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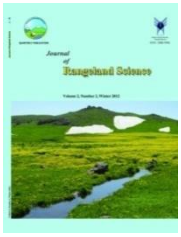

Full Length Article:

Gathering, Identification, Medicinal Utilization and Domestication of Some Wild Edible Plants in Ghasemloo Valley, West Azerbaijan, Iran

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Abstract. We have studied the medicinal plants of Ghasemloo and then surveyed the usage percentage of different parts from each specimen for the medicinal or diet consumptions at three sites from the adjacent villages of Ghasemloo valley, villages of West and East Azerbaijan including 17 questioners. During two years, the medicinal plants that have been collected and provided as herbarium specimens were recognized in 47 families, 124 genera and 149 species. Determining the life form was done by Raunckiaer criterion. Also, the Cultural Index (CI) and mean Cultural Importance of family (mCIf) were surveyed and analyzed by NTSYS-pc Ver. 2.02. The largest families are Asteraceae (n=18), Rosaceae (n=18), Fabaceae (n=11), Lamiaceae (n=11) and Brassicaceae (n=10) species. Hemi-cryptophytes (31.54%), Therophytes (22.15%), Phanerophytes (22.82%), Cryptophytes (10.74%) and Chamaephytes (12.75%) are the most important life forms of reserve. Four families namely Rosaceae, Leguminosae, Labiatae and Juglandaceae had a considerable mCIf. The majority from ten surveyed endemic species indicated a considerable Cultural Index (CI). The studied region includes 0.77% of all endemic species of Iran and this issue confirms the necessity to protect this region more than ever. Thus, the conservation of endemic specimens of this region seems to be necessary.

Key words: Medicinal plants, Cultural Index (CI), Endemic specimen, In situ conservation, Ghasemloo valley.

Introduction

Nowadays, there has been a renewed or increasing interest in consuming wild food plants (Nebel *et al.*, 2006; Heinrich *et al.*, 2006; Delang, 2006a; Vitalini *et al.*, 2006; Halwart, 2006; Redzic, 2006; Johns & Eyzaguirre, 2006). Despite the agricultural societies' primary reliance on crop plants, the tradition of eating wild plants has not completely disappeared and their nutritional role and health benefits are being reported in many surveys worldwide (Delang, 2006b; Ansari *et al.*, 2005; Balemie & Kebebew, 2006; Arenas, 2003; El & Karakaya, 2004; Ertug, 2004; Shrestha & Dhillion, 2006; Lockett *et al.*, 2000; Kuhnlein *et al.*, 2006; Heinrich *et al.*, 2005; Luczaj & Szymanski, 2007). They were important as dietary supplements providing trace elements, vitamines and minerals. However, the consumption is determined less by calorie input and more by the pleasure of gathering wild resources, recreating traditional practices and enjoying characteristic flavors (Pieroni *et al.*, 2002; Pieroni *et al.*, 2005; Bonet & Vallès, 2002; Guarrera *et al.*, 2006; Della *et al.*, 2006; Guarrera, 2003; Pardo-de-Santayana *et al.*, 2005; Tardio *et al.*, 2005; Ghirardini *et al.*, 2007; Lentini & Venza, 2007). Although most studies on wild edible plants focus on the function within one culture or ethnic group, there are only few researches that compare food plants of various cultures (Ladio & Lozada, 2003; Diaz-Betancourt *et al.*, 1999; Leonti *et al.*, 2006). However, some investigations have compared medicinal floras and other useful plants (Goodman & Hobbs, 1988; Leporatti & Ivancheva, 2003; Moerman *et al.*, 1999; Pieroni & Quave, 2005; Rossato *et al.*, 1999). Such comparative studies contribute to understanding why edible species are consumed or rejected and can provide some interesting insights into food selection criteria. Recognition of pharmaceutical plants in the arena of natural resources in talented regions has been one of the basic steps in the constant development of pharmaceutical plants and may provide significant fundamental information for the researchers of various tendencies in these areas. Following the flora accumulation in natural resources, focusing on the accumulation and recognition of pharmaceutical plants and their introduction is one of the necessities for vulnerable natural resources throughout the country. Carrying out various studies including phytosociology, ecological studies and auto-ecological pharmaceutical species paves the way for the practical researches and domestication of species and provides basic yield studies of species and even instructions for beneficiaries in the form of pattern schemes. Several botanical studies on medicinal plants have been done before in Iran (Ghahreman *et al.*, 1981; Shokri and Safaian, 1993). The main objectives of this study were to: (I) Identify the medicinal plants of studied area; (II) Survey the Cultural Index (CI) for the endemic species and mean Cultural Importance of families (mCIf); (III) Survey the cultural capacity of endemic medicinal plants and recommend the cultivation for conservation implications.

