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Ethnobotanical survey of antifertility medicinal plants in Dali District, Yunnan Province, China

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Abstract

In recent years, contraceptive medication has been widely used for birth control. It is worth noting that contraceptive medication from botanical source has great potential for clinical use. Yunnan is the province with the most species of plants in China and is known as the "plant kingdom". This study aims to archive herbal remedies traditionally used as antifertility remedies in Dali District, Yunnan Province, P. R. China. The survey was conducted from February 2011 to September 2016 in the population distributed in Dali and the surrounding counties. The data were collected from three groups of practitioners within the study area: therapists using traditional medicines (n = 104), aboriginal families (n = 37), and herbalists in commercial stalls (n = 12), and a total number of 117 plant species were recorded. Among the 117 plant species, 104 of which have been authenticated by a plant taxonomist from the Dali Herbarium. These plants were classified into 98 genera and 54 families, including Leguminosae (12 species), Liliaceae (7 species), Cucurbitaceae, Rosaceae and Rutaceae (5 species, respectively), Malvaceae, Compositae and Euphorbiaceae (4 species, respectively). Our data provides an in-depth delineation of the contraceptive plants used in Dali, which serve as valuable information for the practitioners of traditional Chinese medicine in contraceptive use. In addition, these data also hint that plants from different genus contain contraceptive components, which should be avoided by pregnant women. Future studies are required to identify the active contraceptive components, assess the toxicology, and elucidate the pharmacological mechanism of action. *(Afr J Reprod Health 2022; 26[5]: 107-119).*

Keywords: Herbal remedies, Contraceptive plants, Yunnan, Leguminosae

Résumé

Ces dernières années, les médicaments contraceptifs ont été largement utilisés pour le contrôle des naissances. Il convient de noter que les médicaments contraceptifs de source botanique ont un grand potentiel d'utilisation clinique. Le Yunnan est la province qui compte le plus d'espèces de plantes en Chine et est connue comme le "royaume végétal". Cette étude vise à archiver les remèdes à base de plantes traditionnellement utilisés comme remèdes contre la fertilité dans le district de Dali, province du Yunnan, République populaire de Chine. L'enquête a été menée de février 2011 à septembre 2016 auprès de la population répartie à Dali et dans les comtés environnants. Les données ont été recueillies auprès de trois groupes de praticiens dans la zone d'étude : les thérapeutes utilisant des médecines traditionnelles (n = 104), les familles autochtones (n = 37) et les herboristes dans les étals commerciaux (n = 12), et un nombre total de 117 plantes espèces ont été enregistrées. Parmi les 117 espèces végétales, dont 104 ont été authentifiées par un taxonomiste végétal de l'Herbier Dali. Ces plantes ont été classées en 98 genres et 54 familles, dont les Leguminosae (12 espèces), les Liliaceae (7 espèces), les Cucurbitaceae, les Rosaceae et les Rutaceae (respectivement 5 espèces), les Malvaceae, les Compositae et les Euphorbiaceae (respectivement 4 espèces). Nos données fournissent une délimitation approfondie des plantes contraceptives utilisées à Dali, qui constituent des informations précieuses pour les praticiens de la médecine traditionnelle chinoise dans l'utilisation des contraceptifs. En outre, ces données suggèrent également que les plantes de différents genres contiennent des composants contraceptifs, qui devraient être évités par les femmes enceintes. Des études futures sont nécessaires pour identifier les composants contraceptifs actifs, évaluer la toxicologie et élucider le mécanisme d'action pharmacologique. *(Afr J Reprod Health 2022; 26[[5]: 107-119).*

Mots-clés: Plantes médicinales, plantes contraceptives, Yunnan, Légumineuses

Introduction

Rapid population growth has become a global issue and raises many concerns for human beings. According to data from the US Census Bureau, the total population of the world is close to 7.6 billion people[1]. Overpopulation has caused numerous social and environmental problems. Human beings must compete for natural resources and strive for harmony between the population and the environment. Mounting evidence shows that the most effective approach to achieving such balance is to control human population[2]. Although modern contraceptive drugs have been widely used as an effective approach for birth control, they could lead to a series of side effects[3]. Besides, due to the financial, geographical, and cultural barriers, the application of modern contraceptive drugs have been limited in the developed regions, which indicates that approximately 75% of the world population has little access to modern healthcare products and conventional therapeutics[4].

