Investigation of China's Yunnan pharmaceutical industry derived from two ethnomedicines, Yi medicine and Dai medicine

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Abstract

Background: Yunnan Province is a multi-ethnic area located in the southwest of China, and she also is rich in Chinese matiera medica resources, known as the 'kingdom of plants'. There is abundant of ethnomedicine resources in Yunnan province and many ethnic minorities inherit and retain numerous knowledge of traditional medicine. The biomedicine and big health industry have been the pillar industry of Yunnan since 2016, which is the important pharmaceutical industrial base for Dai Medicine and Yi Medicine in China, for example Yunnan Baiyao with "amazing efficacy" and originating from a Yi medical formula. Yi medicine and Dai medicine of Yunnan Province were investigated in this work focusing on the basic information of Dai patent medicine (DPM) and Yi patent medicine (YPM), including the clinical indications, herbal resources and their sources of traditional knowledge. Methods: The data and information were collected from the published literatures and some public service websites, and the data base of DPM and YPM was established including the information about manufacturer, approval number, clinical indication, prescription composition, dosage form of drug, etc. We investigated the references and literatures including the publicly available pharmaceutical instructions ensuring the authenticity and reliability of the investigation. Results: The results showed that there were 28 varieties of DPMs and 73 varieties of YPMs approved to use in clinical according to the drug regulatory laws of China. In the DPMs and YPMs, about 109 and 197 herbal medicines are recorded in China Pharmacopoeia, 18 and 52 herbs are recorded in Standards for Chinese medicinal materials in Yunnan Province respectively. Nearly 20 herbs have not any quality standard. Among these herbal medicines, there are 10 herbs considered as Dai Medicine and 30 herbs as Yi Medicine. In order to produce these DPMs and YPMs, about 16 animal medicines and 17 rare and endangered medicinal materials would be collected and used. Conclusions: The investigation would provide a more detailed report on Yunnan ethnic medicine industry, and it should be believed reasonably that the ethnomedicine of Yunnan Province will give more choices for human health through scientific experiments and dealing with the sustainable utilization of medicine resources.

Background

Fossil records date human use of plants as medicines at least to the Middle Paleolithic age some 60,000 years ago[1]. Through the long and slow clinical trial and error-based use of botanicals and other biomaterials in history [2], Individuals in different civilization in the world had built their traditional medical knowledge systems based on local medicinal resources, and varieties of traditional medical systems had been formed. Until now, herbal medicines serve the health needs of about 80% of the world's population, especially for millions of people in the vast rural areas of developing countries, according to the reports of the world health organization (WHO)[3]. The Chinese are known to have one of the oldest and distinct medical systems in the world, named Traditional Chinese Medicine (TCM), spanning a written history of nearly 3000 years, widely accepted in China [4]. China is a multi-racial country with 56 nationalities, of which 55 in over 18 provinces are officially recognized as ethnic minorities. Every ethnic minority has its own traditional medicine and there are many medical traditions practiced by Tibetan, Mongol, Uygur, Dai, Yi, Miao, and other ethnic minorities in China that differ slightly in theory and in practice from TCM.

Yunnan Province is located in the southwest of China and she belongs to a multinational area. According to statistics, apart from the Han nationality, there are 25 ethnic minorities with a population of more than 6,000, including Yi, Hani, Bai, Dai, Zhuang, Miao, Hui, Tibetan and other ethnic minorities, and the population of ethnic minorities has reached 16.0337 million, 33.4% of the total population of Yunnan Province. Dai Medicine, Yi Medicine and Tibetan Medicine are the representatives of ethnomedicine in Yunnan, which are accepted by the common people and own their traditional medical theories and independent hospitals. Except Tibetan Medicine in Shangri-La, which will be reported specially in another paper, Yunnan Province is the important pharmaceutical industrial base for Dai Medicine and Yi Medicine in China. For example, the most famous drug named as Yunnan Baiyao, a Yi medical formula with "amazing efficacy", is well known worldwide [5]. According to report, the biomedicine and big health industry have been the pillar industry of Yunnan since 2016. There are more than 2000 ethnic medicinal resources and more than 10,000 folk prescriptions in Yunnan [6], and taking Dai Medicine and Yi Medicine as representatives, ethnic medicine will be the innovative development path for modern Chinese Medicine and modern medicine from natural products.

In a previous studies,the investigation on Ethnic patent medicine (EPM) in the Chinese Pharmacopoeia (2015 Edition) shows that some herbal medicine (here, herbal medicines refer to not only plants but also animals and minerals with effects of treatments) composed in EPMs are lack of national quality standards. There are 71 herbs not collected in Chinese Pharmacopoeia, which are used in 39 EPMs [7]. This phenomenon is called 'standard upside down', which will affect the safety of Chinese patent medicine (CPM) and healthy development of Chinese pharmaceutical industry. Therefore, it is necessary to have a more comprehensive understanding of ethnic medicine. On the other hand, the fourth national survey on Chinese matiera medica resources is in progress in China, and the main tasks of which are to master the basic situation of Chinese matiera medica resources and to explore fully the modern value of herbal medicine knowledge including ethnic medicine and folk medicine, strengthening the construction of Chinese materia medica resources [8]. Yunnan is rich in Chinese matiera medica resources, known as the 'kingdom of plants'. In view of this, this paper will focus on the ethnic medicine industry and investigate Yi medicine and Dai medicine of Yunnan Province; it includes the basic information of Dai patent medicine (DPM) and Yi patent medicine (YPM), the quality standards of the constituent herbal medicines and the use of rare and endangered resources, toxic herbs and other aspects.

Methods

Data sources

This study focused on the development status of ethnic pharmaceutical industry, especially Yi Medicine and Dai Medicine in Yunnan Province. The review work was dependent on the published literatures (Table 1) and some medical information from public service websites (Table 2). These contents were of interest to us, which include: (1) quantities of CPM from Yi Medicine and Dai Medicine produced by pharmaceutical companies in Yunnan Province; (2) the disease types that these CPM could be used to prevent or treat; (3) the pharmaceutical dosage forms characteristics. (4) The quality standard of medicinal

materials used in DPM and YPM; (5) the utilization of toxic herbal medicine and the rare and endangered herbal medicine in Yunnan ethnic pharmaceutical industry.

Table 1
Published medical literatures used in the study

Name of work	Contributors	Publisher	Publication Year	lang.
Pharmacopoeia of the People's Republic of China(Chinese Pharmacopoeia)	Chinese Pharmacopoeia Commission	The Medicine Science and Technology Press of China	2015	CHS\EN
Ethnic medicine Formula preparation of China	Song Minxian	People's Medical Publishing House	2014	CHS
Standards for Chinese medicinal materials in Yunnan Province(SYNP)	Yunnan Medical Products Administration	Yunnan Science and Technology Press	2005	CHS

Table 2
Website information used in the study

Website Name	Website	Site category
State Administration of Traditional Chinese Medicine of China	http://www.satcm.gov.cn	Government Information Portal
National Medical Products Administration of China	http://www.nmpa.gov.cn	Government Information Portal
Endangered Species Scientific Commission,P.R.C	http://www.cites.org.cn	Scientific research institution of China performing for Convention on International Trade in Endangered Species of Wild Fauna and Flora
Yaozh Network	https://db.yaozh.com	Medical Technology Information Service Platform in China
China wild plant conservation association	https://www.wpca.org.cn	Associations Information Portal
Subject Database of China Plant	http://www.plant.csdb.cn/	Plant Information Service Platform in China
Information System of Chinese Rare and Endangered Plants	http://www.iplant.cn	Rare and Endangered Plant Information Service Platform in China

Investigation

In order to achieve these objectives, these methods were accepted and used as follows: (1) The data base of DPM and YPM was established including the information about manufacturer, approval number, clinical indication, prescription composition, dosage form of drug, etc. (2) Drug information in this review was investigated and evidenced depending on various of references and literatures, including the publicly available pharmaceutical instructions. (3) The important medical information was approached with computer automatic recognition and matching, as well as manual reexamination.

Results

Surveys and Statistics on the varieties and clinical indications of DPM and YPM in Yunnan Province

The CPMs were surveyed and counted, on the basis of ethnic medicine formula preparation of China or the pharmaceutical instructions in which their properties of ethnic medicine were claimed. The results showed that there were 28 varieties of DPMs(Table 3)and 73 varieties of YPMs（Table 4）, which could be approved to use in clinical according to the drug regulatory laws of China. In the DPMs, 15 varieties of prescriptions such as Biao Re Qing Granular, Guan Tong Shu Oral liquid, Hui Xue Sheng Capsule, have been approved as the over-the-counter drugs (OTC), accounting for 53.57% of the total DPMs, while in the YPMs, 28 varieties of prescriptions such as Bai Bei Yi Fei Capsule, Chang Shu Zhi Xie Capsule, Dan E Fu Kang Ointment, have be approved as OTC drugs, accounting for 37.83% of the total YPMs. In the statistics of clinical indications of these EPMs, it is found that the DPMs and YPMs are used to treat respiratory diseases, cardiovascular diseases, mental and neurological diseases etc （Figure 1）. For example, Dan Deng Tong Nao Capsule (DDTN), in which ERIGERONTIS HERBA (Erigeron breviscapus (Vaniot）Hand.-Mazz, Dengzhanxixin) is as one of constituent and recorded in the pattra-leaf scripture of Dai Traditional Medicine for 2500 years, is reported that combined with rehabilitation training, it effectively improve the recovery level of neurological function and improve the life quality of stroke patients with cerebral infarction [9]. And DDTN could prevent cerebral injury of MCAO rats via decreasing the intracellular Ca^{2+} concentration, and inhibiting the release of excitatory amino acids [10].

