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Floristic Study of Firozeh Watershed (North Khorasan Province)

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Abstract: Firozeh watershed with an area of 270 km^2 is located in 20 km South of Bojnord (North Khorasan Province). The altitude of the area ranges is 1280-3010 m. The mean annual rainfall is 385.7 mm and the mean annual temperature is 8.9°C. In order to floristic study in this watershed, plant samples were collected during six growing seasons (2003-2008) and identified using different flora references. The life forms were determined and the biological spectrum of the area was plotted. The position of the area related to phytogeographical classification was investigated based on geographical data and references. In this research 56 family, 243 genera and 405 species were identified. The largest families of region are: compositae with 52 species and poaceae with 47 species. Hemicryptophyte with 149 species are the most frequent life forms in the area. The distribution of the 262 species is restricted to Irano-Turanian region. Of these, 47 species are endemic of Iran. Furthermore, according to the IUCN, three categories of plant species so called vulnerable, lower risk and data deficient are determined. There are total 60 threatened plant species in this area.

Key words: Floristic, life form, chorotype, firozeh, Bojnord, Iran

INTRODUCTION

The diversity of plant life is an essential underpinning of most of the terrestrial ecosystems. Humans and most other animals are almost totally dependent on plants, directly or indirectly. Another important role of plant life is the provision of ecosystem services the protection of watersheds, stabilization of slopes, improvement of soils, medicinal plants, moderation of climate and the provision of a habitat for much of the wild fauna. While, it is generally accepted today that the conservation of all biodiversity should be the goal, understanding the natural distribution of plants (Floristic studies) is central to conserving biodiversity and managing ecosystems for long-term viability and sustainability. Iran is a country with high divers climate and topography, which leads to diversity in natural and biological resources. Therefore, for management in order to conservation of this diversity, prevention from destruction of habitats, determining the native and resistant species and endangered species and supporting them, recognition of medicinal plants for proper use of them, floristic studies is necessary.

Nowadays, many studies in this field have been doing by researchers, such as: Floristic study of Genu Hormozgan (Najafi *et al*., 2005), plant species of Vanak-Semirom-Isfahan (Parishani, 2003), Floristic study of Sangdeh-sari (Akbarinia *et al*., 2004), Floristic study of Darrah Damgahan-Mehriz (Zarezadeh *et al*., 2007), Floristic study of Ghasemloo (Shohada) Valley, Forest reservoir (Malekmohammadi *et al*., 2007). While, this sort of studies is very useful for planning with refer to protection, reclamation and management of valuable species, present study was done in Firozeh region in 2003-2008.

MATERIALS AND METHODS

Firozeh region with 270 km^2 area is located on the Northern slopes of Aladagh elevations in North East of Iran (North Khorasan Province). This region is situated between 57°02'-57°25' East longitudes and 37°13'-37°23' North latitude. This region is located between the cities of Bojnord and Esfarain. The altitude of the area ranges from 1280-3010 m. The rainiest month is March. The mean annual rainfall is 385.7 mm and the median annual temperature is 8.9°C. The average maximum temperature is 26.5°C in August and minimum temperature is -2.6°C in December (Fig. 1). The climate of this region with using of Emberger method is cold semi-arid to climatic heights. The embrothermic diagram show that drought period is for five months of year and wet season stars in November and continues until May (Fig. 2).

In order to presentation the flora of Firozeh, at first related information such as: Meteorological statistics, Topographic maps were gathered. Then, the specimens were collected in different seasons. The collected samples were then identified and named on classification and terminology applied to various Flora, such as: Flora Iranica Rechinger (1963-1998), Flora of Iran Assadi (1988-2003), Flora of Iran Parsa (1943-1950), Colored Flora of Iran Ghahreman (1975-2002), *Astragalus* communities

