Documentation, promotion and awareness of vital medicinal and aromatic plant species (MAPs) of Langtang Region, Nepal.

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Contents

Abstract

Ecosystems in Nepal present a variety of medicinal and aromatic plants. Rural communities have been traditionally using them for healthcare. But this knowledge is being lost due to cultural transformation and increased loss of such plants due to overexploitation and rapid land degradation. As Langtang region presents a similar scenario, this study recorded vital MAPs and their traditional uses to create a proper documentation and create awareness among the local people and concerned. It also helped establish a local MAPs nursery for *Dactylorhiza hatagirea, Delphinium himalayi, Valeriana jatamansi, Aconitum ferox/spicatum and Aconitum orochryseum* to promote artificial propagation for conserving these valuable species

Introduction

Medicinal and Aromatic Plants (MAPs) contain a certain range of plants which either possess certain medicinal values helpful in preventing illness or pain and/or in curing a disease or contain certain aromatic properties and are of immense economic value. Nepal has significantly diverse ecosystems (Subedi 2004) producing a wide range of unique and valuable medicinal and aromatic plant resources. Most of these valuable MAPs (Medicinal and Aromatic Plants) are found in the remotest mountains of Nepal, where 57% of the people live below the poverty line. Langtang presents the same scenario in the case of availability of MAPs well as the number of rural poor. About 85% of the total population lives in the rural areas (HMG/N 2002) and many of them rely on traditional medicines mostly prepared from plants for healthcare. But there has been a rapid loss of traditional medical knowledge and practices due to their dependency on verbal transformation, impacts of modern cultural transformation and rapid land degradation. At the same time there is a depletion of the resource base as a result of over exploitation of the MAPs and lack of the concerned management systems hence resulting to forest biodiversity degradation eventually.

Objectives

1. To identify and document the various species of MAPs in Chilime and Gatlang VDCs.
2. To calculate the distribution, frequency and coverage of the MAPs
3. To understand perception of local people regarding the importance and conservation of MAPs.
4. To document traditional uses of the MAPs recorded.
5. To aware local students about the local MAPs, their traditional uses and conservation.
6. To aware the local community about the existing MAPs, their traditional uses and conservation.

Methodology

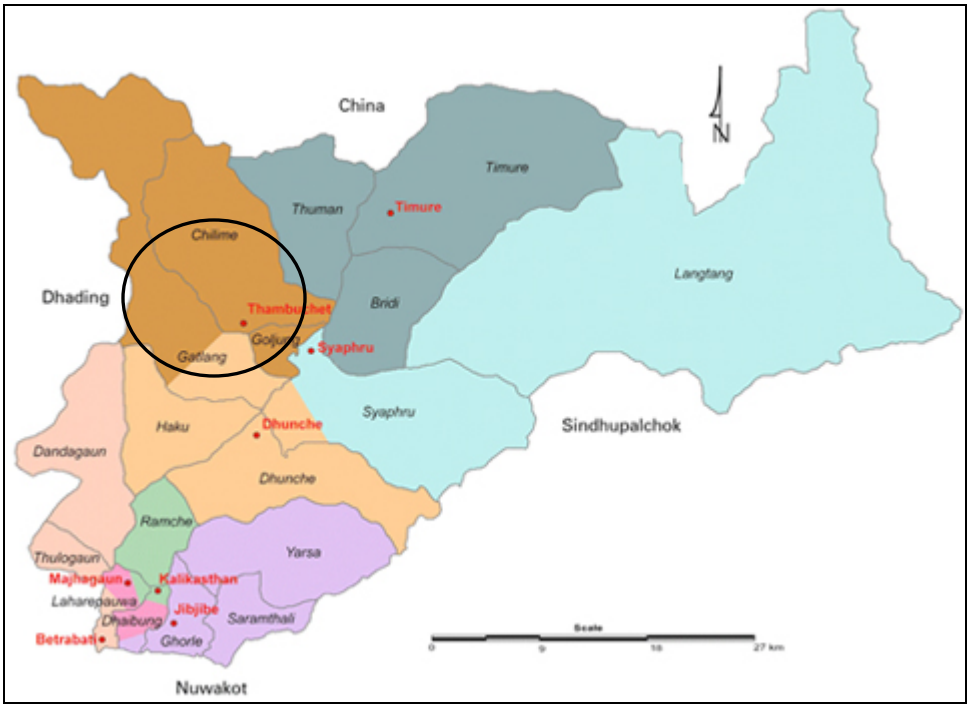
Study area

Rasuwa district lies in Bagmati zone of Central Development Region in Nepal. Chilime ang Gatlang VDCs of Rasuwa district of Central Nepal were chosen for the field study. The district

lies between 27° 2’ and 27° 10’N and 84° 45’ and 85° 88’ E with altitudinal variation ranging from 792 to 7245 masl. Rasuwa district. These VDCs have been selected out of 18 VDCs of the district for the study, based on the literature survey related to MAPs. Both VDCs border with PR of China in the north. The climate ranges from warm humid to alpine. Because of steep terrain, the cultivated land covers only 5.7% area of the whole district.

