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Original Article

Ethnobotanical investigation of medicinal plants used in Lingchuan county, Shanxi, China

Investigação etnobotânica de plantas medicinais usadas no condado de Lingchuan, Shanxi, China

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Abstract

Medicinal plants are the primary sources of healthcare among the people of developing countries in villages and local towns. Documenting and reporting the traditional knowledge of medicinal plants may contribute to pharmaceutical research development. For this reason, we present our findings on ethnomedicinal plants from Lingchuan County, Shanxi, China, an unexplored area rich in medicinal plant resources. Information of ethnomedicinal plants were collected through questionnaire/semi-structured interviews from 180 informants, including traditional healers. Field surveys were conducted in 53 villages of Lingchuan County from 2017 to 2018. Informed consent was obtained from each participant before conducting the interview process. Quantitative analysis was performed for each recorded species, such as Relative Frequency Citation (RFC), Use Value (UV), and Factor of Informant Consensus (F_{IC}). Diseases were categorized into twelve groups. A total 138 species of medicinal plants were recorded, belonging to 123 genera of 58 families. Asteraceae was the dominant plant family with 19 species, followed by Rosaceae and Fabaceae. Herbs were dominant among plant life-forms with 96 species, followed by shrubs and trees (15 species each). Roots were the most commonly used plant parts with 58 species, followed by whole plants and fruits (28 species each). Most plant species were reported non-toxic (84, 60%), followed by unknown toxicity (35, 25%), poisonous, and less toxic (19, 14%). Quantitative analysis revealed that *Forsythia suspensa* was with higher (0.33) RFC value, and *Scutellaria baicalensis* was recorded with a higher (0.91) UV. Treated diseases were categorized in 12 groups and evaluated by their F_{IC} value, in which gynecological diseases have higher (0.93) F_{IC} value followed by urinary system diseases. Most medicinal plants are used to clear away heat and relieve the surface. The present study revealed that local people of Lingchuan County confidently use ethnomedicinal plants for their healthcare needs. The higher indices value of a plant species resulted from quantitative analysis warrants further investigation, which may possess valuable phytochemical compounds that may result in new drugs for treating various human disorders.

Keywords: ethnobotany, Lingchuan county, medicinal plants, traditional knowledge, chinese medicine.

Resumo

As plantas medicinais são as principais fontes de cuidados de saúde entre as pessoas dos países em desenvolvimento, nas aldeias e cidades locais. É importante documentar e relatar o conhecimento tradicional de plantas medicinais, dado que pode contribuir para o desenvolvimento da pesquisa farmacêutica. Por esta razão, apresentamos neste estudo nossas descobertas sobre plantas etnomedicinais do condado de Lingchuan, Shanxi, China, uma área inexplorada e rica em recursos de plantas medicinais. As informações sobre as plantas etnomedicinais foram coletadas por meio de questionário/entrevista semiestruturada com 180 participantes, incluindo curandeiros. As pesquisas de campo foram realizadas em 53 aldeias do condado de Lingchuan, entre 2017 e 2018. O consentimento informado foi obtido de cada participante antes de conduzir o processo de entrevista. Foi realizada uma análise quantitativa de cada espécie registrada, através da Frequência Relativa de Citação (RFC), Valor de Uso (UV) e Fator de Consenso dos Informantes (FCI). As doenças foram categorizadas em doze grupos. Foram registradas 138 espécies de plantas medicinais, pertencentes a 123 gêneros de 58 famílias. Asteraceae foi a família de plantas dominante, totalizando 19 espécies, seguida pelas famílias Rosaceae e Fabaceae. As ervas foram consideradas como as principais formas de vida vegetal usadas, com 96 espécies, seguidas por arbustos e árvores (15 espécies cada). As raízes foram as partes de plantas mais utilizadas com 58 espécies, seguidas de plantas inteiras e frutos

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(28 espécies cada). A maioria das espécies relatadas foram estabelecidas como não tóxicas (84, 60%), seguida de plantas com toxicidade desconhecida (35, 25%), venenosas e menos tóxicas (19, 14%). A análise quantitativa revelou que a espécie Forsythia suspensa alcançou o maior (0,33) valor de RFC, e a Scutellaria baicalensis obteve o maior (0,91) valor de UV registrado. As doenças tratadas foram categorizadas em 12 grupos e avaliadas pelos seus respectivos valores de FCI, onde as doenças ginecológicas apresentaram maior (0,93) valor de FCI, seguido pelas doenças do sistema urinário. Foi concluído que a maioria das plantas medicinais são usadas para amenizar calores e alívio tópico. O presente estudo revelou que a população local do condado de Lingchuan confia no uso de plantas etnomedicinais para lidar com seus problemas de saúde. Seria válido aprofundar as investigações relativas aos índices mais altos obtidos nas análises quantitativas das espécies analisadas, visto que podem possuir compostos fitoquímicos valiosos que podem resultar em novos medicamentos para o tratamento de diversas doenças humanas.

Palavras-chave: etnobotânica, município de Lingchuan, plantas medicinais, conhecimento tradicional, medicina chinesa.

1. Introduction

The modern world with social development and economic growth faces unexpected disease challenges, where the people of developing countries are suffering a lot and looking for better and alternative disease management. Although modern synthetic drugs have solved some problems, but they are also challenging to develop due to the high cost of research in the development of new drugs and may have higher side effects (Miranda, 2021). Therefore, the alternative utilization of medicinal plants due to their low cost may increase and be favored by scientists for drug discovery due to its higher biofunctionality and biodiversity, and its use is promoted by local peoples (Kasilo et al., 2019). The traditionally used medicines have received widespread attention; at the same time, it has become a trend to discover new drugs from the folk and expand the resources of folk medicinal plants (Jamshidi-Kia et al., 2018; Urooj and Shad, 2021).

Globally, there has been an increase in the demand for plant-based products. More than 85% of the populations in North and Central America, the Middle East, Latin America, Asia, and Africa are dependent on traditional medicine, particularly herbal medicine, to treat their diseases. There are still approximately 100 million people in the European Union, and up to 90 percent of the population in some countries, rely on traditional, complementary, or herbal remedies. Herbal medicine is expected to grow as more plants are studied to find their usefulness in treating various diseases since there are about 500,000 plants in the world, many of which have not been thoroughly studied (Issa, 2018).

The loss of medicinal plants as a result of non-principled use poses a considerable challenge to the future of herbal medicine. The International Union for Conservation of Nature states that there are between 50,000 and 80,000 species of flowering plants used as pharmaceuticals around the world. Among these, approximately 15,000 species are at risk of extinction due to a combination of excessive harvesting, habitat destruction, and a growing human population consuming excessive plant resources. Therefore, in order to discover natural drugs, the environmental code of ethics should be considered, in which biodiversity is preserved as part of the exploitation of natural resources. Medicinal plant production should be conducted in accordance with Good Agricultural Practices (GAPs) for quality assurance, standardized production, and maintenance of safety. GAP refers to the systematic use of high quality, safe, non-contaminated (raw drugs) herbal remedies to resolve a range of ailments. GAP pertains to various areas, including environmental ecology, germplasm, production locations, cultivation, pesticide collection and analysis, microscopic and macroscopic validation, identification of active ingredients, and metal element testing. GAP is implemented and promoted by many countries. GAP, for instance, in China, has promoted the cultivation of traditional medicinal plants throughout the country (Jamshidi-Kia et al., 2018).

China is one of the countries with the richest medicinal plants in the world, with more than 12,000 kinds of medicinal plants (Chi et al., 2017; Ji et al., 2020). However, some medicinal plant resources have suffered in many remote areas of China as a result of various factors such as poverty and a large number of people moving to cities, as well as a lack of special records of traditional medicinal plant knowledge and the impact of the modern medical system and new medical culture (Chen et al., 2016). The knowledge of traditional medicinal plants may not be protected and passed on due to the continuous destruction and is rapidly disappearing. Therefore, the collection, arrangement, and inheritance of traditional folk knowledge of medicinal plants are very important (Li et al., 2019).

Medicinal plants utilization for health purpose is a common practices in the local towns of developing countries (Ghulam et al., 2021; Siddique et al., 2021). However, China has a vast territory and complex topography; therefore, a wide range and vast medicinal Flora and their mode of utilization may not be the same in each region. Traditional medicinal knowledge is closely related to local culture, history, economy, Flora, and natural conditions. In recent years, some researchers have conducted a certain degree of research on traditional medicinal knowledge in the northwest and southwest of China, and most of the research objects are ethnic minorities. In contrast, the central area (Shanxi) has not been well explored regarding traditional knowledge of medicinal plants (Sheng-Ji, 2011).

The importance of research in the field of medicinal plants is felt more than ever. Some medicinal plants are the sources of adjuvant therapy in the health systems worldwide, not only to treat diseases but also to prevent them and maintain health. Despite the extensive experiences in use of medicinal plants in traditional medicine, scientific study and identification of active plant compounds and their effects can lead to the discovery of new therapeutic benefits and the production of nature-

based products in the future. To achieve this purpose, extensive research is fundamentally important to control the quality of raw drugs and the formulation to justify their use in the modern medicine system; subsequently, animal studies and clinical trials are required to use the benefits of these plants (Tungmunnithum et al., 2018).

