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Original article

# Ethnobotanical study in the highland of Alvand and Tuyserkan, Iran

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## Abstract

**Background and objectives**: Medicinal plants are widely used by people in the treatment of various diseases. These resources are usually regarded as part of cultural traditional knowledge. The aim of this study was to identify the information about the medicinal plants used by indigenous people of some regions of Hamedan province, Iran. **Methods**: The present ethnobotanical study was conducted in the Alvand mountainous area of Hamedan and Tuyserkan. Interviews were done in 27 villages and totally 53 informants were interviewed. Ethnobotanical indices like relative frequency of citation (RFC) and cultural importance index (CI) were calculated. **Results**: Our study reports 80 traditionally used plant species, belonging to 31 plant families. Asteraceae with 12 species was the most used family in this area. The most used parts were aerial parts (18.57%), leaves (21.42%), and flowers (17.14%), respectively. The most treated ailments were digestive problems. The highest number of ethnobotanical indices RFC and CI were observed in *Stachys lavandulifolia* Vahl. and *Thymus lancifolius* Celak., respectively. **Conclusions**: Hamedan province possesses considerable knowledge about medicinal plants for treating common health problems.

**Keywords***:* Alvand, ethnobotany, Hamedan, Tuyserkan, traditional medicine

## Introduction

Ethnobotanical studies are significant in revealing locally important plant species especially for the discovery of new drugs [1]. From ancient times, the documentation of traditional knowledge especially about the medicinal uses of plants has led to the introduction of new medicines. Traditional medicine still remains the main source for majority of people in developing countries for treating health problems, because medicinal plants are accessible and inexpensive [2].

Iran is located in middle-east, Asia which contains rich ecosystems and biodiversity due to the various climatic conditions and geographical characteristics [3]. Some researchers have investigated the traditional pharmacopoeia and medicinal plants in different areas of the country [4-9].

 
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Hamedan province with a long history in traditional medicine of Iran has shown to be one of the main centers of production and supply of herbal plants in Iran. The province covers 19,493 square kilometers and is located in the west of Iran [10]. Hamedan province lies in a temperate region in the east of Zagros mountains. It is in vicinity of the Alvand Mountains and has a cold, mountainous climate with snowy winters. In fact, it is one of the coldest cities in Iran.

Kalvandi *et al*. have collected 6000 herbaceous species from different regions of Hamedan province among them 315 medicinal plants were identified which were related to 71 families and 209 genus but the ethnobotanical information of the plants had not been investigated [11].

We have previously collected the ethnobotanical information in two villages of Hamedan in first step [12] and in the present survey we specifically focused on ethnobotanical knowledge and medicinal plants used by indigenous people and performed quantitative survey of the information in region of Alvand Mountain of Hamedan and Tuyserkan.

## Experimental

*Study setting*

The present ethnobotanical study was conducted in the highlands of Alvand in Hamedan and Tuyserkan. These are parts of Zagros mountains of Iran and are located between northern latitude 34˚ 40᾽and eastern longitude 48˚ 39᾽. The altitude of most of the studied places were between 1568-2617 m above the sea level. The study was done during March 2012 to September 2013. Interviews were conducted in 27 villages. All data has been collected from conversations with local people who worked and lived close to plants, to ensure the reliability of the information. This model is what anthropologists known as semi-structured [13].

Collected data during the fieldwork were analyzed with Microsoft Access software. Data about the medicinal plant uses were collected from people of tribes who were expert in medicinal plants. Informants were asked to come to the field and the plants were shown to them. In cases that were not possible to do so, plants were collected from around the villages and were shown to confirm the plant names. Interviews have been recorded for documentation. Each time a plant use was mentioned, it was considered as a single "use record". Mentions were then divided into use categories following Cook [14].Voucher samples were also collected for each plant, identified by using floristic and taxonomic references, especially Flora Iranica and were deposited at the Herbarium of the Traditional Medicine and Materia Medica Research Center (TMRC), Shahid Beheshti University of Medical Sciences, Tehran, Iran. Information on medicinal plants including their local names, parts used, methods of preparation and administration routes, disorders treated/medicinal effects, were documented.