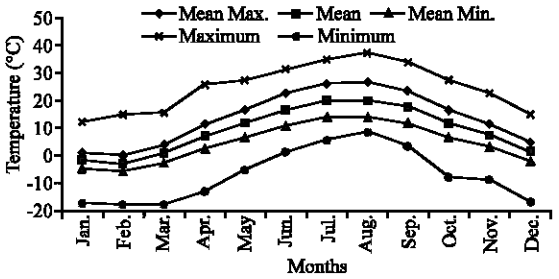

Fig. 1: The line chart of temperatures

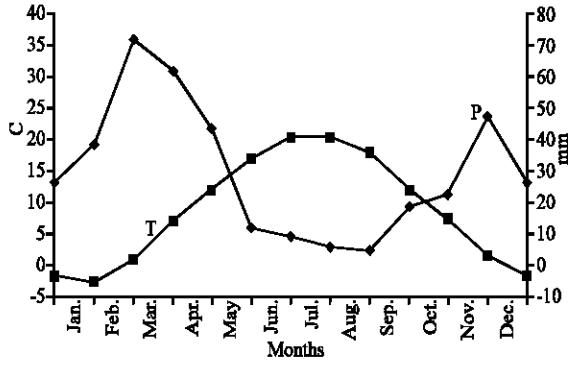

Fig. 2: The lines on 2 Axes chart of embrothermic curve

of Iran Maasoumi (1986-2000). In this manner geographical plant distribution also determined according these Flora. Determining the life form was done by Raunchier (1934)'s method, Endemic species of Iran was determined according to Red data book of Iran Jalili and Jamzad (1999) and chorology of species is based on Zohary (1973) and Takhtajan (1986).

RESULTS AND DISCUSSION

The results of study show that about 405 species belong to 243 Genera and 56 Families have been recognized. Among the existing Families, 47 Families are Dicotyledonous, 7 Families are monocotyledon and 2 Families (Ephedraceae, Cupressaceae) are Gymnosperms. Compositae with 30 Genera and 52 species is the most abundant family in the area, followed by families of Poaceae, Labiatae, Papilionaceae, Brassicaceae and Apiaceae with 47, 35, 31, 28 and 21 species, respectively (Fig. 3 and 4).

Table 1 is a list of all species collected in the area with information about scientific name, chorology, life form and medicinal use.

The life form spectrum of plant species is as follow: Hemicryptophyte 36.79%, Therophyte 25.68%, Chamaephyte 14.07%, Geophytes 13.58% and Phanerophyte 9.88% (Fig. 5).

The Chorotype distributions of species are as follow: Irano-Turanian 64.69%, Irano-Turanian and Mediterranean 11.35%, Cosmopolitan 8.15%, Irano-Turanian, Mediterranean and Euro-Siberian 5.93%, Irano-Turanian and Euro-Siberian 5.18%, Irano-Turanian and Sahara-Sindian 2.47%, Irano-Turanian, Mediterranean and Sahara-Sindian 1.48% and Irano-Turanian, Euro-Siberian and Sahara-Sindian 0.75% (Fig. 6).

Among 405 plant species distributed in the studied area, 47 species are endemic to Iran. Furthermore, according to the IUCN, three categories of plant species so called vulnerable, lower risk and data deficient are determined. There are in total, 60 threatened plant species in this area (Table 2).

Among all plants Hemicryptophyte with 36.79% is dominant and Therophyte with 25.68% is in the next order. In fact life forms of the plants indicate the possibility of adaptation of plants to environmental factors especially climatic condition. According to Archibold (1995) the frequency of Hemicryptophyte plants is due to cold and to altitude climate. On the whole frequency of Hemicryptophyte among the plants of the region show that the effect form of climate area is cold semi-arid to climatic of heights. Therophyte adapted to the dryness of the region and shortage rainfall, because these plants spend vegetative period in the form of seed (Asri, 2003).

Hemicryptophyte adapted to condition of area. They adapted and developed themselves to area by using different ways such as: reserving water, using ground water, reducing their water by loosing their leaves and reduction of vegetative growth.

Dominance of Hemicryptophyte and Therophyte clearly indicate the adaptation of these plants to aridity of area.

The low percentage of Chamaephyte, Geophytes and Phanerophyte shows that they are not adapted to existence climate and edaphically situations. Each plant species has it's special ecological area with a known tolerance to life conditions of area. Therefore, the geographical distribution of plant species depending on life conditions of area and adaptation of plants to area (Asri, 2003).

Astragalus diversity with its 12 species in this area which is mountainous shows that *Astragalus* has adapted to the mountainous conditions.

The Chorotype distribution of plants reflects the climate conditions. Considering to this fact that 64.69% plant species in a region are IT elements, so this region belong to IT. IT (the Irano-Turanian region) is characterized by low rainfall and a long dry season.

The existence endemic species indicate diversity in Iran climate. Among 405 plant species distributed in the