Lingchuan County is located in the Southeast of Shanxi Province and has a long history (Zhang and Ru, 2010). According to records, humans lived here as early as the Paleolithic era. Lingchuan County is the main producing area of Chinese medicinal materials in Shanxi Province and is rich in medicinal plant resources. More than 400 kinds of wild medicinal materials have provided a material basis for the formation of knowledge of Lingchuan traditional medicinal plants. In the process of production and life, local residents use plants in the surrounding environment to treat diseases and have accumulated a lot of knowledge and experience of medicinal plants. In addition, many villages in this area are located in remote mountainous areas, and modern medical conditions are poor, which to a large extent may not satisfy people's needs. Therefore, local barefoot doctors may convince them to collect medicinal plants and use them for basic health needs, so that traditional medical knowledge can be preserved, which has certain research values (Ru and Zhang, 1993).

Therefore, local inhabitants of Lingchuan county confidently practicing and promoting the traditional utilization of medicinal plants. Recording the traditional knowledge of medicinal plants by involving local inhabitants, including traditional healers, may contribute to the advancement of pharmaceutical research and may be helpful for applied research to screen out the proper plant species for target diseases. Thus, the main aim of this study was: (1) to record traditional ethnomedicinal plant knowledge from Lingchuan County, Shanxi Province (China), an unexplored area with lacks such documentation, (2) to compile data on traditional remedies for various ailments, including methods of medication, mode of preparation, and part(s) of the plant(s) employed, as well as their toxicity and applications, (3) To analyze ethnomedicinal data quantitatively to expose the most valued medicinal plants that could be used for further research regarding their phytochemical and pharmacological profiles. Variation in traditional knowledge of locals may influence the relative frequency citation and use-value of a plant species. Thus, the plant species with higher quantitative indices values may reflect the novel uses and warrant further clinical investigation. A preprint has previously been published (Jin et al., 2021), the current work is far superior to the preprint version.

2. Methodology

2.1. Study area

Lingchuan County is located in Jincheng City of Shanxi province, China, with a higher altitude in the southern section of Taihang Mountain (Figure 1). Lingchuan County has 12 towns and villages under its jurisdiction, with a

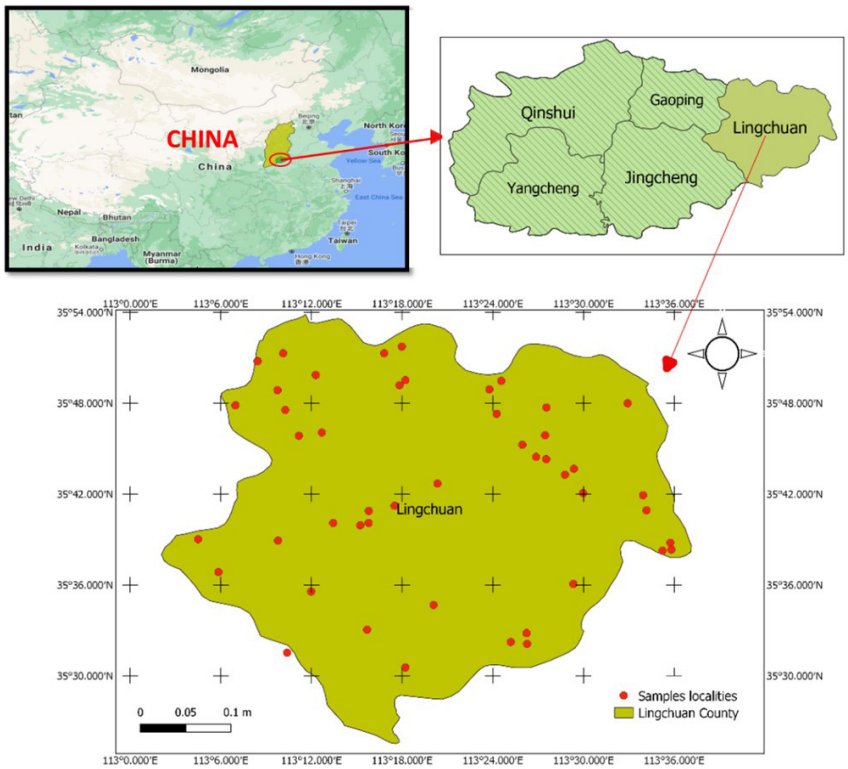

Figure 1. Map of the study area Lingchuan county, Shanxi, China.

population of more than 250,000, and the total area of the County is 1,751 square kilometers. The average elevation is about 1058 m, is a rocky, hilly area, and is mainly divided into three different terrain areas: the rocky mountainous area in the east, the rocky, hilly area in the middle, and the Pingchuan area in the southwest. The east and south have large elevation differences and steep terrain. The relative height difference is generally between 600 and 1000 m, high in the northeast and low in the southwest. The area has a continental monsoon climate with a cool climate and abundant rainfall. The annual average temperature is 7°C~9°C, and the annual precipitation is 700~1000 mm. The County has a frost-free period of 160 days throughout the year, and the average sunshine duration is 2380~2730 h (Wang et al., 2019). The forest coverage rate in Lingchuan County is 51.07%, and the timber stock volume is 1.48 million cubic meters. There are natural forests and artificial forests and unique tree species such as *Taxus Chinensis* (Zhang and Ru, 2010). The precise geographic position of visited localities are shown in supplementary Table S1.

2.2. Ethnobotanical field survey and data collection

Ethnomedicinal information about the use of plant species to treat various disorders in the study area was documented from 53 villages. This survey was carried out from November 2017 to August 2018. Semi-structured interviews and questionnaires were used to document ethnobotanical information with informed consent (Table S2), include field visits following standard protocols (Martin, 1995). Information regarding the plant local name, used part, used method, efficacy, etc. and ethnographical information of the total informants (180) such as age, gender, experience, and educational background was recorded (Table 1, Figure 2).

Table 1. Demographic categories of local respondents.

Variables	Demographic categories	Number of people	Percentage
Gender	Male	113	63
	Female	67	37
Education	Primary school	73	42
	Junior high school	39	22
	High school	6	3
	Technical secondary school	6	3
	Junior college	8	4
	Undergraduate	4	2
	Uneducated	44	24
Profession	Farmer	127	70
	Traditional healers	26	15
	Vendor	11	6
	Village cadre	10	6
	Forester	2	1
	Teacher	4	2
Age group	25-45	38	21
	46-60	47	26
	above 60	95	53

2.3. Plant species collection, identification and preservation

Specimens of plant species used to treat various disorders were collected, dried, preserved, and mounted on herbarium sheets following standard method (Jain, 1977). Subsequently, with the help of plant taxonomists at Changzhi University, the number of voucher specimen was assigned, determined and compared with the specimens in the herbarium of the school. The scientific names of medicinal plant species and their families were confirmed by the *Flora of China* (eFloras, 2013), and Medicinal Plant Names Services (Kew Science, 2022). The system proposed by Raunkiaer (1934), and modified by Brown (1977), was followed to categorize the collected plant specimens into their habits and life forms. The specimens are stored in the herbarium of the Faculty of Biological Science and Technology, Changzhi University, Shanxi, China.

2.4. Quantitative analysis of the ethnomedicinal information

2.4.1. Relative Frequency Citation (RFC)

The RFC was calculated without taking into account the use categories by following the formula (Tardío and Pardo-de-Santayana, 2008) (Equation 1).

$$RFC = FC / N (0 < FRC < 1) \quad (1)$$

RFC shows the importance of each species in the study area given by the FC (FC is the number of local informants who reported the uses of the species) divided by the total number of informants (N).

2.4.2. Use Value (UV) of plant species

Use value (UV) determines the relative importance of plant species uses. It was calculated using the following formula (Tardío and Pardo-de-Santayana, 2008) (Equation 2).

$$UV = UR / N \quad (2)$$

Where "UV" indicates the use-value of individual species for a given disease range from 0 to 1, "UR" is the number of uses for the particular disease of a given species by each informant, and "N" represents the number of informants who reports the given species.

2.4.3. Factor of Informant Consensus (F_{IC})

The diseases are categorized into various groups before the F_{IC} values are calculated (Heinrich et al., 1998; Trotter and Logan, 1986). The F_{IC} were calculated using the following mathematical equation (Equation 3).

Figure 2. Ethnomedicinal data (interviews) and plants collection.

$$F_{IC} = (Nur - Nt) / (Nur - 1) \quad (3)$$

Nur indicates the total number of citations for each disease category, and Nt is the number of plant species in the same disease category. The F_{IC} value range from 0 to 1. Higher F_{IC} values imply that many informants utilize a large group of limited plant species to treat a specific ailment, where the lower F_{IC} values are opposite.

