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# Botanical drugs for bruises used in the Xiangxi region of China, a place rich in martial culture

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***Author contributions***

He JW and Luo BS conceived the project and designed the research. He JW, Gao HT, Liu X, Li Q, Luo J and Yan J performed the investigation. He JW and Luo BS provided the resources. He JW carried out the data curation. He JW and Luo BS prepared the original draft. Luo BS reviewed and edited the writing. All authors read and agreed to the published version of the manuscript.

***Competing interests***

The authors declare no conflicts of interest.

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***Peer review information***

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***Abbreviations***

FL, fidelity level.

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***Abstract***

**Background:** Xiangxi Tujia and Miao Autonomous Prefecture, located in Hunan Province, China, is a culturally rich region with a diverse population. The locals have a deep martial arts history and possess a wealth of traditional knowledge for treating bruises. **Methods:** In order to investigate this topic, we conducted ethnobotanical studies by visiting local medicinal markets and conducting interviews. **Results:** We identified 43 botanical drugs used for treating bruises, categorized into four types: sprains, contusions, strains, and bone injuries. The local people typically prefer to mash these botanical drugs freshly or make medicinal wine for external use. Treatment often involves a combination of drugs to promote blood circulation and remove blood stasis, with medications to dispel rheumatism, clear heat, and detoxify, tailored to the humid climate and high precipitation in mountainous areas. Based on the fidelity level values, the local plant resources with high acceptance, utilization, or potential value in the treatment of bruises included *Sargentodoxa cuneata*, *Lycopodium japonicum*, *Dioscorea cirrhosa*, *Panax japonicus*, *Achyranthes bidentata*, *Lysimachia heterogenea* and so on. **Conclusion:** Herbal medicine and related knowledge for treating bruises are diverse and rich in the Xiangxi region. However, the local traditional medicinal knowledge faces challenges regarding inheritance due to regional modernization. Therefore, it is crucial to protect and further study this knowledge in the future.

**Keywords:** bruises; medicinal plants; ethnobotany; Xiangxi; traditional knowledge

***Highlights***

1. Xiangxi Tujia and Miao Autonomous Prefecture in China possess a rich cultural heritage and traditional knowledge for treating bruises, influenced by their deep martial arts history.
2. Ethnobotanical studies identified 43 botanical drugs categorized into four types for treating bruises, with treatment involving a combination of drugs tailored to the local climate and diverse culture.
3. The region's traditional medicinal knowledge faces challenges due to regional modernization, emphasizing the need for its protection and further research.
4. Specific plants like *Sargentodoxa cuneata* and *Panax japonicus* show significant potential for bruise treatment.

***Medical history of objective***

The Xiangxi region has historically been geographically isolated and culturally restricted. It has long been an area with concentrated ethnic minorities and has experienced numerous armed conflicts with central authorities due to issues like taxation. One well-known example is the Qian-Jia Miao-Min Uprising, which lasted for over 20 years during the reigns of Emperor Qianlong and Emperor Jiaqing of the Qing Dynasty. These prolonged local wars have given rise to distinctive medical knowledge for treating injuries. Furthermore, the ethnic minority residents of the area have long inhabited deep mountains with rugged terrain and dense forests. They have been engaged in intensive physical labor related to agriculture for extended periods, making them prone to bone fractures, sprains, and other injuries. In order to treat various types of injuries from falls and impacts, the local people have gradually developed unique traditional medical knowledge related to treating such injuries through long-term accumulation and experiential summaries.

## *Introduction*

The unique chemical compositions of medicinal plants have made them a fundamental resource for protecting human health [1]. Although medicinal plant use has decreased due to the introduction of synthetic drugs in the 20th century, they remain an essential treatment method for many ethnic groups worldwide [2, 3]. In rural areas where medical facilities are outdated and medical expenses are unaffordable, traditional medicinal plants are often the primary or supplementary choice for treatment [4]. In China, herbal medicine has been a mainstream practice for treating diseases since ancient times, predating the widespread use of modern drugs [3].

The Xiangxi Tujia and Miao Autonomous Prefecture (Xiangxi region) is situated in the western part of Hunan Province, China, and is renowned for its cultural diversity and varied ethnic groups, including Tujia, Miao, Yao, Bai, Tibetan, etc.; the Tujia and Miao ethnic groups are dominant in the region [5, 6]. Throughout history, all local ethnic groups have accumulated extensive knowledge and experience in disease prevention and treatment. The traditional medical culture of the Xiangxi region is predominantly centered around Tujia and Miao medicines. It incorporates various ethnic and folk remedies, including those from Bai and Dong cultures, resulting in a rich medical theory and philosophical tradition culminating in a distinctive and comprehensive healthcare system [5].

