



Traditional uses of wild medicinal plants and their management practices in Nepal-A study in Makawanpur district

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Abstract: Nepal is an important source of wild medicinal plants in the world. Nepalese especially rural people have a long tradition of folk practices for utilization of medicinal plants for various purposes. This paper examines the traditional uses and management practices of such plants in the locality. Therefore, a case study was conducted during March-April 2012 in Daman Village Development Committee (VDC) of Makawanpur district in Nepal. Both social science and natural science methods such as questionnaires, semi-structured interviews, participatory rural appraisal, focus group discussion and plants specimens' collection and identification were applied to collect data from the field. The results of study shows that total 76 species of medicinal plants were mentioned which used local people for treatments of various physical ailments in the study area. Among the listed plants *Swertia chirayita*, *Astilbe rivularis*, *Bergenia ciliata*, *Acorus calamus*, *Nardostachys grandiflora*, *Valeriana jatamansii* were respectively the most preferred and frequently used medicinal species in the locality. Results also shows that the management practices of medicinal plants are being effectively applied in the study area even though there are some problems like illegal collection and overharvesting. The rules are effective because the users' community takes part in defining the rules and the users have the full authority to manage and collect the forest products from the respective community forest. Therefore, it indicates that the local people have a vast knowledge on wild medicinal plants including their traditional uses and management which helps to preserves the indigenous knowledge as well as conserves the biodiversity.

Keywords: Management practices; medicinal plants; Nepal; traditional uses.

Introduction

It has been estimated that about 10% of the plants or around 30,000 species are used for medicinal purposes throughout the world (Farnsworth and Soejarto 1991, Wantanabe 2000), and out of which 6500 species found in Asia (Karki and Williams 1999). According to World Health Organization (WHO) report (2002), 70% of the world population use medicinal plants for curing diseases through their traditional practitioners. In Indian sub-continent, plant oriented medicines are used extensively from an ancient times. According to a survey conducted by WHO, traditional healers treat 65% patients in Srilanka, 60% in Indonesia,

60% in Pakistan, 85% in Myanmar, 80% in India and 90% in Bangladesh. In Nepal, 75% of the population, especially in rural areas is getting health care by traditional practitioners, who prescribe herbal preparations (Hamayun et al. 2006).

Nepal is an excellent repository of cultural heritage for diverse ethnic groups and these ethnic people have a long tradition of folk practices for utilization of wild plants especially as medicinal species (Manandhar 1993). These ethnic groups use about 23% of flowering plants for their medicinal properties (Shrestha et al. 2000). Traditional medicine in Nepal comprises those practices on beliefs that were in existence often

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for hundreds to thousands of years before the development and spread of modern medicine, and which are still in use today. Recently updated database revealed a more than 1950 species of plants used as folk medicine in Nepal (Ghimire 2008). Majority of such valuable plants grow in wild conditions as natural component of vegetation in different regions from tropical to alpine climate in Nepal. The various plant parts of these medicinal species such as roots, rhizomes, leaves, bark, stem, flower, fruit, seeds, etc. are collected by local people for domestic use as well as for sale. In Nepal, every year 15,000 to 20,000 tons of wild medicinal plant products of more than 100 species, valued at 15 to 20 million US\$, are collected and exported. The main market for Nepalese medicinal plants in India and 90% of such exported to India in a raw form (Bhattarai and Karki 2006).

In recent years, the greater quantities of those plants having medicinal values have been indiscriminately collected for export to India, China and other overseas markets. The demand for some of the items is very high in the national as well as international markets, and the species are being overexploited (Sharma et al. 2004). As a result due to overexploitation, some of the medicinal plants species are now in a depleted stage (Rawal 2004). Increasing demand for medicinal plants resulted in an increased pressure on wild plants as most of the plants traded in Nepalese markets are coming from wild source, and not cultivated source (Bhattarai and Karki 2006, Rawal et al. 2009). The interaction between the people and plant resources has emerged as a critical factor in sustaining the region. Indiscriminate collecting, not in accordance with any regulatory procedure or recognized management practices, has threatened the survival of some species and reduced the quality of many medicinal herbs. In Nepal, adequate conservation measures have not yet been thought of. Wild plant resources are regarded as free commodities to be collected from nature and a resource of which poor people think “if I do not pick what I can today, someone else will get it tomorrow”. As a consequence, raw materials are overharvested when, for example, immature plants, roots, tubers, rhizomes, and bark are taken or excess pruning is done (Yonzon 1993). These trends and attitudes have led to a

cycle of impoverishment in which the local people increasingly lose control over the management of their resources. They have also degraded the country's medicinal plant resources and gradually exploited species are becoming more difficult to be found in a given locality where they once flourished.