Majority of the people belong to Tamang ethnic group (93%) in the study area (CBS 2005). Almost 97% households are dependent on agriculture and animal husbandry as main income source and only 2% involved in trade.

Figure 1: Map of study area



Methods

Inventory data for the MAPs species was collected during May-July 2012 conducting inventory following IUCN Guidelines. A total of 20 inventory plots were established vertically between 2000-4000m with 5 horizontal plots in every rise of 500m. Occurrence of MAPs were recorded along nested squared quadrates; 10m x 10m (trees), 5mx5m (shrubs) and 1mx1m (herbs). Each individual herb, shrub and tree MAPs species inside the quadrate were counted. The inventory data was used to calculate the following:

1. Frequency (F) (%) = No of plots with individual species/ Total no of plots studied * 100
2. Density (D) (Total number of plants per hectare) = Total number of species in all quadrates * 10000 m2/ Total no of quadrates * area of quadrate
3. Coverage (shoot area of a species to the ground surface) was calculated with the help of visual estimation.

Although other MAPs species which was observed within the quadrates were counted, density and frequency were calculated for the highest representing MAPs species.

Information on the traditional uses of the available MAPs species in the study area was collected by conducting questionnaire interviews and focus group discussions (FGDs) with local people (50% of the interviewees > 45 years old). A total of 50 household heads participated in the study. Participants were purposively selected to include medicinal plant collectors, members from MAPs groups, Women's Groups, traditional healers and herders. 90% of the respondents were from Tamang ethnic group predominant (65%) in the Rasuwa district. FGDs were accompanied by resource mappings. Consent was taken from the local for the dissemination of their traditional knowledge. Guidelines for the interviews and FGDs were developed to facilitate the collection of information regarding plant uses, parts used and modes of utilization. A checklist was also prepared for use in determining what species were used to treat what kind of diseases/ ailments.

Results

A total of 51 prominent MAPs species were identified in the study area which consisted of predominantly herbs (60%), followed by shrubs, trees and climbers. These MAPs available in the area were recorded during the participatory resource mapping.

S.N.	Scientific Name	Family	Nepali Name
1	Abies spectabilis	Pinaceae	Thingresalla/Gobresalla
2	Taxus wallichiana	Taxaceae	Lothsalla
3	Asparagus racemosus	Liliaceae	Kurilo
4	Dactylorhiza hatagirea	Orchidaceae	Pachaule
5	Centella asiatica	Umbelliferae	Ghodtapre
6	Anaphalis contorta	Compositae	Bukiful
7	Artemisia indica	Compositae	Titepati
8	Eupatorium adenophorum	Asteraceae	Kalijhar, Kalo banmara
9	Berberis asiatica	Berberidaceae	Chutro
10	Cannabis sativa	Urticaceae	Ganja
11	Gaultheria fragrantissima	Ericaceae	Dhasingre
12	Lyonia ovalifolia	Ericaceae	Angeri
13	Rhododendron anthopogon	Ericaceae	Sunpati
14	Swertia chiraita	Gentianaceae	Chiraito
15	Rheum australe	Polygonaceae	Padamchal
16	Aconitum orochryseum	Ranunculaceae	Bikhuma
17	Aconitum ferox/spicatum	Ranunculaceae	Bikh
18	Rubia manjith	Rubiaceae	Majito
19	Zanthoxylum armatum	Rutaceae	Timur
20	Bergenia ciliate	Saxifragaceae	Pakhanbhed
21	Neopicrorhiza scrophulariiflora	Scrophualriaceae	Kutki
22	Daphne retusa	Thymeleaceae	Lokta