The practices of simultaneously using traditional and modern medicines for contraceptive purposes continue in many developing communities[5]. A previous study in India suggests that more than 80% of the ethical people had been primarily relying on ethnobotanical remedies in rural regions due to the accessibility and affordability of traditional medical plants[6]. Recently, ethnobotany information regarding medicinal plants gained considerable attention and has been widely used to discover novel compounds with potential therapeutic effects based on their traditional medical usage[7,8]. Since medicinal plants have been widely used in different countries for contraception[9,10], the archiving and investigation of those medicinal plants have great potential for the formulation of safer contraceptive recipes.

Yunnan Province in China is one of the regions with the richest medicinal plant resources in the world[11]. The usage of medical plants for different complications is a tradition for many local ethnical groups in Yunnan[12,13]. There are multiple surveys regarding the archiving and investigating different medical plants used in Yunnan province[14-19]. For example, a study in Wulian mountainous region of Yunnan province recorded a total of 302 traditional medicinal plant species belonging to 117 families and 252 genera[14]. The most commonly utilized species were members of family Papaveraceae, which are used as an antipyretic drugs[14]. Another study reported that a dibenzofuran compound extracted from a medical plant in Yunnan Province is a promising anticancer agent with strong inhibitory activities on various cancers[17]. However, there is a lack of archive information about the usages of medical plants for contraceptive purpose in Yunnan province.

In this study, we surveyed the therapists using traditional medicines, aboriginal families and herbalists in Dali District, Yunnan Province, P. R. China, and collected the medical plant species which are used as traditional contraceptives. A total number of 117 plant species were recorded, 104 of which were authenticated by a plant taxonomist from the Dali Herbarium. These plants were classified into 98 genera and 54 families. Our study provided useful information to expand evidence-based clinical practice and sustainable utilization of local medical plant resources. Our survey also laid a solid foundation for the exploration of biological activity and phytochemical investigation of their contraceptive usage, which warrants future safety and toxicology evaluation.

Methods

Study area

Dali is an autonomous prefecture in the northwestern area of Yunnan Province at around 24°41′-26°42′ N and 98°52′-101°03′ E, with a total area of 29,459 square Km (11,370 sq mi). The altitude of this area ranges from 730 m to 4295 m. Dali is subdivided into 12 county-level divisions: one county-level city, eight counties and three autonomous counties (Figure 1). Northwestern area of Yunnan Province was identified to be a hotspot of biodiversity in the world[20, 21]. The medicinal plant diversity in the minority area such as Bai, Yi, Lisu, Hui, Naxi, Tibetan, Yao, Yi and Zhuang etc., has been very important to the health-care and disease treatment for local people[22]. The main ethnic group in Dali is Bai. The medical

Figure 1

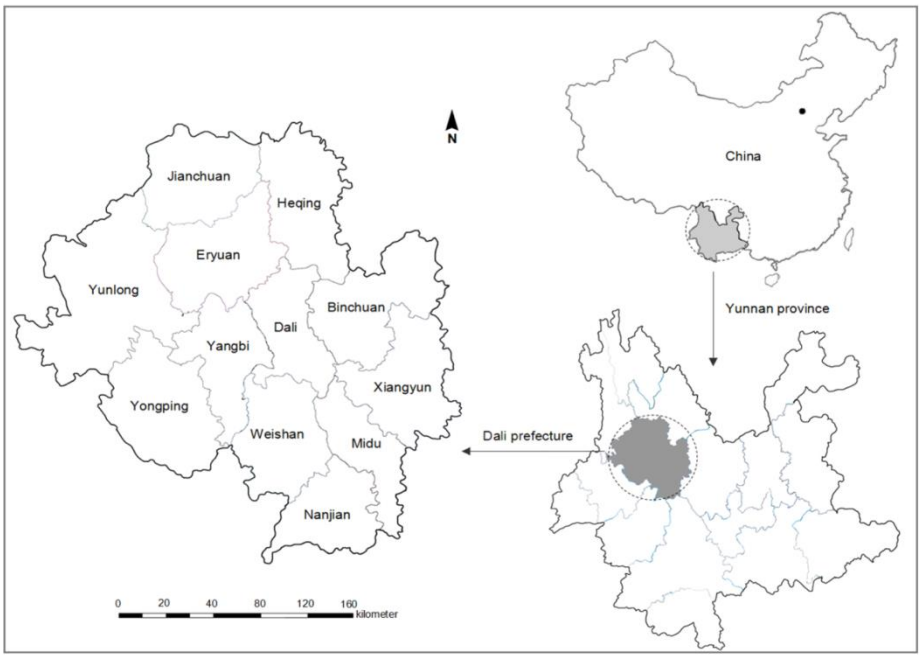

Figure 1: Study area in Dali Bai nationalities autonomous prefecture, NW Yunnan Province, P. R. China