Considering the importance of wild medicinal plants used as traditional practice, it is needed to explore the proper documentation and effective management of such resources. Therefore, the present study has been undertaken to figure out the medicinal plant species collected locally and to describe their traditional uses as well as existing management rules in the local community.

Study area

The study was carried out in Daman VDC which is located in the north side of Makawanpur district (shown in Figure 1), a part of Narayone zone, perched on a hillock and one of the most beautiful village inhabited by Chetri (44%) and Tamang (39%) tribes with almost 83% of the total population of the VDC. Daman village is situated at an altitude of 2320 m and 100 km southwest of Kathmandu, the capital city of Nepal. The area of the VDC is 43.63 sq km. The village provides a grand view of the Himalayas with Mount Everest in the east (Source: Daman VDC office). The climate of the area is variable from tropical to temperate and remains rather cool with sometimes snow-fall during the winter season.

Administratively Daman VDC consists of nine wards. The total population of Daman VDC is 7053 which includes 3615 males (52%) and 3438 females (48%). The total number of households in the VDC is 1303 among which 38 households are landless. The average household size is 5.4. The literacy rate of Daman VDC is 38%. The main occupations of the villagers are agriculture (90%), 4% have private business and 3% are service holder (Source: Daman VDC office).

Vegetation status

Most (67%) of the area of Daman VDC is covered by vegetation which consists of tropical to temperate in nature. There are mainly three specific forest areas viz. i) community forest, ii) whole village owned forest or national forest and, iii) private forest (Source: Daman VDC office). The local people mainly collected medicinal plants from the community forest and national forest. According to altitudinal and climatic variations mixed forest, both evergreen and coniferous as well as bushes and shrubs are found in the study area. The mixed forest mainly consists of *Alnus nepalensis* and *Pinus* species (Basnet 2007). In the high hills and mountains areas the predominant vegetation comprises mostly grasses and valuable medicinal plants i.e. *Swertia chirayita*, *Rubia manjith*, *Valeriana jatamansii*, *Taxus baccata*, *Bergenia ciliata*, *Astilbe rivularis*, *Acorus calamus*, *Nardostachys grandiflora*, *Zanthoxylum armatum*, *Berberis asiatica*, *Paris polyphylla*, *Aconitum* sp., *Parmelia* sp. (Lichens) etc.

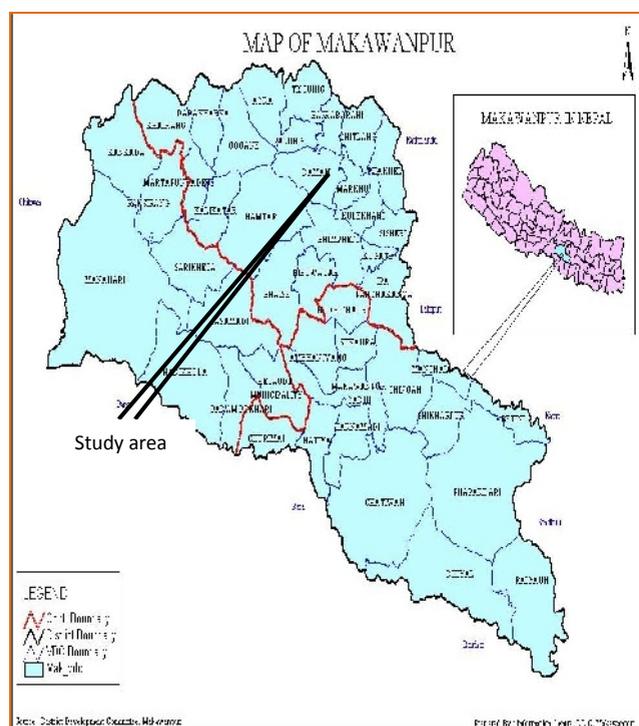


Figure 1: Map of Makawanpur district showing Daman VDC (study area) (Source: <http://www.thekingdomofnepal.com/makawanpur-district-map/>).

Materials and methods

The information regarding the distribution, common species, uses and management of medicinal plant resources in the locality were collected during the empirical fieldwork in the study area. The fieldwork comprises two approaches i.e. inventory technique and survey technique (Martin 1995, Cunningham 2001). The inventory technique means that the field walked with traditional healer and collector in the forest to see the collection sites as well as collect different plant specimens and identify their local name, used plant part(s), mode of use, purposes of use, etc. The survey technique included one household questionnaire, in depth interviews, participatory rural appraisal and focus group discussion with key informants. Therefore, for the collection of information, a field visit was made in the study area during March to April 2012. A questionnaire on the common species of medicinal plants and their traditional uses was conducted in 82 households randomly. For the household questionnaire survey, the sampling size was determined by using Yamane (1967) formula with the error of 11%. During the field visit 18 semi-structured interviews, two focus group discussion and different participatory rural appraisal techniques were conducted with villagers, collectors, traditional healers, community forest chief, etc. with the objective of obtaining a deeper insight into the medicinal plants about common species, local names, parts used, mode of use, purpose of use, and also the local people attitude about the existing management practices, property rights, access rules, extract rules and preservation of indigenous knowledge.

