

# PLANT KNOWLEDGE OF THE SHUHI IN THE HENGDUAN MOUNTAINS, SOUTHWEST CHINA<sup>1</sup>

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**Weckerle, Caroline S.** (*Kunming Institute of Botany, Chinese Academy of Sciences, Heilongtan, Kunming 650204, China, and Institute of Systematic Botany, University of Zurich, Zollikerstrasse 107, 8008 Zurich, Switzerland; Tel: 0086 871 521 22 74; email: weckerle@ethnobot.ch, weckerle@systbot.unizh.ch*), **Franz K. Huber, Yang Yongping, and Sun Weibang** (*Kunming Institute of Botany, Chinese Academy of Sciences, Heilongtan, Kunming 650204, China; e-mail: huber@ethnobot.ch, yangyp@mail.kib.ac.cn, wbsun@mail.kib.ac.cn*). PLANT KNOWLEDGE OF THE SHUHI IN THE HENGDUAN MOUNTAINS, SOUTHWEST CHINA. *Economic Botany* 60(1):3–23, 2006. *The Shuhi are a Tibeto-Burman ethnic group of around 1,500 people living exclusively in the Shuiluo Valley, southwest China. We documented their plant knowledge concerning wild collected species, and analyzed food, medicine, and ritual uses. Overall, uses, collection sites, and use frequencies of 136 plant species were documented. The plants were divided in fodder (46 spp.), food (43 spp.), medicine (27 spp.), ritual plants (20 spp.), fuelwood (17 spp.), plants used for construction (8 spp.), ornamentals (2 spp.), and "others" (34 spp.). Food plants mainly consist of fruits and leafy vegetables, and the uses are comparable with those of other ethnic groups in the area. Knowledge about medicinal plants is relatively limited, since traditional Shuhi healers use ritual and other healing methods instead of medicinal plants. Ritual plants play an important role relative to human well-being. Villagers and ritualists use them to keep the environment clean of malevolent spirits and to maintain a good relationship with the deities. All habitats, from the dry shrub vegetation at the valley bottom up to the alpine shrub, are used for plant collection, but 87% of all species are collected in the near vicinity of the villages around the fields and in the dry shrub vegetation. Finally, we postulate two main factors influencing wild plant use among the Shuhi: cultural values and accessibility.*

**Key Words:** Ethnobotany, food plants, medicinal plants, ritual plants, Shuiluo Valley, Tibeto-Burman.

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The Hengduan Mountains region is well known for its biological diversity and its cultural richness. It is situated at the Himalayan foothills of southwest China, spanning southwest Sichuan, northwest Yunnan, and part of eastern Tibet. Mountains reach altitudes of 7,500 m while networks of streams and rivers, including the Mekong, Salween, and Yangtze, dissect innumerable valleys. The region is one of the world's 25 biodiversity hotspots as identified by Conservation International (Myers et al. 2000; Olson and Dinerstein 2002). It is one of the richest temperate floristic areas in the world, harboring 3,500 endemic species with

high medicinal plant diversity (Wang et al. 1995; Morell 2002). The Hengduan Mountains region belongs to the eastern part of "Ethnic Tibet" (Baumer and Weber 2002:17–18). For several thousands of years, the area has been inhabited by a large number of ethnic groups with distinct and different languages, customs, and land management practices (e.g., Hsu 1998).

Current ethnobotanical studies in the Sino-Himalayan area (including northern Nepal and India) concentrate on nontimber forest products, mainly medicinal plants and their local uses and exploitation, as well as the resulting impacts on the environment (see Kala 2000; Saxena et al. 2001; Ghimire, McKey, and Aumeeruddy-Thomas 2005). There are few English articles dealing with current ethnobotanical research in the Hengduan Mountains. Most

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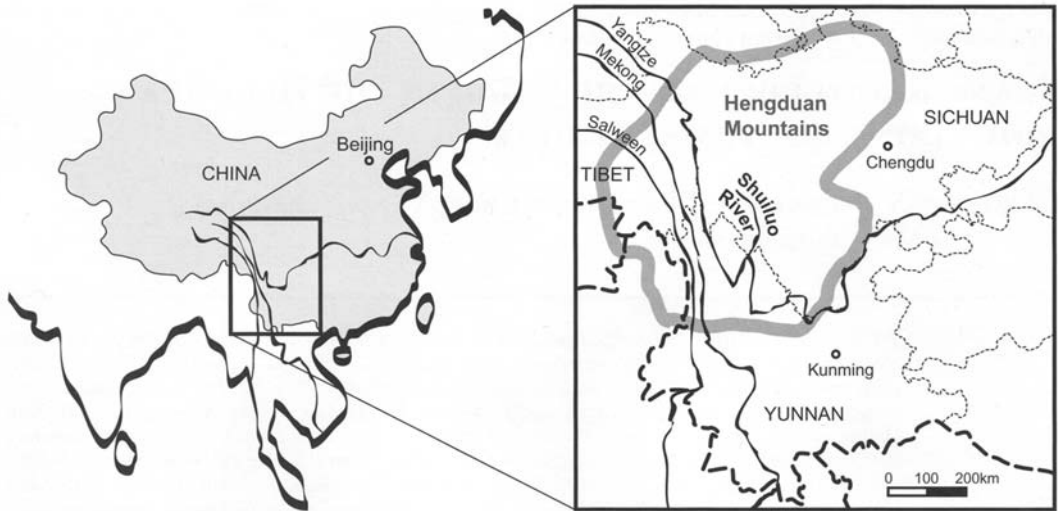


Fig. 1. Location of the study area in southwest China.

research has been conducted in NW Yunnan (see Pei, Li, and Yin 1996; Long et al. 2003; Huang, Pei, and Long 2004; Salick et al. 2004). Pei, Li, and Yin (1996) and Huang, Pei, and Long (2004) document medicinal plant uses. The former study concentrates on local markets, whereas the latter documents local uses among the Lisu people. Long et al. (2003) stress the various uses of the lacquer tree (*Toxicodendron vernicifluum* [Stokes] F.A.Barkley) in agroforestry systems, while Salick et al. (2004) investigate the correlation between useful plants and biodiversity along elevation gradients.

The present study has been conducted in a Shuhi community, a little-known ethnic group living exclusively in the remote Shuiluo valley, situated in the south of the Hengduan Mountains, southwest Sichuan. Only recently, in 2000, has the valley been made accessible by road. As a consequence, acculturation pressures are increasing, and the lives of its inhabitants are rapidly changing. Other than a linguistic study (Sun 1990) and two articles about traditional utilization of *Juglans regia* L. and *Hordeum vulgare* L. (Weckerle et al. 2005a, 2005b), no ethnological or ethnobotanical research articles have been published on the Shuhi. Since acculturation processes are often accompanied by a loss of indigenous plant knowledge (e.g., Benz et al. 2000), ethnobotan-

ical studies are urgently needed to document the present knowledge and to provide a baseline for future analysis regarding knowledge and use changes. This study aims to document the traditional knowledge of the Shuhi concerning wild collected plant species, and to analyze food, medicinal, and ritual plant uses.

Wild collected species as defined here are plants which are not cultivated, i.e., which are not deliberately planted and managed by humans. The term does include semicultivated plants, which are protected to some degree, e.g., not consciously destroyed in agricultural activities or fuelwood collection (see Berlin 1992:120).

## STUDY AREA

### GEOGRAPHICAL ASPECTS AND VEGETATION

The Shuiluo Valley in the Sichuan Province is situated in the south of the Hengduan Mountains, ca. 28° N and 101° E, at an elevation of 2,000–6,000 m. The Shuiluo River, a tributary to the Yangtze River, is approximately 150 km long (Fig. 1). Southwest monsoon from the Indian Ocean strongly influences the climate, resulting in a rainy season from June to October and allowing tropical vegetation to reach almost 29° north latitude (Wang et al. 1995). The annual rainfall in the Shuiluo valley ranges from 400 to 1,000 mm (unpublished data, Wang

1961). The vegetation types can be divided into a dry to semidry valley bottom characterized by shrub vegetation (2,000–2,400 m), subtropical mixed pine and oak forests (2,400–3,500 m), temperate and cold-temperate mixed conifer forests (3,500–4,400 m), and alpine vegetation (above 4,400 m; Handel-Mazzetti 1921).

#### ETHNOGRAPHIC BACKGROUND

The Shuiluo Valley is inhabited by five different Tibeto-Burman ethnic groups living close together but separated by their languages: the Gami-Tibetans, Pumi, Shuhi, Moso, and Naxi. The first three, summarized officially as Tibetans (Chinese: *zangzu*), are in the majority with about 4,500 inhabitants. Around 1,500 of them are Shuhi people, living exclusively in the Shuiluo valley. The Naxi comprise about 400 and the Moso about 300 inhabitants (Ma Shuji 1996, personal communication). The kinship of the Shuhi to other ethnic groups is unclear, but is the subject of recent ethnological studies in the area (Weng 2005, personal communication).