Figure 2

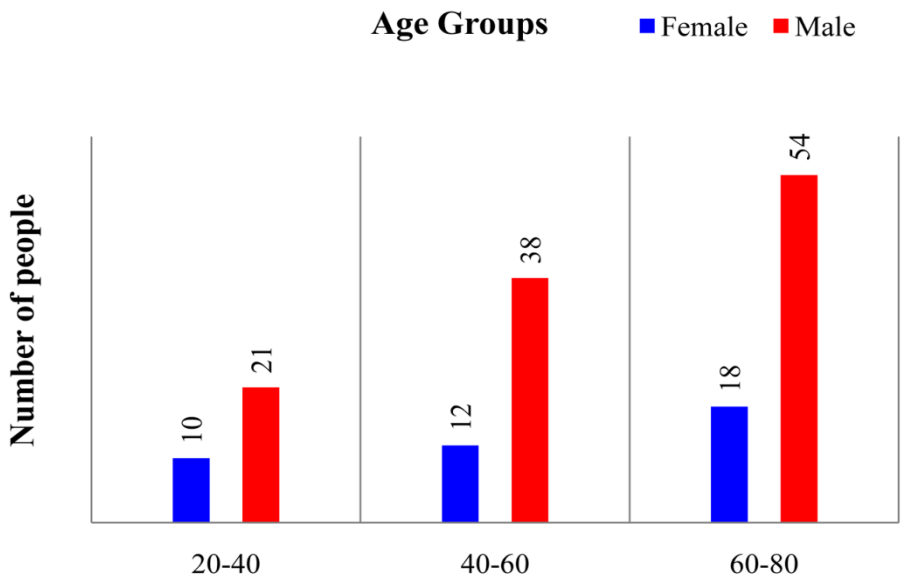

Figure 2: Distribution of gender, age and number of informants interviewed

infrastructure in the region is generally unevenly developed. High-quality medical resources are concentrated in cities, and rural medical resources are relatively scarce. According to the 2018 registered population statistics, the total population of Dali Prefecture in Yunnan is 3.3652 million. The people in Dali were primarily agricultural workers. This survey was conducted in eleven cities, including Dali, Weishan, Binchuan, Midu, Heqing, Yunlong, Yangbi, Yongpin, Eryuan, Nanjian and Jianchuan County.

Data collection

All protocols were approved by the Ethics committee of the first Affiliated Hospital of Dali University (approval number: DLU201205). The survey lasted from February 2011 to September 2016. Information was collected through semi-structured ethnobotanical interviews with the aboriginal people throughout their living areas in fields and mountains[23]. The interviews were repeated for 14 times to validate the information. We try to control the interview time as much as possible, about 10-20 min. The plants were collected after our on-site investigation. Three following groups were interviewed in the study area, including traditional healers (interviewed at their homes, n=104), aboriginal households (house-to-house interviews, n=37), and herbalists in front of the commercial stalls (on the local periodic markets that were primarily the largest ones in each of the following county: Dali, Eryuan, Yunlong, Heqing and Weishan, n=12). All participants were knowledgeable in their interview subjects. Information about local name(s), applications, preparation method, dosage and administration, parts used, and other comments were collected.

Photographs and a voucher specimen from each plant were taken. A total number of 117 voucher specimens were collected and authenticated by a plant taxonomist from the Dali Herbarium. These species were deposited in the Herbarium at Dali University (Yunnan Province, China). The scientific names of plant species were identified according to Flora of China (FOC: http://foc.eflora.cn/) and International Plant Names Index (IPNI: www.ipni.org). These plant species were verified by Dr. De-en Yang from the Department of Botany, Dali University.

Results

Demographics of surveyed informants

A total of 153 inhabitants were interviewed. Men contributed 73.85% in the practices of traditional medicine, probably due to the cultural traditions in the region where women were not encouraged to work outside the family. The informants were divided into three different age groups (Figure. 2). About 47.05% of interviewees were 60~80 years old and 32.67% was 40~60 years old. The median age of the informants was 57 years old. The majority of the people did not have formal education (42.35%) and spent all or most of their lifetime in the studied region. Most of them had 10~20 years of relevant experience (39.62%). A half of herbalists were illiterate (48.2%) and some people only completed primary or secondary education (11.21% and 23.45% respectively).

