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

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Research

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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.

Figure 1A schematic of the study area

In May 2019, based on the plant specimen collection, an ethnobotanical investigation was conducted in Yanbian County through semistructured interviews with doctors of Miao, Yi and Lisu medicine [24]. The local names, medicinal parts and applications of the medicinal plants used in the three medical systems were investigated. The survey results were recorded according to ethnic groups [25–27]. There were seven key informants, aged 55–78, one woman and six men, all of whom are ethnic doctors still practicing medicine and are well known in the areas inhabited by the ethnic groups in Yanbian County. Their medical skills originated from their elders or were learned by experience.

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].

$$JI = \frac{\mathrm{Na}}{\mathrm{Na} + \mathrm{Nb} + \mathrm{Nc}}$$

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.

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

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, enteritis, 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 hemorrhinia, hemafecia, 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 vaginalis, skin infection, hemorrhoids.
3	Cornaceae	□□□	*Alangium chinense* (Lour.) Harms(180802422)	Root: rheumatic fracture pain, traumatic injury, traumatic hemorrhage. Folium: 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.	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, lymphnoditis, 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, epilepsyinfantile convulsion, wind-phlegm dizziness.painful swelling of the throatcarbuncles, traumatic injury, snake and insect bites, postpartum hemorrhage.	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 and Root: dyspepsia in children, traumatic bleeding, hematemesis, traumatic hemorrhinia, bloody dysentery, metrorrhagia and metrostaxis, 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 pruritus vulvae, parotitis, fracture, snake bites, 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 metrostaxis, 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 arthralgia, 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	□□	*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, erysipelascarbuncles, traumatic injury, snake and insect bites.
13	Rutaceae	□□□	*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 snydrome, dysentery, carbuncles, malarial.	Whole plant: malarial, bronchitis, swollen sore throat, influenza, external use for skin infection, allergy.
14	Moraceae	□□	*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	□□□	*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	□□	*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	□□□□	*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, hematemesis, traumatic hemorrhinia, prostatitis.	Whole plant: headache, swollen sore throat, toothache, parotitis, bronchitis, asthma, urinary infection, mastitis, herpes zoster, snakebite, abnormal leukorrhea, gonorrhea, acute enteritis, dysentery, urinary infection, scrofula. gingival inflammation, tympanitis, carbuncles, dysentery, abdominal pain, hernia, uterine prolapse, cold. Fruit: ascariasis, enterobiasis, taeniasis, 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, mastitis, snakebite.
18	Amaranthaceae	□□□	*Celosia cristata* L. (1810201015)	Inflorescence: menoxenia, metrorrhagia and metrostaxis, white diarrhea, diarrhea, hemafecia, hematuria, abnormal leukorrhea, diarrhea. Whole plant: menoxenia, diarrhea.	Whole plant and inflorescence: leucorrhoea, seminal emission, urticaria, itchiness, chronic conjunctivitis, menometrorrhagia, hemorrhoids.	Whole plat: chronic hepatitis, cirrhosis ascites, stomachache, rheumatic fracture pain.
19	Apiaceae	□□□	Centella asiatica (L.) Urban(180808545)	Whole plant: fever, cough, swollen sore throat, urinary calculi, menoxenia, hepatitis, urethritis, gastritis, jaundice, enteritis, dysentery, edema, hematuria, dysmenorrhea, metrorrhagia and metrostaxis, 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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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, lyssodexis, traumatic injury.	Root and folium: tinea capitis, traumatic injury, rheumatalgia, eczema. Whole plant: traumatic injury, 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 dyspnea, cough, intestinal colic.	Whole plant: bloody sputum, tinnitus, deafness, nephritis.
23	Zingiberaceae	□□	*Curcuma longa* L. (180812755)	Rhizome: jaundice, traumatic injury, amenorrhea, menoxenia, dysmenorrhea, afterpains, rheumatic 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, infertility. Root: cystitis, urethritis, dysuria, dysuria, hepatitis, malarial, traumatic hemorrhage, abnormal leukorrhea, dystocia, hepatitis, leucorrhoea, dysentery, hernia. Folium: hernia.	Whole plant: malarial, hepatitis, dysentery, leucorrhoea, pulmonary tuberculosis, traumatic bleeding, fracture.
25	Solanaceae	□□□	*Datura stramonium* L. (180730241)	Flower, folium and seed: cough, beriberi. Folium and flower: gingival inflammation.	Flower: stomachache. Fruit: toothache, bronchitis, asthma. Seed: toothache, dental caries, dog bites, traumatic injury. Folium: cough, stomachache, rheumatalgia, skin infection, snakebite. Whole plant: fracture.	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 leukorrhea, skin infection, lumbagos, 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 snydrome, 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* (Buchanan-Hamilton ex D. Don) Pruski & Anderberg(181014936)	Root: cold, rheumatic arthritis, swollen sore throat, acute suppurative 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, hernia, 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, gastritistoothache, cystitis, itchiness. Whole plant and root: cold, cough, headache, stomachache, rheumatic fracture pain, traumatic injury, menoxenia, leucorrhoea, schistosomiasis.
31	Compositae	□□	*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, hemorrhinia, hemoptysis, traumatic hemorrhage. Root: hematocheziahematuria, bloody dysenterymetrorrhagia and metrostaxis, pruritus vulvae.	Whole plant: hemoptysis, hemorrhinia, hematuria, hemafecia, hepatitis, enteritis, dysentery, dyspepsia in children, kidney deficiencytinnitus, neurasthenia.
32	Compositae	□□□	*Elephantopus scaber* L. (181012268)	Whole plant: insect and snake bites, nephritis enteritis, nephritisedema, malarial, cold, eye conjunctivitis, skin infection, eczema, insect and snake bites, laryngopharyngitis, jaundice, dysentery.	Whole plant: skin infection, acute suppurative 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* (Thunb.) Hyland.(180814834)	Whole plant: heat stroke, dyspepsia.	Root and folium: traumatic injury, eliminate blood stasis, dysuria. Root: fever, abdominal paindiarrhea.	Whole plant: cold, fever, heat stroke, acute gastroenteritis, halitosis, dysuria.
34	Equisetaceae	□□□	*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, amenorrhea.

