A Cross-National Comparison of Medicinal Plants used by the Miao, Yi and Lisu ethnic groups in Yanbian, China

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Research

Keywords: Comparative analysis, Ethnobotany, Lisu medicine, Miao medicine, Traditional medicine, Yi medicine

DOI: https://doi.org/10.21203/rs.3.rs-116799/v1

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Abstract

Background: Its backdrop of multiethnic living makes Yanbian County rich in national culture, and the unique climate and topography make this area rich in medicinal plants. The exchange, collision and integration of the medical cultures of ethnic groups in Yanbian County are of great research significance. The Miao, Yi and Lisu are the most populous ethnic groups in Yanbian. Therefore, in this study, we investigated, sorted and analyzed these three ethnic medical systems with the goal of providing a basis for the study of ethnic medicine in Southwest China.

Methods: The medicinal plants of Miao medicine (MM), Yi medicine (YM) and Lisu medicine (LM) in Yanbian County were inventoried by identifying the collected plant specimens and interviewing the local ethnic doctors with a semistructured form. The inventory included scientific names, family names, Latin names, medicinal parts, diseases treated and other information on the medicinal plants. Finally, the Jaccard similarity index (JI), cluster analysis and functional equivalent species mining were used to preliminarily analyze the similarities and differences of the three ethnic medical systems.

Results: A total of 345 medicinal plants (from 109 families and 299 genera) and 18 unreported special situations of medicinal plant use were recorded and documented in our ethnobotanical investigation of the three medical systems. There were 102 species of medicinal plants with shared uses in MM, YM and LM, among which the families with the most species were Compositae (14 species, 14%), Labiatae (6 species, 6%), Polygonaceae (4 species, 4%) and Rosaceae (4 species, 4%). In the three medical systems, these medicinal plants are used to treat 12 types of disease, and the most commonly used medicinal parts are whole plants, roots and rhizomes. The statistical data showed that the JI of MM and YM was the highest (47.6%) and the overall similarity of these medical systems was the highest among all comparisons (45.9%). The results showed that in Yanbian, MM and YM were more similar than LM.

Conclusions: The Miao, Yi and Lisu groups in the study area have inherited a wealth of ethnic medicine knowledge but are in great danger of losing this knowledge. The results of this study fill the existing knowledge gaps concerning MM, YM and LM in Yanbian, and the almost complete dataset can allow us to preserve ethnic medicine knowledge and carry out a global analysis. The important shared-use medicinal plants in the three medical systems can be used as the basis for future research on new drug resources.

Background

Many ethnic groups live in Southwest China, and these ethnic groups have accumulated rich and unique ethnic medical knowledge and experience in their long-term struggle against diseases. Some of these groups have developed medical theory systems, extensively collecting and using local medicinal plants to treat diseases. Most medical systems of ethnic groups rely on passing information down through the family, and only a few systems include information recorded in written form [1]. Because of the uneven distribution of medical resources in China, traditional ethnic medicine still serves the people in remote areas and plays a huge role in protecting the lives and health of the local people as well as providing convenient medical care for these people. Ethnic medicine is an important supplement to the modern medical system. Under the backdrop of small settlements and large mixed communities, the mutual exchange, influence, and development of medical knowledge and experience of various ethnic groups is a topic worthy of discussion. According to the data of the sixth national census [2], the Miao nationality ranks 6th, the Yi nationality ranks 7th, and the Lisu nationality ranks 21st in the Chinese population. The three ethnic groups have their own medical systems and experiences. For example, MM has five diagnostic methods: looking, listening, smelling, questioning, and pulse-taking. In treatment, there are seven rules: treating cold with heat, treating heat with cold, treating color with color, determining application by shape, treating cases of toxicity with poisonous agents, treating disease with restrictions, and reinforcing organs with other organs [3, 4]. In terms of disease diagnosis, YM mainly relies on methods such as inspection, auscultation and olfaction, inquiry, pulse-taking and palpation monitoring, and cutting open the chicken to eliminate the disease. In terms of treatment, the following methods are used in YM: decoctions, mashes, stimulation of acupuncture points with heat, medical steam therapy, medicinal baths, Tuina and massage therapy and bloodletting [5]. LM is characterized by the combined use of doctors, drug therapy and spirit therapy [6] and can treat internal, surgical, obstetric and gynecological, pediatric, dermatological and otorhinolaryngological diseases. The traditional treatment methods of LM include decoctions, cleansing and dropping medicines, cutting wounds to suck out toxins, breaking wounds and draining pus, and spinning to induce vomiting and detoxification [7].

Yanbian County is located in the northern Yunnan-Guizhou Plateau, the southeastern edge of the Qinghai-Tibet Plateau, and the western edge of Daliang Mountain. It is in the middle of the Chinese Zhang-Yi Corridor [8], is one of the nodes of north-south migration and integration of ethnic groups in southwestern China and is the main southern passage of the ancient Silk Road [9]. Yanbian is a typical multiethnic county in southwest China, with 31 ethnic groups living in the county for generations. The population of ethnic groups accounts for 30.1% of the population of the county, and most of them are Yi, Lisu, Miao, Hui, Naxi, Dai, etc. The county is one of the few multiethnic settlements of Miao, Yi and Lisu peoples in China [6, 7, 10–17].

Therefore, the main purposes of this study were (i) to investigate the varieties and practices of ethnic medicine use in MM, YM and LM in Yanbian County, (ii) to analyze the similarities and differences in MM, YM and LM in Yanbian and (iii) develop criteria to sort the potentially valuable medicinal plants of the three medical systems in Yanbian and make contributions to the knowledge and protection of plant biodiversity and the development of traditional medicine.
Materials And Methods

Study area

The study area was Yanbian County, Panzhihua, Sichuan Province, China, including 4 towns and 12 townships, such as Tongzilin Town, Qinghe Township, and Hongbao Township. Yanbian is located on the southwestern edge of Sichuan and north of Panzhihua City and is located at 26°25′~27°21′N and 101°08′~102°04′E (Fig. 1). Yanbian County is adjacent to Miyi and Huili Counties in the east, Renhe District in the south, Huaping County and Ninglang Yi Autonomous County in the west, and Liangshan Yi Autonomous Prefecture to the north, with a total area of 3269.453 square kilometers [18].

Yanbian County is in the dry-hot valley climate zone of the southern subtropical region. It has a typical southern subtropical semiarid monsoon climate, with warm winters, high spring temperatures, and cool summers and autumns. In addition, Yanbian County has small annual temperature differences, large daily differences, abundant sunshine and vigorous evaporation, and distinct dry and rainy seasons. Under the influence of topography, the temperature in Yanbian County varies significantly vertically. From the valley to the high mountain, Yanbian County has the geographic components of the south, central, north subtropics, south temperate and north temperate zones in turn [19]. Yanbian is known as the plant kingdom of Panzhihua City; Ertan Bird Nature Reserve runs through the county, and Berlin Mountain (with the highest altitude of 4195.5 m) is known as a natural treasure trove of wild Chinese herbs. The county has both typical subtropical forests and valley-type savannas, which are suitable for the growth of various wild plants and have an abundant diversity of medicinal plants [20].

The Yi and Miao people mostly live in Spa, Gesala and Hongbao Township, which are located in northern Yanbian County at an altitude of 2200 ~ 4000 m and are characterized by steep terrain. The Lisu live in Qinghe Township in the northern part of Yanbian, which has an altitude of 1500 ~ 2000 m and a gentle terrain. Guosheng Township, which has a large altitudinal span and an undulating terrain, is the common distribution area of the three ethnic groups.

Plant And Information Collection

According to relevant field survey documents [21, 22], 36 sample plots were selected (five sample quadrats were randomly set up in each plot) to investigate 46 randomly set plots in 16 towns and villages in Yanbian county from July to August 2018 (Fig. 1). Qin Songrong, an expert from the Chongqing Academy of Chinese Materia Medica, identified the plant specimens collected from the sample plots and confirmed their scientific names with reference to Flora Reipublicae Popularis Sinicae [23]. The voucher specimens are preserved in the Specimen Center of the School of Ethnic Medicine, Chengdu University of Traditional Chinese Medicine.

Data Processing

Microsoft Excel was used to inventory the medicinal plants used in the three medical systems in Yanbian. The inventory includes the plant's scientific name, family name, Latin name, medicinal parts and diseases treated [28, 29], and the plants were sorted by name from A to Z. The Dictionary of Chinese Ethnic Medicine [30] was used to screen out the methods for use of the medicinal plants that have not yet been recorded. We used https://www.biovenn.nl to make a Venn graph online [33], and used MultiExperiment Viewer software to draw related heat maps and calculate the JI values [32].

\[
JI = \frac{Na}{Na + Nb + Nc}
\]

where "Na" is the number of shared-use medicinal plants in the two medical systems (A and B), "Nb" is the number of medicinal plants used in medical system A, and "Nc" is the number of medicinal plants used in medical system B.

The R Programming Language was used to perform cluster analysis on the medicinal parts and diseases treated with shared-use medicines in each two ethnic groups [32]. According to clustering analysis, the similarity percentage of medicinal plants used in the three medical systems was calculated, and the functional equivalents (the medicinal plants with the same efficacy in different medical systems) were obtained [24].
Results

Shared-use medicines

The sample plot and quadrat survey collected 778 medicinal plant specimens in total. Among them, 345 species of medicinal plants belonging to 109 families and 299 genera were shared among MM, YM and LM, and the uses of these 345 medicinal plants in the three medical systems are shown in Fig. 2. The number of shared-use medicinal plants in MM and YM, MM and LM, and YM and LM were 146, 127, and 142, respectively, accounting for 32.2%, 30.9% and 31.4% of the total medicinal plants used in the corresponding two medical systems. The JI values of MM and YM, MM and LM, and YM and LM were 47.6%, 44.7%, and 45.8%, respectively. The larger the JI is, the more similar the medicinal plant use among the two medical systems, indicating that the MM and YM have the highest proportion of shared-use medicinal plants. The inventory of 102 shared-use medicinal plants among the three medical systems is shown in Table 1.
| No. | Family     | Chinese name | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                                   |
|-----|------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1   | Compositae | 🌼 🌼 🌼 🌼 🌼 | Achillea wilsoniana Heimerl ex Hand.-Mazz.(180814822) | Whole plant: traumatic injury, toothache, rheumatalgia, frequent or severe headaches, stomachache, amenorrhea and abdominal pain, carbuncles and sores, snake and insect bites, innominate inflammatory, mastitis, carbuncles and sores. | Whole plant: snakebite, mastitis, toothache, traumatic injury, dog bites. | Whole plant: rheumatalgia, toothache, amenorrhea and abdominal pain, stomachache, ententis, dysentery, snakebite, traumatic injury, traumatic hemorrhage. |
| 2   | Rosaceae   | 🌼 🌼 🌼 🌼 🌼 🌼 | Agrimonia pilosa Ldb. (180726082) | Whole plant and Root: toothache, acute gastroenteritis hematuria. Whole plant: hemoptysis, hematemesis, traumatic hemorrinhia, hemapecia, diarrhea, dysentery, trichomoniasis, fever, diarrhea, traumatic hemorrhage, pulmonary tuberculosis, hemoptysis. | Whole plant: diarrhea, itchiness, rheumatism arthralgia, edema, hematemesis, diarrhea, dyspepsia, dysentery, menstrual disorders, dystocia, dystocia. | Whole plant: pulmonary tuberculosis, gastroenteritis, dysentery, taeniasis, trichomonas vaginals, skin infection, hemorrhoids. |
| 3   | Comaceae   | 🌼 🌼 🌼 🌼 🌼 🌼 🌼 | Alangium chinense (Lour.) Harms(180802422) | Root: rheumatic fracture pain, traumatic injury, traumatic hemorrhage. Foliun: traumatic hemorrhage. | Root: jaundice, abdominal paindystocia, rheumatic fracture pain, hemiplegia, traumatic injury, afterpains. | Root: traumatic injury. |
| 4   | Betulaceae | 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 🌼 | Alnus nepalensis D. Don(180726110) | Bark: dysentery, gastroenteritis, abdominal pain, lumbagos, cold, headache, rheumatism arthralgia, measles, traumatic bleeding. Foliun: skin infection. | Folium: skin infection. | Bark: measles, traumatic bleeding, cold, headache, rheumatism arthralgia. |
| 5   | Araceae    | 🌼 🌼 🌼 🌼 🌼 | Amorphophallus konjac K. Koch(180816876) | Tuber: traumatic injury, skin infection, snakebite. | Tuber: traumatic injury, eliminate blood stasis, rheumatoid arthritis. | Tuber: traumatic injury, rheumatoid arthritis. |
| 6   | Rosaceae   | 🌼 🌼 🌼 🌼 | Amygdalus persica L. (180806505) | Seed and folium: pruritus vulvae, amenorrhea | Bark and fruit stone: urticarial, measles, | Seed: amenorrhea, traumatic injury, constipation |

