Ethnomedicine study on traditional medicinal plants in the Wuliang Mountains of Jingdong, Yunnan, China

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Abstract

Background: The Wuliang Mountains of the Jingdong region is a settlement area of the Yi community located in south-western Yunnan Province in China. Due to its unique geographical location, this area harbours abundant medicinal plant resources. The medicinal plants used by the local people have a long history and play an important role in their daily life. During the long-term mixed lifestyle, the knowledge of traditional medicinal plants in different communities has been assimilated to some extent. Therefore, this paper is based on ethnobotanical investigations to document traditional medicinal plants used by local people and discuss the differences between the Yi and Han communities in the study area.

Methods: Data on traditional medicinal plants were collected from September 2016 to August 2017 in the Yi autonomous county of Jingdong. Seven townships and 16 villages were selected for the field investigations. Information was obtained through key informant interviews. A total of 44 key informants were interviewed, and all of them were herbalists or herbal sellers.

Results: In this study, a total of 302 traditional medicinal plant species belonging to 117 families and 252 genera were investigated and documented, most of which were obtained from herbalists. Although family Asteraceae was the most prevalent, with 27 species, the most commonly utilized species were members of family Papaveraceae, Dactylicapnos scandens (D. Don) Hutch., which is used as an antipyretic drug. Herbs comprised half of the total number of species, and the whole plant is the most frequently utilized plant part. The plants were used to treat more than 93 human diseases, with antipyretic drugs being the most common form of herbal medicine. The traditional medicinal plants used in the study area possess a high ratio of being documented in the literature. According to the analysis, the Chinese Pharmacopoeia recorded 76 species and the Resources of Traditional Chinese Medicine recorded 233 species of traditional medicinal plants. By evaluating the endangered status of the traditional medicinal plants in the study area, we found good conservation status of the cited medicinal plants. Regarding the similarity between the communities, there were significant differences between the Yi and Han communities, as indicated by the Jaccard similarity index (0.232).

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Conclusions: Medicinal plants are the embodiment of wisdom from our ancestors and play a significant role in treating various human disorders. As one of the birthplaces of Yi medicine, the study area possesses a high species diversity of traditional medicinal plants used by local people. With the rapid development of modern medicine, however, the inheritance of this valuable culture is facing enormous threats even though its potential value has not yet been fully explored. Therefore, some effective protection measures should be taken, and some modern techniques should be implemented to prove the safety and improve the scientific acceptance of the traditional medicinal plants.

Keywords: Ethnomedicine, Traditional knowledge, Medicinal plants, Wuliang Mountains region

Introduction

According to the World Health Organization (WHO), approximately 65–80% of the world’s population in developing countries essentially depends on plants for their primary health care [1]. China has kept the tradition of using herbs to treat diseases since ancient times, and this was the principal method for the treatment of disease before the popularization of modern medicine. For the remote minority, in particular, traditional medicinal plants hold a significant position in their daily livelihood. The value hidden behind them deserves to be explored. However, the sustainable utilization of traditional medicinal plants is threatened by the rapid development of the social economy in China. Although knowledge regarding traditional medicinal plants has been documented in some regions [2–4], more research is needed to document the knowledge about traditional medicinal plant usages, and urgent conservation measures should be implemented as well [5].

The Yi community is one of the oldest communities in China and lives in the Hengduan region, which has been rich in medicinal plants for a long time. This community created a unique traditional system of medicine with its own theory as it struggled with diseases. Because of the blockage of the traditional knowledge inheritance within the Yi community, such knowledge has only spread within the same clade, family or region, resulting in unbalanced development in different areas [6]. Compared with the adjacent Chuxiong and Shuangbai districts, which have both been systematically studied [7], however, the traditional medicinal plants of the Yi community in Jingdong are still under-researched.

In contrast to other clades, the Yi community in the Wuliang Mountains have no particular wordage. For this reason, the study of the traditional medicinal plants in this region is necessary and urgent [8]. In this survey, the ethnomedicine approach of the key informant interview is used to assess the utilization of traditional medicinal plants by local people.

Study area and data collection

Study area

The Wuliang Mountains are situated in the southwest of Yunnan Province and are located at 23°57′–24°44′ N latitude and 100°22′–101°04′ E longitude (Fig. 1). As an extension of the Hengduan mountain range, the Wuliang Mountains stretch for 89 km from north to south, with an average altitude above 2000 m. The northwestern side of Wuliang Mountains lies in the alternating transition zone between the eastern Asiatic and Paleotropical flora regions, and the southeastern part lies in the alternating transition zone between the China-Japan plant subregion and the China-Himalayan plant subregion. The Wuliang Mountains belong to the western monsoon climate zone, which is characterized by a distinctive south Asian monsoon with obvious wet and dry seasons, harbour plants that exhibit continuous blooming and have the climatic characteristics of plateaus at low latitudes [9]. These unique geographical and climatic conditions result in rich plant diversity in this area. As mentioned by Peng [10], there are more than 300 types of medicinal plants with significant research value.

The Yi autonomous county of Jingdong has a total population of 35.55 million. The Han ethnic group comprises 18.35 million (50.21%), while the Yi comprises 15.46 million (42.36%) of the total population [11]. The Yi community in Jingdong is distributed on both sides of the Wuliang Mountains. As a clade of the Yi ethnic group, the Yi autonomous county of Jingdong is one of the settlements and birthplaces of Yi community medicine [10], with a lifestyle of mixed habitation for a long time. The mutual effects of the two ethnicities have resulted in the fusion of culture and utilization of medicinal plants.

Data collection

Ethnobotanical data were collected from September 2016 to August 2017 in the Yi autonomous county of Jingdong, southwest Yunnan. Seven townships and 16 villages distributed on the two sides of the Wuliang Mountains were selected for the field investigations (Additional file 1). Information was collected via key informant interviews. A total of 44 informants were interviewed in the study area, with all the informants being local inhabitants with a profession of herbalist or seller of herbs and who embrace lots of medicinal knowledge.
Their gender, age, nationality, education level and occupation were recorded. Ethnobotanical investigations were carried out to collect data on the medicinal plants used to treat human ailments, including their Latin name, Chinese name, local name, family name, life form, plant parts used, preparation method and medicinal effect. All plants were identified according to the *Flora Reipublicae Popularis Sinicae* [12]. Voucher specimens of the plants cited by informants were collected and deposited at the Herbarium of Xishuangbanna Tropical Botanical Garden (HITBC).

**Results and discussion**

**Profile of informants**

The constituent information regarding age, gender, nationality, education and occupation of informants is shown in Table 1. Most of the informants were males, and they played a significant role in the activities of collecting and using traditional medicinal plants. Females only had some knowledge about postpartum diseases.

All of the informants were split into six age groups, with an average of 49.64 years old. The 40–49-year-old group comprised 43.18%. The Yi population accounted for 70.45%. The educational level of the informants centred on primary and middle school. In our study, 5 out of 12 herbalists who participated in the interview changed their profession, and the 7 herbalists left were still engaged in this profession. In addition, only 2 herbalists had successors, since no young people were willing to engage in this hard and difficult work. According to our investigation, the main reason for this observation is the fact that the low income as an herbalist makes it difficult to make a living. The trend of this phenomenon poses a significant threat to the inheritance of this traditional culture.

**Traditional medicinal plant diversity in the study**

This study recorded 302 medicinal plant species belonging to 252 genera and 117 families that were used to treat more than 93 ailments (Table 2). The traditional medicinal plants showed high diversity in terms of the composition of species at the family and genus level, with the single-species family and the single-species genus having an absolute advantage in number. Among these medicinal plants, the most species-rich family was Asteraceae, represented by 27 species, followed by family Fabaceae, with 14 species, which is similar to Li [3]. The