2.4.4. Correlation analysis

Pearson's correlation, SPSS (ver. 16) tested correlation analysis between the RFC and UV

3. Results and Discussion

3.1. Medicinal plants survey and demographic profile of respondents

The present study reported the uses of 138 species of medicinal plants disseminated in 123 genera belonging to 53 families for the treatment of various types of diseases (Table 2). The degree of people's uses is related to the distribution of plants, so most of the plants used by local residents are plants that grow locally. A total of 180 informants were interviewed and categorized into different demographic categories (Table 1). The local informants were traditional healthcare practitioners, medicinal plant gatherers, farmers, foresters, teachers, village cadre, and housewives. It was noted that older people have a better grasp of traditional medicinal knowledge, while younger generations know less, this may be due to lifestyle changes promoting modern care system (Kadir et al., 2012). Locals also said that young people spend a long time working and studying in other places and have little demand for traditional medicinal plants. Therefore, fewer people know about traditional medicinal plants. The reason why men know more about medicinal knowledge may because they work more in the field compared to women and have more experience accumulated. Most of the residents are farmers with low education levels, mainly uneducated and elementary school. It also shows that lower educated people are dependent on traditional medicinal plants, while those with higher education levels are less dependent. Most young educated people believe in modern medical treatment (Fan et al., 2018).

3.2. Dominant medicinal plant families

Amongst the plant families, Asteraceae was the dominant with 19 plant species, followed by Rosaceae (10 spp.), Fabaceae (9 spp.), Lamiaceae (8 spp.), Apiaceae (5 spp.), Aristolochiaceae and Solanaceae (4 spp. each), Amaryllidaceae, Araceae, Aristolochiaceae, Brassicaceae, Campanulaceae, Caryophyllaceae, and Ranunculaceae (3 spp. each), and twelve plant families were recoded with two species each (Figure 3). The other remaining plant families were recorded with only one species each (Figure S1).

The recorded dominant plant families in the study area suggest that they may have wide distribution, or their plant species are well known for medicinal uses among the local communities. However, previous literature demonstrated that Asteraceae, Moraceae, Fabaceae and Lamiaceae are well known in traditional utilization amongst the people of China (Lin et al., 2021), and other parts of the Asia (Kumar et al., 2021; Siddique et al., 2021); this knowledge may be disseminated across the world over different communities and ethnic groups.

3.3. Medicinal plant life form and part(s) used

The recorded medicinal plants are categorized according to their life form (Figure 4A). Among them, herbs (96 spp.) were dominant, followed by shrubs (including subshrubs) and trees (15 spp. each), and vines with 12 species only. The domination of herbs in utilization over other life forms may not only their efficacy but may also because the density of the distribution of herbs is higher, the growth cycle is fast, and the yield is higher. They are determined by the characteristics of the collection (Jamshidi-Kia et al., 2018). Some of the medicinal plant materials collected by local inhabitants for medicinal purposes are shown in Figure 5.

The recorded medicinal plants in Lingchuan County are classified according to their parts utilization (Figure 4B). Among them, the most used parts were roots, with 58 species, accounting for 42%, followed by whole plant and fruit (28 spp., 20% each), flower (20 spp., 14.4%),

Table 2. Ethnomedicinal plants used for the management of diseases in Lingchuan county, Shanxi, China.

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
1	*Paris verticillata* M.Bieb. Melanthiaceae YZW0011	Peng lou	Herb	Rh	External application, With other medicines	Animal bites	Small poison	15	0.08	3	0.2
2	*Allium fistulosum* L. Amaryllidaceae YZW0023	Chong	Herb	Ro	DecoctionDecoction	Under fire, Cold, Abdominal pain	Non-toxic	20	0.11	5	0.25
3	*Aletris spicata* (Thunb.) Franch. Nartheciaceae YZW0016	Mai dong	Herb	Ro	DecoctionDecoction	Detoxification, Cough, Nourishing	Unknown	17	0.09	2	0.11
4	*Lilium brownii* var. viridulum Baker Liliaceae YZW0031	Hong dianhua	Herb	Bb	Edible	Cough, Nourishing	Non-toxic	16	0.08	3	0.18
5	*Asparagus cochinchinensis* (Lour.) Merr. Asparagaceae YZW0064	Tian mendong	Herb	Ro	DecoctionDecoction	Detoxification, Under fire, Cough	Non-toxic	10	0.05	2	0.2
6	*Allium ramosum* L. Amaryllidaceae YZW0139	Jiu cai	Herb	Fl	Edible	Nourishing	Unknown	10	0.05	2	0.2

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
7	*Polygonatum multiflorum* (L.) All. Asparagaceae YZW0145	Yu zhu	Herb	Ro	With other medicines	Nourishing	Unknown	8	0.04	2	0.25
8	*Allium macrostemon* Bunge Amaryllidaceae YZW0070	Xiao suan	Herb	Wh, Ro	Edible, External application	Skin diseases	Non-toxic	11	0.06	2	0.18
9	*Polygonatum sibiricum* Redouté Asparagaceae YZW0094	Ji tou shen	Herb	Ro	DecoctionDecoction, Edible	Nourishing	Non-toxic	13	0.07	2	0.15
10	*Platycladus orientalis* (L.) Franco Cupressaceae YZW0055	Bai shu	Tree	Se, St	DecoctionDecoction, External application	Gynecological diseases, Laxative, Skin diseases	Non-toxic	20	0.11	9	0.45
11	*Patrinia scabiosifolia* Link Caprifoliaceae YZW0137	Bai jiang	Herb	Wh	DecoctionDecoction	Cough, Detoxification, Cold	Non-toxic	25	0.13	3	0.12
12	*Plantago asiatica* L. Plantaginaceae YZW0019	Che erzi	Herb	Ro, L, Se, Wh	Soaking in water, Decoction	Diuretic, Under fire, Anti-inflammatory, Hemostasis, Cure diarrhea	Non-toxic	40	0.22	29	0.72

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
13	*Mentha canadensis* L. Lamiaceae YZW0052	Bo he	Herb	L, Ab	Soaking in water, Edible	Detoxification, Cold	Non-toxic	35	0.19	22	0.62
14	*Scutellaria baicalensis* Georgi Lamiaceae YZW0058	Huang qin	Herb	Ro, L	Soaking in water	Detoxification, Cold, Under fire, Anti-inflammatory, Tuberculosis	Unknown	45	0.25	41	0.91
15	*Agastache rugosa* (Fisch. & C.A.Mey.) Kuntze Lamiaceae YZW0061	Huo xiang	Herb	Ab	Decoction	Cold, Prevent heatstroke	Non-toxic	16	0.08	2	0.12
16	*Nepeta tenuifolia* Benth. Lamiaceae YZW0080	Jing jie	Herb	Ab, Ro, Wh, Fl	External application, Decoction, Edible	Animal bites, Detoxification, Cough, Cold, Gynecological diseases, Under fire, Hemostasis, Hypotensive	Unknown	50	0.27	37	0.74
17	*Salvia rosmarinus* Lamiaceae YZW0090	Xue shen	Herb	Ro, Wh	Soaking in water, Decoction, Sparkling wine, Edible	Nourishing, Hypotensive, under fire, Activating blood to remove blood stasis	Non-toxic	48	0.26	34	0.7
18	*Leonurus japonicus* Houtt. Lamiaceae YZW0043	Yi mucao	Herb	Wh,Ab	Decoction	Gynecological diseases, Treat hematuria, Diuretic	Non-toxic	18	0.1	5	0.27
19	*Perilla frutescens* (L.) Britton Lamiaceae YZW0047	Zi shu	Herb	Se, St, L	Decoction	Cold, Cough	Non-toxic	22	0.12	12	0.54

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
20	*Isodon rubescens* (Hemsl.) H.Hara Lamiaceae YZW0154	Dong lingcao	Herb	Wh	Soaking in water	Sore throat, Under fire	Unknown	15	0.08	2	0.13
21	*Stellera chamaejasme* L. Thymelaeaceae YZW0096	Lang du	Herb	Ro	Wash outside	Deworming, Skin diseases	Poisonous	21	0.11	3	0.14
22	*Lablab purpureus* subsp. purpureus Fabaceae YZW0103	Bian dou	Vine	Ro, Fr	Wash outside, Edible	Deworming, Prolactin	Non-toxic	19	0.1	2	0.1
23	*Glycyrrhiza uralensis* Fisch. ex DC. Fabaceae YZW0156	Gan cao	Herb	Ro	Soaking in water	Detoxification	Non-toxic	12	0.06	2	0.16
24	*Glycine max* (L.) Merr. Fabaceae YZW0159	Hei dou	Herb	Se	Decoction	Nourishing	Non-toxic	15	0.08	2	0.13
25	*Caragana rosea* Turcz. ex Maxim. Fabaceae YZW0066	Jin jier	Herb	Ro, Fl	With other medicines	Cough	Unknown	13	0.07	3	0.23