The collected voucher specimens are preserved in the Specimen Center of School of Ethnic Medicine, Chengdu University of Traditional Chinese Medicine.
| No. | Family       | Chinese name | Scientific name and voucher specimen code | Uses in MM | Uses in YM | Uses in LM |
|-----|--------------|--------------|-------------------------------------------|------------|------------|------------|
| 7   | Ranunculaceae | ☀️           | *Anemone rivularis* Buch.-Ham. (180727146) | Whole plant: swollen sore throat, stomachache, scrofula, malarial, cough, lymphnodes, jaundice, rheumatalgia, toothache, traumatic injury. Root: swollen sore throat. | Whole plan, root and folium: toothache, headache, rhinitis, rheumatalgia, malarial. Whole plan: postnatal lack of lactation, cold, malaria, diarrhea. Root and whole plant: malarial, stomachache, innominate inflammatory. | Root: pulmonary tuberculosis, parotitis, rheumatalgia, stomachache, traumatic injury, malarial, hepatitis, liver cirrhosis. |
| 8   | Compositae   | ☀️           | *Arctium lappa* L. (180814832)             | Fruit, root and folium: fever, cough, constipation, cold, swollen sore throat, measles, boils and sores, headache, parotitis, cough, constipation | Root and folium: gastropathy, skin infection, cold, pertussis, hemorrhoids, measles, swollen sore throat. Root: boils and sores, postnatal lack of lactation. Fruit: measles. | Fruit: cold, headache, swollen sore throat, parotitis. Root: cold, swollen sore throat, skin infection, fungal infection, eczema, nephritis, cystitis. |
| 9   | Araceae      | ☀️           | *Arisaema erubescens* (Wall.) Schott (180724057) | Tuber: facial paralysis, hemiplegia, epilepsy, infantile convulsion, snakebite, innominate inflammatory, rheumatalgia, facial paralysis, rheumatalgia, painful swelling of the throat, carbuncles, traumatic injuries. | Tuber: facial paralysis, stomachache, traumatic injuries, snake and dog bites, fracture, rheumatalgia, snakebite, chest pain, hemiplegia, epilepsy, infantile convulsion, wind-phlegm dizziness, painful swelling of the throat, carbuncles, traumatic injuries. | Tuber: facial paralysis, hemiplegia, epilepsy, infantile convulsion, tetanus, wind-phlegm dizziness, painful swelling of the throat, scrofula, carbuncles, traumatic injuries, snake and insect bites. |
| 10  | Compositae   | ☀️           | *Aster indicus* L. (180808566)              | Whole plant: dyspepsia in children, traumatic bleeding, hematemesis, traumatic hemorrhinia, bloody dysentery, metrorrhagia and metrorstaxis, jaundice, edema, cold, throat sore painful swelling of the throat, hemorrhoids, erysipelas, hemafecia. Whole plant: hematemesis, parotitis, chronic gastritis, indigestion. | Whole plant: diarrhea, infertility, menoxenia, external use for puritus vulvae, parotitis, fracture, snake bite, toothache, insect and snake bites, chronic bronchitis, cough, coldfever, swollen sore throat, dyspeptic abdominal distention, enteritis, syphilis, gonorrhea, itchiness. Root: toothache, diarrhea. | Whole plant: hematemesis, traumatic hemorrhinia, nephritis, parotitis, dysentery, metrorrhagia and metrorstaxis, dyspepsia in children, carbuncles. |
| 11  | Compositae   | ☀️           | *Bidens pilosa* L. (180815858)              | Whole plant: influenza, swollen sore throat, jaundice hepatitis, enteritis, dyspepsia in children, dysentery, hemorrhoids, snake and insect bites. | Whole plant: snake and insect bites, diarrhea, malarial, hepatitis, acute nephritis, stomachache, esophagus cancer, swollen sore throat, sinusitis, traumatic injury, rheumatism, rheumatalgia, heat strokeacute gastroenteritis, mastitis, urticarial. | Whole plant: upper respiratory tract infection, swollen sore throat, acute appendicitis, acute icteric hepatitis, gastroenteritis, dyspepsia, rheumatism arthritis, malarial, snakebite, traumatic injury. |

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| No. | Family | Chinese name | Scientific name and voucher specimen code | Uses in MM | Uses in YM | Uses in LM |
|-----|--------|-------------|------------------------------------------|-----------|-----------|-----------|
| 12  | Urticaceae | .checkBox | *Boehmeria nivea* (L.) Gaudich. (180811680) | Whole plant: eczema, menometrorrhagia. | Root: fracture, cold, measles, urinary infection, nephritis, threatened abortion, traumatic injury, impaired vision, traumatic injury, boils and sores, eye conjunctivitis. Folium: rheumatism, menstrual disorders, abortion, epistaxis, hematuria, hemorrhoids. | Root: leucorrhoea, erysipelas, carbuncles, traumatic injury, snake and insect bites. |
| 13  | Rutaceae | .checkBox | *Boenninghausenia albiflora* (Hook.) Reichb. ex Meisn. (180726122) | Whole plant: acute enteritis, malarial, traumatic injury, skin infection, malarial, cold, throat sore, hepatitis, congestion. | Whole plant and Root: cold, fever, abdominal distension, traumatic injury. Whole plant: swollen sore throat, chronic gastritis, loin pain in kidney-deficiency syndrome, dysentery, carbuncles, malarial. | Whole plant: malarial, bronchitis, swollen sore throat, influenza, external use for skin infection, allergy. |
| 14  | Moraceae | .checkBox | *Broussonetia papyrifera* (Linnaeus) L’Heritier ex Ventenat(180804458) | Fruit: dizziness, impotence, edema, soreness-tired of waist and knee, postpartum milk atresia. Stem, folium and latex: edema, inflammation of eyes. | Stem: stomachache, kidney deficiency, fungal infection. | Flower, folium, bark and seed: dizziness, edema. |
| 15  | Loganiaceae | .checkBox | *Buddleja officinalis* Maxim. (180801379) | Flowe, root and folium: inflammation of eyes, dizziness. | Flowe, root and folium: inflammation of eyes, pterygium, pertussis, asthma, hepatitis. Root: snakebite. Whole plant: allergy. | Flower: inflammation of eyes, pterygium. |
| 16  | Moraceae | .checkBox | *Cannabis sativa* L. (180814848) | Seed: constipation, constipation, hemorrhoids, rheumatism, diabetes mellitus, prostatitis, edema, beriberi, dysentery, menoxenia, fungal infection. | Root: rheumatalgia. | Seed: constipation, diabetes mellitus, prostatitis, rheumatism, dysentery, menoxenia, fungal infection. |

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| No. | Family        | Chinese name | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                 |
|-----|---------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 17  | Compositae    | 美洲防己 | *Carpesium cernuum* L. (180809634)         | Whole plant:  
dysentery, urinary infection, facial paralysis, urinary system infection, prostatitis  
rheumatalgia, traumatic injury, snake bites,  
innominate inflammatory, cold, acute enteritis, lymphnoditis.  
Whole plant and root: acute  
tonsillitis, painful swelling of the throat, infantile convulsion,  
pruritus vulvae, tuberculous cervical  
lymphadenitis, toothache, skin infection,  
hemorrhoids, snakebite, ascariasis,  
ascariasis, hematemesisis, traumatic  
hemorrhinia, prostatitis.          | Whole plant: headache,  
swollen sore throat,  
toothache, parotitis,  
bronchitis, asthma,  
urinary infection,  
masitis, herpes zoster,  
snakebite, abnormal  
leukorhea, gonorhea,  
acute enteritis,  
dysentery, urinary infection,  
scrofula, gingival inflammation,  
tympanitis, carbulces,  
dysentery, abdominal pain,  
hemia, uterine prolapse, cold. Fruit:  
ascariasis, enterobiasis,  
raeniasis, ascariasis.  
Folium: tympanitis, skin infection. Root:  
dysentery, cold, prolapse of rectum, uterine prolapse. | Whole plant: cold,  
swollen sore throat,  
toothache, acute  
enteritis, dysentery,  
urinary infection,  
scrofula, skin infection,  
masitis, snakebite.          |
| 18  | Amaranthaceae | 芝麻 | *Celosia cristata* L. (1810201015)         | Inflorescence:  
menoxenia,  
mamorrhagia and  
mestrotaxis, white  
diarrhea, diarrhoea,  
hemafecia,  
hematuria,  
abnormal  
leukorhea, diarrhea. Whole plant:  
menoxenia, diarrhea. | Whole plant and inflorescence:  
leucorrhoea, seminal  
emission, urticaria,  
itchiness, chronic  
conjunctivitis,  
mamometorrhagia,  
hemorrhoids.                | Whole plat: chronic  
hepatitis, cirrhosis  
ascites, stomachache,  
rheumatic fracture pain. |
| 19  | Apiaceae      | 麝香 | *Centella asiatica* (L.) Urban(180808545) | Whole plant: fever,  
cough, swollen  
sore throat, urinary  
calculi, menoxenia,  
hepatitis, urethritis,  
gastritis, jaundice,  
enteritis, dysentery,  
edema, hematuria,  
dysmenorhea,  
mamorrhagia and  
mestrotaxis, scrofula,  
skin infection, herpes  
zoster, traumatic  
injury, traumatic  
hemorrhage, snake and insect bites. | Whole plant: hepatitis.       | Whole plant: cold,  
heat stroke, nephritis,  
pleurisy, urinary  
system infection,  
hepatitis, dysentery,  
traumatic injury,  
snakebite, skin infection,  
herpes zoster.             |

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| No. | Family          | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                 |
|-----|----------------|-------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 20  | Coriariaceae   | *Coriaria nepalensis* Wall. (180816879)   | Root and folium: tinea capitis, epilepsy, fungal infection, traumatic hemorrhage. Folium: skin infection, eczema, scrofula, burns and scalds, impetigo. Root: rheumatic arthritis, toothache, scrofula, acute conjunctivitis, scrofula, leysodexis, traumatic injury. | Root and folium: tinea capitis, traumatic injury, rheumatalgia, eczema. Whole plant: traumatic injury, rheumatism, calds, itchiness. Folium: boils and sores. | Stem: fracture. Root and folium: scrofula, toothache, traumatic injury, rheumatism arthralgia, external use for tinea capitis, eczema. |
|     |                |                                           |                                                                             |                                                                             |                                                                             |
| 21  | Compositae     | *Crepis napifera* (Franch.) Babcock(181012179) | Root: dyspeptic abdominal distention, intestinal colic, dysentery.          | Root: oral ulcer, stomachache, bronchitis, laryngopharyngitis, traumatic injury. Whole plant and Root: fever, cough, cough, dyspepsia in children, acute gastroenteritis, fracture. | Root: nyctalopia, bronchitis, pertussis, abdominal distension, abdominal pain. Whole plant: external use for fracture. |
|     |                |                                           |                                                                             |                                                                             |                                                                             |
| 22  | Fabaceae       | *Crotalaria ferruginea* Grah. ex Benth.(180806490) | Whole plant: rheumatoid arthritis, tinnitus, seminal emission in kidney-deficiency syndrome. | Whole plant and root: fever, phlegm dysnea, cough, intestinal colic.        | Whole plant: bloody sputum, tinnitus, deafness, nephritis. |
|     |                |                                           |                                                                             |                                                                             |                                                                             |
| 23  | Zingiberaceae  | *Curcuma longa* L. (180812755)            | Rhizome: jaundice, traumatic injury, amenorrhea, menoxenia, dysmenorrhea, afterpains, rheumatoid arthritis, headache. | Rhizome: cough and asthma, menoxenia.                                       | Rhizome: menoxenia, amenorrhea.                                             |
|     |                |                                           |                                                                             |                                                                             |                                                                             |
| 24  | Boraginaceae   | *Cynoglossum amabile* Stapf et Drumm.(180730258) | Whole plant: hepatitis, dysentery, cough.                                  | Whole plant: rheumatism, menstrual disorders, infertilaty.                 | Whole plant: malarial, hepatitis, dysentery, leukorrhoea, pulmonary tuberculosis, traumatic bleeding, fracture. |
|     |                |                                           |                                                                             | Root: cystitis, urethritis, dysuria, dysuria, hepatitis, malarial, traumatic hemorrhage, abnormal leukorrhea, dystocia, hepatitis, leukorrhea, hemia. Foliun: hemia. |                                                                             |
| 25  | Solanaceae     | *Datura stramonium* L. (180730241)        | Flower, folium and seed: cough, beriberi. Foliun and flower: gingival inflammation. | Flower: stomachache. Fruit: toothache, bronchitis, asthma. Seed: toothache, dental caries, dog bites, traumatic injury. Foliun: cough, stomachache, rheumatalgia, skin infection, snakebite. | Flower: asthma, abdominal pain, rheumatic arthritis, beriberi. |

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| No. | Family       | Chinese name | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                 |
|-----|--------------|--------------|--------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 26  | Dioscoreaceae | ♂            | *Dioscorea bulbifera* L. (180723001)        | Tuber: painful swelling of the throat, carbuncles and sores, hematemesis, traumatic hemorrhinia, lymphoid tuberculosis, snakebite, tumor, hemoptysis, pertussis, cough, skin infection. | Tuber: skin infection, hemorrhinia, hemafecia. | Tuber: hemorrhinia, painful swelling of the throat, skin infection, scrofula. |
| 27  | Caprifoliaceae | ♂            | *Dipsacus asper* Wallich ex Candolle(180815865) | Root: fracture, traumatic injury, threatened abortion, seminal emission, abnormal leucorrhea, skin infection, lumbago, stomachache, abdominal pain, rheumatic fracture pain, functional uterine bleeding. | Whole plant: soreness-tired of waist and knee, rheumatic arthritis, threatened abortion. Root: rheumatism, asthma, aching loin and knees, traumatic hemorrhage, traumatic injury, flaccid limbs, metrorrhagia and metrostaxis, abdominal pain, stomachache, snakebite, skin infection, pulmonary tuberculosis, stomachache. | Rhizome: aching loin and knees, rheumatic fracture pain, fracture, traumatic injury, functional uterine bleeding, leucorrhoea, seminal emission, frequent urination. |
| 28  | Drynariaceae  | ♂            | *Drynaria delavayi* Christ(180730259)       | Rhizome: loin pain in kidney-deficiency syndrome, tinnitus and deafness, fracture, external use for vitiligo. | Rhizome: rheumatalgia, traumatic injury, fracture. | Rhizome: traumatic injury, rheumatic arthritis, hemorrhoids. |
| 29  | Rosaceae      | ♂            | *Duchesnea indica* (Andr.) Focke(180730255) | Whole plant: epilepsy, cold, dysentery, jaundice, inflammation of eyes, oral ulcer, throat sore, parotitis, skin infection, snakebite, hematemesis, metrorrhagia and metrostaxis, menoxenia, burns and scalds, traumatic injury, nephritis, hemoptysis, innominate inflammatory, herpes zosterinnominate inflammatory. | Whole plant: parotitis, acute suppurative mastitis, skin infection, insect and snake bites, itchiness, skin infection, menoxenia, functional uterine bleeding, snakebite, infantile convulsion, dysentery, eye conjunctivitis, herpes zoster, eczema, urticaria. | Whole plant: epilepsy, cough, hematemesis, swollen sore throat, dysentery, carbuncles, skin infection, snake and insect bites. |

