TRADITIONAL AND INTEGRATIVE MEDICINE

Trad Integr Med, Volume 6, Issue 4, Autumn 2021

Original Research

Ethnopharmacological Studies of Medicinal Plants Used by Ethnic Groups in *Bardsir* Region, *Kerman* Province

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Received: 24 May 2021 **Revised:** 28 Aug 2021 **Accepted:** 9 Sep 2021

Abstract

Ethnobotanical studies try to gather indigenous cultures plant knowledge from different regions and tribes all over the world. This study aimed at obtaining, documenting and analyzing medicinal plants used by some ethnic groups in Bardsir region, Kerman province, Iran. Data collection was done through face-to-face interviews, and finally, 120 questionnaires were filled out. Based on the local knowledge, the data collection was analyzed using quantitative values including family importance value (FIV), relative frequency of citation (RFC), fidelity level (FL), use-value index (UV), and factor of informant consensus (FIC). In this study, 47 medicinal plants were recorded belonging to 22 families. The results expressed the highest FIV belonged to Lamiaceae (57%) family. The hemicryptophytes (49%) were also regarded as the most common life forms of the used species. In the current study, the highest RFCs and UV indices belonged to *Urtica urens* L. 0.21, and 0.39, respectively. *Achillea santolinoides* subsp. *wilhelmsii* (K.Koch) Greuter, and *Teucrium polium* L. had the maximum percentage of FL for treating digestive system disorders. In the present study, the highest indices belonged to *U. urens, A. santolinoides* subsp. *wilhelmsii* and *T. polium*; thus, it is recommended conducting further in vitro and in vivo pharmacological studies on the mentioned species.

Keywords: Botanical folk-knowledge; Family importance value; Fidelity level; Use-value index; Factor of informant consensus

Citation: Sarhadynejad Z, Sharififar F, Eslaminejad T, Sarhadinejad Z, Pourmirzaie A, Ansari M. **Ethnopharmacological Studies of Medicinal Plants Used by Ethnic Groups in *Bardsir* Region, *Kerman* Province.** Trad Integr Med 2021;6(4):427-443.

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Introduction

Ethnobotany is the science of studying interrelations between humans and plants. Up to 25% of prescribed drugs in conventional medicine are related to natural substances. Also, ethnobotany provides basic knowledge about medicinal plant uses and directs where we are today in drug industry [1].

World Health Organization reports that around 65-80% of the world population trusts one way of treatment based on traditional and complementary medicine. Hundreds of published articles in recent years show the important role of medicinal plants in both traditional and conventional medicine [2-5].

Iran has a long history in using medical plants. According to *Vidaevadata*, the fourth section of Zoroastrian holy text (probably in the fifth-fourth centuries B.C), two types of healers cured patients: Surgeon, and herbalist. Around 2500 years ago, these herbalists treated diseases using about 10,000 herbs [6]. Based on this background, utilizing medicinal plants has had a long history in this region. Worthy written documents left from famous hakims like Rhazes (865-925 AD), Haley Abbas (949-982 AD), Avicenna (980-1037 AD), and Jorjani (1042-1137) [7-9] confirm the continuous use of medicinal plants during centuries for curing illnesses. Furthermore, some of these experiences have been transmitted orally from older generation to younger [10].

Special geographic features of Iran have provided the grounds for the growth of various plants. Geographically, Iran can be divided into 12 separate environments and boasts five major climates [11]. Meanwhile, useful medicinal plants have been collected and documented in some pharmacopeias and texts. Around 7500 species of plants have been registered in this area of which 1800 have been mentioned with medicinal properties [12,13].

Since 2000, several ethnobotanical studies have been conducted in different regions of this country. Ghorbani reported 120 species from 136 collected species used in Turkaman Sahra area for therapeutic effects [14]. Mosaddegh et al. presented Asteraceae included 12 species and was the most used family in Alvand mountainous area of Hamedan and Tuyserkan [15]. The results of ethnobotanical knowledge, about analgesic medicinal plants in Shahrekord showed that 23 species of medicinal plants are used to relieve pain. The highest frequency of use was obtained for *Syzygium aromaticum* (L.) Merr. & L.M.Perry, *Alhagi maurorum* Medik., and *Tribulus terrestris* L., respectively. The Laminaceae family (7 species) was the most frequently-used plant family for pain relief [16]. Also, in Kerman province some ethnobotanical surveys were done and their results demonstrated the nomadic tribes of Jiroft used 115 species in 41 families [17]. Meanwhile, 92 species belonging to 35 families were reported as current herbal medicines used by the informants in Hezar mountain of Kerman [18].