Plant specimens' collection and identification

Medicinal plant specimens were collected and tagged to identify species during field walks with traditional healer and collector. Names of medicinal plants were given in the local languages; some plants have more than one local name. Identification to get the botanical name was done through comparing plant materials, photographs and local names with reference books (Joshi and Joshi 2001, Jha et al. 2008, Jha et al. 2010), list of common medicinal plants in

Daman area (Source: Mountain Botanical Garden) and field technicians from Mountain Botanical Garden as well as crosscheck with online materials. Some plants are spelled differently in reference books and dictionary, so some medicinal plants were identified with the help of interpreter.

Data analysis

The data collected from different sources were tabulated, processed and analyzed quantitatively as well as qualitatively. Initially, the information about the common medicinal plant species, local name/nepali name, traditional uses, along with botanical information was compiled into a spreadsheet. The data were analyzed using the computer programme of Microsoft Office Excel and SPSS.

Results and Discussion

Medicinal plant species and their traditional uses in the locality

From the field walk with traditional healer and collector, questionnaire survey, interview with key informants and focus group discussion with villagers, altogether 76 species of medicinal plants were mentioned to be found in the study area (shown in table 1). On the basis of their habitat, 39 species are herbs (52%), 14 shrubs (18%), 14 trees (18%), five climbers (7%), two species of pteridophytes (3%), one lichen (1%) and one fungus (1%). The species those found in the study area belongs to 51 families and 71 genera which were used for curing diseases and disorders in the local communities. The families with the frequently found species are Compositae, Ericaceae, Gramineae, Liliaceae and Ranunculaceae were the largest families used for treatment of diseases locally (shown in Table 1). Similar results have been found by different authors' investigation. Ghimire (2008) analyzed 1714 naturally growing medicinal plant species in Nepal and found that herbs contribute the highest category (60.6%) followed by shrubs (16.6%), trees

(13.6%) and climbers (8.8%) which is similar to the present study result. Manandhar (1989) identified that 102 medicinal plants species used by Chepang tribes of Makawanpur district. Most of the identified species are indigenous to Nepal; some are indicated as introduced plant. Uprety et al. (2008) found that in Twanrakhola community of Hadikhola VDC, among the 109 species used by bankariya ethnic group, most (37%) species are herbs followed by 35% trees, 21% shrubs, and rest species are climbers which also support the findings of the present study. The plant parts used for the medicinal preparations in the study area are root, rhizome, stem, bark, leaf, flower, fruit, seed, resin, latex, spore and whole plant. Present study shows that 44% of the medicinal plant species are harvested for roots, rhizome and whole plant in the study area (shown in Table 1). Uprety et al. (2008) stated that 57% of medicinal plant species were harvested for root or rhizome and whole plant by bankariya ethnic group in Hadikhola VDC in Makawanpur district. Similarly other studies have shown that 70% of taxa of medicinal plants were harvested for underground parts found in Himalayan region. Underground parts or whole plant are most frequently exploited and utilized by local people in Nepal (Lama et al. 2001, Dhar et al. 2000).

Analysis of the data showed that altogether 54 types of human diseases and disorders can be treated by the reported plants (presented in Table 1). Highest (20) numbers of medicinal plant species were found to be used in the treatment of fever or tonic fever diseases. Similarly 18 species were used for cold and cough, 11 species for dysentery, 10 species for diarrhoea, anthelmintic; nine species for cut and wounds, eight species for astringent, asthma, pains; seven species for skin diseases, tonic, headache, urinary trouble, colic pain; six species for digestive and stomachic, gastric; four species each for stimulant, toothache, cooling and refreshes, bronchitis, expectorant; three species for rheumatism, vomiting; two species each used for seven diseases and one species each was used for other 24 diseases (shown in Figure 2).

