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Graphical Abstract

Medicinal and edible plants used by the Lhoba people in Medog County, Tibet, China

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Ethnopharmacological relevance: The Lhoba people are a small, ancient, tribal ethnic group from the Himalayas and are located in the Tibet Autonomous Region of China. Medog County is rich in biocultural diversity. For a long time, Medog has been almost isolated from the outside world. The Lhoba people, who live in Medog, have maintained a relatively unique lifestyle and have accumulated rich traditional knowledge (TK), especially about medicinal and edible plants. Currently, there is very little documentation of the plants traditionally used by the local Lhoba communities.

Aim of the study: Our investigation aimed to (i) document the species of medicinal and food plants used by the Lhoba people in Medog County, Tibet, China; (ii) screen the most important plant taxa for specific medicines, and identify the aliments treated to further contribute to drug and food supplement research; and (iii) examine whether the ethnobotanical knowledge of the Lhoba is similar among different tribes and discuss traditional uses in the health practices and livelihoods of the local communities.

Methods: Ethnobotanical data were recorded through semi-structured interviews, guided field trips, and quantitative analysis. The informant consensus factor (FIC) was used as a quantitative index.

Results: Ninety-one informants (61 men and 30 women) were interviewed. A total of 75 species, including 37 medicinal plants for 14 categories of diseases and 57 edible plants from six types of food, were recorded. Among the usage types of medicinal plants, the highest FIC vaules were recorded for antidotes (FIC = 0.98), anthelmintics (FIC = 0.98), and treatments of gastrointestinal problems (FIC = 0.93). The FIC

values for different types of edible plants were very similar. The most frequently used medicinal and food plants in the studied communities are *Zanthoxylum motuoense*, *Crassocephalum crepidioides*, and *Swertia nervosa*. According to the comparative study, few differences in the use of wild plants were found. There appeared to be more overlapping species between two Lhoba tribes in Medog, named Mixingba and Miguba, with 46 (61%) comnon species, compared with the Bo'gaer tribe in Milin, which had only two (2.7%) overlapping species. This might be due to the different geographical environments, vegetation types, and different influences of other ethnic cultures.

Conclusions: The Lhoba people in Medog County, Tibet, China, have rich TK about the uses of wild plants. However, the TK is seriously threatened due to environmental degradation and acculturation, and it showed signs of being forgotten and abandoned by the younger generation. Therefore, measures are urgently needed to document and protect the TK of the uses of the wild plant resources; and (i) the most frequently used medicinal and/or edible plants; (ii) the plants used to treat the most commonly mentioned diseases; and (iii) the endemic species that are widely used in Medog, which should be assessed for their potential future as food supplements and therapeutic products.

Keywords:

Tibet; Medog; Lhoba; traditional knowledge; medicinal plants; edible plants

1. Introduction

The southeastern area of Tibet is one of the 34 biodiversity hotspots in the world (Myers et al. 2000; Mittermeier et al., 2011). The region in which Medog is located has been regarded as '*the Lotus sacred site*' by pilgrims for its diversity of traditional cultures. Medog has almost all major vegetation types in China, and is called 'the natural museum of vegetation patterns' by biologists (Sun and Zhou, 2001). Previous studies have shown that there are approximately 1819 species of seed plants in Medog (Yang and Zhou, 2015). The population living in Medog mainly consists of the Tibetan, the Monpa, and the Lhoba ethnic groups.

The Lhoba is the ethnicity with the smallest population; there are only approximately 4000 Lhoba in China, according to official records (Jian and Fang, 1992; Kang et al., 2005). The Lhoba population is composed of many different tribes, such as the Bo'gaer, Bengni, Miguba, and Mixingba. The name 'Lhoba' is derived from the Tibetan word for southerners (Chen, 2009a). The majority of the Lhoba people live in Milin, Medog, Zayu, and Lhunze Counties in southern Tibet. The Lhoba language belongs to the Tibetan-Myanmese language family, a branch of the Sino-Tibetan phylum (Chen, 2015). The Lhoba are not uniform linguistically and constitute an amalgamation of little studied dialects. In the last 50 years, having no written script, the Lhoba people kept records by notching wood or tying knots. The Lhoba people worship nature, which differs from Tibetan Buddhism (Chen, 2009a, b; Cai, 2010). They pray to the spirits, seek blessings, and believe that shamans have the power to control them (Guo, 2015; Li et al., 2015). The Lhoba people's daily life is

very traditional and mainly has relied on swidden agriculture, hunting, and wild gathering in the last 50 years. The men were mostly responsible for hunting and gathering in remote places, and the women were primarily responsible for gathering (Chen, 2009a, b, 2015). To date, some of the Lhoba tribes still mainly rely on collecting for their livelihoods. Living at the foot of the Himalayas and almost completely isolated from the outside world, the Lhoba lagged behind the rest of the world by at least 20 years (Guo, 2015; Li et al., 2015). Medog County is the last county that is not accessible by vehicle roads in China and has been virtually isolated from the outside world in the past. There are two main Lhoba tribes, the Mixingba and Miguba, who mix with the Tibetans and the Moinba (or Monpa or Menba) in this area. Wild plant resources play an important role for the Lhoba people, who still rely on the forest for products, such as foods, medicines, building materials, and firewood. In the past, the Lhoba people exchanged some valuable plants, such as those used for medicine, dyes, and weaving, to obtain necessities such as salt, clothing, and other goods and materials (Chen, 2009a, b). To date, the primary monetary income for the villagers is from the sales of nontimber forest products, such as mushrooms, medicinal plants, wild vegetables, and fruits. Thus, the Lhoba people have accumulated abundant ethnobotanical knowledge for describing and applying natural resources from long-term practice. Ethnobotanical studies concerning the Lhoba people are very limited. Only one scientific paper has been published, in which 59 species of wild plants used by the Lhoba people, who belong to the Bo'gaer tribe in Milin County, Tibet, were reported by Chun-Lin Long's group (Li et al., 2015). The

106 traditional knowledge (TK) of medicinal and food plants in the Lhoba communities in
107 Medog County has never been reported.

108 Moreover, in recent years, with new vehicle road access to the outside world, the
109 TK of wild plant uses for Lhoba communities in Medog County is no longer an
110 attraction to the younger generation. Many young people migrate to urban areas for
111 education and job opportunities. The younger generation does not use traditional
112 medicine. Many traditional medicines have been replaced by modern medical
113 techniques and drugs with the establishment of new hospitals and clinics. Moreover,
114 the Lhoba mixed with the Tibetans and the Monpa and intermarried with the Monpa.
115 To some extent, the Lhoba traditional culture has been affected by Tibetan culture,
116 Monpa culture, and Chinese culture. Consequently, only the elderly people possess
117 knowledge of herbs, and only a few people can use traditional remedies to treat illness
118 (Tangjang et al., 2011). The local people developed their own knowledge of the
119 therapeutic treatment of diseases with herbs, and their knowledge is stored only in
120 their memories (Manandhar, 1995). Because of the lack of a written language, the TK
121 is seriously threatened to owe to environmental degradation and acculturation and is
122 rapidly eroding with the death of elderly people.

123 The aim of this study was to assess the Lhoba's local knowledge related to
124 traditional plant uses in Medog County, located in the southeastern Himalayas in
125 southeastern Tibet, to understand the relationships among the different Lhoba tribes
126 and their living environments and to discuss traditional plant uses in the health
127 practices and the livelihoods of the local communities.

2. Materials and methods

2.1 Study area

Medog County lies in the southeastern Himalayas downstream of the Brahmaputra River on the windward slope of the warm airflow of the Indian Ocean and is located between latitudes 27°34′–29°56′ and longitudes 93°46′–96°05′ with a tropical and subtropical warm moist climate (Yang and Zhu, 2015). According to the official data, approximately 1600 Lhoba people lived in Medog, accounting for about 40% of the Lhoba population in China.