This study aimed at obtaining, documenting and analyzing herbal medicines used by ethnic groups of Bardsir region, Kerman province, Iran.

Materials and Methods

Study area

Bardsir is located on the geographic coordinates of 29°55′39″ N, and 56°34′20″ E, near to the West side of Kerman city in Kerman province, with an altitude of 2027 m (Figure 1). Figure 1 also presents some photos from the study area.

Figure 1. Part A shows location of Bardsir in Kerman province (A). Part B shows some photos from study area (B).

Ethnobotanical survey

The ethnobotanical research in Bardsir region was undertaken during 2017-2019. Data collection was done through face-to-face interviews which were recorded, and the questionnaires were filled out by an interviewer. The interviewer was a pharmacist, and had been informed enough about the process of the work. At first, the informants expressed their indigenous knowledge; then if a question was left unanswered, the interviewer would ask it. Finally, 120 questionnaires were filled out asking 28 participants. The informants were 20 years and above in both genders. The questionnaires in detail contained the informants' age, gender, occupation, education, and medicinal plant information such as local name, part(s) used, route of administration, method of preparation, medicinal utilization, single or combined use with any other medicinal plant(s), fresh or dried, and harvest time. After that, the sample plants were collected from the field; then they were pressed, and dried. At the end, the species were identified by an botanist and deposited with specific voucher specimens at Herbarium of Agricul

tural and Natural Resources Research and Education Center, Kerman, Iran, and Herbarium of pharmacognosy department, faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran.

Statistical analysis

The experimental data were analysed using SPSS 21 (SPSS Inc. Chicago, U.S.A). Based on the local knowledge, data collection was carried out using quantitative values including family importance value, relative frequency of citation, fidelity level, use-value index, and factor of informant consensus [19,20].

Family importance value (FIV)

FIV shows the percentage of the informants using a specific family. The formula is mentioned as follows (Equation 1).

Equation 1. $F_{IV} = (F_{Cf}/N)*100$

in which F_{Cf} is regarded as the number of the informants using a specific family, and N as the total number of the informants.

Relative frequency of citation (RFC)

RFC is defined as the ratio between the frequency of citation and the total number of the informants using a specific species. The formula for calculation of RFC is mentioned bellow (Equation 2).

Equation 2. $RFC = FC/N$

where FC stands for the number of the informants mentioning the useful species, and N as the number of the informants using a specific species. This value varies from zero (nobody indicates a plant as a useful one) to one (all the informants mention it as useful).

Use-value for one species (UV)

UV indicates the citation of plant species by informants in a study during interviews. It is calculated as through equation 3.

Equation 3. $UV = \Sigma U/N$

where ΣU is the sum of the total use citation by the informants for a given species and N as the number of the informants.

Equation 4. $FL = [NP/N]* 100$

where NP stands for the number of the informants who reported a specific species for the same major, and N as the total number of the informants who mentioned the same species for any purpose.

Factor of informant consensus (FIC)

FIC is an important index to demonstrate the informants' agreement on using a given species in the same disease category. It is calculated through equation 5.

Equation 5. $F_{IC} = N_{UR} - N_T / N_{UR} - 1$

in which NUR shows the number of usage reports in each special disease category, and NT as the number of species taken as a medicine for that dis-

ease category. This value is ranged from zero (the lowest agreement on a given species usage in each special disease category) to one (the highest agreement on a given species usage in that category).

Results and Discussion

Socio-demographic data

According to the data statistical analysis, about 120 questionnaires were collected in this survey. Up to 70% of the informants were males and the others were females, and in both genders 13% were under 35-year-old and 87% were above. Seventy-three percent were illiterate; while the rest were literate. The majority of the informants were farmers (57%), housewives (30%), grocers (8%), and shepherds (5%).

Floristic study

In this study, 47 medicinal plants were recorded belonging to 22 families. Scientific name, family, voucher No., vernacular name in Persian, part(s) used, route of administration, usages, and method of preparation are mentioned in table 1. According to the collected data, the informants utilized about 75% of the collected species for any medicinal purposes. So, all the statistical analyses were carried out on this number of medicinal plants.