Table 3
Information of DPMs

No.	Drug Name	Chinese Name	Approval Number	Clinical Indications	Dosage form
1	Biao Re Qing Granular (BRQG)	表热清颗粒	Z20026794	Infection of the upper respiratory tract	Granular
2	Dan Lv Bu Shen Capsule (DLBSC)	丹绿补肾胶囊	Z20025620	Impotence and seminal emission	Capsule
3	Guan Tong Shu Oral liquid (GTSL)	关通舒口服液	Z20025408	Joint pain and lumbar muscle strain	Oral liquid
4	Hui Xin Kang Tablet (HXKT)	回心康片	Z20026037	Coronary disease and hypertension	Tablet
5	Hui Xue Sheng Capsule (HXSC)	惠血生胶囊	Z20025066	Anemia	Capsule
6	San Yang Xue Dai Oral liquid (SYXDL)	三阳血疗合剂	Z20025065	Anemia and leucopenia causing by tumor chemotherapy	Oral liquid
7	Lu Xian Bu Shen Tablet (LXBST)	鹿仙补肾片	Z20027604	Impotence and weakness of waist and knee	Tablet
8	7-Jie Du Huo Xue Ointment (7-JDHXO)	七味解毒活血膏	Z20026244	Soft tissue injury and mild scald	Ointment
9	Xiao Jie An Capsule (XJAC)	消结安胶囊	Z20025617	Mammophilia, ovarian cyst and uterine leiomyoma	Capsule
10	Run Yi Rong Capsule (RYRC)	润伊容胶囊	Z20027531	Acne	Capsule
11	Shanzha Neijin Oral liquid (SNL)	山楂内金口服液	Z20027821	Infantile malnutrition and indigestion	Oral liquid
12	Shen Bei Zhi Ke Granular (SBZKG)	参贝止咳颗粒	Z20026126	Chronic bronchitis	Granular
13	Shen Cha Teabag (SCT)	肾茶袋泡茶	Z20026660	Urinary tract infection	Teabag
14	Shu Xin Tong Mai Capsule (SXTMC)	舒心通脉胶囊	Z20025429	Coronary disease and angina pectoris	Capsule
15	Shuang Jiang Wei Tong Pills (SJWTP)	双姜胃痛丸	Z20026657	Chronic superficial gastritis	Pills
16	Xuan Ju Capsule (XJC)	玄驹胶囊	Z20026658	Lumbar and knee pain	Capsule
17	Xue Niao An Capsule (XNAC)	血尿安胶囊	Z20026104	Urinary tract infection	Capsule
18	YaGei Tablet (YGT)	雅解片	Z20025088	Gastric injury by alcohol and overeating	Tablet
19	Ye Xia Zhu Tablet (YXZT)	叶下珠片	Z20026219	Chronic hepatitis B and jaundice	Tablet
20	Ye Xia Zhu Capsule (YXZC)	叶下珠胶囊	Z20027597	Chronic hepatitis B and jaundice	Capsule
21	Yi Kang Bu Yuan Granular (YKBYG)	益康补元颗粒	Z20026434	Insomnia and amnesia	Granular
22	Yi Shen Jian Gu Tablet (YSJGT)	益肾健骨片	Z20027061	Chronic limb pain	Tablet
23	Yin Qing Capsule (YQC)	银芩胶囊	Z20025199	Infection of the upper respiratory tract	Capsule
24	Zhuzi Gan Tai Capsule (ZGTC)	珠子肝泰胶囊	Z20026111	Chronic hepatitis B	Capsule
25	Xiao Jie An Oral liquid (XJAL)	消结安口服液	Z20025884	Mammophilia, ovarian cyst and uterine leiomyoma	Oral liquid
26	Huzhang Fanshi Liniment (HFL)	虎杖矾石搽剂	Z20025342	Skin burns and scalds	Liniment
27	Ya Jiao Ha Dun Powder (YJHDP)	雅叫哈顿散	Z53021363	Irregular menstruation and postpartum bleeding in women	Powder
28	Ru Bi Qing Capsule (RBQC)	乳癖清胶囊	Z20025068	Mammary gland hyperplasia and menstrual breast pain	Capsule

Table 4
Information of YPMs

No	Drug Name	Chinese Name	Approval Number	Clinical Indications	Dosage form
1	Bai Bei Yi Fei Capsule (BBYFC)	百贝益肺胶囊	Z20025124	Bronchitis and cough	Capsule
2	Chang Shu Tablet (CST)	肠舒片	Z20025848	Acute enteritis and dysentery	Tablet
3	Chang Shu Zhi Xie Capsule (CSZXC)	肠舒止泻胶囊	Z20025064	Chronic diarrhea	Capsule
4	Chang Wei Shu Capsule (CWSC)	肠胃舒胶囊	Z20026659	Loss of appetite and abdominal pain	Capsule
5	Chuan Luo Tong Capsule (CLTC)	喘络通胶囊	Z20025126	Bronchial asthma and emphysema	Capsule
6	Shu Lie An Capsule (SLAC)	舒列安胶囊	Z20025167	Chronic prostatitis	Capsule
7	Dan Deng Tong Nao Capsule(DDTNC)	丹灯通脑胶囊	Z20026053	Ischemic stroke	Capsule
8	Dan E Fu Kang Ointment (DEFKO)	丹莪妇康膏	Z20025253	Female irregular menstruation, dysmenorrhea, menstrual discomfort, and pelvic endometriosis	Ointment
9	Danshen Yi Xin Capsule (DYXC)	丹参益心胶囊	Z20026028	Coronary disease and angina pectoris	Capsule
10	Dan Wei Kang Capsule (DWKC)	胆胃康胶囊	Z20025134	Jaundice, Bile Reflux Gastritis and Cholecystitis	Capsule
11	Deng Yin Nao Tong Capsule (DYNTC)	灯银脑通胶囊	Z20026228	Cerebral ischemia	Capsule
12	E Qiu Qi Capsule (EQQC)	饿求齐胶囊	Z20025685	Diarrhea	Capsule
13	Fan Teng Zhi Injection (FTZI)	矾藤痔注射液	Z20026309	Hemorrhoids	Injection
14	Fu Fang Dahongpao Zhi Xue Capsule (FFDZXC)	复方大红袍止血胶囊	Z20025483	Various hemorrhagic diseases, such as functional uterine bleeding, bleeding after induced abortion, epistaxis, gastric bleeding and hemorrhoids bleeding	Capsule
15	Fu Fang Luxiancao Granular (FFLG)	复方鹿仙草颗粒	Z20025653	Primary hepatocellular carcinoma	Granular
16	Fu Fang Qinghao Spray (FFQS)	复方青蒿喷雾剂	Z20025887	Hemorrhoids	Spray
17	Fu Yi Shen Alcohol (FYSA)	茯蚁参酒	Z20026807	Insomnia	Vinum
18	Gan Dan Qing Capsule (GDQC)	肝胆清胶囊	Z20025161	Cholecystitis and cholelithiasis	Capsule
19	Gu Feng Ning Capsule (GFNC)	骨风宁胶囊	Z20026229	Rheumatoid arthritis and Ankylosing spondylitis	Capsule
20	He Wei Zhi Tong Capsule (HWZTC)	和胃止痛胶囊	B20020328	Acute and chronic gastroenteritis, gastric and duodenal ulcers, chronic colitis	Capsule
21	Wen Zhong He Wei Capsule (WZHWC)	温中和胃胶囊	Z20025689	Chronic gastritis and duodenal ulcer	Capsule
22	Huzhang Shang Tong Tincture (HSTT)	虎杖伤痛酊	Z20025395	Pain and swelling due to external injury	Tincture
23	Hu Zhang Ye Capsule (HZYC)	虎杖叶胶囊	Z20026314	Dizziness, dizziness and headache caused by hypertension	Capsule
24	Huoxiang Wan Ying Powder (HWYP)	藿香万应散	Z20025180	Gastrointestinal cold	Powder
25	Jiang Zhi Tong Mai Capsule (JZTMC)	降脂通脉胶囊	Z20026429	Hyperlipidemia	Capsule
26	Kang Shen Granular (KSG)	康肾颗粒	Z20025358	Uremia	Granular
27	Ke Tan Oral liquid (KTL)	咳痰合剂	Z20025740	Bronchitis or upper respiratory tract infection appearing cough and phlegm	Oral liquid
28	Li Dan Jie Du Capsule (LDJDC)	利胆解毒胶囊	Z20025384	Cholecystitis	Capsule
29	Lingdancao Oral liquid (LL)	灵丹草合剂	Z20026041	Acute pharyngitis, tonsillitis and upper respiratory tract infection	Oral liquid
30	Long Jing Tong Lin Capsule (LJTLC)	龙金通淋胶囊	Z20025499	Prostatitis, prostatic hyperplasia	Capsule
31	Lushuicao Capsule (LC)	露水草胶囊	Z20027532	Type 2 diabetes	Capsule
32	Lvji Ke Chuan Granular (LKCG)	绿及咳喘颗粒	Z20025849	Cough, night sweat	Granular
33	Mitonghua Granular (MG)	蜜桶花颗粒	Z20027607	Acute and chronic hepatitis	Granular
34	Niao Lu Kang Granular (NLKG)	尿路康颗粒	Z20027534	non-gonococcal urethritis	Granular
35	Niao Qing Shu Granular (NQSG)	尿清舒颗粒	Z20026440	chronic prostatitis	Granular
36	Ping Xuan Capsule (PXC)	平眩胶囊	Z20025826	Somnipathy,dizziness, and palpitation	Capsule
37	Qiancao Nao Tong Oral liquid (QNTL)	千草脑脉通合剂	Z20025214	Cerebral ischemia	Oral liquid