Medicinal plants species distribution

One hundred and seventeen plant species were recorded with contraceptive usages, among which 104 species were identified. They belonged to 98 genera and 54 families, which are summarized in Table 1. The most common families were Leguminosae (12 species - 11.5%), Liliaceae (7 species - 6.7%), Cucurbitaceae, Rosaceae and Rutaceae (5 species - 4.8%, respectively), Malvaceae, Compositae and Euphorbiaceae (4 species - 3.8%, respectively). The species and the utilization method in herbal medicine are provided (Table 1, Figure 3 and Figure 4). Most medicinal plants were obtained from the Leguminosae family in which a wide range of bio-active compounds was present[24,25]. It is worth mentioning that the Leguminosae family is the third largest plant family on land.

Herbs (53.8%) were the most common plants used as contraceptive medicines, followed by shrubs (18.3%), climbers (14.4%), and trees (13.5%). Herbaceous plants are naturally abundant in the Northwestern area of Yunnan Province[26,27].

Figure 3

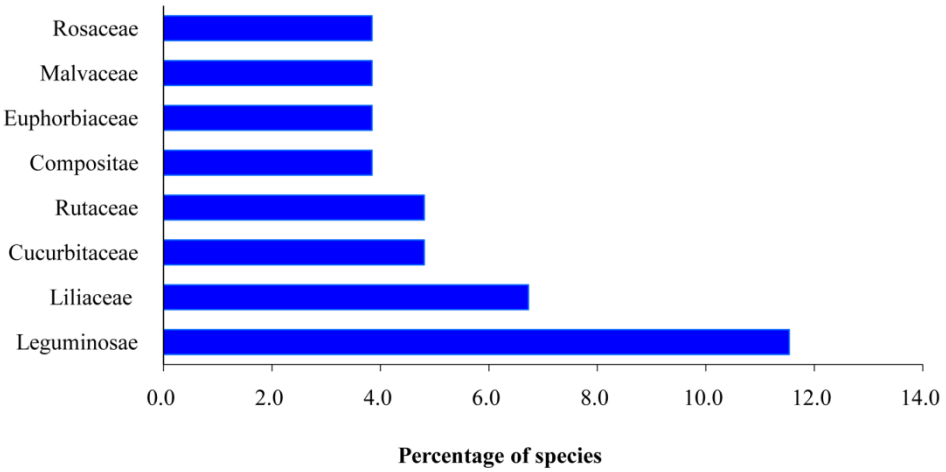

Figure 3: Plant families in this study cover the majority of the species

Figure 4

Figure 4: Collected medicinal plants from Dali district, Yunnan Province, China. (A) *Tripterygium hypoglaucum* (Levl.) Hutch; (B) *Coriarianepalensis* Wall.; (C) *Paris polyphylla* Sm. var. yunnanensis (Franch.) Hand.-Mazz.; (D) *Carthamustinctorius* L.; (E) *Mirabilis jalapa* L.; (F) herbalist with medicine plant in Eryuan district, Yunnan Province, China. (G, H) The crude drugs and the herbalist in the market.

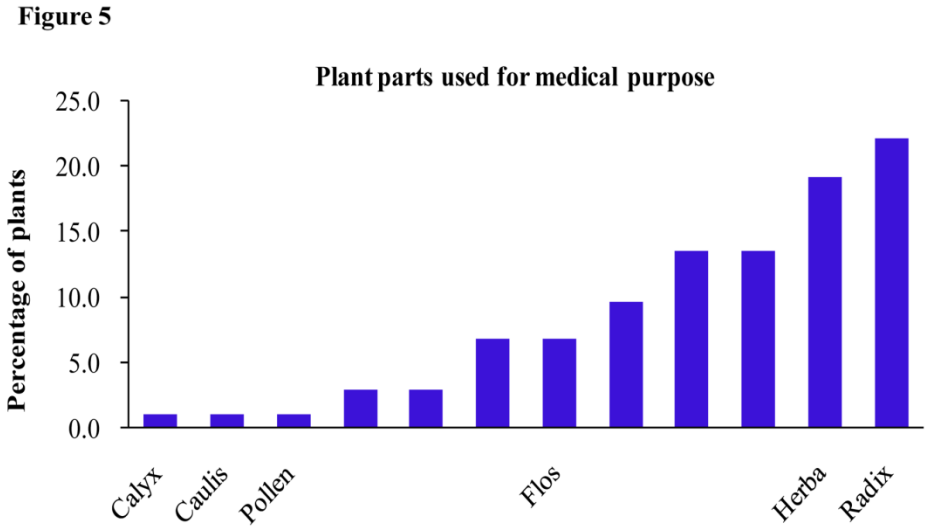

Figure 5: Percentage of medicinal plant parts used for medical purposes

The herbs are a predominant source of herbal therapies because they contain high pharmacologically active components compared to woody plant forms[28]. However, the shrubs seem to be more popular because they are available throughout the year and the active components in these plants might not be significantly affected by seasonal variations[29].