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| No. | Family     | Chinese name | Scientific name and voucher specimen code | Uses In MM                                                                 | Uses In YM                                                                 | Uses In LM                                                                 |
|-----|------------|--------------|------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 30  | Compositae | Duhaldea cappa | *Duhaldea cappa* (Buchanan-Hamilton ex D. Don) Pruski & Anderberg(181014936) | Root: cold, rheumatic arthritis, swollen sore throat, acute supplicative mastitis, fever, puerperal fever, cough. Whole plant: toothache, nephritis, bronchitis, gingivitis, mastitis, urinary infection. | Whole plant: rheumatism, traumatic injury, cough, indigestion, infantile convulsion, gastropathy, schistosomiasis, cold, swollen sore throat, oral ulcer, diarrhea, menoxenia, itchiness, headache, chronic nephritis, cholelithiasis, cholecystitis, herna, visceral hemorrhage, hemorrhoids, toothache, urinary infection, fever, cold. Whole plant and Root: stomachache, indigestion, bloody dysentery, lung abscess, cough. | Folium: fungal infection, gingival inflammation. Root: rheumatic fracture pain, gastritis, toothache, cystitis, itchiness. Whole plant and root: cold, cough, headache, stomachache, rheumatic fracture pain, traumatic injury, menoxenia, leucorrhoea, schistosomiasis. |
| 31  | Compositae | Eclipta prostrata | *Eclipta prostrata* (L.) L. (180812752) | Whole plant: traumatic hemorrhage, dizziness, kidney deficiency, hemorrhinia, hemafecia, metrorrhagia and metrostaxis, traumatic hemorrhage, menoxenia, abdominal distension, diarrhea. | Whole plant: hepatitis, hemorrhoids, hemoptysis, traumatic hemorrhage. Root: hematochezia, hematuria, bloody dysentery, metrorrhagia and metrostaxis, pruritus vulvae. | Whole plant: hepatitis, hemorrhoids, hemoptysis, traumatic hemorrhage. Root: hematochezia, hematuria, bloody dysentery, metrorrhagia and metrostaxis, pruritus vulvae. |
| 32  | Compositae | Elephantopus scaber | *Elephantopus scaber* L. (181012268) | Whole plant: insect and snake bites, nephritis enteritis, nephritis, edema, malarial, cold, eye conjunctivitis, skin infection, eczema, insect and snake bites, laryngopharyngitis, jaundice, dysentery. | Whole plant: skin infection, acute supplicative mastitis, swollen sore throat, cold, pertussis, hepatitis, cirrhosis ascites, acute nephritis, enteritis, dysentery. | Whole plant: cold, acute tonsillitis, swollen sore throat, epidemic encephalitis b, pertussis, hepatitis, cirrhosis ascites, acute or chronic nephritis. |
| 33  | Lamiaceae  | Elsholtzia ciliata | *Elsholtzia ciliata* (Thunb.) Hyland.(180814834) | Whole plant: heat stroke, dyspepsia. | Root and folium: traumatic injury, eliminate blood stasis, dysuria. Root: fever, abdominal pain, diarrhea. | Whole plant: cold, fever, heat stroke, acute gastroenteritis, halitosis, dysuria. |
| 34  | Equisetaceae | Equisetum ramosissimum subsp. debile | *Equisetum ramosissimum subsp. debile* (Roxb.ex Vauch.) Hauke(180724058) | Whole plant: diphtheria, throat sore, jaundice, hepatitis, constipation, asthma, acute nephritis, urinary infection, prostatitis, stomachache, dacryocystitis, external use for fracture. | Whole plant: inflammation of eyes, pterygium, diarrhea, abnormal leukorrhea, infertility. | Whole plant: urinary calculi, urodynia, edema, hypertension, prolapse of rectum, prostatitis. Rhizome: leucorrhoea, amenorrhoea. |

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|-----|--------------|--------------|--------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 35  | Compositae   | 🌼           | *Erigeron breviscapus* (Vant.) Hand.-Mazz. (180811716) | Whole plant and Root: cold, hemiplegia, dyspepsia in children, stomachache, toothache, traumatic injury. Whole plant: headache, dizziness, rheumatoid arthritis, stomachache, toothache. | Whole plant and Root: Caries toothache. Root: neurasthenia. Whole plant: rheumatalgia, stroke, bronchitis, infantile paralysis, traumatic injury, oral ulcer, coldheadache, rheumatism, toothache. | Whole plant: coldheadache, toothache, stomachache. |
| 36  | Rosaceae     | 🌺           | *Eriobotrya japonica* (Thunb.) Lindl. (180804455) | Root: hepatitis, postnatal lack of lactation, rheumatic arthritis. Folium: lung heat cough, emesis, vomiting of pregnancy. | Folium: pulmonary tuberculosis, cough. | Flower and folium: cough, hematemesis, emesis. |
| 37  | Eucommiaceae | 🌳           | *Eucommia ulmoides* Oliver (180814821) | Bark: threatened abortion, dizziness, aching loin and knees, hypertension. | Bark: loin pain in kidney-deficiency syndrome, flaccid limbs, rheumatic fracture pain, threatened abortion, impotence. | Bark: lumbagos, rheumatism, vertigo, hypertension, threatened abortion, traumatic injury. |
| 38  | Compositae   | 🌼           | *Eupatorium japonicum* Thunb. (180811682) | Whole plant: traumatic injury, postpartum lumbago. The folium and stem: external use for traumatic injury. | Whole plant: postpartum lumbago. Root: external use for traumatic injury. folium and stem: external use for traumatic injury, lumbagos. | Root: prolapse of rectum, measles rheumatic fracture pain. |
| 39  | Euphorbiaceae| 🌿           | *Euphorbia sieboldiana* Morr. et Decne. (180813782) | Whole plant: dyspepsia, diarrhea. | Whole plant: stomachache, traumatic injury, skin infection. Root: traumatic injury, traumatic hemorrhage, skin infection. | Whole plant: traumatic injury. |
| 40  | Polygonaceae | 🌿           | *Fagopyrum dibotrys* (D. Don) Hara (180730245) | Rhizome: dyspepsia, pulmonary tuberculosis, mastitis, traumatic injury, metrorrhagia and metrostaxis, dysentery, lyssodexis, lung abscess. Whole plant: stomachache, abdominal pain, hyperthyroidism, snakebite. | Whole plant and rhizome: dyspepsia, stomachache, enteritis, rheumatism, carbuncles, dysmenorrhea, amenorrhea, dysentery, swollen sore throat, hepatitis, pneumonia, leucorrhoea, acute suppurative mastitis, scrofula. | Rhizome: swollen sore throat, pneumonia, stomachache, hepatitis, dysentery, dyspepsia, external use for scrofula. |

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|-----|----------------|--------------|-------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 41  | Polygonaceae   | Fallopia     | *Fallopia multiflora* (Thunb.) Harald.(180730252) | Root tuber: vertigo, palpitation, swollen sore throat, sores, insomnia, anemia, kidney deficiency, seminal emission, leucorrhoea, constipation, skin infection, scrofula, hemorrhoids, vertigo, soreness-tired of waist and knee, neurasthenia, hepatitis, edema, enteritis, ovarian cyst. | Root tuber: loin pain in kidney-deficiency syndrome, rheumatoid arthritis, pneumonia, cough, fever, dyspeptic abdominal distention, anemia. | Root tuber: neurasthenia, anemia, dizziness, insomnia, night sweating, seminal emission, leucorrhoea, soreness-tired of waist and knee. |
| 42  | Apiaceae       | Foeniculum   | *Foeniculum vulgare* Mill. (180814830) | Fruit: hemia. Whole plant: abdominal pain, dysmenorrhea, emphysema, cholera, emesis, hemia, measlesfever. Root: rheumatic fracture pain. | Root: emesis, abdominal distension. | Whole plant, root and seed: stomachachce, dysmenorrhea, hemia, hydrocele of the tunica vaginalis, schistosomiasis. |
| 43  | Polyporaceae   | Ganoderma    | *Ganoderma lucidum* (Curtis) P. Karst.(180728184) | Fruit body: palpitation, swollen sore throat, sores, insomnia, dizziness, cough and asthma, coronary heart disease, jaundice, tumor, mastitis, stomachache. | Fruit body: testicular cyst, prostatitis, frequent or severe headaches. | Fruit body: gastropathy, neurasthenia, bronchitis. |
| 44  | Gentianaceae   | Gentiana     | *Gentiana rubicunda* Franch. (181016978) | Root or whole plant: rheumatismaching loin and knees, nephritis, traumatic injury, hemorrhoids, acute gastritis, jaundice, lung heat cough, dysuria, skin infection carbuncles, inflammation of eyes, pneumonia. | Whole plant: inflammation of eyesheadache, swollen sore throat, epilepsy, macule, pruritus vulvae, traumatic injury, urinary infection, cystitis, toothache, sore throat, infantile convulsion, lumbago soreness of waist. | Whole plant and Root: puerperal fever, infantile convulsion, scalds, bloody sputum due to heat in the lung, jaundice, dysentery, stomachache, hemafecia, pulmonary tuberculosis, asthma, dysuria, dyspepsia in children, jaundice hepatitis, external use for skin infection. |
| 45  | Geraniaceae    | Geranium     | *Geranium nepalense* Sweet(180727136) | Whole plant: rheumatalgia, traumatic injury, dysentery, skin infection fracture. | Whole plant and Root: traumatic injury, rheumatagal, the bite of insect, snake, dog. | Whole plant: rheumatoid arthritis, traumatic injury, sciatica, acute gastroenteritis, dysentery, menoxenia. |
| 46  | Urticaceae     | Gonostegia   | *Gonostegia hirta* (Bl.) Miq. (180726085) | Whole plant: acute suppurative mastitis, skin infection, dysentery, edema, indigestion. | Root: skin infection, traumatic injury, fracture. | Whole plant: skin infection, carbuncles, scrofula, dysentery, leucorrhoea, dyspepsia in children, hematemesis, traumatic hemorrhage. |

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|-----|------------|--------------|------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 47  | Orchidaceae | Orchidaceae  | Habenaria dentata (Sw.) Schltr(181015956) | Rhizome: loin pain in kidney-deficiency syndrome.                         | Root: prostatitis.                                                        | Tuber: soreness of waist, orchitis, urinary infection, hernia, stomachache. |
| 48  | Malvaceae   | Malvaceae    | Hibiscus mutabilis L. (181015957)        | Fruit: cough, hematemesis, inflammation of eyes, metrorrhagia and metrostaxis, diarrhea, carbuncles, skin infection, snakebite, scalds, traumatic injury. The flower and folium: carbuncles and sores. The flower, folium and Root: mastitis, acute suppurative mastitis, leucorrhoea. | Root: cough, traumatic injury. flower and folium: parotitis.              | flower, folium and Root: cough, metrorrhagia, external use for carbuncles, mastitis, parotitis, traumatic injury. |
| 49  | Bignoniaceae| Bignoniaceae | Incarvillea arguta (Royle) Royle(180802413) | Whole plant: dysentery, stomachache, rheumatalgia, menoxenia, carbuncles, fracture, cholecystitis, cholelithiasis, kidney calculi, bladder stone, hepatitis, dysentery. | Whole plant: hepatitis, dysentery, carbuncles, fracture, rheumatism, liver disease, diarrhea, toothache, innominate inflammatory, hemorrhoids, traumatic bleeding, syphilis. | Whole plant and rhizome: rheumatic fracture pain, menoxenia, external use for carbuncles, fracture. |
| 50  | Juglandaceae| Juglandaceae | Juglans regia L.(180726096)              | Seed: flaccid limbs, prostatitis, seminal emission in kidney-deficiency syndrome, cough, intestinal constipation, urethritis, scrofula. Fruit: hemia, fungal infection. | Seed: kidney deficiency, seminal emission in kidney-deficiency syndrome, constipation, soreness-tired of waist and knee, urethritis, dermatitis, eczema. Fruit: kidney deficiency, soreness of waist, seminal emission, frequent urination, syphilis, impetigo, fungal infection, urticaria, asthma, liver disease, external use for scrofula, stomachache, chronic bronchitis. Folium: skin disease. | Fruit: kidney deficiency, cough, flaccid limbs, seminal emission in kidney-deficiency syndrome, urethritis, urethritis, constipation. Folium: hemorrhoids, edema. |
| 51  | Juncaceae   | Juncaceae    | Juncus effusus L. (180731316)            | Whole plant and stem pith: gonorrhea, dysuria, jaundice, painful swelling of the throat, oral ulcer, fever. | Whole plant: coldfever, toothache, edema, urinary system infection. Stem pith: heat stroke. Root: congestion, toothache, urticaria, syphilis, scalds. | Stem pith: oral ulcer, urinary infection, malarial. |
| 52  | Lamiaceae   | Lamiaceae    | Leonurus japonicus Houttuyn(180802437)    | Whole plant: menoxenia, dysmenorrhea, amenorrhea, edema in acute nephritis, leucorrhoea, abortion. Root bark: hematuria. | Whole plant: menoxenia, acute mastitis, traumatic injury, afterpains, acute glomerulonephritis, postpartum uterine contraction, edema, dystocia. | The whole plant and seed: menoxenia, dysmenorrhea, afterpains, nephritis, dysuria, hematuria, boils and sores. |