In the current study, the highest FIV belonged to Lamiaceae, and Compositae families with 57.1%, and 39.3%, respectively (Figure 2). The results of some similar studies performed

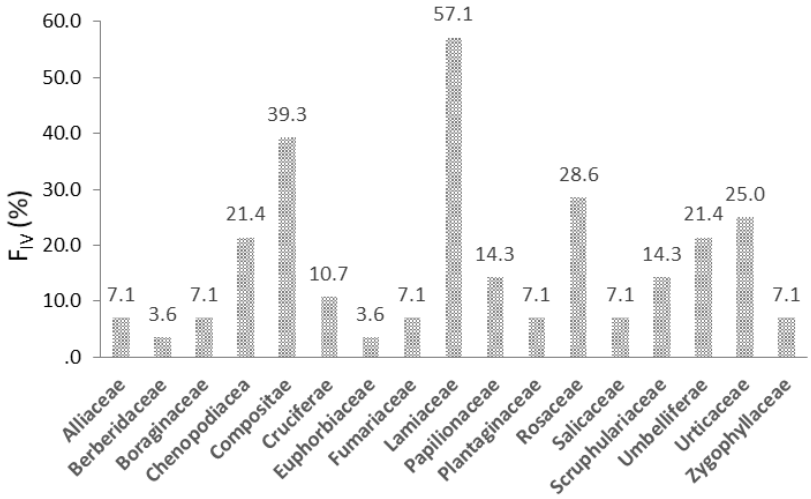

Figure 2. Percentage of family importance value (FIV).

Meanwhile, the percentage of mentioned used medicinal plants life forms were hemicryptophytes (49%), therophytes (20%), phanerophytes (17%), geophytes (9%), and chamaephytes (6%), respectively. This division is based on Raunkiaer system [22]. In our study, the major life form percentage belonged to hemicryptophytes. In accordance with some studies conducted on hemicryptophyte plant species, their results expressed the effectiveness of hemicryptophyte traits as the indicators of grassland productivity and quality state. So, grassland managers used the mentioned indicators to monitor, revive, and continuously use these plant species in different parts of Iran demonstrated the used major families, were also Lamiaceae, and Compositae families [20,21].

[23,24]. Moreover, 74% of the used species by the informants belonged to the Irano-Turanian distribution. This finding was nearly in line with the contents of the book entitled: "Forests of Iran: A Treasure from the Past, a Hope for the Future" stating that 65% of the Iranian species belong to this pattern of geographical distribution. The chamaephyta and hemicryptophyta are also regarded as the most common life forms of the Irano-Turanian plants [25]. Other plant species geographical distributions were Pluriregional (26%), Saharo-Sindian (0.03%), Euro-Siberian (0.03%), and Mediterranean (0.03%), respectively.

Table 1. List of collected plants and indigenous medicinal knowledge of them from the study area

Scientific Name	Family	Voucher No.	Vernacular Name (in Persian)	Part(s) Used	Route of Administration	Usages	Method of Preparation
Achillea santolinoides subsp. *wilhelmsii* (K.Koch) Greuter	Compositae	3271	Bomadaran	Aerial parts	Oral	Abdominal pain, stomach ache, vomiting, leucorrhoea, dysmenorrhea	Infusion, decoction, uncooked
Allium lalesaricum Freyn & Bornm	Amaryllidaceae	KF-1528*	Serimo, Piazoo	Rhizome or radix, aerial parts	Oral	Nutritious purposes	Cooked
Amygdalus elaeagnifolia Spach	Rosaceae	6749	Archang	Fruits or seeds, stems or leaves	Oral	Headache, nutritious purposes	Uncooked
Anethum graveolens L.	Umbelliferae	7416	Maytokhm	Fruits or seeds	Oral	Induction of labor, leucorrhoea, dysmenorrhea, reduce blood pressure and cholesterol	Infusion, decoction
Artemisia aucheri Boiss.	Compositae	3456	Dormoneh, Dormor	Aerial parts, stems, leaves	Oral, topical	Abdominal pain, pain	Distillation, powder
Berberis integerrima Bunge	Berberidaceae	7674	Zarche	Fruits or seeds	Oral	Reduce blood pressure	Infusion, decoction
Biebersteinia multifida DC.	Biebersteiniaceae	8914	Bahmanpich, adamak	Unused	_____	_____	_____
Bunium persicum (Boiss.) B.Fedtsch.	Umbelliferae	8454	Zireh, zireh-e vahshi	Fruits or seeds, aerial parts	Oral, topical	Nutritious purposes, obesity, diarrhea, abdominal bloating	Distillation, powder, infusion, decoction, poultice
Chenopodium foliosum Asch.	Chenopodiaceae	3557	Toot-robah, moko, salmeh	Aerial parts	Oral	Nutritious purposes, abdominal pain	Cooked, infusion, decoction