Materials and Methods

Description of Studied Region

Forest reserves in Ghasemloo valley and its neighboring regions with an expanse of 577 hectares are located in southern Urmia, Iran. Its geographical longitude is between eastern 45°5′ and 45°10′ and its latitude is northern 37°15′ and 37°20′ (Fig. 1). This region is located in the west of Urmia, 30 km far from Oshnaviyeh town. The region is mountainous and its lowest point and highest peak are 1420 m and 2280 m above sea level, respectively. According to the geological structural divisions, the study region is located in the central region of Khoy-Mahabad zone. This zone has one of

the most ancient substratum rocks of Iran crust. This region is divided into two land units including: 1) low altitude mountains with round peaks and flat with many rocky ectopia in the altitudes (60%-70%) and a relatively high gradient. This region lacks terrestrial covering in the altitudes and outskirts which are free of rocky ectopia. It also has a low to mid-depth terrestrial covering and good to very good vegetation covering of trees and shrubs. 2) fan-shaped screes with pebbles and steady inclination are about %5 without much relief with a deep to fairly deep terrestrial covering of pebbles (10%-20%) and a very good arboreal covering (Fig. 2). Three villages are located in the studied area: 1- Silan village at the east, 2- Shirokandi village at the north east and 3- Rashkand village at the south east of studied area.

Regarding the meteorological data of region and the annual humidity conditions of the earth, the xeric humidity and mesothermal patterns are dominant in the study region (Banai, 1998). Considering the climatic divisions, the study area is located in mid-dry-cold climate. The average annual precipitation is 367.5 mm and the highest and lowest average annual temperatures are 33.1°C and -15.5°C, respectively. February and August are considered as the coldest and hottest months in the region and the average frost days equal to 119 (Regional Water Organization, West Azerbaijan, 1991-2004) (Figs. 3, 4 & 5).

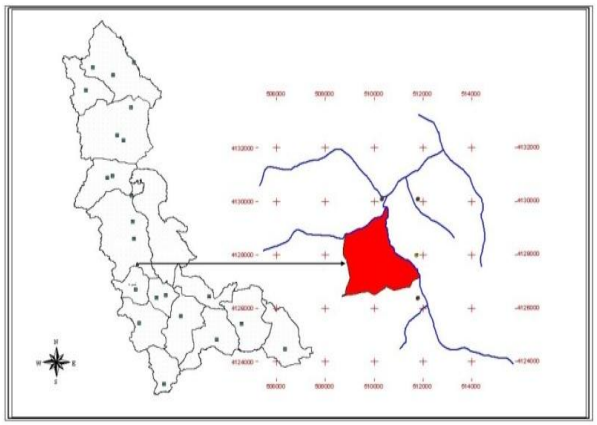


Fig. 1. Map of the study area

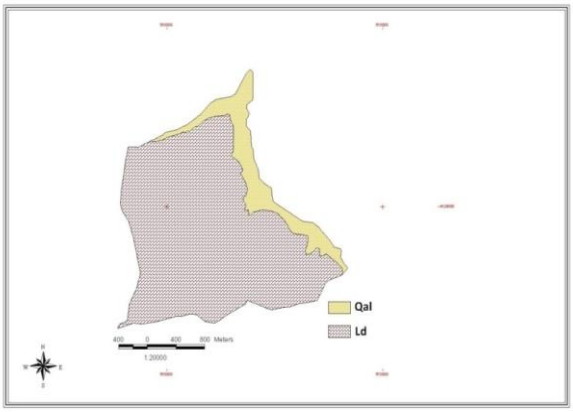


Fig. 2. Geologic & pedologic map of studied area. Qal, Quaternary alluvial sediments (screes);LD, Lime & Dolomite (mountains)

Methods

During two years of field work utilizing human resources, the documented and undocumented sources of plants considered as pharmaceutical ones had been gathered from the region. Alongside the gathering of plants, a number of ecological parameters had also been considered. The samples were transferred to the herbarium; then, they were pressed, dried and identified with the use of various Floras such as Iran Flora (Asadi, 1988-2003 and Khatamsaz, 1992), Iranica flora (Rechinger, 1963-2000), Iranica Flora (Parsa, 1943-1950), Flora of Iran (Mobayen, 1980-1996), Colored Flora of Iran (Ghahreman, 1975-2000), Turkey Flora (Davis, 1965-1988) and Iraq Flora (Towsend and Guest, 1966-1985) Also, in order to obtain information regarding the functional sections and other issues, some sources had been utilized (Ghahreman and Attar, 1996; Ghahreman and Attar, 1998; Akhani, 1998; Akhani, 1994; Mirheydar, 1993-1995; Zargari, 1979-81; Khezri,

2003). The Persian names of species had been derived from various sources, especially Plant Dictionary of Iran (Mozafarian, 1998). In this manner, the status of distribution of these species has been determined according to these Flora. Determining the life form was done by Raunckiaer's criterion (1934).

Provided that the recognition process takes place along with obtaining information from people and the native knowledge of that area, it is possible to add new pharmaceutical species to the pharmaceutical list and provide active work fields for the researchers in the realm of effective material recognition for analyzing the clinical impact of effective material on the acclaimed diseases.

Species Cultural Importance (CI)

The mean value (mCI) was calculated considering only the areas where the species grows since a null value may be due to the species that are not growing there or growing but not being consumed. Therefore, this mean value takes into consideration the species selection or rejection and availability; hence, it is lower for species growing in the area but are rejected or not considered as edible ones (Tardio and Pardo-de-Santayana, 2008).

Culture Importance of the Family (CIf)

Adding the CI of species of each family is a good way to measure the cultural importance of families (CIf). So, a family cultural importance is correlated highly with the number of species in each family (Phillips and Gentry, 1993).