The ethnic groups usually live in confined settlements with 20–30 scattered buildings or, more rarely, in hamlets with more closely arranged houses. All ethnic groups rely on subsistence agriculture with crop rotations and two harvests per year. Both the Shuhi and the Moso are paddy farmers and are settled near the valley bottom between 2,000–2,400 m. The other groups cultivate mainly wheat, barley, and corn, and tend to live at higher elevations, especially the Gami and Pumi.

The religion is influenced by both Tibetan Buddhism (Lamaism) and animistic Bon religion (Baumer 1999). The Shuhi rely on shamans, so-called *dumbu* priests, as well as lamaistic priests. The *dumbus* are the traditional healers of the Shuhi. Their concept of health and disease is related to various kinds of spirits, which are thought to be responsible for human illness.

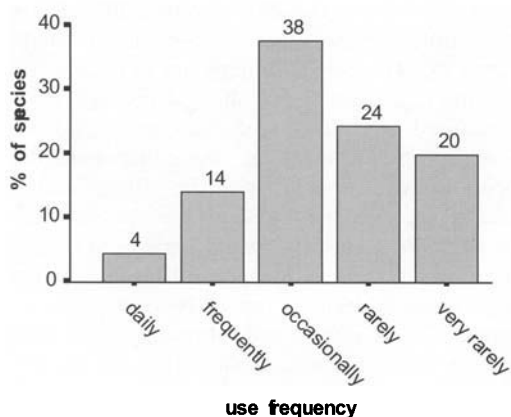
#### RESEARCH METHODS

Fieldwork was conducted for a total of eight months in 1996, 2004, and 2005. It consisted of interview surveys, extensive participant observation, and the collection of plant voucher specimens. A total of 50 households were visited in five Shuhi villages. In Lanman village, repeated interviews were conducted in all houses (17) of one hamlet. We attempted to conduct interviews

with one-third to one-half of randomly selected households in the other villages and hamlets: Xiwa (9), Dongla (6), Pingweng (11), and Mi-anbang (7). Data were collected through semi-structured interviews with both male (34) and female (29) informants, including extended open-ended interviews with the village leaders and persons chosen based on recommendations of villagers. Interviews were carried out in Chinese or the local language with the assistance of translators. Usually one or two “main” interviewees were questioned, although often other people were around and participated in the discussions. The “main” interviewees were 20–70 years old, with an average age of 43.

The semistructured interviews covered the socioeconomic situation (family background, age, income, education, etc.) as well as knowledge of traditional plant use, health care, and healing practices, traditional and recent. Since it was generally difficult to get extensive information on plant use during the interviews, walks in the area (through fields and shrub vegetation) with key informants were conducted, which often triggered their recognition of useful plants. In Lanman village, extensive work with two key informants also included the discussion of randomly collected plants. All information received from key informants was cross-checked with at least two additional informants.

Besides interviews we also collected plant use information (including local names) by informal conversation with people encountered in the fields. Participant observation revealed information on the cultural context of plant use as well as the use frequency of wild collected plant species. Based on these observations and discussions with key informants in different villages, a ranking of use frequencies was developed. Five different categories ranging from daily use (i.e., 5–7 days per week) to very rarely (i.e., less than two times per year; cf. Fig. 2) were chosen and applied to all plants for their main production season, when the plant part used is available. *Toona sinensis* leaves and *Pteridium revolutum* shoots, for example, can only be collected during springtime, but are then frequently consumed. Other plants, however, are used during the whole year with constant frequency, such as *Pinus yunnanensis*, *Pistacia weinmannifolia*, or *Cupressus funebris*. Although this might have a different impact on



**Fig. 2.** Use frequency of wild collected species: daily, 5–7 days per week; frequently, 1–4 days per week; occasionally, 1–3 times per month; rarely, less than 12 times per year; very rarely, less than two times per year. Calculated for the main production season of the plant.

the collected species and their population, it is not considered here.

As shown in Fig. 3, the collection sites of the species have been divided into seven different vegetation zones and habitats: a, fields (2,100–2,400 m); b, dry shrub vegetation (2,000–2,400 m); c, irrigation channels and streams (2,000–2,400 m); d, *Pinus yunnanensis* forest (2,400–2,800 m); e, pine mixed forest (2,800–3,500 m); f, conifer mixed forest (3,500–4,400 m); and g, alpine shrub (above 4,000–4,500 m).

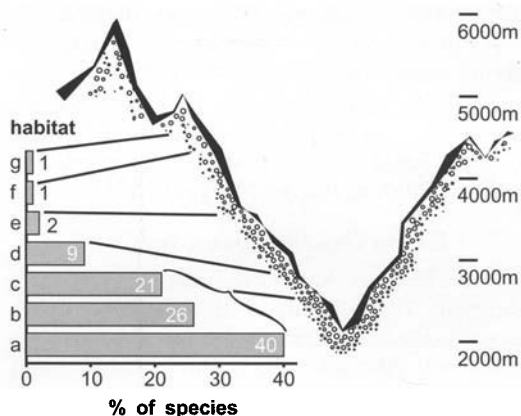
Local plant names and key features of the interviews were recorded on tape and are deposited at the first author's home. The plant specimens were identified at the herbarium of the Kunming Institute of Botany (KUN), where they are also deposited. Nomenclature follows the Flora of China (1994 to present), the Hengdian Mountain Vascular Plants (Wang et al. 1994), and The International Plant Names Index (2004).

The research was performed according to the biodiversity rights of China, and the results are published with the agreement of local village leaders.

## RESULTS AND DISCUSSION

### PLANT USE CATEGORIES, USE FREQUENCY, AND COLLECTION SITES

A total of 136 wild collected plant species were recorded (Appendix 1). The documented



**Fig. 3.** Collection sites of the plants. The black lines indicate the upper limit of the vegetation zones and habitats where the plants are collected: a, fields (2,100–2,400 m); b, dry shrub vegetation (2,000–2,400 m); c, irrigation channels and streams (2,000–2,400 m); d, *Pinus yunnanensis* forest (2,400–2,800 m); e, pine mixed forest (2,800–3,500 m); f, conifer mixed forest (3,500–4,400 m); g, alpine shrub (above 4,000–4,500 m).

plant uses were divided into seven main categories ordered according to the number of species they comprise: fodder plants (46 spp.), culinary or food plants (43 spp.), medicinal plants (27 spp.), ritual plants (20 spp.), fuelwood (17 spp.), plants used for construction (8 spp.), and ornamentals (2 spp.). The eighth category of “others” (34 spp.) includes various plant uses such as fertilizer, as broom, or to make fences and cords, which will not be dealt with in this paper. While the first seven categories coincide with emic use categories found in grouping analysis (unpublished data), the category “others” combines several emic categories, e.g., “fertilizer” and “cleaning.”

Figure 2 shows that only 18% of the wild collected species are used on a daily or frequent basis, while the majority of the species are used occasionally or rarely. However, other than the medicinal plants, species with frequent use are found in every use category (Table 1). Wild collected species used on a daily basis belong to the categories “ritual plants” and “fuelwood.”

Of the used plant species, 87% are collected in the near vicinity of the village, i.e., in the fields, the shrub vegetation, and along the channels and streams (Fig. 3). Similar trends have been observed in other ethnobotanical

TABLE 1. CROSS TABULATION OF USE CATEGORIES AND USE FREQUENCY.

	Use Categories* (Number of Species)								Total
	CUL	MED	RIT	FOD	FUEL	CON	ORN	OTH	
<b>Use Frequency</b>									
Daily (5–7 days per week)	0	0	3	0	1	0	0	2	6
Frequently (1–4 days per week)	11	0	3	1	2	1	1	3	22
Occasionally (1–3 times per month)	15	0	10	25	9	0	1	7	67
Rarely (less than 12 times per year)	10	5	3	19	5	4	0	13	59
Very rarely (less than two times per year)	7	22	1	1	0	3	0	9	43
<b>Total</b>	<b>43</b>	<b>27</b>	<b>20</b>	<b>46</b>	<b>17</b>	<b>8</b>	<b>2</b>	<b>34</b>	

\* CUL, culinary or food plants; MED, medicinal plants; RIT, ritual plants; FOD, fodder; FUEL, fuelwood; CON, construction wood; ORN, ornamentals; OTH, other uses. A single species can appear in more than one use category.

studies. For example, Salick et al. (1999) stress that the Dusun people of Mt. Kinabalu, Borneo, collect most of the useful plants close to their settlements, and only a few plants are collected from higher elevations. It is unclear whether this behavior is due to convenience or the experience that habitats close to human settlements contain more useful plants. Recent quantitative studies confirm the positive correlation between overall species richness and the number of useful plant species (Salick et al. 1999, 2004). Both the dry shrub vegetation and the vegetation between and around the fields are known for high species diversity, which exceeds the diversity of the forests at higher altitudes (Salick et al. 1999, 2004). Thus it might be both convenience and experience which make the close vicinity of settlements favorable for collection sites.