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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. Bark: pertussis in children, bronchitis.	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 snydrome, 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 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 snydrome, 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 vulgare* Mill. (180814830)	Fruit: hernia. Whole plant: abdominal pain, dysmenorrhea, emphysema, cholera, emesis, hernia, measlesfever. Root: rheumatic fracture pain.	Root: emesis, abdominal distension.	Whole plant, root and seed: stomachache, dysmenorrhea, hernia, hydrocele of the tunica vaginalis, schistosomiasis.
43	Polyporaceae	□□	*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 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, lumbagossoreness 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 nepalense* Sweet(180727136)	Whole plant: rheumatalgia, traumatic injury, dysentery, skin infection fracture.	Whole plant and Root: traumatic injury, rheumatalgia, the bite of insect, snake, dog.	Whole plant: rheumatoid arthritis, traumatic injury, sciatica, acute gastroenteritis, dysentery, menoxenia.
46	Urticaceae	□□□	*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	□□□□□	*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	□□□	*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, menometrorrhagia, external use for carbuncles, mastitis, parotitis, traumatic injury.
49	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	□□	*Juglans regia* L.(180726096)	Seed: flaccid limbs, prostatitis, seminal emission in kidney-deficiency syndrome, cough, intestinal constipation, urethritis, scrofula. Fruit: hernia, 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	□□□	*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	□□□	*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, dysmenorrhea, 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 ston, 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, prolapse of rectum, infantile convulsion. Whole plant and folium: cold, inflammation of eyes, throat sore, toothache.
59	Araliaceae	□□□□□	*Metapanax delavayi* (Franchet) J. Wen & Frodin(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, leucorrhoea, articular pain, carbuncles and sores, acute suppurative mastitis, traumatic injury. Whole plant and Root: menoxenia, leucorrhoea.	Root: dysuria, abdominal distension, traumatic injury, skin infection. Whole plant: articular pain, menoxenia, traumatic injury, eliminate blood stasis.	Whole plant and Root: nephritis, menoxenia, prostatitis, 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, nyctalopia, 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 arillata* 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, dysentery, leucorrhoea, 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, prostatitisabnormal leukorrhea, hemorrhoids, snakebite, enteritis, pertussis, pulmonary tuberculosis, dysentery, fungal infectionnephritis, 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, stomachache, 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, diarrhea, leucorrhoea.	Pericarp: epistaxis, hemafecia, metrorrhagia and metrostaxis. Pericarp and folium: diarrhea, hemafecia, prolapse of rectum, functional uterine bleedingabnormal leukorrhea, 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, taeniasis, ascariasis. Flower: hematemesis, traumatic hemorrhinia, tympanitis. Folium: acute enteritis.
74	Ranunculaceae	□□	*Ranunculus japonicus* Thunb. (180801363)	Whole plant: jaundice, asthma, migraine.	Whole plant: coldheadache, cough, rheumatism arthralgia, schistosomiasis, rheumatic arthritis, gastropathy.	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 rhus.
77	Saxifragaceae	□□□□□	*Rodgersia aesculifolia* Batalin(180809619)	Rhizome: traumatic injury, fracture, menoxenia, traumatic bleeding.	Root: diarrhea, traumatic hemorrhage, abdominal distension, rheumatalgia, 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, rheumatalgia, 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 rhus, eczema, skin infection, erysipelas, scrofula, innominate inflammatory, snakebite, sinusitis, gingivitis, traumatic injury.	Whole plant: infantile convulsion, dermatitis rhus, snake bites.	Whole plant: leukemia, dermatitis rhus, 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. Folium, stem, root bark and fruit: lumbagos, traumatic injury, snakebite, menoxenia, insomnia.	Whole plant: rheumatism, traumatic injury, stomachache, menoxenia, buerger's disease. Folium: external use for skin infection, snakebite, traumatic hemorrhage.
83	Lamiaceae	□□□	*Scutellaria amoena* C. H. Wright(180814811)	Root: lung heat cough, inflammation of eyes, jaundice, dysentery, prostatitis, metrorrhagia and metrostaxis, carbunclesskin infection.	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, pneumonia, 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, dysentery, 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, leucorrhoea, 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, lymphnoditis, 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, amenorrhea. 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 hemorrhinia, hemafecia, metrorrhagia and metrostaxis.