In November 2017 and May 2018, ethnobotanical studies were carried out. All the communities investigated (Fig. 1) are located in the Damu township, which is the main habitation of the Lhoba and the only autonomous Lhoba township in Medog County. The Lhoba population accounts for 69% of this town. The villages of Gongri and Zhucun belong to the Mixingba tribe, and the villages of Kabu and Damu belong to the Miguba tribe. Owing to the unique geographical conditions, the people who lived there were undereducated; thus, almost all the villagers are farmers and housewives. The traditional production mode of the local Lhoba is swidden agriculture in addition to hunting and wild gathering. The main staple foods are finger millet (*Eleusine coracana* (L.) Gaertn.), rice, corn, buckwheat, and other wild starch-heavy plants such as the roots of yam and the piths of palm (Chen, 2009a; Li et al., 2015).

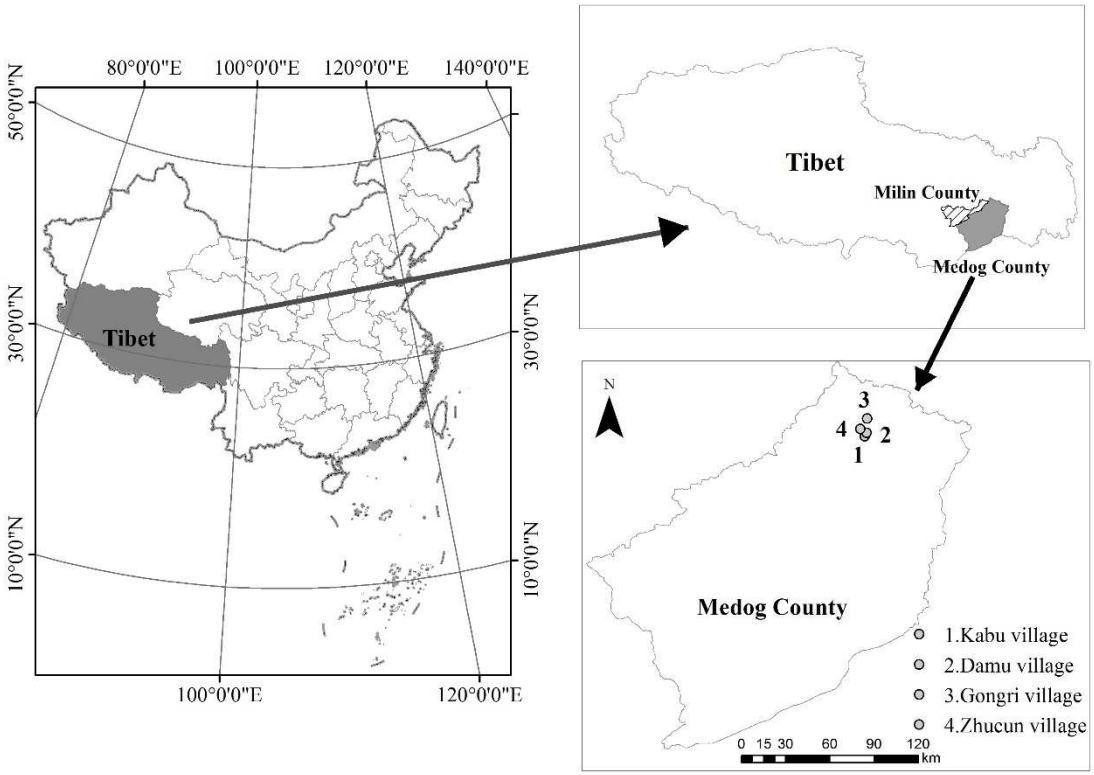


Fig. 1. Location of the study area, Medog County, Tibet, China.

2.2 Data collection

Ethnobotanical field surveys were carried out in November 2017 (dry season) and in May 2018 (rainy season). After obtaining informed consent for the TK investigation from the local government and participants based on the "*Intangible Cultural Heritage Law of the People's Republic of China* (2018)" and access and benefit-sharing (ABS) related rules (Zheng, 2019), the snowball technique was used to identify the key informants with specific knowledge, such as healers and hunters. Other informants were selected randomly during house-to-house questioning.

Semi-structured interviews and free listening were used in surveys. A total of 91 informants (60 males and 31 females), whose ages ranged between 18 and 75 years, were selected. The questions were designed to collect data on the (i) local names of the plants, (ii) use category (food or medicine) and ailments treated by the plants, (iii) parts used, (iv) methods for preparation and administration, and (v) condition of the plant material (dried or fresh). Other factors, such as the plant availability in the area (scarce, sufficient, or abundant), the harvesting season (rainy season, dry season, or year-round), the extent of the food preference (preferred, ordinary, or disliked), and the taste (wonderful, very good, good, ordinary, not tasty, or terrible), were also recorded. All the interviews were carried out in dialects spoken by visiting each respondent individually with assistance from translators and local field guides in the studied communities; we recorded the local names for the plants using Chinese Pinyin.

The plant specimens were collected with the assistance of the key informants during guided field trips, and specimens were identified by referencing *Flora of China*. The taxonomic circumscription of plant families and species followed the APG IV system (APG IV, 2016) and the information found in *The Plant List* (2019) was used to provide a uniform nomenclature. All the voucher specimens were deposited in the Key Laboratory of Economic Plants and Biotechnology, Kunming Institute of Botany, Chinese Academy of Sciences.

2.3 Data analysis and quantitative indexes

194 *2.3.1 Data analysis*

195 An inventory of the medicinal and edible plant species cited by each informant
196 was established in a spreadsheet using Microsoft Excel (Microsoft Corporation,
197 http://www.microsoft.com/). The association between the TK of the plants used for
198 medicine and food plants and the participant's demographic factors such as gender
199 and age, was tested with chi-square analysis. The statistical analysis was carried out
200 using SPSS 21 software (SPSS Science, Chicago, IL, USA) at the 5% significance
201 level ($P < 0.05$). Along with the list of plant taxa, the compiled table (see Table 1) also
202 contains the local and scientific names, family name, aliments treated, parts used, and
203 modes of preparation. Cited ailments were classified into different categories
204 according to the International Classification of Primary Care (ICPC)
205 (https://www.who.int/classification s/icd/en/), which are also accepted by the WHO
206 (Staub et al., 2015). A total of 14 disease categories and six food categories were
207 established (Table 2).

208

209 *2.3.2 Informant consensus factor (FIC)*

210 The informant consensus factor (FIC) is used to determine the importance of each
211 medicinal use category based on the homogeneity of the informant's answer (Heinrich,
212 1998). The FIC was calculated according to the following formula:

213 $FIC = (Nur - Nt)/(Nur - 1)$

214 where Nur is the number of use reports from the informants for a particular plant-use
215 category and Nt is the number of taxa or species that are used for that plant use

category for all the informants.

This index varies from 0, which indicates that the informants disagree on the species to be used within all the use categories, to 1, which indicates that relatively few species are used by a large proportion of people. The product of this factor ranges from 0 to 1. A higher value of FIC (close to 1) indicates a greater consensus on the use of a given plant to treat a particular ailment category. A lower value of FIC (close to 0) indicates that the informants disagree with the category of use of a plant (Trotter and Logan, 1986).

3. Results

3.1 Distribution of knowledge among informants

The demographic characteristics of the informants are shown in Figure 2. The number of male informants was approximately two times that of female informants, which indicated their different social roles in daily life and the dominance of the patriarchal family structure among the Lhoba. In the past, the social status of women, who were treated as property or accessories for men, was disadvantaged in Lhoba society (Chen, 2015). Men's work and women's work clearly delineated categories that men were mainly responsible for hunting and gathering in remote places; in contrast, women were primarily responsible for gathering in surrounding villages (Chen, 2009a, b, 2015). The extent of the mastery of traditional knowledge increased with age (Fig. 2). However, the chi-square test showed that there was no significant association between the number of medicinal and food species recorded and gender

($P > 0.05$) or age ($P > 0.05$).