Through our annual investigations on the utilization of medicinal plants in the Xiangxi region, we have discovered a wealth of traditional knowledge among the local population regarding treating soft tissue injuries, with a particular emphasis on bruises. These injuries are prevalent in their daily lives, making this expertise an essential part of their healthcare practices. The Tujia and Miao ethnic groups have resided in the challenging, mountainous terrain of the Xiangxi region for generations, where dense forests and a long history of intertribal wars have significantly influenced a culture characterized by elements of "martialism" (Figure 1) [7]. In traditional Chinese culture, "kung fu" often evokes images of herbal remedies for treating bruises. The prevalence of practicing kung fu among locals due to the historical and influence of "martialism" culture could be a significant reason for their familiarity with botanical treatments for bruises. Furthermore, the agricultural livelihood characteristics of the region might also contribute to the frequent occurrence of bruises. The demanding physical labor involved in daily activities, especially in mountainous areas, increases the likelihood of falls and injuries.

Despite the prevalence of bruises in the Xiangxi region, there have been few academic reports on plants used to treat such injuries. Zhou Lang et al. recorded 18 commonly used plant species by the Miao people in Guizhou Province to treat bruises and insect bites [8], while Yu Wei et al. identified 49 fern species used for the same purpose in local communities in Guizhou province [9]. However, there is still a research gap concerning the plant resources unique to the Xiangxi region and their distinctive regional characteristics. Furthermore, the influence of modern Western medical systems has led to the gradual decline of traditional medicinal knowledge, emphasizing the urgent need for documentation and preservation. Therefore, the existing knowledge gap and the current state of traditional medicinal knowledge have motivated our research to explore the local medicinal markets, which serve as hubs for concentrated folk medicine knowledge. To identify medicinal plants used for bruises in the Xiangxi region, we employed ethnobotanical methods in our investigation.

The primary objective of this study is to conduct urgent documentation of herbal remedies used for treating bruises in the Xiangxi region of western Hunan, China. Additionally, identifying plant-based remedies with significant potential value could lead to future drug development and benefit the community economically.

## *Materials and methods*

### Study area

The research area for this study was the Xiangxi Tujia and Miao Autonomous Prefecture, also known as the Xiangxi region, located in western Hunan (Figure 2). The Xiangxi region (108°47′–112°57′E, 25°58′–29°48′N) is situated in the northwest of Hunan and shares borders with Chongqing, Hubei, and Guizhou provinces. The region is characterized by two mountain ranges, Wuling and Xuefeng, which encircle the Yunnan-Guizhou Plateau, resulting in a sub-tropical monsoon climate with pronounced continental characteristics. The geological landforms and climate have led to complex biodiversity in the Xiangxi region, resulting in rich plant resources. Statistics show that over 2,000 natural medicinal species, including plants and animals, have been recorded in the area [10].

### Ethnobotanical information collecting

To gain an understanding of local medicinal culture and medication habits, this study conducted a literature review of local chronicles such as the *Jishou City Chronicles* [11], *Tujia Medicine Chronicles* [12], and *The Chinese materia medica* [13]. Ethnobotanical cases from similar regions were also reviewed.

From 2018 to 2019, this study surveyed local markets across the Xiangxi Prefecture in Hunan Province, using ethnobotanical interviews, including key informants and semi-structured interviews [14]. Information reporters, including stall owners and buyers, were randomly selected in the market, with stock owners serving as key informants. In total, 120 information reporters were interviewed. The participants' demographic information, along with data on botanical drugs utilized, including their vernacular names, medicinal parts, process methods, and treatment approaches for bruises, were systematically recorded and subjected to detailed analysis.

### Voucher specimen and quantitative analysis

All plant species were collected with voucher specimens and physical materials during the investigation. The medicinal plants were

identified during the market investigation by the taxonomists from Jishou University. Then, the taxonomic information was confirmed by referring to the voucher specimens and professional online databases like eFlora of China (http://www.efloras.org/) and World Flora Online Plant List (https://wfoplantlist.org/plant-list). The voucher specimens were stored in the Her-barium of Jishou University, and the biological materials of medicines were stored in the National and Local Joint Engineering Laboratory of Eucommia Comprehensive Utilization Technology of Jishou University. The information obtained from the survey is classified, organized, and archived, and an ethnobotanical inventory is completed. The inventory includes family names, scientific names, vernacular names, medicinal parts, process methods, usages, voucher IDs, etc.


**Figure 1 Traditional folk weapons in the Xiangxi region.** (A) Iron nail, an ambush device designed for carriages. (B) Crescent-shaped iron bell with three teeth, serving both offensive and defensive purposes. (C) Nine-section whip, a short-range melee weapon. (D) Iron whip, a tethered iron hammer for medium-range attacks. (E) Iron dart, a common offensive weapon consisting of a wooden stick attached to the back of an iron spearhead. (F) Double iron knife, a close-quarters combat and defense weapon. (G) Civilian bird gun, a long-range weapon. (H) Wooden iron hammer.

