

# Ethnobotanical classification and plant nomenclature system of high altitude agro-pastoralists in Dolpo, Nepal

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## Abstract

This paper describes the findings of ethnobotanical research conducted in Tibetan community of agro-pastoralists in Dolpo, northwest Nepal. We assessed vernacular classification and plant nomenclature system with a particular focus on medicinal plants. We aimed to encompass the interpretation of semantic categories, as well as observing directly how people relate to plants in all material and symbolic aspects of their life. The methodology used consisted of village-level group meetings, indoor semi-structured interviews, *in situ* open interviews and resource mapping. The results showed that a substantial body of knowledge concerning ethno-medical practices and ethno-systematics remain intact in the study area. The Dolpo agro-pastoralists and particularly local *amchi* (specialists trained in the Tibetan medical system) name and classify the plant world based on morphological, ecological and organoleptic criteria producing a system of hierarchical classification. The richness and complexity of the botanical nomenclature reflect their profound knowledge obtained both from Tibetan *materia medica* and through direct field experience about the use and management of plant resources. The knowledge of *amchi*, in particular, is highly linked to the context of social interaction and practices. The study reveals that the use of knowledge and perception of local resource users is valuable for developing management guidelines for medicinal plants in our case and for overall conservation approaches.

**Key-words:** *Amchi*, ethnobotany, ethnoecology, medicinal plants, Tibetan medicine, vernacular classification.

## Introduction

It is well recognized that local societies with a long history of resource use practices not only have knowledge on the utilization of diverse biological resources but also possess a broad knowledge of the local ecological systems. They also have precise system of naming, identification and classification of the perceived environmental components (Conklin 1954; Lévi-Strauss 1962; Friedberg 1986, 1992; Martin 1993, 1995; Alcorn 1995). Knowledge is integrated and classified into the local system according to specific codes understood by all members of the society. Vernacular classification is one form of encoding knowledge (Berlin *et al.* 1974; Aumeeruddy 1994). The study of vernacular classification is concerned with uncovering ways by which different cultural systems categorize diverse forms of natural phenomena (Conklin 1954). Nomenclature relates to description of linguistic principles of naming the conceptually recognized categories (Berlin 1973; Berlin *et al.* 1973).

Vernacular classifications reflect a part of cognitive matrix or knowledge system, the understanding of which constitutes a major way for understanding how people perceive the elements of the natural environment, i.e. the local understanding of biodiversity, as well as a basic reference on which is based their resource management system (Conklin 1954; Berlin 1992; Toledo 1992; Aumeeruddy 1994; Alcorn 1995; Atran 1999). Understanding the rationale of ethnobiological knowledge and classifications is further necessary to set up monitoring systems of biodiversity and ecological

processes, using local indicators (Berlin 1973). Recent studies have highlighted the use of vernacular classification for rapid biodiversity assessment and conservation (Jinxu *et al.* 2003).

Given the importance of local knowledge and practices in environmental management, many international programs have been launched to address this important issue of how to best to incorporate such knowledge in resource management. Our work was conducted in the context of an eight-year project (1997-2004), jointly implemented by the People and Plants Initiative and the WWF Nepal Program for the conservation and development of medicinal plant (MP) resources in the Nepal Himalaya. The major aims of this program were to develop understanding of local knowledge and practices related to the plant world in general and MPs in particular, and to inform resource management systems.

Among different non-timber forest products (NTFPs), MPs play a significant role in the lives of many people in the Himalaya. They are highly valued in different folk healing systems and in codified systems of traditional medicine, such as the Ayurveda, Unani, Chinese and Tibetan medical systems. The use of MPs reflects the long history of human interaction with Himalayan ecosystems. In recent years, concerns have been raised due to the exponential increase in the commercial exploitation of indigenous plant species, many of which have high medicinal and other cultural values locally, in addition to their economic value. Today, high commercial demand of MPs has resulted in overexploitation of resources in different parts of the Himalayas. The knowledge

and skills of local rural societies in Nepal were largely ignored in the past, although they have attracted more attention in recent years. Much of the work so far done has focused on inventory of the use of MPs (for review see Rajbhandari 2001). Approaches in applied ethnobotany and ethnoecology are scarce (but see Messerschmidt 1990; Müller-Böker 1991, 1999; Thapa *et al.* 1995; Ghimire *et al.* 2004).

Tibetan agro-pastoralists living in Dolpo in northwestern Nepal form local rural societies whose long-term interaction with the environment has fostered very strong relationships with nature, and an extremely rich knowledge about MPs (Lama *et al.* 2001). Their management of resources has been challenged largely by the increasing pressure on MPs by commercial collectors coming from outside their territory. Here we present findings of collaborative research conducted with specialist MP users (Tibetan doctors, termed *amchi*) and with other Tibetan agro-pastoralists living in Dolpo, to develop an understanding of local ethnobotanical knowledge and practices that may inform sustainable approaches of plant management. Our main goal has been to assess plant naming and classification systems. We aimed to encompass the interpretation of semantic categories, as well as observing directly how people relate to plants in all material and symbolic aspects of their life.

## Materials and Methods

### STUDY AREA

The study area (Fig. 1) is located in Dolpa district (popularly known as Dolpo) in northwestern Nepal. Dolpo is one of the few remaining Himalayan areas characterized by high diversity of MPs, and where the ancient religion of Tibet, Bon, and the Tibetan system of medicine are still quite intact. Dolpo is partly covered by the Shey-Phoksundo National Park (3555 sq km). The area is characterized by trans-Himalayan ecology, and receives low annual rainfall (400-800 mm). Vegetation of both the Tibetan and west Himalayan types occur in Dolpo, with influences of Mediterranean, SE Chinese and Eastern Asiatic elements.

The present study was conducted in the settlements located in the upper Phoksundo valley inside the national park, at an altitude from 3000 to 4000 m. Some 500 inhabitants (in 93 households) following the culture and religions of Tibet, including Bon and Tibetan Buddhism, live in the Phoksundo valley. They speak a Tibetan dialect known as Kham. The history of human settlement in the northern parts of Dolpo has been traced back to the seventh and eighth centuries, when people migrated to this area from the ancient kingdom of Zhang-zhung, western Tibet (Snellgrove 1992; Kind 2002). This region fell under the Gorkha regime in 1796 and became part of the Kingdom of Nepal in the 18<sup>th</sup> century. According to oral history, Teton Nyima Singhe, the first known *Bon* priest (*lama*) of Pungmo village in Phoksundo, arrived from Tibet to find a place for meditation. Later several other *Bon* priests migrated

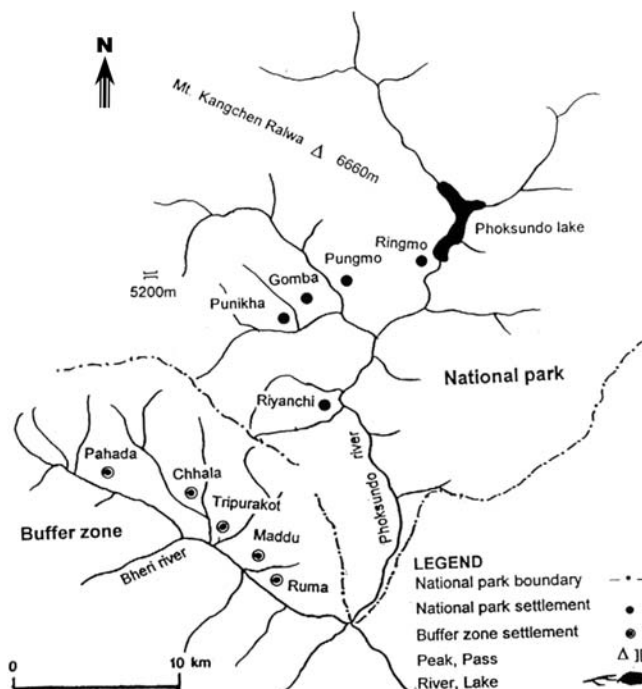


Fig. 1. Map of the study area.

from Tibet and settled in the Phoksundo area for religious reasons. The migration of Tibetan *Bon* priests to this area may have coincided with the rise of Buddhism in Tibet in around the 8<sup>th</sup> century and the subsequent downfall of *Bon* (Snellgrove 1992; Kind 2002).

Below 3000 m in Dolpo, descending towards the Bheri valley, in the southern and south-western buffer-zones of Shey-Phoksundo National Park, different ethnic groups are found, such as Gurung and Magar, which form part of the larger Tibeto-Burman cultural group, known to be among the most ancient inhabitants of Nepal (Bista 2000). Inhabitation of the lower valleys also include Indo-Aryans. The latter speak Nepali with some local variations. The Tibeto-Burmans use elements of their own language. These different groups, though of different cultural origins, have specific social relationships linked to systems of exchange, in which people from upper reaches travel to the lower valleys to exchange goods from Tibet for cereals and other products (Bauer 2004).

The local economy relies on subsistence agriculture, pastoralism and seasonal trade. The people in Phoksundo have retained traditional trade with Tibet, exchanging food grains and woolen commodities for salt, Tibetan tea and other finished goods. However, this trade is dwindling due to the closure of the Tibetan border in 1959, to major economic changes in Tibet, as well as to the increased facility with which commodities are obtained from the south (Bauer 2004). Agriculture is little developed due to the rugged terrain, short growing season and severe climate. Most farmers grow only one crop a year of wheat, barley, buckwheat or potato. Food sufficiency is low (3-6 months per year), and people depend greatly on forest and pasture resources for livelihood.