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
26	*Sophora flavescens* Aiton Fabaceae YZW0071	Ku ahen	Shrub	Ro	Wash outside, Decoction	Detoxification, Treat waist and leg pain, Reduce swelling, Activating blood to remove blood stasis, Skin diseases	Non-toxic	29	0.16	15	0.51
27	*Lespedeza bicolor* Turcz. Fabaceae YZW0131	Shan dougwn	Shrub	Ro	With other medicines	Detoxification	Non-toxic	17	0.09	2	0.11
28	*Styphnolobium japonicum* (L.) Schott Fabaceae YZW0148	Tu huai tiao	Tree	St	Wash outside, Decoction	Skin diseases	Non-toxic	25	0.13	3	0.12
29	*Robinia pseudoacacia* L. Fabaceae YZW0098	Yang huaishu	Tree	Fl	Edible	Treat hemorrhoids, Cure stool bleeding, Cold	Unknown	25	0.13	13	0.52
30	*Pteris cretica* L. Pteridaceae YZW0038	Ji zhuacao	Herb	Wh	With other medicines	Numbness	Unknown	20	0.11	2	0.1
31	*Imperata cylindrica* (L.) P.Beauv. Poaceae YZW0144	Bai maocao	Herb	Ro	Soaking in water	Detoxification, Stop nosebleeds	Unknown	18	0.1	2	0.11
32	*Taxus wallichiana* Zucc. Taxaceae YZW0152	Hong doushan	Tree	L	Decoction	Under fire	Unknown	23	0.12	3	0.13

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
33	*Juglans regia* L. Juglandaceae YZW0141	He tao	Tree	Fr	Edible, Decoction	Nourishing, Heart disease	Non-toxic	18	0.1	2	0.11
34	*Trichosanthes kirilowii* Maxim. Cucurbitaceae YZW0149	Gua lou	Vine	Ro, Fr, Se	Edible, Decoction	Detoxification, Laxative, Cough	Unknown	25	0.13	14	0.56
35	*Cucurbita moschata* Duchesne Cucurbitaceae YZW0054	Nan gua	Herb	Fr, Se	Edible	Deworming, Nourishing	Non-toxic	12	0.06	2	0.16
36	*Tribulus terrestris* L. Zygophyllaceae YZW0155	Ji li	Herb	Fr	Decoction	Headache, Eyesight, Vitiligo	Non-toxic	20	0.11	3	0.15
37	*Viola philippica* Cav. Violaceae YZW0051	Gong jihua	Herb	Ro	Soaking in water	Under fire, Anti-inflammatory, Skin diseases	Non-toxic	23	0.12	6	0.26
38	*Orostachys fimbriata* (Turcz.) A.Berger Crassulaceae YZW0127	wa wei	Herb	Wh	External application	Skin diseases, Insomnia	Unknown	19	0.1	3	0.15

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Table 2. Continued...

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39	*Hylotelephium erythrostictum* (Miq.) H.Ohba Crassulaceae YZW0133	wuducao	Herb	L	External application	Animal bites	Unknown	25	0.13	2	0.08
40	*Platycodon grandiflorus* (Jacq.) A.DC. Campanulaceae YZW0158	Bai yao	Herb	Ro	Decoction, Edible	Under fire, Anti-inflammatory, Cold, Cough, Sore throat	Small poison	30	0.16	25	0.83
41	*Codonopsis pilosula* (Franch.) Nannf. Campanulaceae YZW0173	Wu huashen	Herb	Ro, St	Decoction, Sparkling wine, Wash outside	Nourishing, Black hair	Unknown	50	0.27	40	0.8
42	*Adenophora remotiflora* (Siebold & Zucc.) Miq. Campanulaceae YZW0177	Ling danghua	Herb	Ro	Decoction	Nourishing, Cough, Reduce swelling	Non-toxic	25	0.13	10	0.4
43	*Bidens pilosa* L. Asteraceae YZW0147	gui ge zhen	Herb	Wh	Decoction	Appendicitis, Diuretic, Cold	Non-toxic	19	0.1	4	0.21
44	*Artemisia valandulifolia* DC.Asteraceae YZW0193	Ye aihao	Herb	Wh, L, Ab	Cupping, External application, Wash outside, Decoction, Soaking in water	Joint pain, Headache	Non-toxic	27	0.15	16	0.59

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Table 2. Continued...

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45	*Chrysanthemum morifolium* (Ramat.) Hemsl. Asteraceae YZW0187	Bai juhua	Herb	Fl	Soaking in water	Eyesight, Headache, Detoxification	Non-toxic	20	0.11	5	0.25
46	*Xanthium strumarium* Asteraceae YZW0182	Chang er	Herb	Fr	Decoction	Sinusitis, Cold	Small poison	25	0.13	9	0.36
47	*Atractylodes lancea* (Thunb.) DC. Asteraceae YZW0168	Chang zhu	Herb	Ro	Decoction	Headache, Diuretic	Non-toxic	36	0.2	28	0.77
48	*Cirsium arvense* (L.) Scop. Asteraceae YZW0162	Ci ercai	Herb	Ab	External application, Decoction	Traumatic bleeding, Stomach ulcer, Cure diarrhea, Skin diseases	Non-toxic	30	0.16	13	0.43
49	*Cirsium japonicum* DC. Asteraceae YZW0153	Da cijiao	Herb	Ab, Ro, L, Wh	External application	Traumatic bleeding, Detoxification, Under fire, Reduce swelling, Hemostasis, Diuretic	Non-toxic	25	0.13	7	0.28
50	*Carthamus tinctorius* L. Asteraceae YZW0054	Hong hua	Herb	Fl	Soaking in water	Hypotensive, Gynecological diseases, Treat waist and leg pain	Non-toxic	28	0.15	7	0.25

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Table 2. Continued...

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51	*Artemisia scoparia* Waldst. & Kit. Asteraceae YZW0146	Huang hao	Herb	Ro, Fr	Edible, Decoction	Nourishing	Unknown	16	0.08	2	0.12
52	*Artemisia capillaris* Thunb. Asteraceae YZW0060	Huang huamiao	Herb	Wh,Ab	Decoction, Edible	Liver disease, Detoxification, Scars	Non-toxic	18	0.1	5	0.27
53	*Ixeris polycephala* Cass. Asteraceae YZW0069	Ku maicai	Herb	Ab	Edible	Under fire, Cold	Non-toxic	15	0.08	2	0.13
54	*Tussilago farfara* L. Asteraceae YZW0067	Kuai donghua	Herb	Fl	Decoction	Cough, Anti-inflammatory	Non-toxic	25	0.13	6	0.24
55	*Leuzea uniflora* (L.) Holub Asteraceae YZW0062	Lou lu	Herb	Ro	Decoction	Bone and tendon	Non-toxic	20	0.11	2	0.1
56	*Artemisia verlotiorum* Lamotte Asteraceae YZW0136	Nan aihao	Herb	Wh	Decoction	Burn	Unknown	20	0.11	2	0.1

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57	*Taraxacum mongolicum* Hand.-Mazz. Asteraceae YZW0074	Bu buying	Herb	Wh, L	Edible, Soaking in water, Decoction	Anti-inflammatory, Detoxification, Under fire, Cold, Breast pain	Non-toxic	45	0.25	37	0.82
58	*Sonchus wightianus* DC.Asteraceae YZW0095	Qu qucai	Herb	Ab, Wh	External application, Edible	Traumatic bleeding, Anti-inflammatory, Appendicitis, Hypotensive, Activating blood to remove blood stasis	Non-toxic	23	0.12	12	0.52
59	*Inula japonica* Thunb. Asteraceae YZW0210	Xuan fuhua	Herb	Fl	Decoction	Cough	Unknown	15	0.08	2	0.13
60	*Arctium lappa* L. Asteraceae YZW0181	You bangzi	Herb	Se	Edible, Decoction	Sore throat, Under fire, Detoxification, Skin diseases	Non-toxic	25	0.13	19	0.76
61	*Chrysanthemum indicum* L. Asteraceae YZW0195	Ye juhua	Herb	Fl	Wash outside, Soaking in water	Foot pain, Cold	Small poison	20	0.11	2	0.1
62	*Selaginella tamariscina* (P.Beauv.) Spring Selaginellaceae YZW0076	Juan bai	Herb	Wh	Decoction	Activating blood to remove blood stasis	Unknown	20	0.11	2	0.1

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Table 2. Continued...

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63	*Ailanthus altissima* (Mill.) Swingle Simaroubaceae YZW0129	Chun shu	Tree	Ro, St	Decoction, Edible	Activating blood to remove blood stasis,Sore throat	Unknown	13	0.07	2	0.15
64	*Gastrodia elata* Blume Orchidaceae YZW0097	Tian ma	Herb	St, Ro	Decoction	Anti-inflammatory, Diuretic	Unknown	20	0.11	3	0.15
65	*Bassia scoparia* (L.) A.J.Scott Amaranthaceae YZW0093	Sao zhoumiao	Herb	Fr, Wh	Edible, Decoction	Diuretic, Skin diseases	Non-toxic	19	0.1	8	0.42
66	*Dysphania ambrosioides* (L.) Mosyakin & Clemants Amaranthaceae YZW0024	Hui huicai	Herb	L, Fr	Edible	Detoxification, Liver disease	Poisonous	18	0.1	2	0.11
67	*Toona sinensis* (Juss.) M.Roem. Meliaceae YZW0082	Xiang cun	Tree	L	Edible	Digestion, Detoxification	Unknown	20	0.11	2	0.1
68	*Polygonum aviculare* L. Polygonaceae YZW0160	Bian xu	Herb	Wh, Fl	Soaking in water	Eyesight, Digestion, Cough, Gynecological diseases	Unknown	17	0.094	4	0.23

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Table 2. Continued...