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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 leucorrhea.
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, innominate 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, hernia, dysmenorrhea, beriberi, acute gastroenteritis, dysmenorrhea, stomachache.	The fruit, bark and folium: hernia, gastric ulcer, impetigo.	Fruit: emesis, headache, abdominal distension, beriberi, hernia, 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.

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No.	Family	Chinese name	Scientific name and voucher specimen code	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 plantrheumatoid 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,, diphtheria, malarial, abdominal pain, urinary calculi, traumatic injury, hepatitis, menoxenia, amenorrhea, carbuncles and sores., hepatitis, tetanus, dysentery, jaundice hepatitis, hernia, 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, amenorrhea, carbuncles and sores, gingival inflammation, dysmenorrhea, white diarrhea, infertility, acute mastitis, menoxenia, dysmenorrhea, pertussis, enterospasm, diarrhea, liver disease, toothache, cold, traumatic injury, diphtheria, influenza, schistosomiasis, filariasis, hepatitis.	Whole plant: cold, urinary infection, toothache, night blindness, dysentery, jaundice, edema, malarial, diphtheria, painful swelling of the throat, gonorrhea, amenorrhea, 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: coldcough, 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: coldheadache	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		YM		LM	
		Species number	Percentage (%)	Species number	Percentage (%)	Species number	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	8.78%
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 Havil., *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 Havil. 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 it 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 *Crataegus pinnatifida* Bge. boiled into an ointment and applied it to the affected area to treat burns and scalds. *Saurauia 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., Ampelopsis 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 moellendorffii* 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 flabellata* 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* Morr. 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%, 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.

Table 4
Functional equivalents: plants with the same function among the three medicinal systems

Miao and Yi	*D. asper* Wallich ex Candolle— *Alangium chinense* (Lour.) Harms	*Eclipta prostrata* (L.) L. — *L. japonicus* Houttuyn
	Phytolacca 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* (Linnaeus) Roxburgh	*S.heterophylla* Lour.—*Hibiscus mutabilis* L.
	Cynoglossum 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 Poiret
	Selaginella pulvinata (Hook. et Grev.) Maxim—*Polygonum 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.
	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	*P.acinosa* Roxb.—*Gynura japonica* (Thunb.) Juel.
	H. dentata (Sw.) Schltr—*S. tora* (Linnaeus) 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* (Linnaeus) 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 orchioides* Gaertn.—*R. sambucifolia* Hemsl.
	D. panthaica Prain et Burkill—*S. tora* (Linnaeus) 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. flabellata* Bur. et Franch.
	D. delavayi Christ—*R. nepalensis* Spreng.	*C. cristata* L.—*Phtheirospermum tenuisectum* Bur. et Franch.

	D. asper Wallich 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.—*Incarvillea 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—*Alternanthera 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.) Schltr
	Dioscorea bulbifera L.—*A. erubescens* (Wall.) Schott	*P. tenuisectum* Bur. et Franch.—*C. napifera* (Franch.) Babcock
	C. cristata L.—*C.amabile* Stapf et Drumm.	*V. fordii* (Hemsl.) 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 Lisu	*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.