23	Girardinia diversifolia	Urticaceae	Allo sisnu
24	Urtica dioica	Urticaceae	Sisnu
25	Valeriana jatamansii	Valerianaceae	Sugandhwal
26	Nardostachys grandiflora	Valerianaceae	Jatamansi
27	Acorus calamus	Acoraceae	Bojho
28	Amaranthus spinosus	Amaranthaceae	Kande lundo
29	Fraxinus floribunda	Oleaceae	Lakuree
30	Hippophae salciifolia	Elaeagnaceae	Daale chuk
31	Onychium japonicum	Dennstaedtiaceae	Gajar unyu
32	Vitex negundo	Verbeanceae	Simali
33	Zanthoxylum armatum	Rutaceae	Bhale timur
34	Artimesia vulgaris	Asteraceae	Titepati
35	Gnapahlium spp	Asteraceae	Bukiful
36	Juniperus indica	Cupressaceae	Dhupi
37	Litsea citrata	Lauraceae	Siltimur
38	Rhodhodendron arboreum	Ericaceae	Gurans
39	Rubia cordifolia	Rubiaceae	Manjitho
40	Rumex nepalensis	Polygonaceae	Halhaley
41	Viscum articulatum	Loranthaceae	Harchur
42	Xanthoxylum acanthopodium	Rutaceae	Bokey timur
43	Bergenia purpescens	Saxifragaceae	Lek pakhanbhed
44	Brassiopsis mitis	Araliaceae	Chuletro
45	Delphinium himalayi	Ranunculaceae	Nirmasi
46	Arisaema flavum	Araceae	Sarpako makei
47	Fritillarea cirrhosa	Liliaceae	Kakoli
48	Satyrium nepalense	Orchidaceae	Gamdol (Tamang language)
49	Taraxacum officinale	Asteraceae	Tukiful
50	Astilbe rivularis	Saxifragaceae	Budho-okhati
51	Smilax aspera	Smilacaceae	Kukurdaino

Table 1 List of MAPs species identified during field study

Roots, rhizomes, tubers, bark, leaves, flowers, fruits, pollen, young shoots and whole plants were used to prepare different medicinal formulations but the most frequently used plant parts were roots followed by leaves, whole plant parts and fruits. Most of the plants were collected for their underground parts i.e. roots rhizomes and tubers (41%), while some were collected for leaves (15%) and the rest for other plant parts. Most of the documented species are collected from the wild whereas very few of them like *Swertia chiraita* are cultivated. These MAPs species are used in dried and/or fresh form immediately and are also collected and stored for future use.

Study on traditional uses of the available MAPs

Traditional medicine is a healthcare practice that has been transferred from a generation to another orally through traditional healers with an aim to cure any ailments and disorders.

However, with modernization, this knowledge is gradually vanishing. Indigenous knowledge of such medicinal plants and their uses is useful for the conservation of cultural traditions, biodiversity, community healthcare and development of plant-based drugs for the present and future.

Documentation of the plants and their ethnobiological values is essential to evaluate human-plant relationships and is equally significant for the conservation and utilization of biological resources. Tremendous decline in the traditional knowledge about MAPs use in the local healthcare urges for a proper documentation of this traditional wisdom before it disappears forever.

The medicinal plants found in the study area were used for a large number of ailments such as cough and cold, cuts and wounds, respiratory problems, stomach –related problems, muscles and joints related problems, fever and headache, weakness and dizziness, skin infections, eye problems, menstrual disorders and toothache. It was also observed that most species were used to treat only one ailment whereas some were found to have multiple medicinal uses. The most common use practice was oral administration followed by external use, nasal, eye and lastly in the ear.

The preparation methods for MAPs that are used for remedies of various ailments are as follows:

1. Paste: Fresh plant parts are crushed and used.
2. Juice: Plants parts are crushed/squeezed and filtered by clothes. In addition water is also used for dilution.
3. Chewing: Fresh plant parts are chewed and directly ingested.
4. Infusion: Plant parts, both dried and fresh are soaked in water for a few minutes and the resulting liquid used.
5. Decoction: Plant parts are boiled in water and extract is used.
6. Powder: Plant parts are dried and ground in a mortar and used.

During the interviews and FGDs, it was noted that most people were familiar with the species that are used to deal with only common ailments like cough and cold, digestive problems, fever, headache, skin infections whereas they would consult a traditional healer in case of complex problems.

S.N.	Scientific Name	Use
1	Aconitum ferox/spicatum	Root paste is used for joint pain, fever headache, cuts and wounds.
2	Acorus calamus	Rhizome is used for cough and cold and throat pain.
3	Amaranthus spinosus	Root paste is applied on cuts and wounds.
4	Artemisia indica	Leaf paste is applied on cuts and wounds.
5	Asparagus racemosus	Tuber paste is used for fever, stomach-ache and diarrhoea.
6	Berberis asiatica	Cambium paste is used for treating rheumatism.
7	Berginia ciliata	Whole plant juice to heal indigestion, fever and diarrhoea.
8	Cannabis sativa	Plant paste is used for stomach problems.