The distribution of knowledge was heterogeneous. Most species (78.7% of the total) were mentioned by at least 10 informants; only 16 species (21.3%) were cited by less than 10 informants. Almost half of the species (45.3%) were mentioned by 50 or more informants, and 16 species (21.3%) were mentioned by all the informants (Table 1).

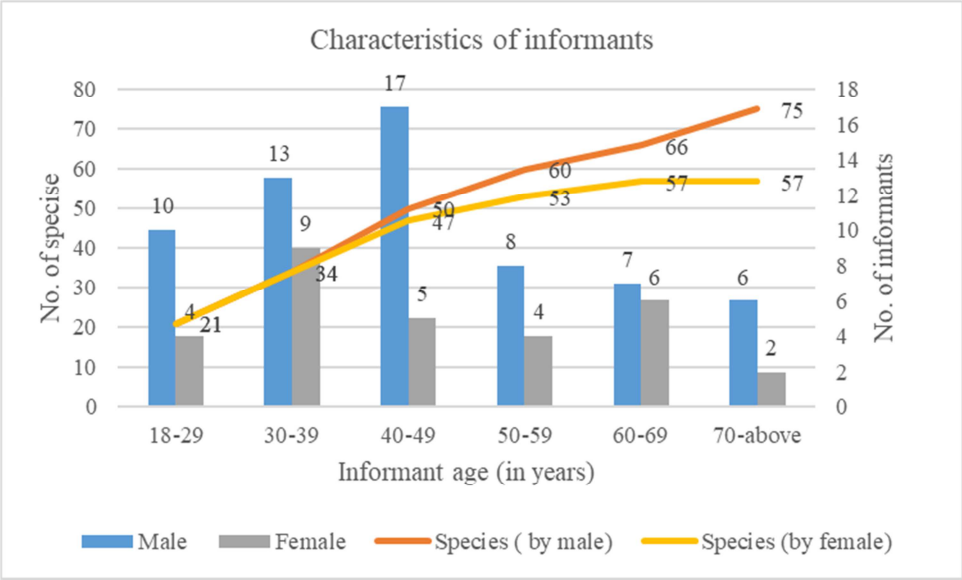


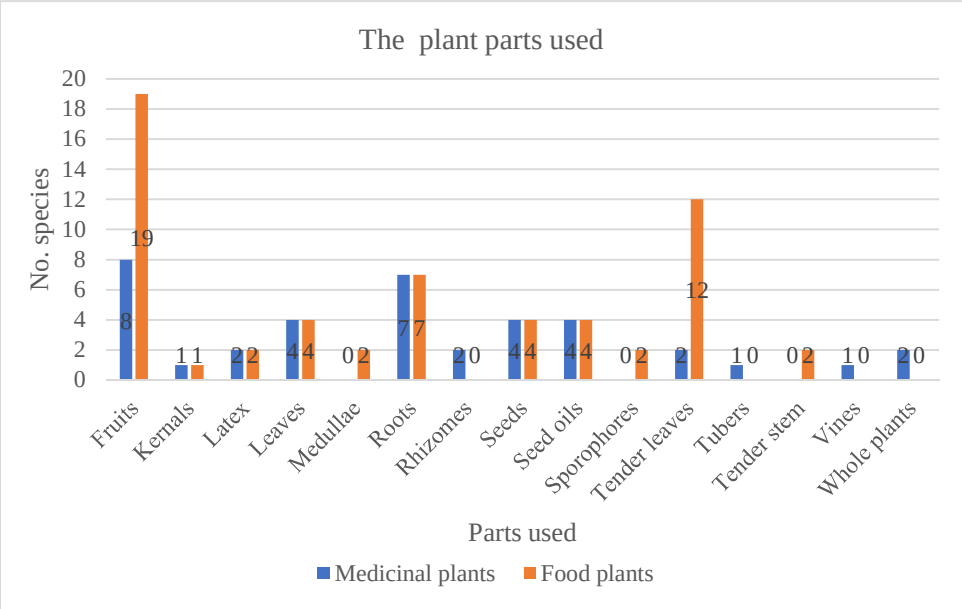
Fig. 2. Characteristics of informants: the average number of species reported by males (red) and females (yellow).

3.2 Gathering season administration and plant parts used

The wild plant gathering activities of the Lhoba people exhibit a certain seasonality. When the local people collect various types of plants, they do not perform a predatory collection of the plants, which is similar to the idea of “draining the pond to catch the fish”; instead, they are selective in their collection according to the

growth patterns of the plants and the needs of people. January and February are the main seasons for collecting bamboo shoots. From March to October, various wild fruits are collected, each of which grows in different seasons. For example, the fruits of the *Ficus. auriculata* Lour., *Ficus. semicordata* Buch.-Ham. ex Sm., and *Ficus. tikoua* Bur. plants, are usually gathered from July to September. The plants growing by the riverside are preferentially collected, followed by the plants growing by the mountains. The tender leaves, such as those from the plants of Urticaceae and Pteridiaceae, are often gathered from March to May. There are some species that the local people can collect year-round, such as *Crassocephalum crepidioides* D.Don, *Solanum nigrum* L., and *Ophiorrhiza rosea* Hook.f.

The analysis of medicinal parts and edible parts in the study area revealed that the wild plant parts recorded by local people for use were the fruits, kernels, latexes, leaves, medullae, roots, rhizomes, seeds, seed oils, sporophores, tender leaves, tubers, tender stems, vines, and whole plants (Fig. 3). The main parts used were the fruits (27%), roots (16%), tender leaves (16%), and seeds (11%). For medicinal plants, the most frequently used parts were the fruits and roots, while for food plants, fruits and tender leaves were commonly used (Fig. 3).



285

286 **Fig. 3.** The plant parts used by the Lhoba people in Medog County.

287

288 *3.3 Diversity and uses of the medicinal plants and their informant consensus factor*

289 *(FIC)*

290 A total of 37 medicinal plants belonging to 20 families and 32 genera were

291 documented for the treatment of 14 different disease types (corresponding to

292 secondary diseases), such as antidotes, cardiovascular diseases, dermatologic

293 disorders, and gastrointestinal problems (Table 2). The most cited families of the

294 medicinal plants were the Zingiberaceae (4 species) and Asteraceae (4), followed by

295 Piperaceae (3), Fabaceae (3), and Lauraceae (2).

296 Most remedies are administered orally, and decoction is the most common method

297 of preparation. The informant consensus factor (FIC) was calculated for the

298 abovementioned diseases and health-related problems (Table 2). The FIC results for

299 the 14 illness categories ranged from 0 to 0.98, and the values of the FIC were the

highest for antidotes (0.98) and parasites (0.98) and the lowest for cardiovascular diseases (0.00), infections (0.00), nervous system disorders (0.00), ophthalmic problems (0.00), and toothaches and mouth inflammations (0.00). This finding means that the medicinal plants were mainly used to treat food poisoning (3 species, 123 use reports) and anthelmintics (4, 156), followed by respiratory complaints (6, 142), gastrointestinal problems (10, 130), and skeleto-muscular system problems (9, 86). The most frequently mentioned diseases are food poisoning (0.98 FIC), parasites (0.98), and gastrointestinal problems (0.93). The most frequently cited medicinal plants for these three illness categories are *Zanthoxylum motuoense* C. C. Huang (91 informants, 423 citations), *Swertia nervosa* (Wall. ex G. Don) C. B. Clarke (91, 270), *F. auriculata* (91, 157) and *Morus macroura* Miq. (66, 96).