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. emblica* L.—*Pinus armandii* Franch.
C. cristata L.—*C. asiatica* (L.) Urban	*Adenophora khasiana* (Hook. f. et Thoms.) Coll. et Hemsl.—*C. sativa* L.
C. cristata L.—*S. japonica* (Sw.) Ohwi	*A. khasiana* (Hook. f. et Thoms.) Coll. et Hemsl.—*F. vulgare* Mill.
C. cristata L.—*S. orientalis* Linnaeus	*A. khasiana* (Hook. f. et Thoms.) Coll. et Hemsl.—*S.tora* (Linnaeus) Roxburgh
F. dibotrys (D. Don) Hara—*A. khasiana* (Hook. f. et Thoms.) Coll. et Hemsl.	*Achillea wilsoniana* Heimerl ex Hand.-Mazz.—*L. angulata* Forst.
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

Table 4 Functional equivalents: plants with the same function among the three medical systems

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<>/h2
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

(Fig. 10). 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 pharmacochemical 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.

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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.

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References

1. Zhao B-Q, Li Q. XiongY-Y. Investigation report on traditional Chinese Medicine commonly used by Minorities in Hunan province. Lishizhen Medicine Materia Medica Research. 2003. doi:10.3969/j.issn.1008-0805.2003.08.055.
2. Han M-Q. The Sixth National Census. Philately Expo. 2010;(6):50.
3. Lu K-M. An Overview of the theoretical system of Miao medicine. Chin J Ethn Ethn. 2000; dio: CNKI:SUN:MZMJ.0.2000-06-002.
4. Yuan H, Zheng J, Cheng S-Y, et al. An overview of miao nationality's medical theory and development status. J Tradit Chin Med. 2014. doi:10.13288/j.11-2166/r.2014.17.021.
5. Li G-D. Research progress of Yi medicine. Chin Pharm J. 1986;21(1):39–41.
6. Yang Q, Zhou Y-Q, Wang H-Y. Research on the cultural connotation of Medicine of the Lisu People in West Yunnan. Journal of Medicine Pharmacy of Chinese Minorities. 2019. doi:10.16041/j.cnki.cn15-1175.2019.09.037.
7. Wang Y, Zheng J, Gai Y-C. The ethnic medicine flower of the Eastern Grand Canyon -- Introduction to The Medicine of the Lisu Nationality of Yunnan. Journal of Yunnan University of Traditional Chinese Medicine. 2008; dio: 10.19288/j.cnki.issn.1000-2723.2008.01.023.
8. Shi S. Zang and Yi corridor: History and Culture. Sichuan People`s Publishing House; 2009.
9. Lan Y. southern silk road. Chongqin University Press; 1992.
10. Yang Y-Q, He Z-Z, Fang L, et al. Investigation on the status quo of medicine of the Lisu Ethnic group in Yunnan. Yunnan Journal of Traditional Chinese Medicine and Materia Medica. 2010; doi: CNKI:SUN:YZYY.0.2010-12-021.
11. Lang W-W. On the historical evolution of miao nationality population in Sichuan. Guizhou Ethnic Studies. 1995;000(002):67–75.
12. Cheng J-X, Shi K-Z. On the Contemporary Population Development of Miao Nationality. Population Society. 2011. doi:10.14132/j.2095-7963.2011.03.011.
13. Louisa S, Tan H-F. A preliminary Study of Miao nationality in Contemporary China. Guizhou Ethnic Studies. 1994; doi:(03): CNKI:SUN:GZNY.0.1994-03-021.
14. Ma X-L. A survey report on the primitive religion of the Yi nationality. Guizhou Ethnic Studies. 1988; doi: CNKI:SUN:GZNY.0.1988-01-014.
15. QuBi X-Y. Unveiling Pedigree Culture of Yi People. Journal of Xihua University(Philosophy Social Sciences). 2010. doi:10.19642/j.issn.1672-8505.2010.06.004.