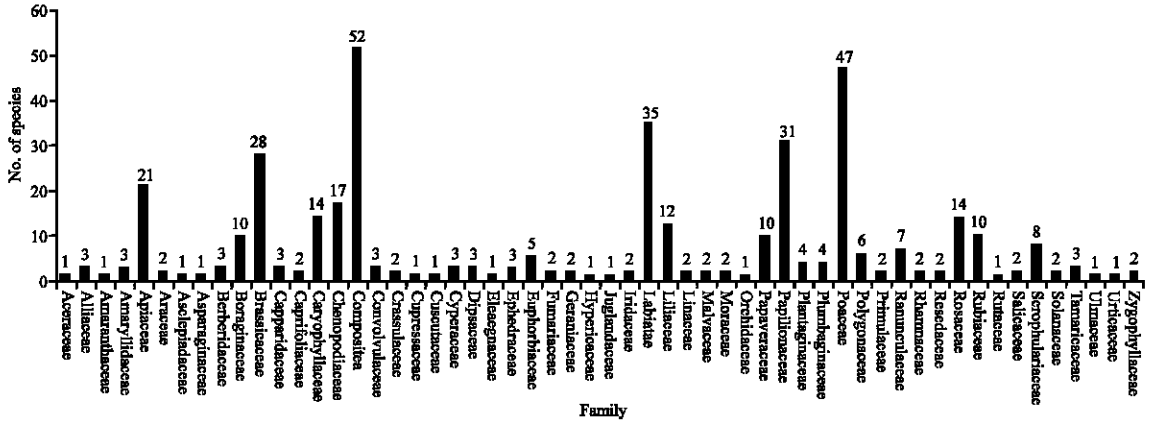

Fig. 3: The column chart of frequency of species in family in Firozeh watershed

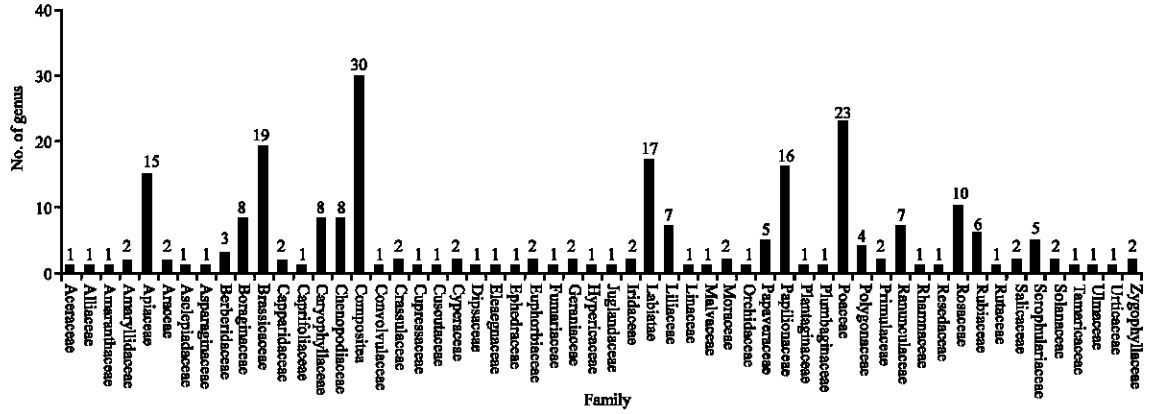

Fig. 4: The column chart of frequency of genus in family in Firozeh watershed

Table 1: Floristic list of firozeh watershed

Scientific name	Life form	Chorotype	Medicinaluse
Aceraceae			
Acer monspessulanum L. *Subsp. ibericum* (M.B.) Yaltirik	ph	IT,ES(End)	-
Alliaceae			
Allium caspium (Pall.) M.B.	Ge	IT	-
Allium monophyllum Vved.	Ge	IT	-
Allium rotundum L.	Ge	IT	-
Amaranthaceae			
Amaranthus retroflexus L.	Th	Cosm	-
Amaryllidaceae			
Ixiolirion montanum (Labill.) Herb.	Ge	IT,ES,SS	-
Ixiolirion tataricum (Pall.) Herb.	Ge	IT,ES,SS	-
Narcissus tazetta L.	Ge	IT,M,ES	-
Apiaceae			
Actinolema macrolema Boiss.	He	IT	-
Bunium cylindricum (Boiss. Et Hoh) Drule.	He	IT	-
Bunium persicum L.	He	IT	*
Caucalis platycarpos L	Ch	IT,M	-
Conium maculatum L.	Ch	Cosm	*
Daucus carota L.	Ch	IT,M	*
Eryngium bungi Boiss.	He	IT	-
Eryngium caeruleum M.B.	He	IT	-
Eryngium billardieri Delaroche	He	IT	*
Falcaria vulgaris Bernh	He	IT,M,ES	*
Ferula stenocarpa Boiss	He	IT(End)	-
Ferula ovina Boiss.	He	IT	-