Plant parts and preparation mode

Among all plant parts, radix was the most frequently used part (21.2%) followed by the herba (19.2%), semen (13.5%), rhizoma (10.6%), cortex (6.7%), fructus (13.5%), flos (6.7%), bulbus and folium (2.9%), calyx, caulis and pollen (1.0%) (Figure 5). Radix and herbal were the most favored parts in herbal medicines as they contain a large number of bio-active compounds[30]. The major remedies were basically followed by decoction (91.3%, 95 species) or cooking with meat (3.8%, 5 species). In general, the plants were used when fresh or dry essentially in the form of decoction and powder.

The informants living in their villages usually used these wild plants after drying, which also enabled study participants to use medicinal plants throughout the year. The medicine was generally prepared by using water or wine as a solvent and orally administrated. In some cases (5.1%), some additives were added into the medicine to make it less bitter. Most remedies were taken once or twice a day. Almost all medicinal remedies were developed according to the preparation of a single plant. This finding is consistent with the previous report[15,16].

Discussion

Yunnan is located on a plateau and is known as the "Plant Kingdom"[31]. It has rich resources of Chinese medicinal materials, and has a long history of ethnic medicine such as Dai medicine and Yi medicine[32,33]. As early as more than 500 years ago, the famous doctor of southern Yunnan, Lan Mao, wrote the earliest Chinese herbal medicine monograph "Southern Yunnan Materia Medica" in Yunnan history[23]. It is more than 140 years before the "Compendium of Materia Medica" by the medical scientist Li Shizhen of the Ming Dynasty, and it still has important academic and clinical value. Therefore, excavating and developing the medicinal value of Chinese herbal medicine plants in Yunnan Province plays an important role in the local economic and social development[22]. Our research team surveyed Dali Prefecture as the main

Table 1: Medicinal plant used for contraceptive purpose in Dali State

Family (total no. of species)	Scientific name	Voucher specimen No.	Local name	Parts used	Mode of use
Acanthaceae	*Andrographis paniculata* (Burm. f.) Nees	11EY07	Chuanxinlian	Herba	Decoction is used orally
Alangiaceae	*Alangiumchinense* (Lour.) Harms	11JC02	Bajiaofeng	Radix	Decoction is used orally
Alismataceae	*Sagittariasagittifolia* L.	11EY24	Cigu	Rhizoma	Decoction is used orally
Amaranthaceae (2)	*Celosia cristata* L.	12YL23	Jiguanhua	Flos	Decoction is used orally
	Achyranthes aspera L.	12YL14	Tuniuxi	Herba	Decoction is used orally
Anacardiaceae	*Anacardium occidentale* L.	11EY02	Yaoguo	Fructus	Decoction is used orally
Apocynaceae	*Rauvolfiaverticillata*(Lour.) Baill.	14YL18	Luofumu	Radix	Decoction is used orally
Apocynaceae (2)	*Catharanthus roseus* (L.) G. Don	12ER12	Changchunhua	Herba	Decoction is used orally
	*Ilex cornuta*Lindl. & Paxton	13JC13	Kudingcha	Folium	Decoction is used orally
Araceae (3)	*Arisaema yunnanense*Buchet	11EY05	Shanzhubanxia	Rhizoma	Decoction is used orally
Araceae	*Pinelliaternata* (Thunb.) Breit.	12YL45	Banxia	Rhizoma	Rhizoma is crushed and mixed with hot water
Araceae	*Acoruscalamus* L.	11YL04	Shuichangpu	Rhizoma	Sparkling wine is used orally
Asclepiadaceae (2)	*Marsdeniaoreophila* W. W. Sm.	14YL02	Niunaicai	Radix	Decoction is used orally
	Impatiensbalsamina L.	13EY01	Jixingzi	Semen	Decoction is used orally
Boraginaceae	*Onosmapaniculatum* Bur. et Fr.	14YL08	Dianzicao	Radix	Leaf juice is taken orally
Bromeliaceae	*Ananascomosus* (L.) Merr.	12JC04	Boluo	Fructus	Decoction is used orally
Capparaceae	*Capparisacutifoliasubsp. bodinieri* (H.Lév.) M.Jacobs	11EY08	Miaohuzihua	Radix	Decoction is used orally
Caprifoliaceae	*Lonicerajaponica*Thunb.	13EY02	Jinyinhua	Flos	Decoction is used orally
Caryophyllaceae	*Vaccariasegetalis* (Neck.) Garcke ex Asch.	13YL50	Wangbuliuxing	Semen	Decoction is used orally
Celastraceae	*Tripterygiumhypoglaucum* (Levl.) Hutch	13YL42	Diaomaocao	Radix	Decoction is used orally
Compositae (4)	*Carthamustinctorius* L.	12EY11	Honghua	Flos	Decoction is used orally
	Taraxacumofficinale Weber ex F. H. Wigg.	14EY09	Pugongying	Radix	Decoction is used orally
	Artemisiaargyi H. Lév. et Vaniot	12HQ09	Aicao	Herba	Decoction is used orally
	Siegesbeckiaorientalis L.	13EY17	Xixiancao	Herba	Decoction is used orally