Cicer spirocceras Jaub. & Spach	Papilionaceae	7656	Nokhodo	Unused	_____	_____	_____
Cichorium intybus L.	Compositae	7655	Kasni	Aerial parts, rhizomes or radix	Oral	Jaundice	Distillation, infusion, decoction
Cotoneaster rechingeri G.Klotz	Rosaceae	8493	Shirekhesht, siahchoo	Unused	_____	_____	_____
Crataegus azarolus var. *aronia* L.	Rosaceae	5609	Zalzalak	Fruits or seeds	Oral	urination	Uncooked
Descurainia sophia (L.) Webb ex Prantl	Cruciferae	8919	Khakeshir	Fruits or seeds	Oral, topical	Fever, constipation, diarrhea	Distillation, infusion, decoction, maceration
Dorema aucheri Boiss.	Umbelliferae	3095	Oshtork	Gum	Smoking	Cough	Powder, aroma inhalation
Ephedra intermedia Schrenk & C.A.Mey.	Ephedraceae	8505	Hoome, kheemooke	Unused	_____	_____	_____
Eremurus kopetdaghensis M. Pop. ex B. Fedtsch.	Liliaceae	8916	Serish	Unused	_____	_____	_____
Euphorbia hebecarpa Boiss.	Euphorbiaceae	7659	Shirmang	Unused	_____	_____	_____
Euphorbia buhsei Boiss.	Euphorbiaceae	3553	Shirmang	Unused	_____	_____	_____
Ferulago angulata (Schltdl.) Boiss.	Umbelliferae	7654	Garchi	Gum/ aerial part	Topical	Skin rash	Powder, uncooked
Foeniculum vulgare Mill.	Umbelliferae	7657	Badian	Aerial parts	Oral	Anxiety, insomnia, dysmenorrhea, amenorrhea, bloating	Distillation, powder, infusion, decoction
Fumaria asepala Boiss.	Fumariaceae	3426	Shahtareh	Aerial parts	Oral	Abdominal pain, dysmenorrhea	Distillation, infusion, decoction
Ixiolirion tataricum (Pall.) Schult. & Schult.f.	Amaryllidaceae	8917	Roghanoo	Unused	_____	_____	_____
Lamium amplexicaule L.	Lamiaceae	8915	_____	Unused	_____	_____	_____
Matricaria chamomilla L.	Compositae	8918	Baboneh	Unused	_____	_____	_____
Medicago sativa L.	Papilionaceae	3423	Espese	Aerial parts	Animal feed	Nutritious purposes	Uncooked
Mentha longifolia (L.) L.	Lamiaceae	7669	Podeneh	Aerial parts	Oral	Abdominal pain	Distillation

Tribulus terrestris L.	Zygophyllaceae	5175	Khar khersak	Aerial parts, fruits or seeds	Oral	Anxiety, urination	Infusion, decoction, distillation
Trifolium pratense L.	Papilionaceae	8503	Shabdar	Aerial parts	Animal feed	Nutritious purposes	Uncooked
Urtica urens L.	Urticaceae	7625	Gesen, geseng	Aerial parts	Oral, topical	Pain, flu, common cold, sore throat, urination, type 2 diabetes, reduce blood pressure	Distillation, powder, infusion, decoction
Ziziphora clinopodioides Lam.	Lamiaceae	7693	Alaleh	Aerial parts, stem or leaves	Oral	Anxiety, feeling sad	Infusion, decoction, distillation

*These species were kept at the Herbarium of pharmacognosy department, faculty of Pharmacy, Kerman University of Medical Sciences, Kerman, Iran. Other species were kept at the Herbarium of Agricultural and Natural Resources Research and Education Center, Kerman, Iran

Plant part used and harvest time

The common used parts reported were leaves, fruits/ seeds, rhizomes/radix, aerial parts, gums, and flowers. With regard to the results, the majority of used parts were aerial parts (43.3%), fruits and seeds (24.4%), leaves (21.3%), and flowers (3.9%). And the lowest percentages belonged to rhizomes/radix (4.7%), and gums (2.4 %). In this study, more than 90 % of the used parts were upper parts of plants including aerial parts, fruits and seeds, flowers, and leaves. These results have also been claimed in other surveys undertaken in different regions of Iran [20, 21,26-28]. March to October was reported as the harvest time, and most of them were harvested in May.

State of used plants and medicinal plants used in combination

The state of used materials (fresh/dried) is explained in figure 3. In addition, figure 3 shows the percentage of medicinal plants used in combination with other plant(s) or in single form. In our study, *Achillea santolinoides* subsp. wilhelmsii (K.Koch) Greuter, *Allium lalesaricum* Freyn & Bornm., *Bunium persicum* (Boiss.) B.Fedtsch., *Chenopodium foliosum* Asch., *Cichorium intybus* L., *Ferulago angulata* (Schltdl.) Boiss., *Foeniculum vulgare* Mill., *Sanguisorba minor* Scop., *Scrophularia frigida* Boiss., *Teucrium polium* L., *Thymus carmanicus Jalas*, and *Ziziphora clinopodioides* Lam. were the used major species in combination with other plant(s). Meanwhile, in one study carried out in the south of Kerman from 2013 to 2015, it was also expressed that some mentioned species such as *A. santolinoides* subsp. wilhelmsii, *B. persicum*, *F. vulgare*, *S. minor, T. polium*, and *Z.clinopodioides* were used in combination forms by the participants for treating some diseases like digestive disorders and cold [28].

