used by the communities residing in Koh-e-Safaid Range, northern Pakistani-Afghan borders. Journal of Ethobiology and Ethnomedicine. 14:30. doi: 10.1186/s13002-018-0229-4.

ICIMOD, WCD, GBPNIHESD, RECAST. 2017. Kangchenjunga Landscape Conservation and Development Initiative feasibility assessment report—regional synthesis. ICIMOD, 2017/9, Kathmandu.

Ijaz S, Perveen A, Ashraf S, Kousar S, Bibi A, Azhar N. 2019. Wild medicinal plants of Lawat village Neelum valley Azad Kashmir, Pakistan and their uses in ethnomedicine. Wulfenia. 26(12):27-55.

Iwu MM. 2002. Ethnobotanical approach to pharmaceutical drug discovery: strengths and limitations. Advances in Phytomedicine 1:309-320. doi: 10.1016/S1572-557X(02)80034-4.

Janbaz KH, Akhtar T, Saqib F, Imran I, Zia-Ul-Haq M, Jansakul C, De Feo V, Moga M. 2015. Pharmacological justification of use of Solena heterophylla Lour. in gastrointestinal, respiratory and vascular disorders. Journal of Translational Medicine 13:134. doi: 10.1186/s12967-015-0470-8.

Joshi HD, Pandeya R, Dhakal B. 2009. Health impact of indoor air pollution. Journal of Nepal Health Research Council 7(15):69-75.

Joshi K, Joshi R, Joshi AR. 2011. Indigenous knowledge and uses of medicinal plants in Macchegaun, Nepal. Indian Journal of Traditional Knowledge. 10(2):281-286.

Kunwar RM, Acharya RP, Chowdhary CL, Bussmann RW. 2015. Medicinal plant dynamics in indigenous medicines in farwest Nepal. Journal of Ethnopharmacology 163:210-219. doi: 10.1016/j.jep.2015.01.035.

Kunwar RM, Bussmann RW. 2008. Ethnobotany in the Nepal Himalaya. Journal of Ethnobiology and Ethnomedicine 4(1):24. doi: 10.1186/1746-4269-4-24.

Kunwar RM, Mahat L, Acharya RP, Bussmann RW. 2013. Medicinal plants, traditional medicine, markets and management in far-west Nepal. Journal of Ethnobiology and Ethnomedicine 9:24. doi: 10.1186/1746-4269-9-24.

Kunwar RM, Nepal BK, Kshhetri HB, Rai SK, Bussmann RW. 2006. Ethnomedicine in Himalaya: a case study from Dolpa, Humla, Jumla and Mustang districts of Nepal. Journal of Ethnobiology and Ethnomedicine 2(1):1-6. doi: 10.1186/1746-4269-2-27.

Kurmi PP, Baral SR. 2004. Ethnomedical uses of plants from Salyan District, Nepal. Banko Janakari 14(2):5-39. doi: 10.3126/banko.v14i2.17049.

Ladio A, Lozada M, Weigandt M. 2007. Comparison of traditional wild plant knowledge between aboriginal communities inhabiting arid and forest environments in Patagonia, Argentina. Journal of Arid Environments 69(4):695-715. doi: 10.1016/j.jaridenv.2006.11.008.

Lahlou M. 2013. The success of natural products in drug discovery. Pharmacology and Pharmacy 4(3A):33502. doi: 10.4236/pp.2013.43A003.

Lepcha TT, Pradhan P, Gaira KS, Badola HK, Shahid M, Singh M. 2019. Ethnomedicinal use of plants by Bhutia tribe in Sikkim Himalaya, Proceedings of the Ist Himalayan Researchers Consortium, volume 1. Almora: National Mission on Himalayan Studies (NMHS), GB Pant National Institute of Himalayan Environment and Sustainable Development (GBPNIHESD), Pp. 71-78.

Lewis WH. 2003. Pharmaceutical discoveries based on ethnomedicinal plants: 1985 to 2000 and beyond. Economic Botany 57(1):126. doi: 10.1663/0013-0001(2003)057[0126:PDBOEP]2.0.CO;2.