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|-----|----------------|--------------|--------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|
| 53  | Campanulaceae  |              | Lobelia angulata Forst. (180727126)        | Whole plant: rheumatalgia, lung abscess, lymphadenitis, dyspepsia in children, acute gastroenteritis. | Whole plant: traumatic injury, rheumatalgia. seminal emission, scrofula, afterpains, menoxenia, leucorrhoea, congestion, dysmenorrhoea, toothache. | Whole plant: cough, lymphadenitis, traumatic injury, uterine prolapse. |
| 54  | Lycopodiaceae  |              | Lycopodium japonicum Thunb. ex Murray(180816920) | Whole plant: rheumatism, traumatic injury, flaccid limbs, rheumatalgia, fracture. | Whole plant: rheumatalgia, hepatitis, jaundice, dysentery, edema, pulmonary tuberculosis, traumatic injury. | Whole plant and spore: hepatitis, dysentery, traumatic hemorrhage. |
| 55  | Lygodiaceae    |              | Lygodium japonicum (Thunb.) Sw.(180804441)  | Whole plant and spore, urinary calculi, fever, urinary system infection, prostatitis edema, hematuria, urinary infection. | Whole plant and spore: urinary system infection, prostatitis edema, dysuria, urinary calculi, urinary infection, nephritis, icteric hepatitis, mastitis, pneumonia, innominate inflammatory. | Whole plant and spore: hepatitis, nephritis, parotitis, Japan encephalitis, urinary infection, gonorrhea. |
| 56  | Primulaceae    |              | Lysimachia christiniae Hance(180727129)     | Whole plant: hepatic stones, cholelithiasis, bladder stone, prostatitis, nephritis, dysentery, snake bites, carbuncles, snakebite, traumatic injury. diarrhea, jaundice, hematuria, fever. | Root: acute mastitis, urinary calculi, urodynia, cough, dysentery. Whole plant: bladder stone, cholelithiasis, hepatitis, dysentery, parotitis, mastitis, hemorrhoids, skin infection, traumatic injury, sciatica, rheumatic arthritis. | Whole plant: jaundice, edema, hepatic stones: cholelithiasis, kidney calculi, bladder stone, traumatic injury, localized skin infection. |
| 57  | Meliaceae      |              | Melia azedarach L. (181014928)              | Fruit and stem bark: ascariasis, ancylostomiasis, enterobiasis. | Stem bark: traumatic injury, congestion. Bark: ascariasis, skin infection, eczema, tinea capitis, pruritus vulvae. | Whole plant: cold, abdominal pain, dysentery, rheumatic arthritis, malarial, constipation, external use for dermatitis. |
| 58  | Lamiaceae      |              | Mentha canadensis Linnaeus(180731349)       | Whole plant and folium: headache, swollen sore throat, measles. Whole plant: keratitis, coldheadache, pharyngitis. Stem and folium: urticaria, swollen sore throat, urticaria, urticaria, measles. | Whole plant and folium: bee bite. Whole plant: neonatal tetanus, asthmacough. | Whole plant: skin infection, itchiness, pro lapse of rectum, infantile convulsion. Whole plant and folium: cold, inflammation of eyes, throat sore, toothache. |
| 59  | Araliaceae     |              | Metapanax delavayi (Franchet) J. Wen & Frudin(1808010666) | Whole plant: heat stroke, menoxenia, dyspepsia, rheumatic fracture pain, acute pharyngitis, throat sore, traumatic injury. | Whole plant: throat sore, cold, dyspepsia, ascariasis, menoxenia, traumatic injury, enteritis. Root: rheumatic fracture pain. | Whole plant: throat sore, cold, dyspepsia, ascariasis, menoxenia, traumatic injury, enteritis. Root: rheumatic fracture pain. |

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|-----|--------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 60  | Nyctaginaceae | Mirabilis jalapa L. | (180806497) | Root: prostatitis, leukorrhea, articular pain, carbuncles and sores, acute suppurative mastitis, traumatic injury. Whole plant and Root: menoxenia, leukorrhea. | Root: dysuria, abdominal distension, traumatic injury, skin infection. Whole plant: articular pain, menoxenia, traumatic injury, eliminate blood stasis. | Whole plant and Root: nephritis, menoxenia, prostateitis, external use for mastitis, traumatic injury. |
| 61  | Oxalidaceae  | Oxalis corniculata L. | (180726086) | Whole plant: dysuria, dystocia, fungal infection, herpes zoster, impetigo, urinary infection, urinary system infection, prostatitis, neurasthenia, insomnia, pneumonia, nephritis, hepatitis, infant respiratory tract infection. | Whole plant and Root: cold, menoxenia, hemorrhoids, toothache, lumbagos, fracture, \ eliminate blood stasis, hemorrhoids, prolapse of rectum. Whole plant: traumatic injury, rheumatism, scalds | Whole plant: coldfever, enteritis, hepatitis, urinary infection, neurasthenia. Folium: external use for traumatic injury, carbuncles. |
| 62  | Rubiaceae    | Paederia foetida L. | (180726117) | Whole plant and Root: rheumatic arthritis, dyspeptic abdominal distention, dyspepsia in children, diarrhea, dysentery, jaundice, burns and scalds, eczema, skin infection, gastritis, traumatic injury. | Whole plant and Root: stomachache, menoxenia, hepatitis, dyspeptic abdominal distention, traumatic injury, abdominal pain swollen sore throat, dystocia, neurodermatitis, chronic osteomyelitis, leprosy, ascariasis. | Whole plant: rheumatalgia, traumatic injuries. Stem: dizziness. Root: menoxenia. |
| 63  | Liliaceae    | Paris marmorata Stearn | (180809606) | Rhizome: traumatic injury, pulmonary tuberculosis, snake and insect bites, stomachache, skin infection, infantile convulsion, tympanitis. Whole plant: innominate inflammatory, snake and insect bites, innominate inflammatory, cough, tuberculous cervical lymphadenitis, innominate inflammatory, carbuncles and sores, painful swelling of the throat, acute suppurative mastitis, localized skin, infection. | Rhizome: skin infection, snake bites, malaria, sore throat, stomachache, epilepsy, cough. | Rhizome: chronic bronchitis, stomachache, nephritis, parotitis, mastitis, insect bites, boils and sores. |
| 64  | Lamiaceae    | Perilla frutescens (L.) Britt. | (180814831) | Folium and stem: cold. Folium: heat stroke, abdominal pain. Whole plant: cough and asthma. Folium: emesis. | Fruit: coldcough. | Whole plant: cold, headache, pulmonary tuberculosis, swollen sore throat, rheumatism. |

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|-----|------------|--------------|--------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|
| 65  | Phytolaccaceae | ☀ ☀ ☀ ☀ | Phytolacca acinosa Roxb. (180727134)       | Root: night sweating, edema.                    | Root: edema, snake bites, dysentery.             | Root: scrofula, edema, skin infection.          |
| 66  | ☀ ☀ ☀ ☀ | ☀ ☀ ☀ | Pinus yunnanensis Franch. (180725077)      | Twig: rheumatic arthritis, traumatic injury, urethritis, acute suppurative mastitis | Seed: nephritis. Loose knot: rheumatic arthritis, traumatic injury. Pollen: gastric ulcer, duodenal ulcer, tympanitis, rhinitis, traumatic hemorrhage. Pine needle: influenza, rheumatoid arthritis, nystalopia, hypertension, neurasthenia. Rosin: skin infection, eczema, burns and scalds. Young twigs: rheumatic arthritis, fracture. | Pollen: headache, dizziness, stomachache, dysentery, traumatic hemorrhage, duodenal ulcer, constipation, impetigo. Twig: cough, fever. |
| 67  | Plantaginaceae | ☀ ☀ ☀ ☀ | Plantago asiatica L. (180727181)          | Whole plant: dysuria, inflammation of eyes, urinary infection, urinary calculi, bladder stone, dysentery, hemorrhinia, hematuria, traumatic bleeding, swollen sore throat, carbuncles and sores, amenorrhea | Seed: dysentery. Whole plant: cough, urinary infection, measles, skin infection. | Whole plant: dysentery. Petiole: ascariasis |
| 68  | Polygalaceae | ☀ ☀ ☀ ☀ | Polygala arilata Buch.-Ham. ex D. Don(180727170) | Root: lumbagos, fracture, traumatic injury. | Root: menoxenia, hepatitis, urinary infection, upper respiratory tract infection, pneumonia, rheumatalgia, traumatic injury, pulmonary tuberculosis, lung heat cough, toothache, soreness-tired of waist and knee, hypotension, dizziness, nephritis, liver disease. | Root bark: rheumatalgia, traumatic injury, pulmonary tuberculosis, edema, infantile convulsion, pneumonia, hepatitis, acute nephritis, anxious chronic gastroenteritis, pertussis, urinary system infection, early mastitis, upper respiratory tract infection, bronchitis, rheumatic heart disease, lumbagos, uterine prolapse. |
| 69  | Polygonaceae | ☀ ☀ ☀ ☀ | Polygonum hydropiper L. (180802424)       | Whole plant: fever, dyspepsia in children, dysentery, acute tonsillitis, malarial. | Whole plant: rheumatoid arthritis. Root: cold. | Whole plant: dysentery, enteritis, diarrhea, rheumatic arthritis, traumatic injury, functional uterine bleeding. |

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|-----|--------------|--------------|-------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 70  | Portulacaceae | ⚬           | Portulaca oleracea L. (180812745)          | Whole plant: dysuria, scanty, leucorrhoea, metrorrhexis, metrorrhagia and metrorrhagia and metrostaxis, hemorrhoids, scrofula, fungal infection, edema, urinary infection, hemorrhoids, enteritis, dysentery, throat sore, toothache, innominate inflammatory, nephritis, diarrhea, herpes zoster, external use for innominate inflammatory. | Whole plant: dysentery, fracture, lung abscess, prostatitis, abnormal leukonhea, hemorrhoids, snakebite, enteritis, pertussis, pulmonary tuberculosis, dysentery, fungal infection, nephritis, hematuria, rheumatism. | Whole plant: acute gastroenteritis, dysentery, appendicitis, mastitis, hemorrhoids, leucorrhoea, external use for localized skin infection, eczema. |
| 71  | Caryophyllaceae | ⚬           | Psammosilene tunicoides W. C. Wu et C. Y. Wu (180809626) | Root: traumatic injury, traumatic bleeding, rheumatic arthritis, stomachache, external use for snake bites. | Root: traumatic injury, rheumatism, traumatic hemorrhage, stomachache, hemiplegia, fracture, cough. | Root: traumatic injury, rheumatalgia, stagnation, external use for traumatic bleeding. |
| 72  | Fabaceae     | ⚬           | Pueraria montana (Loureiro) Merrill (180815862) | Root and flower: cold, fever, cervical spondylosis, macule, coronary heart disease, diabetes mellitus, measles. | Root and flower: pulmonary tuberculosis, swollen sore throat, cervical spondylosis, cold, measles. Flower: emesis. | Root: cold, acute gastroenteritis, dysentery, diarrhea. |
| 73  | Punicaceae   | ⚬           | Punica granatum L. (180814828)             | Fruit, flower, root and root bark: ascariasis, taeniasis, diarrhoea, leucorrhoea. | Pericarp: epistaxis, hemafecia, metrorrhagia and metrostaxis. Pericarp and folium: diarrhoea, hemafecia, prolapse of rectum, functional uterine bleeding, abnormal leukonhea, ascariasis. Folium: leprosy, traumatic injury. Flower: epistaxis, tympanitis, traumatic bleeding. Fruit: flaccid limbs, dysentery, ascariasis, throat sore. Stem bark: bloody dysentery, chyluria, epistaxis. Whole plant: traumatic injury, cough. | Bark of fruit and Root: diarrhea, enteritis, dysentery, hemafecia, prolapse of rectum, functional uterine bleeding, haemorrhoids, ascariasis. Flower: hematemesis, traumatic hemorrhina, tympanitis. Folium: acute enteritis. |
| 74  | Ranunculaceae | ⚬           | Ranunculus japonicus Thunb. (180801363)   | Whole plant: jaundice, asthma, migraine. | Whole plant: coldheadache, cough, rheumatism, arthralgia, schistosomiasis, rheumatic arthritis, gastopathy. | Whole plant: traumatic injury, malaria, edema, fungal infection. |
| 75  | Crassulaceae | ⚬           | Rhodiola yunnanensis (Franch.) S. H. Fu (1810171003) | Root: traumatic injury, rheumatoid arthritis. Whole plant: traumatic bleeding. | Whole plant or rhizome: traumatic injury, fracture, rheumatism, pharyngitis, dysentery. | Whole plant: fracture, rheumatoid arthritis, mastitis. |