Statistical Analysis

To estimate the cultural significance of endemic species of medicinal plants, we used the Cultural Importance Index (CI) with the following formula (Tardio and Pardo-de-Santayana, 2008):

$$CI_S = \sum_{i=1}^{i=NU} URi \; / \; N$$

The index (Reyes-Garcia *et al.*, 2006; Phillips and Gentry, 1993) was obtained by adding the UR in every use-category mentioned for a species divided by the number of questioners in the survey (N). *i* varies from only one use (functional part) to the total number of uses, NU. This additive index takes into account the spread of use (number of questioners) for each species and versatility, i.e. diversity of edible uses. The theoretical maximum value of index is the total number of different edible use categories. A mean Cultural Importance Index (mCI) of the species was used to assess the use of wild food plants in three villages in Ghasemloo valley and 14 villages from West Azerbaijan and East Azerbaijan, Iran. To measure the Cultural Importance of families (CIf), we added the CI of species from each family following Galeano (2000). We preferred using the sum instead of mean as proposed by Phillips and Gentry (1993) to highlight more diverse families which would otherwise be underestimated. A regression analysis is needed to confirm statistically which families have higher values than expected for the number of species. In this order, mCIf plot of family species and linear regression with 95% confidence ellipse were drawn by NTSYS-pc Ver. 2.02e.

Results

Overally, 149 pharmaceutical species have been identified in the region having such species as Fern, three Gymnosperms, 129 Dicotyledonous Angiosperms and 16 Monocotyledonous species. These species belong to 47 families and 124 genera. The most important herbal breeds of the region are Asteraceae with 18 species, Rosaceae with 18 species, Fabaceae with 11 species, Lamiaceae with 11 species and

Brassicaceae with 10 species (Fig. 6). The life forms of reservoir plants have been based on the categorization of Raunkiaer (Fig. 7). Results obtained from this categorization show that Hemi-cryptophytes encompass 31.54% of the most important biological forms of the region while Therophytes, Phanerophytes, Cryptophytes and Chamaephytes include 22.15%, 22.82%, 10.74% and 12.75%, respectively. The 23% presence of Phanerophyte plants in this pip gives it a forest-like appearance. The Hemi-cryptophyte plants are the dominant covering of the region and protect the region soil fairly well. Table 1 shows data including family, genus, life form and chorotype (Table 1). The obtained results from the performed studies on annual rainfall (Fig. 3) and temperature (Fig. 4) during fourteen years (1991-2004) by the meteorology state of Ghasemloo and results from edaphic properties (Table 2) classified this area as an altitudes region based on Emberger Index (Q= 42.8, m= -8.92) (Fig. 5). This region is classified as semi-humid one based on De Martonne Aridity Index. Based on the obtained results from the pedologic reports of meteorology state of Ghasemloo, this area is covered with clay, sand, loam and silt soil tissues. The pH of soil was ranged from 7.4 to 8.1, the soil structure is including course granular, granular and cubical form. According to meteorological statistics related to annual temperature in the region, the soil average temperature of region is between 8-15 ˚C and thus, the soils of this region are containing Mesic temperature regime. The soils of this region based on the method of USDA are classified to Typic Calcixerepts and Xeric Torriorthents (USDA, 1993-2003) while FAO and UNESCO methods classified them to Haplic Regosols and Calcaric Regosols (FAO/UNESCO, 1989) (Table 2).

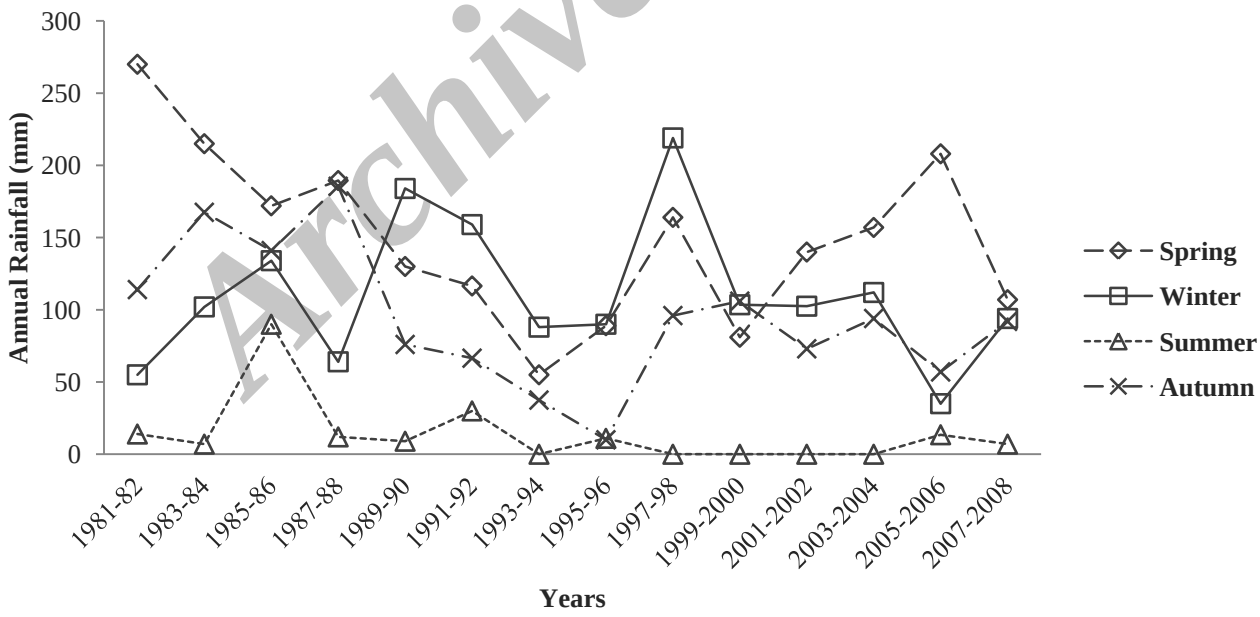


Fig. 3. The curves of annual rainfall of seasons at the studied area since 1991-2004 (Annual Reports of Meteorological State of Ghasemloo)