Pastures have long been utilized for rotational grazing of livestock and harvesting of resources. Transhumance is a social adaptation to these highly seasonal montane environments. The high pastures, in which the local economy is mainly based, are under the jurisdiction of the national park, which has granted use right of pastures for livelihood purposes.

#### AMCHI: PRACTITIONER OF TRADITIONAL TIBETAN MEDICINE

MPs are one of the highly used resources in the study area. The immediate users of MPs in Phoksundo are medical practitioners, known as *amchi*, who practice the codified Tibetan medical system (*Sowa Rigpa* tradition). Most of the people depend on *amchi* medicine, both because it is culturally and socially very accepted, and also because modern biomedical services are virtually absent (Lama *et al.* 2001). Tibetan medicine is an ancient synthesis of the art of healing, drawing on the knowledge of different medical systems, including Chinese and Ayurvedic medicines, as well as Mongolian and other Central Asian medical traditions (Shrestha and Baker 1997). It is a scholarly medical tradition based on the intensive study of medical texts, such as the *Gyushi*, as well as practical training with experienced *amchi*. This system identifies a close link between the human body, the five elements of nature (space, air, fire, water and earth) and three humors (wind, bile and phlegm) (Tsarong 1981; Shrestha and Baker 1997). Diseases are believed to be caused by imbalances between these five elements and between these three humors, imbalances caused by improper diet, habits, behavior, and seasonal routine, which tend to affect the natural body constituents (Lama *et al.* 2001). Medical knowledge of *amchi* in Dolpo, as well as elsewhere in Nepal, is transmitted formally through family lineages, mainly due to the inexistence of formal Tibetan schools in Nepal until very recently (Bista and Lama 2005). A few *amchi* have enough resources to travel to India and acquire scholarly training from institutions in there (Gurung *et al.* 1996). *Amchi* hold a high social status in their villages and are often not only medical doctors, but strong community leaders as well, often having a role in village-level religious practices, although they may not be formal priests (*lama*).

#### METHODS

##### General Approaches

The approach used in this study aimed at working with local counterparts who were seen to some extent as research partners, involved in certain research processes, such as the design of research activities, experiments and discussion of the results (Toledo 1992; Martin 1995; Cunningham 2001). Thus, to conduct research in the local community of Phoksundo, we built research frameworks largely with the consultation of local people. A multidisciplinary research team was formed comprising local specialists (*amchi*), other agro-pastoralists from the village, national park staff, and natural and social scientists. Field work was

conducted in June/July and October/November each year from 1997 to 2004. Much of the information was obtained during focused activities related to MPs with specialists (*amchi*) and non-specialist users (general agro-pastoralists). Specialists are defined as those for whom MPs are a major component of their professional life. Non-specialists are all others who may in certain cases use MPs for self-medication or for other purposes. Several methods described for applied ethnobotany and ethnoecology (Martin 1995; Cunningham 2001) were adopted, including village-level group meetings, indoor semi-structured interviews, *in situ* open interviews with individuals and groups during outdoor field surveys, and resource mapping activities. Information given by an individual was cross-checked and discussed several times with other villagers, including *amchi*.

During each of the field visits, periods varying between two to three weeks were spent living either in villages or in summer pastures, and walking with different groups of people to accompany them from their villages to summer pastures or to go with them from one pasture to another. Information was also collected in transect walks together with the group of users, comprising *amchi* (always 1 to 3) and non-specialists (whose number varied from 2-10). Such walks were aimed to collect and identify MPs in the forests and pastures, and to characterize their habitat and ecology. The outdoor trips were complemented with indoor sessions in the form of semi-structured or open-ended interviews with individuals or small, family-based groups.

Vouchers of all plants encountered in each trip were collected and immediately labeled with their local name, notes on meaning of names, and detailed information on uses. Repeated field-visits made it possible to compile and verify local names and uses of a large group of plant species (for detail see Ghimire *et al.* 2001). Vouchers were dried and mounted following standard methods (Martin 1995), and most of them were identified to species level. Botanical nomenclature follows Press *et al.* (2000).

##### Ethnotaxonomy: Plant Classification and Nomenclature

In June 2001, with the consolidated list of plant species (350) identified during our previous field studies, we held discussions with a larger group of *amchi* (25), representing the entire Dolpo region, to ascertain the level of homogeneity in the plant naming system. The list of plants used in the discussion covered a wide range of species, both medicinal as well as non-medicinal. In addition, in subsequent years, we held further sessions with smaller groups of *amchi* (2-4) and other non-specialists (5-10) of Phoksundo. We used herbarium and live specimens, as well as color photographs of plants from our earlier field trips, as visual guides. During group discussions, we first assessed the criteria expressed in the construction of plant names. We distinguished between names known only to *amchi*, names used only by non-specialists, and names shared between them. We assessed if plant names were linked to any form of grouping related to life forms, habitats, use or properties, morphology, and others. In



the first place plants bearing similar names were grouped, and persons were asked the reasons for grouping these plants. Categorization of the plant world in terms of differentiation between life forms and other characteristics, which may be used to differentiate plants, were also discussed. Some Tibetan texts of *materia medica* (Dorje 1995) frequently used by the local *amchi* and other Tibetan literature (Arya 1998) were also consulted to assess concordance between the plant names identified by the local *amchi* and names mentioned in the texts. In the present paper, for ease of reading, we use phonetic spelling for all local terms.

## Results

### CONCEPTUALIZATION OF THE PLANT WORLD

Although most people do not conceptualize the plant or animal world as an ensemble, some *amchi* distinguish 'ke-nygon' (~plants, all which grow and can be seen by naked eye) and 'naang-chui ke-do' (~animals, all which show movement) at the top level of the hierarchical classification. The rest of the physical environment is termed as 'chhi-nygo jikten', which contains all the five natural elements: space ('namkhaa'), air ('lung'), fire ('me'), water ('chhu') and earth ('saa') considered to have close links with the human body. These concepts are integrated to the Tibetan medical philosophy. However, not all *amchi* and other local people conceptualize 'living things' in the same manner. For example, when we asked how they would designate the whole plant world many people said 'ngo-men-ri'. This term represents all (medicinal) plants of the mountain. This shows that the ethnotaxonomy of 'living things' is not stored knowledge ready to be recalled. The general concepts of ethnotaxonomies outlined below, therefore, provide a rough framework that is mainly the product of interaction between botanists and local specialists and non-specialists.

### LIFE FORM CATEGORIES

Living plants fall under one of the four life-forms: 'ngo-dum' (literally, small herbs), 'tsaa-dum' (grasses), 'shen-ten' (plants rooting or growing on other organisms) and 'shing' (woody plants). These are the major life-form categories, which are commonly shared among the *amchi* and other agro-pastoralists, and they frequently use these terms in their daily life. These life-forms are even expressed in plant names, for example 'ngo pang-tsi dho-wo' (*Anaphalis triplinervis* var. *monocephala*), 'tsaa-waa' (*Lloydia longiscapa*) and 'the-shing' (*Pinus wallichiana*). 'Ngo-dum' includes all herbaceous plants, which are small ('ngo') and non-woody, including terrestrial ferns. 'Tsaa-dum' includes grasses and sedges ('tsaa' literally means grass) as well as other monocotyledonous herbs (mainly those belonging to Liliaceae and Amaryllidaceae), which are perceived as grass-like in gross morphology. MPs under these two categories are known as 'ngo-men' and 'tsaa-men', respectively. Most plants used in *amchi* medicine in Dolpo are herbs ('ngo-men'). These are the source of roots ('chaa-waa'), leaves ('loma'),

flowers ('metog'), fruits ('debu') and whole plants ('dhong-bo') for medicine, and other uses. Within each of these two life forms, 'ngo-dum' and 'tsaa-dum', plants may be classified into intermediate ranks, based on the characteristics of flowers, fruits or roots. For example, based on the characteristics of fruits 'ngo-dum' may be divided into 'gaang-po chen' (fruit capsule-like) or 'dhraa-maa chen' (fruit grain-like). Similarly, size of flowers, fruits and roots is also used to classify plants, giving terms such as 'debu chen' (large fruits), 'debu chung' (small fruits), 'metog chen' (large flower), and 'metog menpaa' (without flower or with indistinct flowers). However, these subgroups are not explicitly used by all people, with the exception that some of these terms (such as those for plant parts, 'debu', 'metog', 'chaa-waa', or for morphological attributes, 'chung', 'chhe-waa') are commonly used in the construction of plant names (see below).

'Shing' mostly includes woody plants, and is further divided into four sub-categories: 'thril-shing' (climbers and vines), 'shing-ten' (shrubs), 'naak-dum' (small trees) and 'shing-dong' (big trees). Most of these are conspicuous subgroups perceived and shared among the villagers, and have variable but often high local use values for timber (mainly 'shing-dong'), firewood and household implements ('shing-ten', 'naak-dum' and 'shing-dong') and medicine (all subcategories). The medicines obtained from woody plants are known as 'shing-men' and are mostly prepared from bark, heartwood, leaves, fruits and seeds. It can be noted that some herbaceous climbers (e.g., 'nyiba' *Codonopsis convolvulacea*; 'dhungmo nyung' *Cynanchum auriculatum*) are, however, considered as 'ngo-men'. True 'thril-shing' mainly includes 'imong' (*Clematis* spp.). 'Shen-ten' are plants which grow on other plants. This category mainly includes 'reraal' (epiphytic ferns, e.g., 'dhumbu reraal', *Drynaria propinqua*); lichens, such as 'shing bel' (*Usnea longissima*), 'ngul-kud' (*Parmelia* spp.); mistletoes, such as 'pushi' (*Scurulla elata*); and parasites, such as 'ser-kud' (*Cuscuta* spp.).