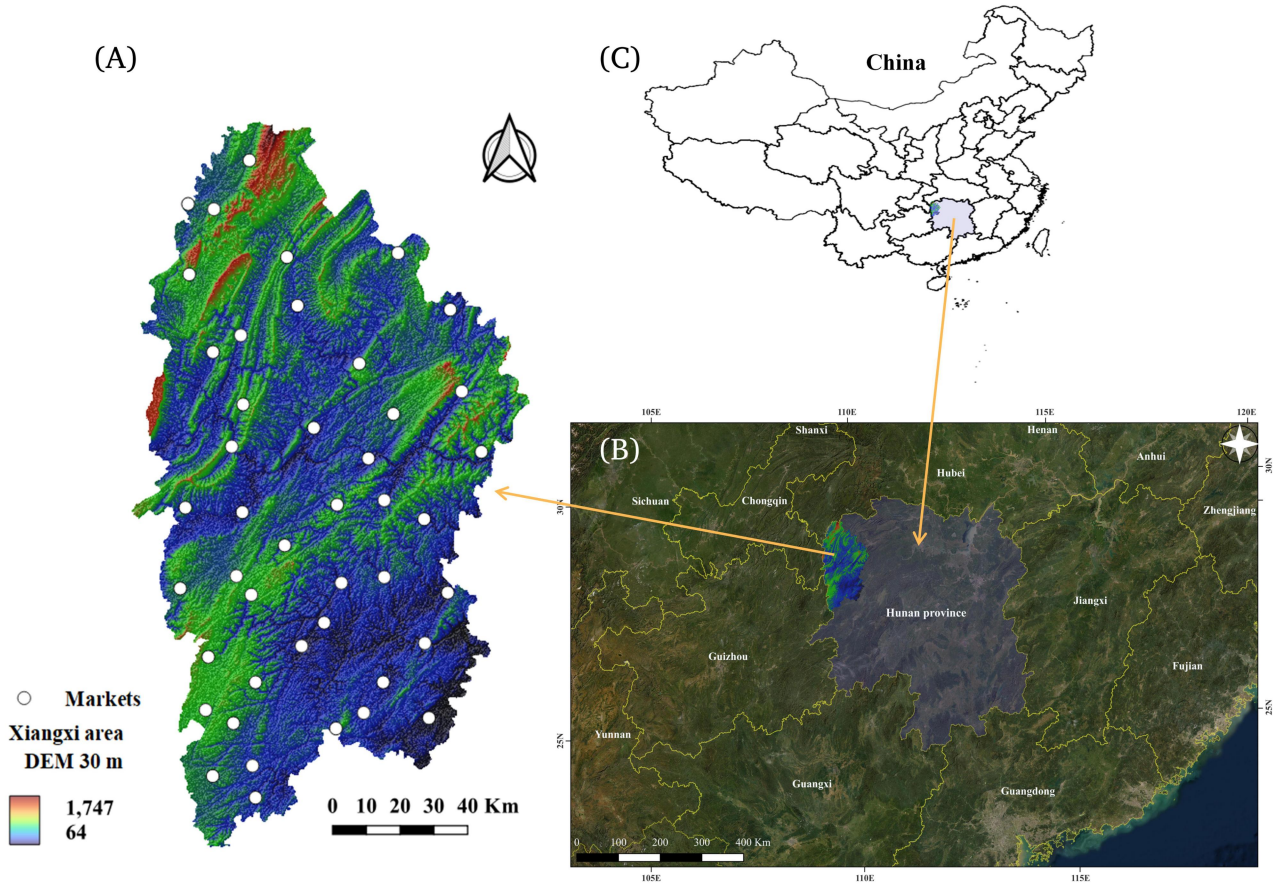


**Figure 2 The study sites in the Xiangxi area.** (A) Map of Xiangxi region and the specific study sites. (B) Map of Hunan Province. (C) Map of China.

**The fidelity level**

This study used the fidelity level (FL) to evaluate the investigated plants used for bruises. The FL was used to check the reliability and consistency of herbal drugs in the local area [15].

The calculation formula [16] of FL is:

$$FL = \frac{I_p}{I_u} \times 100\%$$

In the formula, $I_p$ is the total number of informants providing information on the use of a particular species in the treatment of bruises; $I_u$ is the total number of informants giving information on the arbitrary use of the species. The higher the FL value, the simpler the local use of a specific plant species [15, 16]. In this study, botanical drugs with high FL are considered more important and commonly used in the local treatment of bruises, reflecting that these plants may have a better effect on bruises.