16. Yu J, Xi W-J. Research on the Spatial Distribution of Yi People in Southwest China. Natural Sciences. 2018;006(004):324–39.
17. Yanbian county annals compilation committee. Yanbian county annals. Sichuan Science&Technology Publishers; 1999.
18. Tang P, Wang L-H, Li C, et al. A Survey of Avian Diversity in Yanbian County, Sichuan Province. Journal of Southwest Forestry University(Natural Sciences). 2005;25(03):60–5.
19. Lin Z-G, Zhang J-C. climate in china. Shaanxi People's Publishing House; 1985.
20. Wang Q-Z, He X-J, Wang Q, et al. Study on the spermatophyte flora in Ertan Reservoir and surrounding regions. Jour of Fujian Forestry Sci Tech. 2008. doi:10.13428/j.cnki.fjlk.2008.01.001.
21. Lu J-W, Zhang X-B, Li H-T, et al. Key content and formulation of national Chinese materia medica resources survey at county level. China Journal of Chinese Materia Medica. 2013;16:110–3.
22. Huang L-Q, Lu J-W, Gu L-P, et al. Field Investigation Progress in the Fourth National Survey of Chinese Materia Medica Resources. Modern Chinese Medicine. 2013. doi:10.13313/j.issn.1673-4890.2013.07.001.
23. Editorial Committee of flora of China. Chinese Academy of Sciences. Flora reipublicae popularis sinicae. Beijing: Science Press; 1993.
24. Pei S-J, Long C-L. Applied plant ethnology. Kunming: The Nationalities Publishing House of Yunnan. 1998. P. 115–123.
25. Liu B, Guo Z-Y, Bussmann R, Li FF, et al. Ethnobotanical approaches of traditional medicine studies in Southwest China: A literature review. J Ethnopharmacol. 2016. doi:10.1016/j.jep.2016.02.040.
26. Gary JM, Pei S-J, He S-A. Handbook of ethnobotany. Kunming: Yunnan Science and Technology Press; 1998.
27. Wang Y-H, Wang C. Commonly research method of ethnobotany. Zhejiang: Zhejiang Education Pblishing; 2017.
28. Cheng J-S, Cao L-M, Li X-Z, Cao M. Ethnobotany knowledge of traditional medicinal plants among Hong-Yao in Longsheng, Guangxi. Guihaia. 2019;39(03):375–85.
29. Long C-L, Li R. Ethnobotanical studies on medicinal plants used by the Red-headed Yao People in Jinping, Yunnan Province, China. J Ethnopharmacol. 2004;90(2):389–95.
30. Jia M-R, Zhang Y. Dictionary of Chinese Ethnic Medicine. Beijing: China Medical Science Press; 2016.
31. Behxhet M, Avni H, Andrea P, et al. A cross-cultural comparison of folk plant uses among Albanians, Bosniaks, Gorani and Turks living in south Kosovo. J Ethnobiol Ethnomed. 2015. doi:10.1186/s13002-015-0023-5.
32. Huai H-Y, HaSi B-G. Quantitative Methods in Ethnobotany (â□□). Journal of Inner Mongolia Normal University(Natural Science Edition). 2006;39(04):417–9.
33. Pan S-Y. Analysis on the incidence of gastric cancer in Gaoshan Yi Region. Chinese Journal of Clinical Rational Drug Use. 2012. doi:10.15887/j.cnki.13-1389/r.2012.15.120.
34. Li H-C, He Y. Clinical analysis of Gastric cancer in Rural Yi youth in Liangshan Prefecture. The World Clinical Medicine. 2016;10(21):75,78.
35. Zhao M-M, Wang K-R, Gu R, et al. A comparative study on shared-use medicines in Tibetan and Chinese medicine. J Ethnobiol Ethnomed. 2019. doi:10.1186/s13002-019-0320-5.
36. Qian Y-X, Li X-L. Research on Analysis the Current Situation of Chinese Minority Traditional Medicine. Journal of Medicine Pharmacy of Chinese Minorities. 2011. doi:10.16041/j.cnki.cn15-1175.2011.02.003.
37. Li D-C. Review on the Study of the Barefoot Doctor. Chinese Primary Health Care. 2007;21(001):6–8.
38. Zhang A-H, Yue S-H. The Rise and Fall of Traditional Chinese Medicine and the Concept of Modern Nationstate -From the Abolishment of TCM to the Barefoot Doctors System. Journal of Anhui University(Philosophy Social Sciences Edition). 2010;34(2):139–44.