| Table 1 The background information of informants in this study |
|---------------------------------------------------------------|
| **Gender**                                                                 |
| Male: 36 (81.82%)                                               |
| Female: 8 (18.18%)                                              |
| **Age**                                                                 |
| 20–29: 3 (6.82%)                                               |
| 30–39: 2 (4.55%)                                               |
| 40–49: 19 (43.18%)                                             |
| 50–59: 8 (18.18%)                                              |
| 60–69: 9 (20.45%)                                              |
| 70–79: 3 (6.82%)                                               |
| **Nation**                                                                 |
| Yi nationality: 31 (70.45%)                                   |
| Han nationality: 13 (29.55%)                                   |
| **Education level**                                             |
| Primary school: 20 (45.45%)                                    |
| Secondary school: 20 (45.45%)                                  |
| College/university: 4 (9.09%)                                   |
| **Profession**                                                 |
| Herbalist: 12 (27.27%)                                         |
| Non-herbalist: 32 (72.73%)                                     |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use | Voucher number |
|-----------------|-------------|------------|-------|-----------|---------------|----------------|
| Dakonghua       | Malvaceae   | Abelmoschus manihot var. pungens (Roxb.) Hochr. | Shrub | Root | Unknown swollen | GLL0162        |
| Sheyao          | Compositae  | Achillea millefolium Linn. | Shrub | Root, leaf, whole plant | Snake venom, common cold, meningitis | GLL00113       |
| Tunixi          | Amaranthaceae | Achyranthes aspera Linn. | Herb | Whole plant | Bone-setting | GLL0262        |
| Tongchuicao     | Compositae  | Acnella calva (DC.) RK.Jansen | Herb | Whole plant | Traumatic injury | GLL00123       |
| Jinwu           | Ranunculaceae | Aconitum austroynamense W.T. Wang | Herb | Whole plant, Root | Cold drugs, traumatic injury | GLL0127        |
| Xueshangyizhihao| Ranunculaceae | Aconitum brachypodum Diels | Herb | Root | Traumatic injury, rheumatism | GLL0129        |
| Caowu           | Ranunculaceae | Aconitum carmichaelii Debx. | Herb | Root | Bone-setting, traumatic injury, digestive, general aching, common cold, hyperostogeny, rheumatism | GLL0126        |
| Daduwu          | Ranunculaceae | Aconitum scaposum Franch.var.hupehanum Rapaics | Herb | Root | Traumatic injury | GLL0128        |
| Changpu         | Acoraceae   | Acorus calamus | Herb | Root | Digestive | GLL055         |
| Shichangpu      | Araceae     | Acorus gramineus Sol. ex Aiton | Herb | Whole plant | Digestive | GLL0082        |
| Zhuzongcao      | Adiantaceae | Adiantum bonatianum Brause | Herb | Whole plant | Cystitis, diuretic | GLL098         |
| Suoluo          | Hippocastanaceae | Aesculus chinensis Bunge | Tree | Root, stem | Gastroenteritis | GLL082         |
| Honghualuobo    | Ericaceae   | Agapetes hosseana Diels | Shrub | Root | Traumatic injury | GLL0184        |
| Shujidan        | Ericaceae   | Agapetes marnii Hemsl. | Shrub | Root | Traumatic injury, rheumatism palpitation | GLL0182        |
| Huoxiang        | Labiatae    | Agastache rugosa (Fisch. et Mey.) O. Kuntze | Herb | Whole plant | Relieving cough, pneumonia, ventilation, common cold, digestive | GLL0041        |
| Jima            | Agavaceae   | Agave sialana Perrine ex Englelm. | Herb | Root | Common cold (for child) | GLL075         |
| Daheicao        | Compositae  | Ageratina adengphora (Spreng.) R. M. King et H. Rob. | Herb | Whole plant | Common cold, gastroenteritis | GLL00119       |
| Xianhecao       | Rosaceae    | Agrimonio pilosa var. nepalesis (D. Don) Nakai | Herb | Whole plant, root | Haemostasis, flooding, gastroenteritis, dysentery | GLL0021        |
| Yexiahua        | Compositae  | Ainsliaea peryoides Franch. | Herb | Whole plant | Traumatic injury, gynecologic diseases | GLL00116       |
| Shenyancao      | Compositae  | Ainsliaea spicata Vaniot | Herb | Root | Heat-clearing and detoxifying, nephritis | GLL00115       |
| Mutong          | Lardizabalaceae | Akebia quinata (Houtt.) Decne. | Woody climber | Stem, leaf | Hyperlipidemia, hypertension | GLL079         |
| Handonggua      | Betulaceae  | Alnus nepalesis | Tree | Bark, leaf | Gastroenteritis | GLL067         |
| Dayedengtai     | Apocynaceae | Alstonia scholaris (Linn.) R. Br. | Tree | Leaf | Relieving cough, trachitis | GLL0152        |
| Moyu            | Araceae     | Amorphophallus konjac K. Koch | Herb | Root | Digestive, obesity | GLL0088        |
| Yeputao         | Vitaceae    | Ampelopsis glandulosa (Wall.) Momiy. | Woody climber | Whole plant | Blood phobia | GLL0242        |
| Vernacular name | Family name | Latin name | Habit | Part used     | Medicinal use                                                                 | Voucher number |
|-----------------|-------------|------------|-------|---------------|-------------------------------------------------------------------------------|----------------|
| Taoren          | Rosaceae    | Amygdalus davidiana (Carrière) de Vos ex Henry | Tree  | Nutlet, bark, leaf | Traumatic injury, rheumatism gastroenteritis, toothache                      | GLL0028        |
| Huzhangcao      | Ranunculaceae| Anemone rivularis Buch.-Ham. | Herb  | Root           | Hepatitis, gastroenteritis                                                    | GLL01210       |
| Danggui         | Umbelliferae | Angelica sinesis (Oliv.) Diels | Herb  | Root           | Tonic, traumatic injury                                                       | GLL0117        |
| Sanfensan       | Solanaceae  | Anisodus acutangulus C. Y. Wu et C. Chen ex C. Chen et C. L. Chen | Herb  | Leaf, whole plant, root | Bone-setting, traumatic injury antiphlogosis, rheumatism                     | GLL0204        |
| Baiyundougen    | Fabaceae    | Apios carnea (Wall.) Benth. ex Baker | Woody climber | Root | Digestive                                    | GLL0037        |
| Niubang         | Compositae  | Arctium koppa L. | Herb  | Root           | Nephritis                                                                    | GLL00110       |
| Baoziyanjinghua | Myrsinaceae | Ardisia crenata Sims | Shrub | Root, whole plant | Common cold antiphlogosis gastroenteritis                                    | GLL0323        |
| Zijinniu        | Myrsinaceae | Ardisia japonica (Thunb.) BL. | Shrub | Root | Heat-clearing and detoxifying                                                 | GLL0322        |
| Binlang         | Palmae      | Areca catechu L. | Tree  | Fruit          | Digestive                                                                    | GLL0431        |
| Dahanyao        | Aristolochiaceae | Aristolochia cucurbitooides C.F. Liang | Herbaceous liane | Root | Digestive                                    | GLL0442        |
| Tumuxiang       | Aristolochiaceae | Aristolochia debilis Sieb. et Zucc. | Herbaceous liane | Root | Gastroenteritis. Relieving cough, gastroenteritis                             | GLL0441        |
| Qingmuxiang     | Aristolochiaceae | Aristolochia transsecta (Chatterjee) C. Y. Wu ex S. M. Hwang | Woody climber | Root | Gastroenteritis                                    | GLL0443        |
| Aihao           | Compositae  | Artemisia argyi | Herb  | Whole plant | Gynecologic diseases                                                          | GLL00126       |
| Yinchenhao      | Compositae  | Artemisia capillaris Thunb. | Herb  | Whole plant | Cholecystitis                                                                | GLL0016        |
| Haozi           | Compositae  | Artemisia canifolia Buch.-Ham. ex Roxb. | Herb  | Whole plant, root, leaf | Common cold antiphlogosis, haemostasis, heat-clearing and detoxifying Gynecologic diseases, gastroenteritis, haemostasis | GLL0014        |
| Pingtouhao      | Compositae  | Artemisia japonica Thunb. | Herb  | Whole plant, root, leaf | Common cold, hepatitis                                                        | GLL0015        |
| Quhaitang       | Begoniaceae | Begonia modestiflora Kurz. | Herb  | Root | Nephritis                                                                    | GLL085         |
| Sankezhen       | Berberidaceae | Berberis deinnacantha Schneid. | Shrub | Root | Heat-clearing and detoxifying, antiphlogosis, gastroenteritis, relieving cough | GLL0212        |
| Sankezhenhuanglians | Berberidaceae | Berberis wuliangshanensis C.Y. Wu | Shrub | Root | Toothache                                | GLL0213        |
| Chachacao       | Compositae  | Bidens pilosa Linn. | Herb  | Whole plant | Heat-clearing and detoxifying, common cold, appendicitis, gastroenteritis, heat-clearing and detoxifying, laryngopharyngitis, diabetes mellitus | GLL0012        |
| Xiaobaiji       | Orchidaceae | Bletilla formosana (Hayata) Schltr. | Herb  | Root | Relieving cough, tuberculosis                                                   | GLL0071        |
| Baiji           | Orchidaceae | Bletilla striata (Thunb. ex A. Murray) Rchb. f. | Herb  | Stem | Pneumonia, tuberculosis, haemostasis                                            | GLL0072        |
| Bingpianye      | Compositae  | Blumea balsamifera (L.) DC. | Herb  | Juice | Rheumatism                                                                     | GLL00120       |
| Vernacular name | Family name | Latin name                | Habit       | Part used              | Medicinal use                                | Voucher number |
|----------------|-------------|---------------------------|-------------|------------------------|----------------------------------------------|----------------|