Limbu DK, Rai BK. 2013. Ethno-medicinal practices among the Limbu community in Limbuwan, Eastern Nepal. Global Journal of Human Social Science 2:7-29.

Liu Y, Dao Z, Yang C, Liu Y, Long C. 2009. Medicinal plants used by Tibetans in Shangri-la, Yunnan, China. Journal of Ethnobiology and Ethnomedicine 5:15. doi: 10.1186/1746-4269-5-15.

Luitel DR, Rokaya MB, Timsina B, Münzbergová Z. 2014. Medicinal plants used by the Tamang community in the Makawanpur district of central Nepal. Journal of Ethobiology and Ethnomedicine 10:5. doi: 10.1186/1746-4269-10-5.

Lyon LM, Hardesty LH. 2012. Quantifying medicinal plant knowledge among non-specialist Antanosy villagers in southern Madagascar. Economic Botany 66(1):1-11. doi: 10.1007/s12231-011-9185-9.

Mahomoodally MF. 2013. Traditional medicines in Africa: an appraisal of ten potent African medicinal plants. Evidence-Based Complementary and Alternative Medicine 617459. doi: 10.1155/2013/617459.

Malik ZA, Bhat JA, Ballabha R, Bussmann RW, Bhatt AB. 2015. Ethnomedicinal plants traditionally used in health care practices by inhabitants of Western Himalaya. Journal of Ethnopharmacology 172:133-144. doi: 10.1016/j.jep.2015.06.002.

Malla B, Gauchan DP, Chhetri RB. 2015. An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of western Nepal. Journal of Ethnopharmacology 165:103-117. doi: 10.1016/j.jep.2014.12.057.

Manandhar NP. 1986. Ethnobotany of Jumla District, Nepal. International Journal of Crude Drug Research 24(2):81-89. doi: 10.3109/13880208609083311.

Manandhar NP. 1995. A survey of medicinal plants of Jajarkot district, Nepal. Journal of Ethnopharmacology 48(1):1-6. doi: 10.1016/0378-8741(95)01269-J.

Manandhar NP. 1998. Native phytotherapy among the Raute tribes of Dadeldhura district, Nepal. Journal of Ethnopharmacology 60(3):199-206. doi: 10.1016/S0378-8741(97)00150-5.

Manandhar NP. 2002. Plants and people of Nepal. Timber Press Portland, Oregon.

Manjula K, Pazhanichami K, Rajendran K, Kumaran S, Eevera T. 2015. Herbal remedy for urinary stones. In Vegetables and human health. Edited by MK Rana. Scientific Publishers (India), Daryaganj, Pp. 454-468.

Manohar PR. 2012. In Evidence-based practice in complementary and alternative medicine, Perspectives, protocols, problems, and potential in Ayurveda, Rastogi S. (ed.). Clinical evidence in the tradition of Ayurveda. Evidence-Based Practice in Complementary and Alternative Medicine 67-78.

Maroyi A. 2017. Diversity of use and local knowledge of wild and cultivated plants in the Eastern Cape province, South Africa. Journal of Ethnobiology and Ethnomedicine 13:43. doi: 10.1186/s13002-017-0173-8.

Miftahussurur M, Sharma RP, Shrestha PK, Suzuki R, Uchida T, Yamaoka Y. 2015. Molecular epidemiology of *Helicobacter pylori* infection in Nepal: specific ancestor root. PloS one 10(7):e0134216. doi: 10.1371/journal.pone.0134216.

Mncwangi N, Chen W, Vermaak I, Viljoen AM, Gericke N. 2012. Devil's Claw-A review of the ethnobotany, phytochemistry and biological activity of Harpagophytum procumbens. Journal of Ethnopharmacology 143:755-771. doi: 10.1016/j.jep.2012.08.013.

MoHP. 2010. Brief Profile on Tobacco Control in Nepal. Government of Nepal, Ministry of Health and Population, Kathmandu.

Nafiu MO, Hamid AA, Muritala HF, Adeyemi SB. 2017. Preparation, standardization, and quality control of medicinal plants in Africa. Medicinal spices and vegetables from africa 171-204. doi: 10.1016/B978-0-12-809286-6.00007-8

Naikade S, Meshram M. 2014. Ethno-Medicinal plants used for jaundice from Konkan region, Maharashtra, India. International Journal of Pharmaceutical Science Invention 3(12):39-41.