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Ferula gummosa Boiss	He	IT(End)	*
Ferulago angulata (Schlecht) Boiss.	He	IT(End)	-
Malabaila porphyrodiscus Staph et Wettstein	He	IT(End)	*
Pimpinella saxifrage L.	He	IT	*
Prangos acaulis (DC.) Bornm.	He	IT	-
Prangos gaubae (Bornm.) Herrnstadt et Heya	He	IT(End)	-
Scandix iberica M.B	Th	IT	-
Schumannia karelinii (Bunge) Korov.	He	IT	-
Zozimia absinthifolia (Vent.) Link.	He	IT	-
Araceae			
Arum orientale M.B	Ge	IT	-
Eminium alberti (Rgl.) Engl	Ge	IT	-
Asclepiadaceae			
Vincetuxicum pumilum Decne.	Ch	IT	-
Asparaginaceae			
Polygonatum polyanthemum (M.B.) Link.	Ge	IT	-
Berberidaceae			
Berberis integerrima Bunge.	Ph	IT	*
Bongardia chrysogonum (L.) Boiss.	Ge	IT,M	*
Leontice leontopetalum L.	Ge	IT,M	-
Boraginaceae			
Anchusa italica Retz.	Ch	Cosm	*
Echium italicum L.	Ch	IT,M	*
Lappula microcarpa (Ledeb.) Gurke in Eegler et parntl.	Th	IT	-
Lithospermum tenuiflorum L. Fil.	Th	IT	-
Nonea caspica (Wild.) G.Don.	Th	IT,ES	-
Nonea persica Boiss.	Th	IT	*
Onosma bulbotrichum DC.	Th	IT	-
Onosma koschyi Boiss.	He	IT(End)	-
Paracaryum persicum (Boiss.)	He	IT(End)	-
Rochelia disperma (L.F.) C.Koch	Th	IT	-
Brassicaceae			
Arabis aucheri Boiss.	Th	IT	-
Alyssum bracteatum Boiss. et Buhse	He	IT(End)	-
Alyssum linifolium Steph et Willd.	Th	IT, M,ES	-
Alyssum longistylum (Sommier and Levier) Grossh. and Schischk	He	IT	-
Alyssum marginatum Steud. et Boiss.	Th	IT	-
Brassica deflexa Boiss. *subsp. Deflexa*	Th	IT,SS	-
Brassica elongata Ehrh.	He	IT,M	-
Camelina rumelica Velen.	Th	IT	-
Capsella bursa-pastoris (L.) Medicus	Th	Cosm	*
Clypeola jonthlaspi L.	Th	IT.M.ES	-
Conringia perfoliata (C.A.Mey.) Busch.	Th	IT	-
Descurainia sophia (L.) Webb et Berth.	Th	Cosm	*
Erysimum aitchisonii O.E. Schulz	He	IT	-
Erysimum crassipes Fisch. et C.A.Mey.	He	IT	*
Fibigia suffruticosa (Vent.) Sweet.	He	IT	-
Isatis kotschyana Boiss. et Hohen..	He	IT	-
Lepidium draba L.	He	IT	*
Lepidium perfoliatum L.	He	IT,ES	*
Malcolmia africana	Th	IT,SS	-
Malcolmia strigosa Boiss.	Th	IT	-
Matthiola chenopodiifolia Fisch. et C.A.Mey.	Th	IT	-
Matthiola ovatifolia Boiss.	He	IT(End)	-
Peltaria angustifolia DC.	Th	IT	-
Rapistrum rugosum (L.) All.	Th	IT,M.ES	-
Sameraria armena (L.) Desv.	Th	IT	-
Sisymbrium loeselii L.	Th	IT	*
Sisymbrium officinale (L.) Scop.	Th	IT	*
Thlaspi perfoliatum L.	Th	IT	-
Capparidaceae			
Buhsea coluteoides Boiss.	He	IT	-
Buhsea trinervia (DC.) Stapf.	He	IT	-
Capparis spinosa L.	Ch	IT,M,SS	*
Caprifoliaceae			
Lonicera floribunda Boiss. et Buhse	Ph	IT,M	-
Lonicera iberica M.B.	Ph	IT,M	-