Table 1: List of medicinal plant species and their traditional uses in the study area

S.N.	Name of species Local name/Nepali name	Family	Habitat	Part (s) Used	Uses	Mode of use
1	<i>Achyranthes bidentata</i> Datiwan	Amaranthaceae	Herb	WP, R, S	Toothache, indigestion, asthma	Juice, Raw
2	<i>Aconitum ferox</i> Wall.ex Seringe Bikh	Ranunculaceae	Herb	R	Uric acid, orthopaedic use	Paste
3	<i>Aconitum spicatum</i> (Bruhl).Stapf. Bishjara	Ranunculaceae	Herb	R	Poison, joint pain, Fever	Juice, Paste
4	<i>Acorus calamus</i> L. Bojho	Acoraceae	Herb	Rh	Stomachic, dyspepsia, colic, fever, bronchitis, dysentery, diarrhoea	Paste
5	<i>Aegle marmelos</i> (L.) Bel/Correa	Rutaceae	Tree	R, Fl	Fever, astringent, digestive, diarrhoea, dysentery	Juice, Pulp
6	<i>Allium violaceum</i> Wall. ex Regel Ban lason	Amaryllidaceae	Herb	R, L	Stimulant	Raw, Paste
7	<i>Alnus nepalensis</i> D. Don. Utis	Betulaceae	Tree	S, B	Body pain, chronic fever	Powder
8	<i>Aloe vera</i> (Linn.)Busm.f. Grithokumari	Liliaceae	Herb	L	Fever, Cooling, tonic, cough	Juice, Paste
9	<i>Anaphalis contorta</i> (D.Don) Hook.f. Buki phul	Compositae	Herb	Fl, L	Chest pain, inner bleeding	Juice
10	<i>Asparagus racemosus</i> Willd. Kurilo	Liliaceae	Climber	R	Fermentation, diarrhoea fever tonic	Paste
11	<i>Astilbe rivularis</i> Buch.-Ham.ex D. Don Thulookhati	Saxifragaceae	Herb	R, L	Menstrual disorder	Paste
12	<i>Artemesia indica</i> Willd. Titepati	Compositae	Shrub	L, S	Fever, remove tape worm	Juice
13	<i>Azadirachta indica</i> A. Juss Neem	Meliaceae	Tree	L, B	Toothache, bad breath, gum disease, tonic, astringent, Itch	Juice, Raw, Paste
14	<i>Berberis aristata</i> DC. Chutro	Berberidaceae	Shrub	S	Swelling pain	Paste
15	<i>Bergenia ciliata</i> (Haw.) Sternb. Pashanved	Saxifragaceae	Herb	S, R	Eye pain, cut and wounds	Paste
16	<i>Colocasia</i> sp. Darsan peepal	Calocaceae	Herb	L, Rh	Cough, stomachic, astringent	Juice
17	<i>Carica papaya</i> L. Mewa/Papita	Caricaceae	Herb	La	Toothache, scorpion bite, dys- entery	Latex
18	<i>Centella asiatica</i> (L.) Urb. Ghoptapre	Umbeliferae	Herb	WP	Cuts and wounds, snake bite, skin disease	Paste
19	<i>Cinnamomum tamala</i> (Buch.-Hum.) Ness and Eberm. Tajpat	Lauraceae	Tree	L	Carminative, colic pain, diar- rhoea	Juice
20	<i>Curculigo orchioides</i> Gaertn. Syal Dhoti	Hypoxidaceae	Herb	L, R	Seminal discharge	Paste
21	<i>Cuscuta reflexa</i> Roxb. Akashbeli	Convolvulaceae	Climber	WP	Jaundice, headache, stomachic, rheumatism	Juice, Paste
22	<i>Cyathea spinosa</i> Unyu/Rukh Unyu	Polypodiaceae	Fern	Rh	Anthelmintic	Juice
23	<i>Cymbopogon flexuosus</i> (Nees ex Steud.) W. Watson Lemongrass	Gramineae	Herb	L	Cuts and wounds, cough, fever	Juice
24	<i>Dactylorhiza hatagirea</i> (D.Don) Soo Panchaunle	Orchidaceae	Shrub	R	Colic pain, urinary trouble, astringent, expectorant, tonic	Powder
25	<i>Delphinium dedatum</i> Munz. Nirmansi	Ranunculaceae	Herb	R	Fever, headache, cough/cold	Paste
26	<i>Desmostachya bipinnata</i> (L.) Stapf Kush	Gramineae	Herb	WP	Cooling, aphrodisiac, diuretic, asthma, jaundice, biliousness	Raw, Juice
27	<i>Drymaria cordata</i> (L.) Wild. ex Roem. and Schult Abhijalo	Caryophyllaceae	Herb	L	Calmness, fresh and cool	Paste, Juice
28	<i>Dryopteris filix-mas</i> (L) Schott Unyu	Polypodiaceae	Fern	Rh	Anthelmintic	Juice
29	<i>Ephedra geradiana</i> Wall.ex.Stapf. Somlata	Ephedraceae	Shrub	S	Asthma	Juice
30	<i>Eupatorium odoratum</i> L.	Compositae	Shrub	L	Cuts and wounds	Juice