Namsa ND, Mandal M, Tangjang S, Mandal SC. 2011. Ethnobotany of the Monpa ethnic group at Arunachal Pradesh, India. Journal of Ethnobiology and Ethnomedicine 7:31. doi: 10.1186/1746-4269-7-31.

Newman DJ, Cragg GM. 2012. Natural products as sources of new drugs over the 30 years from 1981 to 2012. Journal of Natural Products 75(3):311-335. doi: 10.1021/np200906s.

Nguyen TS, Xia NH, Van Chu T, Van Sam H. 2019. Ethnobotanical study on medicinal plants in traditional markets of Son La province, Vietnam. Forest Society 3:171-192. doi: 10.24259/fs.v3i2.6005.

Oli KP. 2008. Pasture, livestock, and conservation: challenges in the transborder areas of Eastern Nepal. In Biodiversity Conservation in the Kangchenjunga Landscape. Edited by N Chettri, B Shakya, E Sharma. ICIMOD, Kathmandu, Pp. 91-96.

Ong HG, Ling SM, Win TTM, Kang D-H, Lee J-H, Kim Y-D. 2018. Ethnomedicinal plants and traditional knowledge among three Chin indigenous groups in Natma Taung National Park (Myanmar). Journal of Ethnopharmcology 225:136-158. doi: 10.1016/j.jep.2018.07.006.

Pala NA, Sarkar BC, Shukla G, Chettri N, Deb S, Bhat JA, Chakravarty S. 2019. Floristic composition and utilization of ethnomedicinal plant species in home gardens of the Eastern Himalaya. Journal of Ethnobiology and Ethnomedicine 15:14. doi: 10.1186/s13002-019-0293-4.

Pangeni B, Bhattarai S, Paudyal H, Chaudhary RP. 2020. Ethnobotanical Study of Magar Ethnic Community of Palpa District of Nepal. Ethnobotany Research and Applications 20:1-17. doi: 10.32859/era.20.44.1-17.

Parajuli RR. 2013a. Study on Local Uses of Medicinal Plants in Nayabazar, Pyang and Jamuna VDCs of Ilam District. Nepal Journal of Science and Technology 14(1):57-66. doi: 10.3126/njst.v14i1.8923.

Parajuli RR. 2013b. Indigenous knowledge on medicinal plants: Maipokhari, Maimajhuwa and mabu VDCS of Ilam District, Eastern Nepal. Journal of Department of Plant Resources 35:50-58.

Parajuli SP. 2000. Ethnobotanical study at Khandbari municipality of Sankhuwasabha district, Nepal. Banko Janakari 10(2):29-34. doi: 10.3126/banko.v10i2.17600.

Parasuraman S, Thing GS, Dhanaraj SA. 2014. Polyherbal formulation: Concept of ayurveda. Pharmacognosy reviews 8(16): 73-80.

Patel BP, Singh PK. 2018. *Viscum articulatum* Burm. f.: a review on its phytochemistry, pharmacology and traditional uses. Journal of Pharmacy and Pharmacology 70(2):159-177. doi: 10.1111/jphp.12837.

Polunin O, Stainton A. 1984. Flowers of the Himalaya. Oxford University Press, New York.

POWO 2019. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet. http://www.plantsoftheworldonline.org/ (Accessed 01 Feb 2021).

Pradhan BK, Badola HK. 2008. Ethnomedicinal plant use by Lepcha tribe of Dzongu valley, bordering Khangchendzonga Biosphere Reserve, in north Sikkim, India. Journal of Ethnobiology and Ethnomedicine 4:22. doi: 10.1186/1746-4269-4-22.

Pradhan SP, Chaudhary RP, Sigdel S, Pandey BP. 2020. Ethnobotanical Knowledge of Khandadevi and Gokulganga Rural Municipality of Ramechhap District of Nepal. Ethnobotany Research and Applications 20:1-32. doi: 10.32859/era.20.07.1-32.