*Data analysis*

Some classical quantitative ethnobotanical indices were calculated:

Relative frequency of citation (RFC) is obtained by dividing the number of informants who mention the use of the species (FC) by total number of informants in the survey. This index does not consider the use category and varies from zero, when nobody refers to the plants as useful, to one in case that every informant would mention it as useful [15].

Cultural importance index (CI) was also calculated. This index is the sum of the proportion of informants that have mentioned each species use. It shows the number of participants who mentioned each use of the species divided by total number of informants. In this case, each taxon referred by an informant within a medical use category was counted as a use-report (UR) [16].

Informant consensus factor or informant agreement ratio (IAR) [17] is the ratio between the number of UR in each use category minus the number of used taxa and the number of UR minus one, that concerns what plants to use for specific use categories. It is a comparison of the

number of mentions in a use category and the total number of taxa used in the category concerned. The highest value can be one, which indicates the largest agreement of informants on the use of one species in one use category [18].

**Results and Discussion**

In the present study, 80 traditionally used plants in Hamedan and Tuyserkan were recorded. The plant families, scientific names, local names, parts used, methods of preparation, administration routes, disorders treated/medicinal effects, frequency of citation (FC), number of use reports (UR), number of uses (NU) and voucher numbers are listed in table 1. Totally, 200 interviews with 53 informants were done. Six informants were woman and 47 were men aged from 28 to 84 years. The documented species corresponded to 61 genera, arranged in 31 plant families. As shown in figure 1 Asteraceae with 12 species was the most used family in the area.

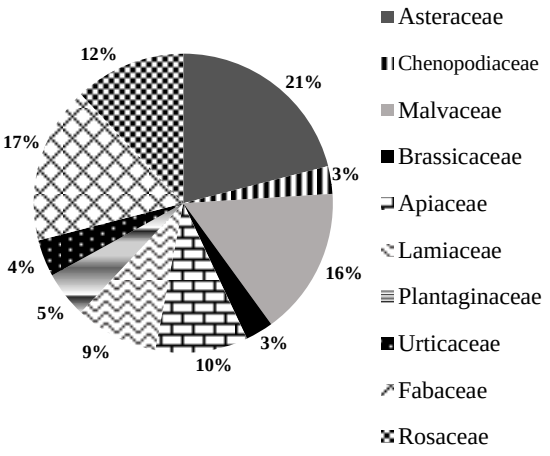


**Figure 1**. Usage of plant families (%)

In other studies conducted in Iran like in Kohgiluyeh va Boyer Ahmad [15] and Hormozgan provinces [19], Asteraceae and Lamiaceae were the most used families. In Hezar mountain in south-east of Iran, Saravan region from Baluchistan of Iran [20] and Kerman provinces [21] the largest number of medicinal species family has been Lamiaceae. Totally, 30 medicinal plants from the west Azerbaijan villages were reported by Miraldi *et al*. [8]. Naghibi *et al*. represented 46 genera and 410 species and subspecies from Lamiaceae family in Iran that several members of this family were used in traditional and folk medicine [9].

Local people use different parts of the plants for variety of purposes. The most used parts in this study were leaves (21.42%), aerial parts(18.57%), and flowers (17.14%), respectively (figure 2).

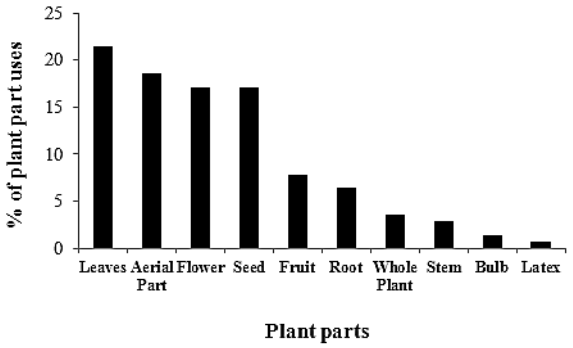


**Figure 2**. Percentage of used plant parts

The reason why leaves and aerial parts were mostly used could be that they are easily accessible and are active in photosynthesis and production of metabolites. The most method of preparation was infusion and decoction. In the region of Turkmen Sahra, north of Iran, decoction [22] and in Hezar mountains decoction and infusion were repeated to be the most used method of preparation [20]. Most dosage forms were syrup and tea which means the most administration rout was oral.