## *Results*

**Medicinal market characteristics and demographic characteristics**

Based on our observations, the locals in the Xiangxi region visit the markets periodically (Table 1), known locally as “catching the autumn field”. To prevent overlap, neighboring markets follow distinct market cycles. For example, the Qianzhou Farmers’ Market in Jishou City operates on the 9th, 14th, 19th, 24th, and 29th of each lunar month, while the Ma Jingao Farmers’ Market in the same city operates on the 1st, 6th, 11th, 16th, 21st, and 26th of each lunar month. The surveyed markets both sell fresh wild medicinal plants and a small quantity of processed botanical drugs. The medicinal parts of the plants sold vary according to the seasons. Plants with leaves and flowers as medicinal parts are more prevalent in spring and summer, while those with barks and rhizomes are more prevalent in autumn and winter.The study found that a majority of the respondents were middle-aged men, with the Miao and Tujia ethnic groups being the most represented (Table 2). Despite differences in ethnicity, their language and medication habits have converged due to long-term mixed living and frequent communication. The number of male respondents was significantly higher than that of female respondents, with 86 men and 34 women. Furthermore, a majority of the 120 informants were over 60 years old, comprising 58.33% of the total sample. The Miao ethnic group was the most represented, with 77 respondents (64.2%), followed by the Tujia ethnic group, with 27 respondents, and the Han ethnic group, with 16 respondents.

**The inventory of plants for bruises in the market**

The research recorded 43 medicinal species for treating bruises, belonging to 37 families and 42 genera. All the collected medicinal information is listed in Table 3. Primulaceae, Berberidaceae, Ranunculaceae, Asteraceae, and Lamiaceae contributed 3, 2, 2, 2, and 2 species, respectively, while the other families each had one species. The botanical drugs used for bruise treatment showed taxonomic diversity, highlighting the wide variety of bruise-healing plants in the Xiangxi region.

In relation to the life forms of medicinal plants employed for treating bruises in the Xiangxi region, our analysis revealed the presence of four distinct categories. Herbs were the most commonly used, with 27 species (62.8%), followed by vines with 9 species

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**Table 1 The locations and period of investigated markets**

| City and county | Specific location | Market period (lunar) |
|---|---|---|
| Jishou city | Majingao Farmers' Market | 1st, 6th |
| | Aizhai Town, Shetangpo Town | 2nd, 7th |
| | Hexi Town | 3rd, 8th |
| | Qianzhou Farmers' Market | 4th, 9th |
| | Daxingzhai Farmers' Market | 5th, 10th |
| Fenghuang county | Mujiangping Town, Shuidatian Town, Heku Town, Qiangongping Town | 1st, 6th |
| | Laershan Town, Alaying Town | 2nd, 7th |
| | Shanjiang Town, Liaojiaqiao Town | 3rd, 8th |
| | Machong Town, Huanghe Village, Xinchang Town | 4th, 9th |
| | Jixin Town, Lianglin Town, Linfeng Town, Luochaojing Town, Guanzhuang Town, Chatian Town | 5th, 10th |
| Guzhang county | Luoyixi Town | 1st, 6th |
| | Guyang Town, Pingba Town, Hepeng Town (Yantouzhai Town) | 3rd, 8th |
| | Gaofeng Town | 4th, 9th |
| | Duanlongshan Town | 5th, 10th |
| Baojing county | Maogou Town, Purong Town (Pomipo Town), Yangcaho Town, Datuo Town | 1st, 6th |
| | Tuzha Town (Chaoyang Town ), FuXing Town (Datuo Town ) | 2nd, 7th |
| | Shuiyin Town, Bier Town, Huanglian Village (yezhuping Town), Bamao Village (Pomipo Town) | 3rd, 8th |
| | Zhongxin Town (Shuitianhe Town) | 4th, 9th |
| | Shuitianhe Town, Hulu Town (Tuzha Town), Hangsha Town | 5th, 10th |
| Huayuan county | Qingshuiping Town | 1st, 4th, 7th |
| | Malichang Town | 1st, 6th |
| | Maoer Town (paiwu Town), Yaqiao Town, Dongmaku Town (Pailiao Town) | 2nd, 7th |
| | Daoer village (LongTan Town), Paibi Town, Yayou Town, Jiwei Town | 3rd, 8th |
| | Tuanjie Town, Minyue Town, Changle Town, Pailiao Town | 4th, 9th |
| | Chadong Village (Biancheng Town), LongTan Town (Maoer Town) | 5th, 10th |
| Longshan county | Shipai Town, Guba Town, Nongche Town, Xihu Town (Hongyanxi Town), Luota Town, Bojiao Village, Shuitianba Town | 1st, 6th |
| | Xichehe Town, Tongche Village, Sanyuan Town, Laoxing Town, Huoyan Town, Hongyanxi Town | 2nd, 7th |
| | Xinglongjie Town, Wantang Town, Maoping village, Jiashi Town,Guitang Town | 3rd, 8th |
| | Ciyantang Town, Xiluo Town, Zanguo Town, Miaoertan Town | 4th, 9th |
| | Shigao Village, Longtou Town, Zhaoshi Town, Da-an Town | 5th, 10th |
| Luxi county | Liye Town | 1st, 4th, 7th |
| | Neixi Town | 2nd, 6th |
| | Bixi village | 3rd, 1st |
| | Xinglong Town, Liang Jiatan Town | 1st, 6th |
| | Pushi Town, Tahu Town, Jiefangyan Town, Xiaozhang Town | 2nd, 7th |
| | Dalan Town, Baiyangxi Town | 3rd, 8th |
| | Shiliuping Town, Bashiping Town, Tanxi Town | 4th, 9th |
| | Heshui Town, Xixi Town, Yongxingchang Town | 5th, 10th |
| Yongshun county | Zejia Town, Kesha Town, Qingping Town, Yangfeng Town, Guanba village | 1st, 4th, 7th |
| | Diaojin Town, Huilong Town | 2nd, 5th, 8th |
| | Yongmao Town, Fuzhi Town, Wota Town, Liexi Town, Duishan Town, Shidi Town | 3rd, 6th, 9th |
| | Shanmu Town, Songbai Town, Shouche Town, Xiqi Town, Sanjiatian village | 1st, 4th, 7th (solar calendar) |
| | Wang Village, Wanming Town, Yanjing Town, Wanfushan Village | 2nd, 5th, 8th (solar calendar) |
| | Gaoping Town, Wanping Town, Shaba Town | 3rd, 6th, 9th (solar calendar) |
| | Shaoha Town, Maoba Town | 5th, 10th (solar calendar) |
| | Xinzhai Town | 2dn, 7th (solar calendar) |