3.4 Diversity and uses of the food plants

Fifty-seven wild plant species, including 19 species common to both the medicinal and food plant groups, are commonly used as food in the Lhoba communities in Medog. Six secondary categories of use were cited: alcoholic beverages, dry fruits, fresh fruits, oil and seasoning, cooked vegetables, and staple foods. Informant consensus factor (FIC) values were obtained (Table 2). The most cited family for food plants was Moraceae (339 citations, 5 species), followed by Actinidiaceae (273, 3) and Piperaceae (90, 3). The most cited food plants were fruits (19 ethnospecies, 33% of all food plants). The results of this study are similar to those of studies in the neighboring regions in which fruits were recorded as wild edible

322 plants in the Sikkim Himalaya (Sundriyal and Sundriyal, 2001) and Milin County (Li
323 et al., 2015). The most frequently used food plants were *Zanthoxylum motuoense*,
324 *Crassocephalum crepidioide*s, *Ophiorrhiza rosea*, *Solanum nigrum*, *Momordica*
325 *subangulata* Blume, *Eleusine coracana*, and *Houttuynia cordata* Thunb.
326
327 4. Discussion
328 *4.1 The relationships among the different Lhoba tribes and their environments*
329 Our study documented 75 species used in traditional medicines and foods.
330 Compared our study with other comprehensive ethnobotanical studies of the Lhoba
331 people that have been performed in the neighboring areas, 59 wild species were found
332 to be used in traditional medicines, food, dyeing technologies, and religion, including
333 45 species used in traditional medicines and food, among the Lhoba people belonging
334 to the Bo'gaer tribe (Li et al., 2015). Besides, there are only two overlapping species
335 *Pteridium aquilinum* var. *latiusculum* (Desv.) Underw. ex Heller and *Senecio*
336 *scandens* Buch.-Ham. ex D. Don between the two research areas. By contrast, the two
337 Lhoba tribes in Medog, Mixingba (with a total of 65 medicinal and food plant species)
338 and Miguba (with a total of 55 medicinal and food plant species), were quite similar,
339 with 46 overlapping species in our study area. In general, the wild medicinal and food
340 plant resources that the Lhoba use in Medog County are more abundant than in Milin
341 County. These different results might be caused by the distributions of the plants.
342 Firstly, the research areas are not the same size, and the geographical, climatic
343 environments and vegetation types are outstanding different; it includes from tropical

344 to sub-tropical climate and broad-leaved evergreen forests. However, the climate type
345 in Milin County covers from temperate to cool temperate climate, and the main
346 vegetation types are coniferous-broad leaved mixed forest (Li et al., 2015). In regions
347 with different climate and vegetation, the distributions of the plants are significantly
348 different. The local people can always choose substitute species to mitigate the
349 problem of the plant distributions. For example, they can choose plants of the same
350 genus as a substitute. The fruits of the *Piper* genus are substituted for each other as
351 medicines, the fruits of the *Ficus* genus are substituted for each other, and the roots of
352 the *Dioscorea* genus are interchangeable with each other as staple foods, as reported
353 by the informants in our study area, who provide the best knowledge regarding
354 substitutions. The TK about the substitutes for the wild medicinal and food plants has
355 been passed down from generation to generation and has created a diversity of plant
356 resources in the neighboring areas. Secondly, because of the different tribes were
357 influences of the cultures of other ethnic groups. In Milin County, traffic is more
358 convenient and faster than that in Medog County, and owing to this phenomenon, the
359 Lhoba traditional culture has been deeply affected by the Tibetan culture and Chinese
360 culture. Moreover, the Lhoba's use of ethnomedicinal species has been deeply
361 influenced by traditional Tibetan medicine and Chinese medicine, and the
362 development of tourism has changed the Lhoba lifestyle and production structure. (Li
363 et al., 2015). For example, most young and mid-aged Lhoba speak the Tibetan
364 language or Mandarin Chinese, and the New Year is their major festival (Cai, 2010).
365 In our study, we found that the knowledge the Lhoba people had acquired of plants

366 from the genus *Piper* came from Tibetan medicine. The local name “Bi Bi Lin” also
367 comes from the Tibetan language.

368 Thirdly, like other ethnic groups, the Lhoba people of Medog have a significant
369 habit of cultivating useful wild plant resources in their home gardens (Gbedomon et
370 al., 2017). For example, *Zanthoxylum motuoense* is an endemic species in Medog.
371 The local people use it as a spice by mixing it with meat or vegetables to improve the
372 taste of food. To facilitate its collection and management, almost every family plants
373 it in their home garden, and all the local people know how to use it. This species
374 represents great cultural heritage and significance as a traditional source of spice
375 among the diverse minority cultures in Medog. The increased consumption of *Z.*
376 *motuoense* as a spice in recent years requires the proper conservation of this
377 economically and culturally important resource. Owing to its cultivation, this species
378 is protected, and the associated traditional knowledge is passed down from generation
379 to generation by the Lhoba people.

380 Overall, the Lhoba people follow the natural laws of plant growth with respect to
381 collecting wild plants for medicine and food. They have accumulated an abundance of
382 TK for using various parts of plants to satisfy their needs. It appears to during the
383 process by which the Lhoba traditional culture is generated through the specific
384 natural and social environment, the local people have also accumulated a rich
385 awareness and concept of environmental respect and protection.

386

387 *4.2 Current situation of the TK of medicinal and edible plants in Medog*

In this study, we found that a great variety of medicinal plants were used by village people for the treatment of numerous diseases and ailments. However, only a few people hold the TK of the plants and their medicinal properties, and there are fewer medicinal plant species than in other ethnobotanical medicinal plant studies (Tangjang et al., 2011; Nawash et al., 2013; Sivasankari et al., 2014; Baydoun et al., 2015). This may be due to several reasons. Firstly, this may be due to the small size of the Lhoba population (Li et al., 2015), which is only approximately 4000 Lhoba in China. Secondly, the TK about medicinal plants is influenced by the production method, traditional culture, and social customs. In the past 50 years, when the local people had a serious disease, they sought the shamans to help them drive away evil spirits by sacrificing livestock. In addition, the expensive sacrificial livestock was not affordable for everyone; herbs were used by the local people for common diseases. They usually eat ginger, garlic, and Sichuan pepper to treat colds (Jian and Fang, 1992). They also have a certain understanding of the necessary food supplements that correspond to the treatment of an illness, a postpartum issue, or a weakness, e.g., eating fish, chicken, or frog meat (Jian and Fang, 1992; Chen, 2009b). Thirdly, and perhaps most importantly, the people who hold this traditional knowledge have no successors.

The most frequently used medicinal plant was *Swertia nervosa*, and the most frequently used food plants were *Zanthoxylum motuoense*, *Crassocephalum crepidioides*, *Dioscorea pentaphylla*, and the *Auricularia* spp. were shown to be widely known in the entire study area and were also sold in the local market. These

wild medicinal and food plants play an important role in the socioeconomic sustainability of the local Lhoba communities. For example, *Auricularia* spp., which are collected in Medog, are a popular local specialty product in Tibet. They have been used in barter and for health improvement in the past. During the bartering season, the Lhoba people often exchange fungi for salt in the Tibetan area (Chen, 2009b). The exchange of wild products is still the main income source for the local people whose traditional livelihood has not changed until recently leading to the TK of the most frequently used medicinal and food plants being retained and inherited. Moreover, the Lhoba people collect wild plants to substitute for foods, especially during times of famine; they always choose substitutes with a high starch content for staple foods plants. There are some species, such as *Eleusine coracana*, *Chenopodium giganteum* D. Don, and *Arenga pinnata* (Wurmb) Merr., that are traditional staple foods for the Lhoba. At first, these plants were substitutes for other foods, but then, as time progressed, the TK was passed down from generation to generation. However, in recent years, with the development of society and economy and new vehicle road access to the outside world, compared with traditional lifestyles and knowledge, modern lifestyle and new cultural ideas are more attractive to the younger generation. Except for those species widely known and now still sold in the local market, the younger generation does not use the medicinal and food plant resources. The associated TK is threatened by the absence of successors.