Route of administration and method of preparation

In this survey, the major route of administration,

about 80%, was oral (Table 1). Also, decoction/ infusion, and distillation were 32%, and 24%, respectively that were regarded as the popular methods for preparing medicinal plants (Figure 4). Also, in similar researches in different parts of the world, oral administration, and decoction/ infusion were reported as the frequently used methods for medicine preparations [29,30].

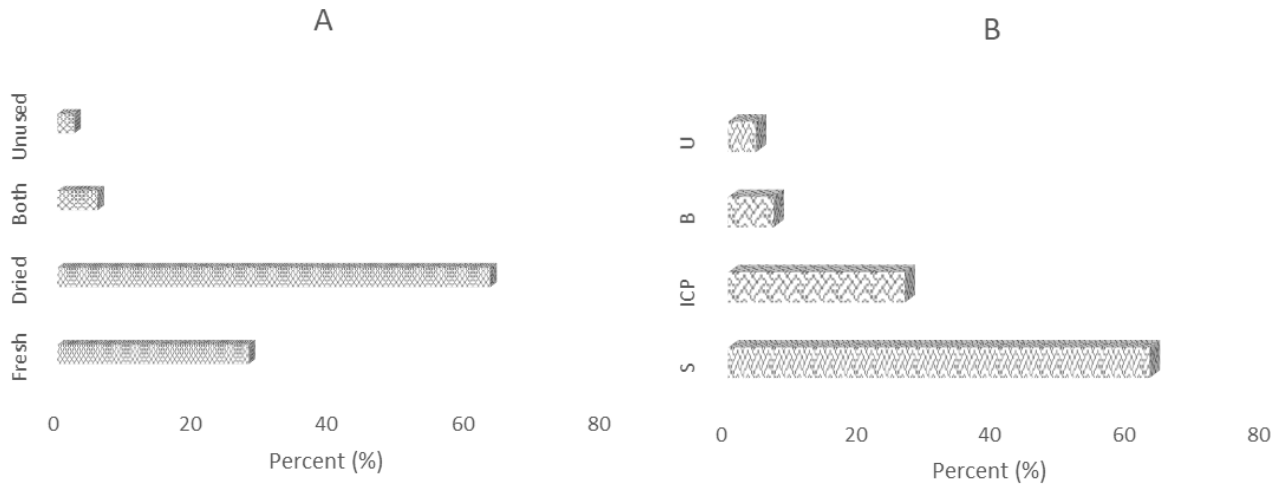

Figure3. Part A presents state of used materials percentage (fresh or dried); Part B presents percentage of species used in single forms or combined with other plant(s).
S: Single form; ICP: In Combination with other Plant(s); B: Medicinal plants in both forms (single/ in Combination); U: Unused

Table 2. Relative frequency of citation of medicinal plant species

Scientific name	FC*	RFC**
Achillea santolinoides subsp. *wilhelmsii* (K.Koch) Greuter	6	0.2
Allium lalesaricum Freyn & Bornm	2	0.07
Amygdalus elaegnifolia Spach	1	0.03
Anethum graveolens L.	2	0.07
Artemisia aucheri Boiss.	2	0.07
Berberis integerrima Bunge	1	0.03
Bunium persicum (Boiss.) B.Fedtsch.	2	0.07
Chenopodium foliosum Asch.	6	0.21
Cichorium intybus L.	2	0.07
Crataegus azarolus var. *aronia* L.	1	0.03
Descurainia sophia (L.) Webb ex Prantl	3	0.1
Dorema aucheri Boiss.	1	0.03
Ferulago angulata (Schltdl.) Boiss.	1	0.03
Foeniculum vulgare Mill.	2	0.07
Fumaria asepala Boiss.	2	0.07
Medicago sativa L.	1	0.03
Mentha longifolia (L.) L.	1	0.03
Nepeta bracteata Benth.	4	0.14
Nepeta glomerulosa subsp. *carmanica* (Bornm.) Rech.f.	3	0.1