Banmara						
31 <i>Euphorbia hirta</i> L. Rato lahare ghas/Dudhe ghas	Euphorbiaceae	Herb	WP	Colic, cough, asthma, vomiting, worms, dysentery	Paste, Juice	
32 <i>Ficus religiosa</i> L. Pipal	Moraceae	Tree	B, L, Fl, La	Astringent, gonorrhoea, scabies, diarrhoea, dysentery	Juice, paste	
33 <i>Gaultheria fragrantissima</i> Wall.	Ericaceae	Shrub	L	Rheumatism, stimulant, carminative, hookworms	Oil	
Dhasingre						
34 <i>Geranium</i> sp. Gurije	Geraniaceae	Herb	R	Cuts and wounds	Paste	
35 <i>Girardinia diversifolia</i> (Link) Friis Allo/Allo sisnu	Urticaceae	Herb	WP, R, L	Eczema, worm killer, gastric, headache, fever	Juice, paste, ash	
36 <i>Glycyrrhiza glabra</i> L. Jethimodhu	Leguminosae	Herb	R, S	Stimulant, astringent, tonic	Juice	
37 <i>Heracleum candicans</i> Wall. ex Tokar	Apiaceae	Shrub	Se	Cough, cold	Powder	
38 <i>Justicia adhatoda</i> L. Asuro	Acanthaceae	Shrub	WP, L, Fl	Fever, cough, asthma, malaria, ophthalmic	Juice,	
39 <i>Litsea cubeba</i> (Lour.) Pers. Siltimur	Lauraceae	Tree	R, B, F	Pain	Powder, Raw	
40 <i>Lobelia pyramidalis</i> Wall. Eklebir	Campanulaceae	Herb	L, Fl	Expectorant, asthma, chronic bronchitis, vomiting	Juice	
41 <i>Lycopodium clavatum</i> L. Nagbeli	Lycopodiaceae	Herb	Sp	Burns, headache	Powder	
42 <i>Mahonia napaulensis</i> DC. Jamanemandro	Berberidaceae	Tree	B, F	Dysentery, diarrhoea, diuretic	Raw, Juice	
43 <i>Melothria heterophylla</i> (Lour.) Cogn. Gol kaankri	Cucurbitaceae	Climber	R, F	Throat pain, fever, ulcer, urination	Juice, Raw	
44 <i>Momordica charantia</i> L. Bankarela	Cucurbitaceae	Climber	F	Fever, skin disease	Raw	
45 <i>Myrica esculenta</i> Buch.-Ham. Ex D. Don Kaphal	Myricaceae	Shrub	B, F, S	Cold	Crushed, Raw	
46 <i>Nardostachys grandiflora</i> DC. Jatamansi	Valerianaceae	Herb	Rh	Stimulant, tonic, antispasmodic	Paste	
47 <i>Neopicrorhiza scrophulariiflora</i> (Pennell) Hong Kutki	Scrophulariaceae	Herb	Rh	Fever, Cough, Cold	Juice	
48 <i>Ocimum tenuiflorum</i> L.	Lamiaceae	Herb	WP, L	Cough, fever, headache, skin disease, diarrhoea, dysentery	Paste, Juice	
Tulsi						
49 <i>Ocimum basilicum</i> Babri	Lamiaceae	Herb	Se	Chest pain	Powder	
50 <i>Paris polyphylla</i> Smith Satuwa	Liliaceae	Herb	R	Fever, Vomiting, Worms	Paste	
51 <i>Parmelia</i> sp. Jhyau	Parmeliaceae	Lichen	WP	Epilepsy, antibiotic	Paste	
52 <i>Phoenix humilis</i> Royle ex Becc. and Hook. Thakal/Khajura	Palmae	Tree	L	Toothache	Juice	
53 <i>Phyllanthus emblica</i> Linn. Aala/Amala	Euphorbiaceae	Tree	B, L, F	Dysentery, constipation, acidity, astringent, diarrhoea	Juice, dried fruit	
54 <i>Phytolacca acinosa</i> Roxb. Jaringo	Phytolaccaceae	Herb	WP	Narcotic	Raw	
55 <i>Pinus roxburghii</i> Sarg. Sallo/Khote sallo	Pinaceae	Tree	Re	Healing of wounds, gastric	Resin	
56 <i>Pogostemon benghalensis</i> Kuntz. Rudilo	Labiatae	Herb	L	Headache, fever, colic, dysentery	Juice	
57 <i>Potentilla peduncularis</i> D. Don Bajradanti	Rosaceae	Herb	R	Gastric	Paste	
58 <i>Rhododendron anthopogan</i> D. Don. Sunpati	Ericaceae	Shrub	Fl	Cause high altitude, High altitude sickness	Juice	
59 <i>Rhododendron arboreum</i> Sm. Lali gurans	Ericaceae	Shrub	B, Fl	Treat cuts, fish bone	Paste, Raw	
60 <i>Rubia manjith</i> Roxb.ex Fleming Majitho	Rubiaceae	Climber	R	Scabies/ Skin Disease	Paste	
61 <i>Rubus ellipticus</i> Sm. Aiselu	Rosaceae	Shrub	R, F	Fever, diarrhoea, dysentery, colic, cough,	Juice	
62 <i>Saccharum spontaneum</i> L. Kasa	Gramineae	Herb	R	Inflammations, cold, dysuria	Paste	