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|-----|------------|--------------|-------------------------------------------|------------|------------|------------|
| 76  | Anacardiaceae | Rhus chinensis Mill. (180808533) | Root and folium: hemorrhoids, night sweating, cough, diarrhea, hemorrhoids, seminal emission, prolapse of rectum, metrorrhagia and metrostaxis, boils and sores, traumatic hemorrhage, burns and scalds. Rhizome: rheumatic arthritis, edema, traumatic injury. | Whole plant: traumatic injury, congestion, cough, edema, skin infection. | Root: cold, bronchitis, hemoptysis, enteritis, dysentery, hemorrhoids. Folium: traumatic injury, snakebite, dermatitis rhf. | |
| 77  | Saxifragaceae | Rodgersia aesculifolia Batalin(180809619) | Rhizome: traumatic injury, fracture, menoxenia, traumatic bleeding. | | Root: diarrhea, traumatic hemorrhage, abdominal distention, rheumatogia, dysentery, stomachache, traumatic injury, dysmenorrhea, menoxenia. | Rhizome: cold, rheumatic fracture pain, enteritis, traumatic hemorrhage, traumatic injury, diarrhea, gastropathy, menoxenia, fracture, traumatic bleeding, senile chronic bronchitis. |
| 78  | Saxifragaceae | Rodgersia sambucifolia Hemsl.(180809648) | Rhizome: traumatic injury, fracture, menoxenia, traumatic bleeding. | | Rhizome: diarrhea, traumatic hemorrhage, dyspeptic abdominal distention, rheumatogia, dysentery, stomachache, traumatic injury, dysmenorrhea, menoxenia. | Rhizome: coldheadache, rheumatic fracture pain, enteritis, traumatic hemorrhage, traumatic injury, diarrhea, gastropathy, traumatic injury, fracture, menoxenia, traumatic bleeding, senile chronic bronchitis. |
| 79  | Polygonaceae | Rumex nepalensis Spreng. (180730261) | Root: pulmonary tuberculosis, hepatitis, dysentery, constipation, hemorrhoids, hematemesis, functional uterine bleeding, traumatic hemorrhage, burns and scalds, external use for parotitis, neurodermatitis, scrofula, acute suppurative mastitis, traumatic hemorrhage. | | Root: constipation, jaundice, pulmonary tuberculosis, hepatitis, dysentery, hemorrhoids, functional uterine bleeding, scrofula, skin infection, traumatic injury, diarrhea, parotitis, neurodermatitis, traumatic hemorrhage, burns and scalds, toothache. | Root and folium: pulmonary tuberculosis, hepatitis, dysentery, constipation, functional uterine bleeding, hemorrhoids, external use for parotitis, scrofula. |

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|-----|----------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 80  | Caryophyllaceae |              | *Sagina japonica* (Sw.) Ohwi(180811710)  | Whole plant: dermatitis rhin, eczema, skin infection, erysipelas, scrofula, inflammatory, snakebite, sinusitis, gingivitis, traumatic injury. | Whole plant: infantile convulsion, dermatitis rhin, snake bites.          | Whole plant: leukemia, dermatitis rhin, scrofula, carbuncles, dental caries. |
| 81  | Araliaceae      |              | *Schefflera delavayi* (Franch.) Harms ex Diels(180814840) | Root, stem and folium: rheumatic arthritis, stomachache, headache.        | Stem and folium: flaccid limbs, arthritis.                                 | Root and stem: fracture, rheumatoid arthritis, loin pain in kidney-deficiency syndrome. |
| 82  | Magnoliaceae    |              | *Schisandra propinqua* subsp. *sinensis* (Oliver) R. M. K. Saunders(180804443) | Root and stem: rheumatic arthritis, stomachache, carbuncles, traumatic injury, menoxenia, skin infection influenza, snakebite. | Root bark and stem: rheumatism, traumatic injury, hematemesis, stomachache, menoxenia, snakebite, fracture, chronic gastritis, rheumatoid arthritis, dysmenorrhea, traumatic hemorrhage. Foliurn, stem, root bark and fruit: lumbagos, traumatic injury, snakebite, menoxenia, insomnia. | Whole plant: rheumatism, traumatic injury, stomachache, menoxenia, buerger’s disease. Foliurn: external use for skin infection, snakebite, traumatic hemorhage. |
| 83  | Lamiaceae       |              | *Scutellaria amoena* C. H. Wright(180814811) | Root: lung heat cough, inflammation of eyes, jaundice, dysentery, prostatitis, metrorrhagia and metrostaxis, carbuncles. | Root and rhizome: dysentery, parotitis, liver disease, children with acute respiratory tract infection, chronic bronchitis, leptospirosis, hepatitis, nephritis, hypertension, indigestion, inflammation of eyes, prostatitis, constipation, white dysentery, stomachache, metrorrhagia and metrostaxis. | Root: cough, dysentery, jaundice, prostatitis, inflammation of eyes, threatened abortion, metrorrhagia and metrostaxis, carbuncles. |
| 84  | Selaginellaceae |              | *Selaginella pulvinata* (Hook. et Grev.) Maxim(181014942) | Whole plant: amenorrhea, traumatic injury, functional uterine bleeding, leucorrhoea, abdominal distensionedema, pulmonary hemorrhage, hemorrhinia, hematemesis, jaundice hepatitis, rheumatism. | Whole plant: functional uterine bleeding, leucorrhoea, pulmonary hemorrhage, hemafecia, hemorrhoids, metrorrhagia and metrostaxis, amenorrhea, abdominal distensionedema, menoxenia, dystocia, traumatic injury, hemorrhoids, gastrointestinal bleeding, epistaxis. | Whole plant: gastrointestinal bleeding, hematuria, traumatic hemorrhage, dystocia, constipation, burns and scalds. |
| 85  | Compositae      |              | *Senecio analogus* Candolle(180801390) | Whole plant: influenza, hemiplegia, rheumatalgia, dysentery, stomachache, indigestion. | Whole plant: influenza, hemiplegia, rheumatalgia, dysentery, stomachache, indigestion. | Whole plant: traumatic injury, edema pain, carbuncles, mastitis. |

The collected voucher specimens are preserved in the Specimen Center of School of Ethnic Medicine, Chengdu University of Traditional Chinese Medicine.
| No. | Family       | Chinese name | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                 |
|-----|--------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 86  | Compositae   |              | *Senecio scandens* Buch.-Ham. ex D. Don(181017988) | Whole plant: upper respiratory tract infection, nephritis, impetigo, urticaria, dysentery, eczema, enteritis, acute keratitis, allergic dermatitis, eczema, trichomoniasis, cold. Folium: fever. | Whole plant: rheumatalgia, acute conjunctivitis, eczema, dermatitis, keratitis, skin infection, menoxenia, diarrhea, cold, malarial, scrofula, rheumatism arthralgia, hemorrhoids, swollen sore throat, syphilis, innominate inflammatory, nyctalopia, chronic conjunctivitis. Root: inflammation of eyes, traumatic injury, ecchymoma pain, dysentery, syphilisgonorrhea, hemorrhoids, eczema, insect and snake bites. | Whole plant: eczema, upper respiratory tract infection, nephritis, laryngopharyngitis, pneumonia, eye conjunctivitis, dysentery, enteritis, appendicitis, acute lymphangitis, erysipelas, allergic dermatitis, hemorrhoids, acute conjunctivitis, dermatitis, rheumatic arthritis. |
| 87  | Fabaceae     |              | *Senna tora* (Linnaeus) Roxburgh(181014931) | Seed: constipation, hemorrhoids, rheumatism, diabetes mellitus, prostatitis, edema, beriberi, dystentery, menoxenia, fungal infection. | Root: rheumatalgia.                                                      | Seed: intestinal constipation, diabetes mellitus, prostatitis, rheumatism, dysentery, menoxenia, fungal infection. |
| 88  | Solanaceae   |              | *Solanum nigrum* L. (180728212)         | Whole plant: skin infection, carbuncles, erysipelas, parotitis, acute nephritis, urethritis, leukorrhea, traumatic injury, chronic bronchitis, nephritis. Root: coughhemoptysis, menoxenia. | Whole plant: snake bites, skin infection, cough, hepatitis, liver disease, bladder stone, urinary infection, rheumatism, traumatic injury. | Whole plant: skin infection, carbuncles, erysipelas, traumatic injury, chronic bronchitis, acute nephritis. |
| 89  | Solanaceae   |              | *Solanum violaceum* Ortega(180724050)   | Fruit: gastropathy, skin infection abscesses fester.  Flower and folium: headache, toothache, throat sore, lymphnodes, stomachache, rheumatic arthritis, traumatic injury, stomachache, carbuncles and sores, rhinitis. | Root and fruit: menoxenia, afterpains, cough, hemoptysis, edema, hematuria, jaundice, abnormal leukorrhea, swollen sore throat, cough, malarial, palpitation, swollen sore throat, sores, toothache, stomachache, insomnia, swollen sore throat, dysmenorrhea, amenorrhoea. Root, fruit and seed: toothache, stomachache, nephritis. | Fruit, folium and seed: headache, inflammation of eyes, sinusitis, gingivitis. |
| 90  | Compositae   |              | *Sonchus oleraceus* L. (180813798)      | Whole plant: dysentery, jaundice, prostatitis.                             | Whole plant: white dysentery.                                             | Whole plant: enteritis, dysentery, acute icteric hepatitis, appendicitis, mastitis, stomatitis, pharyngitis, nephritis, pulmonary tuberculosis, hematemesis, traumatic hemorhnia, hemafecia, metrorrhagia and metrostaxis. |
| No. | Family          | Chinese name | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                 |
|-----|----------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 91  | Portulacaceae  |              | *Talinum paniculatum* (Jacq.) Gaertn. (180806506) | Root: menoxenia, prostatic hyperplasia, infantile enuresis, cough, night sweating, abnormal leukorrhea, postnatal lack of lactation, fungal infection. Whole plant: diarrhea, pulmonary tuberculosis, vertigo. | Root: prostatic hyperplasia, infantile enuresis, cough, night sweating, boils and sores. | Root: diarrhea, pulmonary tuberculosis, night sweating, menoxenia, abnormal leukorrhea. |
|     |                |              |                                           |                                                                           |                                                                           |                                                                           |
| 92  | Compositae     |              | *Taraxacum mongolicum* Hand.-Mazz. (180816921) | Whole plant: mastitis, acute suppurative mastitis, skin infection, inflammation of eyes, gingivitis, lymphadenitis, hepatitis, throat sore, lung abscess, jaundice, upper respiratory tract infection, laryngopharyngitis, parotitis, gastritis, acute icteric hepatitis, burns and scalds, tympanitis, conjunctivitis, blepharitis, skin infection, innominat inflammatory. | Whole plant: dyspeptic abdominal distention, lung abscess, skin infection, infertility. | Whole plant: upper respiratory tract infection, acute tonsillitis, parotitis, acute mastitis, acute appendicitis, urinary infection, hepatitis, inflammation of eyes, postnatal lack of lactation, external use for skin infection, snakebite. Root: acute mastitis, lymphadenitis, acute bronchitis, nephritis, cholecystitis. |
| 93  | Rutaceae       |              | *Tetradium ruticarpum* (A. Jussieu) T. G. Hartley (180730249) | Fruit: pain and coldness in the lower abdomen, headache, hemia, dysmenorrhea, berber, acute gastroenteritis, dysmenorrhea, stomachache. | The fruit, bark and folium: hemia, gastric ulcer, impetigo. | Fruit: emesis, headache, abdominal distension, beriberi, hemia, oral ulcer, eczema, impetigo. |
| 94  | Vitaceae       |              | *Tetrastigma serrulatum* (Roxb.) Planch. (180808560) | Whole plant: rheumatism, activating blood, fracture. | Root: rheumatoid arthritis, traumatic injury, swollen sore throat, hematuria, external use for fracture. Whole plant and Root: traumatic injury, rheumatism, amenorrhea, pulmonary tuberculosis, rheumatalgia, flaccid limbs, fracture, abscesses fester, traumatic injury, hematuria, swollen sore throat. Whole plant: traumatic injury, fracture, ecchymoma pain, rheumatism, carbuncles and sores, abscesses fester, swollen sore throat, hematuria. | Root and stem: rheumatic fracture pain, traumatic injury, external use for fracture, traumatic hemorrhage. |
| No. | Family       | Scientific name and voucher specimen code | Chinese name | Uses in MM | Uses in YM | Uses in LM |
|-----|--------------|-------------------------------------------|--------------|------------|------------|------------|
| 95  | Euphorbiaceae | *Triadica sebifera* (Linnaeus) Small(180812750) | Seed, folium, root bark and stem: edema, abdominal distension, eczema, snakebite, constipation, beriberi, urticarial. | Root bark and folium: diarrhea, acute mastitis, snakebite, traumatic injury, skin infection, burns and scalds, appendicitis, hepatitis. | Root bark: edema, abdominal distension, scrofula. |
| 96  | Celastraceae  | *Tripterygium wilfordii* Hook. f. (180726092) | Root: innominate inflammatory, neurodermatitis. Root and stem: fungal infection, itchiness. | Root: rheumatoid arthritis, traumatic injury. Root bark: rheumatic fracture pain, traumatic injury, systemic lupus erythematosus, chronic glomerulonephritis, bronchitis, skin infection, eczema, fungal infection, neurodermatitis. Root and stem bark: rheumatism, rheumatism, cough, traumatic injury, fungal infection. | Whole plant and Root: barkrheumatoid arthritis, traumatic injury, hemiplegia. external use for fracture, traumatic hemorrhage. |
| 97  | Malvaceae    | *Urena lobata* L.(180726121) | Whole plant and Root: edema, amenorrhea. Whole plant: rheumatoid arthritis, cold, malarial, enteritis, dysentery, dyspepsia in children, external use for traumatic injury, snakebite, mastitis. | Stem bark: snake and insect bites, innominate inflammatory, oral ulcer. | Whole plant: rheumatic arthritis, malarial, enteritis, dyspepsia, traumatic injury. |
| 98  | Usneaceae    | *Usnea diffracta* (180809568) | Lichen thalli: tympanitis, mastitis. | Thallus: scrofula, acute mastitis, traumatic hemorrhage, snakebite, rheumatalgia. Filamentous body: lymphoid tuberculosis, amenorrhea, cough, ascariasis. | Thallus: traumatic injury, rheumatoid arthritis, hemiplegia, hemoptysis, traumatic hemorrhage, skin infection, palpitation, swollen sore throat, sores, traumatic infection, snakebite, scrofula, mastitis, pulmonary tuberculosis, cough, lymphadenitis, ascariasis. |