**Table 2 The demographic information of participants**

| | Types | People | Percentage (%) |
|---|---|---|---|
| Genders | Male | 86 | 71.67 |
| | Female | 34 | 28.33 |
| Ages | 20–40 years old | 1 | 0.84 |
| | 40–60 years old | 49 | 40.83 |
| | older than 60 years old | 70 | 58.33 |
| Ethnic groups | Miao | 77 | 64.17 |
| | Tujia | 27 | 22.5 |
| | Han | 16 | 13.33 |

**Table 3 The inventory of medicinal plants for bruises in the Xiangxi region**

| Scientific name | Family | Local name | Medicinal part | Process method | Life form | FL value (%) | Voucher ID |
|---|---|---|---|---|---|---|---|
| *Sargentodoxa cuneata* (Oliv.) Rehder & E.H.Wilson | Lardizabalaceae | nar ga qing | root, stem | DO, WE | liana | 89 | 19DS15 |
| *Lycopodium japonicum* Thunb. | Lycopodiaceae | ya ji xi | whole plant | DO, WE, CE | herb | 87 | 19DS37 |
| *Dioscorea cirrhosa* Lour. | Dioscoreaceae | san tou ji | rhizome | DO, WE | liana | 86 | 19DS20 |
| *Diphylleia sinensis* H.L.Li | Berberidaceae | | rhizome | DO, WE, CE | herb | 86 | 19DS23 |
| *Lysimachia heterogenea* Klatt | Primulaceae | re sa ku ha | whole plant | DO, WE | herb | 85 | 19DS31 |
| *Achyranthes bidentata* Blume | Amaranthaceae | bu diu ho | root, rhizome | DO, WE | herb | 84 | 19DS22 |
| *panax japonicus* (T.Ness) C.A.Mey | Araliaceae | shu jia pi | rhizome | DO | herb | 83 | 19DS21 |
| *Sarcandra glabra* (Thunb.) Nakai | Chloranthaceae | | whole plant | DO | shrub | 83 | 19DS34 |
| *Campsis grandiflora* K.Schum. | Bignoniaceae | | root | DO, WE | herb | 82 | 19DS28 |
| *Toddalia asiatica* (L.) Lam. | Rutaceae | shui cai | root | DO, CE | shrub | 81 | 19DS27 |
| *Ardisia pusilla* A.DC. | Myrsinaceae | bi pan da | whole plant | DO, CE | shrub | 80 | 19DS43 |
| *Schisandra propinqua* (Wall.) Baill. | Schisandraceae | re mia lou da | root, leaf | DO, WE, CE | liana | 78 | 19DS42 |
| *Selaginella tamariscina* (P.Beauv.) Spring | Selaginellaceae | guo nao za | whole plant | DO, CE | herb | 75 | 19DS11 |
| *Paris polyphylla* Sm. | Melanthiaceae | qi zhi hua | rhizome | DO, WE, CE | herb | 72 | 19DS35 |
| *Scutellaria barbata* D.Don | Lamiaceae | | whole plant | DO, CE | herb | 72 | 19DS01 |
| *Begonia palmata* D.Don | Begoniaceae | | whole plant | WE, CE | herb | 70 | 19DS36 |
| *Salvia miltiorrhiza* Bunge | Lamiaceae | | root and rhizome | DO | herb | 70 | 19DS02 |
| *Eucommia ulmoides* Oliv. | Eucommiaceae | nao ba dai | bark, leaf | DO | tree | 69 | 19DS04 |
| *Acmella paniculata* (Wall. ex DC.) R.K.Jansen | Asteraceae | ben nuo dou | whole plant | DO, CE | herb | 66 | 19DS10 |
| *Achillea millefolium* L. | Asteraceae | | whole plant | DO, CE | herb | 63 | 19DS09 |
| *Clematis henryi* Oliv. | Ranunculaceae | qiu hai tang | root, leaf | DO, WE, CE | liana | 60 | 19DS13 |
| *Polygala japonica* Houtt. | Polygalaceae | | whole plant | DO, CE | herb | 55 | 19DS26 |
| *Coniogramme japonica* (Thunb.) Diels | Pteridaceae | guo nao zan bi n | rhizome | DO, WE, CE | herb | 54 | 19DS33 |