Coriariaceae	*Coriarianepalensis* Wall.	11EY12	Masang	Folium	Decoction is used orally
Cruciferae	*Raphanussativus* L.	11EY33	Luobo	Semen	Cooked together with meat
Cucurbitaceae (5)	*Momordicacharantia* L.	14JC01	Kugua	Fructus	Cooked together with meat
	Trichosantheskirilowii Maxim.	11EY37	Tianhuafen	Radix	Decoction is used orally
	Bolbostemmapaniculatum (Maxim.) Franquet	12HQ13	Tubeimu	Rhizoma	Decoction is used orally
	*Luffacylindrica*Roem.	14EY04	Siguazi	Semen	Decoction is used orally
	Momordicacochinchinensis (Lour.) Spreng.	14JC06	Mubiezi	Semen	Decoction is used orally
Dryopteridaceae (2)	*Arachniodesexilis* (Hance) Ching	12HQ02	Erjue	Rhizoma	Decoction is used orally
	*Dryopteriscrassirhizoma*Nakai	12YL50	Guanzhong	Rhizoma	Decoction is used orally
Ebenaceae	*Diospyroskaki*Thunb.	11EY18	Shidi	Calyx	Decoction is used orally
Euphorbiaceae (4)	*Mallotusphilippensis* (Lam.) Müll.Arg.	11EY26	Cukangchai	Fructus	Decoction is used orally
	Euphorbia *kansui*S.L.Liou ex S.B.Ho	12YL51	Gansui	Radix	Decoction is used orally
	*Euphorbiajolkinii*Boiss.	13YL49	Dalangdu	Radix	Decoction is used orally
	Ricinuscommunis L.	13JC40	Bima	Semen	Decoction is used orally
Labiatae (2)	*Menthahaplocalyx*Briq.	11EY31	Bohe	Herba	Cooked together with meat
	*Leonurusjaponicus*Houtt.	11EY25	Yimucao	Herba	Decoction is used orally
Leguminosae (12)	*Spatholobussuberectus* Dunn	11EY36	Jixueteng	Caulis	Decoction is used orally
	*Albiziajulibrissin*Durazz.	11JC05	Hehuanpi	Cortex	Decoction is used orally
	Acaciafarnesiana (L.) Willd.	11YL03	Jinhehuan	Cortex	Decoction is used orally
	Psoraleacorylifolia L.	12YL47	Buguzhi	Fructus	Decoction is used orally
	Sophorajaponica L.	13EY23	Huaijiao	Fructus	Decoction is used orally
	*Sophora*flavescensAiton	12YL49	Kushen	Radix	Decoction is used orally
	*Puerariaedulis*Pamp.	13YL35	Gegen	Radix	Decoction is used orally
	Abrusprecatorius L.	12YL02	Xiangsizi	Semen	Decoction is used orally
	Trigonellafoenum-graecum L.	13EY28	Huluba	Semen	Decoction is used orally
	Urarialagopodioides (L.) Desv. ex DC.	11EY41	Tuweicao	Herba	Decoction is used orally
	Medicagosativa L.	14YL05	Zimuxu	Herba	Decoction is used orally
	Phaseolusvulgaris L.	14YL24	Baifandou	Semen	Decoction or cooked with meat
Liliaceae (7)	*Alliumcepa* L.	11JC06	Yangcong	Bulbus	Decoction is used orally
	Alliumsativum L.	12JC03	Dasuan	Bulbus	Decoction is used orally