63	<i>Sapindus mukorossi</i> Gaertn. Ritta	Sapindaceae	Tree	F	Expectorant, epilepsy	Raw, Powder
64	<i>Selinum wallichianum</i> (DC.) Bhutkesh	Umbelliferae	Herb	WP	Cough, cold	Juice
65	<i>Swertia chirayita</i> (Roxb.ex Fleming) Karsten Chiraito	Gentianaceae	Herb	WP	Fever, headache	Juice
66	<i>Taxus baccata</i> L. Lodh salla	Taxaceae	Tree	L	Anti-tumour, cancer, asthma, bronchitis	Taxol
67	<i>Terminalia bellirica</i> (Gaertn.) Roxb Barro	Combretaceae	Tree	F	Anthelmintic, digestive, tonic, asthma, bronchitis, laxative	Juice
68	<i>Terminalia chebula</i> Retz. Harro	Combretaceae	Tree	B	Diuretic	Bark
69	<i>Tinospora sinensis</i> (Lour.) Merr. Gurjo	Menispermaceae	Climber	R, B, S	Diarrhoea, tonic, aphrodisiac	Dried
70	<i>Thysanolaena maxima</i> (Roxb.) Kuntze Amreso	Poaceae	Herb	WP	Boils	Paste
71	<i>Urtica dioca</i> L. Sisno	Urticaceae	Herb	R, S, L	Dog bites, cuts and wounds, fever, boils	Paste, Juice
72	<i>Valeriana jatamansii</i> Jones. Sugandhawal	Valerianaceae	Herb	Rh	Cough/cold, Throat pain	Paste
73	<i>Zanthoxylum armatum</i> DC. Timur/Promo	Rutaceae	Shrub	F	Gastric	Paste
74	<i>Flickingeria macraei</i> Jibonti	Orchidaceae	Shrub	R	Colic pain, urinary problem, astringent, expectorant	Powder
75	<i>Raphanus raphanistrum</i> Bonmula	Brassicaceae	Herb	L	Rheumatism	Raw, cooked
76	Khorane grass		Herb	WP	Cut and wounds, stop bleeding	Juice

Note: B=Bark, S=Stem, L=Leaf, F=Fruit, Fl=Flower, WP=Whole plant, R=Root, Rh=Rhizome, Se=Seed, La=Latex, Re=Resin, Sp=Spore.

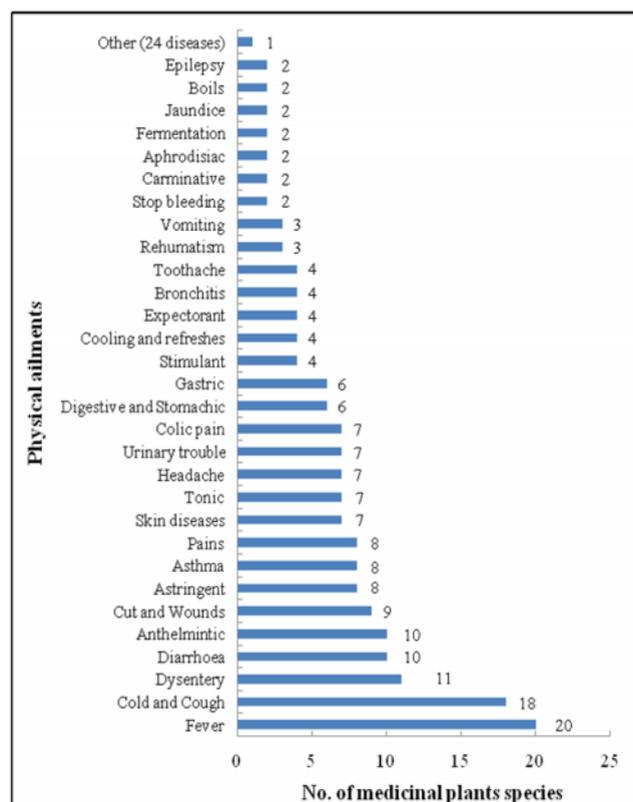


Figure 2: Number of medicinal plant species used in different diseases in the study area