No	Drug Name	Chinese Name	Approval Number	Clinical Indications	Dosage form
38	Qing Chang Tong Bian Capsule (QCTBC)	清肠通便胶囊	Z20025654	Constipation	Capsule
39	Rong Shuan Nao Tong Capsule (RSNTC)	溶栓脑通胶囊	Z20025006	Cerebral ischemia	Capsule
40	She Chang Zhi Xie Powder (SCZXP)	涩肠止泻散	Z20025892	Diarrhea	Powder
41	Sha Mei Xiao Ke Capsule (SMXKC)	沙梅消渴胶囊	Z20025120	Type 2 diabetes	Capsule
42	Shang Yi Aerosol (SYA)	伤益气雾剂	Z20026238	Skin scald and injury	Aerosol
43	Shen An Capsule (SAC)	肾安胶囊	Z20025529	Lower urinary tract infection	Capsule
44	Shen Qi Xin Shu Capsule (SQXSC)	参七心疏胶囊	Z20025482	Coronary disease and angina pectoris	Capsule
45	Shijiaocao Ke Chuan Granular (SKCG)	石椒草咳喘颗粒	Z20025635	Chronic bronchitis	Granular
46	Shu Mi Tong Capsule (SMTC)	舒泌通胶囊	Z20054802	Hyperplasia of the prostate	Capsule
47	Shu Wei Yao Alcohol (SWYA)	舒胃药酒	Z20025389	Indigestion	Vinum
48	Tianhusui Yu Gan Tablet (TYGT)	天胡荽愈肝片	Z20025236	Acute and chronic hepatitis	Tablet
49	Tian Xiang Tincture (TXT)	天香酊	Z20025711	Soft tissue sprain and joint pain	Tincture
50	Tian Jing Yang Yan Capsule (TJYYC)	调经养颜胶囊	Z20025599	Irregular menses and Dark skin in women	Capsule
51	Tong Shu Capsule (TSC)	痛舒胶囊	Z20025478	Traumatic pain and rheumatoid arthritis pain	Capsule
52	Tong Shu Kou Shuang Capsule (TSKSC)	通舒口爽胶囊	Z20026241	Constipation, gum swelling and pain	Capsule
53	Wei Fu Shu Capsule (WFSC)	胃复舒胶囊	Z20025893	Chronic superficial gastritis	Capsule
54	Wen Ya Capsule (WYC)	稳压胶囊	Z20025645	Hypertension	Capsule
55	Wujin Huo Xue Zhi Tong Capsule (WHXZTC)	乌金活血止痛胶囊	Z20025249	Various of pains, including limb pain, rheumatic arthralgia and cancer pain	Capsule
56	Xiang Teng Capsule (XTC)	香藤胶囊	Z20025211	Limb pain and rheumatic arthralgia	Capsule
57	Yanhu Wei An Capsule (YWAC)	延胡胃安胶囊	Z20026112	Vomiting, stomachache, indigestion	Capsule
58	Yan Lu Ru Kang Capsule (YLRKC)	岩鹿乳康胶囊	Z20025379	Cyclomastopathy	Capsule
59	Yan Shu Oral liquid (YSL)	咽舒合剂	Z20025601	Acute and chronic pharyngitis and tonsillitis	Oral liquid
60	Yi Xin Kang Capsule (YXKC)	鼻心康胶囊	Z20025345	Coronary diseases, ischemic cerebrovascular disease	Capsule
61	Yu Mai Kou Yan Oral liquid (YMKYL)	余麦口咽合剂	Z20025158	Mouth ulcer	Oral liquid
62	Yun Wei Ning Capsule (YWNC)	云胃宁胶囊	Z20026811	Gastric and duodenal ulcers, Chronic gastritis and gastric spasm pain	Capsule
63	Zhi Xuan An Shen Granular (ZXASG)	止眩安神颗粒	Z20027533	Vertigo, tinnitus, insomnia, palpitation	Granular
64	Zhong Tong Liniment (ZTL)	肿痛搽剂	Z20026008	Vertigo, tinnitus, insomnia, palpitation, shoulder periarthritis, gout arthritis, breast lobular hyperplasia.	Liniment
65	Zidan Huo Xue Tablet (ZHXT)	紫丹活血片	Z20025190	Coronary heart disease, angina pectoris and cerebral arteriosclerosis	Tablet
66	Zi Deng Capsule (ZDC)	紫灯胶囊	Z20025593	Neck and shoulder pain caused by cervical spondylosis	Capsule
67	Zi Jiao Xuan Tincture (ZJXT)	紫椒癣酊	Z20025684	Tinea manus	Tincture
68	Fu Fang Luxiancao Capsule (FFLC)	复方鹿仙草胶囊	Z20110028	Primary hepatocellular carcinoma	Capsule
69	Hong Jin Xiao Jie Pill (HJXJP)	红金消结浓缩丸	Z20080315	Female breast hyperplasia, uterine leiomyoma, ovarian cyst	Pill
70	Hong Jin Xiao Jie Capsule (HJXJC)	红金消结胶囊	Z20026032	Female breast hyperplasia, uterine leiomyoma, ovarian cyst	Capsule
71	Shu Lie An Capsule (SLAC)	舒列安胶囊	Z20025167	Chronic prostatitis	Capsule
72	Wu Jin Huo Xue Zhi Tong Tablet (WJHXZTT)	乌金活血止痛片	Z20090688	Various of pains, including limb pain, rheumatic arthralgia and cancer pain	Tablet

No	Drug Name	Chinese Name	Approval Number	Clinical Indications	Dosage form
73	Jin Wei Tai Capsule (JWTC)	金胃泰胶囊	Z20026039	Acute and chronic gastroenteritis, gastric and duodenal ulcers, chronic colitis	Capsule

In this review, we also counted and analyzed the information of pharmaceutical enterprises which have the right to produce these EPMs legally in China. According to our statistics, these EPMs are procduced by 39 enterprises, including 2 corporations outside Yunnan province. Some of these companies have to be mentioned. Yunnan Baiyao Group Co.LTD, which is famous for producing Yunnan Baiyao (Baibaodan) invented by Qu Huanzhang (A.D.1880–1938), has the abilities to produce more than 300 varieties and 19 dosage forms of drugs. Shu Lie An Capsule, Qiancao Nao Tong Oral liquid, Gu Feng Ning Capsule, Shang Yi Aerosol, Tong Shu Capsule and Zhong Tong Liniment are manufactured by Yunnan Baiyao Group Co.LTD. Another company should be mentioned is Dihon Pharmaceutical Co. Ltd which was purchased by Bayer in 2014, a famous multinational pharmaceutical enterprise group coming from Germany and that was considered as the hallmark event for Bayer to enter the field of traditional Chinese medicine. Dan E Fu Kang Ointment, Gan Dan Qing Capsule, Yu Mai Kou Yan liquid and Wei Fu Shu Capsule are produced by Dihon. Furthermore the dosage forms used in DPMs and YPMs were counted out (Fig. 2) and it could be found that the capsule, tablet and oral liquid are the main dosage forms in these prescriptions under investigation.

Surveys and Statistics on the compositions and their standardization of DPMs and YPMs in Yunnan Province

In China, quality standards of ethnic medicines and their prescriptions are on the basis of the national standards including Chinese Pharmacopoeia (ChP), which collected ethnic medicine beginning since 1977, and the provincial standards relating to Tibet Autonomous Region, the Xinjiang Uygur Autonomous Region, the NeiMonggol Autonomous Region, the Guangxi Zhuang Autonomous Region, Qinghai, Sichuan, Yunnan, and Guizhou Provinces [11]. Besides, the academy group standards and enterprise standards also play the role in quality standards of ethnic medicines. In this study, it was found that in the total 28 DPMs, quality standards of 109 herbal medicines come from Chinese pharmacopoeia; quality standards of 27 herbal medicines are collected in Standards for Chinese medicinal materials of Yunnan Province (SYNP) or other provincial herbal quality standard. (Fig. 3) There are 5 herbal medicines including Tuoshu Gen(柘树根), Dabaijie(大百解), Zhuyelan(竹叶兰), Mahan钟麻罕, Xiaobaibu钟小百部and leaf &stem of Vitex trifoliaL钟蔓荆子茎及叶, whose quality standards have not be built. In the total 73 YPMs, 183 herbal medicines have been collected in Chinese pharmacopoeia and 73 herbal medicines are used with SYNP or other provincial herbal quality standard. Otherwise, 16 herbal medicines have no quality standard, which include Gugongguo Gen(固公果根), Zidiyu(紫地榆),Dahuangteng钟大黄藤,Damayao钟大麻药and Zhou YeXiangru钟皱叶香薷, DianCaowu(滇草乌),Lushuicao(鲁水草), Xiaolvji(小绿菽), Yudaicao(玉带草),Shashen(沙参),Daotihu钟倒提壶and Wanzhangsheng钟万丈深and Yunxiangcao(芸香草), Ziheche钟紫河车and the extract of Xuedan(雪胆提取物)˙ etc.

In the frequency statistics of herbal medicines used in these prescriptions, the total frequency and frequency in DPMs and YPMs were calculated out (Fig. 4). Besides GLYCYRRHIZAE RADIX ET RHIZOMA(Glycyrrhiza uralensis Fisch, Gancao), NOTOGINSENG RADIX ET RHIZOMA (Panax notoginseng (Burk.)F. H. Chen, Sanqi), ANGELICAE SINENSIS RADIX,钟Angelica sinensis (Oliv.) Diels, Danggui and ASTRAGALI RADIX(Astragalus membranaceus (Fisch.) Bge. Var. mongholicus 钟Bge.and Hsiao, Huangqi), which ranked ahead in this statistics, are considered as genuine medicinal materials of Yunnan province. Otherwise, these herbs used in DPMs and YPMs, which are collected and considered as Dai medicine or Yi medicine in SYNP, their information are listed in Table 5.