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Caryophyllaceae			
Acanthophyllum crassifolium Boiss.	Ch	IT(End)	*
Acanthophyllum glandulosum Bunge.	Ch	IT	-
Acanthophyllum chloroleucum Rech. F. and Aell.	Ch	IT(End)	-
Dianthus crinitus sm. Var.crossopetalus Boiss.	Ch	IT	-
Dianthus orietalis Adams	Ch	IT	-
Dianthus macranthoides Hausskn. ex Bornm.	Ch	IT(End)	-
Gypsophila virgata Boiss.	Ch	IT	-
Gypsophila bicolor (Freyn et sint) Grossh	Ge	IT	-
Holostum umbellantum L.	Th	IT	-
Mesostomma kotchyans (Fenzl ex Boiss.) Vved.	He	IT	-
Saponaria orientalis L.	Th	IT	-
Silene conoidea L.	Th	IT,M	-
Silene vulgaris (Moench) Garcke.	He	IT	-
Vaccaria oxyodonta Boiss.	Th	IT,M,ES	-
Chenopodiaceae			
Anabasis aphylla L.	Ch	IT	*
Atriplex aucheri Moq.	Th	IT	-
Atriplex tatarica L.	Th	IT	-
Atriplex verrucifera M.B.	Ch	IT	-
Camphorosma monspeliaca L.	Ch	IT	*
Ceratocarpus arenarius L.	Th	IT	-
Chenopodium album L.	Th	Cosm	*
Chenopodium ambrosioides L.	Th	IT	*
Chenopodium botrys L.	Th	IT,M	*
Chenopodium foliosum (Meomch)	Th	IT	*
Chenopodium murale L.	Th	Cosm	*
Kochia prostrata (L.) Schrad.	Ch	IT	-
Kochia scoparia L.	Th	Cosm	-
Noeae minuta Boiss. and Bal.	Th	IT	-
Noeae mucronata (Forssk) Aschers et schweif	Ch	IT	-
Salsola arbusculiformis Drob.	Ch	IT	-
Salsola kali L.	Th	Cosm	*
Compositea			
Achillea micrantha Willd	Th	IT	*
Achillea millefolium L.	He	IT,ES	*
Achillea tenuifolia Lam.	He	IT	*
Achillea wilhelmsii C.Koch	He	IT,ES	*
Acroptilon repens (L.) DC.	He	IT	*
Anthemis kotschyana Boiss.	He	IT	-
Arctium minus (Hild) Bernh.	He	IT	*
Artemisia aucheri Boiss.	Ch	IT	*
Artemisia kopetdaghensis Krasch.	Ch	IT	-
Artemisia scoparia Waldst. Et Kit.	Ch	IT,ES	*
Artemisia sieberi Boiss.	Ch	IT,SS	*
Carthamus lanatus L. Subsp. turkestanicus (M.Pop.) Hanelt	Th	IT	*
Carthamus oxyacantha M.B.	Th	IT,M	-
Centaurea aucheri (DC.) Wagenitz.	Ge	IT(End)	-
Centaurea depressa M.B.	Th	IT,M.ES	*
Centaurea kotschyi (Boiss. ex Heldr.) Hayek	Ge	IT	-
Centaurea virgata Lam.	He	IT,ES	-
Chardinia orientalis (L.) Kuntze	Th	IT	-
Cichorium intybus L.	He	Cosm	*
Cirsium arvense (L.) Ledeb.	Ge	Cosm	*
Cirsium congestum Fisch. et C.A. Mey.	He	IT	-
Cirsium vulgare (Savi) Ten.	He	IT	-
Cousinia eryngioides Boiss.	He	IT	-
Cousinia linczewskii Juz.	He	IT	-
Cousinia ironica C. Winkl. and Sttauss	He	IT(End)	-
Cousinia smirnowii Trautv.	He	IT	-
Cousinia umbrosa Bunge	He	IT	-
Echinops polygamus Bunge	He	IT(End)	-
Echinops ritro L.	He	IT	-
Echinops ritrodes Bunge.	He	IT	*
Heteropappus altaicus (Willd.) Novopokr Var. altaicus	He	IT	*
Gundelia tournefortii L.	He	IT,M	*
Jurinea stenocalathia Rech.f.	Ch	IT(End)	-