Fifty eight use records were classified in 21 medicinal use categories. The most treated use categories by plants presented in this study include digestive problems (23.19% citation, 17.68% species), Infections/Infestations (11.79% citation, 12.15% species) and respiratory problems (9.51% citation, 11.05% species) (figure 3) while in another province, Kohgiluyeh va Boyer Ahmad, digestive system disordes, musculoskeletal disorders and infections had the highest number of records [15].

**Table 1.** Plants used in Hamedan province

| Voucher Number | Family | Scientific Name | Local Name's Pronunciation | Plant part | Method of Preparation | Administration Route | Use |
|---|---|---|---|---|---|---|---|
| 3419 | Asteraceae | *Achillea biebersteinii* Afan | /bu:ma:dærʌn/ | Flower, Leaf, Root, Whole Plant | Extraction, Infusion, Decoction | Oral | Fever, hypoglycemia, hypothermia, carminative, infection, stomachache |
| 3670 | Asteraceae | *Achillea vermicularis* Trin. | /bu:ma:dærʌn/ | Flowering Aerial part | Crude | | Fever |
| 3680 | Asteraceae | *Achillea vermicularis* Trin. | /bu:ma:dærʌn/ | Aerial Part | Crude, Decoction | Topical, Oral | Infection |
| 3645 | Asteraceae | *Achillea vermicularis* Trin. | /bu:ma:dærʌn/ | Shoot | Infusion | Oral | Stomachache |
| 3389 | Asteraceae | *Achillea wilhelmsii* C. Koch | /bu:ma:dærʌn/ | Aerial Part | Extraction | Oral | Stomachache, backache |
| 3402 | Asteraceae | *Achillea wilhelmsii* C. Koch | /bu:ma:dærʌn/ | Flower | Decoction | Oral | Anemia, fever, dizziness, stomachache |
| 3696 | Malvaceae | *Alcea arbelensis* | /gɔ:l-e xætmɾ/ | Flower | Infusion, Decoction, Crude | Oral, Topical | Constipation, coughs, sores |
| 3435 | Malvaceae | *Alcea calvertii* Boiss. | /gɔ:l-e xætmɾ/ | Flower | Maceration | Oral | Respiratory system, coughs, infection, asthma |
| 3438 | Malvaceae | *Alcea tarica* Pakravan. & Ghahremani | /gɔ:l-e xætmɾ/ | Flower | Infusion, Decoction, Extraction | Oral, Inhalation | Throat, joint pains, fever, respiratory system |
| 3415 | Malvaceae | *Alcea flavovirens* (Boiss. & Buhse) Iljin | /xætmɾ/ | Flower | Decoction | Oral | Stomachache |
| 3387 | Malvaceae | *Alcea koelzii* I. Riedl. | /gɔ:l-e xætmɾ/ | Flower | Decoction | Oral | Infection, respiratory system |
| 3392 | Malvaceae | *Alcea kurdica* Alef. | /gɔ:l-e xætmɾ/ | Flower | Infusion | Oral | Carminative-veterinary, coughs |
| 3399 | Malvaceae | *Alcea rechingeri (Zohary)* I. Riedl | /xætmɾ/ | Flower | Decoction | Oral | Respiratory system |
| 3440 | Alliaceae | *Allium iranicum* (Wendelbo) Wendelbo | /si:r-e væhʃr/ | Bulb, Leaf | Decoction | Oral | Hypothermia, kidney stone, carminative |
| 3457 | Rosaceae | *Amygdalus communis* L. | /bɑ:dɑ:m/ | Seed | Crude | Topical, Oral | Joint pains, osteoporosis, hypoglycemia, cramp |
| 3444 | Rosaceae | *Amygdalus lycioides* Spach | /bɑ:dɑ:m-e væhʃr/ | Fruit, Seed | Crude | Oral | Hyperlipidemia, hypoglycemia |
| 3432 | Boraginaceae | *Anchusa azurea* Mill. | /gɔ:lku:/ | Flower, Root | Decoction | Oral | nervous system, asthma |
| 3412 | Apiaceae | *Anethum graveolens* L. | /ʃevɾd/ | Flower, Leaf, Aerial Part | Infusion | Oral | Cold, hyperlipidemia, hypertension |
| 3660 | Asteraceae | *Arctium minus (*Hill*)* Bernh. | /tɔ:gʌ bærg/ | Leaf & Root | Extraction | Oral | Skin, diabetes, infection |