| Baihucao       | Rutaceae    | Boenninghausenia albiflora (Hook.) Rchb. ex Meisn. | Herb        | Whole plant, root      | Antiphritis, exorcise evil spirits            | GLL0134        |
| Mumian         | Malvaceae   | Bombax ceiba L.           | Tree        | Bark                   | Bone-setting, traumatic injury                | GLL0163        |
| Dabusi         | Crassulaceae| Bryophyllum pinnatum (Lam.) Oken | Herb        | Leaf, whole plant      | Bone-setting, Traumatic injury                | GLL070         |
| Huanghua       | Buddlejaceae| Buddleja officinalis Maxim. | Shrub       | Root                   | Replenishing qi                              | GLL117         |
| Chaihu         | Umbellifera | Bupleurum hamiltonii Balacr. | Herb        | Whole plant, leaf      | Common cold                                  | GLL0111        |
| Baihainu       | Umbellifera | Bupleurum marginatum Wallex DC. | Herb        | Whole plant            | Common cold                                  | GLL0112        |
| Wannianqings   | Buxaceae    | Buxus bodinieri Lév.      | Shrub       | Whole plant            | Gastroenteritis, traumatic injury, antiphlogosis | GLL0341        |
| Sumu           | Fabaceae    | Caesalpinia sappan Linn.  | Tree        | Stem                   | Gynecologic diseases                         | GLL111         |
| Hehuanhua      | Mimosaceae  | Calliandra haematoccephala Hassk. | Shrub      | Flower, leaf, bark    | Tranquilizing effect                         | GLL0332        |
| Dawanwanhua    | Convolvulaceae | Calystegia hederacea Wall. ex Roxb. | Herb       | Whole plant            | Antiphlogosis                                | GLL104         |
| Chaiye         | Liliaceae   | Campylandra watf. C. B. Clarke | Tree        | Leaf                   | Antiphlogosis                                | GLL088         |
| Aiqi           | Liliaceae   | Campylandra watf. C. B. Clarke | Herb        | Whole plant            | Gastroenteritis                              | GLL0056        |
| Douling        | Liliaceae   | Cardiocinum giganteum (Wall.) Makino | Herbaceous liane | Stem               | Relieving cough, trachitis, pneumonia, emphysema | GLL0051        |
| Xiaohonggaoliang | Cyperaceae | Carex alta Boott | Herb        | Root                   | Gynecologic diseases                         | GLL0461        |
| Yegaolianggen  | Cyperaceae  | Carex baccans Nees        | Herb        | Root                   | Haemostasis                                  | GLL0462        |
| Goujiaoji      | Vitaceae    | Cayratia trifolia (Linn.) Domin | Woody climber | Whole plant            | Digestive, common cold, Heat-clearing and detoxifying | GLL0241        |
| Jiguanhua      | Aramanthaceae | Celosia cristata Linn.   | Herb        | Whole plant, flower    | Heat-clearing and detoxifying, gynecologic diseases | GLL0263        |
| Yingtaopi      | Rosaceae    | Cerasus pseudocerasus (Lindl.) G. Don | Tree        | Bark                   | Heat-clearing and detoxifying                | GLL00212       |
| Mugua          | Rosaceae    | Chaenomeles sinensis (Thouin) Koehne | Shrub        | Fruit                  | Rheumatism, traumatic injury                 | GLL0022        |
| Suanmugua      | Rosaceae    | Chaenomeles speciosa (Sweet) Nakai | Shrub        | Fruit                  | Rheumatism                                   | GLL0023        |
| Yinfengao      | Sinopteridaceae | Chelanthus albomarginata C.B. Clarke | Herb        | Whole plant            | Gynecologic diseases                         | GLL113         |
| Sikuaiwa       | Chloranthaceae | Chloranthus holostegius | Herb        | Whole plant, root      | Common cold                                  | GLL069         |
| Tengzhong      | Apocynaceae | Chonomorpha valvata       | Woody climber | Stem, leaf            | Rheumatism                                   | GLL0154        |
| Feijicao       | Compositae  | Chromolaena odorata (Linn.) R. M. King et H. Rob. | Herb        | Whole plant            | Gastroenteritis, heat-clearing and detoxifying | GLL00124       |
| Santiaojin     | Lauraceae   | Cinnamomum beijolghata (Buch.-Ham.) Sweet | Tree        | Bark                   | Ventilation, bone-setting                    | GLL0273        |
| Zhangmuzi      | Lauraceae   | Cinnamomum camphora (L.) J.Presl | Tree        | Fruit                  | Common cold, heatstroke, ventilation         | GLL0275        |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use | Voucher number |
|-----------------|-------------|------------|-------|-----------|---------------|----------------|
| Rougui          | Lauraceae   | *Cinnamomum cassia* Nees ex Blume | Tree  | Bark      | Ventilation, dispel coldness | GLL0272 |
| Xiangzhang      | Lauraceae   | *Cinnamomum glanduliferum* (Wall.) Nees | Tree  | Stem, fruit, root | Ventilation, refreshing, gastroenteritis | GLL0274 |
| Yaluqing        | Meliaceae   | *Cipadessa baccifera* (Roth.) Miq. | Tree  | Leaf      | Diabetes mellitus, gastroenteritis, catharsis | GLL0231 |
| Jicigen         | Compositae  | *Cirsium griseum* H. Lév. | Herb  | Root, leaf, whole plant | Gynecologic diseases, haemostasis, bone-setting | GLL00125 |
| Foshougan       | Rutaceae    | *Citrus medica* var. sarcodactylis (Noot.) Swingle | Shrub | Fruit  | Ventilation | GLL0131 |
| Chenpi          | Rutaceae    | *Citrus reticula* Blanco | Tree  | Peel      | Antiphlogosis | GLL0132 |
| Xiaomutong      | Ranunculaceae | *Clematis armandii* Franch. Woody climber | Root  | Whole plant, root | Diuretic, cystitis | GLL0125 |
| Weilingxian     | Ranunculaceae | *Clematis chinensis* Osbeck Woody climber | Whole plant | Heat-clearing and detoxifying | GLL0124 |
| Santiagooanyin  | Verbenaceae  | *Cladodendrum serratum* var. amplexifolium Moldenke | Shrub | Bark, leaf | Bone-setting, traumatic injury | GLL0361 |
| Huanglian       | Ranunculaceae | *Coptis chinensis* Franch. | Herb  | Whole plant | Heat-clearing and detoxifying, hepatitis | GLL0121 |
| Jijiaohuanglian | Ranunculaceae | *Coptis teeta* Wall. | Herb  | Whole plant, root | Heat-clearing and detoxifying, traumatic injury | GLL0122 |
| Shanzha         | Rosaceae    | *Crataegus pinnatifida* Bunge | Tree  | Fruit | Digestive, hyperlipidemia | GLL0027 |
| Naijiangcao     | Compositae  | *Crepis phoenix* Dunn | Herb  | Whole plant | Common cold | GLL0013 |
| Honghua         | Iridaceae   | *Crocus sativus* Linn. | Herb  | Stamen | Traumatic injury, gynecologic diseases | GLL110 |
| Gouxiangling    | Fabaceae    | *Crotalaria albida* Heyne ex Roth Herbaceous liane | Whole plant, root | Gynecologic diseases | GLL0039 |
| Huangguaye      | Cucurbitaceae | *Cucumis sativus* Linn. Herbaceous liane | Leaf | Antialcoholism | GLL0142 |
| Baishu          | Cupressaceae | *Cupressus funebris* Endl. | Shrub | Leaf | Heat-clearing and detoxifying, tranquilizing effect, antiphlogosis rheumatism, *exercise evil spirits* | GLL052 |
| Houzibeiyan     | Hypoxidaceae | *Curculigo capitulata* (Lour.) Kuntze | Herb  | Root | Hyperostereogeny, tonifying kidney | GLL101 |
| Huangjiang      | Zingiberaceae | *Curcuma longa* Linn. | Herb  | Root, stem | Hepatitis | GLL068 |
| Wugenteng       | Cuscuteaceae | *Cuscuta chinensis* Lam. Herbaceous liane | Whole plant | Ventilation, tonifying kidney | GLL099 |
| Lushuicao       | Commelinaceae | *Cyanotis vaga* (Lour.) Roem. et Schult. Herbaceous liane | Whole plant | Rheumatism | GLL0411 |
| Xiaohonghao     | Compositae  | *Cyathochile purpurea* (Fam.O.Ktze) O. Kuntze. | Herb  | Whole plant | Haemostasis | GLL00121 |
| Niuxi           | Amaranthaceae | *Cyathula officinalis* Kuan | Herb  | Root | Lumbar muscle strain | GLL0261 |
| Tieteng         | Menispermacea | *Cyclea watii* Diels Woody climber | Stem | Gynecologic diseases | GLL0191 |
| Hutoulan        | Orchidaceae  | *Cymbidium hookerianum* Rchb. f. | Herb  | Root, stem | Traumatic injury | GLL0073 |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use | Voucher number |
|----------------|-------------|------------|-------|-----------|---------------|----------------|
| Tuoyaoyao      | Asclepiadaceae | Cynanchum otophyllum Schneid. | Herbaceous liane | Root, stem | Lumbar muscle strain, tonifying kidney | GLL0171 |
| Geshanxiao     | Asclepiadaceae | Cynanchum wilfordii (Maxim.) Hemsl. | Herbaceous liane | Root | Digestive | GLL0172 |
| Huoliangchongye | Boraginaceae | Cynoglossum amabile Stapf & J.R. Drumm. | Herb | Leaf | Snake venom | GLL114 |
| Wandouxi       | Fumariaceae | Dactylipcapsos scandens (D. Don) Hutch. | Herbaceous liane | Root, whole plant | Gastroenteritis, antiphlogosis, haemostasis, digestive, hypertension, traumatic injury | GLL115 |
| Huangcao       | Orchidaceae | Dendrobium moniliforme (L.)Sw. | Herb | Whole plant | Improve immunity | GLL0074 |
| Diaolanhua     | Orchidaceae | Dendrobium nobile Lindl. | Herb | Whole plant | Bone-setting | GLL0078 |
| Shushen        | Araliaceae | Dendropanax dentiger (Harms) Merr. | Shrub | Whole plant | Traumatic injury | GLL0104 |
| Yeluodisong    | Fabaceae | Desmodium griffithianum Benth. | Herb | Whole plant | Snake venom | GLL0036 |
| Banjiuwo       | Fabaceae | Desmodium triflorum (Linn.) DC. | Woody climber | Whole plant | Haemostasis | GLL0035 |
| Yuxingcao      | Compositae | Dichrocephala benthamii C. B. Clarke | Herb | Whole plant, leaf | Headache, gastroenteritis, digestive, unknown swollen | GLL00118 |
| Shanyangtou    | Dioscoreaceae | Dioscorea cirrhosa Lour. | Herbaceous liane | Root | Gastroenteritis | GLL0471 |
| Shanyao        | Dioscoreaceae | Dioscorea hemsleyi Prain et Burkill | Herbaceous liane | Root | Tonifying kidney, replenishing Qi | GLL0472 |
| Xuduan         | Dipsacaceae | Dipsacus asperoides C.Y.Cheng et T.M.Ai | Herb | Root | Heat-clearing and detoxifying, bone-setting, gastroenteritis | GLL057 |
| Wanshouzhu     | Liliaceae | Disporum cantoniense (Lour.) Merr. | Herb | Whole plant | Replenishing qi, hysteritis, cystitis | GLL0053 |