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69	*Fallopia multiflora* (Thunb.) Harald. Polygonaceae YZW0169	He shouwu	Vine	Ro, St	Wash outside, Decoction	Black hair, Fixed tooth, Cough, Laxative, Nourishing, Lower blood lipids, Insomnia	Non-toxic	25	0.13	19	0.76
70	*Cyrtomium fortunei* J.Sm. Polypodiaceae YZW0171	Guan zhong	Herb	Ro	Soak directly into the water tank	Cold, Plague prevention, Detoxification	Non-toxic	12	0.06	3	0.25
71	*Vincetoxicum auriculatum* (Royle ex Wight) Kuntze Apocynaceae YZW0178	Lao wabutirang	Shrub	Lx	Drip on the wart	Skin diseases	Unknown	18	0.1	2	0.11
72	*Periploca sepium* Bunge Apocynaceae YZW0089	Yang getaoye	Shrub	Ro, L	Edible, Decoction	Skin diseases	Unknown	18	0.1	2	0.11
73	*Ephedra sinica* Stapf Ephedraceae YZW0143	Ma huang	Shrub	St	Decoction	Cold	Non-toxic	15	0.083	2	0.13
74	*Portulaca oleracea* L. Portulacaceae YZW0092	Wu Rocao	Herb	Ab	External application, Edible	Skin diseases, Reduce swelling, Anti-inflammatory, Hypotensive, Abdominal pain	Non-toxic	25	0.13	7	0.28
75	*Aristolochia clematitis* L. Aristolochiaceae YZW0206	Mu tong	Vine	Ro	Decoction	Laxative, Diuretic, Detoxification	Unknown	23	0.12	3	0.13

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Table 2. Continued...

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76	*Asarum sieboldii* Miq. Aristolochiaceae YZW0157		Herb	Ro	Decoction, With other medicines	Joint pain	Small poison	19	0.1	3	0.15
77	*Aristolochia contorta* Bunge Aristolochiaceae YZW0028		Vine	Fr	Soaking in water	Tuberculosis, Abdominal pain	Non-toxic	25	0.13	4	0.16
78	*Aconitum carmichaeli* Debeaux Ranunculaceae YZW0163	Cao wu	Herb	Ro	Decoction	Heart disease, Tuberculosis	Poisonous	13	0.07	2	0.15
79	*Pulsatilla chinensis* (Bunge) Regel Ranunculaceae YZW0138	Bai touweng	Herb	Ro	With other medicines	Cure diarrhea, Sore throat	Non-toxic	30	0.16	5	0.16
80	*Coptis chinensis* Franch. Ranunculaceae YZW0086	Huang lian	Herb	Ro	Soaking in water	Under fire, Reduce swelling	Non-toxic	28	0.15	5	0.17
81	*Paeonia suffruticosa* Andrews Paeoniaceae YZW0083	Mu dan	Shrub	Ro	Decoction	Nourishing	Unknown	18	0.1	2	0.11

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82	*Schisandra chinensis* (Turcz.) Baill. Schisandraceae YZW0166	Wu weizi	Vine	Fr	Edible, Decoction	Cough, Nourishing, Under fire	Non-toxic	26	0.14	12	0.46
83	*Forsythia suspensa* (Thunb.) Vahl Oleaceae YZW0123	Qing qiao	Shrub	Fr, Fl	Soaking in water	Detoxification, Cold, Under fire	Non-toxic	60	0.33	39	0.65
84	*Pueraria montana* var. lobata (Willd.) Maesen & S.M.Almeida ex Sanjappa & Predeep Fabaceae YZW0077	Gi gen	Vine	Ro	Edible, Soaking in water	Eyesight, Ear disease	Non-toxic	22	0.12	2	0.09
85	*Cotinus coggygria* Scop. Anacardiaceae YZW0102	Huang lu	Shrub	St	Grinding fine water suit	Skin diseases	Non-toxic	22	0.12	2	0.09
86	*Rubia cordifolia* L. Rubiaceae YZW0196		Herb	Ro	Sparkling wine, Decoction	Traumatic bleeding, Skin diseases, Hemostasis, Joint pain	Non-toxic	18	0.1	3	0.16
87	*Agrimonia pilosa* Ledeb. Rosaceae YZW0189	Xian hecao	Herb	L, Fl, Ro	With other medicines	Hemostasis, Deworming	Non-toxic	18	0.1	4	0.22

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Table 2. Continued...

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88	*Prunus persica* (L.) Batsch Rosaceae YZW0225	Tao	Tree	Fr	Decoction, Edible	Cold, Activating blood to remove blood stasis, Headache, Insomnia	Poisonous	32	0.17	14	0.43
89	*Potentilla discolor* Bunge Rosaceae YZW0151	Fan baicao	Herb	Wh	External application	Traumatic bleeding	Non-toxic	22	0.12	2	0.09
90	*Dasiphora glabra* (G.Lodd.) Soják Rosaceae YZW0044	Guan yincha	Shrub	Ab	Soaking in water	Detoxification	Unknown	20	0.11	2	0.1
91	*Akebia trifoliata* (Thunb.) Koidz. Lardizabalaceae YZW0142	Mu gua	Shrub	Fr	Edible	Edema	Non-toxic	18	0.1	2	0.11
92	*Prunus davidiana* (Carrière) Franch. Rosaceae YZW0056	Qi tao	Tree	Se	Decoction, Edible	Headache, Activating blood to remove blood stasis, Detoxification	Unknown	23	0.12	4	0.17
93	*Crataegus pinnatifida Bge.* Rosaceae YZW0216	Hong guo	Tree	Fr	Decoction, Edible, Soaking in water	Nourishing, Digestion, Lower blood lipids	Non-toxic	25	0.13	13	0.52
94	*Rosa xanthina* Rosaceae YZW0072	Xiang lihua	Shrub	Fl	Soaking in water	Detoxification, Under fire, Reduce swelling,	Unknown	10	0.05	2	0.2

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95	*Potentilla indica* (Andrews) Th.Wolf Rosaceae YZW0046	Jia caomei	Herb	St, L	Decoction	Detoxification	Poisonous	18	0.1	2	0.11
96	*Prunus armeniaca* L. Rosaceae YZW0048	Heng	Tree	Se	Edible, Decoction	Detoxification, Cough, Activating blood to remove blood stasis	Small poison	18	0.1	2	0.11
97	*Datura stramonium* L. Solanaceae YZW0084	Mai tuoluo	Herb	Lx	Put the juice on the towel and apply externally	Anesthesia	Poisonous	15	0.08	2	0.13
98	*Alkekengi officinarum* Moench Solanaceae YZW0164	Hong denglong	Herb	Fr	Soaking in water, Edible, Decoction	Hemostasis, Cough, Detoxification, Reduce swelling	Non-toxic	12	0.06	2	0.16
99	*Lycium chinense* Mill. Solanaceae YZW0079	Di gu pi	shrubs	Ro, Fr	Soaking in water, Sparkling wine, Edible, Decoction	Bone and tendon, Nourishing, Eyesight, Under fire,	Non-toxic	25	0.13	14	0.56
100	*Solanum melongena* L. Solanaceae YZW0073	Qie	Herb	Fr	Decoction	Cough	Non-toxic	11	0.06	2	0.18

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101	*Lonicera japonica* Thunb. Caprifoliaceae YZW0045	Yin yanghua	Vine	Fl	Soaking in water, Decoction	Detoxification	Non-toxic	10	0.05	2	0.2
102	*Saposhnikovia divaricata* Apiaceae YZW0161	Pang feng	Herb	Ro	Decoction	Cold, Headache	Non-toxic	29	0.16	20	0.68
103	*Kitagawia praeruptora* (Dunn) Pimenov Apiaceae YZW0134	Qian hu	Herb	Ro	Decoction, Soaking in water, External application	Cough, Cold, Reduce swelling, Anti-inflammatory, Asthma	Non-toxic	35	0.19	17	0.48
104	*Cnidium monnieri* (L.) Cusson Apiaceae YZW0057	She chuangzi	Herb	Fr	With other medicines	Skin diseases	Non-toxic	12	0.06	2	0.16
105	*Bupleurum chinense* DC. Apiaceae YZW0063	Chai hu	Herb	Ro	Soaking in water, Decoction, Edible	Cold, Detoxification, Digestion	Non-toxic	36	0.2	27	0.75
106	*Humulus scandens* (Lour.) Merr. Cannabaceae YZW0018	La lateng	Vine	Wh	Soaking in water	Treat hemorrhoids	Non-toxic	11	0.06	2	0.181
107	*Cannabis sativa* L. Cannabaceae YZW0065	Ma zi	Herb	Se	External application, Decoction	Laxative	Poisonous	13	0.07	2	0.15

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Table 2. Continued...