### 'RIG': LOWER RANKS AND OTHER CLASSIFICATION CRITERIA

People use the term 'rig' (to refer family as well as variety) to represent a small grouping of several distinct groups of plants that are considered to be similar in gross morphology, habitat specificity, or sometimes properties and uses. Some of the important 'rig' taxa are given in Table 1. Many of the 'rig' taxa include botanical species belonging to a single family, or sometimes only those belonging to a single genus. At the 'rig' level, for example, species belonging to Boraginaceae are grouped together as 'dimok' (hairy plant), characterized by their hairy stems and leaves. However, many 'rig' include species from diverse botanical genera and families and are mostly grouped together based on gross morphology or other characters. Two examples illustrate this, one is 'dabma-sajar' and the other is 'ngo tserma'. In the first case, herbs with similar leafy habit, having leaves all at ground level arranged in a rosette, are grouped together and contain diverse species belonging to Gesneriaceae, Lamiaceae, Polygonaceae, Plantaginaceae and

**Table 1.** Major 'rigs' and local generic terms.

'Rigs'	Characters as described by people	Local generic terms and corresponding botanical genera and families
<i>(i) 'Rig' based on morphology</i>		
dabmaa-saajar	herbs with leaves all at ground level arranged in a rosette	'draak-ya haabo' ( <i>Corallodiscus</i> , Gesneriaceae); 'gaadur' ( <i>Bergenia</i> , Saxifragaceae); 'laa-kaang', 'paang-raam' ( <i>Bistorta</i> , Polygonaceae); 'na-ram' ( <i>Plantago</i> , Plantaginaceae); 'paayaak-tsa' ( <i>Lancea</i> , Scrophulariaceae), 'taapaag' ( <i>Lamiophlomis</i> , Lamiaceae)
dimok	Hairy plant	'dimok' ( <i>Artemisia</i> , <i>Onosma</i> , <i>Maharanga</i> ), 'yuchung' ( <i>Eritrichium</i> ), 'nema-tsermaa' ( <i>Cynoglossum</i> , <i>Hackelia</i> , <i>Microala</i> , all Boraginaceae)
jip-tsi	Bi-lobed flower, flower is sucked for sweet nectar, flower color vary	'jip-tsi' ( <i>Dracocephalum</i> , <i>Glechoma</i> , <i>Lamium</i> , <i>Salvia</i> , <i>Scutellaria</i> , Lamiaceae), 'zin-tik' ( <i>Ajuga</i> , Lamiaceae)
ngo-tsermaa	Plant herbaceous, spiny ('tser' = spine)	'ajaak tsher ngon' ( <i>Meconopsis</i> , Papaveraceae), 'chaang-tser' ( <i>Morina</i> , Dipsacaceae; <i>Carduus</i> , Asteraceae)
shing-tsermaa	Plant woody with thorns	'kyer-waa' ( <i>Berberis</i> , Berberidaceae), 'kandaa-kaa-ri' ( <i>Rubus</i> , Rosaceae), 'se-waa' ( <i>Rosa</i> , Rosaceae), 'tarbu' ( <i>Hippophae</i> , Elaeagnaceae), 'tsar-waa' ( <i>Cotoneaster</i> , Rosaceae); 'zomo shing' ( <i>Astragalus</i> , <i>Caragana</i> , Fabaceae)
saa-zin	Plant spreading, mostly through stolon	'di-taa saazin' ( <i>Fragaria</i> , Rosaceae), 'paarpataa' ( <i>Hypocoum</i> , Papaveraceae)
so-tshen	leaf soft or fleshy, store more water	'draak-tshen', 'paang-tshen', 'solo' ( <i>Rhodiola</i> , <i>Sedum</i> , Crassulaceae)
zil-paa	Dew plant (these plants have dew all day); flowers resembling birds beak	'dum-naag zil-paa', 'dum paayakaa', 'dum bashakaa', 'rekon', 'tongri zil-paa', 'tsi-maar zil-paa' (all <i>Corydalis</i> , Papaveraceae)
<i>(ii) 'Rig' based on habitat, property and uses</i>		
bong	Plant mostly poisonous	'tsen-duk', 'bong-ngaa', 'zin-paa' ( <i>Aconitum</i> ), 'jaakaang', 'a-tik' ( <i>Delphinium</i> , all Ranunculaceae)
chhu-rug	Plant found on wet place ('chhu' = water), hot in taste	'chu-rug bellaak' ( <i>Halerpestes</i> , Ranunculaceae), 'chu-rug-paa', 'che-tsa' ( <i>Ranunculus</i> , <i>Trollius</i> , Ranunculaceae)
gok-paa	wild onion or garlic plant; color and habitat vary	'gok', 'zimu' (all <i>Allium</i> , Amaryllidaceae)
khur-mong	Plant produce milky or sticky sap	'khur mong' ( <i>Taraxacum</i> ), 'gyaa-khur' ( <i>Gynura</i> ), 'tsaatri' ( <i>Ixeris</i> , all Asteraceae)
me-tsa' gyabpe (taawaa)	Moxa plant (plant used in moxibustion)	'tsampaakaa' ( <i>Anaphalis</i> ), 'taawaathokar' ( <i>Leontopodium</i> ), 'taa-tsa' ( <i>Gerbera</i> , all Asteraceae)
paang-kyen	Jewellery ('kyen') of meadows ('paang'); flower bell-shaped	'gangaa chung', 'kyiche', 'pangyaan' (all <i>Gentiana</i> , Gentianaceae)
poe	Incense plant	'balwaa lag-paa' ( <i>Cassiope</i> , Ericaceae), 'balu' ( <i>Rhododendron</i> , Ericaceae), 'khen' ( <i>Artemisia</i> , <i>Tanacetum</i> , Asteraceae), 'poe' ( <i>Jurinea</i> , <i>Waldheimia</i> , Asteraceae; <i>Nardostachys</i> , <i>Valeriana</i> , Valerianaceae), 'shuk' ( <i>Cupressus</i> , <i>Juniperus</i> , Cupressaceae)
liklaa	Plant bitter	'tik' ( <i>Gentianopsis</i> , <i>Halenia</i> , <i>Swertia</i> , Gentianaceae; <i>Erysium</i> , Brassicaceae), 'honglen' ( <i>Neopicrorhiza</i> , Scrophulariaceae), 'bashakaa' ( <i>Lagotis</i> , Scrophulariaceae)

Saxifragaceae. In the second case, all herbs which have spines are grouped together; this group includes species belonging to Asteraceae, Dipsacaceae and Papaveraceae.

'Rig' is also used in relation to plants which are not known to the *amchi* and therefore paradoxically do not belong to any other 'rig'. During the identification process, the term 'rig' is often used (as a suffix after the name of an already known plant) to show that a plant is 'similar to' a known plant or represents a variety of the known plant. This process involves close observation of overall plant morphology, of the root system, of specific properties such as stickiness, smoothness (presence or absence of spines, hairs), or other organoleptic perceptions such as taste and scent. *Amchi* and some elderly persons rarely conceive that a plant species may not have a name, even for those which they have never seen. For such species, they attempt to relate it to one of the categories in their own nomenclature and for such plants use the term 'rig'.

In addition, both *amchi* and other people use the descriptive terms 'chog-paa' (superior or true) and 'men-paa' (inferior or false) both in a general sense as well as to specify superiority of use value of one species over the other. In the general sense, these

terms are used as suffixes just as use the term 'rig' to name and classify an unknown plant, usually an unknown plant is categorized as 'men-paa' (literally 'medicine-no'). Specifically, these two terms are used to classify and name highly useful and less useful plants, mainly in terms of their medicinal values. The 'men-paa' species are less preferred in medicine, but when the superior one becomes scarce the 'men-paa' may be used as a substitute. For example, some terrestrial orchids, other than the superior type 'waang-laag chog-paa' (*Dactylorhiza hatagirea*) are termed as 'wang-lag men-paa' (inferior types, e.g., *Neottianthe calcicola*, *Ponerorchis chusua*). 'Wang-lag chog-paa' is considered to have high medicinal value and is also highly threatened and rare in natural stands.

#### PLANT NAMING SYSTEM

The plant naming system in the study area is somewhat complex. *Amchi*, who learn their terminologies from Tibetan texts of *materia medica*, generally use a fairly straightforward Tibetan naming system, which is closely associated to the Tibetan medical system (*Sowa rigpa* tradition of medicine), also shared among other *amchi* in the Himalaya. A number of plant names used by *amchi* are also

shared, to some extent, among the other users in the village. This may be due to the popularity of Tibetan medicine for local health care, and also because *amchi* may request inhabitants of his village, especially women (who generally spend long periods in high pasture) or those who are involved in trade, to collect specific plants. In addition to asking some of the villagers to collect plants, the *amchi* also give them instructions about methods of collection, preservation and storage. Sometimes, the *amchi* accompany the villagers on such trips, during which period they collect large numbers of species. However, sharing of *amchi* knowledge is often found to be related to kinship ties.

The non-specialists, who are common agro-pastoralists, also have their own terminology of plant names, which sometimes varies among neighboring villages, although in some cases these names stem derived from various Tibetan dialects. As these agro-pastoralists, including *amchi*, are linked to low-lying Nepali-speaking areas through seasonal trade movements, their plant names may include some Nepali terms, such as 'atik' (*Delphinium himalayai*), 'dhaturaa' (*Datura stramonium*), 'khasru' (*Quercus semecarpifolia*), 'diyaar' (*Cedrus deodara*) and 'ghodaa-marchaa' (*Thymus linearis*). Some *amchi* plant names also show evidence of their origin from Sanskrit, such as 'upaal' (*Meconopsis* spp.), 'bashakaa' (*Lagotis kunawurensis*) and 'kandaa-kaa-ri' (*Rubus* spp., *Sorbaria tomentosa*). Examples of plant names used only by *amchi*, those used only by non-specialists, those which are shared among the whole society (including *amchi* and non-specialists), and medicinal utilities of such plants are given in Appendix 1.