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Inula oculus-Christi L.	He	IT	-
Lactuca glaucifolia Boiss.	Th	IT	-
Lactuca scarioloides Boiss.	He	IT,ES	-
Leontodon asperrimus (Willd.) Boiss.	Ge	IT	-
Onopordon heteracanthum C.A.Mey.	He	IT	-
Picnomon acarna (L.)Cass.	Th	IT,M	-
Picris strigosa M.B.	He	IT(End)	-
Scariola orientalis (Boiss.) Sojak subsp. Orientalis	Ch	IT	-
Scorzonera tortuosissimo Boiss.	Ge	IT	-
Scorzonera persica Boiss. et Buhse	Ge	IT(End)	-
Serratula latifolia Boiss.	He	IT	*
Sonchus oleraceus L.	He	Cosm	-
Tanecetum myriophyllum Willd	He	IT	-
Taraxacum montanum (C.A. Mey.) DC.	He	IT	-
Taraxacum vulgare Hand. Mzt.	Th	IT	-
Tragopogon Morginatus Boiss et Buhse.	He	IT	-
Varthemia persica DC.	Ch	IT	-
Xanthium spinosum L.	Th	Cosm	*
Xanthium strumarium L.	Th	IT	*
Convolvulaceaes			
Convolvulus arvensis L.	Th	Cosm	*
Convolvulus cantabrica L.	He	IT,M	-
Convolvulus dorycnium L.	Ch	IT	-
Crassulaceae			
Sedum album L.	Ge	IT	-
Sempervivum iranicum Bornm. and Gauba	Ge	IT(End)	-
Cupressaceae			
Juniperus excelsa MB.	Ph	IT,M	*
Cuscutaceae			
Cuscuta approximate Bebingt	Th	IT	-
Cyperaceae			
Cyperus eremicus Rottb.	Ge	Cosm	-
Carex stenophylla Wahlenb.	Ge	Cosm	-
Carex sylvatica Huds.	Ge	Cosm	-
Dipsaceae			
Scabiosa micrantha Desf.	Th	IT	-
Scabiosa olivieri Coult	Th	IT	-
Scabiosa rotata M.B.	Th	IT	-
Elaeagnaceae			
Elaeagnus aungistifolia L.	Ph	IT,M	*
Ephedraceae			
Ephedra intermedia Stanf	Ph	IT	*
Ephedra major Host.	Ph	IT,ES	*
Ephedra procera Fisch. and Mey.	Ph	IT,SS	*
Euphorbiaceae			
Andrachne aspera Spreng.	He	IT,SS	-
Euphorbia cheiradenia Boiss. et Hohen.	He	IT	-
Euphorbia helioscopia L.	Th	IT,M	-
Euphorbia humilis C.A. Mey. et Ledeb.	He	IT	-
Euphorbia myrsinites L.	He	IT	-
Fumariaceae			
Fumaria asepala Boiss.	Th	Cosm	*
Fumaria parviflora Lam.	Th	IT,ES,M	*
Geraniaceae			
Biebersteinia multifida DC.	Ge	IT	*
Geranium robertianum L.	Ge	IT,M,ES	*
Hypericaceae			
Hypericum scabrum L.	He	IT	*
Juglandaceae			
Juglans regia L.	Ph	IT	*
Iridaceae			
Gladiolus halophilus Boiss. et Heldr.	Ge	IT	-
Iris songarica Schrenk.	Ge	IT	-
Labiatae			
Clinodium vulgare L.	He	IT,M	-
Dracocephalum kotschyi Boiss.	He	IT,M(End)	*
Eremostachys labiosa Bunge	He	IT,M	-

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Eremostachys laevigata Bge.	He	IT	-
Hymenocrater calycinus (Boiss). Benth.	Ph	IT	*
Hymenocrater elegans Bunge.	Ch	IT	*
Lagochilus cabulicus Benth.	Ch	IT	-
Lagochilus kotschyanus Boiss. in DC.	Ch	IT(End)	-
Lamium album L.	He	IT,M	*
Marrubium parviflorum Fisch. and C.A.Mey.	He	IT,M	-
Marrubium vulgare L.	Ge	IT,M	*
Mentha longifolia L.	He	Cosm	*
Nepeta pungens (Bunge) Benth.	Th	IT	*
Nepeta racemosa Lam.	Ch	IT	-
Nepeta sintenisii Bornm.	He	IT	-
Perovskia abrotanoides Karel.	Ph	IT	*
Perovskia artemisioides Boiss.	Ch	IT	*
Phlomis cancellata Bunge	He	IT	-
Phlomis persica Boiss.	Ch	IT(End)	-
Phlomis anisodonta Boiss.	He	IT	-
Salvia chloroleuca Rech.f. et Aell.	He	IT	-
Salvia nemorosa L.	Ge	IT	*
Salvia reuterana Boiss.	He	IT	*
Salvia syriaca L.	He	IT	-
Scutellaria orientalis L.	He	IT	*
Stachys inflata Bth.	Ch	IT	*
Stachys lavandulifolia Vahl.	Ch	IT	*
Stachys laxa Boiss. and Buhse	Ch	IT(End)	*
Stachys pilifera Benth.	Ch	IT(End)	*
Stachys turcomanica Trautv.	Ge	IT	*
Teucrium polium L.	Ch	Cosm	*
Thymus kotschyanus Boiss. et Hohen.	Ch	IT	*
Thymus fallax fisch et C.A. Mey.	Ch	IT	*
Ziziphora clinopodioides Lam.	Ch	IT	*
Ziziphora tenuior L.	Th	IT,ES	*
Liliaceae			
Bellevalia saiviczii Woron	Ge	IT	-
Fritillaria gibbosa Boiss.	Ge	IT	-
Eremurus olgae Regel.	Ge	IT	*
Eremurus spectabilis M.B.	Ge	IT	*
Gagea olgae Regel	Ge	IT	-
Gagea reticulata (Pull.) Roem et schult.	Ge	IT,ES	-
Muscari neglectum Guss.	Ge	IT,M,SS	-
Scilla bisotunensis Speta.	Ge	IT(End)	-
Tulipa cuspidate Staph.	Ge	IT	-
Tulipa humilis Herb.	Ge	IT	-
Tulipa micheliana Hoog.	Ge	IT	-
Tulipa montana Lindl.	Ge	IT(End)	-
Linaceae			
Linum album Ky.	Ge	IT(End)	*
Linum strictum L.	Th	IT,M,SS	-
Malvaceae			
Malva neglecta Wallr.	He	IT,M,ES	*
Malva parviflora L.	He	IT,M	*
Moraceae			
Ficus carica L.	Ph	IT,M,ES	*
Morus alba L.	Ph	IT	*
Orchidaceae			
Orchis mascula L.	Ge	IT	*
Papaveraceae			
Chlidonium majus L.	He	IT	*
Glaucium elegans F. et M.	Th	IT	-
Glaucium oxylobum Boiss. et Buhse.	Th	IT	-
Glaucium vitellinum Boiss.	He(Th)	IT,M	-
Hypecum pendulum L.	Th	IT,M	-
Papaver argemone L.	Th	IT	*
Papaver gaubae Cullen et Rech	Th	IT(End)	-
Papaver rhoeas L.	Th	IT	*
Papaver tenuifolium Boiss. and Hohen.	Th	IT(End)	-
Roemeria refracta DC.	Th	IT	-