Figures

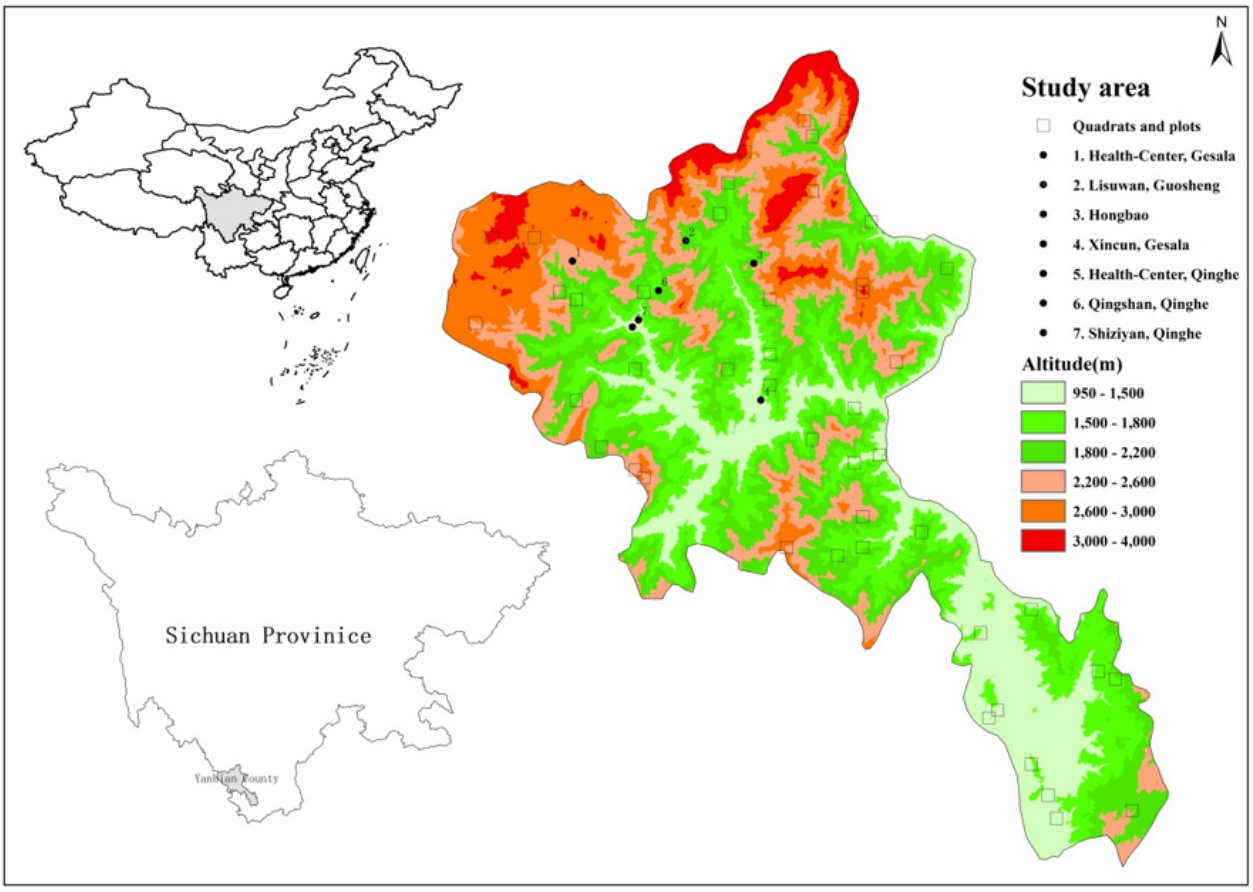

Figure 1

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.