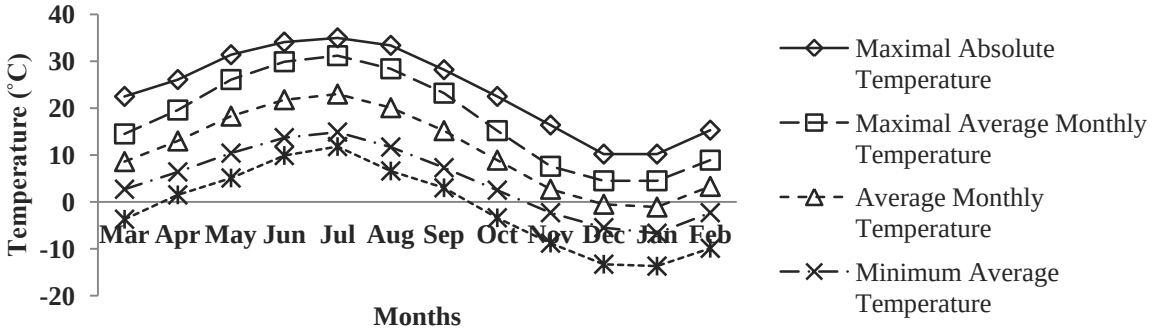
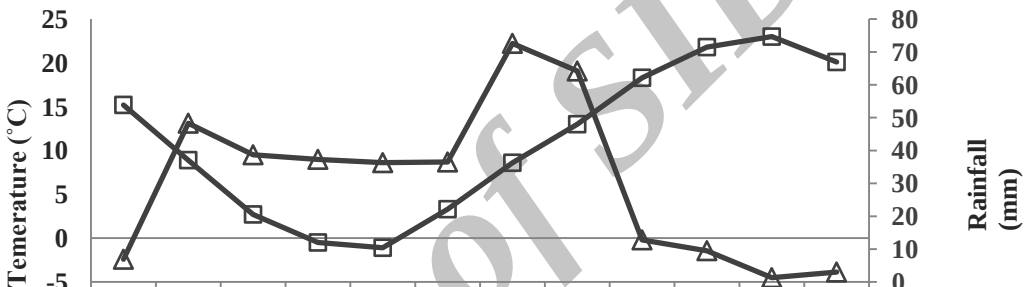


Fig. 4. The curves of temperature variances (˚C) in all months at the studied area since 1991-2004 (Annual Reports of Meteorological State of Ghasemloo)



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Temerature (˚C)	15.2	8.9	2.7	-0.5	-1.1	3.3	8.6	13	18.3	21.8	23	20.1
Rainfall (mm)	6.9	48.3	38.7	37.3	36.3	36.5	72.6	64.2	12.8	9.5	1.3	3

Fig. 5. Embrothermic diagram of studied area since 1991-2004 (Annual Reports of Meteorological State of Ghasemloo)

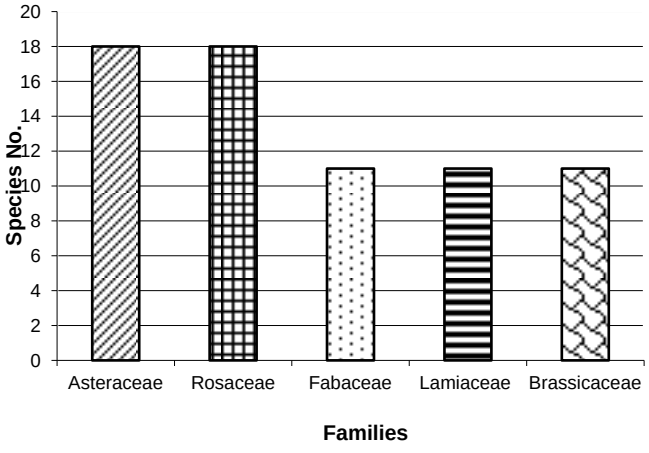


Fig. 6. The families that appropriated the largest number of whole species of studied area