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| No. | Family               | Chinese name | Scientific name and voucher specimen code | Uses in MM                                                                 | Uses in YM                                                                 | Uses in LM                                                                 |
|-----|----------------------|--------------|-------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 99  | Verbenaceae          |              | Verbena officinalis L. (180724063)         | Whole plant: fever, jaundice, urinary infection, edema, swollen sore throat, fracture, diptheria, malarial, abdominal pain, urinary calculi, traumatic injury, hepatitis, menoxenia, amenorhea, carbuncles and sores, hepatitis, tetanus, dysentery, jaundice hepatitis, hemia, chest pain, lumbagos, white diarrhea, fracture, pelvic inflammation. | Whole plant and Root: cold, toothache, hematuria, jaundice, swollen sore throat, chronic gastritis, edema, malarial, edema, dysentery, gonorrhea, amenorhea, carbuncles and sores, gingival inflammation, dysmenorrhea, white diarrhea, infertility, acute mastitis, menoxenia, dysmenorrhea, pertussis, enterospasms, diarrhea, liver disease, toothache, cold, traumatic injury, diptheria, influenza, schistosomiasis, filariasis, hepatitis. | Whole plant: cold, urinary infection, toothache, night blindness, dysentery, jaundice, edema, malarial, diptheria, painful swelling of the throat, gonorrhea, amenorhea, gingival inflammation, carbuncles and sores. |
| 100 | Euphorbiaceae        |              | Vernicia fordii (Hemsl.) Airy Shaw (180806494) | Root, juice, seed and oil: external use for schistosomiasis.               | Seed: dyspeptic abdominal distention, scrofula and scrofula.               | Seed: painful swelling of the throat, scrofula, scrofula, scalds, erysipelas, dyspeptic abdominal distention. |
| 101 | Campanulaceae        |              | Wahlenbergia marginata (Thunb.) A. DC. (180808543) | Whole plant: cough cold, night sweating, hypertension.                     | Whole plant and Root: anemia, rheumatism.                                 | Rhizome: dyspepsia in children, bronchitis, cough, malarial, hypertension, leucorrhoea. |
| 102 | Rutaceae             |              | Zanthoxylum armatum DC. (180730280)         | Fruit: pain and coldness in the lower abdomen, emesis, diarrhea, eczema, ascariasis, caries toothache, scrofula. Root and stem: traumatic injury, rheumatic arthritis. Root: cold headache | Fruit: abdominal pain. Root: keratitis, stomachache, cold, skin infection, rheumatalgia. | Fruit: ascariasis, toothache, eczema. |

The collected voucher specimens are preserved in the Specimen Center of School of Ethnic Medicine, Chengdu University of Traditional Chinese Medicine.

Table 1 Inventory of shared-use medicinal plants in the three medical systems

Figure 2 Venn diagram: The intersection of medicinal plants used in the three medical systems

**Family Distribution**

The 14 families Compositae, Lamiaceae, Fabaceae, Rosaceae, Polygonaceae, Euphorbiaceae, Campanulaceae, Ranunculaceae, Apiaceae, Urticaceae, Orchidaceae, Solanaceae, Rutaceae, and Saxifragaceae are commonly used in MM, YM and LM to treat diseases. Moreover, from the heat map of the family distribution (Fig. 3), it can be intuitively seen that the YM and LM utilize more similar plant families than the other combinations of medical systems examined.

Figure 3 Heat map: The family-level distribution of the medicinal plants used in the three medical systems

(The color reflects the quantity of information on the medicinal plants belonging to the families in the corresponding medical system, red represents a large quantity and green represents a small quantity. Families of similar size in the three medical systems are clustered in the tree above. Two medical systems with similar distributions at the plant family level are clustered together in the left tree.)
There were 146 medicinal plants with shared uses among MM and YM, involving 69 families and 130 genera, and the most well represented families were Compositae (13 species, 9%) and Cucurbitaceae (13 species, 9%). A total of 126 medicinal plants from 69 families and 116 genera were shared among MM and LM, and the dominant families were Urticaceae (10 species, 8%), Lamiaceae (10 species, 8%), and Acanthaceae (10 species, 8%). A total of 142 medicinal plants involving 72 families and 129 genera had shared uses in YM and LM, and the dominant families were Caprifoliaceae (12 species, 8%) and Compositae (11 species, 8%). There were 102 shared-use medicinal plants among the three medical systems, involving 66 families and 93 genera. Among the shared-use plants, those of Compositae (14 species, 14%) and Lamiaceae (6 species, 6%) accounted for the dominant proportions (Fig. 4).

Figure 4 Pie chart: The family-level distribution of shared-use medicinal plants among the three medical systems

**Medicinal Plant Parts**

Whole plants, roots and rhizomes were extensively used in MM, YM and LM, followed by caulis and lignum, foliage, fruits, seeds, flowers, cortexes, resin, phycomycetes and plant oils. MM and YM used similar plant parts. The difference between LM and the other two medical systems was large, mainly reflected in the lower use of roots and rhizomes, caulis and lignum, whole plants and plant oils than MM and YM and the greater use of resin and phycomycetes than the other two nationalities. The tree diagram on the left of the heat map can also visually reflect the similarities between MM and YM in terms of the medicinal plant parts utilized by these groups (Fig. 5).

Figure 5 Heat map: Medicinal parts used in the three medical systems

(The color reflects the frequency with which medicinal parts were used in the corresponding medical system, with red representing more and green representing less. The medicinal parts used at similar frequencies in the three medical systems are clustered together in the tree above. Two medical systems with similar frequency of use of medicinal parts are clustered together in the left tree.)

**Diseases Treated And Special Uses**

Compared with the other two medical systems, YM used significantly more medicinal plants for surgery, anorectal, orthopedic, stomatological and infectious diseases. MM used more medicinal plants for ophthalmologic and otorhinolaryngologic diseases and fewer for urological and infectious diseases. However, there were few medicinal plants used in obstetrics and gynecology, orthopedics, surgery, pediatrics, and stomatological diseases in LM. According to the analysis of the types of diseases treated (Table 2, Fig. 6), MM and YM were the most similar medical systems.

Some of the information about the efficacy of the medicinal plants obtained from the study participants is recorded in the Dictionary of Chinese Ethnic Medicine, while some is not recorded. The unrecorded information may indicate special uses of medicinal plants by local Miao, Yi, and Lisu doctors in Yanbian. These unrecorded special uses are recorded in Table 3 and related to the treatment of rheumatism, snake and insect bites, burns and scalds, cold, strokes and other diseases (Table 3).
### Table 2
The number of medicinal plants in each medical system used to treat various diseases

| No. | Field of use         | MM     | Percentage (%) | YM     | Percentage (%) | LM     | Percentage (%) |
|-----|----------------------|--------|----------------|--------|----------------|--------|----------------|
| 1   | Internal medicine    | 196    | 95.15%         | 233    | 94.33%         | 191    | 93.17%         |
| 2   | Surgery              | 143    | 69.42%         | 189    | 76.52%         | 138    | 67.32%         |
| 3   | Dermatology          | 50     | 24.27%         | 59     | 23.89%         | 43     | 20.98%         |
| 4   | Proctology           | 16     | 7.77%          | 29     | 11.74%         | 16     | 7.80%          |
| 5   | Urology              | 9      | 4.37%          | 23     | 9.31%          | 18     | 8.70%          |
| 6   | Obstetrics and Gynecology | 77 | 37.38%     | 103    | 41.70%         | 65     | 31.71%         |
| 7   | Pediatrics           | 38     | 18.45%         | 43     | 17.41%         | 25     | 12.20%         |
| 8   | Ophthalmology        | 31     | 15.05%         | 21     | 8.50%          | 21     | 10.24%         |
| 9   | Otorhinolaryngology  | 51     | 24.76%         | 46     | 18.62%         | 39     | 19.02%         |
| 10  | Orthopedics          | 30     | 14.56%         | 52     | 21.05%         | 22     | 10.73%         |
| 11  | Stomatology          | 30     | 14.56%         | 53     | 21.46%         | 26     | 12.68%         |
| 12  | Infection            | 40     | 19.42%         | 71     | 28.74%         | 46     | 22.44%         |

### Table 3
The special uses of medicinal plants in the three medical systems

| Nation | Special usages                                                                                                                                                                                                 |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MM     | Soaking *Asarum maximum* Hemsl., *Uncaria rhynchophylla* (Miq.) Miq. ex Havi., *Ligusticum sinense* 'Chuanxiong' and *Saposhnikovia divaricata* (Turcz.) Schischk. In wine, drink the medicated wine to treat arthralgia. |
|        | Roasting the leaves of *Ricinus communis* L. on the fire and apply on the affected area to treat headache and shoulder-neck pain.                                                                                 |
|        | Stale tea oral administration and external application to relieve the poison of centipede bites.                                                                                                               |
|        | Using the whole plant of *Glechoma longituba* (Nakai) Kupr., *U. rhynchophylla* (Miq.) Miq. ex Havi. And the root or whole plant of *Periploca sepium* Bunge. to boil water, and use the water for bathing, which can treat rheumatism |
|        | The pulp of *Melia azedarach* L. is ground into a powder and steamed with eggs to treat hemorrhoids.                                                                                                           |
|        | Dry snakeskin, roasted until it is yellow and crisp, and then ground into powder. Coating the affected area with rapeseed oil and sprinkle with snakeskin powder to treat herpes zoster. |
|        | The seeds of *Amorphophallus konjac* K. Koch are dried and ground into powder, sprinkled on steamed glutinous rice, mixed with lard and eaten to treat uterine prolapse.                                   |
|        | Urine external application to relieve snake venom.                                                                                                                                                           |
| YM     | The cortex of *Crateagus pinnatifida* Bge. boiled into an ointment and applied it to the affected area to treat burns and scalds.                                                                            |
|        | *Sauraria tristyla* DC. Parasiticus can cure asthma.                                                                                                                                                        |
|        | Using *Phyllanthus emblica* L., *Lonicera japonica* Thunb. and *Cyrtomium fortunei* J. Sm. to boil water, and take them orally to prevent colds and cure influenza.                                         |
|        | Using *P. emblica* L., the cortex of *Citrus reticulata* Blanco and *Zingiber officinale* Roscoe to boil water, and take them orally to treat colds.                                                          |
|        | The folium of *Platycladus orientalis* (L.) Franco is soaked in white vinegar and outer applying to treat intractable ringworm.                                                                            |
|        | Smashing *Dipsacus asper* Wallich ex Candolle, *Gonostegia hirta* (Bl.) Miq., *Amelopsis* and the root of *Davallia trichomanoides* Blume mix with wine, and apply external application to treat fractures |
|        | The juice of *Musella lasiocarpa* (Franchet) C. Y. Wu ex H. W. Li or honey can relieve the toxicity of *Aconitum carmichaelii* Debeaux.                                                                       |
|        | Igniting the thread is drawn from the *Boehmeria nivea* (L.) Gaudich., cauterize on the vein to treat strokes.                                                                                               |
|        | Smashing the root of *B. nivea* (L.) Gaudich. and apply it to the affected area, with a hole in the middle can treat pustules.                                                                           |
| LM     | Sour things can detoxify, such as pickled cabbage soup can dispel the effects of alcohol and counteract toxicity.                                                                                           |

Figure 6 Heat map: The types of diseases treated by the three medical systems
(The colors reflect the number of medicinal plants used to treat diseases in the three medical systems, with red representing more and green representing less. In the three systems, diseases treated with a similar number of medicinal plants are clustered together in the tree above. Two medical systems with similar numbers of medicinal plants used for various diseases are clustered together in the left tree.)

Table 3 The special uses of medicinal plants in the three medical systems

**Comparison Of Medicinal Uses**

The results of the cluster analysis of MM and YM show that among the 146 shared-use medicinal plants, the medicinal parts and diseases treated with the four plants were consistent in MM and YM: (i) The whole plant of *Eupatorium japonicum* Thunb. is used for the treatment of postpartum lumbar pain, and the root is used for the treatment of traumatic injuries. (ii) The whole plant of *Senecio analogus* Candolle can treat influenza, headache, pyrexia, hemiplegia, rheumatalgia, carbuncle sores, bacillary dysentery, indigestion distension syndrome, and weak body physique due to long-lasting diseases and hemorrhage. (iii) The whole plant of *Sagina japonica* (Sw.) Ohwi. is used to treat dermatitis rhus and snake bites. (iv) The whole plant of *Selaginella moellendorfii* Hieron. has a therapeutic effect on acute icteric hepatitis, phthisic hemoptysis, hemorrhoids, burns, and scalds.