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108	*Morus alba* L. Moraceae YZW0068	Sang baipi	Shrub	Ro, St, Fr, L	Soaking in water, Sparkling wine, Decoction	Cough, Asthma, Under fire, Detoxification, Diuretic, Laxative	Non-toxic	30	0.16	21	0.7
109	*Sinapis alba* L. Brassicaceae YZW0105	Bai jiezi	Herb	Fr	Edible	Cough	Non-toxic	15	0.08	2	0.13
110	*Isatis tinctoria* L. Brassicaceae YZW0075	Bai lanRo	Herb	Wh, Ro, Fl	Decoction	Cold, Detoxification	Non-toxic	22	0.12	7	0.31
111	*Raphanus raphanistrum* subsp. sativus (L.) Domin Brassicaceae YZW0117	Bai luobo	Herb	Ro, Fr	Edible, Decoction	Cure diarrhea, Cold	Non-toxic	20	0.11	4	0.2
112	*Punica granatum* L. Lythraceae YZW0191	Shi liupi	Tree	Fr	Edible, Soaking in water	Cure diarrhea, Nocturnal emission	Non-toxic	9	0.05	2	0.22
113	*Vaccaria hispanica* (Miller) Rauschert Caryophyllaceae YZW0207	Wang buliuxing	Herb	Se	With other medicines	Prolactin	Non-toxic	11	0.06	2	0.18
114	*Dianthus chinensis* L. Caryophyllaceae YZW0176	Shi zhu	Herb	Fl	Decoction	Detoxification	Non-toxic	8	0.04	2	0.25

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115	*Dianthus superbus* L. Caryophyllaceae YZW0183	Qu mai	Herb	Wh	Decoction	Diuretic	Non-toxic	10	0.05	2	0.2
116	*Diospyros kaki* L.f. Ebenaceae YZW0041	Shi	Tree	Fr	Decoction	Hiccup	Non-toxic	13	0.07	2	0.15
117	*Ziziphus jujuba* Mill. Rhamnaceae YZW0037	Suai zao	Shrub	Fr, Ro	Edible, Soaking in water, Decoction	Insomnia	Non-toxic	22	0.12	6	0.27
118	*Dioscorea nipponica* Makino Dioscoreaceae YZW0184	Chuan dilong	Vine	Ro, Fr	Edible	Nourishing	Unknown	22	0.12	5	0.22
119	*Dioscorea esculenta* (Lour.) Burkill Dioscoreaceae YZW0124	Hong shu	Vine	Ro, L	Edible	Nourishing, Hypotensive	Non-toxic	10	0.05	2	0.2
120	*Pinus tabuliformis* Carrière Pinaceae YZW0006	Xiong xu	Tree	Fl, Fr	Apply oil from the stick stove, Soaking in water	Skin diseases, Lower blood lipids, Insomnia, Nourishing, Bone and tendon	Non-toxic	25	0.13	7	0.28
121	*Sauromatum giganteum* (Engl.) Cusimano & Hett. Araceae YZW0198	Bai fu zi	Herb	Ro	Decoction	Skin diseases	Unknown	10	0.05	2	0.2

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122	*Daucus carota* Apiaceae YZW0125	Bai xia	Herb	Ro	Decoction	Cough	Poisonous	30	0.16	7	0.23
123	*Typha orientalis* C.Presl Typhaceae YZW0205	Mao la	Herb	Fl	External application	Traumatic bleeding	Non-toxic	22	0.12	4	0.18
124	*Arisaema erubescens* (Wall.) Schott Araceae YZW0188	Tian nanxing	Herb	Ro	With other medicines	Reduce swelling	Non-toxic	10	0.05	2	0.2
125	*Pinellia ternata* (Thunb.) Makino Araceae YZW0199	Xiao baixia	Herb	Wh	With other medicines	Mouth ulcers	Poisonous	12	0.06	2	0.16
126	*Phryma leptostachya* L. Phrymaceae YZW0165	Tou gucao	Herb	L, Wh, Ro	External application, Wash outside, Decoction	Reduce swelling, Bruises, Numbness, Activating blood to remove blood stasis, Anti-inflammatory, Stop nosebleeds	Poisonous	29	0.16	13	0.44
127	*Opuntia dillenii* (Ker Gawl.) Haw. Cactaceae YZW0081	Xian renzhang	Shrub	L	External application	Reduce swelling, Skin diseases	Non-toxic	10	0.05	2	0.2
128	*Berberis amurensis* Rupr. Berberidaceae YZW0104	Shi dagonglao	Shrub	Fl	With other medicines	Detoxification, Under fire	Unknown	11	0.06	2	0.18

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Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
129	*Epimedium brevicornu* Maxim. Berberidaceae YZW0035	Yin yanghuo	Herb	Wh	Decoction	Nourishin, Abdominal pain	Non-toxic	20	0.11	4	0.2
130	*Ipomoea purpurea* (L.) Roth Convolvulaceae YZW0078	Hei baichou	Herb	Se	Decoction	Digestion, Diuretic	Poisonous	25	0.13	11	0.44
131	*Cuscuta chinensis* Lam. Convolvulaceae YZW0174	Fen tiao	Herb	Se	Decoction	Nourishing	Non-toxic	17	0.09	2	0.11
132	*Ginkgo biloba* L. Ginkgoaceae YZW0203	Bai guo	Herb	Fr	Edible	Cough	Poisonous	15	0.08	2	0.13
133	*Corydalis repens* Mandl & Muhldorf Papaveraceae YZW0179	Yan husuo	Herb	Ro	With other medicines	Activating blood to remove blood stasis, Bruises	Unknown	18	0.1	2	0.11
134	*Zea mays* L. Poaceae YZW0192	Yu mi xu	Herb	Fl	Decoction	Diuretic	Non-toxic	12	0.06	2	0.16
135	*Iris domestica* (L.) Goldblatt & Mabb. Iridaceae YZW0185	She gan	Herb	Wh	Decoction	Headache, Under fire, Detoxification	Poisonous	16	0.08	2	0.12

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

Table 2. Continued...

S.no	Taxonomic name, Family, Voucher No.	Local name	Life form	parts used	Mode of utilisation	Types of diseases	Toxicity	Quantitative Indices			
								FC	RFC	UR	UV
136	*Polygala tenuifolia* Willd. Polygalaceae YZW0172	Yuan zhi	Herb	Ro	With other medicines, Decoction	Insomnia, Under fire, Anti-inflammatory	Non-toxic	22	0.12	11	0.5
137	*Zanthoxylum bungeanum* Maxim. Rutaceae YZW0175	Hua jiao	Tree	Fr, L	Wash outside	Reduce swelling, Cure diarrhea	Non-toxic	17	0.09	3	0.17
138	*Hemionitis michelii* (Christ) Christenh. Pteridaceae YZW0186	Qu feng cao	Herb	Wh	Wash outside	Gynecological diseases, Pediatric shock	Unknown	25	0.13	7	0.28

Ro=root, Rh= rhizome, Bb= bulb, Fl=flower, Wh=whole, Se=seed, St=stem, L=leaf, Ab=abower ground, Fr=fruit, Lx=latex.

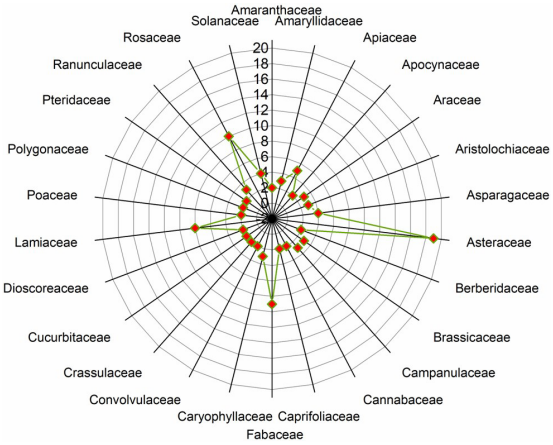

Figure 3. Dominant plant families of the study area.

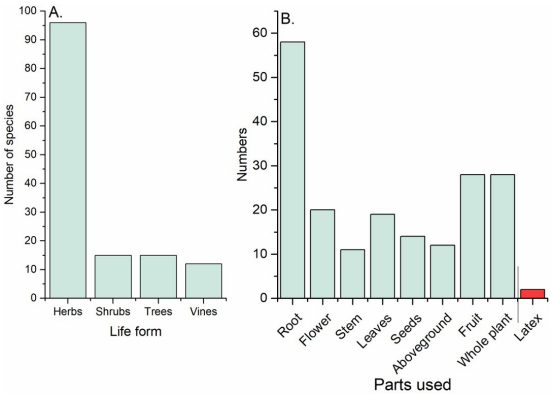

Figure 4. Description of medicinal plants (A) life form (B) parts used.