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Papilionceae			
Alhagi camelorum Fisch.	Ch	IT,M	*
Anthyllis boissieri Sagorski	He	IT	-
Astragalus brachycalyx Syn.	Ph	IT	*
Astragalus brevidens Freyn.	He	IT	-
Astragalus cruciatus Link.	He	IT,ES,SS	-
Astragalus effuses Bunge.	He	IT(End)	-
Astragalus grammocalyx Boiss. et Hoh.	He	IT	-
Astragalus microcephalus Maass and Mozaff.	Ph	IT	-
Astragalus magistratus Maass.	He	IT(End)	-
Astragalus mollis M.B.	He	IT	-
Astragalus remotijugus Boiss.	He	IT	-
Astragalus semnanensis Bornm. et Rech.F.	He	IT(End)	-
Astragalus Senilis Bornm.	He	IT(End)	-
Astragalus pinetorum Boiss.	He	IT	-
Colutea buhsei (Boiss.) Shap.	Ph	IT,ES	-
Colutea persica Boiss.	Ph	IT(End)	-
Coronila varia L.	He	IT,M,ES	*
Glycyrrhiza glabra L.	Ch	IT,M,ES	*
Hedysarum callithrix Bunge et Boiss.	He	IT(End)	-
Lathyrus sativus L.	Th	IT,M	-
Lotus corniculatus L.	He	IT,M	*
Medicago sativa L.	He	Cosm	*
Melilotus officinalis (L.) Lam.	He	Cosm	*
Meristotropis xanthioides Vassilcz.	Ch	IT	-
Onobrychis cornuta (L.) Desv. *Subsp.cornuta*	Ch	IT	-
Onobrychis gaubae Bornm.	He	IT(End)	-
Onobrychis sativa Lam.	He	IT	-
Onobrychis transcaspica V.Nikitn	He	IT	-
Sophora pachycarpa C.A.Mey.	He	IT	-
Trifolium repens L.	Ge	IT	*
Vicia monantha Retz.	Th	IT,M	-
Plantaginaceae			
Plantago lagopus L.	He	IT,M	-
Plantago lanceolata L.	He	Cosm	*
Plantago major L.	He	Cosm	*
Plantago media L.	He	IT,M	-
Plumbaginaceae			
Acantholimon acmostegium Boiss. et Buhse	Ch	IT(End)	-
Acantholimon aspadanum Buge.	Ch	IT(End)	-
Acantholimon oliganthum Boiss.	Ch	IT(End)	-
Acantholimon scorpius (Jaub. et Sp.) Boiss.	Ch	IT(End)	-
Poaceae			
Aegilops crassa Boiss.	Th	IT	-
Aegilops cylindrica Host.	Th	IT	-
Aegilops ovata L.	Th	IT	-
Agropyron cristatum (L.) Gaert.	He	IT	-
Agropyron imbricatum (M.B.) Roem. et Schult.	He	IT	-
Agropyron intermedium (Host) P. Beauv.	He	IT,ES	-
Agropyron pectinofome Roemen and Schutes.	He	IT	-
Agropyron repens (L.) P. Beauv.	Ge	IT,ES	*
Agropyron trichophorum (Link) Richter.	He	IT,M	-
Agrostis gigantean Roth.	Ge	IT,M	-
Avena wiestii Steud.	Th	IT	-
Boissiera squarrosa (Banks et soland) Nevski	Th	IT	-
Bothriochloa stenophylla (Boiss.) Bor	He	Cosm	-
Bromus briziformis Fisch. et C.A.Mey.	Th	IT,M	-
Bromus danthoniae Trin.	Th	Cosm	-
Bromus gedrosianus Penzes	Th	IT,M,ES	-
Bromus inermis Leyss.	He	IT	-
Bromus riparius Rehman	He	IT	-
Bromus scoparius L.	Th	IT,M,SS	-
Bromus tectorum L.	Th	Cosm	-
Bromus tomentellus Boiss.	He	IT	-
Cynodon dactylon (L.) Pers.	Ge	Cosm	*
Dactylis glomerata L.	He	IT,M	-
Dichanthium annulatum (Forssk) Taff.	Ge	IT,SS	-