9	Eupatorium adenophorum	Leaf juice is used for cuts and wounds, and reducing swelling in mumps.
10	Fraxinus floribunda	Bark infusion is used body pain.
11	Hippophae salciifolia	Fruit juice is used for cough, diarrhoea and menstrual disorder.
12	Nardostachys grandiflora	Whole plant juice is taken to treat headache and high altitude sickness.
13	Neopicrorhiza scrophiilariiflora	Dried rhizomes soaked overnight in water and the water used during cough, cold, dysentery, diarrhoea, headache, stomachache, throatpain and fever.
14	Onychium japonicum	Used for skin problems, fever and headache.
15	Rheum australe	Root juice is taken for fever, indigestion, diarrhoea and stomachache.
16	Rhodhodendron anthopogan	Flowers are chewed for treating stomachache.
17	Rubia manjith	Root paste is applied over scabies and other skin diseases.
18	Swertia chiraita	Whole plant juice is used to treat fever, cold and headache.
19	Gaultheria fragrantissima	Leaves and immature fruits are consumed to treat gastric problem.Oil from seed is massaged to get relief from body pain.
20	Valeriana jatamansi	Rhizome paste is applied on cuts and wounds and joint problems. It is also chewed to heal throat pain.
21	Vitex negundo	Seed paste is used for worms.
22	Zanthoxylum armatum	Fruits are crushed and taken for stomachache and indigestion.
23	Gnapahlium spp	Root juice used orally in indigestion and stomachache.
24	Juniperus indica	Burning scent of fruit powder is inhaled to reduce headache and blood pressure. Dried fruit powder is used with tea and milk to get relief from cough and cold in high altitude.
25	Litsea citrata	Dried fruits chewed during nausea.
26	Rhodhodendron arboreum	Fresh or dried petal chewed diarrhoea, blood dysentery and throat pain. Young leaves are chewed to get relief from headache.
27	Rubia cordifolia	Leaf and root juice used during fever, stomachache and dysentery. Root juice is applied in cuts and wounds.
28	Rumex nepalensis	Root paste is massaged to relieve body pain, cure scabies and on scalp to reduce hair loss. Leaf extract is used in cuts, wounds and swellings.
29	Viscum articulatum	Root paste is applied in fractured bones.
30	Xanthoxylum acanthopodium	Fruits and stem barks used in indigestion and tooth decay. Decoction of fruit juice used in cold and stomachache.
31	Brassiopsis mitis	Dried roots is used orally in dysentery.
32	Dactylorhiza hatagirea	Rhizome paste is used in cuts and wounds.
33	Abies spectabilis	Leaf juice used in asthma and bronchitis.
34	Taxus wallichiana	Dried leaves used in asthma, bronchitis, epilepsy and headache.
35	Centella asiatica	Leaves ingested for urinary problem (urination stopped) and acidity.
36	Girardinia diversifolia	Root juice is used for treating gastritis and constipation. Juice

		from leaves is used headache, fever and joint pains.
37	Urtica dioica	Decoction of the root is taken to reduce fever. Cooked leaves are taken in case of diabetes.
38	Hippophae salciifolia	Ripe berries are used toothache, joint pain and menstrual disorders.
39	Vitex negundo	Leaf juice is used stomachache.
40	Daphne retusa	Seeds are taken for stomachache.
41	Aconitum orochryseum	Used as antidote for A. Ferox/spicatum poisoning.
42	Lyonia ovalifolia	Leaves are crushed into a paste and massaged to get relief from body pain.
43	Anaphalis contorta	Paste made out of leaves and flower heads is used for cuts wounds and boils.
44	Artemisia vulgaris	Heated shoot part is placed on the affected part to treat rheumatic pain.
45	Delphinium himalayi	Roots are used to reduce pain, diarrhoea, fever and cough.
46	Arisaema flavum	Rhizome juice is used in earache and skin diseases.
47	Fritillarea cirrhosa	Bulbs used for relieving cough.
48	Satyrium nepalense	Dried tuber powder is used as an energizing tonic.
49	Taraxacum officinale	Root juice is taken to cure jaundice and kidney disorder.
50	Astilbe rivularis	Dried stem is consumed by women during pregnancy and after delivery.
51	Smilax aspera	Root juice is applied to cure rheumatic pain.

Table 2 List of MAPs usage documented

It was found during the study that the traditional healers believed in keeping secrecy over the formulation as they believed that its exposure would lose its potency. The traditional healers collected the medicinal plants themselves as a misnamed or falsely collected medicinal plant can be very dangerous and cause death of a patient. This is particularly true in the case of *Aconitum orochryseum* and *Aconitum ferox/spicatum*; both look very similar but *A. ferox/spicatum* is highly poisonous.