Although *amchi* plant names are cognitively linked to learning from Tibetan medical practices, *amchi* frequently shift from one name to another, depending upon the people with whom they interact. When interacting with the local villagers, for example, they use terms commonly used by the villagers. Our repeated interviews with the same *amchi* showed that for some plants (species most salient and popular in the village, e.g., 'buk' [local name] vs. 'thaang naak' [*amchi* name, which means black *Abies*], in the case of *Abies spectabilis*) they shift from one name to another. When they are interviewed individually in their house they use terms which are based on the classical Tibetan medical system, but when the same *amchi* is asked in the presence of other villagers he frequently uses plant names which are commonly shared among the villagers.

Our analysis (below) is mostly related to *amchi* plant names. However, in some cases we also use examples from those names shared between *amchi* and non-specialists, or names used only by non-specialists. In the latter two cases, local terms are marked by superscript 'sh' (shared names) and 'kh' (Kham name, used only by non-specialists; *amchi* are also familiar with these names, but do not use them), when they first appear. Plant names are mostly binomials and one or both terms correspond through a system of analogy to morphological, ecological, biochemical, symbolic and utilitarian characteristics (Table 2). However, most trees and some other highly salient plants are identified by only basic terms, such as 'buk<sup>sh</sup>' (*Abies*

*spectabilis*), 'taakpaa<sup>sh</sup>' (*Betula utilis*) or 'go-nyo<sup>sh</sup>' (*Carum carvi*). Some of these unitary plant names (which are identified by only basic terms) have no other meaning. The binomial names have a generic term (principal word or basic term) being modified by a specific term (a determinant or qualifier), the basic term being the one which is more commonly used. The basic term indicates a collective concept that includes a set of plants with a common character, while the determinant refers to a specific property of the plant or designates some obvious morphological character. Plant names that we studied in Phoksundo showed that often flower color and plant size are associated to distinguish different species in a generic group.

The basic term (generic level) may be given on the basis of a metaphoric approach, which refers to the obvious similarity, mostly in flower characters, with animal parts, such as 'lug-mik<sup>sh</sup>', literally 'sheep eye' (*Aster* spp.); 'lug-ru<sup>sh</sup>', literally 'sheep horn' (*Pedicularis* spp.); and 'laag-naa<sup>sh</sup>', literally elephant trunk (*Pedicularis* spp.). Flowers of 'lug-mik' with dark disk florets surrounded by light-colored ray florets are perceived to resemble a sheep's eye, the coiled beak in the flowers of 'lug-ru' is perceived to resemble a sheep's horn, and the straight beak in the flower of 'laag-na' is perceived to resemble an elephant's trunk. Different species of 'lug-ru' and 'laag-naa' are differentiated mainly on the basis of flower color, e.g., 'lug-ru mar-po' (red flower, *Pedicularis cheilanthifolia*), 'lug-ru ser-po' (yellow flower, *Pedicularis hoffmeisteri*). In some cases, morphological similarity has symbolic connotations, as in the case of 'Waang-laag<sup>sh</sup>' (*Dactylorhiza hatagirea*), where the name refers to the hand ('laag') of a Vedic god 'Indra', because the plant's tuber resembles a human hand. The morphological characteristics are also related to inflorescence structure [e.g., 'chyaag-kyu', which refers to the drooping nature of the inflorescence (*Thalictrum* spp.)]; hairiness [e.g., 'dimok<sup>sh</sup>', which means hairy plant (*Onosma* spp., *Arnebia* spp.)]; or thorniness [e.g., 'zomo-shing<sup>sh</sup>', which refers to woody plants with long spines (*Astragalus* spp., *Caragana* spp.)]. Different species of 'chyaag-kyu' and 'dimok' are differentiated on the basis of flower color, and species of 'zomo-shing' are differentiated on the basis of plant size (Table 2). In addition, male ('pho'), female ('mo') and neutral ('maaning') criteria are also used to name plants. Generally these terms occur in such botanical genera as *Heracleum* [e.g., 'chaa-pho<sup>sh</sup> kaar-po' meaning 'white male heracleum' (*Heracleum nepalense*)]; *Iris* (e.g., 'maning der-maa<sup>sh</sup>' meaning 'neutral iris' (*Iris goniocarpa*)); and *Rosa* [e.g., 'se-goe<sup>sh</sup> pho' meaning 'male rose' (*Rosa macrophylla*) and 'se-goe mo' meaning 'female rose' (*Rosa brunonii*)]. 'Pho' species are perceived to have large leaves and big flowers, but small roots and generally no seeds, or sometimes with small seeds. 'mo' species, in contrast, have small leaves, small flowers, large roots, and well developed seeds. However, these characteristics are not universal for all taxa.

Plant names also show linkages with ecological characteristics such as habitat categories or landscape features (Table 2). MPs are distributed throughout the landscape and in different habitats

**Table 2.** Examples of some local plant names.

Name based on	Characters used	Example
Inflorescence structure and flower color	<i>Generic terms:</i> 'chyaag-kyu' (drooping inflorescence head), 'sub-kaa' (inflorescence branching at the tip of the peduncle, known as 'sub'). <i>Specific terms:</i> mostly flower color, such as 'ser-po' (yellow), 'kaar-po' (white), 'maar-po' (red), 'naak-po' (dark or black), 'muk-po' (brown), 'ngon-po' (blue).	'chyaag-kyu ngon-po' ( <i>Thalictrum cultratum</i> ), 'chyaag-kyu kaar-po' ( <i>Thalictrum foetidum</i> ), 'chyaag-kyu ser-po' ( <i>Thalictrum foliolosum</i> ), 'subkaa kaar-po' ( <i>Anemone tetrasepala</i> , <i>A. rivularis</i> , <i>A. rupicola</i> , <i>A. vitifolia</i> ), 'sub-kaa maar-po' ( <i>Anemone polyanthes</i> ), 'sub-kaa ngon-po' ( <i>Anemone obtusiloba</i> ).
Flower character and use	<i>Generic terms:</i> 'jip-tsi' (the name refers to lobed flowers, which are sucked for sweet nectar) <i>Specific terms:</i> mostly flower color, as above; size of the plant, such as 'chhung-waa' (small), 'chhe-waa' (large).	'jip-tsi kaar-po' ( <i>Dracocephalum heterophyllum</i> ), 'jip-tsi ngon-po' ( <i>Glechoma nivalis</i> ), 'jip-tsi chhung-waa' ( <i>Lamium tuberosum</i> ), 'jip-tsi muk-po' ( <i>Salvia hians</i> , <i>Scutellaria prostrata</i> ).
Analogy with animal organs, objects, and flower color	<i>Generic terms:</i> 'lug-ru' ('sheep's horn'), 'laag-naa' ('elephant trunk'); 'shaang-dril' (literally 'religious bell') <i>Specific terms:</i> mostly flower color, as above.	'lug-ru ser-po' ( <i>Pedicularis klotzschii</i> , <i>Pedicularis hoffmeisteri</i> ), 'lug-ru maar-po' ( <i>P. cheilanthisifolia</i> , <i>P. siphonantha</i> ), 'laang-naa maar-po' ( <i>Pedicularis</i> spp.), 'laang-naa ser-po' ( <i>P. longiflora</i> ); 'shaang-dril kaar-po' ( <i>Primula involucreta</i> ), 'saang-dril maar-po' ( <i>P. glomerata</i> ), 'shaang-dril naak-po' ( <i>P. macrophylla</i> ), 'shaang-dril ngon-po' ( <i>Primula</i> sp.), 'shaang-dril ser-po' ( <i>P. sikkimensis</i> ).
Presence of spine, thorns, hair & in connection with flower color and plant size	<i>Generic terms:</i> 'tser' (spine), 'zomo-shing' (woody and spiny), 'dimok' (hairy) <i>Specific terms:</i> flower color and plant size as above	'chaang-tser kaar-po' ( <i>Morina polyphylla</i> ), 'chaang-tser naag-po' ( <i>Carduus edelbergii</i> ), 'dimog kaar-po' ( <i>Onosma hookeri</i> ), 'dimog ngon-po' ( <i>Maharanga emodi</i> ), 'zomo-shing chhung-waa' ( <i>Astragalus candolleanus</i> ), 'zomo-shing chhe-waa' ( <i>Caragana gerardiana</i> ).
Plant properties and in connection with habitat and color of the flower or whole plant	<i>Generic terms:</i> 'poe' (incense plant which are aromatic), 'duk' (plant poisonous), 'tik' (plant bitter in taste); 'ji-rug' (plant hot in taste) <i>Specific terms:</i> (i) represent habitat, such as 'draak-ri' (rocky mountain), 'naak-ri' (forest), 'ghaang-ri' (high mountains); (ii) color of whole plant, such as 'chaag' (iron), 'zaang' (copper), 'zhaa' (lead), 'she' (golden); (iii) color of the flower, as above	'draak poe' ( <i>Nardostachys grandiflora</i> ), 'naak poe' ( <i>Valeriana jatamansi</i> ), 'ghaan-poe' ( <i>Waldheimia glabra</i> ), 'tsen-duk' ( <i>Aconitum</i> spp.), 'bho tik' ( <i>Swertia</i> sp.), 'chaag tik' ( <i>Halenia elliptica</i> ), 'gyaa tik' ( <i>Swertia ciliata</i> ), 'she tik' ( <i>Swertia mussoffi</i> ); 'ji-rug naak-po' ( <i>Elsholtzia densa</i> ), 'ji-rug ser-po' ( <i>Elsholtzia eriostachya</i> ).

which were identified when people positioned different species on resource use maps, in their oral descriptions of places where such plants are found, or during focused discussions to identify plant habitats and distribution. Major habitat categories in relation to the distribution of MPs are 'naak-ri' or 'naak-sep' (forests), 'penh-ri' or 'paang-ri' (meadows or pastures), 'draak-ri' (rocky areas) and 'sim' or 'syajen-chen' (moist places). 'Naak' mean forest, 'penh' or 'paang' mean upland meadow, while 'draak' mean rocky place. The suffix 'ri' refers to mountainous areas, and shows that these forests and meadows are located in the mountains as opposed to 'rong', which refers to low valleys. Very high mountains (with glaciers and snow) are called 'ghaang-ri'.