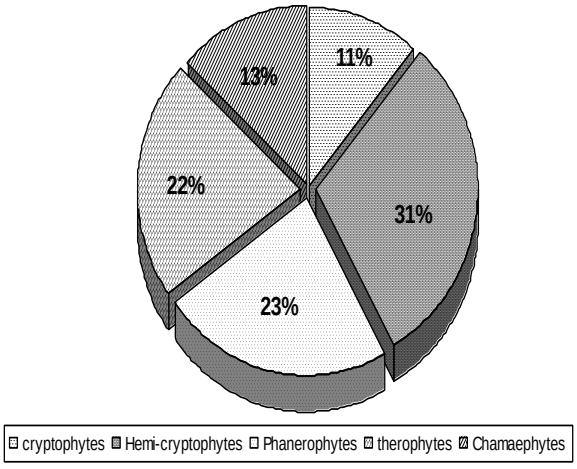


Fig. 7. Life form of all allocated medicinal specimens

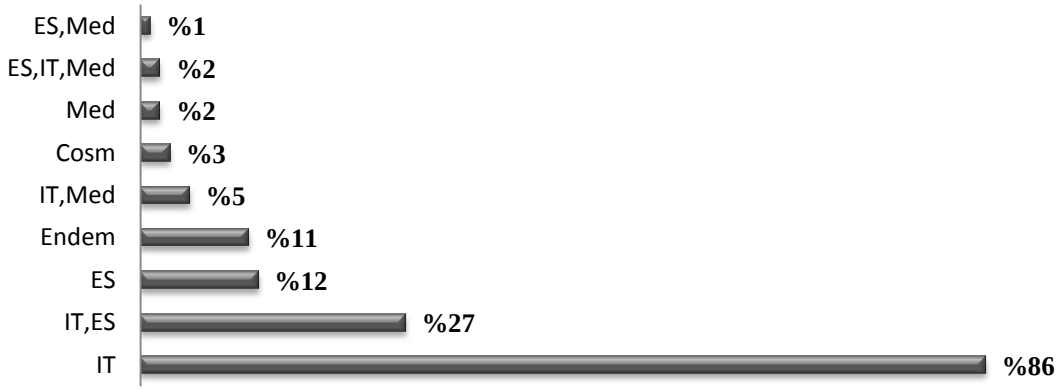


Fig. 8. Chorotype of all allocated medicinal specimens in the studied area. IT, Irano-Turanian; ES, Euro-Siberian; Med, Mediterranean; Cosm, Cosmopolitan; Endem, Endemic

Table 1. List of medicinal specimens with related family, life form and chorotype in studied area

Scientific Name	Family	Life Form	Chorotype
Acer monspessulanum L. subsp. *cinerascens*. (Boiss.) Yaltirik.	Aceraceae	Ph	IT,ES
Ixiolirion tataricum (Pall.) Herb.	Amaryllidaceae	Cr	IT
Rhus coriaria L.	Anacardiaceae	Ph	IT
Aristolochia bottae Jaub & Spach.	Aristolochiaceae	He	IT
Berberis integerrima Bunge	Berberidaceae	Ph	Med
Anchusa italica Retz.	Boraginaceae	Th	IT,ES
Asperugo procumbens L.	Boraginaceae	Th	ES
Nonnea persica Boiss.	Boraginaceae	Th	Endem
Aethionema grandiflorum Boiss.	Brassicaceae	Ch	IT
Alliaria petiolata M. B.	Brassicaceae	Ch	IT,Med
Alyssum desertorum Stapf.	Brassicaceae	Th	Cosm
Capsella bursa-pastoris (L.) Medicus.	Brassicaceae	Th	Cosm
Cardaria draba (L.) Desv.	Brassicaceae	He	Med
Chorispora tenella (Pall.) DC.	Brassicaceae	Th	IT,ES
Descurainia sophia (L.) Schur.	Brassicaceae	Th	IT
Erophila verna (L.) Besser.	Brassicaceae	Th	ES,IT,Med.

Isatis cappadocica Desv.	Brassicaceae	He	IT
Nasturtium officinale R.	Brassicaceae	He	IT,ES
Sisymbrium orientale L.	Brassicaceae	Th	IT
Lonicera nummularifolia Jaub.	Caprifoliaceae	Ph	IT
Dianthus orientalis Adams.	Caryophyllaceae	He	Endem
Gypsophila polyclada Fenzl.	Caryophyllaceae	He	IT,ES
Silene marschallii C. A. Mey.	Caryophyllaceae	He	IT
Chenopodium album L.	Chenopodiaceae	He	IT,ES
Achillea millefolium L.	Compositae	Cr	Endem
Achillea vermicularis Trin.	Compositae	He	IT
Acroptilon repens L.	Compositae	He	IT
Anthemis sp.	Compositae	Th	IT
Carthamus sp.	Compositae	Th	IT,Med
Centaurea behen L.	Compositae	He	IT
Centaurea iberica Hausskn. ex Bornm.	Compositae	He	IT
Centaurea solstitialis L.	Compositae	Th	IT
Centaurea virgata Lam.	Compositae	He	IT
Chardinia orientalis (L.) DC.	Compositae	Th	IT
Cichorium intybus L.	Compositae	He	ES
Echinops orientalis Trautv.	Compositae	He	IT
Gundelia tournefortii L.	Compositae	He	IT
Helichrysum armenium DC.	Compositae	Ch	IT
Lactuca scarioloides Boiss.	Compositae	Th	IT,ES
Serratula cerinthifolia (Sm.) Boiss.	Compositae	He	IT
Taraxacum montanum (C. A. Mey.) DC.	Compositae	He	IT
Tragopogon carcifolius Boiss.	Compositae	He	Endem
Convolvulus arvensis L.	Convolvulaceae	Cr	IT