Press JR, Shrestha KK, Sutton DA. 2000. Annotated checklist of the flowering plants of Nepal. Natural History Museum Publications, London.

Rahman IU, Hart R, Afzal A, Iqbal Z, Ijaz F, Abd-Allah EF, Ali N, Khan SM, Alqarawi AA, Alsubeie M, Bussmann RW. 2019. A new ethnobiological similarity index for the evaluation of novel use reports. Applied Ecology and Environmental Research 17(2):2765-2777. doi: 10.15666/aeer/1702_27652777.

Rai MB. 2003. Medicinal plants of Tehrathum district, eastern Nepal. Our Nature 1(1):42-48. doi: 10.3126/on.v1i1.304.

Rai R, Singh NB. 2015. Medico-ethnobiology in Rai community: a case study from Baikunthe Village development committee, Bhojpur, eastern Nepal. Journal of Institute of Science and Technology 20(1):127-132. doi: 10.3126/jist.v20i1.13935.

Rajbanshi N, Thapa LB. 2019. Traditional knowledge and practices on utilizing medicinal plants by endangered Kisan ethnic group of eastern Nepal. Ethnobotany Research and Applications 8:1-9. doi: 10.32859/era.18.23.1-9.

Rajbhandari KR, Rai SK. 2017. A Handbook of the Flowering Plants of Nepal, volume 1. Department of Plant Resources, Kathmandu.

Ramirez CR. 2007. Ethnobotany and the Loss of Traditional Knowledge in the 21st Century. Ethnobotany Research and Applications 5:245-247.

Ranabhat CL, Kim C-B, Kim C-S, Jha N, Deepak K, Connel FA. 2015. Consequence of indoor air pollution in rural area of Nepal: a simplified measurement approach. Front Public Health 3:5. doi: 10.3389/fpubh.2015.00005.

Rashid N, Gbedomon RC, Ahmad M, Salako VK, Zafar M, Malik K. 2018. Traditional knowledge on herbal drinks among indigenous communities in Azad Jammu and Kashmir, Pakistan. Journal of Ethnobiology and Ethnomedicine 14:16. doi: 10.1186/s13002-018-0217-8.

Reyes-García V, Marti N, McDade T, Tanner S, Vadez V. 2007. Concepts and methods in studies measuring individual ethnobotanical knowledge. Journal of Ethnobiology 27(2):182-203. doi: 10.2993/0278-0771(2007)27[182:CAMISM]2.0.CO;2.

Rijal A. 2008. Living knowledge of the healing plants: Ethno-phytotherapy in the Chepang communities from the Mid-Hills of Nepal. Journal of Ethnobiology and Ethnomedicine 4:23. doi: 10.1186/1746-4269-4-23.

Robinson MM, Zhang X. 2011. The World Traditional Medicines Situation 2011 in Traditional medicines: Global Situation, Issues and Challenges, third en. World Health Organization, Geneva.

Rodrigues E, Cassas F, Conde BE da Cruz C, Barretto EHP, dos Santos G, Figueira GM, Passero LFD, dos Santos MA, Gomes MAS. 2020. Participatory ethnobotany and conservation: a methodological case study conducted with quilombola communities in Brazil's Atlantic Forest. Journal of Ethobiology and Ethnomedicine 16:2. doi: 10.1186/s13002-019-0352-x.

Rokaya MB, Münzbergová Z, Timsina B. 2010. Ethnobotanical study of medicinal plants from the Humla district of western Nepal. Journal of Ethnopharmacology 130(3):485-504. doi: 10.1016/j.jep.2010.05.036.

Rokaya MB, Uprety Y, Poudel RC, Timsina B, Münzbergová Z, Asselin H, Tiwari A, Shrestha SS, Sigdel SR. 2014. Traditional uses of medicinal plants in gastrointestinal disorders in Nepal. Journal of Ethnopharmacology 158:221-229. doi: 10.1016/j.jep.2014.10.014.

RStudio Team 2020. RStudio: Integrated Development Environment for R. RStudio, PBC, Boston, MA. http://www.rstudio.com/.