Figure 4 shows the association between use frequency and collection sites. Interestingly, the most often used species are not necessarily collected in the close vicinity of the villages. Two of the three daily-used ritual plants (*Pinus yunnanensis* and *Cupressus funebris*) are collected at higher altitudes in the *P. yunnanensis* forest and the conifer forest. Ritual plants from higher altitudes are preferred because they are perceived to be in close proximity to the mountain gods. The selection of ritual plant collection sites is thus strongly influenced by cultural factors. Still, some of the regularly used ritual plants, e.g., *Pistacia weinmannifolia*, are collected close to home, allowing sufficient sup-

ply during busy times. The frequently used species are collected in six different vegetation zones, whereas the majority are collected in the close vicinity of the villages (Fig. 4). Again, some of the frequently used ritual plants (*Juniperus* spp.) are collected at higher altitudes in the alpine shrub vegetation at 4,000 m and above.

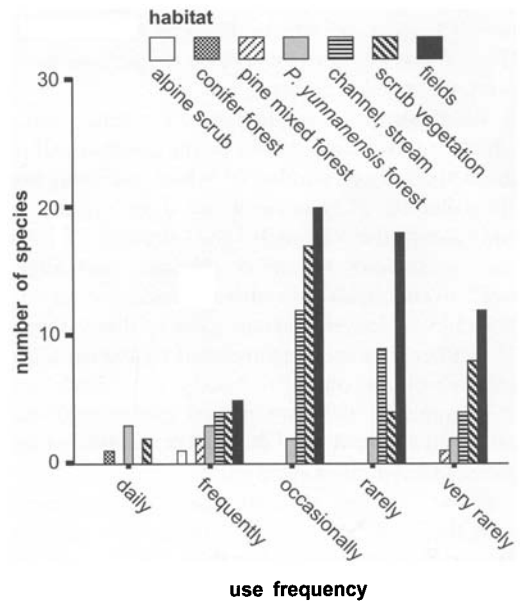


Fig. 4. Association between use frequency and collection sites of plant species.

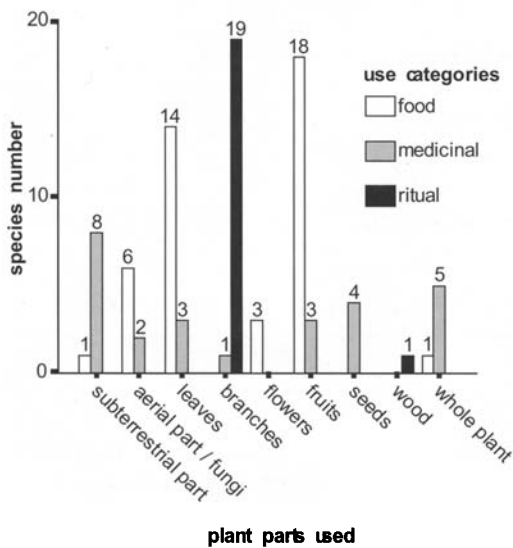


Fig. 5. Association between plant parts used and different use categories.

### RITUAL PLANTS

Ritual plants play an important role in the daily life of the Shuhi as well as in healing rituals of the *dumbus*. Ritual plants are used either to please the deities and assure their support of human health and well-being or to drive out malevolent spirits. The ritual plants are typically shrubs (17 spp.) or trees (3 spp.), of which the branches are used (Figs. 5 and 6). For one species (*Cupressus funebris*), the wood is gathered.

We recorded nine plant species, called *lahu*, which are exclusively used by the *dumbus*. All of these species are shrubs, of which the branches are collected. They occur in the shrub vegetation and along the channels and streams. *Mahonia bracteolata*, *Rhamnus gilgiana*, and *Sageretia pycnophylla* are characterized by thorny branches or leaves and are used to drive ghosts off. Either they are actively used by the ritualists to drive ghosts out of the body, the house, and the hamlet, or they are put on the ground and weighted down with a stone, e.g., under hamlet gates, to keep ghosts away.

In the past the ritualists made "little houses" with the branches of *Salix cheilophila*. One of the *dumbus* explained that these "little houses" were also used to drive ghosts away and were employed in the context of illnesses, conflicts, and funerals. However, they are no longer used today. Mueggler (2001:31) describes the prepa-

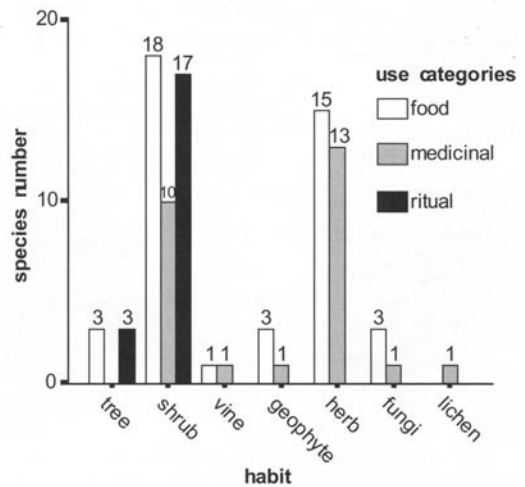


Fig. 6. Association between plant growth habit and different use categories.

ration of "ghost bodies" during rituals among the ethnic group of the Lolopo. For the construction of these sculptural representations of ghosts, the ends of three willow sticks are tied to an old sieve and bound together above it. They might resemble the "little houses" mentioned by the *dumbu*, which probably also functioned as effigies for the ghosts during the ritual.

*Rhododendron decorum* is another important plant used by the *dumbus*. Before each ritual the leaves are burned, the smoke being thought to clean the room or the environment where the ritual takes place. Additionally, the leaves provide an important device for the *dumbu* to remember his ritual texts, which, according to legend, have long been lost. He either touches a leaf with the tip of his tongue or just holds the leaves in his hands while reciting.

Most of the ritual plants commonly used by the local people are burned as incense to please the deities. Foremost among these are *Pinus yunnanensis*, *Pistacia weinmannifolia*, *Cupressus funebris*, and *Juniperus* spp. The first two are burned fresh, in a ritual burner or in the hearth; the last two are dried and burned in an incense bowl. The plants are burned to communicate with the gods and to offer them food, either in the form of good smell or as food offerings spread over the burning branches (e.g., *tsampa*, flour prepared from roasted barley grain, mixed with flowers of *Tagetes erecta* L.). White smoke is considered to be important for

communication with the gods. Thus, there are two main criteria for the selection of ritual plants: their smell and the type of smoke they produce when burned.

A third criterion is the habitat of the plants. Since the high mountains represent the most important gods, ritual plants growing at high altitudes are preferred. Between *Pinus yunnanensis* and *Pistacia weinmannifolia*, which both can be burned in the ritual burner on the flat roof of the houses during the daily morning ritual, pine is claimed to be the better choice, since it grows on higher altitudes. *Pistacia*, however, grows close to the villages and is therefore often used during busy times. *Quercus guajavifolia* and *Aster lavandulifolius* can also be used instead.

*Cupressus funebris* and *Juniperus* spp. are collected in the conifer mixed forest (3,500–4,400 m) and the alpine shrub vegetation (above 4,000–4,500 m), respectively. While the latter species is usually bartered from people of other ethnic groups, who either herd yaks at high altitudes or who are doing some pilgrimage to the holy mountains, *Cupressus funebris* is collected by the Shuhi themselves. The Shuhi of Lanman village, for example, collect the wood in the forests surrounding their village mountain god. Once or twice a year, groups of persons from different households go to collect wood of old fallen trees, because it is not allowed to cut trees in forests close to the mountain tops, and, additionally, old wood produces the best smell when burned.

Another group of ritual plants is not burned but used for the decoration of special places in and outside the house, such as the door, the *yatze* (little stone towers on the flat roofs of the houses), the pillars in the living room, the *tala* (the holy place behind the hearth), the house altar, and places outside, such as the water god place. Branches of *Cornus oblonga*, *Pinus yunnanensis*, *Pistacia weinmannifolia*, *Tagetes erecta*, and *Phyllostachys* sp. are placed at these holy places to invite the deities. Most of the species used are evergreen, a property which was claimed to be especially appreciated by the deities. During the Tibetan New Year, all the plants are renewed. However, on other occasions as well during the year fresh plants are mounted, e.g., during the harvest festivals in spring and autumn, or for special rituals performed by individual households.

## MEDICINAL PLANTS

Wild collected medicinal plants for primary health care in rural communities and as an income source are important in many regions of the Himalaya (e.g., Bhattarai 1989; Joshi and Joshi 2000; Huang, Pei, and Long 2004; Sharma, Chauhan, and Lal 2004). Overall the uses of 27 medicinal plants have been recorded for the Shuhi. Like the wild food plants, most of the medicinal plants are collected in the near vicinity of the villages: in the fields (63%), in the shrub vegetation (22%), and along the channels and streams (7%). *Papaver somniferum* L. is the only medicinal plant which is cultivated in the fields. Herbs (13 spp.) and shrubs (10 spp.) are the predominant source of plant medicine (Fig. 6).