Juniperus communis L.	Cupressaceae	Ph	ES
Juniperus excelsa M. B.	Cupressaceae	Ph	IT,ES
Elaeagnus angustifolia L.	Elaeagnaceae	Ph	ES
Ephedra major Host.	Ephedraceae	Ch	IT,ES
Equisetum arvens L.	Equisetaceae	He	ES
Euphorbia macroclada Boiss.	Euphorbiaceae	He	IT
Geranium tuberosum L.	Geraniaceae	Cr	IT
Aegilops cylindrica Host.	Gramineae	Th	IT
Agropyron repens (L.) P.	Gramineae	Th	IT,ES,Med
Cynodon dactylon (L.) Pers.	Gramineae	Cr	IT
Dactylis glomerata L.	Gramineae	He	IT,ES
Hordeum bulbosum L.	Gramineae	He	ES,Med
Phragmites australis (Cav.) Trin. ex Steud.	Gramineae	He	Cosm
Secale montanum Guss.	Gramineae	Th	IT
Triticum aestivum L.	Gramineae	Th	IT
Hypericum perforatum L.	Guttiferae	He	ES
Juglans regia L.	Juglandaceae	Ph	IT,ES
Lamium garganicum L.	Labiatae	Cr	IT
Mentha longifolia (L.) Hadson.	Labiatae	Cr	Endem
Nepeta bracteata Benth.	Labiatae	Th	IT
Phlomis tuberosa L.	Labiatae	He	IT,ES
Salvia hydrangea DC.	Labiatae	Ch	IT
Salvia nemorosa L.	Labiatae	He	ES
Stachys lavandulifolia Vahl.	Labiatae	Ch	IT
Teucrium polium L.	Labiatae	Ch	IT,Med
Thymus kotschyanus Boiss.	Labiatae	He	IT
Thymus migricus Klokov. & Desj-Shost.	Labiatae	Ch	IT

Ziziphora tenuior L.	Labiatae	He	IT,ES
Alhagi camelorum Fisch.	Leguminosae	Ch	IT
Astragalus caryolobus Beek.	Leguminosae	Ch	IT
Astragalus effusus Bge.	Leguminosae	Ch	Endem
Astragalus gossypinus Fisch.	Leguminosae	Ch	IT
Glycyrrhiza glabra L.	Leguminosae	Ch	Endem
Lotus corniculatus L.	Leguminosae	Th	IT
Medicago sativa L.	Leguminosae	He	IT
Melilotus officinalis (L.) Desr.	Leguminosae	Th	IT
Trifolium hybridum L.	Leguminosae	He	IT,ES
Trifolium pratense L.	Leguminosae	He	IT,ES
Trifolium repens L.	Leguminosae	He	IT,ES
Vicia variegata Willd.	Leguminosae	Th	IT
Allium sp.	Liliaceae	Cr	IT
Bellevalia longistyla (Miscz.) Groosh.	Liliaceae	Cr	IT,Med
Colchium specoisum Steven.	Liliaceae	Cr	ES
Eremurus sp.	Liliaceae	Cr	IT
Muscari caucasicum (Griseb.) Baker.	Liliaceae	Cr	IT
Muscari neglectum Guss.	Liliaceae	Cr	IT
Linum austriacum L.	Linaceae	He	IT
Alcea angulata Freyn. & Sint.	Malvaceae	He	IT
Malva sylvestris L.	Malvaceae	Th	IT,ES
Ficus carica L.	Moraceae	Ph	IT
Fraxinus excelsior L.	Oleaceae	Ph	IT,ES
Fraxinus rotundifolia Miller	Oleaceae	Ph	IT,ES
Papaver macrostomum Boiss.	Papaveraceae	Th	IT,ES
Plantago lanceolata L.	Plantaginaceae	He	ES

Acantholimon sp.	Plumbaginaceae	Ch	IT
Polygonum avicular L.	Polygonaceae	Th	IT
Pteropyrum aucheri Jaub & Spach.	Polygonaceae	Ch	IT
Rheum ribes L.	Polygonaceae	Ch	IT
Rumex tuberosus L.	Polygonaceae	Ch	IT
Ceratocephalus falcata (L.) Pers.	Ranunculaceae	Th	IT,ES
Nigella arvensis L.	Ranunculaceae	Th	IT
Ranunculus arvensis L.	Ranunculaceae	Th	IT
Thalictrum sp.	Ranunculaceae	Cr	IT
Rhamnus pallasii Fisch. & C.A. Mey.	Rhamnaceae	Ph	Endem
Amygdalus elaeagnifolia Spach.	Rosaceae	Ph	Endem
Amygdalus korshinsky (Hand-Mazt) Bornm.	Rosaceae	Ph	IT
Amygdalus kotschyi Boiss.	Rosaceae	Ph	IT
Amygdalus pabotii Browicz	Rosaceae	Ph	IT
Amygdalus trichoamygdalus (Hand-Mast.) woron.	Rosaceae	Ph	IT
Cerasus mahaleb (L.) Miller	Rosaceae	Ph	IT
Cerasus microcarpa (C. A. Mey.) Boiss.	Rosaceae	Ph	Endem
Cotoneaster nummularioides Pojark.	Rosaceae	Ph	IT
Crataegus aronia (L.) Pojark.	Rosaceae	Ph	IT
Crataegus davisii Browicz	Rosaceae	Ph	IT
Crataegus pseudoheterophylla Pojark.	Rosaceae	Ph	IT
Potentilla recta L.	Rosaceae	He	IT,ES
Pyrus communis L.	Rosaceae	Ph	IT,ES
Pyrus glabra Boiss.	Rosaceae	Ph	Endem
Rosa canina L.	Rosaceae	Ph	IT
Rubus caesius L.	Rosaceae	Ph	IT,ES
Sanguisorba minor Scop.	Rosaceae	He	IT,ES