Peganum harmala L.	1	0.03
Plantago major L.	2	0.07
Rosa beggeriana Schrenk ex Fisch. & C.A.Mey.	2	0.07
Rosa× damascena Mill.	3	0.1
Salix acmophylla Boiss.	2	0.07
Salvia rhytidea Benth.	1	0.03
Sanguisorba minor Scop.	3	0.1
Scrophularia frigida Boiss.	4	0.14
Solenanthus circinatus Ledeb.	2	0.07
Tanacetum parthenium (L.) Sch.Bip.	1	0.03
Teucrium polium L.	5	0.17
Thymus carmanicus Jalas	4	0.14
Tribulus terrestris L.	1	0.03
Urtica urens L.	6	0.21
Ziziphora clinopodioides Lam.	4	0.14

*FC: frequency of citation; **RFC: Relative frequency of citation

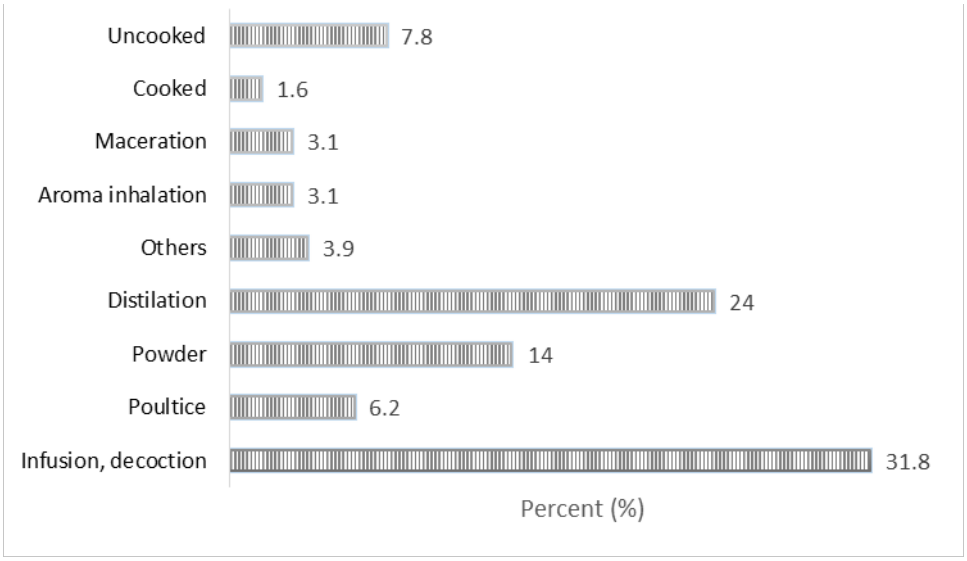

Figure 4. Different methods used by informants for preparing medicinal plants.

Relative frequency of citation

In accordance with table 2, the highest RFCs belonged to *U. urens* (0.21), *C. foliosum* (0.21), *A. santolinoides* subsp. wilhelmsii (0.2), *T. polium* (0.17), *Z. clinopodioides* (0.14), *T. carmanicus* (0.14), *S. frigida* (0.14), and Nepeta bracteata (0.14), respectively. So, these species were regarded as the most popular plants in this region. Also in a similar research conducted in 2011-2012 in another part of Kerman province A. santolinoides subsp. wilhelmsii, and T. polium had high RFCs [21]. In addition, the results of a study on pharmacological activities of U. urens showed some effects including anti-in-

flammatory, and immunomodulatory activities, and its effect on sex hormone binding globulin binding capacity, sex hormone, and aromatase inhibition [31].

Use-value for one species and fidelity level

The UV index is helpful for analysing a single species usage. Also it explains the use of a given species for treatment of different ailments by informants. Considering table 3, this index varied from 0.03 to 0.39. The highest UV indices belonged to *U. urens* (0.39) and T. polium (0.32), respectively. Furthermore, another ethnopharmacological study performed on Saravan, Balouchestan of Iran reported *T. polium* had high UV [32]. Other studies expressed that UV was a useful parameter to choose potential plant species for research and development in drug industry [30,33].