Habitat features usually occur in connection with use or biochemical principles, locally perceived through taste and odor, and which are generally associated to distinguish different species. For example, 'naak poe<sup>sh</sup>' [literally 'forest incense' (*Valeriana hardwickii*)], 'draak poe<sup>sh</sup>' [literally 'rock incense' (*Nardostachys grandiflora*)], 'ghaan poe' [literally 'high mountain incense' (*Waldheimia glabra*)], etc. The basic term, 'poe', means 'incense' and is also used at the 'rig' level (Table 1) to include other aromatic plants that may have different basic terms, such as 'balu<sup>sh</sup>' (*Rhododendron* spp.), some 'balu' being also incense species. Ecological characteristics may also refer to interactions of the plant with mammals, birds or insects, e.g., 'dhro-maak amaa<sup>kh</sup>' (*Morina polyphylla*), literally 'ant mother', because it is known to be a species near which ants make their colony, so that the plant is also said to smell like ants. Another example is 'laawaa semaa<sup>sh</sup>' (*Thermopsis barbata*), a name literally meaning 'bean of musk'. It is locally

known that many musk deer graze in the habitat where this plant grows. Plant names may also refer to therapeutic effects derived by analogy between the morphology or specific characteristics of the plant and some human organs. For example, 'me-tog cha-thui' (unidentified species of Liliaceae) bear leaves with long ('thui') dark veins ('cha'); the leaves are thus used in disorders related to the circulatory system.

Names applied to the same species may vary in order to label specific ontogenetic phases (different growth stages) in the case of highly useful plant species. For example, 'tiyaangku<sup>sh</sup>' (*Dracocephalum tanguticum*) is a medicinal plant, needed at different stages of growth for various medical and religious purposes. People therefore name this plant differently according to its growth stage. At the immature stage, the plant is called 'lumu gurkum', at the young flowering stage it is called 'sila poe', and at the mature stage it is called 'tiyaangku'. At the immature stage, young leaves are used in the treatment of dysentery and fever in children; at the young flowering stage, the plant is used as incense; and at the mature stage, the whole plant is used in the treatment of liver complaints, fever and cough. Plant names also show variation according to habitat. For example, the medicinal and incense plant *Nardostachys grandiflora* is called 'draak poe' when growing on rocky outcrops, while the same plant is called 'paang poe' when it grows in upland meadows, shrublands or forests. Plants which grow in outcrops and meadows are preferred by *amchi* to those growing in shrublands and forests. Their overall power and scent is considered to be higher in the outcrop and meadow than in shrublands and forests, which are more humid with richer soils.



## LIMITATIONS OF LOCAL NAMING SYSTEM

Although *amchi* identified and named a larger number of plants than did other non-specialists of their own village, we found instances where they gave conflicting responses. Particularly, confusion occurred for the names of some groups of plants with similar morphology. For example, *amchi* have two separate generic terms for *Pedicularis*: 'lug-ru', meaning sheep's horn, and 'laang-naa', meaning elephant's trunk. They frequently shift from 'lug-ru' to 'laang-naa' and vice versa for the same plant at different periods of interview. 'Lug-ru' and 'laang-naa' correspond respectively to species in which flower spurs are curved or straight, as described above. Other plants, for which *amchi* gave conflicting responses include species belonging to *Corydalis*, *Aster* and *Rubus*. These genera, along with *Pedicularis*, are among the largest genera in the study area. In the case of *Corydalis*, for example, two generic terms are widely used, 'zil-paa' and 'recon'. Both 'zil-paa' and 'recon' are further grouped in the same 'rig', based on the shape of flowers (which resembles bird's beak, the term 'recon' referring to this character) and on the observation that these plants retain dew on their leaves throughout the day (the term 'zil-paa' refers to this character). *Amchi* sometimes shift from 'tongri zil-paa ser-po' to 'recon ser-po' for those species which have yellow flowers (e.g., *C. megacalyx*, *C. meifolia*). Similarly, under-differentiation (i.e., a single named folk species corresponds to more than one biological species) is another limitation of *amchi* taxonomy. This occurred particularly in those botanical genera (e.g., *Aster*, *Anemone*, *Corydalis*, *Gentiana*, *Pedicularis*, *Swertia*) which contain large number of botanical species.

## Discussion

The present study shows that a substantial body of knowledge concerning ethno-medical practices and ethnosystematics remain intact in the study area. All cultures have their own ways of classifying the world. The local interpretation of nature is a result of empirical practices and framed according to cultural elements (Conklin 1954). Although *amchi* acquire much of their knowledge from classical Tibetan medical texts, we found several kinds of evidence that they also have a high level of empirical knowledge, which is reflected in their classification systems, use and harvesting of MPs (Ghimire *et al.* 2004).

It has been argued by some scholars that folkbiological taxonomy is composed of inclusive groups of organisms, i.e., taxa which may be hierarchically organized into a small number of distinct levels, or *ranks*, such as kingdom, life-form, generic, specific and varietal, that are in many instances quite similar to scientific categories (Berlin 1973, 1992; Atran 1999). Taxa of the same ethnobiological category (or rank) may show lexical similarities or may be perceived to have similar biological characteristics, and are always mutually exclusive (Atran 1999). Ethnobiological taxa are based on criteria which may vary greatly among different societies (Conklin 1954), but

hierarchical ranks are considered to be apparently universal (Berlin 1992; Atran 1999). However, ethnobiological categories may also be linked to symbolic cognitive processes, such as the division of natural elements into hot and cold or male and female (Levi Strauss, 1962; Descola 1986, 1996), also reported in the present study. Such categories are also helpful to understand specific practices, such as the use of hot or cold plants for the treatment of different kinds of diseases recognized in the medical system. Both *amchi* and other agropastoralists use the descriptive terms 'chog-paa' (superior or true) and 'men-paa' (inferior or false) to specify superiority of use value of one species over the other. Such terms are also used to name and classify an unknown plant; usually an unknown plant is categorized as inferior. An identical process has been noted by Breedlove and Laughlin (1993, cited in Berlin 1999) in their description of Tzotzil ethnobotany. They observed two descriptive terms – 'batz'i', genuine or true and 'yit'ix', bastard or false. The process of associating unknown plants to an already known plant through an analogical approach by comparing either morphology, use, or habit shows the dynamic process of *amchi* knowledge, a process which may be also shared by non-specialists.

According to Atran (1985) folk-botanical classification represents a holistic appreciation of the local flora that mostly reflects gross morphological patterns. We found that naming and classification of plants by *amchi* not only give importance to morphological characters, but also relate to other locally perceived ecological and biochemical characteristics. Although classification by *amchi* does not distinguish the whole range of the diversity of plant resources of the study area, the approaches that *amchi* use in naming an unknown plant species represent a way towards their understanding of its relationship to other plants. Except for a few cases, *amchi* never said that a plant has no name, even those that they had never seen before. It has been shown that no folk system is fully comprehensive, i.e., the taxa at its lowest ranks (folk genera and folk species) do not partition the full range of plant diversity (as recognized by scientific classification) for a local habitat. However, the conceptual ordering of those taxa that are recognized may be based on the affinities that humans observe among the species themselves, independently the cultural importance of those species (Berlin 1992, 1999).

Considering the different relationships, properties and classes of groups used to build plant names, the *amchi* classification system could be defined as highly naturalistic. The naming and classification by Phoksundo *amchi* reflects knowledge learned not only from Tibetan texts of *materia medica* but also through direct experience in the field. Although Tibetan texts of *materia medica* also describe plants, especially through paintings that often relatively accurately depict morphological or physical characteristics, as well as through color photographs or drawings, most often plants are classified non-explicitly (i.e., criteria used for classification are not expressed in the nomenclature) on the basis of their medical use, taste and properties (Parfionovitch *et al.* 1992;



Dorje 1995). Glover (2003) found that *amchi* in Rgyalhang, Tibet, rarely used morphological or physical characteristic when referencing similarities and differences between plants, but rather classified plants according to the illness they treat. Earlier studies have shown that Phoksundo *amchi* also use such ethnomedical criteria to group MPs (Lama *et al.* 2001). However, this type of categorization is used in the context of their medical practices and not necessarily in the explanation of their knowledge of plants to non-practitioners, i.e., investigators such as ourselves who refer to the plant world on the basis of naturalistic characteristics but have no medical knowledge.