The results of the cluster analysis of MM and LM showed that among the 126 shared-use medicinal plants, eight plants had consistent medicinal parts and diseases treated among MM and LM: (i) The root of *Psammosilene tunicoides* W. C. Wu et C. Y. Wu is used for the treatment of traumatic injuries, traumatic bleeding, and rheumatalgia. (ii) The root of *D. asper* Wallich ex Candolle can treat traumatic injuries, back and knee pain, rheumatic bone pain and functional uterine bleeding. (iii) The tuber of *Arisaema erubescens* (Wall.) Schott is used to treat facial hemiplegia, epilepsy, infantile convulsion, excessive phlegm, dizziness and painful swelling of the throat. (iv) The root of *Scutellaria amoena* C. H. Wright has a therapeutic effect on lung inflammation, cough, diarrhea, acute conjunctivitis, jaundice, metrorrhagia and metro taxis. (v) The cortex of *Alnus nepalensis* D. Don can treat bleeding knife wounds, cold, headache, and rheumatic arthrodynia. (vi) The fruiting body of *Ganoderma lucidum* (Curtis) P. Karst. is useful for neurasthenia and chronic bronchitis. (vii) The whole plant of *Hemipilia abellata* Bur. et Franch. is used for the treatment of low fever and lung dryness. (viii) The whole plant of *Crotalaria ferruginea* Grah. ex Benth. can treat tinnitus.

The results of the cluster analysis of YM and LM show that among the 142 shared-use medicines, eight plants had consistent medicinal parts and diseases treated among YM and LM: (i) The root of *Phytolacca acinosa* Roxb. is used for the treatment of edema. (ii) The tuber of *A. konjac* K. Koch can treat traumatic injuries and rheumatic arthrodynia. (iii) The rhizomes of *Curcuma longa* L. are used to treat pectoral pain and menstrual disorders. (iv) The whole plant of *Euphorbia sieboldiana* Mor. et Decne. has a therapeutic effect on traumatic injuries and hemorrhage. (v) The rhizomes of *Paris marmorata* Stearn can treat snake and insect bites, boils and sores, throat sore, and stomachache. (vi) The seeds of *Vernicia fordii* (Hemsl.) Airy Shaw are useful for dyspeptic abdominal distention and scrofula mange. (vii) The whole plant of *Metapanax delavayi* (Franchet) J. Wen & Frodin is used for the treatment of throat sore, cough, indigestion, ascariasis, menstrual disorders, traumatic injuries, enteritis, and rheumatic bone pain. (viii) The whole plant of *Peperomia tetraphylla* (Forst. F.) Hooker et Arnott can treat rheumatic arthritis, traumatic injuries, and asthma.

In the clustering analysis results, among the shared-use medicinal plants in the MM and YM, MM and LM, and YM and LM comparisons, the identity rates (the proportion of medicinal plants with the same or similar uses in two medical systems) were 2.7%, 6.3%, and 5.6%; the functional equivalent rates (the proportion of two different medicinal plants that have the same effect in two medical systems) were 43.2%, 39.4%, and 39.4%, and the similarity percentages (equal to the identity rate plus the functional equivalent rate, reflecting the comprehensive similarity of the two medical systems) were 45.9%, 45.7%, 45%, respectively. MM and YM had the highest similarity percentages, indicating that MM and YM were the most similar medical systems, and the internal relationship between them was closest.

According to the clustering analysis results, 169 functional equivalents composed of 98 species of plants were found and inventoried, as shown in Table 4.
| Miao and Yi | D. asper | Pallich ex Candolle—Alangium chinense (Lour.) Harms | Eclipta prostrata (L.) L. — L. japonicus Houttuyn |
|------------|----------|-------------------------------------------------|-------------------------------------------------|
|            | Phytolaccaceae americana L.—Cannabis sativa L. | Agrimonia pilosa Ldb.—Mirabilis jalapa L.        |
|            | P. americana L.—Kochia scoparia (L.) Schrad. | Astilbe chinensis (Maxim.) Franch. et Savat.—Ampelopsis delavayana Planch. |
|            | P. americana L.—F. vulgare Mill. | Ranunculus japonicus Thunb.—Perilla frutescens (L.) Britt. |
|            | P. americana L.—Codonopsis convolvulacea Kurz | Solena heterophylla Lour.—P. americana L. |
|            | P. americana L.—Senna tora (Linnaeaeus) Roxburgh | S. heterophylla Lour.—Hibiscus mutabilis L. |
|            | Cynoglossus amabile Stapf et Drumm.—Centella asiatica (L.) Urban | A. konjac K. Koch—Dioscorea panthaica Prain et Burkill |
|            | C. amabile Stapf et Drumm.—S. japonica (Sw.) Ohwi | G. nepalense Sweet—Cucurbita moschata (Duch. ex Lam.) Duch. ex Poir. |
|            | Selaginella pulvinata (Hook. et Grev.) Maxim—Polygonon runcinatum Buch.—Ham. ex D. Don | Rumex nepalensis Spreng.—P. americana L. |
|            | Habenaria dentata (Sw.) Schltr.—C. sativa L. | R. nepalensis Spreng.—H. mutabilis L. |
|            | D. delavayi—Phtheirospermum tenuisectum | R. yunnanensis (Franch.) Babcock—K. scoparia (L.) Schrad. |
|            |            | Curtuligo orchoides Gaertn.—R. sambucifolia Hemsl. |
|            | H. dentata (Sw.) Schltr.—K. scoparia (L.) Schrad. | G. hirta (Bl.) Miq.—Solanum nigrum L. |
|            | H. dentata (Sw.) Schltr.—F. vulgare Mill. | S. japonica (Sw.) Ohwi—C. asiatica (L.) Urban |
|            | H. dentata (Sw.) Schltr.—C. convolvulacea Kurz | Pacinosa Roxb.—Gynura japonica (Thunb.) Juel. |
|            | H. dentata (Sw.) Schltr.—S. tora (Linnaeaeus) Roxburgh | Dioscorea polystachya Turczaninow—C. longa L. |
|            | E. sieboldiana Morr. et Decne.—C. asiatica (L.) Urban | Crepis napifera (Franch.) Babcock—C. sativa L. |
|            | E. sieboldiana Morr. et Decne.—S. japonica (Sw.) Ohwi | C. napifera (Franch.) Babcock—K. scoparia (L.) Schrad. |
|            | Polygala arillata Buch.—Ham. ex D. Don—Drynaria delavayi Christ | C. napifera (Franch.) Babcock—F. vulgare Mill. |
|            | D. panthaica Prain et Burkill—C. sativa L. | C. napifera (Franch.) Babcock—C. convolvulacea Kurz |
|            | D. panthaica Prain et Burkill—K. scoparia (L.) Schrad. | C. napifera (Franch.) Babcock—S. tora (Linnaeaeus) Roxburgh |
|            | D. panthaica Prain et Burkill—F. vulgare Mill. | Rodgersia sambucifolia Hemsl.—A. chinense (Lour.) Harms |
|            | D. panthaica Prain et Burkill—C. convolvulacea Kurz | Curculigo orchoides Gaertn.—R. sambucifolia Hemsl. |
|            | D. panthaica Prain et Burkill—S. tora (Linnaeaeus) Roxburgh | Elsholtzia ciliata (Thunb.) Hyland.—C. asiatica (L.) Urban |
|            | C. convolvulacea Kurz—C. asiatica (L.) Urban | E. ciliata (Thunb.) Hyland.—S. japonica (Sw.) Ohwi |
|            | C. convolvulacea Kurz—S. japonica (Sw.) Ohwi | P. runcinatum Buch.—Ham. ex D. Don—G. nepalense Sweet |
|            | C. longa L.—R. sambucifolia Hemsl. | P. runcinatum Buch.—Ham. ex D. Don—Pimpinella candolleana Wight et Arn. |
|            | P. tunicoides W. C. Wu et C. Y. Wu—P. americana L. | Rhodiola yunnanensis (Franch.) S. H. Fu—E. sieboldiana Morr. et Decne. |
|            | P. tunicoides W. C. Wu et C. Y. Wu—H. mutabilis L. | R. yunnanensis (Franch.) S. H. Fu—A. chinensis (Maxim.) Franch. et Savat. |
|            | G. japonica (Thunb.) Juel.—G. nepalense Sweet | Pinus yunnanensis Franch.—A. konjac K. Koch |
|            | G. japonica (Thunb.) Juel.—P. candolleana Wight et Arn. | Desmodium sequax Wall.—S. nigrum L. |
|            | S. analogus Candolle—S. nigrum L. | Maclura tricuspidata Carriere—P. americana L. |
|            | Wahlenbergia marginata (Thunb.) A. DC.—C. asiatica (L.) Urban | M. tricuspidata Carriere—H. mutabilis L. |
|            | W. marginata (Thunb.) A. DC.—S. japonica (Sw.) Ohwi | — |
| Miao and Lisu | A. chinense (Lour.) Harms—P. acinosa Roxb. | Celosia cristata L.—S. japonica (Sw.) Ohwi |
|            | D. delavayi Christ—P. tunicoides W. C. Wu et C. Y. Wu | C. cristata L.—H. labellata Bur. et Franch. |
|            | D. delavayi Christ—R. nepalensis Spreng. | C. cristata L.—Phtheirospermum tenuisectum Bur. et Franch. |
D. asper Wall. ex Candolle—R. sambucifolia Hemsl.  C. cristata L.—E. ciliata (Thunb.) Hyland.

Pilea sinofasciata C. J. Chen—C. amabile Stapf et Drumm.  P. tunicoides W. C. Wu et C. Y. Wu—R. nepalensis Spreng.

P. sinofasciata C. J. Chen—E. sieboldiana Morr. et Decne.  S. analogus Candolle—G. hirta (Bl.) Miq.

P. sinofasciata C. J. Chen—W. marginata (Thunb.) A. DC.  S. nigrum L.—G. hirta (Bl.) Miq.

P. sinofasciata C. J. Chen—S. japonica (Sw.) Ohwi  A. konjac K. Koch—P. yunnanensis Franch.

P. sinofasciata C. J. Chen—H. flabellata Bur. et Franch.  G. nepalense Sweet—S. pulvinata (Hook. et Grev.) Maxim

P. sinofasciata C. J. Chen—P. tenuisectum Bur. et Franch.  G. hirta (Bl.) Miq.—P. sinofasciata C. J. Chen

P. sinofasciata C. J. Chen—E. ciliata (Thunb.) Hyland.  Ligustrum lucidum Ait.—R. japonicus Thunb.

C. amabile Stapf et Drumm.—Incarnillea arguta (Royle) Royle  Eriobotrya japonica (Thunb.) Lindl.—Ginkgo biloba L.

D. polystachya Turczaninow—S. analogus Candolle  H. flabellata Bur. et Franch.—C. amabile Stapf et Drumm.

D. polystachya Turczaninow—Altemanthera philoxeroides (Mart.) Griseb.  H. flabellata Bur. et Franch.—E. sieboldiana Morr. et Decne.

S. pulvinata (Hook. et Grev.) Maxim—P. sinofasciata C. J. Chen  H. flabellata Bur. et Franch.—W. marginata (Thunb.) A. DC.

Kyllinga brevifolia Rottb.—S. analogus Candolle  H. flabellata Bur. et Franch.—S. japonica (Sw.) Ohwi

K. brevifolia Rottb.—A. philoxeroides (Mart.) Griseb.  H. flabellata Bur. et Franch.—P. tenuisectum Bur. et Franch.

C. reticulata Blanco—R. japonicus Thunb.  H. flabellata Bur. et Franch.—E. ciliata (Thunb.) Hyland.

E. sieboldiana Morr. et Decne.—Euphorbia hirta L.  Polygonum hydropiper L.—S. pulvinata (Hook. et Grev.) Maxim

E. sieboldiana Morr. et Decne.—R. yunnanensis (Franch.) S. H. Fu  Lobelia angulata Forst.—S. pulvinata (Hook. et Grev.) Maxim

Fallopia multiflora (Thunb.) Harald.—C. longa L.  P. tenuisectum Bur. et Franch.—H. dentata (Sw.) Schlr

Dioscorea bulbifera L.—A. eubescens (Wall.) Schott  P. tenuisectum Bur. et Franch.—C. naipfera (Franch.) Babcock

C. cristata L.—C. amabile Stapf et Drumm.  V. fordii (Hems.) Airy Shaw—C. reticulata Blanco

C. cristata L.—E. sieboldiana Morr. et Decne.  R. yunnanensis (Franch.) S. H. Fu—G. nepalense Sweet

C. cristata L.—W. marginata (Thunb.) A. DC.  B. nivea (L.) Gaudich.—C. longa L.

Yi and Liu  Hemiphragma heterophyllum Wall.—Taraxacum mongolicum Hand.-Mazz.  G. nepalense Sweet—T. mongolicum Hand.-Mazz.

D. delavayi Christ—H. mutabilis L.  Duchesnea indica (Andr.) Focke—Elephantopus scaber L.

D. asper Wallich ex Candolle—A. chinense (Lour.) Harms  Triplostegia glandulifera Wall. ex DC.—C. longa L.

D. polystachya Turczaninow—Adiantum philippense L. Sp.  P. hydropiper L.—T. mongolicum Hand.-Mazz.

D. polystachya Turczaninow—S. analogus Candolle  Amygdalus persica L.—Torilis japonica (Houtt.) DC.

D. polystachya Turczaninow—S. nigrum L.  L. angulata Forst.—T. mongolicum Hand.-Mazz.

Delphinium delavayi Franch.—F. multiflora (Thunb.) Harald.  Potentilla lineata Treviranus—E. sieboldiana Morr. et Decne.

Dinetus racemosus (Roxb.) Buch.-Ham. ex Sweet—E. sieboldiana Morr. et Decne.  P. lineata Treviranus—Valeriana hardwickii Wall.