**Table 3 The inventory of medicinal plants for bruises in the Xiangxi region (*continued*)**

| Scientific name | Family | Local name | Medicinal part | Process method | Life form | FL value (%) | Voucher ID |
|---|---|---|---|---|---|---|---|
| *Sambucus williamsii* Hance | Adoxaceae | dou jier ba | root, stem | DO, WE | shrub | 52 | 19DS41 |
| *Rubia cordifolia* L. | Rubiaceae | rui ha jiu | root, rhizome | DO, WE, CE | liana | 48 | 19DS17 |
| *Rhododendron molle* G.Don | Ericaceae | | flower | DO, CE | shrub | 47 | 19DS32 |
| *Reynoutria japonica* Houtt. | Polygonaceae | ruai xu nou | rhizome | DO, WE | herb | 43 | 19DS12 |
| *Lobelia chinensis* Lour. | Campanulaceae | ban bian lian | whole plant | DO, CE | herb | 42 | 19DS08 |
| *Anisodus acutangulus* C.Y.Wu & C.Chen | 茄科 Solanaceae | | root | DO, WE | herb | 41 | 19DS18 |
| *Aconitum scaposum* Franch. | Ranunculaceae | o jiong la mei | root | DO | herb | 40 | 19DS14 |
| *Hypericum attenuatum* Fisch. ex Choisy | Hypericaceae | rui jia so | whole plant | DO, CE | herb | 040 | 19DS07 |
| *Tetrastigma hemsleyanum* Diels & Gilg | Vitaceae | kar tuo mon na diasa | whole plant | WE, CE | liana | 39 | 19DS16 |
| *Phanera championii* Benth. | Fabaceae | | whole plant | DO, WE | liana | 37 | 19DS03 |
| *Hydrotyle nepalensis* Hook. | Umbelliferae | | whole plant | DO, WE, CE | herb | 36 | 19DS19 |
| *Drynaria quercifolia* (L.) J.Sm. | Polypodiaceae | | rhizome | DO, WE | herb | 33 | 19DS38 |
| *Ardisia crenata* Sims | Primulaceae | zhu sha gen | root | DO, WE | shrub | 32 | 19DS29 |
| *Arisaema heterophyllum* Blume | Araceae | ye mo yu | rhizome | DO, CE | herb | 32 | 19DS40 |
| *Epimedium brevicornu* Maxim. | Berberidaceae | rui ba da | whole plant | DO | herb | 31 | 19DS24 |
| *Corydalis davidii Franch.* | Papaveraceae | jia lian | whole plant | CE | herb | 30 | 19DS25 |
| *Stephania epigaea* H.S.Lo | Menispermaceae | di bu rong | tuberous root | DO, WE | liana | 30 | 19DS05 |
| *Piper mullesua* Buch.-Ham. ex D.Don | Piperaceae | | whole plant | DO, CE | liana | 29 | 19DS06 |
| *Lysimachia insignis* Hemsl. | Primulaceae | | root | DO | herb | 25 | 19DS30 |
| *Reineckea carnea* (Andrews) Kunth | Asparagaceae | gor bi xi | whole plant | DO, CE | herb | 23 | 19DS39 |

The species order is firstly followed by the FL value and then the alphabetical order of Latin names. DO, decoction for oral administration; CE, crushing for external application; WE, preparation of medicinal wine for external application.

(20.9%), shrubs with 6 species (14.0%), and trees with one species (2.3%). From an ethnobotanical perspective, this accords with the hypothesis of ecological visibility and resource availability. Herbs with a short growth cycle are more accessible than perennial woody plants and are more likely to be used in medicine. According to the local Miao basic laws of Miao medicine, liana drugs are similar to human tendons and veins, and most of them relieve meridians and disseminate blood.

The survey revealed that the medicinal parts used for treating bruises could be classified into five categories, reflecting the richness of traditional knowledge associated with bruise treatment. These categories are roots and stems (including rhizomes) (27), whole plants (20), leaves (3), barks (1), and flowers (1) (Table 4). The majority of medicinal parts used were roots and stems, as well as whole plants, which accounted for 90% of the total frequency. This preference can be attributed to the Tujia and Miao people's practice of using fresh botanical drugs for external application after crushing or making medicinal wine. Whole plants are usually used externally, while roots and rhizomes are typically used for making medicinal wine by soaking them in liquor. Moreover, collecting the whole plant, roots, and rhizomes is relatively easy, and they are less affected by seasonal variations.