In contrast to wild collected food, which mainly consists of fruits or leaves, underground plant parts play an important role in the preparation of medicine. Among the Shuhi, subterranean parts (8 spp.), fruits and seeds (7 spp.), leaves or branches (4 spp.), or the whole plants (5 spp.) are used in similar proportion (Fig. 5). Underground plant parts are commonly used in the Sino-Himalayan area. While some studies document the medicinal use of different plant parts to equal degrees (Bhattarai 1989; Huai and Pei 2004; Huang, Pei, and Long 2004), others stress the predominant use of underground parts (Shrestha and Dhillion 2003; Sharma, Chauhan, and Lal 2004) or the whole plant (Navachoo and Buth 1989; Long and Li 2004). Roots are known to contain high concentrations of bioactive compounds, thus tending to be more pharmacologically potent or even toxic than leaves are (Johns 1990:259).

Most of the documented medicinal remedies are based on the preparation of a single plant, and by far the most often recorded preparation mode (67% of the species) is decoction for internal use. Sometimes a decoction of two or three plants together is prepared, e.g., of *Gyromitrion falcatum* and *Mentha spicata* to treat cough and sore throat, or *Acorus calamus*, *Rumex nepalensis*, and *Valeriana jatamansi* for a stomachache. Rarely, smoke is inhaled (e.g., of the seeds of *Datura stramonium* for a toothache), or fresh plant material or decoctions are used for external applications (e.g., decoction of *Wikstroemia delavayi* as analgesic). Overall, 37% of the species are used to treat

gastrointestinal problems such as diarrhea, constipation, stomachache, and parasites, and 26% are used to treat respiratory tract infections such as cold, cough, and sore throat. To a lesser extent, plants are used to treat wounds and genital-urinary ailments, for dental care, or as a tonic.

These findings correspond to other studies in the Sino-Himalayan area, which show that the most frequent treatments with medicinal plants involve the digestive system (Joshi and Joshi 2000; Huang, Pei, and Long 2004) and the respiratory system (Shrestha and Dhillion 2003). However, in some places a relatively high number of medicinal plants are known to treat dermatological illnesses (Joshi and Joshi 2000; Huai and Pei 2004; Huang, Pei, and Long 2004), broken bones (Huai and Pei 2004; Huang, Pei, and Long 2004), or fever (Bhattarai 1989). The number of known remedies in a certain area most likely reflects the commonly contracted diseases. For example, dermatological illnesses are more likely to occur in warm and humid areas, and, accordingly, in those areas more medicinal plants are known to cure these diseases (Joshi and Joshi 2000; Huai and Pei 2004; Huang, Pei, and Long 2004).

The recorded information on medicinal plants was compared with literature on Chinese medicinal plants (Compilation of Chinese Herb Medicine 1976–1978) and ethnobotanical surveys from other Sino-Himalayan areas. Besides four species (*Cyrtomium falcatum*, *Mahonia bracteolata*, *Rosa soulieana*, and *Wikstroemia delavayi*) of which closely allied taxa are known to be used as medicinal plants, all of the recorded species are used for similar purposes in other parts of China and the Himalayan area. The pharmacological literature supports the effectiveness of the most often mentioned species, i.e., *Acorus calamus*, *Rumex nepalensis*, and *Valeriana jatamansi*. *Acorus calamus* has been positively tested for its antidiarrheal effect (Shoba and Thomas 2001), while the purgative effects of the roots of *Rumex nepalensis* have also been affirmed (Ghosh et al. 2003). *Valeriana jatamansi* is a critically endangered medicinal plant in Western Himalaya (e.g., Airi et al. 2000; Rai, Prasad, and Sharma 2000). Much like other *Valeriana* spp., the major recorded uses are as a tranquilizer and CNS sedative and as a treatment for gastrointestinal hyperactivity, both of which are approved in

pharmacological studies (Houghton 1999). The Shuhi, however, only mentioned its use to treat a stomachache.

Among the medicinal plants, six species (*Mahonia bracteolata*, *Paeonia delavayi*, *Polygonatum cirrhifolium*, *Prinsepia utilis*, *Vitis betulifolia*, and *Prunus* sp.) are occasionally collected for trade. While the first three are collected for their roots or rhizomes, the seeds of the last three are sold. Due to overharvesting, the trade of *Mahonia bracteolata* roots was banned several years ago. The other species, however, are occasionally collected when traders from outside the valley request them. The demand seems to vary greatly from year to year, so medicinal plant collection is not a regular source of income for the Shuhi.

Compared with other studies, relatively few medicinal plants and preparation modes have been recorded for the Shuhi. Other small-scale studies in the area, which are based on interviews with local people and specialists (herbalists, traditional healers), usually record between 45 and 65 species (e.g., Manandhar 1998; Joshi and Joshi 2000; Huang, Pei, and Long 2004), while our study only documents the use of 27 species. The Shuhi people have no herbalists, and all of the interviewed persons stated that they do not have, and have never had, a tradition of using medicinal plants. They claimed that they borrowed their knowledge from surrounding ethnic groups such as the Bai, Han, Miao, and Tibetans. As noted, traditional healers among the Shuhi are the *dumbus*, specialists who use ritual practices and other methods for healing instead of medicinal plants.

All key informants mentioned that there was a general increase in the use of medicinal plants in the 1960s and 1970s, during the time of the so-called barefoot doctors. To improve primary health care in the rural areas, the state organized basic medical training for farmers. Barefoot doctors were given a set of medicines, Chinese and Western, that they would dispense. Often they grew their own herbs in the backyard. However, according to key informants, there was not much knowledge transfer between the barefoot doctors and the local people, so the overall medicinal plant knowledge did not change significantly. Not surprisingly, therefore, medicinal plants seem to be used very rarely these days. Instead, the few village doctors in the area sell allopathic drugs. The



usual treatment for most diseases consists of a penicillin injection. All interviewed persons mentioned that they prefer to use allopathic drugs instead of medicinal plants, both because of a lack of knowledge about plant medicine and because it is easier to buy the medicine than to prepare it at home. However, several claimed interest in information about effective and easy to use medicinal plants. In addition to Western medicine, ritual healing practices are still widely applied. While some of the interviewees mentioned that they call a ritualist in the case of serious illnesses, others prefer to invite them for minor illnesses.

### FOOD PLANTS

Wild edible plants are an important constituent of traditional diets in Himalayan areas as sources of proteins, sugars, vitamins, and minerals (Samant and Dhar 1997; Sundriyal and Sundriyal 2001). Among the Shuhi, we documented 43 wild culinary or food plants. Most of these are collected near the villages: in the fields (42%), along the channels and streams (28%), and in the shrub vegetation (21%). Plants of which the fruits are eaten represent the largest number of species (18 spp.), followed by leafy vegetables (15 spp.; leaves and shoots of herbs or geophytes). Rarely, people consume the whole plant (1 sp.), subterranean parts (1 sp.), leaves collected from shrubs or trees (2 spp.), flowers (3 spp.), or fungi (3 spp.) (Figs. 5 and 6).

The marked preference for wild collected fruits and leafy vegetables over underground plant parts seems to be common among various ethnic groups in China and the Himalayan area and might be due to the ease of the collection of aerial plant parts. Chen et al. (1999) and Xu et al. (2004) give an overview of wild collected edible plants in Xishuangbanna, southern Yunnan (China). Wild collected fruits and leafy vegetables are highly diverse, while plants which are consumed for their underground parts make up only a few percent of the overall species number (6% in Xu et al. 2004). Similar patterns are found among Inner Mongolian herdsmen (Khasbagan, Huai, and Pei 2000), in the Sikkim Himalaya area for low (300–900 m) as well as high elevations (>2,000 m; Sundriyal, Sundriyal, and Sharam 2004), and in an overview of wild collected food plants of the Indian Himalaya (Samant

and Dhar 1997). Whether the fruiting species or the leafy vegetables are more diverse seems to vary from region to region, but this might also reflect the methodology used by researchers.

The Shuhi consume most of the wild fruits fresh, as snacks eaten while on their way to the fields, forest, etc. They are collected from shrubs and rarely from trees (*Diospyros lotus* and *Morus alba*) or vines (*Vitis betulifolia*). Fruits might also be collected for young children at home (e.g., *Rubus parvifolius* or *Sageretia pycnophylla*) or for conservation through drying (e.g., *Diospyros lotus*). Few fruits are used for cooking. The fresh or dried fruits of *Zanthoxylum armatum* are used as spice for vegetable dishes and the fruits of *Ficus sarmentosa* are sometimes cooked with rice. Almost half of the species (8 spp.) are exclusively collected for their edible fruits. The others are used multicontextually, e.g., the fruits or seeds are also used as medicine (*Zanthoxylum armatum*, *Vitis betulifolia*, and *Opuntia ficus-indica*), the branches for rituals (*Cornus capitata*, *Rhamnus gilgiana*, *Sageretia pycnophylla*), the branches and leaves as fodder (*Opuntia ficus-indica*, *Morus alba*, and *Ficus sarmentosa*), or the wood as fuel (*Diospyros lotus*).

The daily diet of the Shuhi mainly consists of cooked rice, preserved pork, and chili (*Capsicum annuum* L.). Before each meal, butter tea together with *tsampa* is served. Other than chili, few vegetables are cultivated and consumed. The most widely used vegetable is cabbage leaves, which are usually cooked in water and served as soup. Instead of the cultivated cabbage leaves, leaves or shoots of wild collected herbs are occasionally cooked, e.g., *Chenopodium album*, *Sonchus oleraceus*, or *Stellaria media*.