| Yebaihe        | Liliaceae | Diurantlihia minor (C.H. Wright) C.H. Wright ex Hemsl. | Herb | Stem | Pneumonia | GLL0052 |
| Heliandou      | Caryophyllaceae | Drymaria cordata (L.) Wildl. ex Schult. | Herb | Whole plant | Antiphlogosis, gastroenteritis | GLL118 |
| Duyingguo      | Elaeocarpaceae | Elaeocarpus decipiens Hemsl. | Tree | Fruit | Cholelithiasis, heat-clearing and detoxifying, gastroenteritis, Phlegm, antiphlogosis | GLL059 |
| Jindaolifeisan | Compositae | Elephantopus scaber L. | Herb | Root | Asthma | GLL0011 |
| Ciwujia        | Araliaceae | Eleutherococcus senticosus (Ruhr. et Maxim.) Maxim. | Shrub | Leaf, root, bark | Hypertension, traumatic injury, rheumatism, bone-setting, cerebral infarction, common cold. Hepatitis | GLL0105 |
| Cisanjia       | Araliaceae | Eleutherococcus trifoliatu s (Linnaeus) S. Y. Hu | Tree | Stem | Rheumatism | GLL0107 |
| Silenghao      | Labiatae | Elsholtzia blanda Benth. | Herb | Whole plant | Common cold | GLL0046 |
| Saobake        | Labiatae | Elsholtzia rugulosa Hemsl. | Herb | Whole plant | Gastroenteritis, common cold | GLL0044 |
| Suantengzi     | Myrsinaceae | Embelia laeta (Linn.) Mez | Woody climber | Root | Gastroenteritis | GLL0321 |
| Yinyanghuo     | Berberidaceae | Epimedium brevicornu Maxim. | Herb | Whole plant, root, stem | Improve immunity, nephritis | GLL0214 |
| Pashulong      | Araceae | Epipremnum pinnatum | Herbaceous | Whole | Traumatic injury, bone-setting | GLL0083 |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use                                                                 | Voucher number |
|----------------|-------------|------------|-------|-----------|-------------------------------------------------------------------------------|----------------|
| Tongqiao       | Equisetaceae| *Equisetum ramosissimum* Engl. | liane plant | Whole plant, root | Ventilation, traumatic injury, cholelithiasis, heat-clearing and detoxifying, gastroenteritis | GL081          |
| Pipaye         | Rosaceae    | *Eriobotrya japonica* (Thunb.) Lindl. | Tree | Leaf | Relieving cough, common cold                                                   | GL0024         |
| Duzhong        | Eucommiaceae| *Eucommia ulmoides* Oliv. | Tree | Bark | Traumatic injury, bone-setting nephritis, rheumatism                           | GL060          |
| Yipinhong      | Euphorbiaceae| *Euphorbia cyathophora* Murr. | Herb | Whole plant | Traumatic injury                                                              | GL0291         |
| Candouqi       | Euphorbiaceae| *Euphorbia sessiliflora* Roxb. | Herb | Whole plant | Traumatic injury, bone-setting                                                | GL0292         |
| Xiaohuangsan   | Rutaceae    | *Evodia lepta* (Spreng.) Merr. | Tree | Leaf | Gastroenteritis, Heat-clearing and detoxifying                               | GL0136         |
| Wuchuoyi       | Rutaceae    | *Evodia rutaecarpa* (A. Juss.) Benth. | Shrub | Root, seed, whole plant | Antiphlogosis, gastroenteritis                                                  | GL0135         |
| Heshouwu       | Polygonaceae| *Fallopia multiflora* (Thunb.) Haraldson | Herbaceous liane | Root | Digestive, enriching blood, gastroenteritis                                   | GL0094         |
| Dibanteng      | Moraceae    | *Ficus tikoua* Bur. | Woody climber | Stem, root, whole plant, leaf | Common cold, antiphlogosis, ventilation, nephritis, gastroenteritis             | GL037          |
| Jiayanpi       | Fabaceae    | *Flemingia macrophylla* (Willd.) Merr. | Shrub | Root | Gastroenteritis                                                              | GL0034         |
| Lalateng       | Rubiaceae   | *Galium aparine* Linn. | Herbaceous liane | Whole plant | Bone-setting                                                                  | GL0066         |
| Xiaohongshen   | Rubiaceae   | *Galium elegans* Wall. ex Roxb. var. elegans | Herbaceous liane | Root | Bone-setting, Gynecologic diseases                                             | GL0067         |
| Lingzhi        | Polyporaceae| *Ganoderma lucidum* (Curtis) P. Karst. | Herb | Whole plant | Improve immunity, hypertension, diabetes mellitus, ventilation, inducing diuresis | GL061          |
| Zhizi          | Rubiaceae   | *Gardenia jasminoides* Ellis | Shrub | Root | Headache                                                                     | GL0069         |
| Tianma         | Orchidaceae | *Gastrodia elata* Bl. | Herb | Root, stem | Cerebral haemorrhage                                                          | GL0076         |
| Ditanxiang     | Ericaceae   | *Gaultheria fragrantissima* Wall. | Shrub | Root, leaf | Gastroenteritis, heat-clearing and detoxifying, allergy, dermatosis, eczema    | GL0181         |
| Gounaohua      | Loganiaceae | *Gelsemium elegans* (Gardn. et Champ.) Benth. | Woody climber | Root | Heat-clearing and detoxifying                                                 | GL0077         |
| Qinjiao        | Gentianaceae| * Gentiana macrophylla* Pall. | Herb | Whole plant | Rheumatism                                                                    | GL0301         |
| Longdancao     | Gentianaceae| *Gentiana rigescens* Franch. ex Hemsl. | Herb | Whole plant, root | Heat-clearing and detoxifying, antiphlogosis, hepatitis, gastroenteritis         | GL0302         |
| Baitouweng     | Compositae  | *Gerbera piloselloides* (Linn.) Cass. | Herb | Whole plant, root | Heat-clearing and detoxifying, antiphlogosis, cervicitis                        | GL00122        |
| Shifengdan     | Orchidaceae | *Goodyera procera* HK. | Herb | Whole plant | Rheumatism, digestive                                                          | GL0077         |
| Yidaocao       | Compositae  | *Gynura divaricata* (Linn.) DC. | Herb | Leaf | Diabetes mellitus                                                             | GL0017         |
| Shuiganlan     | Rubiaceae   | *Hedyotis diffusa* Willd. | Woody | Whole | Heat-clearing and detoxifying,                                                 | GL0062         |
| Vernacular name | Family name  | Latin name | Habit | Part used       | Medicinal use                              | Voucher number |
|-----------------|--------------|------------|-------|-----------------|--------------------------------------------|----------------|
| Jiegudan        | Rubiaceae    | Hedysotis hedysotidea (DC.) Merr. | Herb  | Root, plant     | Antiphlogosis, improve immunity, gastroenteritis, digestive | GLL0061        |
| Yeshanghua      | Cornaceae    | Helwingia himalaica Hook. f. et Thoms. ex C. B. Clarke | Shrub  | Leaf, whole plant | Bone-setting, traumatic injury              | GLL0382        |
| Shanbaizhi      | Umbelliferae | Heracleum barmanicum Kurz | Herb   | Root            | Hypertension                               | GLL0113        |
| Baizhiye        | Umbelliferae | Heracleum scabridum Franch. | Herb   | Leaf            | Haemostasis                                | GLL0118        |
| Guiqingcao      | Gramineae    | Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult. | Herb   | Whole plant     | Diabetes mellitus                          | GLL0223        |
| Fusanghua       | Malvaceae    | Hibiscus rosa-sinensis Linn. | Shrub  | Flower          | Gynecologic diseases                        | GLL0164        |
| Daheifuzi       | Araceae      | Homalomena occulta (Lour.) Schott | Herb   | Root, stem      | Digestive, rheumatism                       | GLL0084        |
| Yuxingcao       | Saururaceae  | Houttuynia cordata Thunb. | Herb   | Whole plant, leaf | Gynecologic diseases, traumatic injury, expedites afterbirth, gastroenteritis, Laryngopharyngitis | GLL086         |
| Xiaqingteng     | Hernandiaceae| Illigera nervos Merr. | Woody climber | Stem | Snake venom | GLL074 |
| Huangpicao      | Gramineae    | Imperata cylindrica (L.) Raeusch. | Herb   | Root | Haemostasis, replenishing qi | GLL0222 |
| Jiagushigun     | Compositae   | Inula cappa (Buch.-Ham. ex D. Don) DC. | Herb   | Root | Common cold | GLL00127 |
| Yitong          | Flacourtiaceae| Itoa orientalis Hermsl. | Tree   | Root | Heat-clearing and detoxifying, snake venom | GLL058 |
| Baitucao        | Compositae   | Ixeris polycephala Cass. | Herb   | Whole plant | Antiphlogosis                              | GLL0018        |
| Yinxunhua       | Oleaceae     | Jasminum nudiflorum Lindl. | Shrub  | Leaf | Heat-clearing and detoxifying | GLL080 |
| tongsuexiang    | Schisandraceae| Kadsura heteroclitica (Roxb.) Craib | Woody climber | Root, stem | Lumbar muscle strain, rheumatism | GLL0109 |
| Ziwei           | Lythraceae   | Lagerstroemia indica Linn. | Tree   | Bark | Dermatosis, urticaria | GLL083 |
| Chouliningdan   | Compositae   | Laggera crispata (Vahl) Hepper & J.R.I.Wood | Herb   | Leaf, whole plant | Heat-clearing and detoxifying, haemostasis, snake venom, gastroenteritis, Laryngopharyngitis | GLL0019 |
| Yema            | Labiatae     | Leonurus japonicus Houtt. | Herb   | Whole plant | Gynecologic diseases                        | GLL0048        |
| Gezaocao        | Fabaceae     | Lespedeza cuneata (Dum. Cours.) G. Don | Shrub  | Whole plant | Thrush                                    | GLL0031        |
| Mifengcao       | Labiatae     | Leucas ciliata Benth. | Herb   | Whole plant | Rheumatism, stroke, heat-clearing and detoxifying | GLL0045 |
| Guichuxiao      | Caprifoliaceae| Leycesteria formosa Wall. | Shrub  | Whole plant | Ventilation                               | GLL0251        |
| Chuanxiong      | Umbelliferae | Ligusticum sinense Oliv. | Herb   | Root | Gynecologic diseases, traumatic injury, rheumatism | GLL0114 |
| Lapi            | Lauraceae    | Lindera tonkinensis var. tankinensis | Tree   | Bark | Ventilation | GLL0271 |
| Jinqiancaoc     | Campanulaceae| Labelia angulata Forst. | Herbaceous liane | Whole plant | Nephritis | GLL119 |
Table 2 The inventory of medicinal plants traditionally used by local people (Continued)