Table 5

Herbal medicines used in DPMs and YPMs coming from SYNP

No	Scientific Name	Pinyin Name	Chinese name	Origin	MP	EM	Frequency	EPM
1	CAULIS ET FOLIUM PLUMBAGINIS	Baihuadan	白花丹	Plumbago zeylanica Linn.	Stem and leaf	Yi	1	DLBSC
2	CAULIS TODDALIAE	Feilongzhangxue	飞龙掌血	Toddalia asiatica (L.)Lam.	Stem	Yi	1	GTSL
3	RADIX TRIPTERYGII HYPOGLAUCI	Huobahuagen	火把花根	Tripterygium hypoglaucum (Levl.) Hutch	Root	Yi	3	GFNC,ZTL, GTSL
4	HERBA INULAE CAPPAE	Yang'erju	羊耳菊	Inula cappa (Buch –Ham) DC.	Whole plant	Yi	2	YGT,WZHWC
5	HERBA GEI	Wuqihuanyangcao	五气朝阳草	Geum aleppicum Thumb.var.chinese Bolle	Whole plant	Yi	3	XTC,YXKC, RBQC
6	HERBA RHODOBRYI GIGANTEI	Huixincao	回心草	Rhodobryum giganteum (Hook.)Par.	Whole plant	Yi	2	HXKT,DYXC
7	RHIZOMA POLYGONI PALEACEI	Caoxuejie	草血竭	Polygonum paleaceum Wall.ex Hook.	Rhizome	Yi	2	CWSC,EQQC
8	RADIX ET CAULIS POLYGALAE ARILLATAE	Jigen	鸡根	Polygala arillata Buch.Ham.ex D .Dom	Roots and rhizome	Yi	1	CLTC
9	RADIX SALVIAE YUNNANENSIS	Zi Danshen	紫丹参	Salvia yunnanensis C.H.Wright	Root	Yi	6	DEFKO,DYXC, GFNC,LJTLC ZHXT,ZDC
10	RADIX AMPELOPSIS DELAVAYANAE	Yuputao gen	玉葡萄根	Amoelopsis delavayana (Franch.)Planch.	Root	Yi	3	SYA,TSC,ZTL
11	HERBA SWERTIAE PATENTIS	Xiao'er futong cao	小儿蹙痛草	Swertia patens Burk.	Whole plant	Yi	3	XTC,WZHWC, LDJDC
12	FOLIUM POLYGONI CUSPIDATI	Huzhangye	虎杖叶	Polygonum cuspidatum Sieb.et Zucc.	Leaf	Yi	1	HZYC
13	HERBA CYNODONIS	Qianxiancao	铁线草	Cynodon dactylon (L.)Pets.	Whole plant	Yi	1	JZTMC
14	RADIX POTENTILLAE FULGENTIS	Guanzhong	管仲	Potentilla fulgens Wall.ex Hook	Root	Yi	2	HWZTC,JWTC
15	HERBA AINSLIAEAE	Yexiahua	叶下花	Ainsliaea pertyoides Franch.var.albo-tomentosa Beauv.	Whole plant	Yi	1	GFNC
16	RADIX ET RHIZOMA VALERIANAE JATAMANSI	Matixiang	马蹄香	Valeriana jatamansi Jones	Roots and rhizome	Yi	1	QCTBC
17	HERBA GAULTHERIAE	Tougucao	透骨草	Speranskia tuberculata (Bunge) Baillon	Aerial part	Yi	3	XTC,YXKC,LKCG
18	RHIZOMA ARTHROMERIS MAIREIS	Diwugong	地蜈蚣	Arthromeris mairei (Brause)Ching	rhizome	Yi	1	QCTBC
19	CAULIS ET FOLIUM SCHEFFLERAE VENULOSAE	Qiyelian	七叶莲	Schefflera venulosa (Wight et Arn.) Harms	Whole plant, stem and leaf	Yi	3	SYA,TSC,ZTL
20	HERBA BOENNINGHAUSENIAE	Shijiaocao	石椒草	Boenninghausenia sessilicarpa Levl .	Whole plant	Yi	2	SAC,SKCG
21	HERBA OXALIS CORNICULATAE	Zajiacao	酢浆草	Oxalis corniculata Linn.	Whole plant	Yi	1	TYGT
22	RADIX ANEMONES RIVULARIS	Huzhangcao	虎掌草	Anemone rivularis Bunch.Ham.ex DC.	Root	Yi	2	TYGT,YSL
23	CAULIS OPUNTIAE	Xianrencao	仙人掌	Opuntia stricta (Haw.) Haw.var.dillenii (KerGawl.) Benson.	Stem	Yi	1	SQXSC
24	RHIZOMA DYSOSMATIS	Bajiaolian	八角莲	Dysosma versipellis (Hance)M.Cheng ex Ying	Rhizome	Yi	4	ZTL,HJXJC, WJHXZTT, HJXJP
25	CORTEX JATROPHAE	Gaotong	膏桐	Jatropha curcas L.	Root bark, stem bark	Yi	1	WYC

Note: EPM: Ethnic patent medicines, MP: Medicinal parts, EM: Ethnic medicine

No	Scientific Name	Pinyin Name	Chinese name	Origin	MP	EM	Frequency	EPM
26	CAULIS FICI TIKOUAE	Dibanteng	地板藤	Ficus tikoua Bur.	Cane	Yi	1	TJYYC
27	CAULIS KADSURAE	Wuxiangxueteng	五香血藤	Kadsura longipedunculata Finet et Gagnep.	Cane	Yi	3	HJXJC,HJXJP, WJHXZTT
28	HERBA LEYCESTERIAE STENOSEPALAE	Dazuifeng	大追风	Leycesteria aponic Wall.var.stenosepala Rehd.	Aerial part	Yi	1	XTC
29	HERBA ANAPHALIS	Wuxiangcao	午香草	Anaphalis bulleyana (J.F.Jeffr.)Chang	Whole plant	Yi	1	YSL
30	FOLIUM CRAIBI0DENDRONIS	Jinyezi	金叶子	Craibiodendron yunnanense W.W.Smith	Leaf	Yi	1	ZTL
31	HERBA PHYLLANTHI URINARIAE	Yexiazhu	叶下珠	Phyllanthus urinaria L.	Aerial part	Dai	2	YXZT,YXZC
32	SEMEN BRASSIAE INTEGRIFOLIAE	Kucaizi	苦菜子	Brassica integrifolia (West)O.E.Schulz ex Urb.	Seed	Dai	1	SJWTP
33	RHIZOMA ZINGIBERIS PURPUREI	Zisejiang	紫色姜	Zingiber purpureum Rosc.	Rhizome	Dai	1	SJWTP
34	FORMICA NIGERIS	Weimayi	黑蚂蚁	Polyrhachis dives Smith	Body	Dai	4	FYSA,HJXJC,HJXJP, WJHXZTT
35	HERBA PHYLLANTHI NIRURI	Zhuzicao	珠子草	Phyllanthus niruri L	Whole plant	Dai	1	ZGTC
36	RHIZOMA TACCAE	Jiangenshu	箭根薯	Tacca chantrieri Andre	Stem tuber	Dai	2	YGT,YJHDP
37	RADIX STEPHANIAE EPIGAEAE	Diburong	地不容	Stephania epigaea H.S.Lo	Root tuber	Dai	1	SJWTP
38	RADIX STREPTOCAULI	Tengkushen	藤苦参	Streptocaulon juventas (Lour.) Merr.	Root	Dai	1	YJHDP
39	RADIX ET RHIZOMA INULAE CAPPAE	Yangerjugen	羊耳菊根	Inula cappa (Buch –Ham) DC	Root	Dai	1	YJHDP
40	FRUCTUS BENINCASAE	Kudonggua	苦冬瓜	Benincasa hispida (Thunb.) Cogn.	Fruit	Dai	1	YJHDP

Note: EPM: Ethnic patent medicines, MP: Medicinal parts, EM: Ethnic medicine

Note

Gancao (甘草): GLYCYRRHIZAE RADIX ET RHIZOMA; Sanqi (三七): NOTOGINSENG RADIX ET RHIZOMA; Danggui (当归): ANGELICAE SINENSIS RADIX; Huangqi (黄芪): ASTRAGALI RADIX; Jishiteng (鸡矢藤): HERBA PAEDERIAE SCANDENTIS; Dengzhanxixin (灯盏细辛): ERIGERONTIS HERBA; Sharen(砂仁): AMOMI FRUCTUS; Huzhang (虎杖): POLYGONI CUSPIDATI RHIZOMA ET RADIX; Jinqiaomai (金荞麦): FAGOPYRI DIBOTRYIS RHIZOMA; Chonglou (重楼): PARIDIS RHIZOMA; Gonglaomu: MAHONIAE CAULIS; Dahongpao (大红袍): RADIX CAMPYLOTROPIS HIRTELLAE; Gegen (葛根): PUERARIAE LOBATAE RADIX; Zidanshen (紫丹参): RADIX SALVIAE YUNNANENSIS; Chuangxiong (川芎): CHUANXIONG RHIZOMA; Chaihu (柴胡): BUPLEURI RADIX; Yanhusuo (延胡索): CORYDALIS RHIZOMA; Zhizi (栀子): GARDENIAE FRUCTUS; Baiji (白及): BLETILLAE RHIZOMA; Chenpi (陈皮): CITRI RETICULATAE PERICARPIUM; Honghua (红花): CARTHAMI FLOS

Surveys and Statistics on the herbal resources in DPMs and YPMs of Yunnan Province

Botanical, animal and mineral medicine used in DPMs and YPMs

Because of the differences in geographical and climatic conditions, residents in various geographical regions in China have distinctive lifestyles, customs, and cultures, as well as the usage of medicinal resources. In general, botanical medicines are the most commonly used in traditional medicine. In this investigation, there are 361 botanical medicines, 22 animal medicines and 9 mineral medicines used in DPMs and YPMs (Fig. 5). It is an interesting discovery that the number of animal medicines in YPMs is more than that in DPMs. The Yi Nationality as excellent hunters with a long history, were adept in using animal medicines, which is proved with many ancient documents. In Yi Nationality Offering Medicine Scriptures (Yi Zu Xian Yao Jing), written in the early Qing Dynasty of China, the ratio of animal medicines was up to 92.8%. And the animal medicines were divided into 12 types including the insects, meats, bones gallbladders, fats, bloods, fish gall bladders, and hairs etc. In another medical work named Book of Good medicines for treating diseases (Yi Bing Hao Yao Shu, AD.1737), the number of animal medicines reached 152, it accounted for 35.68% of the total number of Yi medicines [12].