4.3 Efficacy of the most frequently cited medicinal plants

Z. motuoense, *S. nervosa*, *F. auriculata*, and *M. macroura* were the most highly cited medicinal plant species for the most commonly mentioned illness categories, such as food poisoning, parasites, and gastrointestinal problems. Their known phytochemistry demonstrates their relevant pharmacological activities, as briefly reviewed below. In this study, *Z. motuoense* was the most cited medicinal plant for treating food poisoning; its fruits mixed with food can relieve food poisoning. The genus *Zanthoxylum* contains approximately 250 species, and there are some species that are widely consumed as a spice in Asia. Phytochemical studies have indicated that coumarins, alkaloids, triterpenoids, steroids, and flavonoids are the main components of this genus (Negi et al., 2011), and its essential oil has been shown to be antibacterial (Nissanka et al., 2001; Zhu, 2011; Misra et al., 2013), against select foodborne pathogen activities (Diao et al., 2013).

S. nervosa can be regarded as the most medicinally useful species. Aside from having the highest number of citations (270), it also accounted for the highest number of types of uses, with 8 uses in 5 disease categories. A decoction of its roots is used as a common remedy for colds (91 informants, 91 citations), diarrhea (85, 85), nausea (85, 85), arthralgia (2, 2), headaches (2, 2), eye problems (2, 2), anti-alcohol (1, 1), and food poisoning (1, 1). The highest recorded citation is for use against gastrointestinal problems (85, 170), including diarrhea and nausea. Ethnobotanical studies have shown that these usages are similar to those of the neighboring region of Nepal (Joshi, 2008). *Swertia* is a native Himalayan genus with a large ethnopharmacological significance and trade value. Within this genus, *S. chirayita* is

454 the most important species (Khanal et al., 2015). The other species of *Swertia* are
455 reported to be substitutes and alternatives to *S. chirayita* (Joshi, 2008; Khanal et al.,
456 2014). These species are known for their bitter taste and are used in traditional
457 remedies for a loss of appetite, fever, and digestive disorders (Nagalekshmi et al.,
458 2011; Khanal et al., 2014). Swertiamarin and mangiferin were detected in the
459 methanolic extracts of *S. nervosa* (Khanal et al., 2015). Mangiferin has been shown to
460 possess antiallergic effects (Rivera et al., 2006) as well as anti-inflammatory
461 properties (Saha et al., 2016). Swertiamarin has shown antinociceptive (Vaijanathappa
462 and Badami, 2009), antihyperlipidemic (Vaidya et al., 2009), gastroprotective,
463 antiulcerogenic, anticholinergic, and CNS depressant activities (Bhattacharya et al.,
464 1976; Yamahara et al., 1991; Soni and Gupta, 2009; Farrag et al., 2017). According to
465 previous studies, the Lhoba people are at a high risk for *Helicobacter pylori* infection,
466 which is associated with gastrointestinal problems (Deng et al., 2018). The
467 hydroalcoholic extract of *S. chirayita* has been shown to have a gastroprotective effect
468 on peptic ulcers that might be caused by *Helicobacter pylori* infection (Selvamathy et
469 al., 2010).

470 The bark of *F. auriculata* and *M. macroura* has been used as a vermifuge. The
471 latex of some species of *Ficus* has traditionally been used as a vermifuge in
472 neotropical regions, such as India, and Central and South America; it has been shown
473 that the anthelmintic activity is due to from a proteolytic fraction called ficin
474 (Hansson et al., 1986; de Amorin et al., 1999), a proteolytic enzyme that is able to
475 eliminate round-worms and hook-worms (Berg and Corner, 2005.). Betulinic acid was

476 isolated from *F. ovata* Vahl., another plant of the *Ficus* genus (Kuete et al., 2009).
477 Betulinic acid has been shown to possess anthelmintic properties (Enwerem et al.,
478 2001). The 80% ethanol extract of *M. macroura* fruits has been shown to possess
479 properties that prevent gastric ulcers (Farrag et al., 2017). The anthelmintic properties
480 of a plant from the same genus, *M. alba* L., have been demonstrated (Agarwal and
481 Singh, 2016).
482
483 *4.4 Notable uses of edible plants*
484 Wild plants have been reported to be related to the human diet in several studies
485 (Nunes et al., 2018), and in terms of everyday food, one of the most important
486 contributions of wild plants was as a vegetable (Aryal et al., 2018). In the Lhoba
487 communities, wild vegetables play an important role in the daily diet. The most
488 frequently collected species were *Crassocephalum crepidioides*, *Houttuynia cordata*,
489 *Momordica subangulata*, *Ophiorrhiza rosea*, and *Solanum nigrum*. Almost all the
490 informants used these wild plants to meet their daily vegetable requirements, except
491 for the species that they can gather year-round. There are three main ways to process
492 and prepare wild vegetables; the Lhoba usually eat them raw with chili pepper powder
493 (making a salad), fried with some meat or cooked with meat in a stone bowl. This
494 study is the first record of *Ophiorrhiza rosea* being used as an edible plant. This is a
495 potential medicinal species because a plant from the same genus, *Ophiorrhiza mungos*
496 L., has been shown cancer chemopreventive properties (Baskar, et al., 2011).
497 The food safety of wild edible plants is also one of the issues considered by local

498 people. Some species need specific methods of cooking. A poisonous plant, *Entada*
499 *phaseoloides*, was reported by the informants as a poison used for hunting. However,
500 the plant was also used as a food. The local people believed that the toxicity could be
501 removed by repeated boiling; they usually boiled the kernels more than nine times and
502 then cooked it mixed with other vegetables before eating it. The kernels of *E.*
503 *phaseoloides* are also widely eaten in India as a source of protein, and the local people
504 there also prepare the kernels by boiling or roasting them (Arora, 1981). The
505 rationality of this traditional processing method has been confirmed by a scientific
506 experiment. Entadamides A–C (Ikegami et al., 1985; Ikegami et al., 1987; Ikegami et
507 al., 1989), phenylacetic acid derivatives (Dai et al., 1991; Singh et al., 2011; Chen et
508 al., 2013; Xiong et al., 2017), and triterpenoid saponins (Iwamoto et al., 2012; Xiong
509 et al., 2013) are the major chemical constituents isolated from *E. phaseoloides* seed
510 kernels. The triterpenoid saponins, which had high hemolytic activity (HeU) against
511 cattle erythrocytes and caused high mortality in fish, were identified as the major
512 toxic constituents, and boiling and cooking could reduce the saponin concentration;
513 hence, the membranolytic activity could also be reduced to below toxic levels
514 (Siddhuraju et al., 2002). According to previous studies, *E. phaseoloides* seed kernels
515 are rich in protein with a well-balanced amino acid composition. The kernels could
516 serve as an inexpensive and additional protein source to alleviate protein malnutrition,
517 which is widely prevalent among the low socioeconomic portion of the population
518 (Siddhuraju et al., 2002).

519 *Crassocephalum crepidioides* is the most frequently collected species of food

plant by the Lhoba. It not only can be gathered year-round, but also has a taste preferred by the local people. It is widely used as a leafy vegetable in some areas, such as Africa, Japan, Pakistan and China (Asada et al., 1985; Kongsaeree et al., 2003; Aniya et al., 2005; Tomimori et al., 2012; Rozhon et al., 2018. As a widely used wild food plant, its chemical constituents and pharmacological activities have also received attention. It is very rich in nutrients (Arawande et al., 2013). In addition, antioxidant, hepatoprotective (Aniya et al., 2005), antimalarial (Kongsaeree et al., 2003), and antitumor activities and macrophage nitric oxide (Tomimori et al., 2012) have been reported in association with this species. However, this plant cannot be considered safe for human consumption because it possesses toxic pyrrolizidine alkaloids with considerable hepatoxic, tumorigenic and genotoxic potential (Asada et al., 1985; Chen et al., 2010; Rozhon et al., 2018).