Figure 5. Collection of plant materials by local inhabitants for medicinal purposes.

leaves (19 spp., 13.7%), seeds (14 spp., 10%), above ground (12 spp., 8.6%), stem (11 spp., 8%), as well latex (2 spp. 1.4%). The same plant species have different medicinal parts, and its medicinal effects vary. For example, the multiple parts of *Trichosanthes kirilowii* can be used for multiple purposes. Root can be used to clear away heat and detoxify, fruit as laxative, and the seeds can be used for the treatment of coughs. The same part of the plant collected at different times has different efficacy. For example, *Artemisia capillaris* collected in March can be used to treat liver disease, but locals reported that it is not effective at other times. People need to distinguish correctly when using medicinal plants.

Locals utilized more perennial herbs compared to any other life form of plants, and roots were widely used as medicinal materials. It may be because the roots can be collected in all seasons and are easier to preserve compared to other parts. At the same time, plants co-exist with a variety of microorganisms in the soil, and the secondary metabolites of microorganisms may have important medicinal effects compared to the aboveground parts (WHO, 2018). It has certain timeliness and is not easy to collect and store. Therefore, in order to obtain medicines in time, people are looking for more plant roots with medicinal value as medicine.

3.4. Mode of utilizations of folk traditional medicinal plants

Locals used different mode of utilization of different plant parts, among them decoction (77, 38%) was dominant, followed by edible (taking orally) (43, 20.68%) soaking in water (31, 15.20%), external application (17, 8.37%), kinds of plant parts with other medicine (15 7.38%), wash outside plants (11, 5.4%), sparking wine (5, 2.46%), and the other used method such as cupping with six times for different plant parts account for 3% of the total (Figure 6).

The use of medicinal plants is closely related to the type of disease. For example, the common method of medicinal plants used to treat colds, coughs, and other diseases is to boil in water (decoction). Previous studies found that decoction is a common and dominant method used in ethnomedicinal recipes (Shoaib et al., 2021; Siddique et al., 2021). Decoction may be commonly used due to the higher availability of bioactive compound

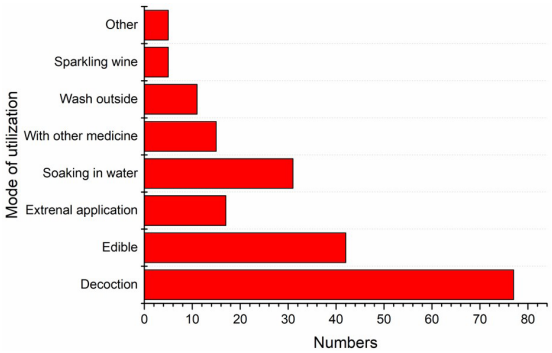

Figure 6. Mode of the utilization of medicinal plants.

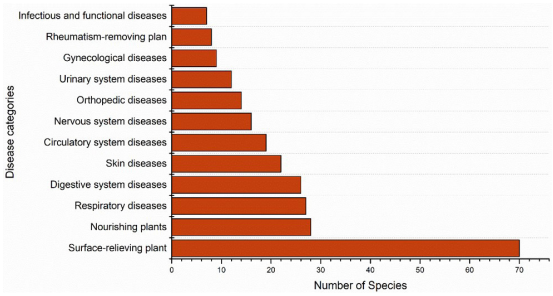

Figure 7. Major disease categories treated by a number of remedies.

resulted from heating process which speed up biological reaction (Chen et al., 2008; Han et al., 2007; Zhang et al., 2005), or because they're so easy to make with water. External application and external washing are usually practiced to treat traumatic bleeding, skin diseases, and several other diseases. Edible wild fresh medicinal plants are usually boiled in water before eating, is effective against detoxifying, and nourishing (Guarrera, 2003). Plant parts boiling in water can decompose some toxic substances in the plant and also dissolve some fibers, making the plant softer when eating. People may choose the most effective method of use according to the severity of the disease and other symptoms.

3.5. Disease categories treated by folk medicinal plants

According to the efficacy and applicable diseases of medicinal plants, the recorded medicinal plants in Lingchuan County are divided into 12 categories (Figure 7). I) Most plants were utilized as surface-relieving plants recorded with 70 species, generally used for the effect of clearing away heat, detoxifying, reducing heat, reducing inflammation, and reducing swelling. Common plants used to treat these diseases include *Scutellaria baicalensis*, *Nepeta tenuifolia,* and *Xanthium strumarium* L., etc. II) twenty-eight plant species were used as nourishing plants, which have nourishing and diseases preventing properties. They are used to improve eyesight, black hair, fix teeth, prevent heatstroke, etc. Common plants include *Fallopia multiflora*, *Lycium barbarum*, and *Epimedium brevicornu,* etc. III) Twenty-seven kinds of plants were utilized for the management of respiratory disease, mainly for coughs, including tuberculosis, asthma, qi inversion, and other diseases. Common treatment plants include *Allium fistulosum*, *Nepeta tenuifolia,* and *Platycodon grandiflorus*, etc. IV) Twenty-six plant species were utilized to treat digestive system diseases, mainly used for gastritis, appendicitis, constipation, hemorrhoids, and gastrointestinal bleeding with common plants including *Plantago asiatica*, *Morus alba*, *Bupleurum chinense.* V) Twenty-two kinds of plants were employed for skin diseases, generally used for burns, vitiligo, acne, and other diseases with common plants, including *Sophora flavescens*, *Styphnolobium japonicum*, *Stellera chamaejasme,* and so on. VI) Nineteen plants were utilized for circulatory system diseases; these plants promote blood circulation and remove blood stasis. They are used for high blood pressure, hyperlipidemia, heart disease, etc. Common therapeutic plants include *Sonchus wightianus*, *Carthamus tinctorius*, *Fallopia multiflora,*, and so on. VII) Sixteen plant species were used for the treatment of nervous system diseases. They are used to treat numbness, insomnia, headaches, convulsions in children, etc. Common therapeutic plants are *Prunus persica*, *Pinus tabuliformis*, and *Polygala tenuifolia* Willd. etc. VIII) Fourteen plant species were used to treat orthopedic diseases, which have the effect of connecting bones and tendons. They are used to treat traumatic bleeding, animal bites, bruises, and other diseases. Common therapeutic plants include *Potentilla discolor*, *Acorus calamus*, and *Rubia cordifolia*, etc. IX) Twelve plant species used to treat urinary system diseases, commonly for the treatment of blood in urine, stones (diuresis), etc. Common treatment plants include *Plantago asiatica*, *Leonurus japonicus*, and *Bidens pilosa,* etc. X) Nine plant species used to treat gynecological diseases (lactation, breast pain, etc). Common therapeutic plants are *Leonurus japonicus, Taraxacum mongolicum, Vaccaria hispanica*, etc. XI) Eight plant species were used as rheumatism-removing plants; it has the effects of reducing edema, relieving pain and anesthesia. It is used to treat low back and leg pain, foot pain, joint pain, and other diseases. Common therapeutic plants include *Rubia cordifolia, Sophora flavescens*, and *Carthamus tinctorius*, etc. XII) Seven plant species used to treat infectious and functional diseases, which have insecticidal, anthelmintic, and antiviral effects. They are used to treat liver diseases, parasitic diseases, and spermatorrhea. Common therapeutic plants include *Cucurbita moschata, Artemisia valandulifolia, Punica granatum*, etc.

3.6. Toxicity of medicinal plants

According to the toxicity level of plants, plants are divided into four types: non-toxic, unknown, small-toxic, and toxic (Figure 8). The non-toxic plants are the most, with 84 species, accounting for 61% of the total recorded plant species, followed by unknown toxicity (35 spp., 25%), poisonous plants (13 spp., 10%), and less poisonous plants (6 spp., 4%). These findings demonstrated that people care about mainly using non-toxic plants. However, for some toxic drugs, people use them for external washing to treat skin diseases or for sale, and there are strict conditions when they are taken internally (George, 2011). It shows that people are very cautious about medication.

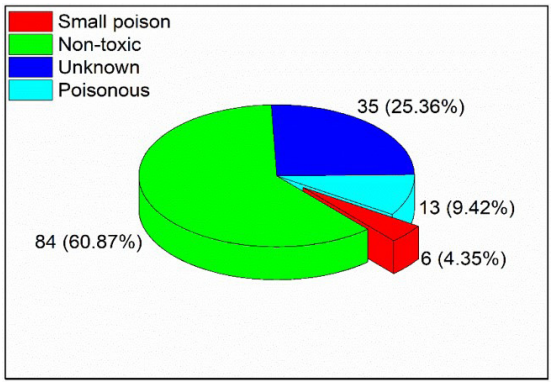

Figure 8. Toxicity level of recorded medicinal plants.