**Table 1**. Continued

| Voucher Number | Family | Scientific Name | Local Name's Pronunciation | Plant part | Method of Preparation | Administration Route | Use |
|---|---|---|---|---|---|---|---|
| 3456 | Rosaceae | *Armeniaca vulgaris* Lam. | /zærdaːluː/ | Fruit | Crude | Oral | Anthelmintic |
| 3639 | Fabaceae | *Astragalus verus* Olivier | /gævæn/ | Aerial part & Leaf | Maceration | Topical, Oral | Hair, coughs |
| 3672 | Asteraceae | *Centaurea depressa* M. B. | /gɔːl kuː/ | Aerial Part | Crude, Decoction | Topical | Injuries, hair, skin |
| 3423 | Asteraceae | *Centaurea solstitialis* L. | /ʧæɜertekʌnr/ | Whole Plant | Decoction | Oral | Kidney Stone |
| 3661 | Rosaceae | *Cerasus vulgaris* Miller | /ʌlbʌlu/ | vegetative part | Decoction | Oral | Kidney Stone |
| 3448 | Ranunculaceae | *Ceratocephalus falcata* (L.) Pers | /peykɔːL/ | Spine, Aerial Part | Decoction | Oral | Kidney Stone |
| 3439 | Chenopodiaceae | *Chenopodium album* L. | /sælmʌntære/ | Leaf | Crude, Decoction | Oral | Hyperthermia, carminative, respiratory system |
| 3443 | Fabaceae | *Cicer anatolicum* Alef. | /nɔːxɔːd srya: væhʃr/ | Whole Plant, Fruit | Decoction | Oral | Diarrhea, kidney stone, constipation |
| 3648 | Asteraceae | *Cichorium intybus* L. | /KʌsnR/ | Aerial Part, Root | Infusion, Decoction, Extraction | Oral | Respiratory system, hypertension, fever and chills, kidney stone |
| 3426 | Cucurbitaceae | *Citrullus lanatus* (Thumb.) Matsum & Nakai | /hendevɑːne deym/ | Fruit | Cooked | Oral | Kidney stone |
| 3646 | Convolvulaceae | *Convolvulus arvensis* L. | /Luː Luː/ | Aerial Part | Infusion | Oral | Liver, hypercholia |
| 3653 | Apiaceae | *Coriandrum sativum* L. | /geʃniːz/ | Aerial Part, Seed | Extraction | Oral | Hyperlipidemia, diabetes, carminative-veterinary |
| 3669 | Apiaceae | *Echinophora platyloba DC.* | /dʌrʌ duːrʌɤ/ | Leaf | Extraction | Oral | Cold |
| 3668 | Boraginaceae | *Echium amoenum* Fisch. & C. A. Mey. | /gɔːlgaːvzæbʌn/ | Flower | Infusion | Oral | Nervous system, sedative, cold |
| 3452 | Elaeagnaceae | *Elaeagnus angustifolia* L. | /serendʒek/ | Seed, Fruit | Crude | Oral | Osteoporosis, diarrhea |
| 3652 | Apiaceae | *Falcaria vulgaris* Bernh. | /ɤæzejʌæɤr/ | Aerial Part | Crude | Topical, Oral | Wound, stomachache |
| 3446 | Apiaceae | *Falcaria vulgaris* Bernh. | /ɤæzejʌæɤr/ | Leaf | Crude | Topical | wound |
| 3667 | Apiaceae | *Foeniculum vulgare* Mill. | /raːzryaːne/ | Seed | Decoction, Infusion | Oral | Gallstones, lactation stimulant, carminative |
| 3678 | Fumariaceae | *Fumaria asepala* Boiss. | /ʃʌhtære/ | Aerial Part, Leaf | Crude, Extraction, Infusion | Topical, Oral | Infection, sores, blood system disorders, infection, skin |
| 3430 | Rubiaceae | *Galium verum* L. | /ælæfdʒuːʃ/ | Aerial Part | Crude | Topical | Wound |