Indeed, animals are therapeutic arsenals that have been playing significant roles in the healing processes, which are also known as zootherapy. Animal medicines have been elaborated from parts of the animal bodies, from products of their metabolism (corporal secretions and excrements), or from non-animal materials (nests or cocoons) [13].Since the pertinence of traditional medicine based on animals cannot be denied, animal medicines used in CPM should be strengthened modern scientific research. The animal medicines in DPMs and YPMs were set out in Table 6.

Table 6
Animal medicines used in DPMs and YPMs coming from SYNP

Scientific Name	Pinyin Name	Chinese Name	Origin	MP	Standard	DPM	YPM
CERVI CORNU PANTOTRICHUM*	Lurong	□□	Cervus nip port Temminck	Antler	ChP	LXBST	-
CICADAE PERIOSTRACUM	Chantui	□□	Cryptotympana pustulata Fabricius	Slough	ChP	SNL,SBZKG	-
GALLI G IG ERII ENDOTHELIUM CORNEUM	Jineijing	□□□	Gallus gallus domesticus Brisson	Gizzard	ChP	SNL	GDQC
FORMICA NIGERIS	Heimayi	□□□	Polyrhachis dives Smith	Body	SYNP	XJC	FYSA,HJXJP, HJXJC,WJHXZTT
GECKO	Gejie	□□	Gekko gecko Linnaeus	Body	ChP	-	GFNC,RSNTC,WYC, CLTC
PHERETIMA*	Dilong	□□	Pheretima aspergillum (E. Perrier)	Body	ChP	-	GFNC, RSNTC, WYC, CLTC
BUFONIS VENENUM*	Chansu	□□	Bufo bufo gargarizans Cantor	Secretion	ChP	-	CLTC
ASPONGOPUS	Jiuxiangchong	□□□	Aspongopus chinensis Dallas	Body	ChP	-	FFLG,FFLC
-	Xiongdanfen	□□□	Selenaretos thibetanus Cuvier	Bile	SYNP	-	LJTLC
BOMBYX BATRYTICATUS	Jiangchan	□□	Bombyx mori Linnaeus.	Body	ChP	-	SMXKC
PERIPLANETA AMERICANA	Feilie	□□	Periplaneta aponicas Linnaeus	Body	SYNP	-	SYA
SEPIAE ENDOCONCHA	Haipiaoqiao	□□□	Sepiella maindronide Rochebrune	Shell	ChP	-	YWAC
MOSCHUS*	Shexiang	□□	Moschus berezovskii Flerov	Secretion	ChP	-	ZTL
ARMADILLIDIUM	Shufuchong	□□□	Armadillidium vulgare Latreille	Body	SSDP	-	HJXJP,HJXJC
CERVI CORNU DEGELATINATUM*	Lujiaoshuang	□□□	Cervus nip port Temminck	Antler colloid	ChP	RBQC	YLRKC
CORDYCEPS	Dongchongxiacao	□□□□	Cordyceps sinensis (BerK.) Sacc.	Bacterial & insect complex	ChP	HXSC, RBQC	RSNTC,WYC

Note: EPM: Ethnic patent medicines, MP: Medicinal parts, ChP: Chinese Pharmacopoeia, SSDP: Standards for Chinese medicinal materials in Shandong Province(2012),* means the herb has more than 2 origins, and only 1origin is showed in the table.

Medicinal parts of botanical medicines used in DPMs and YPMs

The plant parts used in herbal therapy include seeds, berries, roots, leaves, fruits, barks, flowers, or even the whole plants. From ancient times to the present, people have been mainly dependent on crude botanical material for medical needs to retain vitality and cure diseases [14]. In this work, we have analyzed amount of medicinal parts of botanical medicines in DPMs and YPMs (Fig. 6). Statistically, the distribution rules of medicinal parts of botanical medicines in DPMs and YPMs showed similarity, and in the usage frequency of plant parts, Top 3 are Root and Rhizome, Fruit and seed and Whole plant respectively. The different medicinal parts are related to the traditional efficacy of herbal medicines, and on the other hand, the shapes of medicinal parts also are concerned with the nomenclature of some herbs. For example,Huangqin(SCUTELLARIAE RADIX□Scutellaria baicalensis Georgi)is called as Rijishi in Yi language□in this name, Ri means it is a herbaceous plant, and Ji means root, the medicinal parts of Scutellaria baicalensis Georgi, Shi means the color of yellow[15].

Surveys and Statistics on the rare and endangered medicinal materials in DPMs and YPMs in Yunnan Province

The rapidly increasing demand for Chinese patent drugs is likely to challenge herbal resources in China. Consequently 80% of the most usually used species cannot meet medical demand [16]. Data analysis showed that 1,800–2,100 medicinal species were facing the challenge of extinction in China[17].In the China Plant Red Data Book published in 1992, 388 species of plants are listed as threatened, which include 121 as endangered(i.e., first grade national protection), 110 as rare (second grade national protection), and 157 as vulnerable (third grade national protection). Among these plant species, 77 are typical herbal medicines that account for 19.86% of the total threatened species[18].Besides, 257 kinds of animal medicines appear in the national key protection name list of wild animals. Although the shortage of medicinal materials is alleviated to some extent since more than 200 kinds of herbs could be artificially planted, for pharmaceutical enterprises of ethnic medicine, some special herbs are from continuous wild collection without scientific plans. The rare medicinal materials used in DPMs and YPMs were listed in Table 7, which are protected legally by Chinese government and some international non-government organizations

such as International Union for Conservation of Nature. This is the truth that CISTANCHES HERBA (Cistanche deserticola Y.C.Ma, Rouchongrong), GINSENG RADIX ET RHIZOMA(Panax ginseng C. A. Mey, Renshen), GLYCYRRHIZAE RADIX ET RHIZOMA□Glycyrrhiza aponic Bat ,Gancao□or other rare medicinal materials listed in the catalogues are protected and utilized sustainably in China. But in fact, the number of ethnic specific herbal medicines in danger is far bigger than that recorded in the catalogues. As a example with RHIZOMA RODGERSIAE□Rodgersia sambucifolia Hemsl.or Rodgersia pinnata Franch.,Yantuo □,which is the raw material for YPM depending on mining wild resources, the quantity of excavation exceeds 3000 tons per year, and the wild resources of Rodgersia plants are reduced sharply and resources are damaged severely in Luquan, Yongsheng, Yulong, Heqing and Ninglang of Yunnan province[19].In light of this, 30 herbal medicines were listed to protect in the Rare Traditional Chinese Herbs of Yunnan Province in Urgent Needs (RTCHYN) [20]. These herbs used in DPMs and YPMs were summarized in Table 8.

Table 7

Investigation on the use of rare medicinal materials in DPMs and YPMs

Herbal name	Pinyin Name	Chinese name	Origin	NPWP	IUCN	Proprietary	NPWM	UF
GLYCYRRHIZAE RADIX ET RHIZOMA	Gancao	甘草	Glycyrrhiza uralensis Fisch	II	LC	-	Ⅱ	26
			Glycyrrhiza inflata Bat.	II	LC	-	Ⅱ	
			Glycyrrhiza glabra L.	II	LC	-	Ⅱ	
GINSENG RADIX ET RHIZOMA	Renshen	人参	Pana:c ginseng C. A. Mey	I	CR	-	Ⅱ	4
FORSYTHIAE FRUCTUS	Lianqiao	连翘	Forsythia suspense (Thunb.) Vahl	-	-	-	Ⅲ	4
SCUTELLARIAE RADIX	Huangqin	黄芩	Scutellaria baicalensis Georgi	-	-	-	Ⅲ	4
SCHISANDRAE CHINENSIS FRUCTUS	Wuweizi	五味子	Schisandra chinensis (Turcz.) Baill.	II	LC	-	Ⅲ	1
CERVI CORNU	Lurong	鹿茸	Cervus nip port Temminck	-	-	-	Ⅰ	1
			Cervus elaphus Linnaeus.	-	-	-	Ⅰ	
CISTANCHES HERBA	Rouchongrong	肉苁蓉	Cistanche deserticola Y. C. Ma	II	EN	-	Ⅲ	1
			Cistanche tubulosa (Schenk) Wight	II	-	-	-	
PHELLODENDRI CHINENSIS CORTEX	Huangbai	黄柏	Phellodendron chinense Schneid	-	-	-	Ⅱ	2
EUCOMMIAE CORTEX	Duzhong	杜仲	Eucommia ulmoides Oliv.	-	-	-	Ⅱ	1
GENTIANAE RADIX ET RHIZOMA	Longdan	龙胆	Gentiana manshurica Kitag.	-	-	-	Ⅲ	3
			Gentiana scabra Bge	-	-	-	Ⅲ	
			Gentiana triflora Pall.	-	-	-	Ⅲ	
			Gentiana regescens Franch.	-	-	-	Ⅲ	
COPTIDIS RHIZOMA	Huanglian	黄连	Coptis chinensis Franch	-	-	Unique to China	Ⅱ	1
			Coptis deltoidea C. Y. Cheng et Hsiao	-	VU	Unique to China	Ⅱ	
			Coptis teetoides C. Y. Cheng.	-	-	-	Ⅱ	
MAGNOLIAE OFFICINALIS CORTEX	Houpu	厚朴	Magnolia officinalis Rehd. et Wils	II	NT	Unique to China	Ⅱ	1
			Magnolia officinalis Rehd. et Wils. var. biloba Rehd. et Wils	II	-	Unique to China	Ⅱ	
PHELLODENDRI CHINENSIS CORTEX	Huangbai	黄柏	Phellodendron chinense Schneid	-	-	-	Ⅱ	2
ARNEBIAE RADIX	Zicao	紫草	Arnebia euchroma (Royle) Johnst	-	-	-	Ⅲ	1
GENTIANAE MACROPHYLLAE RADIX	Qingjiao	秦艽	Gentiana macrophyllaPall.	-	-	-	Ⅲ	1
			Gentiana macrophyllaMaxim.	-	-	-	Ⅲ	
			Gentiana crassicaulisDuthie ex Burk.	-	-	-	Ⅲ	
			Gentiana dahuricaFisch	-	-	-	Ⅲ	
MOSCHUS	Shexiang	麝香	Moschus berezovskii Flerov.	-	-	-	Ⅱ	1
			Moschus sifanicus Przewalski.	-	-	-	Ⅱ	
			Moschus moschiferus Linnaeus.	-	-	-	Ⅱ	
PARIDIS RHIZOMA	Chonglou	重楼	Paris polyphylla Smith var. chinensis (Franch.) Hara	II	-	-	-	7

Note: NPWP: National key protected wild plants of China (Aug 4th, 1999), NPWM: National key protected species of wild medicinal materials of China (Dec.1th, 1987), IUCN: List of International Union for Conservation of Nature(CR: Critically Endangered, LC:Least Concern, EN: Endangered ,VU:Vulnerable, NT:Near Threatened), UF:Usage frequency in DPMs and YPMs.