D. racemosus (Roxb.) Buch.-Ham. ex Sweet—V. hardwickii Wall.  Ainsliaea spicata Vaniot—D. racemosus (Roxb.) Buch.-Ham. ex Sweet

E. sieboldiana Morr. et Decne.—V. hardwickii Wall.  A. spicata Vaniot—C. asiatica (L.) Urban

F. multiflora (Thunb.) Harald.—T. glandulifera Wall. ex DC.  A. spicata Vaniot—S. japonica (Sw.) Ohwi

F. multiflora (Thunb.) Harald.—R. sambucifolia Hemsl.  A. spicata Vaniot—Sigesbeckia orientalis Linnaeus

F. multiflora (Thunb.) Harald.—Rubia yunnanensis Diels  Hypoxis aurea Lour.—Drymaria cordata (Linnaeus) Willdenow ex Schultes

D. cordata (Linnaeus) Willdenow ex Schultes—A. philippense L. Sp.  H. aurea Lour.—P. tetraphylla (Forst. F.) Hooker et Arnott

D. cordata (Linnaeus) Willdenow ex Schultes—S. analogus Candolle  T. japonica (Houtt.) DC.—P. frutescens (L.) Britt.
Table 4 Functional equivalents: plants with the same function among the three medical systems

| D. cordata (Linnaeus) Willdenow ex Schultes | S. nigrum L. | Pueraria montana (Loureiro) Merrill | F. multiflora (Thunb.) Harald. |
|-------------------------------------------|-------------|-----------------------------------|---------------------------------|
| C. cristata L. | D. racemosus (Roxb.) Buch.-Ham. ex Sweet | P. embleica L. | Pinus amandii Franch. |
| C. asiatica (L.) Urban | Adenophora khasiana (Hook. f. et Thoms.) Coll. et Hems. | C. sativa L. |
| C. japonica (Sw.) Ohwi | A. khasiana (Hook. f. et Thoms.) Coll. et Hems. | F. vulgare Mill. |
| C. orientalis Linnaeus | A. khasiana (Hook. f. et Thoms.) Coll. et Hems. | S. tora (Linnaeus) Roxburgh |
| F. dibotrys (D. Don) Hara | A. konjac K. Koch | M. delavayi (Franchet) J. Wen & Frodin | F. dibotrys (D. Don) Hara |
| P. tunicoides W. C. Wu et C. Y. Wu | H. mutabilis L. | M. delavayi (Franchet) J. Wen & Frodin | F. dibotrys (D. Don) Hara |
| S. analogus Candolle | D. cordata (Linnaeus) Willdenow ex Schultes | Polygonum viviparum L. | C. sativa L. |
| S. analogus Candolle | P. tetraphylla (Forst. F.) Hooker et Arnott | P. viviparum L. | F. vulgare Mill. |
| S. nigrum L. | D. cordata (Linnaeus) Willdenow ex Schultes | P. viviparum L. | S. tora (Linnaeus) Roxburgh |
| S. nigrum L. | P. tetraphylla (Forst. F.) Hooker et Arnott | B. nivea (L.) Gaudich. | T. glandulifera Wall. ex DC. |
| P. tetraphylla (Forst. F.) Hooker et Arnott | D. cordata (Linnaeus) Willdenow ex Schultes | B. nivea (L.) Gaudich. | R. sambucifolia Hemsl. |
| A. konjac K. Koch | D. bulbifera L. | B. nivea (L.) Gaudich. | R. yunnanensis Diels |

Discussion

Family-level distribution

Rubiaceae, Melastomataceae, Myrtaceae and Apocynaceae had high diversity worldwide, but plants of these families are seldom used in the three medical systems in Yanbian County. Polygonaceae, Campanulaceae, Rutaceae and Saxifragaceae had low diversity in the world, but members of these families are widely used in the three ethnic medical systems. This is consistent with the results of our field plant surveys in Yanbian County. In addition to Urticaceae and Solanaceae, the other 12 families with the largest number of medicinal plants used in the three medical systems were consistent with the families with the largest numbers of plant species in Yanbian County. The family-level distribution of the most commonly used medicinal plants in the three medical systems was basically consistent with the vegetation in Yanbian, which is characteristic of the medical practices of the three ethnic groups. These groups are good at extensively using plants readily collected from the surrounding environment to treat multiple diseases or adopting treatment methods adapted to the local environment [16]. In simple terms, the closer a plant grows to civilization, the more it is used by locals.

Differences In The Diseases Treated

The Miao and Yi peoples inhabit the precipitous and high mountains above 2,000 meters above sea level. Most of these people live on raising goats and pigs and selling wild medicinal plants from the mountains. This kind of living environment and way of life makes people very prone to accidental injury. The Lisu people live in relatively flat hills and live near the town. Most of the Lisu people have jobs in business and work for a living. Therefore, MM and YM have more medicinal plants for surgical and orthopedic diseases than LM.

The Yi people in Yanbian have a special and simple diet: pickles, cured meats, potatoes, and buckwheat cakes are the staple foods, and they favor rough hard foods, fire-roasted food and salty food. They often grab food with their fingers, drink and smoke frequently, eat leftovers and maintain irregular eating habits. Such dietary structure and eating habits are particularly unfavorable for the gastrointestinal system and oral cavity, causing oral problems easily and increasing the transmission rate of Helicobacter pylori in the population [33, 34]. This may be the reason why Yi people have more drugs for the treatment of anal and rectal, stomach, and infectious diseases.

Integral Analysis Of The Three Medical Systems

The reasons for the similarities in medications across the different medical systems may be as follows [35]: (i) the medicinal materials have obvious medicinal effects in
a certain aspect, (ii) the geographical environment is widely shared, so the types of medicinal plants are similar, (iii) and there are interactions between different medical systems. While the reasons for the differences in the same medicine vary, they could be due to the following: (i) different lifestyles and habits and (ii) the persistence of each ethnic group in practicing their own traditional medical knowledge.

The ancestors of White Hmongs migrated to Yanbian from Zunyi, Guizhou Province in the 9th year of Hongwu in the Ming dynasty (1376), and the ancestors of Blue Mongs moved to Yanbian during the Xianfeng period of the Qing dynasty (1851~1864). The Miao ethnic group has its own language, which belongs to the Miao branch of the Hmong–Mien languages [17]. Most of the Yi people in Yanbian migrated from Daliang Mountain in the north, and the earliest Yi people came to Yanbian around the 13th year of Jiaqing in the Qing Dynasty (1808). The Lisu people moved to Yanbian from Lijiang, Yunnan Province in southern China between the Daoguang (1821) and Guangxu (1894) periods of the Qing Dynasty. Interestingly, the Lisu originated from the ancient Di-Qiang ethnic group who migrated to the south, and Lisu may have the same ethnic origin as the Yi [10, 11]. The Lisu language belongs to the Tibetan-Burman language, like that of the Yi.

In terms of ethnic origin and language, the Yi and Lisu peoples are closer than the Miao and should be more conducive to cross-ethnic communication concerning ethnic medicine. However, from our study, regardless of the medicinal plants, the medicinal parts, or the diseases treated in the medical system, the overall similarity of YM and MM is greatest among all group comparisons. This is because the formation of the theoretical system of national traditional medicine is a long-term process, and its development must be affected by many factors. Among these influencing factors, the geographical environment is the strongest [36]. Over this long developmental process, the effect of the geographical environment may be stronger than the influence of ethnic origin. Ethnic minorities in China are generally distributed across large areas of small settlements. Sharing the same geographic environment, vegetation type and lifestyle make communication between the Miao and Yi ethnic groups in Yanbian County more likely. This may be the main reason why MM is closer to YM than LM in Yanbian.

Although MM and YM have the highest similarity percentage (45.9%), there is not much difference in the similarity percentages of the three medical systems (MM and LM: 45.7%, YM and LM: 45%). At the same time, the three medical systems have a large number of shared-used medicines. This is because (i) the three ethnic groups live in Yanbian, and in addition to using the plants around the environment of their small settlements, they also gather medicinal plants in the same resource-rich areas, such as Bailin Mountain (at the junction of Guosheng Township and Hongbao Township). (ii) In addition to the intersection of medicinal collection sites, Yanbian has a well-developed medicinal market due to its convenient transportation.
A large number of medicinal material vendors set up stalls on market day in the village, and the availability of the medicinal market during the Dragon Boat Festival has strengthened the exchange of medical knowledge across various nationalities. (iii) The ethnic medicine of minority groups and HM have shown signs of close communication among groups since ancient times [36], and the influence of HM on ethnic medicine after the founding of New China cannot be ignored. The implementation of policies such as barefoot doctor programs has allowed HM to take root in the remote areas in which many ethnic groups live, and the popularization of Mandarin and economic development have promoted the exchange and integration of primitive and plain national medicinal knowledge and HM knowledge [37, 38]. Six of the seven ethnic doctors interviewed in this study had gone to Xichang Health School to study HM systematically in the 1960s and 1970s. During their practice, they extensively combined the use of Han herbal compounds with nationally-known prescription medicines. The uses of the bulk medicinal materials in the three medical systems surveyed showed a clear trend of convergence with HM. For example, *D. asper* Wallich ex Candolle is used to treat waist and knee pain, rheumatalgia, traumatic injuries, and functional uterine bleeding by the doctors of Han, Miao, Yi, and Lisu medical systems, and *A. erubescens* (Wall.) Schott is used to treat facial paralysis, hemiplegia, epilepsy, infantile convulsion, and snake and insect bites by the doctors of Han, Miao, Yi, and Lisu medical systems.

**Figure 7** The medicinal materials market of Yanbian County (From Rui Gu)

**Conclusions**

The present work provides information on medicinal plants from three medical systems and includes a preliminary comparative analysis. From this study, it is clear that Yanbian has many plants currently used for medicinal use, indicating the rich indigenous knowledge of the Miao, Yi and Lisu peoples living in the area. These natural resources and indigenous knowledge are still of economic importance and of benefit to the health of the local people, in particular those who are poor. Much of the existing knowledge of ethnic medicine in this area has been mastered by relatively less educated people over the age of 55, whose children are reluctant to pass on this knowledge and prefer to seek careers in urban areas. These ethnic groups have amassed knowledge over centuries and are currently threatened by the rapid urbanization of modern society. Despite the similarities and differences in indigenous knowledge between different ethnic groups, as well as the disappearance and integration of certain practices, each group still has its own characteristics. This knowledge represents cultural and ethnobotanical heritage that needs to be well preserved and developed. We hope that our collation and analysis of this ethnic medical knowledge can provide a basis for ethnic medical research on the three ethnic groups in Southwest China.

Computer-aided cross-cultural comparative ethnopharmacy research is a good way to reveal more intersections between different ethnic groups in terms of their understanding and use of natural medicines. The medicinal plants with the same therapeutic functions in the three medical systems of Yanbian County screened by their functional equivalents are of great significance; this information should be recorded in written form and can be used as the basis for future research on new drug resources. It is recommended that future research and development efforts should focus on these medicinal plants, and their effectiveness should be verified through pharmacocochemical studies to scientifically identify the medical potential of the plants and to substantially improve traditional herbal therapies.

**Abbreviations**

MM  
Miao medicine; YM: Yi medicine; LM: Lisu medicine; JI: Jaccard similarity index; HM: Han medicine.

**Declarations**
Ethics approval and consent to participate

Yuan-chang Cheng, director of the Yanbian County Health Bureau, and the subordinate health centers were informed of this traditional knowledge investigation and participated in and assisted. Before the interview, the interviewee was introduced to the team members and the intention of the visit, and the interviewee's verbal consent was obtained. The authors have all copyrights.

Consent for publication

The informants orally approved their consent for the publications of the shared information.

Competing interests

The authors declare that they have no competing interests.

Funding

This work was financially supported by the fourth national survey on Chinese material medica resources.

Authors’ contributions

Rui Gu and Shi-hong Zhong designed the study. Ke-ru Wang, Rong Ding, Nan-cuo and Ding-jian Hu collected data through field investigation. Jing Lin participated in data compilation. Ke-ru Wang analyzed the data and compiled the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We are grateful to the County Health Bureau of Yanbian County for their help while carrying out this study. We fully acknowledged the local informants for participating the surveys and sharing their knowledge on the use of medicinal plants with us. Without their contribution, this study would have been impossible. Thanks to Qinghe Wang for her help in the analysis of data and Cheng-hui Wang for his help in writing.

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Figures
Figure 1

A schematic of the study area Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

Figure 2

Venn diagram: The intersection of medicinal plants used in the three medical systems
Figure 3

Heat map: The family-level distribution of the medicinal plants used in the three medical systems. (The color reflects the quantity of information on the medicinal plants belonging to the families in the corresponding medical system; red represents a large quantity and green represents a small quantity. Families of similar size in the three medical systems are clustered in the tree above. Two medical systems with similar distributions at the plant family level are clustered together in the left tree.)

Figure 4

Pie chart: The family-level distribution of shared-use medicinal plants among the three medical systems.
Figure 5
Heat map: Medicinal parts used in the three medical systems (The color reflects the frequency with which medicinal parts were used in the corresponding medical system, with red representing more and green representing less. The medicinal parts used at similar frequencies in the three medical systems are clustered together in the tree above. Two medical systems with similar frequency of use of medicinal parts are clustered together in the left tree.)

Figure 6
Heat map: The types of diseases treated by the three medical systems (The colors reflect the number of medicinal plants used to treat diseases in the three medical systems, with red representing more and green representing less. In the three systems, diseases treated with a similar number of medicinal plants are clustered together in the tree above. Two medical systems with similar numbers of medicinal plants used for various diseases are clustered together in the left tree.)
Figure 7

The medicinal materials market of Yanbian County (From Rui Gu)