Although *amchi* plant names are cognitively linked to learning from Tibetan medical practices, *amchi* frequently shift from one name to another, depending upon the people with whom they interact. This shows flexibility in the manipulation of plant names by *amchi*. The expression of their knowledge, is thus socially readjusted, showing a rather great capacity to adapt to different circumstances, including that of conversing with conservation managers. In other words, the knowledge of *amchi* can be considered as situational and highly linked to the context of social interaction and practices in which they engage with different types of people bearing different types of knowledge (Aumeeruddy-Thomas and Lama 2005). The important naturalistic knowledge of Dolpo *amchi* is linked to their field experience and is easily communicated to scientists like us, but between themselves they often communicate with reference to the domain of the medical system. However, with other local people they also use a third group of terms, those which are understood by all local people, even non-specialists. Thus their knowledge represents a very interesting asset for interaction with people speaking different languages and with very different approaches to the plant world (scientists, park managers, local people). This knowledge may also be useful for biodiversity assessment and conservation, as well as for setting up biodiversity monitoring systems through the use of local indicators (Jinxu *et al.* 2003; Sheil and Lawrence 2004).

For the species used by *amchi* across the Himalayan region there is some variation in names mentioned in the Tibetan *materia medica* and names used by local *amchi*. Many plant species not mentioned in the classical Tibetan medical texts that we consulted (e.g., Parfionovitch *et al.* 1992; Dorje 1995) are named and used by Phoksundo *amchi* based on their empirical knowledge and practices, e.g., 'jaapo tse-tse' (*Coleus barbatus*), 'ba-gaan' (*Megacarpaea polyandra*), 'yaki-si-ki metog' (*Parnassia nubicola*). These names are also recorded among other agro-pastoralists in Phoksundo. For some species, we also found differences in names mentioned in the Tibetan medicinal texts that we consulted, and those used by *amchi*. For example, *amchi* use the terms 'gaadur muk-po', 'raambu god-paa' and 'jip-tsi kaar-po' for the botanical species *Bergenia ciliata*, *Bistorta vivipara* and *Dracocephalum heterophyllum*, respectively. In the texts, these species are referred to as 'brag-lcam', 'na-ram' or 'tha-ram' and 'sngo-sga', respectively

(Parfionovitch *et al.* 1992). Some texts showing the *materia medica* in Tibetan medicine have attempted to give botanical identifications and descriptions (Dorje 1995). However, problems in identifying plants figuring in Tibetan *materia medica* and in translating their names, have also been emphasized (e.g., Clark 2000). Plant descriptions in Tibetan medical texts often emphasize similarities with other objects or animals, or parts of animals, as well as habitat and taste (e.g., Dorje 1995; Clark 2000). If these texts are being interpreted in geographical regions different from those where they were originally written, local *amchi* tend to use those plants growing in their area that are similar to the description. Clark (2000) pointed out that sometimes the same name is attributed to two or more completely different substances derived from very different plants. This is due to the fact that the Tibetan *amchi* consider them to have the same taste, potencies and properties as those mentioned in the texts. For example, in Dolpo, *amchi* use the terms 'dhungmo nyung' to refer to two botanical species, *Cynanchum auriculatum* and *Marsdenia roylei* (both Asclepiadaceae). Both of these species are herbaceous climbers. Clark (2000) mentioned another species, *Holarrhena antidysenterica* (a small tree belonging to Apocynaceae), to which the same name 'dhungmo nyung' has been attributed by Tibetan *amchi* elsewhere. All these are connected by their similar use in treating bile disorders and dysentery (Clark 2000; Lama *et al.* 2001).

However, we sometimes found that *amchi* gave conflicting responses concerning the same plants during different periods of interview. Hunn (1999) discussed several factors limiting the recognition of biodiversity in folk biological classification. The most important factors are the size of the organism and its ecological and cultural salience. Size affects perceptual salience, i.e., more conspicuous (large) organisms are perceived more easily than are smaller ones. Two other limitations of vernacular classification system for its potential use in biodiversity assessment and monitoring studies are its under-differentiation (i.e. a single named folk species corresponds to more than one biological species) and over-differentiation (i.e. one biological species is represented by two or more folk species) of plant/animal names (Fleck *et al.* 1999; Wilkie and Saridan 1999). In *amchi* taxonomy, over differentiation was evident in some cases when distinct morphological types were distinguished in relation to habitat variation, e.g., 'draak poe' and 'pang poe' in the case of *Nardostachys grandiflora*. Under-differentiation was particularly evident in botanical genera containing large numbers of species (e.g., *Aster*, *Anemone*, *Corydalis*, *Gentiana*, *Pedicularis*, *Swertia*). However, the differentiation criteria used in the *amchi* classification of species in these genera agreed in most cases with those used to differentiate the species in scientific classification. Folk genera constitute the most salient taxonomic rank in folk classification, and are found to be as inclusive as scientific genera (Holman 2002).

The vast body of knowledge possessed by *amchi* has great implications for conservation of Himalayan MPs, as well as for

developing biological and ecological research appropriate for resource management. It appears that the *amchi* medical cultures strongly determine the overall knowledge of people in the identification, use and management of MPs. It is therefore crucial to find ways to transfer part of this knowledge to other social groups and to facilitate its incorporation into new resource management approaches.

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**Appendix 1.** List of most commonly used plants for medicinal purpose in Phoksundo, Dolpo. Plant names used only by *amchi*, those used only by non-specialists, and those which are shared among the whole society (including *amchi* and non-specialists) are given in the first column.

Vernacular names <sup>†</sup>	Botanical name	Parts use* and medicinal uses
ajaak tsher ngon <sup>am</sup> , tsher ngon <sup>sh</sup> , tik <sup>ikm</sup>	<i>Meconopsis horridula</i> Hook. f. & Thoms.	<i>Ff</i> , <i>Lf</i> , <i>Fr</i> : in headache, bile and lung disorders, skin disease, sinusitis, fever and wound.
a-tik <sup>am,sh</sup>	<i>Delphinium himalayai</i> Munz	<i>Rt</i> in cough, fever, liver and 'bile' disorders.
baal-tik <sup>am</sup> , tik-taa <sup>sh</sup>	<i>Swertia ciliata</i> (D. Don ex G. Don) B.L. Burt	<i>Wp</i> : in liver disease, fever, bile, headache, gastritis.
ba-gaan <sup>am,sh</sup>	<i>Megacarpaea polyandra</i> Benth.	<i>Lf</i> in malarial fever, and as cooling agent.
balwaa laag-paa <sup>am</sup> ; paa-suk <sup>sh</sup> , khaandui-kyapsaa <sup>km</sup>	<i>Cassiope fastigiata</i> (Wall.) D. Don	<i>Lf</i> , <i>St</i> in urinary trouble, cough, indigestion, joint pain, wind imbalances.
bha-sa-kaa <sup>am</sup> , tik-taa <sup>sh</sup>	<i>Lagotis kunawurensis</i> (Royle ex Benth.) Rupr.	<i>Wp</i> : for blood purification. <i>Lf</i> , <i>Ff</i> , <i>Rt</i> to treat high blood pressure, fever, blood in cough, fresh cuts and wounds.
bong-ngaa kaar-po (= bong kaar) <sup>am</sup> , duk <sup>km</sup> ‡	<i>Aconitum naviculare</i> (Brühl) Stapf	<i>Rt</i> , <i>Lf</i> , <i>St</i> as antidote; in bile fever, infections, high blood pressure, cough, cold and intestinal problem.
bong-ngaa naak-po (= bong naak) <sup>am</sup> , chenduk <sup>sh</sup> , duk <sup>km</sup> ‡	<i>Aconitum spicatum</i> (Brühl) Stapf	<i>Rt</i> in cough, 'bile' fever, headache, lung and intestine infection, cuts and wounds.
busuhaang men-paa <sup>am</sup> , chi ta kaa <sup>km</sup>	<i>Medicago falcata</i> L.	Use as substitute of 'busuhaang' ( <i>Trigonella emodi</i> ), see below.
busuhaang <sup>am</sup> ; tunje, chong <sup>km</sup>	<i>Trigonella emodi</i> Benth.	<i>Lf</i> , <i>Ff</i> , <i>Fr</i> , <i>Rt</i> in cough and other lung disorders, rheumatism, fever, sweating, stomach problem, skin disease, wounds, and as antidote.
chaag tik <sup>am</sup> , tik-taa <sup>sh</sup> , muktsi kaar-po <sup>km</sup>	<i>Gentianopsis paludosa</i> (Munro ex Hook. f.) Ma	<i>Lf</i> , <i>Ff</i> , <i>Fr</i> : in bile-related disorders, jaundice, liver and lung disorder, fever, stomach trouble, wounds, and a communicable disease called "rim".
chaag-tik <sup>am</sup> , tik-taa <sup>sh</sup>	<i>Halenia elliptica</i> D. Don	<i>Ff</i> , <i>Lf</i> , <i>St</i> in bile-related disorders, fever, headache, cold and cough.
chaang-tser kaar-po <sup>am</sup> , chaang-tser <sup>sh</sup> , dhromaak amaa <sup>km</sup>	<i>Morina polyphylla</i> Wallich ex DC.	<i>Rt</i> in gastritis, joint pain and swellings.
chu-maa tsi <sup>am</sup> , nyalowa nyalu <sup>km</sup>	<i>Oxyria digyna</i> (L.) Hill	<i>Lf</i> , <i>Ff</i> , <i>Pt</i> : use as cooling agent, and in lymph disorders, and bloody dysentery.
chum-tsaa <sup>sh</sup> ; umjoe, shorchen <sup>km</sup>	<i>Rheum acuminatum</i> Hook. f. & Thomson ex Hook., <i>R. moorcroftianum</i> Royle	<i>Rt</i> in fever, dysentery, intestinal lymph, bone fracture, body pain and swelling. <i>Pt</i> , <i>Rt</i> in gastritis, stomachache due to cold and urinary trouble. Mostly substituted for 'tarbu bhatar' ( <i>Rheum australe</i> ), see below.
chum-tsaa <sup>am</sup> , bhote khaayo <sup>sh</sup> , lete <sup>km</sup>	<i>Eskekukerjea megacarpum</i> (H. Hara) H. Hara	<i>Rt</i> in bleeding wounds, dysentery, diarrhea, constipation, given during child birth for safe delivery.
chyaag-kyu kaar-po <sup>am</sup> , chyag-kyu <sup>sh</sup>	<i>Thalictrum foetidum</i> L.	Use as substitute of 'chyag-kyu ser-po' ( <i>Thalictrum foliolosum</i> ), see below.
chyag-kyu ser-po <sup>am</sup> , chyag-kyu <sup>sh</sup> , dolo <sup>km</sup>	<i>Thalictrum foliolosum</i> DC.	<i>Rt</i> in contagious fever and wounds.