Sorbus graeca (Spach.) Loddiges ex Schauer	Rosaceae	Ph	IT
Asperula arvensis L.	Rubiaceae	Th	IT
Galium aparine L.	Rubiaceae	Th	IT
Galium verum L.	Rubiaceae	He	IT
Salix alba L.	Salicaceae	Ph	IT,ES
Verbascum phoeniceum L.	Scrophulariaceae	He	IT,Med
Verbascum sp.	Scrophulariaceae	He	IT,ES
Veronica orientalis Miller	Scrophulariaceae	Ch	IT
Hyocyamus reticulatus L.	Solanaceae	Th	IT
Daphne mucronata Royle.	Thymelaeaceae	Ph	IT
Ulmus carpinifolia Borkh.	Ulmaceae	Ph	ES
Ulmus glabra Hudson.	Ulmaceae	Ph	ES
Eryngium billardieri Delar.	Umbelliferae	He	IT
Falcaria vulgaris Bernh.	Umbelliferae	He	IT
Ferula communis	Umbelliferae	He	IT
Pimpinella affinis Ledeb.	Umbelliferae	Th	IT
Pimpinella corymbosa Boiss.	Umbelliferae	Th	IT
Prangos uloptera DC.	Umbelliferae	He	IT
Sium sisarum L.	Umbelliferae	Cr	ES
Smyrnium cordifolium Boiss.	Umbelliferae	Th	IT
Urtica dioica L.	Urticaceae	He	IT
Valeriana sisymbriifolia Vahl.	Valerianaceae	He	IT
Viola odorata L.	Violaceae	Cr	IT
Vitis sylvestris Gmelin.	Vitaceae	Ph	IT
Peganum harmala L.	Zygophyllaceae	Ch	IT

Ph, Phanerophyte; Th, Therophyte; He, Hemicryptophyte; Cr, Cryptophyte; Ch, Chamaephyte; IT, Irano-Turanian; Med, Mediterranean; ES, Euro-Siberian; Cosm, Cosmopolitan; Endm, Endemic.

Table 2. The soil characteristics of studied communities

Plant Class	Soil pH	Soil Texture	Soil Color		Soil Structure	Soil Depth
1	7.8	Clay-sand	Grayish brown	10YR4/3	Course granular	>82
2	8	Loam-clay	Redish brown	10YR3/2	Cubical form	>57
3	7.8	Loam	Brown	10YR5/2	Course granular	>60
4	7.4	Loam-clay	Redish brown	10YR3/3	Cubical form	>73
5	8	Loam-silt	Redish brown	10YR3/2	Cubical form	>22
6	8	Sand-clay	Redish brown	5YR5/4	Granular	>35
7	7.5	Loam-clay	Dark redish brown	5YR6/4	Cubical form	>31
8	7.9	Silt-clay	Yellowish brown	5YR4/4	Granular	>81
9	8.1	Loam-sand	Yellowish brown	5YR3/3	Cubical form	>33
10	7.6	Loam-clay	Dark redish brown	5YR 4/3	Cubical form	>64
11	7.8	Loam	Yellowish brown	10YR 3/3	Course granular	>90

CI values variations of endemic species among different sites

The results from CI values among ten endemic species obtained in three different regions (including 17 questioners from adjacent villages of Ghasemloo valley, West Azerbaijan and East Azerbaijan) indicated high CI values for all species, but low differences among regions. In other hand, most of them to some extent showed near report percentage of questioners (Fig. 9).

Species Cultural Importance (CI)

Fig. 9 demonstrated that ten wild species that are the most proper ones to culture include *Pyrus glabra* (pear), *Tragopogon carcifolius* (salsify), *Mentha longifolia* (horsemint), *Glycyrrhiza glabra* (common liquorice), *Astragalus effusus* (milk-vetch), *Achillea millefolium* (milfoil), *Amygdalus* sp. (mountain almond), *Cerasus microcarpa* (sour cherry), *Rhamnus pallasii* (buckthorn) and *Dianthus orientalis* (carnation). The mean value (mCI) was calculated considering only the areas where the species grows since a null value may be due to the species not growing there or growing but not being consumed. This mean value therefore takes into consideration the species selection or rejection and availability; hence, it is lower for the species growing in the area but are rejected or not considered as edible ones.

Discussion & **Conclusion**

Medicinal plants are an important aspect of all traditional cultures. They are important because of spiritual beliefs and because they provide accessible health care to the local population. With the introduction of health centers in many indigenous communities, non-indigenous pharmaceuticals are taking the place of traditional medicines. Medicinal plant knowledge has been shown to be more susceptible to the acculturation than other categories of plant knowledge. The herbs are mostly gathered from nature as spring plants from the beginning of germinating season and are sold in the market. This issue is considered highly notable for the

culture of people living in this region and even in Urmia and throughout the province. Some of the species in this area seem to be 'naturally rare'. Most of the documented recent population decline is attributed to human activity increasing the risk of extinction as a result of their reduced population size. For instance, the construction of a public road seriously altered the population size. Other biological factors such as plant longevity and absence of significant levels of herbivore demolition do not appear to compromise the species survival in the short term. Based on the obtained results in chorotype percentage of medicinal plants in the studied area, the percentage of endemic specimens has shown a relatively noticeable percentage of all specimens (Fig. 8). Beside, these specimens are under pressure especially in non-reserved region of Ghasemloo valley due to the urbanization, agriculture, grazing and wood harvesting; also, for the implications of biodiversity conservation of endemic medicinal specimens with emphasis on the obtained results from the edaphic and climatic properties of this region, the cultivation of endemic specimens is recommended in the regions as the same climatic, edaphic, latitude and altitude properties with the studied area.