**Folk classification on bruises in the Xiangxi region**

According to our interviews, the locals divide the bruise in the Xiangxi region into four categories: sprain, contusion, strain, and bone injury. Sprain mainly refers to the joint injury of the extremities, characterized by blue, swelling, and pain, but there is no skin rupture, bleeding, or fracture-dislocation. Blunt or heavy instruments often cause contusions, most of which are injured by working tools in their daily life. The injuries often show pain, swelling, or bleeding, and the wound is easily inflamed. Sprain and contusion are similar in the choice of medicinal plants, mainly using plants promoting blood circulation and dispersing blood stasis, relaxing muscles, and activating collaterals. Internal administration and external applications are all used primarily for external use. The treatment of closed injury can be fully covered with fresh botanical drugs; for the treatment of open injury, the wound should be disinfected, and the botanical drugs for external use should not be too broken and not easy to remove. Strain is caused by long-term intensive work, characterized by muscle blockage and muscle soreness, while locals believe that the root cause of strain is the invasion of "poison gas". Therefore, the locals mainly take botanical drugs that help detoxify, relax muscles, and activate collaterals. Bone injuries include fracture and dislocation, mainly treated by external application of fresh botanical drugs and rubbing medicinal wine.

**Quantified evaluation of plants for bruises**

The statistical results of the FL of plants for bruises are shown in Table 3. The theoretical value FL ranges from 0 to 100%. The high FL value indicates that the medicinal knowledge about a specific species is highly consistent among the informants; the plant is the most important and commonly used medicinal plant for treating a specific disease in this area. Based on the FL values, the local plant resources with high acceptance, utilization, or potential value in the treatment of bruises included *Sargentodoxa cuneata, Lycopodium japonicum*, *Dioscorea cirrhosa*, *Panax japonicus*, *Achyranthes bidentata*, *Lysimachia heterogenea* and so on.

We have reviewed the literature about several species with high FL values. For example, as the species with the highest FL in this study, over 110 chemical constituents have been isolated and identified from the stem of *Sargentodoxa cuneata*, including phenolic acids, phenolic glycosides, lignans, flavones, triterpenoids, and other compounds [17]. The extract and compounds of *Sargentodoxa cuneata* have a broad spectrum of pharmacological activities, including anti-tumor, anti-inflammatory, antioxidant, antimicrobial, anti-sepsis, and anti-arthritis effects [17]. As the second FL high species, *Lycopodium japonicum*, 132 chemical compounds have been identified and isolated from this plant, especially the alkaloids and serrate triterpenoids, some of which were shown to possess acetylcholinesterase inhibitory, cytotoxic, anti-inflammatory, anti-HIV-1 and α-glucosidase inhibitory activities, also partly supports the folk use for bruises [18]. Other species with good FL value, like *Dioscorea cirrhosa, Panax japonicus, and Achyranthes bidentata*, have all been reported to have promising bioactivities like antimicrobial, anti-inflammatory, antioxidant activities, which are related to the treatment of bruises [19–21].

These studies not only show that local people are scientific in the traditional use of plants but also show that these plants can be paid more attention to in future research and development of drugs for bruises. However, the current research about those high FL plants in this study mainly focuses on chemical composition analysis. Although most of them have been reported to have promising bruises-treatment-related bioactivities, the research on the mechanism of active substances is still in its infancy.

## *Discussion*

**The uniqueness of local medication**

Bruises, also known as soft tissue injuries, are characterized by a clear history of trauma, accompanied by pain, swelling, hematoma, congestion, and dysfunction [22]. In modern medicine, the primary treatments for bruises are anti-inflammatory and analgesic drugs, including non-steroidal anti-inflammatory and immune drugs, steroidal anti-inflammatory and immune drugs, anabolic steroids, and others [23]. However, these drugs have serious side effects, and long-term use in large quantities can affect the function of many organs and systems [23]. On the other hand, local medicine has unique efficacy in treating bruises, especially when used freshly. According to the local philosophy in Xiangxi Region, using botanical drugs freshly is convenient and safe, which can also maintain the original characteristics of botanical drugs without destroying the active ingredients and the original activity.

The investigation found that the most commonly used medicinal plants locally sold on the markets have antibacterial, anti-inflammatory, analgesic, anticoagulant, and other pharmacological effects. Otherwise, these botanical drugs are also often used to treat rheumatoid arthritis. The Xiangxi Prefecture experiences a regular rainy season, coupled with a humid living environment and inadequate sanitary conditions, which renders the residents vulnerable to rheumatism and infections following injuries. As a result, residents often use botanical drugs in combination with external use and internal administration. Fresh leaves of plants are mashed to promote blood circulation or remove blood stasis and applied externally to the injured area, while the roots are made into medicinal wine and rubbed on sore places. Plants for heat-clearing and detoxification are often decocted in water after drying and then administrated orally.