## Appendix 1 contd...

Vernacular names <sup>†</sup>	Botanical name	Parts use* and medicinal uses
dhawaa <sup>sh</sup> , dhoyung, dolo <sup>km</sup> †	<i>Arisaema flavum</i> (Forsk.) Schott, <i>A. jacquemontii</i> Blume, <i>A. tortuosum</i> (Wall.) Schott	<i>Rt.</i> in worm infestation, sinusitis, stomach pain, toothache, rheumatism and scabies. <i>Ft.</i> to regulate menstruation, and treat uterus disorders. <i>Arisaema flavum</i> is considered to be superior in terms of medicinal potency.
dhum ba-sha-ka <sup>am</sup> , dhum-nag dom-tri <sup>sh</sup>	<i>Veronica ciliata</i> Fisch var. <i>cephaloides</i> Pennell, <i>V. himalensis</i>	<i>Wp.</i> in wounds, 'bile' related disorder, high blood pressure and malarial fever. <i>Veronica ciliata</i> is considered to be superior in terms of medicinal potency.
dhungmo nyung <sup>sh</sup> †	<i>Cynanchum auriculatum</i> Wight, <i>Marsdenia roylei</i>	<i>Wp.</i> in bile-associated fever, cough, stomachache, diarrhea, dysentery, jaundice, worm infestation, and earache.
dhurji <sup>sh</sup> †	<i>Euphorbia longifolia</i> D. Don	<i>Rt.</i> in hot and cold diseases, skin diseases and sinusitis.
dimok, muktsi <sup>am</sup> ; maharangi <sup>sh</sup> , komaa <sup>km</sup>	<i>Arnebia benthamii</i> (Wall ex G Don) IM Johnston, <i>Onosma bracteatum</i> Wall., <i>Onosma hookeri</i> C.B. Clarke var. <i>longiflorum</i> Duthie ex Stapf	<i>Rt.</i> in blood disorder, high blood pressure, fever, lung diseases, cough, body pain and ear pain; root extract is applied mixed with hair oil to cure dandruff. <i>Arnebia benthamii</i> and <i>Onosma bracteatum</i> are considered to be superior in terms of medicinal potency.
draak poe, paang poe <sup>am</sup> ; daak poe <sup>sh</sup>	<i>Nardostachys grandiflora</i> DC.	<i>Rh.</i> in wound, cough, cold and chronic fever, intestinal worm, high blood pressure, food poisoning, gastritis and swellings. <i>Lf.</i> headache, high altitude sickness, fever and wounds.
draak tse, paang tse <sup>am</sup> ; tshe, tshe dum <sup>sh</sup>	<i>Ephedra Gerardiana</i> Wall. ex Stapf	<i>Lf.</i> <i>Fr.</i> to stop bleeding, and in liver disorder, common cold, blood pressure, asthma, hydrocele and nasal disease. <i>Fr.</i> to treat indigestion.
dum-naak zil-paa <sup>am</sup> ; rekon ngon-po, ye khi <sup>sh</sup>	<i>Corydalis cashmeriana</i> Royle	<i>Wp.</i> in chronic fever and jaundice.
gyaa tik <sup>am</sup> , tigtaa <sup>sh</sup>	<i>Swertia chirayita</i> (Roxb. ex Fleming) Karsten, <i>S. racemosa</i> (Griseb.) C.B. Clarke	<i>Wp.</i> in bile disorders, cough and cold, fever, headache, loss of appetite, jaundice and heart disease.
honglen, honglen naak-po <sup>am</sup> ; honglen, tikta <sup>km</sup>	<i>Neopicrorhiza scrophulariiflora</i> (Pennell) Hong	<i>Rh.</i> in bile disorders, fever, high blood pressure, sore throat, gastritis, intestinal pain, conjunctivitis, cold and cough, and headache.
imong kaar-po <sup>am</sup> , imong <sup>sh</sup>	<i>Clematis montana</i> Buch.-Ham. ex DC, <i>C. phlebantha</i> L.H.J. Williams	<i>Lf.</i> <i>St.</i> <i>Ft.</i> in indigestion, wound, cough, cold and joint pain.
imong naak-po <sup>am</sup> , imong <sup>sh</sup> , thil dhaka <sup>km</sup>	<i>Clematis buchananiana</i> DC., <i>C. tibetana</i> Kuntze	<i>Lf.</i> <i>St.</i> <i>Ft.</i> in indigestion, wounds, gastritis, bile problem, cough, cold and joint pain.
jaa-go poe <sup>sh</sup> †	<i>Delphinium brunonianum</i> Royle	<i>Lf.</i> <i>St.</i> <i>Ft.</i> in fever, loss of appetite, headache, dysentery, swelling and wounds.
jip-tsi kaar-po (= jip kar) <sup>am</sup> , jip-tsi <sup>sh</sup> , atun metok <sup>km</sup>	<i>Dracocephalum heterophyllum</i> Benth	<i>Wp.</i> in bile and liver disorders, fever, gastritis, weakness, mouth sore, cough and toothache.
kyer kaar (= kerwaa-kaarpo) <sup>am</sup> , kyer-waa <sup>sh</sup>	<i>Berberis aristata</i> DC., <i>B. everestiana</i> Ahrendt, <i>B. mucrifolia</i> Ahrendt	<i>Lf.</i> <i>Fl.</i> <i>Fr.</i> <i>Br.</i> in eye disease, and 'bile' disorders.
kyiche kar-po <sup>am</sup> , kyiche <sup>sh</sup>	<i>Gentiana robusta</i> King ex Hook f.	<i>Lf.</i> <i>Ft.</i> use as appetite stimulant, and in bile disorder, fever, stomach troubles, inflammations, weakness, swelling, food poisoning, and pain due to cold and hot weather. <i>Fl.</i> <i>Fr.</i> in sore throat, stomachache, swelling, fever, rheumatism and allergy.
laang-na ser-po, ngo ghewang <sup>am</sup> ; lug-ru <sup>sh</sup>	<i>Pedicularis longiflora</i> Rudolph var. <i>tubiformis</i> (Klotzsch) Tsoong	<i>Wp.</i> in food poisoning, cough and cold, liver disorders, weakness, asthma, bile, headache, wounds, and lymph disorder.
lha shuk, de shuk <sup>am</sup> ; shuk-paa <sup>sh</sup>	<i>Juniperus indica</i> Bertol.	<i>Lf.</i> <i>Fr.</i> in kidney diseases, cough and cold, wound, lymph disorder and sores.
luduedorje naak-po <sup>am</sup> , gaa <sup>sh</sup>	<i>Fritillaria cirrhosa</i> D. Don, <i>Lilium nepalense</i> D. Don	<i>Bt.</i> as tonic to increase memory and reduce mental disorders, also in fever, cough and cold. <i>Fritillaria cirrhosa</i> is considered to be superior in terms of medicinal quality.
lug-ru maar-po <sup>am</sup> , lug-ru <sup>sh</sup>	<i>P. cheilanthifolia</i> Schrenk, <i>Pedicularis rhinanthoides</i> Schrenk, <i>P. Siphonantha</i> D. Don	<i>Lf.</i> <i>Ft.</i> in bile and phlegm related disorders, colic, fever, body pain, and headache. Also dries up lymph fluid and heals wounds.
lug-ru ser-po, lug-ru <sup>sh</sup>	<i>Pedicularis hoffmeisteri</i> Klotzsch, <i>P. klotzschii</i> Hurusawa, <i>P. oederi</i> Vahl	Use same as 'lug-ru maar-po' and 'laang-na ser-po'.
luk shuk <sup>am</sup> gangla metok <sup>sh</sup>	<i>Saussurea gossypiphora</i> D. Don	<i>WP.</i> in genital disorders, excess bleeding, hysteria, and septic disease.
maak-tok, maaktok-paa <sup>am</sup> ; ghodaa-marchaa <sup>sh</sup> ; chhonbo ghodamachha <sup>km</sup>	<i>Thymus linearis</i> Benth. ex Benth.	<i>Lf.</i> used as appetite stimulant, blood purifier and digestive; in gum and tooth problems; also taken as herbal tea.
ma-ning dre-maa <sup>am</sup> , dre-ma <sup>sh</sup> , jarok gok-pa <sup>km</sup>	<i>Iris goniocarpa</i> Baker	<i>Wp.</i> use as appetite stimulant, and in worm infestation, urinary disorder and poisoning. <i>Scd.</i> in sinusitis.
metog lug-mig <sup>sh</sup> , mingchen ser-po	<i>Aster diplostephioides</i> (DC.) C.B. Clarke	<i>Lf.</i> <i>St.</i> <i>Ft.</i> in back pain, chest pain, paralysis, poisoning, fever, wounds and sores.
ngo dhungmo nyung <sup>am</sup> , dhungmo nyung <sup>sh</sup> †	<i>Cynanchum canensense</i> (Willd.) K. Schum.	<i>Fr.</i> <i>Scd.</i> in worm infestation, bile fever, cough, stomach disorder, diarrhea, dysentery, jaundice, earache.
nye-shing <sup>sh</sup> , gajaa tugtug <sup>km</sup>	<i>Asparagus fillicinus</i> Buch.-Ham. ex D. Don	<i>Rt.</i> in menstrual disorder (high bleeding), nasal bleeding, diarrhea, dysentery, urinary disorder, and as galactagogue.