**Table 1**. Continued

| Voucher Number | Family | Scientific Name | Local Name's Pronunciation | Plant part | Method of Preparation | Administration Route | Use |
|---|---|---|---|---|---|---|---|
| 3442 | Fabaceae | *Glycyrrhiza glabra* L. | /ʃiːrrn bæyʌn/ | Root, Latex | Decoction | Oral, Topical | Gastric ulcer, stomachache, joint pains, wound, inflammation, gastric ulcer, fracture |
| 3644 | Asteraceae | *Gundelia tournefortii* L. | /kæŋær/ | Aerial Part | Extraction | Oral | Hyperlipidemia |
| 3647 | Hypericaceae | *Hypericum perforatum* L. | /gɔːlə tʃaːyr/ | Flower | Infusion | Oral | Nervous system, pains |
| 3665 | Juglandaceae | *Juglans regia* L. | /gerduː/ | Leaf | Crude | Topical | Pains, diabetes |
| 3451 | Oleaceae | *Ligustrum ovalifolium* Hassk. | /bærg-e nɔː/ | Seed, Flower | Crude, Infusion | Oral | Hypercholia, vomiting, diarrhea |
| 3663 | Linaceae | *Linum album* Ky. Ex Boiss. | /kæm/ | Aerial Part, Leaf, Stem | Crude | Topical | Fracture, wart |
| 3699 | Malvaceae | *Malva sylvestris* L. | /tuːle/ | Flower, Leaf | Infusion, Decoction | Oral | Constipation, stomachache, hair, coughs |
| 3408 | Fabaceae | *Medicago sativa* L. | /jɔːndʒe/ | Leaf | Extraction, Decoction | Oral | Heart disease, coagulation, stomachache |
| 3433 | Fabaceae | Melilotus officinalis (L.) Desr. | /dæle jɔːndʒe/ | Aerial Part, Leaf | Decoction, Juice | Oral | Hypoglycemia, hypotension, coagulation, wound, hypercholia |
| 3417 | Lamiaceae | *Mentha longifolia* (L.) Hudson | /puːne/ | Aerial Part, Leaf, Flower | Extraction, Decoction, Crude | Oral | Carminative, vomiting, stomachache, hypertension, diarrhea, poisoning, asthma, fever |
| 3414 | Lamiaceae | *Mentha spicata* L. | /nænɑː/ | Leaf, Arrial part, Flower, Stem | Extraction | Oral | Diarrhea, stomachache, nausea |
| 3675 | Lamiaceae | *Nepeta crispa* Willd | /mefrʌh/ | Aerial Part | Infusion | Oral | Hypothermia |
| 3640 | Lamiaceae | *Nepeta crispa* Willd | /mefrʌh/ | Aerial Part | Infusion, Decoction | Oral | Nervous system, diarrhea |
| 3418 | Fabaceae | *Ononis spinosa* L. | /gælem bʌrmʌdʒr/ | Leaf, Root | Decoction | Oral, Topical | Stomachache, skin, pains |
| 3450 | Orchidaceae | *Orchis palustris* Jacq. | /sæəlæb/ | Leaf | Crude | Oral | Respiratory system |
| 3437 | Liliaceae | *Ornithogalum brachystachys* C. Koch | /giːlɑːʁe/ | Leaf | Cooked | Oral | Infection, anthelmintic |
| 3421 | Papaveraceae | *Papaver argemone* L. | /ʁuːr ʧæŋr/ | Flower, Seed | Decoction, Infusion, Crude | Oral | Headache, coughs, drug dependence |
| 3447 | Rosaceae | *Persica vulgaris* Mill. | /hɔːluː/ | Leaf | Crude | Anal | Hemorrhoids |
| 3650 | Fabaceae | *Phaseolus vulgaris* L. | /luːbiː/ | Seed | Crude | | Respiratory system |
| 3698 | Plantaginaceae | *Plantago lanceolata* L. | /rægkiːʃe/ | Leaf, Seed | Crude, Maceration | Topical, Orally | Scabies, throat, wound, hemorrhage, infection |