Table 8
Information of herbal medicines in RTCHYN

Scientific Name	Pinyin Name	Chinese Name	Origin	Medicinal parts	Distribution**	Standard	UF	EPN
ERIGERONTIS HERBA	Dengzhanxixin	□□□□	Erigeron breviscapus (Vaniot) Hand.-Mazz.	Whole plant	Areas except southwest of Yunnan	ChP	7	DD DY ZTL
CORDYCEPS	Dongchongxiacao	□□□□	Cordyceps sinensis (BerK.)Sacc.	Bacterial & insect complex	Deqin, Shangri-la,Lijiang,Binchuan,Lvfeng,Guangtong	ChP	4	HXS RSN
RESINA DRCAENIS	Longxuejie	□□□	Dracaena cochinchinensis (Lour.) S.C.Chen A	Resin	Jinping, Menglian, Pu'er,Jinghong,Zhenkang,	SGZP	2	HXS HXS
-	Lushuicao	□□□	Cyanotis arachoids C.B.Clarke	Whole plant	Menghai,Menglian,Jinghong,Jingdong,Mengzi□ Anning, Kunming, Pingbian	No	1	LC
SWERTIAE MILEENSIS HERBA	Qingyedan	□□□	Swertia mileensis T. N. He et W. L. Shi	Whole plant	Mile	ChP	2	DW
RADIX ANISODI*	Sanfensan	□□□	Anisodus acutangulus C.Y.Wu et C.Chen	Roots	Lijiang	SYNP	1	TXT
-	Xuedan	□□	Hemsleya amabilis Diels	Roots	Kunming,Chongming,Binchuan,Eryuan,Dali, Heqing	NO	1	RSN
BERGENIAE RHIZOMA	Yanbaicai	□□□	Bergenia purpurascens (Hook.f.et Thoms.)Engl. var. delavayi (Franch.)Engl. et lrm.	Rhizome	Deqin,Weixi, Shangri-La,Lijiang,Dali,Qujing,Ludian, Zhaotong,Gongshan,Fugong	ChP	1	YW

Note: * means the herb has more than 2 origins, and only 1origin is showed in the table, ** The distribution information comes from Flora of Yunnan (Science China,2006), UF : Usage frequency, SGZP: Standards for Chinese medicinal materials in Guizhou Province (2009)

Surveys and Statistics on the toxic herbal medicines in DPMs and YPMs in Yunnan Province

In traditional medicine of ethnic minorities, herbs with pharmacological activity are likely to be clinically useful, but may also be toxic, especially if used incorrectly or do not master the correct use method. Different from modern drugs, efficacy and toxicity assessments of herbal medicines are based on traditional knowledge and clinical experience rather than evaluation in a laboratory [21]. The causes of toxic medicine usage in Chinese ethnomedicine are related with living environments, religious belief and medical practices concerned with poisons. In China, 83 herbal medicines are officially recorded and defined as toxic according to the Chinese Pharmacopoeia and the certain number of toxic herbs is also recorded in provincial standards for herbal medicine. Toxic herbal medicines are classified into three categories: high toxicity, medium toxicity, and low toxicity [22]. According to the statistics, there are 10 toxic herbs used in 11 DPMs, and 6 toxic herbs recorded in Chinese Pharmacopoeia and 4 toxic herbs recorded in SYNP. Among them, 1 herb is called Dai medicine and 2 herbs belong to Yi medicine. In the 40 YPMs, the toxic herbs are counted to 24, and the number of 12 toxic herbs is collected in Chinese Pharmacopoeia, 12 herbs recorded in SYNP. 4 herbs are known as Yi medicine. These results are showed in Table 9 and Table 10.

Table 9
Toxic herbal medicines in DPMs

Scientific Name	Pinyin Name	Chinese Name	Origin	Toxicity degree	Standard	DPM	Modern toxicology	Ref.
PARIDIS RHIZOMA*	Chonglou	□□	Paris polyphylla Smith var. chinenisi (Franch)Hara	LT	ChP	RBQC	Toxic to digestive system and have cardio toxicity and neurotoxicity, LD_{50} = 2.68 g/kg (mice, p.o.)	[27]
CURCULIGINIS RHIZOMA	Xianmao	□□	Curculigo orchioides Gaertn	MT	ChP	LXBST	LD_{50} = 215.9 g/kg (ethanol extract, rats ,p.o.), injury to liver, kidney and reproductive organs with oral administration of 120 g/kg (ethanol extract, rats, 6 months)	[28]
CNIDII FRUCTUS	Shechuangzi	□□□	Cnidium monnieri (L.)Cuss.	LT	ChP	LXBST	Nausea and vomiting, decreased spontaneous activity, shortness of breath, unstable gait and tremor(ethanol extract), LD_{50} = 17.45 g/kg (mice, p.o.), MTD = 1.50 g/kg or LD_{50} = 3.45 g/kg (Osthol, mice, p.o.)	[29] [30] [31]
ZANTHOXYLRADIX	Liangmianzhen	□□□	Zanthoxylum nitidum (Roxb.)DC.	LT	ChP	7JDHXO	Nitidine chloride could damage liver and kidney cells, and lead to the decrease of heart rate in zebrafish	[32]
PINELLIAE RHIZOMA	Banxia	□□	Pinellia ternate (Thunb.) Breit.	MT	ChP	SBZKG	LD_{50} = 42.7 ± 1.27 g/kg (mice, p.o.) ,it would cause renal and liver damage, induce serious damage of gastric mucosa. A significant toxicity on pregnancy maternal mice and embryo has been found and total alkaloids are one of the toxic substances.	[33]
ARMENIACAE SEMEN AMARUM*	Kuxinren	□□□	Prunus armeniaca L. var. ansu Maxim	LT	ChP	SBZKG	LD_{50} of Amygdalin is 25 g/kg (mice, i.v.),887 mg/kg(mice, p.o.),and hydrocyanic acid produced by Amygdalin could inhibit the activity of cytochrome oxidase, leading to cell respiration inhibition and cell death.	[34]
CAULIS ET FOLIUM PLUMBAGINIS	Bhuadan	□□□	Plumbago zeylanica Linn.	LT	SYNP	DLBSC	Skin redness, swelling and peeling contacted with Baihuadan, plumbagin free alcohol extract. Root and leaves have the reversible antiovulation activities for female rats	[35] [36]
RHIZOMA TACCAE	Jiangenshu	□□□	Tacca chantrieri Andre	MT	SYNP	YGT	Diarrhoea and vomiting have been reported in patients with mild intoxication, and intestinal mucosal exfoliation and hemorrhoea could appear in severe poisoning patients.	[37]
RADIX TRIPTERYGII HYPOGLAUCI	Huobahuagen	□□□□	Tripterygium hypoglaucum (Levl.) Hutch	LT	SYNP	GTSL	LD_{50} = 79 g/kg (male mice, p.o.) and 95% confidence limit is 69 ~ 89 g /kg, LD_{50} = 100 g/kg (female mice, p.o.) and 95% confidence limit is 90 ~ 112 g /kg. It has the reversible antifertility effect.	[38] [39]
ERYTH RINAE CORIEX *	Haitongpi	□□□	Erythina variegate L. Var.orientalis (L.)Merr	MT	SSCP	GTSL	Unknown	

Note: HT: high toxicity, MT: medium toxicity, LT: low toxicity, * means the herb has more than 2 origins, and only 1origin is showed in the table. SSCP: Standards for Chinese medicinal materials in Sichuan Province (2010)