The most common and preferred medicinal plant species used in the households of the study area is *Swertia chirayita*, mentioned in 94% of all the surveyed households (shown in Figure 3). The next most prevalent species mentioned by respondents were *Astilbe rivularis* and *Bergenia ciliata*, mentioned in 73 and 71% of all of them surveyed; *Raphanus raphanistrum*, *Acorus calamus*, *Aconitum ferox*, *Valeriana jatamansii* and *Nardostachys grandiflora* were only used by approx 20-24% of the surveyed households. Other species found in the study area were used by less than 15% of the households' surveyed as shown in Figure 3. From the study, the most frequently used species in the local area were the same recorded in the list of the most highly demanded and traded species by the study of Subedi (2006), and Bhattarai and Ghimire (2006). On the other hand ranking and scoring with collectors showed that *Bergenia ciliata* is the most important and *Swertia chirayita* is the second most important species in terms of frequently used (Figure 4). This is because *Bergenia ciliata* is used not only for treating diseases but also for making pickle locally. Fur-

thermore, many kinds of diseases can be treated with this species, and with immediate effect. One of the traditional healers mentioned he made powder from *Bergenia ciliata* and mixed it with other species for treating toothache, since

it acts very rapidly. During in depth interviews with traditional healer, most of them also mentioned *Bergenia ciliata* as the most frequently used and collected species.