**Table 1**. Continued

| Voucher Number | Family | Scientific Name | Local Name's Pronunciation | Plant part | Method of Preparation | Administration Route | Use |
|---|---|---|---|---|---|---|---|
| 3385 | Plantaginaceae | *Plantago major* L. | /baːrhæŋ/ | Seed | Infusion | Oral | Respiratory system |
| 3643 | Platanaceae | *Platanus orientalis* L. | /tʃenaːr/ | Leaf | Infusion | Oral | Fever |
| 3664 | Portulacaceae | *Portulaca oleracea* L. | /xɔːrfe/ | Aerial Part, Leaf, Seed | Crude | Oral, Topical | Skin |
| 3671 | Anacardiaceae | *Rhus coriaria* L. | /sɔːmaːɷ/ | Fruit, Seed | Crude, Maceration | Oral | Wound, diabetes, hyperlipidemia |
| 3658 | Rosaceae | *Rosa damascena* Mill. | /rɔːz/ | Flower | Extraction, infusion, | Oral | Stomachache, constipation |
| 3453 | Rosaceae | *Sanguisorba minor* Scop. | /reveleks/ | Bulb, Root | Decoction | Oral | Hypothermia, infection, hemorrhoids |
| 3454 | Asteraceae | *Senecio vulgaris* L. | /kɑːhu kuːhr/ | Whole Plant | Decoction | Oral | Drug dependence |
| 3409 | Brassicaceae | *Sisymbrium brassiciforme* C. A. Mey | /xɑːkʃiːr/ | Seed | Maceration | Oral | Hyperthermia, fever, cold |
| 3403 | Brassicaceae | *Sisymbrium gaubae* Rech. f. & Bornm. | /xɑːkʃiːr/ | Seed | Extraction | Oral | Constipation, hyperthermia |
| 3697 | Solanaceae | *Solanum tuberosum* L. | /siːb zæmiːnr/ | Root Tuber | Juice | Oral | Gastric ulcer |
| 3384 | Fabaceae | *Sophora alopecuroides* L. | /ʃiːrrn bæyʌn/ | Root | Crude | Topical | Fracture |
| 3642 | Lamiaceae | *Stachys lavandulifolia* Vahl. | /tulkrʤe/ | Flower, Aerial part | Infusion, Decoction, Extraction | Oral, Topical | Pains, nervous system, cold, burn, hypertension, infection, hyperlipidemia, stomachache, carminative |
| 3659 | Asteraceae | *Tanacetum parthenium* (L.) Schultz-Bip. | /sʌrʌ kelkʌnʌ/ | Flower | Extraction, Infusion | Oral, Topical | Headache, hair, nervous system, kidney, sedative, headache |
| 3641 | Lamiaceae | *Thymus lancifolius* Celak. | /ʌzɔːrbe/ | Aerial Part | Infusion, Extraction | Oral | Fever, cold, stomachache, sedative, gastric ulcer, hypothermia, carminative |
| 3428 | Asteraceae | *Tragopogon rechingeri* M. Ownbey | /ʃeng/ | Leaf, Aerial Part | Cooked, Crude | Oral | Anemia, stomachache |
| 3429 | Asteraceae | *Tripleurospermum disciforme* (C. A. Mey.) Schultz | /riːʃe gæzr/ | Flower | Decoction | Oral | Kidney stone |
| 3390 | Urticaceae | *Urtica dioica* L. | /gæzæne/ | Leaf | Crude, infusion, Decoction | Topical, Oral | Pains, kidney stone, diabetes, hypoglycemia |
| 3655 | Scrophulariaceae | *Verbascum macrocarpus* Boiss. | /xærguːʃæk/ | Aerial Part | Juice | Topical | Hair |