Samuel AJSJ, Kalusalingam A, Chellappan DK, Gopinath R, Radhamani S, Husain HA, Muruganandham V, Promwichit P. 2010. Ethnomedical survey of plants used by the Orang Asli in Kampung Bawong, Perak, West Malaysia. Journal of Ethnobiology and Ethnomedicine 6:5. doi: 10.1186/1746-4269-6-5.

Santamaría L, Méndez PF. 2012. Evolution in biodiversity policy - current gaps and future needs. Evolutionary Applications 5(2):202-218.

Shaheen H, Qaseem MF, Amjad MS, Bruschi P. 2017. Exploration of ethno-medicinal knowledge among rural communities of Pearl Valley, Rawalakot, District Poonch Azad Jammu and Kashmir. PloS one 12(9):e0183956. doi: 10.1371/journal.pone.0183956.

Shrestha KK, Bhattarai S, Bhandari P. 2018. Handbook of Flowering Plants of Nepal (Vol. 1 Gymnosperms and Angiosperms: Cycadaceae-Betulaceae). Scientific Publishers, Jodhpur.

Shrestha KK, Kunwar RM, Dhamala MK, Humagain K, Pandey J, Khatri NB. 2008. Conservation of Plant Resources in Kanchenjunga-Singalila Ridge, Eastern Nepal. Nepal Journal of Plant Sciences 2:62-68.

Shrestha N, Shrestha S, Koju L, Shrestha KK, Wang Z. 2016. Medicinal plant diversity and traditional healing practices in eastern Nepal. Journal of Ethnopharmacology 192(4):292-301. doi: 10.1016/j.jep.2016.07.067.

Shrestha PM, Dhillion SS. 2003. Medicinal plant diversity and use in the highlands of Dolakha district, Nepal. Journal of Ethnopharmacology 86(1):81-96. doi: 10.1016/S0378-8741(03)00051-5.

Sigdel SR, Rokaya MB. 2011. Utilization of plant resources in Dang district, West Nepal. Banko Janakari 21(2):45-54. doi: 10.3126/banko.v21i2.9143.

Singh KN, Lal B. 2008. Ethnomedicines used against four common ailments by the tribal communities of Lahaul-Spiti in western Himalaya. Journal of Ethnopharmacology 115(1):147-159. doi: 10.1016/j.jep.2007.09.017.

Singh KJ, Huidrom D. 2013. Ethnobotanical uses of medicinal plant, *Justicia adhatoda* L. by Meitei community of Manipur, India. Journal of Coastal Life Medicine 1(4):322-325. doi: 10.12980/JCLM.1.2013C895.

Slingenberg A, Braat L, van der Windt H, Rademaekers K, Eichler L, Turner K. 2009. Study on Understanding the Causes of Biodiversity Loss and the Policy Assessment Framework', European Commission Directorate-General for Environment. http://ec.europa.eu/ environment/enveco/biodiversity/pdf/causes_biodiv_loss.pdf.

Smith P. 2018. Managing the global land resource. Proceedings of the Royal Society B. 285 20172798. doi: 10.1098/rspb.2017.2798.

Srithi K, Balslev H, Wangpakapattanawong P, Srisanga P, Trisonthi C. 2009. Medicinal plant knowledge and its erosion among the Mien (Yao) in northern Thailand. Journal of Ethnopharmacology 123(2):335-342. doi: 10.1016/j.jep.2009.02.035.

Stainton A, Polunin O. 1988. Flowers of the Himalaya. New York: Oxford University Press.

Subba B, Srivastav C, Kandel RC. 2016. Scientific validation of medicinal plants used by Yakkha community of Chanuwa VDC, Dhankuta, Nepal. Springerplus 5(1):155. doi: 10.1186/s40064-016-1821-5.

Tamang P, Singh NB. 2014. Medical ethnobiology and indigenous knowledge system of the Lapcha of Fikkal VDC of Ilam, Nepal. Journal of Institute of Science and Technology 19(2):45-52. doi: 10.3126/jist.v19i2.13851.

Tamang R, Sedai DR. 2016. Documentation of ethnomedicinal knowledge on plant resources used by baram community in arupokhari VDC, Gorkha District, Central Nepal. Bulletin of Department of Plant Resources 38:60-64.