| Vernacular name | Family name | Latin name | Habit     | Part used    | Medicinal use                              | Voucher number |
|-----------------|-------------|------------|-----------|--------------|--------------------------------------------|----------------|
| Dajiangjun      | Campanulaceae | Lobelia clavata E. Wimm. | Herb      | Root         | Heat-clearing and detoxifying              | GLL035         |
| Jinyinhua       | Caprifoliaceae | Lonicera maackii (Rupr.) Maxim. | Herbaceous liane | Flower     | Heat-clearing and detoxifying              | GLL0252        |
| Dingxiang       | Rubiaceae    | Luculia pinceana Hook. var. pinceana | Shrub      | Bark         | Rheumatism                                 | GLL00610       |
| Jiaogua          | Cucurbitaceae | Luffa acutangula (Linn.) Roxb. | Herbaceous liane | Whole plant | Snake venom                               | GLL0144         |
| Gouqi           | Solanaceae   | Lycium chinense Mill. | Shrub      | Fruit        | Gynecologic diseases, antiphlogosis, cystitis, diuretic | GLL0201         |
| Shenjincao      | Lycopodiaceae | Lycopodium japonicum Thunb. ex Murray | Herb      | Whole plant  | Bone-setting, Lumbar Muscle strain, rheumatism | GLL094         |
| Guoluhuang      | Primulaceae  | Lysimachia christinhae Hance | Herb      | Whole plant  | Cholecystitis, snake venom                  | GLL054         |
| Aishen          | Gesneriaceae | Lysionotus pauciflorus var. pauciflorus Maxim. | Herb      | Whole plant  | Bone-setting                               | GLL073         |
| Dashuhuanglian  | Berberidaceae | Mahonia duclouxiiana Gagnep. | Shrub      | Whole plant, root, stem | Heat-clearing and detoxifying, antiphlogosis, relieving cough | GLL0211 |
| Dabaigai        | Asclepiadaceae | Marnsdenia griffithii Hook. f. | Woody climber | Root         | Heat-clearing and detoxifying, gastroenteritis, diabetes mellitus | GLL0174         |
| Tongguansan     | Asclepiadaceae | Marnsdenia tenacissima (Roxb.) Moon | Woody climber | Root         | Digestive, antiphlogosis, rheumatism, laryngopharyngitis | GLL0175         |
| Xiaohongteng    | Urticaceae   | Menonials hirta (BL)Wedd. | Herbaceous liane | Root        | Heat-clearing and detoxifying, traumatic injury | GLL0311         |
| Haixiucao       | Mimosaceae   | Mimosa pudica Linn. | Herb      | Whole plant  | Rheumatism                                 | GLL0331         |
| Fenguo          | Nyctaginaceae | Mirabilis jalapa Linn. | Herb      | Root, whole plant | Heat-clearing and detoxifying, antiphlogosis, toothache, snake venom, diabetes mellitus, mumps | GLL116         |
| Sangpi          | Moraceae     | Morus alba L. | Shrub      | Bark, fruit, root, leaf, juice | Relieving cough, tonifying kidney, jaundice hepatitis, hyperlipidemia, laryngopharyngitis, common cold, heat-clearing and detoxifying, cholangic, hypertension, diabetes mellitus, tonifying kidney, rheumatism | GLL120         |
| Daxueteng       | Fabaceae     | Mucuna macrobotrys Hance | Herb      | Root, stem   | Bone-setting, pneumonia, relieving cough | GLL0038         |
| Aituotuo        | Meliaceae    | Munronia pinnata (Wall.) W. Theobald | Shrub      | Root         | Traumatic injury                           | GLL0233         |
| Yangmei         | Myricaceae   | Myrica rubra (Lour.) Siebold et Zucc. | Tree      | Bark         | Gastroenteritis, analgesic                 | GLL106         |
| Jingjie         | Labiatae     | Nepeta cataria Linn. | Herb      | Whole plant  | Haemostasis, common cold                   | GLL0042         |
| Shuqincai       | Umbelliferae | Oenanthe javanica (BL) DC. | Herb      | Whole plant  | Hypertension                               | GLL0116         |
| Babaozhenxindan | Liliaceae    | Ophiopogon dracaenoides (Baker)HK.f. | Herb      | Whole plant  | Heart disease                              | GLL0057         |
| Xianrenzhang    | Cactaceae    | Opuntia dillenii (Ker Gawl.) Haw. | Herb      | Stem         | Antiphlogosis, unknown swollen, exercise evil spirits | GLL102         |
| Haichuang       | Bignoniaceae | Oroxylum indicum (Linn.) Kurz | Tree      | Fruit        | Hepatitis                                  | GLL0421         |
| Chaotianguan    | Melastomataceae | Obeckia crinita Benth. ex C. B. Clarke | Shrub      | Whole plant  | Hepatitis                                  | GLL0107         |
| Vernacular name          | Family name | Latin name               | Habit           | Part used          | Medicinal use                                                                                      | Voucher number |
|-------------------------|-------------|--------------------------|-----------------|--------------------|-----------------------------------------------------------------------------------------------------|----------------|
| Laowasuanyingcai        | Oxalidaceae | Oxalis corniculata Linn. | Herb            | Whole plant        | Rheumatism, gynecologic diseases, nephritis, gastroenteritis, Migraine, heat-clearing and detoxifying, traumatic injury, haemostasis | GLL0452        |
| Honghuadiding           | Oxalidaceae | Oxalis corymbosa DC.     | Herb            | Whole plant        | Traumatic injury, heat-clearing and detoxifying                                                     | GLL0451        |
| Jishiteng               | Rubiaceae   | Paederia foetida Linn.   | Herbaceous liane| Stem, leaf         | Antiphlogosis                                                                                       | GLL0065        |
| Mudanhu                 | Paeoniaceae | Paeonia suffruticosa Andr.| Shrub           | Root               | Heart disease, neurasthenia                                                                           | GLL091         |
| Sanqi                   | Araliaceae  | Panax pseudo-ginseng Wall.| Herb           | Root               | Hypertension, traumatic injury, lumbar muscle strain                                               | GLL0102        |
| Yesanqi                 | Araliaceae  | Panax zingiberensis C. Y. Wu et K. M. Feng | Herb | Root | Traumatic injury, bone-setting                                                                       | GLL0103        |
| Yingsu                  | Papaveraceae| Papaver somniferum Linn. | Herb            | Nutshell, fruit    | Gastroenteritis, antiphlogosis                                                                      | GLL109         |
| Chonglou                | Liliaceae   | Paris polyphylla Smith   | Herb            | Root               | Traumatic injury haemostasis, unknown swollen, antiphlogosis, gastroenteritis                        | GLL0055        |
| Sanxuedan               | Piperaceae  | Piperomia blanda (Jacq.) Kunth | Herb          | Whole plant        | Traumatic injury                                                                                   | GLL0281        |
| Suzi                    | Labiatae    | Penilla frutescens var. purpurascens (Hayata) | Herb | Whole plant        | Relieving cough                                                                                   | GLL0049        |
| Fengteng                | Asclepiadaceae | Periploca calophylla (Woght) Falc. | Woody climber | Leaf, whole plant, Stem | Heat-clearing and detoxifying, antiphlogosis rheumatism                                            | GLL0173        |
| Ganlanguo               | Euphorbiaceae| Phyllanthus emblica Linn. | Tree            | Bark, fruit        | Gastroenteritis, hyperlipidemia                                                                     | GLL0293        |
| Shanglu                 | Phytolaccaceae | Phytolacca americana Linn. | Herb          | Whole plant        | Heat-clearing and detoxifying, diuretic                                                             | GLL090         |
| Dafangfeng              | Umbelliferae| Pimpinella candolleana Wight et Arn. | Herb | Whole plant        | Digestive, antiparasitics                                                                           | GLL0115        |
| Banxia                  | Araceae     | Pinella ternata (Thunb.) Makino | Herb | Root | Heat-clearing and detoxifying                                                                         | GLL0081        |
| Simaosong               | Pinaceae    | Pinus kesya Royle ex Gordon | Tree          | Branch, leaf, root | Catharsis, traumatic injury, exorcise evil spirits                                                  | GLL096         |
| Yezilan                 | Piperaceae  | Piper boehmeriaefolium (Miq.) C. DC. | Shrub | Fruit, whole plant, root, stem | Digestive, common cold, gastroenteritis, traumatic injury, bone-setting, rheumatism             | GLL0284        |
| Waiyezilan              | Piperaceae  | Piper boehmeriaefolium var. tonkinense C. DC. | Tree | Whole plant | Rheumatism                                                                                         | GLL0283        |
| Yehujiuao               | Piperaceae  | Piper nigrum Linn.       | Tree            | Root, bark, fruit  | Antiphlogosis                                                                                       | GLL0282        |
| Laihamacao              | Plantaginaceae | Plantago minuta Pall. | Herb          | Whole plant        | Heat-clearing and detoxifying, common cold, antiphlogosis, cystitis, Prostatitis                   | GLL056         |
| Baihuadian              | Plumbaginaceae | Plumbago zeylanica Linn. | Herb          | Root               | Traumatic injury                                                                                   | GLL050         |
| Jidanhua                | Apocynaceae | Plumeria rubra Linn.     | Shrub           | Leaf               | Lumbar muscle strain, traumatic injury                                                               | GLL0151        |
| Jiduzishu               | Polygalaceae| Polygala arilkata Buch.-Ham. ex D. Don | Shrub | Root | Gynecologic diseases, digestive                                                                    | GLL0482        |
| Hongbeilian             | Polygalaceae| Polygala latouchei Franch. | Tree          | Whole plant        | Heat-clearing and detoxifying                                                                       | GLL0481        |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use | Voucher number |
|----------------|-------------|------------|-------|-----------|---------------|----------------|
| Suanjiangcao   | Polygonaceae | Polygonum capitatum Buch.-Ham. ex D. Don | Herb   | Whole plant | Bone-setting, traumatic injury checking diarrhoea, haemostasis | GLL0091       |
| Huzhang        | Polygonaceae | Reynoutria japonica Houtt.               | Herb   | Whole plant | Traumatic injury | GLL0097       |