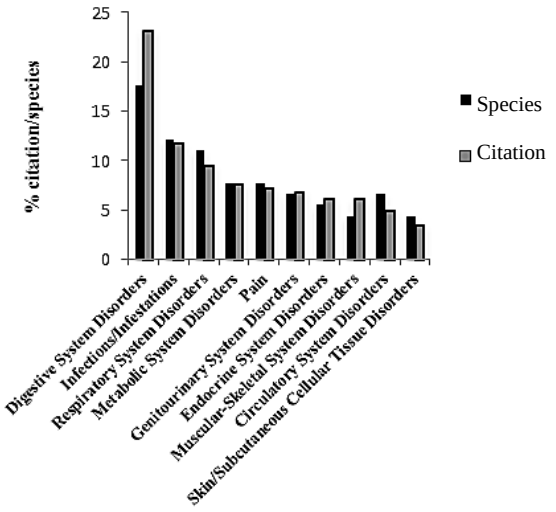


**Figure 3**. Percentage of species and citation in each use category

IAR was calculated in order to assess reliability and consistency of medicinal plant uses. Culturally important plants were those that were used by a large number of healers for the same category of indigenous use, while plants that were cited as useful by only one or two informants were considered to be of low cultural importance [23].The highest value of IAR was related to the use category of pregnancy/ birth/ puerperium disorders. In five use categories (inflammation, mental disorders, defined symptoms, nutritional disorders and sensory system disorders) the number of plants and the number of citations for each species, in each use category were the same, which resulted to the value zero for IAR. That means there was no agreement between informants on the use of species. A similar observation was reported in an ethnobotanical study of Hani ethnicity located in Yunnan, China [13]. Interestingly, the number of species and the number of citations was the highest in digestive system category, but it did not show the highest value in the IAR ranking (table 2).

Quantitative data collection from ethnobotanical studies is turning to be essential for further information evaluation and for carrying out more comparisons between ethnobotany works that use the same methodology.

The highest number of informants was ten which belonged to *Thymus lancifolius Celak.* (figure 4). It means the plant was the most known plant in this province. *Stachys lavandulifolia* Vahl. showed the maximum number of use-reports (figure 5).

Ethnobotanical indices of RFC and CI also showed the highest number in *Thymus lancifolius* Celak. and *Stachys lavandulifolia* Vahl., respectively (table 3).

**Table 2**. Informant agreement factor for different use categories

| Use Category | nur | nt | IAR |
|---|---|---|---|
| Digestive System Disorders | 61 | 32 | 0.4833 |
| Infections/Infestations | 31 | 22 | 0.3 |
| Respiratory System Disorders | 25 | 20 | 0.2083 |
| Metabolic System Disorders | 20 | 14 | 0.3158 |
| Pain | 19 | 14 | 0.2778 |
| Genitourinary System Disorders | 18 | 12 | 0.3529 |
| Muscular-Skeletal System Disorders | 16 | 8 | 0.5333 |
| Endocrine System Disorders | 16 | 10 | 0.4 |
| Circulatory System Disorders | 13 | 12 | 0.0833 |
| Skin/Subcutaneous Cellular Tissue Disorders | 9 | 8 | 0.125 |
| Injuries | 6 | 5 | 0.2 |
| Inflammation | 6 | 6 | 0 |
| Blood System Disorders | 6 | 4 | 0.4 |
| Poisoning | 4 | 3 | 0.3333 |
| Mental Disorders | 4 | 4 | 0 |
| Nervous System Disorders | 3 | 2 | 0.5 |
| Pregnancy/Birth/Puerperium Disorders | 2 | 1 | 1 |
| Sensory System Disorders | 1 | 1 | 0 |
| Nutritional Disorders | 1 | 1 | 0 |
| Defined Symptoms | 1 | 1 | 0 |