	Iphigeniaindica (L.) A.Gray ex Kunth	12YL24	Lijiangshancigu	Bulbus	Decoction is used orally
	*Veratrumtaliense*O.Loes.	14YL26	Dalililu	Radix	Decoction is used orally
	Parispolyphylla Sm.	14YL17	Chonglou	Rhizoma	Rhizoma is crushed and taken orally
	Parispolyphylla Sm. var. *yunnanensis* (Franch.) Hand.-Mazz.	14YL21	Dianchonglou	Rhizoma	Rhizoma is crushed and taken orally
	Parismairei H. Léveillé	12YL17	Chonglou	Rhizoma	Rhizoma is crushed and taken orally
Loranthaceae	*Loranthusyadoriki*Sieb	14ER01 g	Maoyesangjishen	Herba	Decoction is used orally
Malvaceae (4)	*Hibiscussyriacus* Linn.	12YL61	Mujin	Cortex	Decoction is used orally
	*Abelmoschusmanihot*L.Medic.	11EY01	Huangshukui	Flos	Decoction is used orally
	Gossypiumherbaceum L.	12YL55	Miangen	Radix	Decoction is used orally
	Hibiscusrosa-sinensis L.	12YL58	Zhujin	Flos	Decoction is used orally
Meliaceae	*Meliaazedarach* L.	12YL37	Chuanlian	Fructus	Decoction is used orally
Moraceae	*Cannabissativa* L.	12EY05	Huomaren	Semen	Decoction is used orally
Myrsinaceae	*Ardisiacrenata* Sims	12HQ07	Zhushagen	Radix	Decoction is used orally
Myrtaceae (2)	*Punicagranatum* L.	13YL37	Shiliupi	Cortex	Decoction is used orally
	Psidiumguajava L.	13JC31	Fanshiliu	Fructus	Decoction is used orally
Nyctaginaceae	*Mirabilis*jalapa L.	14JC09	Zimoli	Radix	Decoction is used orally
Palmae	*Trachycarpusfortunei* (Hook.) H. Wendl.	14EY11	Zonglv	Fructus	Decoction is used orally
Phytolaccaceae	*Phytolaccaacinosa*Roxb.	14YL30	Shanglu	Radix	Decoction is used orally
Pinaceae	*Pseudolarixamabilis* (J. Nelson) Rehder	13EY10	Jinqiansong	Cortex	Decoction is used orally
Piperaceae (2)	*Pipernigrum* L.	13EY04	Hujiao	Fructus	Decoction is used orally
	Piperlongum L.	14YL12	Bibo	Fructus	Decoction is used orally
Plumbaginaceae	*Ceratostigmaminus*Stapf ex Prain	11EY10	Xiaolanxue	Herba	Decoction is used orally
Portulacaceae	*Portulacaoleracea* L.	13EY05	Machixian	Herba	Decoction is used orally
Primulaceae	*Androsaceumbellata* (Lour.) Merr.	12HQ01	Diandimei	Herba	Decoction is used orally
Pteridiaceae	***Pteridiumaquilinum*** (L.) Kuhn ***var. latiusculum*** (Desv.).	11EY32	Jue	Herba	Decoction is used orally
Pyrolaceae	*Pyrolacalliantha* Andres	13YL38	Luxiancao	Herba	Decoction is used orally