Table 3 also presents FL of 35 species. These results showed *A. santolinoides* subsp. wilhelmsii (Digestive system disorder), *T. polium* (Digestive system disorder), *Z. clinopodioides* (mental disorders), and *C. foliosum* (Digestive system disorder) had the highest FL for the above categories. In recent studies, the efficacy of *A. santolinoides* subsp. wilhelmsii has been evaluated in patients with ulcerative colitis [34] and in rabbit blood pressure and heart rate [35]. As stated by the informants, *T. polium* was used not only for digestive disorders but also for gynecology diseases which in turn highlights its traditional usage. Some results also expressed T. polium could be utilized for the treatment of primary dysmenorrhea as it highly decreased intensive and long duration menstrual pain [36,37]. Although in our study Z. clinopodioides was used for treating mental disorders, studies about the essential oil effect of *Z. clinopodioides* have demonstrated antioxidant and antimicrobial activities [38,39]. Moreover, a study presented essential oil of the herbs could be considered as ecofriendly alternative pesticides [40]. Table 3 presents *C. foliosum* with the highest FL, and the informants used leaves of this plant as a food. Guil-Guerrero et al analyzed leaves of three species of *Chenopodium* and reported mineral elements (Na, K, Ca, Mg, P, Fe, Cu, Zn and Mn), fatty acids, vitamin C, carotenoids, oxalic acid, and high fiber amount. So they suggested them for nutritious purposes because they contained high amounts and diversity of nutrients [41]. However, in one study 30-Normedicagenic acid glycosides from aerial part of *C. foliosum* were isolated, and it demonstrated cytotoxicity effects of these compounds on three leukemic cell lines (BV-173, SKW-3, HL-60). Moreover, the isolated saponins from this plant showed moderate stimulatory effects on interleukin-2 production [42].

Table 3. Use-value for one species and Fidelity level index of medicinal plant species

Scientific name	Principal use	*NP	**FL (%)	***UV
Achillea santolinoides subsp. *wilhelmsii* (K.Koch) Greuter	Digestive system disorders	7	25.00	0.29
	Gynecology diseases and fertility	1	3.57	
Amygdalus elaeagnifolia Spach	Mental disorders	1	3.57	0.07

Anethum graveolens L.	Gynecology diseases and fertility	2	7.14	0.1
	Heart problems	1	3.57	
Artemisia aucheri Boiss.	Digestive system disorders	1	3.57	0.07
	Pain	1	3.57	
Berberis integerrima Bunge	Heart problems	1	3.57	0.03
Bunium persicum (Boiss.) B.Fedtsch.	Digestive system disorders	2	7.14	0.17
	Overweight	1	3.57	
Chenopodium foliosum Asch.	Digestive system disorders	5	17.85	0.29
Cichorium intybus L.	Jaundice	2	7.14	0.07
Crataegus azarolus var. *aronia* L.	Urinary disorders	1	3.57	0.03
Descurainia sophia (L.) Webb ex Prantl	Digestive system disorders	3	10.71	0.14
	Infectious diseases	1	3.57	
Dorema aucheri Boiss.	Respiratory disorders	1	3.57	0.03
Ferulago angulata (Schltdl.) Boiss.	Dermatological disorders	1	3.57	0.07
Foeniculum vulgare Mill.	Mental disorders	2	7.14	0.14
	Digestive system disorders	1	3.57	
	Gynecology diseases and fertility	1	3.57	
Fumaria asepala Boiss.	Digestive system disorders	1	3.57	0.07
	Gynecology diseases and fertility	1	3.57	
Mentha longifolia (L.) L.	Digestive system disorders	1	3.57	0.03
Nepeta bracteata Benth.	Respiratory disorders	4	14.29	0.14
Nepeta glomerulosa subsp. *carmanica* (Bornm.) Rech.f.	Pain	3	10.71	0.14
Peganum harmala L.	Respiratory disorders	1	3.57	0.03
Plantago major L.	Jaundice	3	10.71	0.1
Rosa beggeriana Schrenk ex Fisch. & C.A.Mey.	Heart problems	2	7.14	0.03
Rosa × *damascena* Mill.	Mental disorders	2	7.14	0.1
Salix acmophylla Boiss.	Dermatological disorders	1	3.57	0.18
	Infectious diseases	2	7.14	
	Jaundice	2	7.14	
Salvia rhytidea Benth.	Respiratory disorders	1	3.57	0.03
Sanguisorba minor Scop.	Pain	2	7.14	0.1
	Respiratory disorders	1	3.57	
Scrophularia frigida Boiss.	Digestive system disorders	4	14.29	0.21
	Respiratory disorders	2	7.14	
Solenanthus circinatus Ledeb.	Pain	3	10.71	0.1
Teucrium polium L.	Digestive system disorders	5	17.86	0.32
	Respiratory disorders	2	7.14	
	Gynecology diseases and fertility	3	10.71	
Thymus carmanicus Jalas	Gynecology diseases and Fertility	1	3.57	0.14