Also, it was found that the older generation of the society was the only ones aware about the traditional uses of such medicinal plants, the younger generation were hardly aware or completely unaware of this traditional knowledge. The younger generation was more reliant on the modern medicine for treating their diseases and disorders. The study assumes lack of interest among young people, monopoly of the healers in keeping the knowledge to oneselves, dominance of modern medicine and the disappearance of the MAPs species in their natural habitats due to unsustainable extraction to be the major causes for the disappearance in the traditional knowledge regarding the usage of MAPs species in the rural parts of Nepal such as Rasuwa.

Ecological study of MAPs species

As the inventory was done in an interval of 500 m starting from 2000m concluding at 4000m, therefore the study area has been divided into four altitudinal zones for the ecological study of MAPs species. For this purpose frequency and density of the MAPs trees, shrubs and herbs here studied and analyzed in their respective quadrates in each plot.

Altitudinal Zone 1: 2000-2500m

In this altitudinal range, a total of six trees, nine shrubs and 14 herbs with medicinal values were observed. The highest density (0.87 trees/100m^2) and frequency (25%) was found for *Abies spectabilis*. In case of herbs, *Rumex nepalensis* presented the highest density and frequency in this range (1.13 plants/m^2, 20%).

Altitudinal Zone 2: 2500-3000m

Altogether four tree species, seven shrubs and 11herbs species were observed in this altitudinal range. *Rhodhodendron arboreum* had the highest density and frequency among the trees in this altitudinal range (1.10 trees/m^2, 25%) Among the herbs, *Delphinium himalayi* was observed to have the highest density and frequency (0.28 plants/m^2, 10%).

Altitudinal Zone 3: 3000-3500m

A total of two tree species and five herbs species with medicinal values were observed in this range. Shrubs were not observed in this range though the trees looked like shrubs as they were bushy. *Juniperus indica* presented the highest density in this range (0.35 trees/m^2, 20%) whereas *Aconitum ferox/spicatum* had the highest density and frequency (0.61 plants/m^2, 15%).

Altitudinal Zone 4: 3500-4065m

Only only tree species, bushy and dwarf *Rhodhodendron anthopogan* presented the highest density and frequency in this altitudinal belt (0.25 trees/m^2, 15%). Whereas three herbs species with medicinal values were observed in this range. Among these, *Aconitum ferox/spicatum* had the highest density and frequency (0.71 plants/m^2, 25%).

Though the resource mapping identified and listed 51 MAPs species from the study area, only about 50% of this number was observed during the field inventory. The major reason is that the available species were found in very high and inaccessible cliffs and slopes and at least 500 meters away from the trails.

However, the number occurring from either the resource mapping or the field inventory is not an encouraging number for an area which has been recognized as a haven for MAPs species. Formal consultations during social data collection and informal consultations during fieldwork with the local herders and the communities have revealed that the number has reduced immensely. The study area being a prime location and passage for the illiterate pastoralists provides open access for extraction of MAPs species. It was found that the collection of such plants is done unsustainably and with an intention to earn cash. While doing so, it was mentioned that immature plants are collected from their habitats without leaving any shoots, which ends the possibility of replenishing it back.

'We used to easily find Pachaule (Dactylorhiza hatagirea) in these pasture while we were kids but now it is very difficult to spot one.'

Conclusion

1. Although Langtang region and particularly the study area is a haven for MAPs species, they are disappearing at an alarming rate mainly due to unsustainable harvesting and lack of conservation. The available MAP species are also limited to relatively difficult terrains such as cliffs, crevices and areas more that 500m away from the trails.
2. The indigenous knowledge of traditional healthcare using MAPs is disappearing due to migration of the younger people, lack of interest and time, declining population of older generation and the effective outreach of modern health care.
3. The study perfectly reveals how a development project can drain human resources and interest of the local people from a conservation project. The local people are attracted to short term cash income from a major hydropower project that has been constructed in the study area, this has reduced their enthusiasm towards conservation and development of a MAP enterprise locally.

Recommendations

1. Government and non-government sector should be urged to get involved in awaring the communities on conservation and promotion of the MAPs in this region.
2. The local communities should be provided with better alternatives for sustainable income generation activities at the local level; this can be either in the forestry sector or agriculture sector and these people need to be made aware to make wise choices.
3. Local people should not be lured into short term income benefits now, which will harm their future and the ecosystem as well.