By comparing our findings with relevant research reports on the medicinal market in adjacent regions, such as Guizhou, we have discovered a significant prevalence of herbal remedies targeting rheumatism and inflammation in the Guizhou area. This observation can be attributed to the region's mountainous and humid climate, as

**Table 4 Statistics of medicinal plant parts used for treating bruises in the Xiangxi region**

| Medicinal part | Percentage (%) | Part (number) |
|---|---|---|
| Whole plant | 38.5% | Whole plant (20) |
| Root and stem | 51.9% | Root (13 ) rhizome (5) stem (6) tuber (2) root tuber (1) |
| Leaf | 5.8% | Leaf (3) |
| Bark | 1.9% | Bark (1) |
| Flower | 1.9% | Flower (1) |

well as its distinct patterns of production and lifestyle practices [24–26]. Both the Guizhou and Xiangxi areas predominantly favor the use of fresh herbs, mainly administered as decoctions or applied topically in alcohol. However, a noteworthy disparity lies in the practice of herbal baths, with Guizhou exhibiting a substantial utilization of medicinal plants for this purpose, whereas Xiangxi shows limited incorporation of medicinal herbs in such bathing practices [24–26]. This intriguing finding piques our interest in exploring the scarcity of medicinal bathing traditions and cultural practices in the local area. We postulate that this phenomenon is influenced by the geographic environment; although Xiangxi is situated in the southern region of China and receives ample rainfall, its residents primarily inhabit karst landscape mountains, which pose challenges in retaining sufficient water sources for daily needs, consequently restricting opportunities for herbal bathing practices.

**The problems that local herbal medicine faces**

The medicine of Tujia and Miao ethnic groups has a rich history and extensive folk treatment experience, making it an integral part of Chinese ethnic medicine. These traditional healing methods not only reflect the unique national characteristics of Tujia and Miao medicine but also have the potential to supplement the shortcomings of modern medical treatment. However, our survey found that most informants were over 50 years old, and many reported difficulties in finding a suitable successor to pass on their knowledge. Although modern medicine has made significant strides, it has also profoundly impacted ethnic and folk medicine. Many young people now prefer the more straightforward administration of modern medicine. The inheritance of local medical knowledge relies primarily on dictation and years of experience in practicing medicine, and the traditional concept dictates that traditional doctors hold a cautious attitude when choosing successors. For instance, the Miao ethnic group regards medicine as mysterious and strict, with many taboos, such as not passing on surnames or relatives and not teaching in the presence of three people. Hence, it is crucial to take adequate measures to excavate, organize, and protect this traditional medical knowledge.

Our survey results indicate that traditional knowledge faces a serious inheritance problem. Although the strict selection of successors has brought some difficulties, the most fundamental reason is that the younger generation cannot obtain economic benefits from it. Therefore, rescuing and documenting this knowledge, as well as conducting scientific research to find its scientific connotation, is vital.

The traditional market in Xiangxi is a comprehensive farmers' market, and the trading of medicinal materials is only a part of it. The sale of agricultural products such as fruits, vegetables, cooked food, and raw poultry ensures the flow of people in the market but also aggravates the difficulty of management. The quality and specifications of medicinal materials sold in the market are uneven, and the forms of stalls are random and diverse, without a unified standard. The price of medicinal plants is arbitrary, often with "one bundle, one handful, one plant, one root" as the sales unit. For example, fresh *Paris polyphylla* is sold at 3 yuan per plant, while fresh *Lycopodium japonicum* is sold at 15 yuan per bundle. Our interviews revealed that low education levels and different clan languages lead to the frequent use of "synonyms" and "homonyms," which can create confusion about some medicinal plants. The trade of medicinal plants manifests the exchange, utilization, and dissemination of traditional medical knowledge with strong regional and national characteristics. Strengthening the management of medicinal plant trading in the traditional market and establishing unified sales standards can standardize the market and further promote the protection and dissemination of folk medical knowledge.

## *Conclusion*

Our study has revealed that the utilization of plants by the Miao and Tujia ethnic groups for medicinal purposes lacks scientific verification, particularly concerning dosage and safety. Although no negative reports were observed during our visits, addressing this concern in future research is essential, especially considering the oral ingestion of these plants. Moreover, given the potential anti-inflammatory properties of the drugs used in treating bruises, it is crucial to identify their key chemical components through further investigations. The plants identified in our study show promise as raw materials for screening active components.

In conclusion, our ethnobotanical studies in Xiangxi Tujia and Miao Autonomous Prefecture unveiled a rich diversity of 43 botanical drugs used for treating bruises, reflecting the region's distinct cultural and traditional characteristics. Notably, specific plant resources like *Sargentodoxa cuneata* and *Panax japonicus* hold significant potential for bruise treatment.

However, preserving this valuable traditional medicinal knowledge faces challenges due to regional modernization. To ensure its continuity, efforts must be made to protect and further investigate these herbal remedies. By comprehending and documenting these practices, we can contribute to the advancement of ethnobotany and foster responsible utilization of natural resources in healthcare. The findings from our research provide valuable insights for the advancement of scientific knowledge and cultural heritage preservation.

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