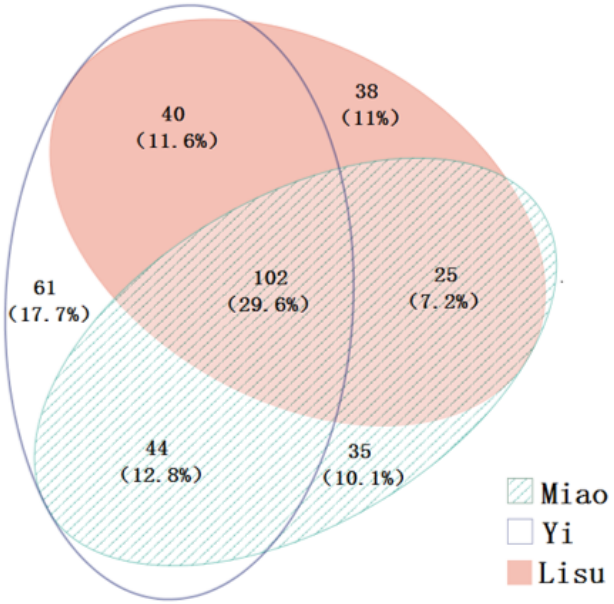

Figure 2

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

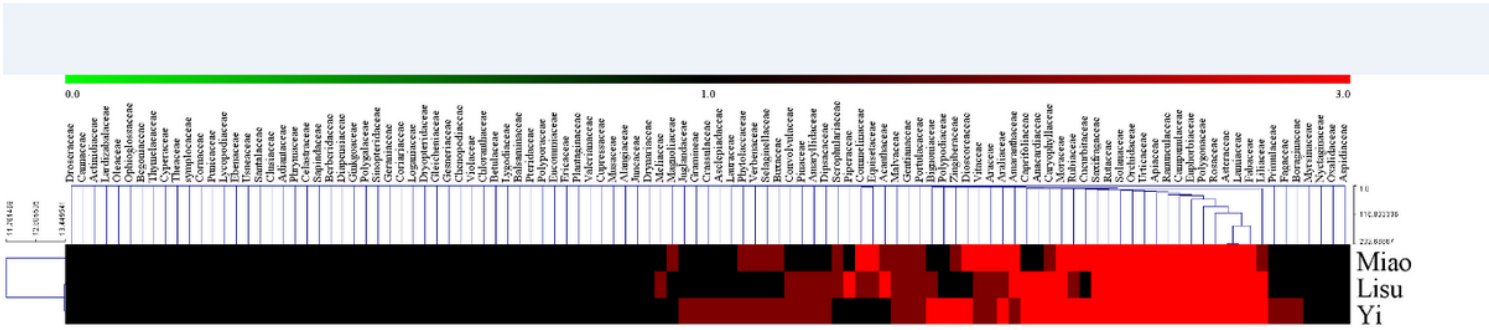

Figure 3

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.)