5. Conclusion

For the first time, information about 75 species of traditional uses for medicines and foods by the Lhoba people in Medog, Tibet, China, was obtained through this study. Our results show that the Lhoba people living in this area have rich TK about the uses of wild plant resources, which might be attributed to the various climatic environments, vegetation types, and diverse influences of other ethnic cultures, and that some of the plants used are important components of both the cultural identity and livelihood strategies of households. We also found that a great variety of medicinal plants were used by villagers for the treatment of various diseases and

ailments, but only a few informants possess the TK of the plants and their medicinal properties. This traditional knowledge faces a threat because of the lack of successors.

Among the uses of medicinal plants for 14 different disease types, the highest values of the FIC were recorded for antidotes (0.98 FIC), anthelmintics (0.98), and treatments of gastrointestinal problems (0.93). The most frequently used medicinal plants were *Z. motuoense, S.nervosa* , *M. macroura,* and *F. auriculata*. There were six secondary categories of use for edible plants: alcoholic beverages, dry fruits, fresh fruits, oils and seasoning, cooked vegetables, and staple foods. The FIC values were very similar, and the most frequently used food plants were *Zanthoxylum motuoense, Crassocephalum crepidioide*s, *Ophiorrhiza rosea, Solanum nigrum*, *Momordica subangulata*, *Eleusine coracana*, and *Houttuynia cordata*.

Based on the comparison study, no differences in the use of wild plants were found among different tribes in the same region. However, the use of wild plants differed sharply among different areas, which might be attributed to the various geographical environments, vegetation types, and diverse influences of other ethnic cultures.

Medicinal and edible plants play a significant role for the Lhoba people in terms of household-level food and nutrition, as well as health care. It is essential to consider how such species can contribute to future foods and modern drugs. The most frequently used medicinal and food plants should be thoroughly investigated to determine their possible pharmacological activity.

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572 **Table 1**
573 List of the plants used by the four Lhoba communities in Medog County, Tibet,
574 China.
575
576 **Table 2**
577 Categories of use and the main quantitative results.
578
579

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Table 1

List of plants used by four Lhoba communities in Medog County, Tibet, China.

Ba = Bark, Bu = Bulbil, Bs = Bamboo shoots, Fr = Fruit, Ke = Kernal, La = Latex, L = Leaves, Me = Medulla, R = Roots, Tl = Tender leaves, Tu = Tuber, Ts = Tender stem, Vi = Vine, Se = Seeds, So = Seeds oil, Sp = Sporophore, W = Whole plant

Botanical taxon	Botanical family	Local name(s)	Voucher number	Preparation	Uses (Used part, Informants, Citations)	Total number of informants	Total number of citations	Tribe	Village
Acmella oleracea (L.) R.K. Jansen	Asteraceae	Dong Ge Ye Ma	2-037	Boiled	Food: cooked vegetables (L, 10, 10); Medicinal: diarrhea (L, 10, 10), nephralgia (L, 10,10)	10	30	Miguba/Mixingba	Kabu/Zhu cun
Alpinia malaccensis (Burm.f.) Roscoe	Zingiberaceae	Me Gen Zen Mo	2-101	Decoction	Medicinal: nephropathy (Se, R, 1, 2)	1	2	Mixingba	Gongri
Amaranthus tricolor L.	Amaranthaceae	Jia Ni	2-061	Boiled or powder	Food: cooked vegetables (L, 32, 76),	64	141	Mixingba	Gongri/Zhucun

					substitutes for staple food cooking with rice or making cakes (Se, 32, 65)				
Amomum maximum Roxb.	Zingiberaceae	Ga Guo La	2-102	Decoction	Medicinal: stomachache (R, 1, 1)	1	1	Mixingba	Zhucun
Arenga pinnata (Wurmb) Merr.	Arecaceae	Bu Rang (Gongri, Zhucun)/A Xi (Damu, Kabu)	2-018	Crushed	Food: substitutes for staple food (Me, 66, 66); made yellow wine (Me, 22, 22)	66	88	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Aristolochia griffithii Hook.f. et Thoms. ex Duch.	Aristolochiaceae	Ni Qi Jiu Gui	2-107	Decoction	Medicinal: malaria (Vi, 2, 2)	2	2	Miguba/Mixingba	Damu/Zhucun
Auricularia spp.	Auriculariaceae	Ba Mu (Damu, Kabu)/Xia Mu (Gongri, Zhucun)	2-175	Boiled or made salad	Food: cooked vegetables (Sp, 91, 182)	91	182	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Brassaiopsis simplicifolia C.B.Clarke	Araliaceae	Rong Guo	2-274	Made salad or saute	Food: cooked vegetables (In, 49, 68)	49	68	Miguba/Mixingba	Damu/Gongri

Caryota obtusa Griff.	Arecaceae	Da Ma (Zhucun)/ Da Xie (Damu)	2-080	Crushed	Food: substitutes for staple food (Me, 30, 30)	30	30	Miguba/Mixingba	Damu/Zhucun
Castanopsis ceratacantha Rehder & E.H.Wilson	Fagaceae	Ba Lang	2-215	Dry	Food: dry fruit (Se, 36, 42)	36	42	Miguba	Damu/Kabu
Chenopodium giganteum D.Don	Amaranthaceae	Da Rong	2-020	Boiled or powder	Food: substitutes for staple food cooking with rice or making flat cake (Se, 91, 91)	91	91	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Cinnamomum sp.	Lauraceae	Ru	2-054	Decoction	Medicinal: cold (Ba, 3, 3), arthralgia (Ba, 1, 1)	3	4	Mixingba	Zhucun
*Cirsium argyrancanthu*m DC.	Asteraceae	Da Ka Ce Ma	2-007	Boiled	Food: cooked vegetables (Ts, R, 43, 43); Medicinal: gastrotympanites (R, 12, 12)	43	55	Mixingba	Damu
Citrus medica L.	Rutaceae	Xeng Gen	2-044	Decoction or raw	Food: fresh fruit (Fr, 48, 48); Medicinal: cold	48	90	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun

					(Fr, 42, 42)				
Colocasia esculenta (L.) Schott	Araceae	Ya	2-049	Boiled	Food: cooked vegetable (Tu, 1, 1); Medicinal: stomachache (Tu, 1, 1), diarrhea (Tu, 1, 1)	1	3	Mixingba	Zhucun
Crassocephalum crepidioides (Benth.) S. Moore	Asteraceae	Jia Ga Dong Ba (Kabu, Zhucun)/Jia Dong (Damu,Gongri)	2-060	Boiled	Food: cooked vegetables (Tl, 91, 273); Medicinal: fractures (Tl, 4, 4), dyspnea (Tl, 4, 4)	91	281	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Curculigo capitulata (Lour.) O. Ktze.	Amaryllidaceae	Juo Jie (Damu)/Dai er (Kabu)	2-024,2-213	Raw	Food: fresh fruit (Fr, 70, 70)	70	70	Miguba	Damu/Kabu
Curcuma longa L.	Zingiberaceae	Da Se	2-057	Decoction and crushed	Medicinal: diuretic (R, 3, 3), laxative (R, 3, 3), wounds (R, 3, 3)	3	9	Mixingba	Zhucun
Datura stramonium L.	Solanaceae	Lang Que Nie Ba	2-128	Incineration	Medicinal: toothache (Se, 2,	2	2	Miguba	Kabu