| Gongyaoalao    | Polygonaceae | Polygonum paleaceum Wall. ex Hook. f.   | Herb   | Root       | Lumbar muscle strain, nephritis, traumatic injury | GLL0092       |
| Sanxuelan      | Polygonaceae | Polygonum runcinatum Buch.-Ham. ex D. Don var. sinense Hemsl. | Herb   | Whole plant | Traumatic injury | GLL0093       |
| Machixian      | Portulacaceae | Portulaca oleracea Linn. | Herb   | Whole plant | Traumatic injury, hypertension | GLL076        |
| Dibinlang      | Rosaceae     | Potentilla fulgens Wall. ex Hook.       | Herb   | Fruit      | Digestive     | GLL0029       |
| Fanbaiye       | Rosaceae     | Potentilla lineata Trevir.              | Herb   | Whole plant, root | Heat-clearing and detoxifying, gastroenteritis, digestive, dysentery | GLL00210 |
| Xiakucao       | Labiatae     | Prunella vulgaris Linn.                 | Herb   | Whole plant | Heat-clearing and detoxifying, antiphlogosis, hepatitis, hypertension | GLL0043       |
| Fanshiliu      | Myrtaceae    | Psidium guajava Linn.                  | Tree   | Leaf       | Gastroenteritis | GLL097        |
| Fengweiciao    | Pteridaceae  | Pteris multifida Poir.                 | Herb   | Whole plant | Dog bite      | GLL062        |
| Gegen          | Fabaceae     | Pueraria montana var. lobata (Willd.) Maesen et S. M. Almeida ex Sanjappa et Predeep | Shrub | Root       | Common cold, snake venom, antialcoholism | GLL00310 |
| Shiliuhua      | Punicaceae   | Punica granatum Linn.                  | Tree   | Flower, fruit, bark | Gynecologic diseases, cholelithiasis | GLL093        |
| Mali           | Fagaceae     | Quercus acutissima Carruth.            | Tree   | Bark, root, leaf | Lumbar muscle strain, gastroenteritis | GLL072        |
| Luobo          | Cruciferae   | Raphanus sativus Linn.                 | Herb   | Root, stem | Common cold   | GLL092        |
| Luofumu        | Apocynaceae  | Rauvolfia verticillata (Lour.) Baill.  | Shrub  | Root, leaf | Hypertension   | GLL0153       |
| Guoshanlong    | Araceae      | Rhaphidophora lancifolia Schott        | Herbaceous liane | Root | Bone-setting | GLL0085       |
| Dahuang        | Polygonaceae | Rheum officinale Baill.                | Herb   | Root       | Catharsis, checking diarrhoea | GLL0096       |
| Huixincao      | Bryaceae     | Rhododrum roseum Limp.                 | Herb   | Whole plant | Heart disease  | GLL112        |
| Dujuanhua      | Ericaceae    | Rhododendron delavayi Franch.         | Shrub  | Flower     | Gynecologic diseases | GLL0183 |
| Yueji          | Rosaceae     | Rosa chinensis Jacq.                  | Shrub  | Flower     | Gynecologic diseases | GLL0026       |
| Jinyingzi      | Rosaceae     | Rosa laevigata Michx.                 | Woody climber | Root, fruit | Gastroenteritis | GLL0025       |
| Nianniancao    | Rubiaceae    | Rubia cordifolia L.                   | Herbaceous liane | Root | Haemostasis | GLL0068       |
| Huangciguo     | Rosaceae     | Rubus ellipticus var. obcordatus (Franch.) Focke | Shrub | Root, leaf | Tonic, gastroenteritis | GLL00211 |
| Tudahuang      | Polygonaceae | Rumex dentatus Linn.                  | Herb   | Whole plant | Gastroenteritis | GLL0095       |
| Qingfengteng   | Sabiaceae    | Sabia yunnanensis Franch.             | Woody climber | Stem, leaf | Heat-clearing and detoxifying | GLL084        |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use | Voucher number |
|-----------------|-------------|------------|-------|-----------|---------------|----------------|
| Liushupi        | Salicaceae  | *Salix matsudana* | Tree  | Bark      | Stroke        | GLL105         |
| Xuepencao       | Caprifoliaceae | *Sambucus javanica* | Shrub | Whole plant, leaf | Bone-setting, traumatic injury, rheumatism | GLL0253 |
| Yeshanhu        | Buxaceae    | *Sarcococca ruscifolia* | Shrub | Root      | Bone-setting   | GLL0342        |
| Qielian         | Araliaceae  | *Schefflera arboricola* | Shrub | Leaf      | Traumatic injury | GLL0101 |
| Xiaohongteng    | Schisandraceae | *Schisandra henyi* | Woody climber | Root, fruit | Heat-clearing and detoxifying, heat-clearing and detoxifying, rheumatism | GLL0108 |
| Zuandifeng      | Saxifragaceae | *Schizophragma integrolium* | Woody climber | Root | Heat-clearing and detoxifying, traumatic injury, rheumatism | GLL066 |
| Huoqieyao       | Compositae  | *Scozonera ikonnikovii* | Herb  | Whole plant | Heat-clearing and detoxifying | GLL00117 |
| Yizhijian       | Labiatae    | *Scutellaria discolor* | Herb  | Whole plant, Root | Antiphlogosis, relieving cough | GLL0047 |
| Jiuliguang      | Compositae  | *Senecio scandens* | Herb  | Root      | Heat-clearing and detoxifying, antiphlogosis | GLL00112 |
| Xiaohuaishu     | Fabaceae    | *Senna occidentalis* (L.) Link | Tree | Flower | Haemostasis | GLL00311 |
| Yehuasheng      | Fabaceae    | *Senna tora* (L.) Roxb. | Shrub | Whole plant | Snake venom | GLL0032 |
| Baduyao         | Malvaceae   | *Sidà acuta* | Shrub | Root      | Traumatic injury, unknown swollen | GLL0161 |
| Tufuling        | Smilacaceae | *Smilax glabra* | Shrub | Root      | Gynecologic diseases | GLL049 |
| Xiwanshu        | Solanaceae  | *Solanum donianum* | Tree  | Root      | Common cold | GLL0203 |
| Kuliangcai      | Solanaceae  | *Solanum nigrum* | Herb  | Whole plant | Heat-clearing and detoxifying, traumatic injury, haemostasis | GLL0202 |
| Laoshuhuanggua  | Cucurbitaceae | *Solena amplexicaulis* (Lam.) Gandhi | Herbaceous liane | Root | Diabetes mellitus, antiphlogosis, tonsillitis | GLL0143 |
| Huaishu         | Fabaceae    | *Sophora japonica* | Flower | Shrub | Haemostasis | GLL0033 |
| Huibaocao       | Caryophyllacea | *Stellaria vestita* Kurz var. vestita | Herb | Whole plant | Heat-clearing and detoxifying, traumatic injury, haemostasis, bone-setting | GLL039 |
| Jiuguniu        | Steronaceae | *Stemona tuberosa* | Herb  | Root      | Phlegm, replenishing qi | GLL051 |
| Shanwugui       | Menispermaceae | *Stephania delavayi* Diels | Herbaceous liane | Root | Digestive, antiphlogosis, gastroenteritis, analgesic | GLL0193 |
| Juhuaxin        | Menispermaceae | *Stephania tetrandra* S. Moore | Herbaceous liane | Root | Gastroenteritis | GLL0192 |
| Banlangen       | Acanthaceae | *Strobilanthes cusia* (Nees) J.B.Imlay | Herb | Root, leaf | Common cold, antiphlogosis, gastroenteritis | GLL071 |
| Yudancao        | Gentianaceae | *Swertia bimaculata* (Siebet Zucc.) Hook.f et Thoms. | Herb | Whole plant | Hepatitis, cholecystitis | GLL0303 |
| Xiaohoke        | Symplocaceae | *Symplocos paniculata* (Thunb.) Miq. | Shrub | Whole plant | Common cold | GLL089 |
| Huanghualam     | Compositae  | *Taraxacum mongolicum* Hand.-Mazz. | Herbeaceous liane | Whole plant | Heat-clearing and detoxifying, antiphlogosis, analgesic, breast cancer | GLL00111 |
| Sangjisheng     | Loranthaceae | *Taxillus sachuenensis* (Lecomte) Danser | Shrub | Whole plant | Tonifying kidney, rheumatism, antiphlogosis | GLL087 |
| Hongduoshan     | Taxaceae    | *Taxus wallichiana* Zucc. | Tree  | Bark      | Antiparastics | GLL064 |
| Zhulinbiao      | Bignoniaceae | *Tecoma capensis* (Thunb.) | Woody | Whole | Lumbar muscle strain | GLL0422 |
| Vernacular name | Family name | Latin name | Habit | Part used | Medicinal use | Voucher number |
|----------------|-------------|------------|-------|-----------|---------------|----------------|
| Wuzhuajinlong  | Vitaceae    | Tetrastigma hypoglauum Planch. | Woody climber | Whole plant | Traumatic injury | GLL0243        |
| Huanglian      | Ranunculaceae | Thalictrum falialosum DC. | Herb | Whole plant | Gastroenteritis | GLL0123        |
| Luoguodi       | Cucurbitaceae | Thladiantha villosula Cogn. | Herbaceous liane | Root, stem, whole plant | Heat-clearing and detoxifying, gastroenteritis, antiphlogosis | GLL0141        |
| Aijiao         | Orchidaceae  | Thunia alba (Lindl.) Rchb. f. | Herb | Root, stem, whole plant | Traumatic injury bone-setting | GLL0075        |
| Jinxiaidiaohulu | Menispermaeae | Tinospora sagittata (Oliv.) Gagnep. | Herbaceous liane | Root | Heat-clearing and detoxifying, analgesic, unknown swollen, gastroenteritis | GLL0194        |
| Xiangchun      | Melliaceae   | Toona sinensis (A. Juss.) Roem. | Tree | Root, bark | Heat-clearing and detoxifying, allergy | GLL0232        |
| Laomianguashu  | Cornaceae    | Toricella nilifolia DC. | Tree | Leaf | Nephritis | GLL0381        |
| Zongshu        | Palmaeae     | Trachycarpus fortunei (Hook.) H. Wendl. | Tree | Root | Traumatic injury | GLL0432        |
| Zizhumei       | Connelliaeae | Tradescantia pallida (Rose) D.R.Hunt | Herb | Whole plant | Antiphlogosis | GLL0412        |
| Yiner          | Tremellaceae | Tremella fuciformis | Whole plant | Tonic | | GLL108         |
| Citong         | Araliaceae   | Trevesia palmata (Roxb.) Vis. | Shrub | Root, bark | Bone-setting, traumatic injury | GLL0106        |
| Leigongteng    | Celastraceae | Tripterygium wilfordii Hook. f. | Shrub | Stem, leaf | Liver cancer | GLL100         |
| Jinsiling      | Tropaeolaceae | Tropaeolum majus Linn. | Herb | Whole plant | Otitis | GLL063         |
| Gaojiaoaiqi    | Liliacea     | Tulpistra aurantica Wallex Baker | Herb | Whole plant | Bone-setting, gastroenteritis | GLL0054        |
| Baibuhuanyuan  | Araceae      | Typhonium blumei Nicolson et Sivadasan | Herb | Whole plant | Laryngopharyngitis, snake venom, heat-clearing and detoxifying | GLL0086        |
| Yutouqi        | Araceae      | Typhonium divaricatum (L.) Decne | Herb | Stem | Gastroenteritis | GLL0087        |
| Jingou         | Rubiaceae    | Uncaria laevigata Wall. ex G. Don | Woody climber | Root, stem | Traumatic injury | GLL0064        |
| Gouteng        | Rubiaceae    | Uncaria rhynchophylla (Miq.) Miq. ex Havil. | Woody climber | Root, stem | Heat-clearing and detoxifying | GLL0063        |
| Xiqianma       | Urticaceae   | Urtica angustifolia Fisch. ex Hornem. | Herb | Whole plant | Rheumatism | GLL0312        |
| Xiezicao       | Urticaceae   | Urtica fissa E. Pritz. | Herb | Whole plant | Rheumatism, urticaria | GLL0313        |
| Matixiang      | Valerianaceae | Valeriana jatamansi Jones | Herb | Whole plant | Gastroenteritis | GLL053         |
| Xiaozongbao    | Liliacea     | Veratrum mengtzeanum Loes. f. | Herb | Root, stem | Antiparastics | GLL0058        |
| Mabiancao      | Verbenaceae  | Verbena officinalis Linn. | Herb | Root, whole plant | Common cold, heat-clearing and detoxifying, gastroenteritis | GLL0362        |
| Dashufasan     | Compositae   | Vernonia parishii Hook. f. | Herb | Root | Common cold | GLL00114       |
main reason for this result is likely the abundance of species in these two families. Furthermore, the richest plant genera were *Cinnamomum*, *Aconitum*, *Artemisia* and *Polygonum*, each represented by 4 species. The most commonly utilized species is *Dactylicapnos scandens* (D. Don) Hutch., which belongs to Papaveraceae and is used as an antipyretic drug.