Wild leafy vegetables seem to be rarely used among the Shuhi. Several elderly people mentioned that they were mainly eaten in the past during times of food shortage. However, some are regularly consumed during springtime: *Epilobium hirsutum* (young shoots), *Mentha spicata* (young shoots), *Houttuynia cordata* (whole plant including rhizomes), *Toona sinensis* (young leaves), and *Pteridium aquilinum* (young shoots). The first three are consumed fresh with chili. *Toona sinensis* leaves are consumed fresh or cooked, and the *Pteridium*

*aquilinum* shoots have to be detoxified before consumption; they are cooked over the fire in periodically renewed water for several hours. The consumption of *Houttuynia cordata*, *Toona sinensis*, and *Pteridium aquilinum* as wild vegetables is common in many parts of China (personal observation).

Like wild collected fruits, leaves might also be dried for consumption during the winter. This use was especially mentioned for the leaves of *Arisaema flavum*, a geophyte (perennial plant with underground buds) flowering during June and July and not consumed fresh. The mature leaves of the plant are collected in autumn and dried for consumption during the winter. There are several other *Arisaema* species growing in the same habitat, which, however, were described as toxic, causing the swelling of lips and tongue.

Nine species are consumed exclusively as leafy vegetables. The remaining species are used additionally either as medicine or as fodder. For example, the roots of *Acorus calamus*, *Mentha spicata*, *Sonchus oleraceus*, and *Valeriana jatamansi* are occasionally used to prepare decoctions against cold, stomachache, and diarrhea. If the leaves of *Sonchus oleraceus* are consumed as a vegetable, the first decoction is poured away, since it is too bitter. It is, however, this first decoction which can be used as medicine for a cold or stomachache. The old leaves of *Chenopodium album* and *Heracleum burmanicum* aff. are collected and cooked as pig's fodder. Multicontextual use of species, especially a continuum between medicinal and food plants, is a phenomenon found all over the world (e.g., Johns et al. 1999; Bonet and Vallès 2002; Scherrer, Motti, and Weckerle 2005) and might reflect the joint origin of human diet and medicine (Johns 1990:285–287).

Mainly two fungi, *Auricularia auricula-judae* and *Lentinula edodes*, are used fresh or dried. They occur near the villages in the vegetation along the channels. *Tricholoma matsutake* is collected for trade. It is found in the mixed pine forest and is collected during July and August by middle-aged household members. It is a highly valuable fungus and an important source of cash income for the households.

*Allium macrostemon* and *Houttuynia cordata* are the only species of which the whole plant or underground parts are consumed as vegetables.

*Chelonopsis mollissima* and *Silene napuligera* flowers are often sucked for their nectar, and occasionally flowers of *Rhododendron yunnanense* are eaten as snacks.

## CONCLUSIONS

First, in the Shuhi community ritual plants play an important role in human well-being. Both cleaning the environment of malevolent spirits and pleasing the deities are considered essential for health and are achieved by using various kinds of plants. Although ritual plants are used daily, they are preferentially collected in habitats at high altitudes close to the mountain gods. Thus, habitat selection of this plant category is strongly influenced by cultural values.

Second, the knowledge of the Shuhi regarding wild food plants is comparable with other ethnic groups in the Sino-Himalayan area. The food plants mainly consist of wild collected fruits and leafy vegetables, some of which are regularly consumed during springtime. However, medicinal plant knowledge is relatively limited, probably due to the fact that traditional Shuhi healers use ritual and other healing methods instead of medicinal plants. We therefore conclude that although the Shuhi live in an area known for its medicinal plant richness, their traditional healing system is not based on medicinal plants.

Third, all habitats from the dry shrub vegetation at the valley bottom up to the alpine shrub are used for plant collection, but 87% of all species are collected in the near vicinity of the villages, around the fields and in the dry shrub vegetation. This can be explained by convenience as well as the experience of the people that habitats close to human settlements contain a high diversity of useful plants.

Therefore we postulate two main factors influencing wild plant use of the Shuhi: cultural values and accessibility. Cultural values have a strong effect on the use and collection of ritual and healing plants, whereas accessibility is more likely to affect the utilization of plants of other categories.

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Appendix 1. Wild collected plants used by the Shuhi in Shuiluo, southwest China

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Acer</i> spp. (Aceraceae)	040607 5/1	lɔ'be	Wood	OTH, wood used to make hollow-ware and small furniture.
<i>Acorus calamus</i> L. (Acoraceae)	040612 1/1 041010 1/1	'ɕje'da	Leaves, rhizome	CUL, leaf basis cooked as vegetable. MED <sup>c</sup> , decoction of rhizome against diarrhoea.
<i>Acrolochin persicarioides</i> Moq. (Chenopodiaceae)	041012 1/4	njɔnjæ'ru <sup>d</sup>	Aerial parts	FOD, cooked as pig's fodder.
<i>Ailanthus vilmoritiana</i> Dode (Simarubaceae)	040607 2/4	kɛ'ise	Wood	OTH, wood used for yokes. It is not used as fuelwood, since it produces a strong smell.
<i>Albizia julibrissin</i> Durazz. (Fabaceae)	040511 7/1	'rube bæ'tse	Leaves	FOD, nutritious fodder collected for cows.
<i>Allium macrostemon</i> Bunge (Liliaceae)	040427 2/1	'dʒilæ	Bulb	CUL, used as spice.
<i>Arctium lappa</i> L. (Asteraceae)	040420 1/2	'qɔlɔbjæ	Leaves, inflorescences	FOD, pig's fodder, leaves are cut and doused with hot water. VET <sup>d</sup> , used for horses; leaves burned on coal, smoke used to cure colds. OTH <sup>e,d</sup> , inflorescences put in storage against mice.
<i>Arisaema flavum</i> Schott (Araceae)	040605 1/2	'jɔljæhæ	Leaves	CUL <sup>c</sup> , dried old leaves cooked as vegetable.
<i>Armeniaca mume</i> Siebold (Rosaceae)	040528 1/2 040421 2/2	—	Fruits	CUL, edible fruits collected.
<i>Artemisia</i> cf. <i>divaricata</i> (Pamp.) Pamp. (Asteraceae)	050401 1/7	bæ / bæ'hɔ	Roots	MED/CUL, root used as ingredient of the "white rings", which are used to prepare barley wine.
<i>Artemisia</i> sp. (Asteraceae)	—	bæ'ni <sup>d</sup>	Aerial parts	OTH, used for cleaning (broom).
<i>Aster lanandulifolius</i> Hand.-Mazz. (Asteraceae)	040529 1/1	a dʒɔ'garbu	Branches	RIT, fresh branches can be used as incense.
<i>Bauhinia brachycarpa</i> Wall. (Fabaceae)	040530 4/5	'rɔdʒi'si	Branches, wood	FOD, sometimes collected for animals. FUE, used as fuelwood.
<i>Benula platyphylla</i> Sukaczew (Betulaceae)	050405 1/1	wɔ'gi	Branches	RIT <sup>e,d</sup> , used by ritual specialist.
<i>Buddleja</i> cf. <i>crispata</i> Benth. (Buddlejaceae)	050314 3/1	'ɕipæ	Branches	FOD, collected for animals.
<i>Buddleja</i> cf. <i>officinalis</i> Maxim. (Buddlejaceae)	050314 2/1	'ɕipæ	Branches	FOD, collected for animals.
<i>Calyptegia hederacea</i> Wall. (Convolvulaceae)	050401 1/1	'bjæburu'ʒi: / 'ræ:æ	Leaves	CUL <sup>c</sup> , young leaves cooked as vegetable.
<i>Campylotropis polyantha</i> (Franch.) Schindl. (Fabaceae)	050401 2/1	—	Branches	FOD, collected for animals.
<i>Catalpa bungei</i> C.A.Mey. (Bignoniaceae)	040614 1/1	'tsembu	Wood	OTH <sup>e</sup> , wood used to make furniture.

## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
cf. <i>Lancea tibetica</i> Hook.f. & Thomson (Scrophulariaceae)	040510 4/2	bagi <sup>r5d</sup> / d3arabu <sup>hu</sup>	Leaves	CUL <sup>c,d</sup> , young leaves cooked as vegetable.
<i>Chelonopsis mollissima</i> C.Y. Wu (Lamiaceae)	040604 2/1 040611 1/1 050315 1/1	'h3ipæ	Flowers, branches	CUL, nectar can be sucked. OTH <sup>c</sup> , branches can be spread on the fields as fertilizer.
<i>Chenopodium album</i> L. (Chenopodiaceae)	040530 5/3 040516 1/3	n <sup>1</sup> mu	Leaves, aerial parts	CUL, young leaves and shoots cooked as vegetable. FOD, cooked as pig's fodder.
<i>Clematis connata</i> DC. (Ranunculaceae)	040530 2/2	'gm3r	Branches	FOD, sometimes collected for animals.
<i>Clematis parviflora</i> Gardn. & Champ. (Ranunculaceae)	040613 1/1	'gm3r	Branches	FOD, collected for animals.
<i>Colutea delavayi</i> Franch. (Fabaceae)	040603 1/1 041012 2/1	'b3ba / d3u3d3a <sup>s3</sup> / 'd3ad3æ	Branches	FOD, collected for animals. OTH, can be used as fertilizer; the fresh branches are distributed in the stable and mixed with manure.
<i>Coriaria nepalensis</i> Wall. (Coriariaceae)	040523 1/2 050314 4/2 050315 1/2	gu3s3	Wood, branches, leaves	FUE, used as fuelwood. OTH, branches as fertilizer. Decoction of leaves used as insecticide.
<i>Cornus capitata</i> Wall. (Cornaceae)	040522 1/1	'l3axa	Fruits, branches, wood	CUL, edible fruits collected. RIT, used by ritual specialist. FUE, used as fuelwood. OTH, branches used as broom.
<i>Cornus macrophylla</i> Wall. (Cornaceae)	040524 1/2 040608 1/2	bu <sup>1</sup> : 'd3æ	Wood	RIT, used by ritual specialist. FUE, fuelwood. OTH, used to make handles of tools.
<i>Cornus oblonga</i> Wall. (Cornaceae)	040419 1/1 040523 2/1 040611 3/2	'j3unga	Branches	RIT, used in various kinds of rituals and as decoration to invite the deities.
<i>Cotoneaster buxifolius</i> Wall. ex Lindl. (Rosaceae)	050401 2/5	'endu3s3	Wood, branches,	FUE, fuelwood. OTH, branches used for making baskets.
<i>Cotoneaster pannosus</i> Fra. (Rosaceae)	040614 3/1	'enda	Branches	RIT, used by ritual specialist to drive out ghosts (only in case of death).
<i>Cupressus funebris</i> Endl. (Cupressaceae)	040430 1/1 050401 4/1	'j3ula <sup>1</sup> , pæ [tree] / 's3ues3ue [wood] / 'ju <sup>1</sup> g3i	Wood, branches	RIT, dry wood and rarely the branches used as incense.
<i>Cynoglossum wallichii</i> G. Don (Boraginaceae)	040426 2/5	tsua <sup>1</sup> gæ <sup>1</sup> numæ <sup>1</sup> d33i	Aerial parts	FOD, collected for animals.

## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Datura stramonium</i> L. (Solanaceae)	040607 1/1	tsu'xu	Seeds	MED <sup>c</sup> , smoke of seeds against toothache.
<i>Debregeasia orientalis</i> C.J.Chen (Urticaceae)	040512 4/1 040529 2/1 050401 1/10	kwæ'mu	Fruits, bark	CUL, fruits edible, eaten as snack. OTH, bark used to make cords.
<i>Deutzia monbeigii</i> W.W.Sm. (Hydrangeaceae)	040523 3/2	ʒiti'si <sup>d</sup> / 'ɣipæ bu'hu	Fruits	CUL <sup>d</sup> , fruits edible, eaten as snack.
<i>Diospyros dumetorum</i> W.W.Sm. (Ebenaceae)	050401 1/4	budʒjuə'ise	Fruits	CUL, fruits eaten as snack.
<i>Diospyros lotus</i> L. (Ebenaceae)	040523 3/1	'dʒjuə'si	Fruits, wood	CUL, fruits eaten fresh or dried. FUE, used as fuelwood.
<i>Ehretia corylifolia</i> C.H.Wright (Boraginaceae)	040613 3/2	kwat'ɔ	Branches, wood	FOD, collected for animals. FUE, used as fuelwood. OTH, wood used to prepare tools.
<i>Elaeagnus umbellata</i> Thunb. (Elaeagnaceae)	050401 2/4	sapapa'sæ	Fruits	CUL, fruits are edible.
<i>Elymus</i> cf. <i>dahuricus</i> Turcz. (Poaceae)	041012 1/3	ʒi	Aerial parts	FOD, collected and dried as fodder during the winter.
<i>Epilobium hirsutum</i> L. (Onagraceae)	040627 1/2 040420 1/1	'rɔ'sa hɔ	Leaves	CUL, fresh young leaves and shoots eaten as salad together with chili.
<i>Eupatorium heterophyllum</i> DC. (Asteraceae)	040610 3/1	'rwaɓjægu	Aerial parts	OTH, used for cleaning (broom).
<i>Excoecaria acerifolia</i> F.Didr. (Euphorbiaceae)	040426 1/1 050401 1/9	'agu,bjæ	Leaves	MED, decoction of leaves against intestinal parasites.
<i>Fagopyrum dibotrys</i> (D. Don) Hara (Polygonaceae)	040611 2/1 041012 1/5	njæ:'zæ	Aerial parts	FOD, collected for animals.
<i>Ficus sarmentosa</i> Buch.-Ham. ex Sm. (Moraceae)	040607 4/1 041012 1/2	'bɔ:du:sɪ / tsæ'ɪp dʒjuə'dʒjuə	Fruits, branches	CUL, fruits eaten as snack or cooked together with rice. FOD, branches collected as fodder for goats.
<i>Galinsoga parviflora</i> Cav. (Asteraceae)	040520 3/3	'plɪnʒɔ:dʒæ	Aerial parts	FOD, collected for animals.
<i>Galium asperuloides</i> Edgew. (Rubiaceae)	040520 1/4	bɪdʒjɔ'ru <sup>d</sup> / 'gɪmər / dʒɔ:ruŋjɔ	Aerial parts	FOD, collected for animals.
<i>Glycyrrhiza yunnanensis</i> Cheng f. & L.K.Tai ex P.C.Li (Fabaceae)	040523 4/1	'kula:dʒjuə'dʒjuə <sup>d</sup>	Branches	FOD, collected for animals. OTH, can be used as fertilizer.
<i>Gnaphalium affine</i> D. Don (Asteraceae)	040426 1/2	bɪ'ɸu'jæ'ku / 'ɸju'bu'hu / 'dʒarabu hu	Aerial parts	FOD, collected for animals.

## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Hedera nepalensis</i> K. Koch. (Araliaceae)	040513 1/1	'tsasi / tsæ'xɔ	Fruits	OTH, fruits used to make necklaces.
<i>Hemistepta lyrata</i> Bunge (Asteraceae)	040510 1/1	dʒu: dʒa / nju'xɔ	Roots	MED <sup>c</sup> , decoction of dried root pieces drunk against inflammations.
<i>Heracleum</i> cf. <i>burmanicum</i> Kurz (Apiaceae)	041012 1/1	bi:dʒja'ru <sup>d</sup>	Leaves	CUL <sup>d</sup> , young leaves cooked as vegetable. FOD <sup>d</sup> , old leaves used as pig's fodder.
<i>Houttuynia cordata</i> Thunb. (Saururaceae)	040530 3/1	'borradʒy	Aerial parts, rhizome	CUL, fresh plant parts as salad (including rhizome).
<i>Hypericum patulum</i> Thunb. (Clusiaceae)	040604 3/1	'dʒja rami'du	Aerial parts	FOD, collected for animals.
<i>Ichmanthus</i> sp. (Poaceae)	050401 1/15	tsæ'hɔ	Aerial parts	FOD, collected for animals.
<i>Ilex centrochinensis</i> S. Y. Hu (Aquifoliaceae)	040512 1/1 050314 1/1	'gujwædʒɔ	Branches	OTH <sup>c</sup> , used to clean the ceiling before Tibetan New Year (broom).
<i>Incarvillea arguta</i> Royle (Bignoniaceae)	040510 5/1 040601 3/1	dʒjuə'ʃi	Aerial parts	CUL, pith edible, as snack in the fields. FOD, collected for animals. OTH, used for cleaning (broom).
<i>Itea yunnanensis</i> Franch. (Saxifragaceae)	040521 1/4	'gujwædʒɔ	Branches	OTH <sup>c</sup> , used to clean the ceiling before Tibetan New Year (broom).
<i>Juncus seichuensis</i> Buchenau (Juncaceae)	040520 2/1	dʒje jumjæ'xu / 'jars	Aerial parts	FOD, collected for animals.
<i>Juniperus</i> spp. (Cupressaceae)	040524 4/1	'xua	Branches	RIT, dried branches used as incense.
<i>Koeleria cristata</i> Pers. (Poaceae)	040520 2/2	mazebjæ'ksu <sup>d</sup> / ʒi	Aerial parts	FOD, collected for animals.
<i>Koeleria paniculata</i> Laxm. (Sapindaceae)	040609 1/4	tjæ'ʃi	Wood	OTH <sup>c</sup> , wood can be used for furniture.
<i>Leycesteria formosa</i> Wall. (Caprifoliaceae)	040510 3/1	dʒje ubjæ'xu	Leaves, roots	MED <sup>c</sup> , decoction of leaves and roots as tonic for elders.
<i>Ligustrum compactum</i> (Wallich ex G. Don) J. D. Hooker & Thomson ex Brandis (Oleaceae)	040605 1/3	'luxɔ'si <sup>d</sup> / ulimə'hɔ <sup>d</sup> / 'salmidʒɔ <sup>d</sup>	Branches, wood	FOD, branches collected for goats. FUE, used as fuelwood.
<i>Lonicera chrysantha</i> Turcz. (Caprifoliaceae)	040521 1/2 040530 2/1 040608 5/2	'bjæ	Branches	RIT, used by ritual specialist.
<i>Mahonia bracteolata</i> Takeda (Berberidaceae)	040419 2/1	'ra : ittsagi	Roots, branches	MED, decoction of roots against diarrhoea. Used for trade in the past (Chinese medicine). RIT, used by ritual specialists to drive out ghosts.
<i>Malva verticillata</i> L. (Malvaceae)	050401 1/2	dʒja'kɔ	Aerial parts	OTH <sup>c</sup> , used to wash clothes.



## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Menha spicata</i> L. (Lamiaceae)	040627 1/4	'hiʃju / 'uʃɪ	Leaves, roots	CUL, fresh leaves as spice or salad. MED <sup>c</sup> , decoction of roots and leaves as digestive and against cold, cough and sore throat. Fresh leaves chewed against gingival problems.
<i>Morus alba</i> L. (Moraceae)	040511 3/1 040511 6/2	ke'si	Fruits, leaves, wood	CUL, edible fruits collected. FOD, leaves are used as fodder, especially for milk cows. OTH, the wood is elastic and used to prepare various tools such as rakes or drums; trees are planted around sacred springs to please the deities.
<i>Myrsine africana</i> L. (Myrsinaceae)	040419 1/3	'gɪlɪbjəgu	Branches	OTH, used for cleaning (broom).
<i>Novelia insignis</i> Franch. (Asteraceae)	040521 1/5	wo'pɪɪ / wo'ʃɪpə	Branches	FOD, collected for cows.
<i>Opuntia ficus-indica</i> (L.) Mill. (Cactaceae)	040522 1/2	'umlaba	Fruits, succulent stems	CUL, edible fruits collected. MED, fruits eaten against lung problems. FOD, spines of succulent stems burned over the fire, than cooked for pigs. OTH, planted as fence.
<i>Oxyris quadripartita</i> Salzm. ex Decne. (Santalaceae)	040529 1/2 040502 1/1 050402 1/1	'agr / a'garru	Branches	RIT, fresh branches can be used as incense.
<i>Oxyria digyna</i> Hill (Polygonaceae)	040426 2/2	bi:'xa <sup>d</sup> / ra'ɟɪ / ba'hæ / 'ralhɪ	Leaves	FOD, pig's fodder, leaves are cooked in water.
<i>Paeonia delavayi</i> Franch. (Paeoniaceae)	040421 2/5 040615 1/1	'mi:dʒɪjəgɔ̃ɪ	Roots	MED <sup>c</sup> , roots collected for trading (Traditional Chinese Medicine).
<i>Perya phyllicoides</i> Jeffrey (Asteraceae)	040522 2/1	'ændi <sup>d</sup> / rabjæ'ku <sup>d</sup> / ɟɟɟjæ'gu	Branches, wood	FUE, used as fuelwood. OTH, branches used for fences.
<i>Philadelphus purpurascens</i> (Kochme) Rehder (Saxifragaceae)	040615 1/1	watə'si	Wood	FUE, used as fuelwood.
<i>Phyllostachys</i> sp. (Poaceae)	040521 1/1	ʃæ:'xu	Branches	RIT, used in various kinds of rituals as decoration to invite the deities. OTH, preparation of baskets.
<i>Pinus yunnanensis</i> Franch. (Pinaceae)	040602 5/1	'tɔ̃ru [branch] / tɔ̃:'si [tree]	Branches, leaves, wood	RIT, fresh branches burned as incense and used for decoration of altars and sacred places. Branches wrapped with a prayer flag stuck in the middle of new fields to keep insects and animals away. OTH, old leaves used as fertilizer. Wood used for construction of the houses and to prepare furniture. Wood pieces used as torches and for the morning ritual fire. Not used as fuelwood, since it produces too much smoke.
<i>Pistacia weinmannifolia</i> Poiss. ex Franch. (Anacardiaceae)	040419 1/2 040611 5/1	'igi	Branches	RIT, used in various kinds of rituals as incense and decoration. snack in the middle of new fields together with pine and/or some flowers to keep insects and animals away and assure a good growth.

## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Pittosporum heterophyllum</i> Franch. (Pittosporaceae)	050401 2/3	tsobjetsæ'sæ	Leaves	FOD, collected as fodder.
<i>Plantago asiatica</i> L. (Plantaginaceae)	-	dʒil'hi	Aerial parts	MED <sup>c,d</sup> , decoction used against cold and as tonic.
<i>Polygonatum cirrhifolium</i> Royle (Liliaceae)	040511 5/1 040515 1/1	tskæ'mu / jje'mu / gwæ'wæ <sup>d</sup>	Rhizome	MED <sup>c</sup> , decoction of rhizome drunk for wound healing. Also collected for trading (Chinese Medicine).
<i>Prinsepia utilis</i> Royle (Rosaceae)	040421 2/1	'jodatsagi	Seeds, branches	MED <sup>c</sup> , seeds collected for trading (oil production, Chinese medicine). OTH, spiny branches used for fences and to block gaps in hedges against animals.
<i>Prunus</i> sp. (Rosaceae)	050401 1/12	buxa'tsæ	Leaves, fruits	MED, fruits sometimes sold. FOD, pig's fodder.
<i>Pyraeantha angustifolia</i> C.K.Schneid. (Rosaceae)	040520 1/3	'bšhutsa'gi	Fruits	CUL, fruits edible, eaten as snack.
<i>Quercus</i> cf. <i>cocciferoides</i> Hand.-Mazz. (Fagaceae)	040609 1/2 040608 1/1 040518 1/12	'disi [tree] / 'diru [branch] / 'dihū	Branches, wood	OTH, can be used as fodder and fertilizer. FUE, wood used as fuelwood.
<i>Quercus</i> cf. <i>spinosa</i> David ex Franchet (Fagaceae)	040609 1/1 040518 1/4 040518 1/5	'bahū	Branches, wood	OTH, can be used as fodder and fertilizer. FUE, wood used as fuelwood.
<i>Quercus dentata</i> Thunb. (Fagaceae)	040609 2/1 040518 1/2	lu'si	Leaves, branches	FOD, OTH, fresh leaves are put in the stable as fodder and fertilizer. During the winter the dried leaves are collected and put in the stable. FUE, wood used as fuelwood.
<i>Quercus gvajavifolia</i> H.Lév. (Fagaceae)	040609 1/3 040609 2/6 040518 1/3 040518 1/8	bjæ:'jæ	Branches, wood	RIT, fresh branches can be used as incense, if no other plants are available. FUE, wood used as fuelwood. OTH, most important fertilizer; large amounts of fresh branches are distributed in the stable. After several months the fertilizer, consisting of leaves, straw, and manure, is brought to the fields and piled up for some additional months.
<i>Quercus monimotricha</i> Hand.-Mazz. (Fagaceae)	040609 2/2 040609 2/5 040518 1/7	'bjæ:tsa,ræ	Branches	OTH, can be used as fodder and fertilizer.
<i>Quercus rehderiana</i> Hand.-Mazz. (Fagaceae)	040609 2/3 040518 1/1	'nɔʃi	Wood	FUE, used as fuelwood.
<i>Randia lichiangensis</i> W.W.Sm. (Rubiaceae)	040511 5/3	tsu'si	Leaves	OTH, ghost plant, should not be cut.
<i>Ranunculus chinensis</i> Bunge (Ranunculaceae)	040511 1/1	sa'pæ	Leaves	OTH <sup>c</sup> , leaves used to prepare toys.