Tribulus terrestris L.	Mental disorders	1	3.57	0.07
	Urinary disorders	1	3.57	
Urtica urens L.	Pain	2	7.14	0.39
	Respiratory disorders	4	14.29	
	Type 2 diabetes	3	10.71	
	Heart problems	1	3.57	
	Urinary disorders	1	3.57	
Ziziphora clinopodioides Lam.	Mental disorders	5	17.86	0.18
Use of medicinal plants as spices and food additives				
Scientific name	*NP		**FL (%)	***UV
Allium lalesaricum L.	2		7.14	0.07
Amygdalus elaeagnifolia Spach	1		3.57	0.07
Bunium persicum (Boiss.) B.Fedtsch.	2		7.14	0.17
Chenopodium foliosum Asch.	3		10.71	0.29
Medicago sativa L.	1		3.57	0.07
Thymus carmanicus Jalas	3		10.71	0.14

*NP: Number of informants who reported a specific species for the same major; **FL: Fidelity Level; ***UV: Use-value for one species

Factor of informant consensus

The FIC for 11 disease categories is demonstrated in table 4. In addition, it shows FIC calculated for species consumed as spices and food additives. In accordance with the results, the highest FIC value belonged to Type 2 diabetes (full mark), digestive system disorder, mental disorder, respiratory disorder, jaundice etc. Thirty-time-use reports from 10-time-use taxa for digestive system disorder showed the consistency of informants' agreement about this particular ailment. Stomach ache and abdominal pain, nausea and vomiting, constipation, diarrhea, and bloating were the main ailments that were reported by the informants. The highest FIC value presented the tendency of the informants to utilize traditional medicine for curing these diseases. *A. santolinoides subsp. wilhelmsii, T. polium, C. foliosum, S. frigida*, and *Descurainia* sophia (L.) Webb ex Prantl were frequently used for this purpose. Moreover, some studies performed in Iran presented the efficacy and safety of these medicinal plants in treatment of digestive diseases like ulcerative colitis, and functional constipation [34,43]. In our study, the most reported complains of mental disorders were feeling sad, anxiety, and insomnia. *Z. clinopodioides*, *Rosa* × *damascena* Mill., and *F. vulgare* were recommended species for this purpose. It is interesting that the traditional usage of *Z. clinopodioides* was nearly in line with the antinociceptive effect of essential oil of the species via opioidergic pathways [44]. Also receiving *F. vulgare* in postmenopausal women with depression or anxiety disorder showed a borderline or significant improvement [45]. Concerning respiratory disorder, the main ailments were cough, flu, sneezing, and common cold. N.

bracteata, *U. urens*, and *S. frigida* were recurrent species which were advised by the informants. A review study about Nepeta genus described these species contained terpenoid-type compounds and phenolic constituents with several antimicrobial, and anti-inflammatory therapeutic activities, and induction of apoptosis [46]. Furthermore, a randomized double-blind clinical trial on the efficacy of N. bracteata on allergic rhinitis indicated that this species had significant effects on improving the symptoms of illness [47].

But for some ailments like urinary and dermatological disorders, gynecology diseases and fertility, and heart problems, the agreement ratio was the lowest. This outcome showed the low tendency of local people and inadequate agreement to apply traditional therapy for the whole diseases, and they preferred using conventional medicine for some diseases.

Table 4. Factor of informant consensus (FIC) for disease category

Disease categories	*NUR	**NT	***FIC
Mental disorders	11	5	0.6
Digestive system disorders	30	10	0.68
Dermatological disorders	3	3	0
Pain	11	6	0.50
Respiratory disorders	15	8	0.5
Gynecology diseases and fertility	8	7	0.14
Type 2 diabetes	3	1	1
Infectious diseases	3	2	0.50
Jaundice	7	3	0.6
Heart problems	5	4	0.25
Urinary disorders	3	3	0.00
Other purposes	* NUR	* *NT	***FIC
Spices and Food Additives	11	6	0.5

*NUR: Number of usage reports in each special disease category; **NT: Number of species taken as a medicine for that disease category; ***FIC: Factor of informant consensus

Conclusion

Surprisingly, only fifteen percent of all over the world plant species have been phytochemically evaluated and a fewer percent (6%) of them have been also assessed for biological activities [48]. Ethnobotanical studies highly encourage more and more phytochemical evaluations and biological activity assessments on plant species used by local people as a medicine. To this end, using quantitative indices help researchers to better understand and analyze local knowledge of plants [49]. In the current study, the highest indices belonged to *U. urens, A. santolinoides* subsp. *Wilhelmsii*, and *T. polium*; thus it is recommended for the researches in this field to conduct further in vitro and in vivo pharmacological studies on the mentioned species.

It is notable to say that these species used by indigenous people be recorded before being late. Moreover, carrying out similar studies in differ-

ent regions of the world help scientists to have organized plans to prevent plant species from dying out for overexploitation.

Conflict of interest

The authors declare that they have no competing interests.

Acknowledgments

None.

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