Table 10

Toxic herbal medicines in YPMs

Scientific Name	Pinyin Name	Chinese Name	Origin	Toxicity degree	Standard	YPM	Modern toxicology
PARIDIS RHIZOMA*	Chonglou	□□	Paris polyphylla Smith var. chinenisi (Franch)Hara	LT	ChP	GFNC,NQSG, SYA,TSC,ZTL	-
OSMUNDAE RHIZOMA	Ziqiguanzhong	□□□□	Osmunda aponica Thunb.	LT	ChP	SWYA	Unknown
EUODIAE FRUCTUS	Wuzhuyu	□□□	Evodia rutaecarpa(Juss.)Benth.	LT	ChP	GDQC,HWYP	LD_{50} of its volatile oil is 2. 70 ml /kg(95% confidence limit: 2.58 ~ 2. 84 ml /kg, mice, p.o.), one of main target organ is liver.
BUFONIS VENENUM*	Chansu	□□	Bufo bufo gargarizans Cantor	MT	ChP	CLTC	Toad Venom (90 mg/kg) caused opisthotonus, ventricular arrhythmias, and increases in cardiac levels of Ca^{2+}, CK and LDH.
ARTEMISIAE ARGYI FOLIUM	Aiye	□□	Artemisia argyi Levl. Et Vant.	LT	ChP	KSG	LD_{50} of aqueous extract is 80.2 g/kg(95% confidence limit :77.4 ~ 83.4 g/kg, mice, p.o.), LD_{50} of volatile oil is 1.67 mL/kg□95% confidence limit :1.55 ~ 1.80 mL/kg ,mice, p.o.□, MTD of ethanol extract is 75.6 g/kg(mice, p.o.□
ACONITI KUSNEZOFFII RADIX	Caowu	□□	Aconitum kusnezoffii Reichb.	HT	ChP	TXT	It can cause serious cardiac dysfunction, and be damage to nervous system. LD50 of Aconitine is 1.8 mg/kg, for mice is 0.3 mg/kg. LD50 of Hypaconitine is 5.8 mg/kg, and LD50 of Mesaconitine is 1.9 mg/kg.
PAPAVERIS PERICARPIUM	Yingsuqiao	□□□	Papaver somniferum L.	MT	ChP	KLT	The main toxic components are morphine and codeine. Morphine with 60 mg could cause poisoning, and 250 mg could cause death.
ARISAEMATIS RHIZOMA*	Tiannanxing	□□□	Arisaema erubescens (Wall.)Schott.	MT	ChP	TXT	Producing folate deficiency and injury of kidneys
LAGGERAE HERBA	Choulingdan	□□□□	Laggera pterodonta (DC.) Benth.	MT	ChP	LL,SKCG	LD_{50} of water extract is 1.19 g/kg (mice,ip).
ARMENIACAE SEMEN AMARUM*	Kuxinren	□□□	Prunus armeniaca L. var. ansu Maxim	LT	ChP	SKCG,CLTC	-
PINELLIAE RHIZOMA	Banxia	□□	Pinellia ternate (Thunb.) Breit	MT	ChP	WFSC,ZXASG	-
PSAMMOSILENES RADIX	Jintiesuo	□□□	Psammosilene tunicoides W. C. Wu et C. Y. Wu	LT	ChP	ZTL	LD_{50} = 4.847195% confidence limit : 4.3251 ~ 5.4508 g/kg, mice, p.o.), the toxic target organs include lung, spleen and stomach
HERBA BOENNINGHAUSENIAE	Shijiaocao	□□□	Boenninghausenia sessilicarpa Levl .	LT	SYNP	SAC,SKCG	The ether extract could reduce the activity in mice by intraperitoneal injection.

Note: HT: high toxicity, MT: medium toxicity, LT: low toxicity, * means the herb has more than 2 origins, and only 1origin is showed in the table.

SGZP: Standards for Chinese medicinal materials in Guizhou Province (2009), SGDP: Standards for Chinese medicinal materials in Guangdong Province (20
SHNP: Standards for Chinese medicinal materials in Hunan Province (2009).

Scientific Name	Pinyin Name	Chinese Name	Origin	Toxicity degree	Standard	YPM	Modern toxicology
RHIZOMA DYSOSMATIS	Bajiaolian	□□□	Dysosma versipellis (Hance)M.Cheng ex Ying	LT	SYNP	ZTL,HJXJC, SLAC, WJHXZTT	LD_{50} = 0.493 ± 0.032 g/kg (mice, p.o.), it is toxicity to heart, and has the influcen on central nervous system appearing excited then inhibited.
RADIX MILLETTIAE BONATIANAE	Dafahan	□□□	Millettia bonatiana Pamp.	MT	SYNP	HSTT	Damage to stomach
FOLIUM CRAIBI0DENDRONIS	Jinyezi	□□□	Craibiodendron yunnanense W.W.Smith	HT	SYNP	ZTL	Unknown
RADIX TRIPTERYGII HYPOGLAUCI	Huobahuagen	□□□□	Tripterygium hypoglaucum (Levl.) Hutch	MT	SYNP	ZTL,GFNC	-
RADIX ANEMONES RIVULARIS	Wuzhangcao	□□□	Anemone rivularis Bunch.Ham.ex DC.	LT	SYNP	TYGT,YSL	Unknown
-	Daotihu	□□□	Delphinium yunnanense Franch.	MT	SGZP	WHXZTC	Unknown
RHIZOMA DIOSCOREAE BULBIFERAE	Huangyaozi	□□□	Dioscorea bulbifera L.	LT	SGDP	FFLC,FFLG	LD_{50} = 25.49 g/kg(mice, i.p), LD_{50} = 79.98 g/kg,250.3 g/kg or544g/kg(mice, p.o.), toxic target organs include liver and kidney.
CAULIS CLEMATIDIS ARGENTILUCIDAE	Shanmutong	□□□	Clematis apiifolia var. argentilucida (H.Leveille □ vaniot) W. T. Wang	LT	SHNP	NQSG	Unknown
RADIX ANISODI	Sanfensan	□□□*	Anisodus acutangulus C. Y. Wu et C. Chen	HT	SYNP	TXT	Unknown
FOLIUM DATURAE STRAMONII	Mantuoluoye	□□□□	Datura stramonium L.	MT	SYNP	YWNC	Shortness of breath and death after nerve stimulation
RADIX ACONITI BRACHYPODI SEU PENDULI	Xueshangyizhihao	□□□□□	Aconitum brachypodum Diels	HT	SHNP	ZTL	Petroleum ether extracts and N-butanol extracts are 6766.928,5492.337 mg/kg (mice, p.o.)

Note: HT: high toxicity, MT: medium toxicity, LT: low toxicity, * means the herb has more than 2 origins, and only 1origin is showed in the table.

SGZP: Standards for Chinese medicinal materials in Guizhou Province (2009), SGDP: Standards for Chinese medicinal materials in Guangdong Province (20
SHNP: Standards for Chinese medicinal materials in Hunan Province (2009).

Although some toxic herbs used in DPMs and YPMs, these proprietary medicines are considered safe and applied in clinical legally in China because of the unique set of pharmaceutical theories that include particular methods for processing, combining and decocting,which contribute to reducing toxicity as well as enhancing efficacy.For example, in traditional Dai medicine(TDM), the herbs used to reduce poison of toxic herbs are called “YaGei”, and “YaGei” theory (YGT or Detoxification theory) is considered as aunique supplementary theory of TDM[23]. The Dai herbal medicines named “YaGei” as antidotes could relieve all kinds of adverse reactions caused by food poisoning, drug poisoning and other substances[24].Besides, in order to keep healthy, Dai people also take antidotes regularly to eliminate the micro toxins in the body, and thus reduce the chance of illness and prolong life.

Due to the lack of more pharmaceutical information disclosed, as well as the lack of basic research, the safety information of these DPMs and YPMs including toxic herbal medinces is insufficient. The modern toxicological evidences of these toxic herbal medicines were collected and also showed in Table 9 and Table 10. Our focus is on these toxic herbal medicines which are known as Dai medicines or Yi medicines. Root of Tripterygium hypoglaucum (LevL.)Hutch (Huobahuagen,□□□□) soaked in wine as oral medicine was recorded inAilaoMateria Medica(□□□□□), a book translated and published according to ancient Yi medicine classics,and could be used to treat the arthritis, joint swelling and pain, bruise and sprain[25]. Boenning hauseniases silicarpa Levl. (Shijiaocao, □□□) was collected in Materia medica in South Yunnan(Dian Nan Ben Cao, AD.1396–1476) written by Lan Mao, its medicine property characteristics is bitter, pungent and warm, and it could treat chest pain or heartache□stomachache and abdominal distension. According to AilaoMateria Medica, Shijiaocao was used to deal with sore throat□gastric pain□dysentery□ it also could cure acute gastroenteritis in combination with the parasite of Zanthoxylum bungeanum in Wa Die Yi Medical book□□□□□□□□, a book proved to be written in the end of Qing dynasty in China[26]. In fact, more evidence in ancient documents would be researched deeply to record the application of these toxic herbs in the medical practice of Yi, Dai or other ethnic minorities in Yunnan. While modern toxicology experiments have provided more toxicity information of these toxic herbs, which are benefit to use them safely and cautiously. Of course, more scientific research are necessary to identify how these toxic herbs reduce the toxicity and remain effective in the prescriptions.

Discussion

Ethnomedicine is the important part of traditional Chinese medicine, which has formed its own unique medical theoretical system. During the course of thousands of years of ethnic amalgamation, traditional medicine of different nationalities has appeared a phenomenon of "diversity, integration and difference". According to statistics, about 8000 medicinal species are used in 40 ethnomedicines, which account for over 70% of total traditional Chinese medicine resources in China. Data from National Medical Products Administration of China shows that there are more than 600 kinds of EPMs[11].EPMs including DMP were collected from 1977 edition of Chinese Pharmacopoeia, some Miao patent medicines and YMPs were collected in Chinese Pharmacopoeia (2015 Edition), and the total number of EPMs reached 39. 26 prescription drugs and 13 OTC drugs are involved [7]. Furthermore, varieties of non-governmental prescriptions that cannot be counted are still use in clinical in the regions inhabited by ethnic groups of China.

This article focuses on traditional Dai medicine and traditional Yi medicine in Yunnan province because their long histories and ancient medical literature. The earliest ancient book of Yi Medicine that can be verified is Yuanyang Yi Medicine book, which was found in Yuanyang County of Yunnan Province in 1985 and written in 957 A.D[12]. The earliest ancient book of Dai Medicine that can be verified is Ge Ya San Ha Ya, which was considered to write in 964 – 884 B.C, and another work named Dang Ha Ya Long written in 1323 A.D[53]. According to statistic, there are 1666 Dai medicine (Dai Medicine Records of China, People's Medical Publishing House,2018) and nearly 1400 Yi Medicine[12], and 400 herbs are recorded in Yi Materia medica (Yi Yao Ben Cao, □□□□, Yunnan Science and Technology Press, 2019). The number of Yi medical prescriptions is 478 collated and published by Chinese Yi Medicine Prescriptions (Yunnan Ethnic Publishing House, 2017), and the number of Dai medical prescriptions is 200 collated and published by Study on Dai Traditional Medicine Prescriptions of China (Yunnan Ethnic Publishing House, 2013). The folk prescriptions from Dai or Yi medicine are not available to count out yet. Just as the example Yunnan Baiyao mentioned before, series of ethno medicines in Yunnan are successfully industrialized and modernized to promote the modern vitality of ancient ethno medicines and thus serve a wide population range. Tong Shu Capsule, an YPM produced by Yunnan Baiyao Group Co., Ltd., has been approved recently to conduct phase II clinical research in the United States. According to the plan of Yunnan Province, the total output value of pharmaceutical industry will reach 140 billion RMB, with an average annual growth of more than 15%□and traditional Chinese medicine including ethnic medicine and natural products account for 75% until 2020 [54]. The conclusions could be obtained from this investigation on Dai medicine and Yi medicine, and we summarized them into 5 aspects.