The traditional medicinal plants used in the study area possess a high ratio of being documented in the literature. Of all 302 species, 76 were recorded in the Chinese Pharmacopoeia, which is an authoritative masterwork in China, and 233 species were recorded in Traditional Chinese Medicine Resources. The local medicine journal Plant Medicine of Yi and Simao Herbal Medicine recorded 34 and 99 species, respectively (Fig. 2).

According to the analysis of the constitution of medicinal plants, the single-species family and the single-species genus had an absolute advantage in number (Tables 3 and 4), indicating that the medicinal plants in this region have high diversity in the composition of species at the family and genus level, which is similar to the survey of Shen [13].

In Fig. 3, the life form analysis of traditional medicinal plants showed that herbaceous plants constituted the highest proportion, represented by 151 (50%) species, while there were 53 (17.55%) shrub species, 25 (8.28%) herbaceous lianas, 29 (9.60%) woody climbers and 44 (14.57%) tree species. This result is similar to the study of Lisu community in Nujiang, which is a minority community of China and lives in the Hengduan Mountains area as well [14, 15]. The main reason why herbs are the main medicinal plants is likely due to their diversity and convenience.

Informants in the study area used different plant parts for the preparation of traditional drugs. Based on the data from informants, the majority of the traditional medicinal plant species were harvested as a whole plant (130), followed by the roots (127), leaves (37), stems (33), bark (24), fruits (22), flowers (10) and other parts (4) (Fig. 4). However, some studies suggest that this