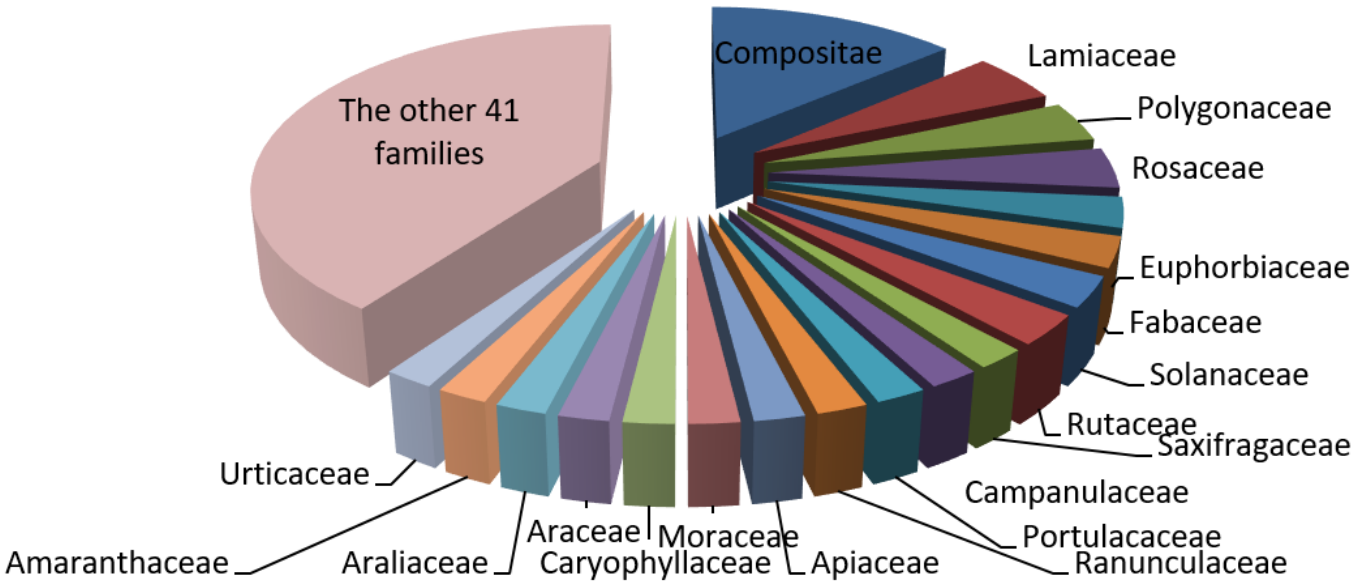

Figure 4

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

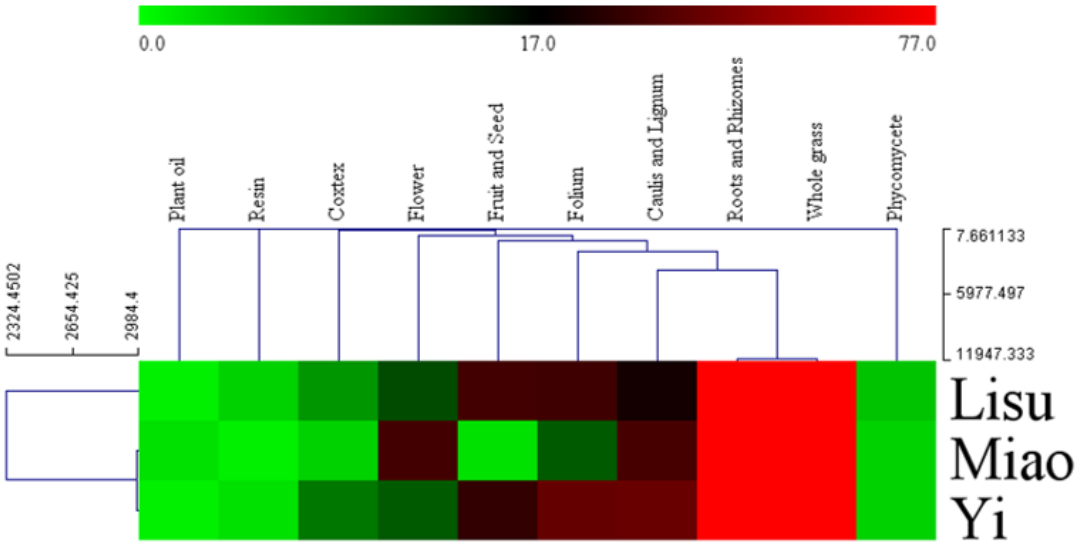

Figure 5

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.)

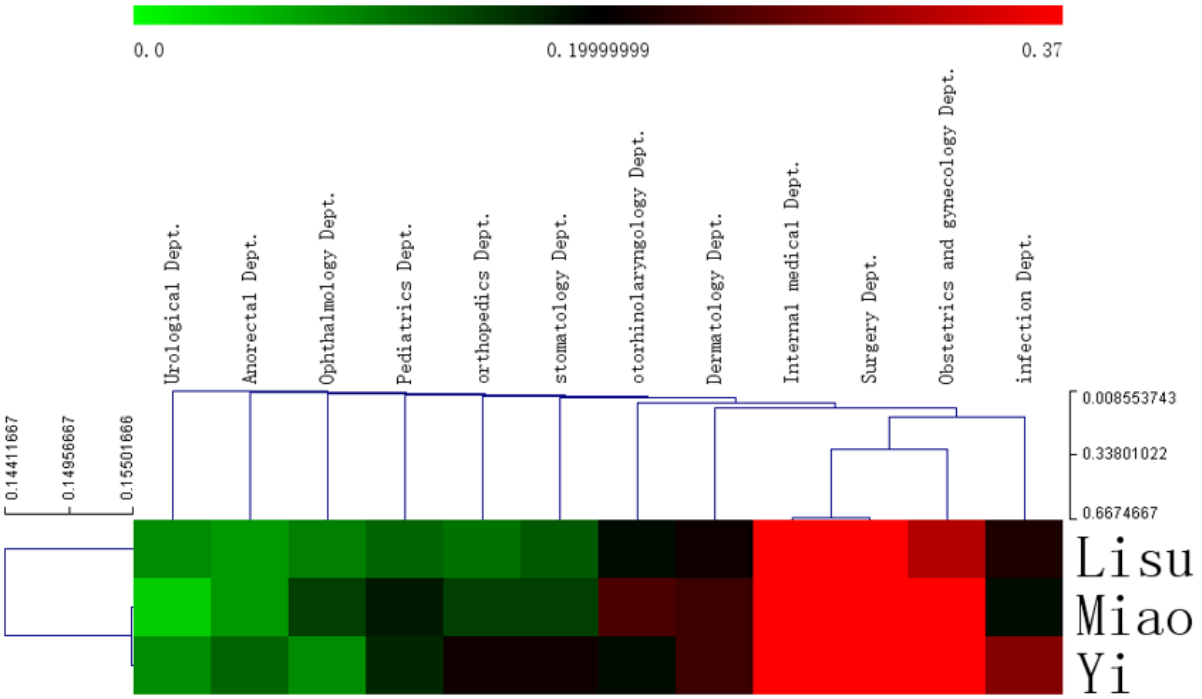

Figure 6

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)