$n_t$ = number of taxa, $n_{ur}$ = number of citation in each use category; IAR= informant agreement ratio

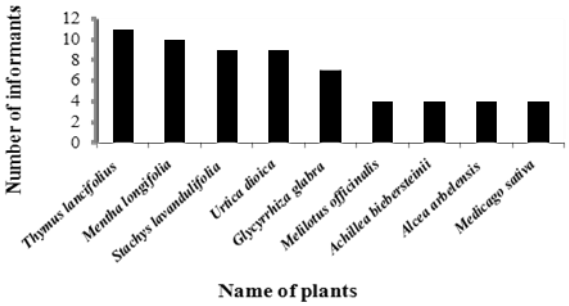


**Figure 4**. Species with the highest number of informants

RFC directly depends on the number of informants mentioning the use of the plant. The CI index measure is independent to the number

of informants and considers diversity of use. Culturally important plants are those that are used


**Figure 5**. Species with the highest number of use reports

**Table 3**. The highest value of RFC and CI in plants

| NO. | Scientific Name | CI | RFC |
|---|---|---|---|
| 1 | *Stachys lavandulifolia* Vahl. | 0.358 | 0.17 |
| 2 | *Thymus lancifolius* Celak. | 0.321 | 0.208 |
| 3 | *Mentha longifolia* (L.) Hudson | 0.283 | 0.189 |
| 4 | *Urtica dioica* L. | 0.264 | 0.17 |
| 5 | *Glycyrrhiza glabra* L. | 0.226 | 0.132 |
| 6 | *Achillea biebersteinii* Afan | 0.132 | 0.075 |
| 7 | *Melilotus officinalis (L.)* Desr. | 0.132 | 0.075 |
| 8 | *Alcea arbelensis Boiss. & Hausskn* | 0.113 | 0.075 |
| 9 | *Ceratocephalus falcata* (L.) Pers | 0.094 | 0.075 |
| 10 | *Medicago sativa* L. | 0.094 | 0.075 |

by a large number of people for the same category of use [24].In this paper we focused mainly on species by medicinal uses, but some species had other interests; mostly as food. From the 50 species reported in this paper, thirty- eight plants had both medicinal and non-medicinal uses. Most of the edible plants were used as food additives. Five species including *Medicago sativa* L., *Chenopodium album* L., *Mentha spicata* L., *Mentha longifolia* L., *Tragopogon rechingeri* M. Ownbey, were used as raw vegetables.

Two species including *Rumex acetosa* L. and *Heracleum persicum* Desf. ex Fischer were recorded only as edible plants. *Sophora alopecuroides* L. was used as insecticide and fungicide. *Elaeagnus angustifolia* L. and *Ononis spinosa* L. were used for producing colors and *Alcea tarica* Pakravan. & Ghahremani was used as detergent.

30 plants from 50 species such as *Achillea biebersteinii* Afan, *Senecio vulgaris* L.، *Thymus lancifolius* Celak. were used for feeding animals in this region. This might be a big threat for these plants. Special attention should be given to protect these species of the region.

Recognition of plants in each province helps in better identification of restorable natural resources and characteristics of the medicinal plants and their applications. Hamedan province has good ethnobotanical potential for medicinal plants. It is a suitable place for further ethnobotanical and ethnopharmacological studies. We are aware that this study was not exhaustive. More similar studies are necessary to gather ethnobotanical knowledge, including all kinds of usefull plants, in the various regions of Hamedan province.

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**Declaration of interest**

The authors declare that there is no conflict of interest. The authors alone are responsible for the content of the paper.

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