### Table 2 The inventory of medicinal plants traditionally used by local people (Continued)

| Vernacular name | Family name | Latin name | Habit   | Part used | Medicinal use                  | Voucher number |
|-----------------|-------------|------------|---------|-----------|--------------------------------|----------------|
| Pangxiejiao     | Viscaceae   | *Viscum articulatum* Burm. f. | Herb    | Whole plant | Antiphlogosis, cystitis         | GLL065         |
| Yantong         | Scrophulariaceae | *Wightia speciosissima* (D.Don)Merr. | Tree    | Bark       | Bone-setting                    | GLL103         |
| Yulan           | Magnoliaceae | *Yulania denudata* (Desr.) D. L. Fu | Tree    | Flower     | Headache                        | GLL078         |
| Huajiao         | Rutaceae    | *Zanthoxylum bungeanum* Maxim. | Shrub   | Bark, fruit, root | Toothache, antiphlogosis       | GLL0133        |
| Yumixu          | Gramineae   | *Zea mays* Linn. | Herb    | Stamen     | Hypertension, diuretic          | GLL0221        |
| Shuixianhua     | Amaryllidaceae | *Zephyranthes carinata* Herb. | Herb    | Root       | Antiphlogosis                   | GLL095         |
mode of utilization may lead to the depletion of traditional medicinal resources [16, 17].

Efficacy analysis of traditional medicinal plants was carried out based on Chinese Medicinal Materials [18]. The results showed that the medicinal plants were used for treating 93 human ailments in the study area. Antipyretics drugs occupy the highest proportion, followed by activating blood and eliminating stasis, diaphoretics and antirheumatics (Fig. 5). This result differed from the study of medicinal plants used by the Yi ethnic group in Chuxiong of Yunnan, showed that trauma was the most common disease. The particular geology and climate are ideal for unique Yi medicine effective in treating pyretic toxicity, rheumatism and other ailments [14].

Endangered category assessment
According to the Red List of Chinese Biodiversity (Higher Plant Volume) [19], the level of endangerment of the traditional medicinal plants in the study area was assessed. The ratio of endangered species of traditional medicinal plants in the Jingdong Yi community area (Fig. 6) was higher than that in the Wuliang Mountains National Nature Reserve but lower than that observed nationwide [20], which does not suggest that the harvest of traditional medicinal plants by local people to treat disease is the main reason for their decrease.

Comparison differences of medicinal plants between Yi and Han communities
The Yi and Han communities in the study area have lived in the Yi autonomous county of Jingdong in a multi-ethnic association for many years. When comparing their traditional medicinal plants, an extremely dissimilar relationship was found. The Jaccard similarity index was 0.232, which indicated a low degree of medicinal species overlap between the two communities. This result could be explained by the viewpoint that different cultural backgrounds play an essential role in the utilization of traditional medicinal plants [21]. Comparisons of different communities within the same area proved that a massive discrepancy in terms of traditional medicinal plants still exists even after being fused for a long time. Therefore, the national specificity in the utilization of medicinal plants persists in the region and modern society as well [22]. However, more ethnobotanical documentation research from Yunnan Province have shown that minority's medicinal culture is facing the increasing danger of dying out, under the great impact from Han community's culture and way of life [4, 5, 23].

Conclusion
This is the first ethnobotanical study conducted in the Wuliang Mountains of Jingdong, and a total of 302 species were recorded. The results show a high diversity of traditional medicinal plants, as we previously suspected. By assessment of endangered status, the traditional medicinal plants need to be protected.
medicinal plants in the study area exhibit excellent conditions. This indicates that folk utilization is not the main reason for the degeneration of wild resources. The use of a large number of certain herbs as merchandize may contribute to the deteriorating situation of wild medicinal plants, such as the reduction of *Panax notoginseng* (Burkill) F.H. Chen ex C. Chow & W.G. Huang and *Paris polyphylla* var. *yunnanensis* (Franchet) Handel-Mazzetti. In contrast, some minority communities have traditional methods to protect their precious wild resources. For example, the Red-Headed Yao People in China select different parts of medicinal plants to treat diseases and selectively harvest old roots, leaving the new roots, according to different seasons and climatic conditions [24]. The Yi community in Jingdong Autonomous County also has a belief in nature, which plays a
vital role in the sustainable utilization of wild resources. They have a belief of animism and believe that every tree is divine and thus deserves to be protected and respected. The people who engage in the destruction of the sacred trees have a fear of future retaliation and punishment [25].

Despite the abundance of medicinal plants in the study area, the inheritance of this valuable culture is facing a serious threat, mainly due to the rapid development of modern medicine. The ageing of herbalists without inheritors results in the rapid loss of valuable knowledge. In addition, the knowledge of traditional medicinal plants in Jingdong inherited via the oral mode and the accuracy of inheritance are difficult to determine. The most critical challenge is the lack of wild resources. According to statistics, approximately 96% of traditional medicinal plants come from the wild [26]. Especially in China, with the increasing demand for resources, tremendous pressure from overexploitation is faced by many regions. Hence, these regions should take some effective measures to protect these valuable resources and maintain their sustainable utilization in the future.

As one of the birthplaces of Yi medicine, knowledge about traditional medicinal plants is infinite, and it is a precious wealth left behind by ancestors. With regard to the application of these species, there are still many limitations that should be addressed and improved by modern science and techniques.

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Authors’ contributions
LLG carried out the field study, analysed the data and drafted the manuscript. GPY assisted in identifying the plant species. CTC provided guidance for the entire project and helped to supervise the study. NW revised the manuscript and contributed ideas to the discussion. ZXZ assisted with the efficacy analysis. GZL helped in the field work. All authors read and approved the final manuscript.

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Availability of data and materials
We are willing to share the data generated and analysed during the current study.

Ethics approval and consent to participate
We followed the ethical guidelines adopted by the International Society of Ethnobiology (2008). All participants were asked for their free prior informed consent before interviews were conducted.

Consent for publication
Not applicable

Competing interests
The authors declare that they have no competing interests.

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