Ranunculaceae (3)	*Paeonia suffruticosa* Andrews	12YL41	Danpi	Cortex	Decoction is used orally
	Aconitumbrachypodun Diels	11YL05	Xueshangyizhiga o	Radix	Decoction is used orally
	*Clematischinensis*Osbeck	12ER17	Weilingxian	Radix	Decoction is used orally
Rosaceae (5)	*Amygdaluspersica* L.	12YL15	Tao	Folium	Decoction is used orally
	Prunus *mumeSiebold* et Zucc.	13EY09	Wumei	Fructus	Decoction is used orally
	Sanguisorbaofficinalis L.	14EY07	Diyu	Radix	Decoction is used orally
	*Agrimoniapilosa*Ledeb.	12YL11	Xianhecao	Herba	Decoction is used orally
	Gardeniajasminoides J. Ellis	11EY22	Zhizihua	Flos	Decoction is used orally
Rubiaceae (2)	*Hedyotisdiffusa*Willd.	12YL25	Baihuasheshecao	Herba	Decoction is used orally
	Paederiascandens (Lour.) Merr.	14YL13	Jishiteng	Herba	Decoction is used orally
Rutaceae (5)	*Phellodendronchinense* C. K. Schneid.	14YL29	Huangbai	Cortex	Decoction is used orally
	Tetradiumruticarpum (A. Juss.) Hartley	13EY22	Wuzhuyu	Fructus	Decoction is used orally
	Murrayaexotica L.	11EY34	Jiulixiang	Radix	Decoction is used orally
	Rutagraveolens L.	12EY15	Yunxiang	Herba	Decoction is used orally
	*Boenninghauseniasessilicarpa*H.Lév.	12HQ10	Shijiaocao	Herba	Decoction is used orally
Sapindaceae	*Sapindusmukorossi*Gaertn.	13EY15	Wuhuanzi	Semen	Decoction is used orally
Theaceae	*Camelliaoleifera* Abel.	12EY01	Youchaguo	Semen	Decoction is used orally
Thymelaeaceae	*Daphnegenkwa*Sieb. et Zucc.	12EY27	Yanhua	Flos	Decoction is used orally
Typhaceae	*Typhaangustifolia* L.	13YL45	Puhuang	Pollen	Decoction is used orally
Umbelliferae (3)	*Daucuscarota* L.	12EY31	Huluobuzi	Fructus	Decoction is used orally
	Cnidiummonnieri (L.) Cusson	12ER18	Shechuangzi	Semen	Decoction is used orally
	Coriandrumsativum L.	12ER23	Yansuizi	Semen	Decoction is used orally
Verbenaceae	*Clerodendrumbungei*Steud.	11EY13	Chumudan	Radix	Decoction is used orally
Zingiberaceae	*Curcumalonga* L.	11EY17	Jianghuang	Rhizoma	Decoction is used orally

study area, and archived the species of herbs traditionally used for anti-fertility remedies in Dali, Yunnan Province, China. As far as we know, this is the first collection of medical plant information regarding contraceptive usage in Yunnan province.

It is well known that long-term use of norethindrone contraceptives have many toxic and side effects[27]. In the past ten years, researchers have made great efforts to discover more effective, non-toxic and convenient contraceptive drugs. Many scholars have focused their efforts on the anti-fertility pharmacological research of Chinese herbal medicine, and the modes of actions of some anti-fertility herbs have been elucidated. For instance, the anti-fertility effect of *Tripterygium wilfordii* is mainly in the testis, which can hinder the conversion of round sperm cells to elongated sperm[28]. *Ophiopogon japonicus* destroys and damages the surface morphology and ultrastructure of human sperm[34]. Allicin (a compound from *Allium sativum,* family Liliaceae) has been reported to have a strong inhibitory effect on human and animal sperm[35], which seems non-irritating to the vagina and does not interfere with the normal growth of bacteria in the vagina. The above studies have conducted in-depth investigation of the antifertility effect of Chinese herbal medicine. Interestingly, we also found 7 members of Liliaceae have been used as contraceptive medicines in Dali region. We expect that the future exploration of these plants could shed lights on the bioactive compounds and their modes of actions. It is also worth mentioning that radix and herbal were the most frequently used parts in the recorded medical plants, which maybe because that those parts produce a large number of bio-active compounds[30].

Since the indigenous people in the region have a long history of using medicinal plants as contraceptive, our data provided a comprehensive reference to further evaluate the safety and compare the efficacy of different plants in the future studies. In addition, the contents and level of active components in the plants may vary by seasonal changes[29]. Comparative studies are required to further assess the contraceptive values of the medical plants collected indifferent seasons. As some of those plants are rare species, it is also important for the local government to set up regulations as a curb for the over-exploration before the extinction. Unfortunately, there is currently a lack of knowledge about the physiological effects and mechanisms of actions of these medical plants. These plant species should be further studied to systematically assess their efficacy, toxicology, and pharmacological mechanisms of actions. We anticipate that the future efforts will shed lights on some safe and effective contraceptive compounds from the study of these medical plants.

Conclusion

This study archived the use of anti-fertility medicinal plants by local people in Dali, Yunnan Province, China. Our data provide valuable information for the local practitioners of traditional Chinese medicine in contraceptive use. In addition, our data also hint that these plants should be avoided by pregnant women. Future efforts are required to identify the active contraceptive compounds, evaluate the toxicology and elucidate their mechanisms of actions.

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Conflict of interest

The authors have declared that no competing interests exist.

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