Tardío J, Pardo-de-Santayana M. 2008. Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Economic Botany 62(1):24-39. doi: 10.1007/s12231-007-9004-5.

Tewari D, Mocan A, Parvanov ED, Sah AN, Nabavi SM, Huminiecki L, Ma ZF, Lee YY, Horbańczuk JO, Atanasov AG. 2017. Ethnopharmacological approaches for therapy of jaundice: Part I. Frontiers in Pharmacology 8:518. doi: 10.3389/fphar.2017.00518.

Thapa LB. 2012. Indigenous knowledge on common medicinal plants among Raji community of Surkhet District, Mid-Western Nepal. Nepalese Journal of Biosciences 2:88-92. doi: 10.3126/njbs.v2i0.7494.

Tropicos 2021. Tropicos.org. Missouri Botanical Garden. http://www.tropicos.org. Accessed 01 February 2021.

Trotter RT, Logan MH . 1986. Informant Consensus: a new approach for identifying potentially effective medicinal plants. In Plants in indigenous medicine and diet. Edited by NL Etkin. Bedfort Hills: Redgrave Publishers, Pp. 91-112.

Turner NJ, Ignace MB, Ignace R. 2000. Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia. Ecological Applications 10(5): 1275-1287.

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. Journal of Ethnobiology and Ethnomedicine 6:3. doi: 10.1186/1746-4269-6-3.

Uprety Y, Poudel RC, Asselin H, Boon E. 2011. Plant biodiversity and ethnobotany inside the projected impact area of the Upper Seti Hydropower Project, Western Nepal. Environment, Development and Sustainability 13(3):463-492. doi: 10.1007/s10668-010-9271-7.

Uprety Y, Poudel RC, Gurung J, Chettri N, Chaudhary RP. 2016. Traditional use and management of NTFPs in Kangchenjunga Landscape: implications for conservation and livelihoods. Journal of Ethnobiology and Ethnomedicine 12:19. doi: 10.1186/s13002-016-0089-8.

Uprety Y, Poudel RC, Shrestha KK, Rajbhandary S, Tiwari NN, Shrestha UB, Asselin H. 2012. Diversity of use and local knowledge of wild edible plant resources in Nepal. Journal of Ethnobiology and Ethnomedicine 8:16. doi: 10.1186/1746-4269-8-16.

Wachtel-Galor S, Benzie IFF. 2011. Herbal Medicine: An Introduction to Its History, Usage, Regulation, Current Trends, and Research Needs, In Herbal Medicine: Biomolecular and Clinical Aspects, second edition. Edited by IFF Benzie, S Wachtel-Galor. Boca Raton (FL): CRC Press/Taylor and Francis.

Wali R, Rahman K, Raja NI, Qureshi R, Bussmann RW, Mashwani Z-R. 2019. A quantitative medico-botanical expedition of Fairy
Meadows National Park, Diamir, Gilgit Baltistan, Pakistan. Ethnobotany Research & Applications 18:35. doi.org/10.32859/era.18.35.1-30

Wambugu SN, Mathiu PM, Gakuya DW, Kanui TI, Kabasa JD, Kiama SG. 2011. Medicinal plants used in the management of chronic joint pains in Machakos and Makueni counties, Kenya. Journal of Ethnopharmacology 137:945-955. doi: 10.1016/j.jep.2011.06.038.

Watson MF, Mkiyama S, Ikeda H, Pendry C, Rajbhandari KR, Shrestha KK. 2011. Flora of Nepal. volume 3. The Royal Botanic Garden, Edinburgh.

Weckmüller H, Barriocanal C, Maneja R, Boada M. 2019. Factors affecting traditional medicinal plant knowledge of the Waorani, Ecuador. Sustainability, 11:4460. doi: 10.3390/su11164460.

Wu N, Oli KP, Gilani H, Joshi S, Bisht N. 2016. Yak raising challenges: transboundary issues in far eastern Nepal. In Yak on the Move: Transboundary challenges and opportunities for Yak raising in a changing Hindu Kush Himalaya Region. Edited by N. Wu, S. Yi, Joshi S, N Bisht. ICIMOD, Pp. 53-64.