					2)				
Dendrocalamus sp.	Poaceae	A Ze	2-221	Boiled	Food: cooked vegetables (Bs, 43, 105)	43	105	Miguba	Damu/Kabu
Dioscorea bulbifera L.	Dioscoreaceae	Ang La	2-048	Boiled	Food: cooked vegetables (Bu, R, 3, 6)	3	6	Mixingba	Zhucun
Dioscorea kamoonensis Kunth	Dioscoreaceae	Yang Gi	2-047	Boiled	Food: cooked vegetables (Bu, R, 3, 6)	3	6	Mixingba	Zhucun
Dioscorea pentaphylla L.	Dioscoreaceae	He Xia	2-013	Boiled or toasted	Food: substitutes for staple food (R, 91, 182)	91	182	Miguba/Mixingba	Damu/Kabu/Gongri
Elaeagnus nanchuanensis C. Y. Chang	Elaeagnaceae	Jia Ga Mu	2-218	Raw	Food: fresh fruit (Fr, 43,43)，mixing with Tsam-pa (Fr, 25,25)	43	68	Miguba/Mixingba	Damu/Gongri
Elaeocarpus varunua Buch.-Ham ex Masters	Elaeocarpaceae	A Ru Ra	2-034	Raw	Food: fresh fruit (Fr, 42, 42); Medicinal: food poisoning (Ke, 42, 42), arthralgia (Fr, 2, 2), lumbago (Fr,	42	88	Miguba/Mixingba	Damu/Kabu

					1, 1), leg pain (Fr, 1, 1)				
Eleusine coracana (L.) Gaertn.	Poaceae	Mei Jia	2-021	Power and boiled	Food: staple food (Se, 91, 91), made yellow win (Se, 91, 91)	91	182	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Entada phaseoloides (L.) Merr.	Fabaceae	Bong Ji	2-046	Boiled more than 9 times as vegetables; Boiled more than 8 times as medicinal; Crushed and mixed with other two plants as poison arrow；Raw (made a dog collar) as veterinary drug	Food: cooked vegetables (Ke, 46, 46); Medicinal: anthelmintic (Ke, 2, 2), poison arrow for hunting (Ke, 40, 40), veterinary medicinal (especially the dog plague) (Se, 2, 2)	46	90	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun

Fagopyrum esculentum Moench	Polygonaceae	Ba Gei Qie Ma (Zhucun)/Ba Jia Mu (Gongri)	2-083	Boiled	Food: cooked vegetables (L, 58, 58)	58	58	Mixingba	Damu/Kabu
Ficus auriculata Lour.	Moraceae	Wo Se	2-032	Decoction	Food: fresh fruit (Fr, 91, 93); Medicinal: anthelmintic (Ba, 62, 62), wounds (La, 2, 2), dermatitis (La, 2, 2)	91	157	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Ficus semicordata Buch.-Ham. ex Sm.	Moraceae	Da guo (Damu, Kabu)/Gou(Gongri, Zhucun)	2-0235	Raw	Food: fresh fruit (Fr, 91, 91)	91	91	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Ficus tikoua Bur.	Moraceae	Ba Jiu	2-030	Raw	Food: fresh fruit (Fr, 91, 91)	91	91	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Fraxinus sikkimensis (Lingelsh.) Hand.-Mazz.	Oleaceae	Ji Bu Jiu	2-197	Decoction	Medicinal: fractures (Ba, 8, 8), wounds (Ba, 8, 8)	16	16	Miguba	Kabu
Gonostegia hirta (Bl.) Miq.	Urticaceae	Huo You	2-172	Boiled	Food: cooked vegetables (Tl, 91, 91)	91	91	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Houttuynia cordata Thunb.	Saururaceae	Gong Ge	2-193	Raw	Food: cooked vegetable (R, Tl,	75	150	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun

					75, 150)				
Hydrocotyle nepalensis Hk.	Apiaceae	Pa Zhe Dun Ba	2-002	Dried and powder	Medicinal: poison in fishing (W, 1, 1)	1	1	Mixingba	Gongri
Laportea medogensis C. J. Chen	Urticaceae	Cuo Wa	2-246	Boiled	Food: cooked vegetables (Tl, 26, 26)	26	26	Mixingba	Gongri
Laportea bulbifera (Sieb. et Zucc.) Wedd.	Urticaceae	Suo Wa	2-005	Boiled	Food: cooked vegetables (Tl, 68, 68)	68	68	Mixingba	Gongri/Zhucun
Laurocerasus undulata (Buch.-Ham. ex D. Don) M. Roem.	Rosaceae	Da Me	2-012	Pressed oils	Food: edible oil (So, 46, 46); Medicinal: wounds (So, 4, 4)	46	50	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Litsea sp.	Lauraceae	Xeng Ge	2-136	Decoction	Medicinal: cold (Ba, 1, 1)	1	1	Miguba	Kabu
Lobaria hengduanensis C.C.Miao et Li S. Wang	Lobariaceae	Beng Gou (Damu)/Bang Xi (Gongri)	2-288	Boiled	Food: cooked vegetables (Sp, 41, 79)	41	79	Miguba/Mixingba	Damu/Gongri
Millettia cinerea Benth.	Fabaceae	Ke Ma Xuo Xia	2-100	Crushed	Medicinal: poison in fishing (Se, 3, 3)	3	3	Mixingba	Gongri

Millettia pachycarpa Benth.	Fabaceae	Ke Ma Xuo Xia (Zhucun)/Nia Du (Damu)	2-033	Crushed	Medicinal: poison in fishing (R, Fr, 3, 6)	3	6	Miguba/Mixingba	Kabu/Zhucun
Morus macroura Miq.	Moraceae	Wu Ze Xing (Damu, Kabu, Zhucun)/Wo Se Xing (Gongri)	2-053	Decoction	Food: fresh fruit (Fr, 30, 30); Medicinal: anthelmintic (Ba, 66, 66), wounds (La, 2, 2), dermatitis (La, 2, 2)	66	96	Miguba/Mixingba	Damu/Gongri/Zhucun
Momordica subangulata Bl.	Cucurbitaceae	Ga Di (Damu, Kabu,)/Ka Ji(Zhucun)	2-022	Boiled or saute	Food: cooked vegetables (L, 66, 156)	66	156	Miguba/Mixingba	Damu/Kabu/Zhucun
Musa balbisiana Colla	Musaceae	Ang Gu	2-035	Raw	Food: fresh fruit (Fr, 34, 34)	34	34	Miguba	Kabu
Musa sanguinea Hook.f.	Musaceae	Niang Bu Ga Duo (Damu, Kabu)/Za Ang Ang (Gongri, Zhucun)	2-077	Raw	Food: fresh fruit (Fr, 91, 91)	91	91	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Ophiorrhiza rosea Hook. f.	Rubiaceae	Mian Pi (Damu/Kabu)/Ming Qi Ce Ma (Gongri)	2-191	Boiled	Food: cooked vegetables (Tl, 57,171)	57	171	Miguba/Mixingba	Damu/Kabu/Gongri

Paris polyphylla var. *chinensis* (Franch.) Hara	Melanthiaceae	A Tuo Ba Tuo	2-010	Crushed	Medicinal: arthralgia (Rh, 1, 1), lumbago (Rh, 1, 1)	1	2	Mixingba	Gongri
Paris forrestii (Takht.) H. Li	Melanthiaceae	A Tuo Ba Tuo	2-283	Crushed	Medicinal: arthralgia (Rh, 5, 5), lumbago (Rh, 5, 5)	10	10	Miguba/Mixingba	Kabu/Gongri
Perilla frutescens (L.) Britton	Lamiaceae	Da Nang Mu	2-017	Pressed oils, the leaves are crushed	Food: edible oil (So, 46, 46); Medicinal: insect bites (L, 1, 1)	46	47	Miguba/Mixingba	Damu/Gongri/Kabu/Zhucun
Piper longum L.	Piperaceae	Bi Bi Lin	2-097	The fruits are crushed	Food: fresh fruit (Fr, 30, 30); Medicinal: fractures (Fr, 30, 30)	60	60	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Piper rhytidocarpum J. D. Hooker	Piperaceae	Bi Bi Lin	2-176	The fruits are crushed	Food: fresh fruit (Fr, 30, 30); Medicinal: wound-cleaning potion (Fr, 30, 30)	60	60	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun