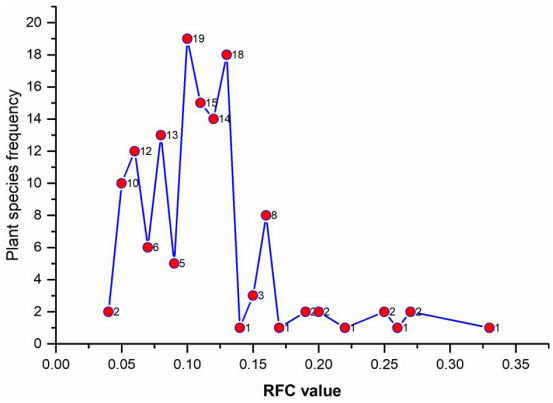

Figure 9. Relative frequency citation of the recorded medicinal plants.

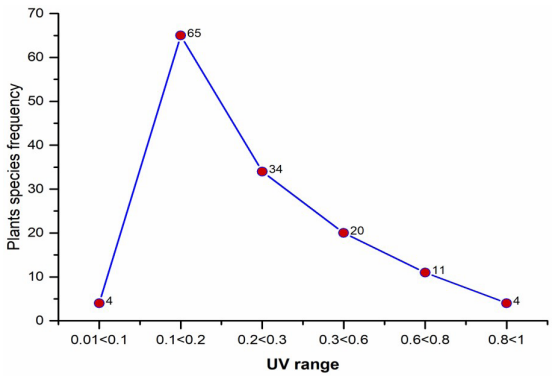

Figure 10. Use values of the recorded medicinal plants.

3.7. Quantitative analysis of folk traditional medicinal plants

3.7.1. Relative Frequency Citation (RFC)

The RFC value of the recorded plant species ranges from 0.04 to 0.33. Among, RFC range 0.00 ≥ 0.05 recorded with 12 plant species, 0.06 ≥ 0.10 with 55 plant species, 0.11 ≥ 0.15 with 51 plant species, 0.16 ≥ 0.2 with 13 plant species, and the remaining 7 plant species was recorded in the RFC range 0.22 ≥ 0.33. Among the plant species, *Forsythia suspensa* was recorded with the highest RFC value 0.33, followed by *Nepeta tenuifolia* and *Codonopsis pilosula* with RFC value 0.27 each, *Salvia rosmarinus* (RFC=0.26), followed by *Scutellaria baicalensis* and *Taraxacum mongolicum* with RFC value 0.25 each. Furthermore, *Polygonatum multiflorum* L. and *Dianthus chinensis* L. were recorded with the lowest (0.04 each) RFC value (Figure 9). The higher RFC value demonstrated that informant's contribution was more for a particular plant species, and they have knowledge of particular plant uses. In fact, the plants with low RFC value are not medicinally less important, but the informants may not know about the uses of these plants, or the plants may not be common to an area (Siddique et al., 2021). In addition, it was observed during the survey that young generations were less familiar with the traditional utilization of medicinal plants, alarming threats to indigenous knowledge of medicinal plants.

3.7.2. Use Values (UV)

Use value determines the importance of each species for particular diseases. The present study recorded the UV range (0.08 to 0.9 value) of the total recorded species. Among them, most plant species (69 spp.) were recorded at the range of 0.01 to <0.2, followed by the UV range of 0.2 to <0.3 with 34 plant species. Thirty-five plants species were recorded with a UV value ≥0.3 (Figure 10). The highest UV (0.91 value) was recorded for *Scutellaria baicalensis*, followed by *Platycodon grandifloras* (UV=0.83), *Taraxacum mongolicum* (UV= 0.82), and *Codonopsis pilosula* with 0.8 UV value. The lowest UV (0.08 value) was recorded for *Hylotelephium erythrostictum*. Plant species with higher UV demonstrated that their informants have more common knowledge of plant uses and frequently reported for the same uses. However, those diseases were included in the results that have been commonly reported (more than one) to be treated by particular/same plant species, thus influences the UV values. In contrast, UV is dynamic and can change with informant's knowledge or an area to area (Rao et al., 2015). Use values were significantly correlated to RFC (R^2=0.52), demonstrating that UV can be defined 50% by RFC value (Figure 11). These findings revealed that the number of informants for given species reported 50% similar uses.

3.8. Dominant disease categories with Fic value

The higher F_{IC} value was recorded for the treatment of gynecological diseases (F_{IC} =0.93) with a total of 109 citations, followed by Urinary system diseases (F_{IC} = 0.91), respiratory diseases and Digestive system diseases (F_{IC} = 0.90 each), Surface-relieving plant and Orthopedic diseases (F_{IC} = 0.89), and the other disease categories were recorded <0.89 F_{IC} value (Table 3).

The plants that contributed more to gynecological diseases are *Nepeta tenuifolia* and *Taraxacum mongolicum*, with 37 citations. *Nepeta tenuifolia* is mainly used to treat colds, coughs, hypertension, and other diseases. The fresh leaves of *Nepeta tenuifolia* are mixed with flour, kneaded into cakes, and deep-fried; it becomes a refreshing food

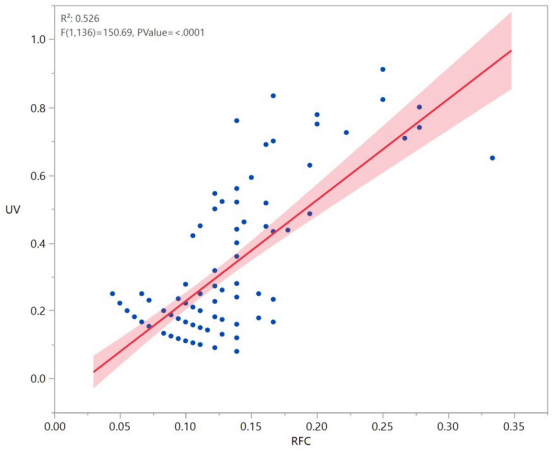

Figure 11. Correlation between use value and relative frequency citation.

Table 3. Disease categories with their F_{IC} value.

Types of diseases	Nt	Nur	F_{IC}
Infectious and functional diseases	7	18	0.65
Gynecological diseases	9	109	0.93
Urinary system diseases	12	123	0.91
Orthopedic diseases	14	118	0.89
Nervous system diseases	16	158	0.90
Circulatory system diseases	19	192	0.91
Skin diseases	22	113	0.81
Digestive system diseases	26	260	0.90
Respiratory diseases	27	249	0.90
Rheumatism-removing plants	8	47	0.85
Nourishing plants	28	206	0.87
Surface-relieving plants	70	621	0.89

that can prevent colds (Huang et al., 2017). *Plantago asiatica* were cited 29, and *Atractylodes lancea* with 28 citations by informants among the total citation (123 citations) of Urinary system diseases. *Plantago asiatica* contains more than 60 compounds that can treat various diseases, and multiple parts can be used, such as its leaves can be eaten directly (Zou, 2016). In respiratory diseases, the more contribution was by *Scutellaria baicalensis* with 41 citations. Shen et al. (2021) demonstrated that *Scutellaria baicalensis* mainly contains flavonoids, volatile oils, polysaccharides, and other compounds, with obvious anti-virus, anti-tumor, and anti-oxidation activities (Shen et al., 2021). Another disease category is dispelling rheumatism, having a F_{IC} value of 0.85, with frequently used plants *Sophora flavescens* (15 citation), and *Artemisia valandulifolia* (16 citations). During our investigation, local people in Lingchuan County used *Sophora flavescens* for skin diseases. Modern research found that *Sophora flavescens* has anti-inflammatory, analgesic, anti-tumor, and antibacterial effects (Ding et al., 2004; Zhang et al., 2020). *Arctium lappa* is an important plant for skin diseases management; its seeds are proceeds to deep-fry, ground, and take with water for the treatment of sore throat (Knott et al., 2008). Infectious and functional diseases have a relatively large impact and require timely medical treatment. However, most of the informants did not share relevant information or may feel shy to mention such diseases; generally, they did not share treatment experience, which may lead to low consistency of medicinal plants to treat such diseases.

4. Conclusion

The present study concluded that the inhabitants of Lingchuan County confidentially using medicinal plants and are still practicing them for their healthcare needs. The overcollecting, land-use, and habitat changes of medicinal plants may drive Flora to extension due to loss of genetic diversity and unsuitable environment for harvesting; the present study found that roots were widely collected plant parts may threaten the survival of plants compared to other plant parts collection such as leaves. Indeed, awareness campaigns and scientific collection guidelines are required through a proper channel with the government support for the sustainability of the regional Flora. Future studies should consider the reported medicinal plants for phytochemical screening based on their traditional knowledge and their quantitative indices value, which may lead to better understanding and prevention of diseases in the modern healthcare system.

Acknowledgements

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Supplementary Material

Supplementary material accompanies this paper.

Table S1. Latitudinal and longitudinal position of the visited localities.
Table S2. Proforma of Ethnobotanical Research- Questionnaire.
Figure S1. Medicinal plant families recorded with one species.

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