As shown in (Fig. 10), the highest number of medicinal species and mCIf of them are appropriate for Rosaceae, Compositae, Leguminosae, Labiatae and Brassicaceae. In addition, the endemic species presented in the region were belonging to three families namely Rosaceae (*Pyrus glabra*, *Amygdalus elaeagnifolia* and *Cerasus microcarpa*), Compositae (*Achillea millefolium*, *Tragopagon carcifolius*) and Leguminosae (*Astragalus effusus*, *Glycyrrhiza glabra*) (Fig. 9). But only four families (Rosaceae, Leguminosae, Labiatae and Juglandaceae) are located at the top of regression line at mCIf plot (Fig. 10). so, they had a considerable mCIf. Based on the attained statistical results of considerable local measurement usage from endemic species and belonging of these majority species to the mentioned families, the culture of endemic species, especially the resulted species to these four families is recommended; so, culture of species, especially endemic species related to them (Figs. 9 and 10) are recommended because of market demand and economical advantage.

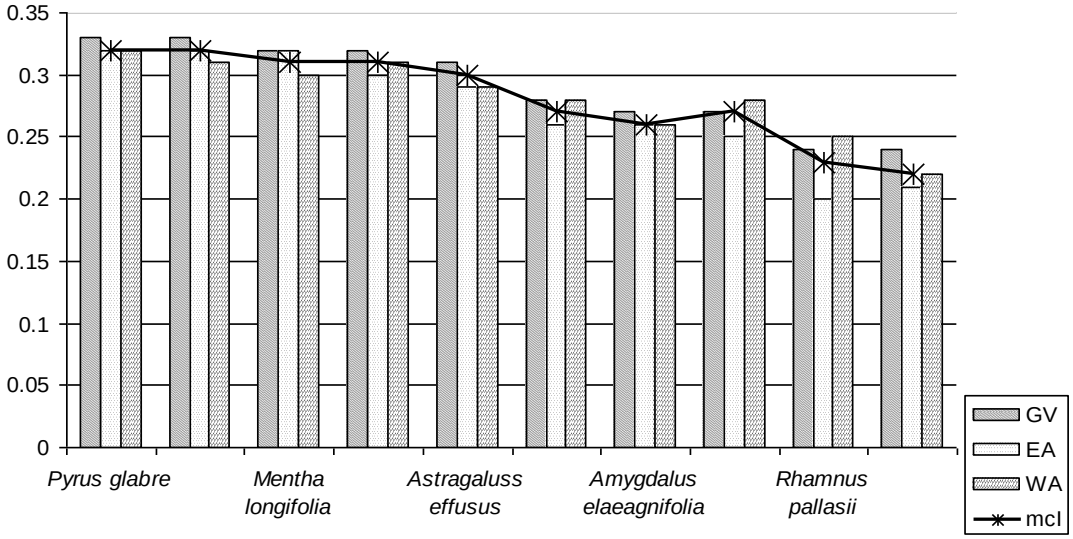


Fig. 9. Cultural Importance Index (CI) of the 10 most relevant species in three villages near Ghasemloo Valley (GV), villages of West Azerbaijan (WA) and East Azerbaijan (EA) in descending order by mean value (mCI)

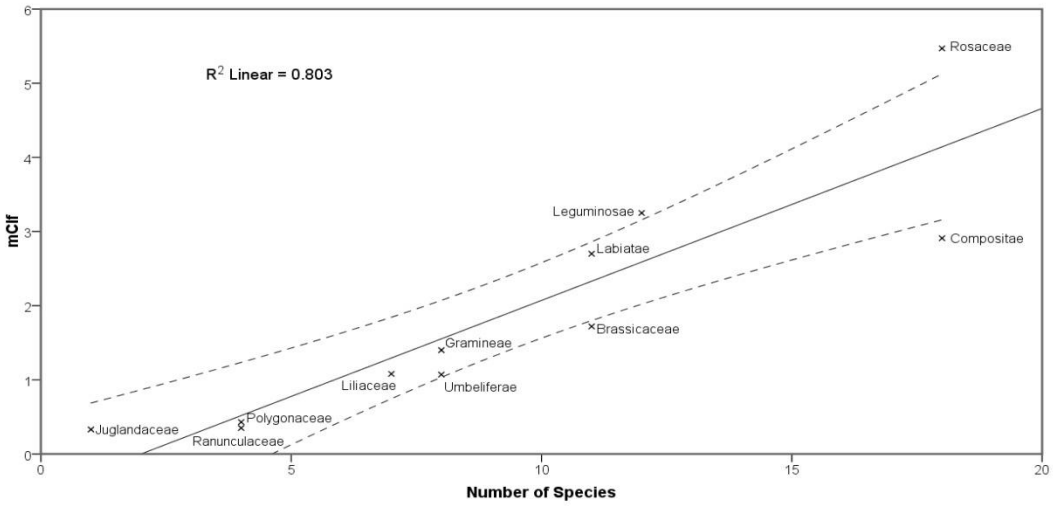


Fig. 10. Linear regression of Cultural Importance of Families (mCIf) on the number of species in the family with 95% confidence ellipse

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