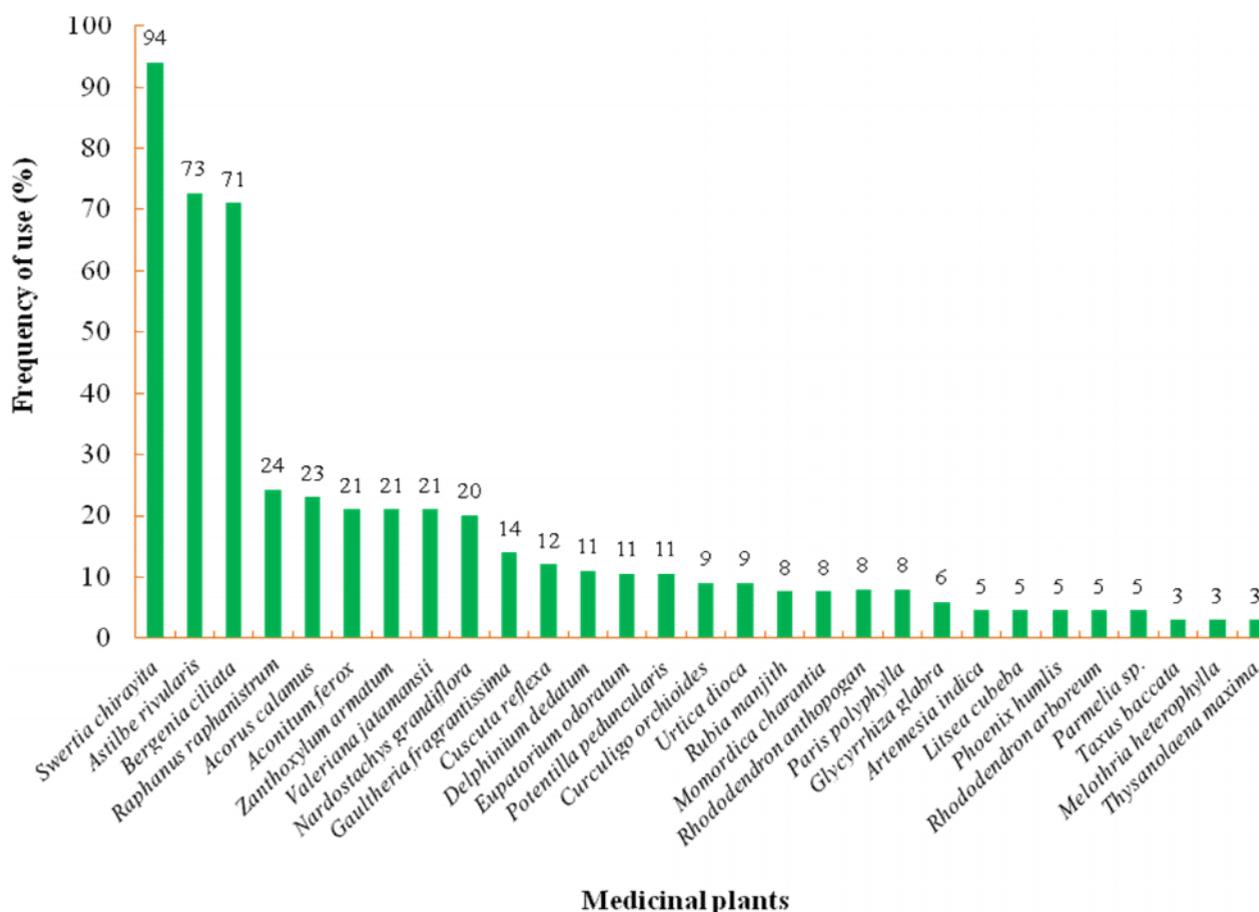


Figure 3: Percentage of species preferred in the households

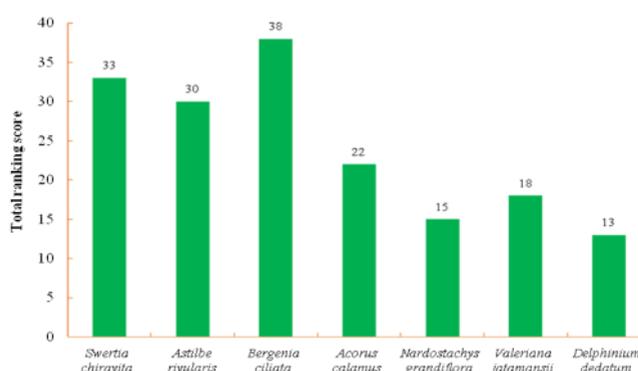


Figure 4: Medicinal plant species ranked by order in terms of frequent use

Management practices of medicinal plants

Through focus group discussions with the local people who gathered medicinal plants, and interviews with community forest chief, collec-

tors, and traditional healers it has been found that there are management rules for collection and harvesting of forest products including medicinal plants from the community forest, not for government forest in the study area. The users of community forests have the full authority to manage and harvest the medicinal plants according to the forest ordinance of Nepal Government. The community forest chiefs mentioned that there is a management team for every community forest which consists of twelve person and they are nominated by VDC administration for four years. The president is the chief of the management team and his responsibilities are making rules, supervise at their implementation, increase awareness of local people, maintenance of community forest user groups, etc.

The management rules mainly deal with:

- Who is allowed to collect?
- How to harvest the plants?
- What plants to use and not to use?
- From which area is not allowed to collect plants?

The management rules say that everybody within the community is allowed to collect medicinal plants from the same community forest and they do not need to ask permission for collection of medicinal plants but people from outside the community need to ask permission from the chief of the respective community forest to collect medicinal plants.

The plants that are allowed to be used in the local area are generally plant roots, rhizome, leaves, fruits, seeds and herbs. But people also use bark of tree for medicinal purposes. When harvesting medicinal plants, the rules for collectors are that they should leave some of the plants behind, and not harvest the plants at young stage. When a plant is big and at the end of its growth it is allowed to take the whole plant, but only if it is a plant that is easy to find in the area. This is to some extent a very ambiguous rule that could be problematic because gatherers have to have a very broad knowledge about the area and the plants, if the rule should not have a negative impact on the biodiversity.

When harvesting medicinal plants it is said not to use tools like spades and shovels because they cut the roots of the plants horizontally in the process and can kill remaining plants that are left behind to grow. The general harvesting rule is to use picks and pickaxes to loosen the soil around the plant, take the whole plant out of the ground and clean the roots of soil by hand. This way the gatherers can divide the plant vertically so the upper plant part is still connected with the roots and can live on when replanted after being divided. When making a hole in the ground, it is important to fill the hole after digging. Collectors are allowed to harvest as much as they please for both household consumption and for selling purpose.

The chief of one of the community forest mentioned in his forest there is a one sacred place where people are not allowed to collect anything from there and they protect this area.

Most interviews with traditional healers and collectors, and focus group discussion with local people reported that they were informed about the rules but sometimes they were not respecting them. People were collecting medicinal plants outside of their community forest illegally without permission. And community forest chiefs also mentioned this illegal collection is the main threat to medicinal plants resource in the study area. During the collection season, everybody seems rushing to collect those items that have high market value before maturing and even before flowering instead of sustainable collection. They cannot wait for the maturity because if they do not collect at that time, others will definitely collect in the logic of 'first come first served'. Sometimes they are using the traditional tools to dig up the plant parts and collect all the underground parts, not leaving anything for regeneration, which is a threat for sustainable production. Therefore, the overexploitation and premature harvesting exacerbates the decline of medicinal plants from the wild source in the study area.

Conclusion

In conclusion the results of the study, the medicinal plants have an important role in the primary health care system for the local people livelihood where majority of the households surveyed use indigenous medicines for treating diseases and disorders. The fact that a wide range of such plants were collected at household levels mostly for domestic consumption, and some also for sale, allows us to conclude that a larger part of the local people rely on medicinal plants for their subsistence needs. The local participation is the main effort for the management and conservation of the naturally available resources like medicinal plants as they are only the users. The local participation is already in practice through community forestry banner. Furthermore, there should be need to increase more collaborative involvement among the management team, users groups of community forest and local people to minimize the existing threats of medicinal plant management.

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