## Appendix I (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Rhamnus gilgiana</i> Heppeler (Rhamnaceae)	040513 1/2, 050401 1/6, 050401 2/6, 040613 3/1	'ɰnu / gɔnjæse	Fruits, branches	CUL, fruits eaten as snack. RIT, branches used by the ritual specialist.
<i>Rhododendron decorum</i> Franch. (Ericaceae)	040422 1/1 040621 2/3	mɔ:gi	Branches, leaves	RIT, as incense for ritual cleaning. Dumbu use the leaves to remember the chanting text.
<i>Rhododendron trichostomum</i> Franch. (Ericaceae)	040502 1/3 040608 7/1	'sigæ	Branches	RIT, dried branches used as incense.
<i>Rhododendron yunnanense</i> Franch. (Ericaceae)	040422 1/2	ræ:ɬæbu'hu / ræʒɬabu'hu	Flowers, branches	CUL, fresh flowers edible (as snack in the forest). ORN, on the altar as decoration and grant for a good rice harvest. OTH <sup>c,d</sup> , branches can be used as fertilizer. Infected rice can be separated with fresh branches to avoid contamination of the remaining field.
<i>Rosa soulieana</i> Crepin (Rosaceae)	040511 1/2	tsa'gi	Fruits, flowers	MED, decoction of dried fruits and flowers against stomach ache.
<i>Roscoea tibetica</i> Batalin (Zingiberaceae)	040608 2/1	'tsəkwæ: <sup>d</sup> / 'tsəru <sup>d</sup>	Leaves	CUL <sup>c,d</sup> , young leaves cooked as vegetable.
<i>Rubus parvifolius</i> L. (Rosaceae)	040512 1/2	naratsa'gi	Fruits	CUL, fruits are edible, collected for young children.
<i>Rumex nepalensis</i> Spreng. (Polygonaceae)	040426 2/1 041010 1/3	ra'dzy	Roots, leaves	MED <sup>c</sup> , decoction of roots against obsipation. FOD, pig's fodder, leaves are cooked in water.
<i>Sageretia pycnophylla</i> C.K.Schneid. (Rhamnaceae)	040613 2/1 050401 1/13 041012 2/2 040606 1/1	'gubutsa gi	Fruits, branches	CUL, fruits eaten, sometimes collected. RIT, branches used by the ritual specialist.
<i>Salix babylonica</i> L. (Salicaceae)	040605 1/5	njæ'ɰ	Whole plant	ORN, cultivated along channels.
<i>Salix cheilophila</i> C.K.Schneid. (Salicaceae)	040605 1/6 040608 5/1 040614 2/1	ra'gi / ra'dzywo	Branches, bark	RIT <sup>c</sup> , branches used by the ritual specialist. OTH, bark used to make cords.
<i>Salix</i> sp. (Salicaceae)	040608 1/3	'tsəxɔ'ʂ / 'sɪxə <sup>d</sup> / 'tu:ɰu	Branches	FOD, collected for goats.
<i>Secamone likiangensis</i> Tsiang (Asclepiadaceae)	040511 2/1 040608 6/1	m'dʒ: <sup>d</sup> / 'gɰmɔr	Aerial parts	FOD <sup>c,d</sup> , pig's fodder, aerial parts cooked in water.
<i>Silene napuligera</i> Franch. (Caryophyllaceae)	040426 2/4	dʒəbu'hu / 'ɰudʒəbu'hu	Flowers, aerial parts	CUL, nectar can be sucked. FOD, pig's fodder, aerial parts are cooked in water.
<i>Solanum lyratum</i> C.P.Thunberg ex A.Murray (Solanaceae)	040510 5/2	ge:nar	Aerial parts	FOD, collected for animals.

## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Sonchus oleraceus</i> L. (Asteraceae)	040426 2/3 050401 1/3	du	Leaves, roots	CUL, young leaves cooked as vegetable, first decoction is poured away. MED, first decoction of leaves and roots against cold and stomach ache.
<i>Sophora davidii</i> Kom. ex Pavol. (Fabaceae)	040511 4/1 040611 3/1	adʒətsə ʒr	Wood	FUE, used as fuelwood.
species unknown	050401 1/14	tuswæːsə	Fruits	OTH, skin of fruits used for washing.
<i>Stellaria media</i> (L.) Vill. (Caryophyllaceae)	050401 1/8	ˌratsəkətse	Aerial parts	CUL, aerial parts cooked as vegetable.
<i>Taraxacum officinale</i> agg. (L.) Weber (Asteraceae)	040614 1/5 041010 1/2	dʒuːdʒa / kʊŋkəˈtse <sup>d</sup>	Leaves	CUL, young leaves eaten fresh or cooked as vegetable.
<i>Terminalia franchetii</i> Gagnep. (Combretaceae)	040511 6/1 040613 3/3 040607 1/2	piˈtu	Wood, bark	FUE, used as fuelwood. OTH, bark used to make cords.
<i>Toona sinensis</i> M. Roem. (Meliaceae)	040427 1/1	səːˈru	Leaves	CUL, very young leaves fresh or cooked as vegetable.
<i>Torilis japonica</i> (Houttuyn) DC. (Apiaceae)	040426 2/7	numuːdʒi	Aerial parts	FOD, collected for animals.
<i>Tussilago farfara</i> L. (Asteraceae)	050314 2/3	dʒyudʒabuˈhu <sup>d</sup>	Leaves	MED <sup>c,d</sup> , decoction used against stomach ache.
<i>Urtica urens</i> L. (Urticaceae)	040520 1/2 040529 2/1	ˈnʲæpuː <sup>d</sup> / ˈnips <sup>d</sup>	Aerial parts	FOD <sup>c</sup> , pig's fodder, aerial parts cooked in water.
<i>Vaccinium fragile</i> Franch. (Ericaceae)	040518 1/9 040609 2/4	dʒyudʒjuə / tsidʒjuə	Leaves, fruits	CUL, leaves as tea ( <i>Camellia sinensis</i> ) substitute; fruits eaten as snack.
<i>Valeriana jatamansi</i> Jones (Valerianaceae)	040426 1/5 050314 2/2	dʒuːdʒa / ˈhulhi <sup>d</sup>	Leaves, roots	CUL, young leaves cooked as vegetable; root used as ingredient of the "white rings", which are used to prepare barley wine. MED, decoction of fresh or dried roots against stomach ache.
<i>Viburnum cylindricum</i> Buch.-Ham. ex D. Don (Caprifoliaceae)	040523 1/1 040610 2/1	hwiːsi	Leaves	OTH, leaves have a waxy epidermis and can easily be used to engrave notes.
<i>Vitex yunnanensis</i> W. W. Sm. (Lamiaceae)	040515 1/11 040525 1/1	ˈwəgəʒʒjuə dʒjuə / ˈnɪnb <sup>d</sup> / ˈpneb <sup>d</sup> / ˈljegidʒjuə dʒjuə	Fruits	CUL, fruits edible, eaten as snack.
<i>Vitis betulifolia</i> Diels & Gilg (Vitaceae)	050401 1/5	genjeːtse	Fruits	CUL, fruits eaten as snack. MED, seeds sometimes sold (Chinese Medicine).
<i>Wikstroemia delavayi</i> Leconte (Thymelaeaceae)	040429 3/1 040502 1/2 040611 3/3 050401 2/1	raˈju / ˈraimdu	Branches	MED <sup>c,d</sup> , decoction analgetic, externally applied. OTH <sup>c</sup> , cooked and mixed with clay to prepare plaster. Used to make cords. People often form loops with living branches on the shrub for good luck.

## Appendix 1 (continued)

Scientific name and botanical family	Specimen number <sup>a</sup>	Local names <sup>b</sup>	Parts used	Uses recorded
<i>Zanthoxylum armatum</i> Druce (Rutaceae)	040530 2/3	tsɿ / bit <sup>1</sup> tsɿ	Fruits	CUL, used as spice. VET, pig's medicine, not further specified.
<b>Pteridophytes</b>				
<i>Cyrtomium falcatum</i> Pr. (Pteridophyta)	040510 4/3	'dara	Whole plant	MED <sup>c</sup> , decoction of whole plant against cold.
<i>Equisetum diffusum</i> D. Don (Equisetaceae)	040520 3/4	nɿ <sup>1</sup> tsɿ	Aerial parts	FOD, collected as fodder.
<i>Pteridium aquilinum</i> (L.) Kuhn (Dennstaedtiaceae)	040513 1/3	an <sup>1</sup> gwɿ	Aerial parts	CUL, young shoots eaten as vegetable after detoxification: the shoots are cooked in water for several hours while the water is renewed three or four times. OTH, used as fertilizer on the fields.
<i>Selaginella tamariscina</i> (Beauv.) Spring (Selaginellaceae)	040511 5/4	'kwarmtu	Aerial parts	MED <sup>c,d</sup> , decoction against abdominal pain of women.
<b>Lichens</b>				
<i>Usnea longissima</i> Ach. (Parmeliaceae)	040518 1/6	ʃupu <sup>1</sup> nu	Whole lichen	MED <sup>c,d</sup> , decoction against abdominal pain of women. OTH, as cleaner for pans, cups etc.
<b>Fungi</b>				
<i>Auricularia auricula-judae</i> St. Amans (Auriculariaceae)	—	aba <sup>1</sup> 'ho <sup>1</sup> J	Aerial parts	CUL, fresh or dried cooked as vegetable. Bartering means.
<i>Astraeus hygrometricus</i> (Pers.) Morgan (Sclerodermataceae)	040518 1/14	'boʊgʊgʊ <sup>d</sup> / kapu <sup>1</sup> ʃɿ	Spores	MED <sup>c</sup> , spores used as powder to dry up blains.
<i>Lentinula edodes</i> (Berk.) Pegler (Marasmiaceae)	040610 1/1	bjæ <sup>1</sup> mu	Aerial parts	CUL, fresh or dried cooked as vegetable. Bartering means.
<i>Tricholoma matsutake</i> (Ito et Imai) Sing. (Tricholomataceae)	—	'gõrɿ	Aerial parts	OTH, collected for trade.

<sup>a</sup> The specimens were collected by Weckerle C.S., Huber F.K. and Gao F.; <sup>b</sup> Local names are transcribed according to the International Phonetic Alphabet (IPA); <sup>c</sup> Use not observed during field studies; <sup>d</sup> Species, local name or use mentioned by less than three informants; CUL, culinary use; MED, medicinal use; RIT, ritual use; FOD, fodder; VET, veterinary use; FUE, fuelwood; CON, used for construction; ORN, ornamental use; OTH, other uses.