## Appendix 1 contd...

Vernacular names <sup>†</sup>	Botanical name	Parts use* and medicinal uses
paang tsampaa-kaa <sup>am</sup> , champaa metog <sup>sh</sup> , ta thok paa <sup>km</sup>	<i>Anaphalis triplinervis</i> (Sims) C.B. Clarke var. <i>monocephala</i> (DC.) Airy Shaw	<i>Ft</i> , <i>Lf</i> , <i>St</i> : fever, chest pain, indigestion, inner bleeding, cold associated disorder like swellings, and as antidote to food poison. Also used in heat therapy (moxibustion).
paang-raam <sup>am</sup> ; men-bu, mon-bu <sup>sh</sup> monluk lakang <sup>km</sup>	<i>Bistorta macrophylla</i> (D. Don) Sojak	<i>Rt</i> : in cough, lung disease, intestinal disorders, and diarrhea. <i>Fr</i> : in diarrhea and to increase blood.
paarpataa <sup>sh</sup> , yakyi metok <sup>km</sup>	<i>Hypocoum leptocarpum</i> Hook.f. et Thoms.	<i>Wp</i> : in liver disorders, bile and blood fever, fever due to contagious poisoning, colds, coughs, tuberculosis, pain, headache and to reduce blood pressure.
raa-nye goe-paa, raa moshak <sup>am</sup> ; raanye <sup>sh</sup> ; rawa nyalu <sup>km</sup>	<i>Polygonatum cirrhifolium</i> (Wall.) Royle, <i>Polygonatum verticillatum</i> (L.) All	<i>Rt</i> : used as tonic to restore vitality, physical strength and increase regenerative fluid; also beneficial for cold wind disorder, rheumatism, arthritis, blood purification, bile and to generate stomach heat.
rejaak, rejaak-pa <sup>sh</sup> ; o nara <sup>km</sup> †	<i>Stellera chamaejasme</i> L.	<i>Lf</i> , <i>Ft</i> , <i>Rh</i> : in infectious diseases, swellings. <i>Rh</i> : paste applied as poultice in swellings and fractured bone, in wounds; also applied for body massage.
ri gog, ruk naak <sup>am</sup> ; gok-paa <sup>sh</sup> ; daang-song gok-paa <sup>km</sup>	<i>Allium carolinianum</i> DC.	<i>Bt</i> , <i>Lf</i> : used as stimulant and tonic in weakness and tiredness, in indigestion, wind problem, toothache, earache and headache.
se goe fo <sup>am</sup> ; se goe <sup>sh</sup> ; amdogaa, bellaa <sup>km</sup>	<i>Rosa macrophylla</i> Lindl.	<i>Fr</i> : in fever, weakness, diarrhea, and bile disorder.
se goe mo <sup>am</sup> ; se goe <sup>sh</sup> ; seldokaa <sup>km</sup>	<i>Rosa brunonii</i> Lindl.	<i>Fr</i> : in 'bile'; fever.
sewaa <sup>am</sup> ; se goe <sup>sh</sup> ; serogaa, sewaa metog <sup>km</sup>	<i>Rosa sericea</i> Lindl.	<i>Ft</i> , <i>Fr</i> : in bile disease and wind and lung disorders, in fever, menstrual disorder. <i>Fr</i> : in jaundice and liver disease. <i>Br</i> : as antidote, and in joint pain and lymph fluid disorders.
solo muk-po <sup>am</sup> , tsen chungbaa <sup>sh</sup> , tangaa lama cha <sup>km</sup>	<i>Rhodiola himalensis</i> (D. Don) S.H. Fu	<i>Rt</i> : in kidney problem, for urine purification, in asthma, lung infection, fever. <i>Lt</i> : in skin diseases, infection in mouth.
sur-kaar <sup>am</sup> , balu kaar-po <sup>sh</sup> , dhale kaarpo or da jik <sup>km</sup>	<i>Rhododendron anthopogon</i> D. Don	<i>FL</i> , <i>Lf</i> : in cough, bleeding, skin disease, and nerve problems; also used for blood purification, and to promote heat. <i>FL</i> : in gastritis, cold, indigestion, sore throat. Fresh flowers are used in making herbal tea to treat liver disorders.
sur-naak <sup>am</sup> ; balu maar-po, balu naag-po <sup>sh</sup>	<i>Rhododendron lepidotum</i> Wall. ex G. Don	<i>FL</i> , <i>Lf</i> : use same as 'sur-kaar' ( <i>Rhododendron anthopogon</i> ).
tarbu bhatar <sup>am</sup> , chur-tsaa <sup>sh</sup>	<i>Rheum australe</i> D. Don	<i>Rt</i> : in swellings, fracture, sore, sprain, high bleeding during menstruation, indigestion, diseases of the blood, and bile fever. <i>Pt</i> : in worm infestation, gastritis, stomachache, swellings, and urinary disorder.
tar-bu naam-taar <sup>am</sup> , tar-bu <sup>sh</sup>	<i>Hippophae salicifolia</i> D. Don	<i>Fr</i> : for blood purification, in toothache, joint pain, gum swellings, dysentery, menstruation trouble, diabetes, and worm infestation.
tar-bu saa-taar; tar-bu <sup>sh</sup> ; taru, tirtsuk <sup>km</sup>	<i>Hippophae tibetana</i> Schltr.	<i>Fr</i> : used as appetite stimulant, diuretic, anthelmintic and tonic; and in cold, cough, bleeding, and for blood purification and dilution.
ti yang ku, pri yang ku, lumu gorkum, sila poe <sup>am</sup> ; jib tsi nag po <sup>sh</sup>	<i>Dracocephalum tanguticum</i> Manim	<i>Wp</i> : in fever, and phlegm disorder. Young leaves in seedlings stage (lumukurkum) are used in dysentery and fever of child; whole parts of mature plant (tiyangku) are used in liver disease, bile, fever, cough, cuts and wounds.
waang-laag <sup>am</sup> ; waang-po laag-paa <sup>sh</sup>	<i>Dactylorhiza hatagirea</i> (D. Don) Soó	<i>Rt</i> : used as tonic to increase regenerative fluid, increase vitality and strength. Their paste is applied to open wounds, cuts and burns to promote healing.
wolmo se <sup>am</sup> , balugu <sup>sh</sup>	<i>Podophyllum hexandrum</i> Royle	<i>Fr</i> : in gynecological diseases, irregular menstruation ( <i>mona</i> ), worm infection in the cerebrum ( <i>lappa</i> ), and in cough ( <i>loman</i> ), kidney disorder and scabies.
wun-bu chung-waa <sup>am</sup> , wun-bu <sup>sh</sup> , thi-shing <sup>km</sup>	<i>Myricaria rosea</i> W.W. Smith	<i>Ft</i> , <i>Lf</i> : in fever, headache, stomache disorder, and as antidote to various types of poison.
zimu naak-po <sup>am</sup> ; gonyo, zimbu <sup>sh</sup> ; koje <sup>km</sup>	<i>Allium wallichii</i> Kunth	<i>Wp</i> : used as tonic and aphrodisiac, and in abdominal pain, tuberculosis and hemorrhages.
zin-tik yung-waa <sup>am</sup> ; zin-tik <sup>sh</sup> , khaangsu metog, Chhotten tamba <sup>km</sup>	<i>Ajuga lupulina</i> Maxim.	<i>Lf</i> , <i>Ft</i> , <i>Sd</i> : in skin disease (itching, allergy), wounds, boil, fever, sinusitis, menstruation trouble, epilepsy, infection and quinsy.
zomo shing chhe-wa <sup>am</sup> , zomo shing <sup>sh</sup> , ji tser <sup>km</sup>	<i>Caragana gerardiana</i> Royle	<i>Wd</i> : as substitute for tsenden karmo ( <i>Santalum album</i> ) in high blood pressure, heart pain and eye problem.
zomo shing chung-waa <sup>am</sup> , zomo shing <sup>sh</sup> , ji tser <sup>km</sup>	<i>Astragalus candolleanus</i> Royle ex Benth.	<i>Wd</i> : in high blood pressure, heart pain, eye problem. Plant parts are also used in kidney problem, weakness, blood disorder, and menstrual disorder.

<sup>†</sup>Superscript letter represent *amchi* name (am), name used only by non-specialist users ('km'), and shared name used by both *amchi* and non-specialist users (sh).

<sup>‡</sup>Poisonous plants, *amchi* detoxify the poison before use.

\*Parts use: *Bt*: bulb, *Br*: bark, *Ft*: flower, *Fr*: fruit, *Lf*: leaf, *Lt*: latex, *Pt*: petiole, *Rh*: rhizome, *Rt*: root, *Sd*: seed, *St*: stem, *Wd*: wood, *Wp*: whole plant.