Piper semiimmersum C. DC	Piperaceae	Bi Bi Lin	2-250	The fruits are crushed	Food: fresh fruit (Fr, 30, 30); Medicinal: fractures (Fr, 30, 30)	60	60	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Pouzolzia argenteonitida W. T. Wang	Urticaceae	Jie Ba	2-210	Boiled	Food: cooked vegetables (Tl, 38, 44)	38	44	Miguba/Mixingba	Damu/Gongri
Pteridium aquilinum var. *latiusculum* (Desv.) Underw. ex Heller (Li et al., 2015)	Pteridiaceae	Rong Guo (Damu, Kabu)/Da Ga (Gongri)	2-182	Boiled	Food: cooked vegetables (Tl, 39, 42)	39	42	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Pueraria montana var. *chinensis* (Ohwi) Sanjappa & Pradeep	Fabaceae	Ri Ga	2-173	Raw and crushed	Food: snacks (R, 51, 51), staple food (R, 4, 4)	51	56	Miguba	Damu/Kabu
Rhaphidophora decursiva (Roxb.) Schott	Araceae	Jia Ruo Ruo Bu	2-099	Raw	Medicinal: veterinary medicinal for treat diarrhea (L, 21, 21)	21	21	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun

Ricinus communis L.	Euphorbiaceae	Jie Mu La	2-056	pressed oils as food; external application with lard oil as medicinal	Food: edible oil (So, 4, 5); Medicinal: fractures (L, 3, 3), toothache (L, 2, 2), relieve pain (L, 50, 50)	55	60	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Rorippa indica (L.) Hiern	Cruciferae	Gan Reng Ceng Ma	2-291	Boiled	Food: cooked vegetables (TL, 36, 72)	36	72	Mixingba	Gongri
Rubus ellipticus Smith var. *obcordatus* (Franch.) Focke	Rosaceae	Bia Mie Zei Zei (Damu)/Zei Zei (Gongri)	2-179	Raw	Food: fresh fruit (Fr, 35, 35), cooked vegetables (Ts, 35, 35)	35	70	Miguba/Mixingba	Damu/Gongri
Saurauia punduana Wall.	Actinidiaceae	Da Ding	2-261	Raw	Food: fresh fruit (Fr, 91, 91)	91	91	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Saurauia polyneura var. *paucinervis* (C.F. Liang & Y.S. Wang) J.Q. Li & Soejarto	Actinidiaceae	Hen gen (Kabu)/Nong (Damu, Gongri,Zhucun)	2-036	Raw	Food: fresh fruit (Fr, 91, 91)	91	91	Miguba/Mixingba	Kabu/Damu/Gongri/Zhucun

Saurauia rubricalyx C.F. Liang & Y.S. Wang	Actinidiaceae	Dang	2-026	Raw	Food: fresh fruit (Fr, 91, 91)	91	91	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Sauromatum venosum (Dryand. ex Aiton) Kunth	Araceae	Ya Gu	2-169	Boiled as vegetables; direct swallowing as medicinal	Food: cooked vegetable (Tl, 3, 3); Medicinal: anthelmintic (Tl, 25, 25)	25	27	Miguba	Damu/Kabu
Senecio scandens Buch.-Ham. ex D. Don (Li et al., 2015)	Asteraceae	Ji Ji Bei	2-011	External application	Medicinal: chapped skin (W, 10, 10), coryza (W, 10, 10)	10	20	Mixingba	Gongri
Solena amplexicaulis (Lam.) Gandhi	Cucurbitaceae	Duo Er	2-224	Boiled or saute	Food: fresh fruit (Fr, 70, 70)	70	70	Miguba/Mixingba	Damu/Gongri
Solanum torvum Sw.	Solanaceae	Bang Guo	2-072	Boiled	Food: cooked vegetables (Fr, 34, 49）	34	49	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Solanum nigrum L.	Solanaceae	Huo Wa (Damu, Kabu)/Ke you (Gongri)	2-041	Boiled or raw	Food: cooked vegetables (Tl, 70, 140), fresh fruit (Fr, 23, 23)	70	163	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun

Swertia nervosa (G. Don) Wall. ex C. B. Clarke	Gentianaceae	Bao Se Bu	2-052	Decoction	Medicinal: cold (R, 91, 91), diarrhea (R, 85, 85), arthralgia (R, 2, 2), headache (R, 2, 2), eye problems (R, 2, 2), nausea (R, 85, 85), anti-alcohol (R, 1, 1), food poisoning (R, 1, 1)	91	270	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun
Taxus wallichiana Zucc.	Taxaceae	La Seng	2-009	Decoction	Medicinal: high blood pressure (Ba, 1, 1), cold (Ba, 1, 1), diarrhea (Ba, 1, 1)	1	3	Mixingba	Gongri
Turpinia macrosperma C.C. Huang	Staphyleaceae	Ji Bu Jiu	2-114	Decoction	Medicinal: wounds (Ba, 3, 5), diarrhea (Ba, 2, 2), backache (Ba, 2, 2), fracture (Ba, 3, 3); veterinary	5	15	Miguba	Damu/Kabu

					medicinal: wounds (Ba, 2, 4), fatten (Ba, 1, 1)				
Urtica ardens Link	Urticaceae	Suo Wa	2-081	Boiled	Food: cooked vegetables (Tl, 68, 68)	68	68	Mixingba	Gongri/Zhucun
Viburnum cylindricum Buch.-Ham. ex D. Don	Caprifoliaceae	Dong A	2-025	Pressed oils and external application	Food: eaten with yellow wine (So, 68, 68), edible oil (So, 15, 15), eaten with tsam-pa (So, 10, 10); Medicinal: insect bites (So, 10, 10), wounds (So, 10, 10)	68	113	Miguba/Mixingba	Damu/Kabu/Zhucun
Zanthoxylum motuoense Huang	Rutaceae	Ye Ma	2-014	Boiled and decoction	Food: flavouring (Fl, Fr, Tl, 91, 273); Medicinal: food poisoning (Fr, 89, 89); veterinary medicinal: insecticide (Se, 61, 61)	91	423	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun

Zingiber officinale Rosc.	Zingiberaceae	Ge Xia	2-071	Boiled	Food: flavouring (R, 91, 91); Medicinal: cold (R, 66, 66)	91	157	Miguba/Mixingba	Damu/Kabu/Gongri/Zhucun

Table 2
Categories of use and main quantitative results.

Primary category of use	Secondary category of use	Tertiary category of use	Number of taxa (Nt)	Number of use reports (Nur)	Informant's consensus index factor (Fic)
Medicinal			37		
	Antidote	Food poisoning	3	123	0.98
	Cardiovascular disease	High blood pressure	1	1	0.00
	Dermatologic disorders	Wound-cleaning potion, wounds, chapped skin, allergy, insect bits	12	76	0.85
	Gastrointestinal problems	Diarrhea, stomachache, nausea, constipation, flatulence	10	130	0.93
	Infections	Malaria	1	1	0.00
	Nervous system	Headache	1	1	0.00
	Ophthalmic	Eye problems	1	1	0.00
	Parasites	Anthelmintic	4	156	0.98
	Poisons	Piscicide (Poison in fishing)	3	10	0.78
	Respiratory complaints	Cold, coryza, dyspnea	6	142	0.96
	Skeleto-muscular system	Arthralgia, lumbago, leg pain, fractures	9	86	0.91
	Toothache and mouth inflammations	Toothache	2	2	0.00
	Urology	Nephropathy, diuresis	3	24	0.91
	Veterinary medicinal	Veterinary medicinal	4	69	0.96
Food			57		
	Alcoholic beverages	Made yellow win	2	113	0.99
	Dry fruit	Dry fruit	1	42	1.00
	Fresh fruit	Fresh fruit	17	1032	0.98
	Oil and seasoning	Edible oil and flavouring	4	456	0.99

Cooked vegetables	Cooked vegetables	25	1808	0.99
Staple foods	Staple food and substitutes for staple food	7	468	0.99