(1) Except Yunnan Baiyao Group Co., Ltd. and Dihon Pharmaceutical Co. Ltd, most of pharmaceutical enterprises of Yunnan Province for EPMs are small in the production scale, which lead to the limit on abilities of research and development on EPMs. We searched the number of publications of DPMs in CNKI (www.cnki.net), and until now the total number of 163 articles about these 28 DPMs has been published, while the number of documents about Yunnan Baiyao Aerosol has reached 59. It should be known that Yunnan Baiyao Aerosol is only one of CPMs produced by Yunnan Baiyao Group Co., Ltd., and just in 2015, 100 million bottles of Yunnan Baiyao Aerosol were produced, its output value exceeded 1.5 billion RMB. In the same year, the overall sales revenue of Yunnan Baiyao Group Co., Ltd. already achieved 20.74 billion RMB [5].

(2) Although it could not be acquired about the sales volume of YPMs and DPMs, and whether the herbal sources used in YPMs and DPMs are from wild collection, from the usage frequency in YPMs and DPMs, Ganca, Sanqi and Dengzhanxixin have a high proportion in YPMs and DPMs. The challenges of these herbal resources for sustainable utilization have been discussed before.

(3) The use of toxic herbal medicine is always affecting people's worries about the safety of TCM. Aristolochic acid nephropathy in Belgium and the adverse events of Xiao Chaihu Tang in Japan are the warning of the safety of CPM. More scientific evidence is needed to prove the rationality and necessity of using toxic herbs in EPMs.

(4) In the medical practice and the process of identifying and using herbal medicine, every ethnic minority mastered and formed their own experiences of using herbs. In this study, the characteristics of using animal medicines by Yi people were found out through the surveys and statistics on the herbal resources in DPMs and YPMs. And it also is certificated by the ancient medical literature of Yi minority.

(5) The usage methods of Dai and Yi medical prescriptions were recorded with Dai and Yi language historically; the clinical indications DPMs and YPMs are described with Chinese language. It is difficult to master more accurate usage information of DPMs and YPMs because of translation and it will be the next important work.

Conclusions

In the investigation, we can't get the selling information of these DPMs and YPMs because it's a trade secret for the enterprise, which affect our access to collect more information about DPMs and YPMs. On the other hand, it is a hard work to translate ancient Yi and Dai languages to Chinese; we cannot review the records of ethnic medicine formula in ancient medical literature. But abundant of medical practice and culture of ethnic minorities have existed in Yunnan for thousands of years, there are more than 1300 kinds of ethnic medicinal materials recorded in writing, and near to 30000 folk prescriptions in Yunnan Province. The medical information was recorded scatteredly in oral experiences or ancient documents written in various ethnic minority languages, such as *San Ma Tou Yi Medical book* (□□□□□□)and*Lao Wu Dou Yi Medical book* (□□□□□□) written in late Qing Dynasty of China. It should be believed reasonably that the ethnomedicine of Yunnan Province will provide more choices for human health through scientific experiments and dealing with the sustainable utilization of medicine resources.

Abbreviations

CPM: Chinese patent medicine; ChP: Chinese Pharmacopoeia; CK: creatine kinase; CR: Critically Endangered; Ca^{2+} : calcium ion; DPM: Dai patent medicine; DDTN: Dan Deng Tong Nao Capsule; EM: Ethnic medicine; EN: Endangered; HT: high toxicity; IUCN: List of International Union for Conservation of Nature; LC: Least Concern; LT: low toxicity; LDH: lactate dehydrogenase ; LD_{50} : Median lethal dose; i.v.: intravenous; MP: Medicinal parts; MT: medium toxicity; NPWP: National key protected wild plants of China (Aug 4th, 1999); NPWM: National key protected species of wild medicinal materials of China (Dec.1th, 1987); NQS:

No Quality Standard; NT: Near Threatened; OTC: over-the-counter drug; p.o. : per os; RTCHYN: the Rare Traditional Chinese Herbs of Yunnan Province in Urgent Needs; RMB: Renminbi; Ref. : Reference; SYNP: Standards for Chinese medicinal materials in Yunnan Province; SPOP: Standards for Chinese medicinal materials in other Province except Yunnan; SSDP: Standards for Chinese medicinal materials in Shandong Province(2012); SSCP: Standards for Chinese medicinal materials in Sichuan Province (2010); SGZP: Standards for Chinese medicinal materials in Guizhou Province (2009); TCM: Traditional Chinese Medicine; UF: Usage frequency; VU: Vulnerable ;WHO: the world health organization; YPM: Yi patent medicine

Declarations

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Availability of data and materials

We are willing to share the data generated or analyzed during the current study.

Authors 'contributions

LZY and HLQ conceived of and designed the study, conducted the data collection, and interpreted the data. LCF undertook the work of drawing, and evaluation of clinical indications was done by TSH and HXL. The herbal resource information was collected by ZXB and CXM. LZY and YHJ analyzed the data, and LZY drafted the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate:

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests

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Figures

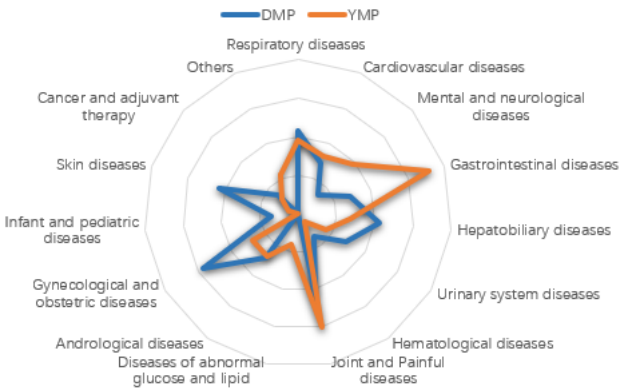


Figure 2

Statistics of clinical indications of DPM and YPM

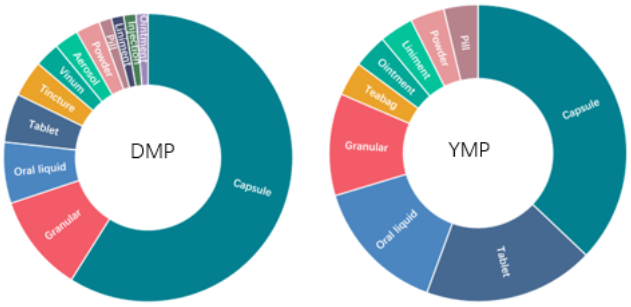
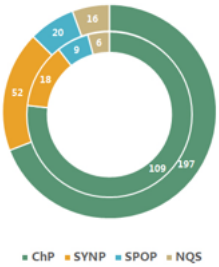


Figure 4

Statistics of dosage forms of DMP and YMP



ChP: China Pharmacopoeia; SYNP: Standards for Chinese medicinal materials in Yunnan Province; SPOP:Standards for Chinese medicinal materials in other Province except Yunnan; NQS: No Quality Standard

Figure 5

Quality standard levels of herbal medicines in DPMs（inner circle） and YPMs （external circle）

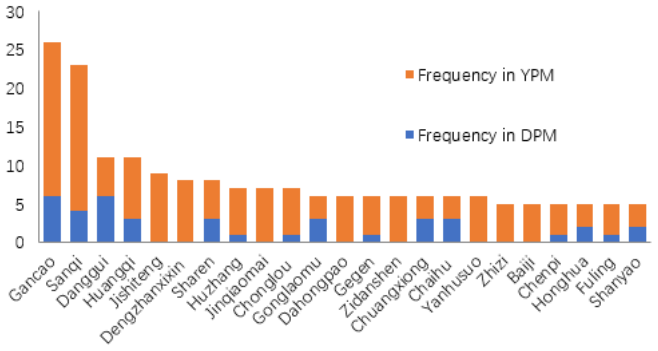


Figure 8

Usage frequency of herbal medicines in DPMs and YPMs

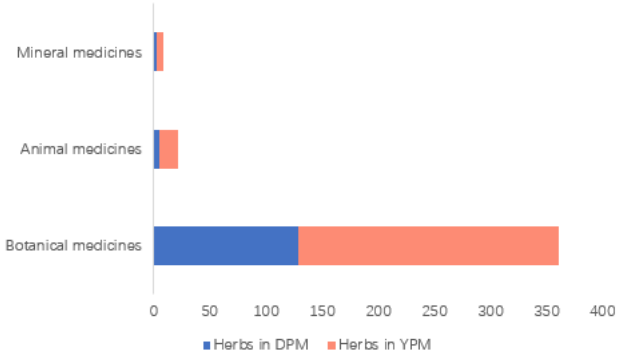


Figure 10

Source statistics of medical resources in DPMs and YPMs

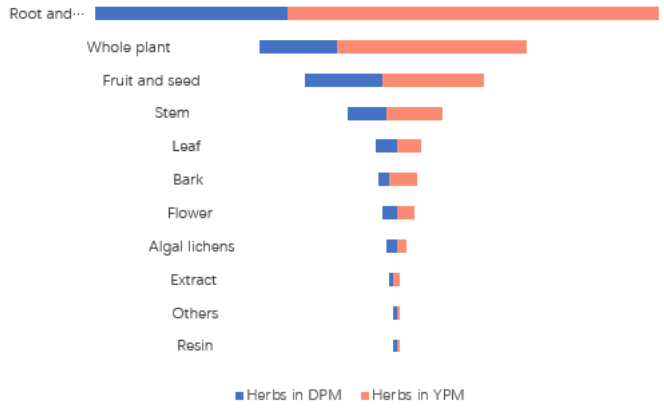


Figure 12

Statistics on Medicinal parts of Botanical medicines in DPMs and YPMs