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Eremopyrum confusum Melderis var. confusum	Th	IT	-
Eremopyrum distans (K.Koch) Nevski	Th	IT	-
Eremopyrum orientale (L.) Jaub et Spach	Th	IT,M,ES	-
Festuca ovina L.	He	IT	-
Festuca robra L.	He	IT	-
Heteranthelium piliferum (Banks et Soland.) Hochst.	Th	IT	-
Hordeum bulbosum L.	Ge	IT,M	-
Hordeum glaucum Stand.	Th	IT,M	-
Hordeum violaceum Boiss et Huet.	He	IT	-
Melica persica Kunth subsp. *Persica*	He	IT	-
Phalaris minor Rezt	Th	IT,M	-
Pennisetum orientale L.C.Rich.	He	IT,SS	-
Phleum pratense Commoni	He	IT,M	*
Phragmites australis (Car.) Trin	Ge	IT,M,SS	-
Poa annua L.	Th	IT,ES	-
Poa bulbosa L.	Ge	IT,M,ES	-
Secale montanum Guss.	He	IT,M,ES	-
Setaria glauca (L.) P.Beauv.	Th	Cosm	-
Stipa barbata Desf.	He	IT,M,SS	-
Stipa hohenacheriana Trin and Rupr.	He	IT	-
Stipa parviflora Desf.	He	IT,M	-
Stipa pennata L.	He	IT	-
Trisetum flavescens (L.) P.Beauv.	He	IT	-
Polygonaceae			
Atraphaxis spinosa L.	Ph	IT	*
Polygonum aviculare L.	Th	Cosm	*
Polygonum persicaria L.	He	IT	-
Pteropyrum aucheri Jaub. et Spach	Ph	IT	-
Rumex elbursensis Boiss.	He	IT(End)	-
Rumex caucasicus Rech.F.	He	IT	-
Primulaceae			
Anagallis arvensis L.	Th	Cosm	*
Androsace maxima L.	Th	IT,M,ES	-
Ranunculaceae			
Adonis flammea Jacq.	Th	IT,M,ES	*
Anemone biflora DC.	Ge	IT	-
Ceratocephalus falcatus (L.) Pers	Th	IT,M,ES	*
Consolida regalis S.F.Gray	Th	IT	*
Delphinium cyphoplectrum Boiss.	He	IT	-
Ranunculus arvensis L.	Th	IT	*
Thalictrum minus L.	Ge	IT	*
Rhamnaceae			
Rhamnus pallasii Fisch. and C.A. Mey.	Ph	IT(End)	*
Rhamnus persica Boiss.	Ph	IT(End)	-
Resedaceae			
Reseda aucheri Boiss.	He	IT,SS	*
Reseda lutea L.	Th	IT,M,ES	*
Rosaceae			
Amygdalus eburnea Spach.	Ph	IT(End)	-
Amygdalus spinosissima Buuuge.	Ph	IT	-
Cerasus incana (Pall.) Spachr	Ph	IT	*
Cerasus microcarpa (C.A. mey) Boiss.	Ph	IT	*
Cerasus pseudoprostrata Pojark.	Ph	IT	-
Cotoneaster multiflora Bge.	Ph	IT	-
Cotoneaster nummularias Fisch. C.A Mey.	Ph	IT,M	*
Crataegus turkestanica A.	Ph	IT,ES	-
Hulthemia persica mich.	Ch	IT	*
Geum kokanicum Regel et Schmalh.	He	IT	*
Potentilla recta L.	Ge	IT	-
Rosa beggeriana Schrenk	Ph	IT	-
Rosa canina L.	Ph	IT,M,ES	*
Rubus caesius L.	Ph	IT,ES	*
Sanguisorba minor Boiss. et Hausskn.	He	IT,M	*
Rubiaceae			
Asperula arvensis L.	Th	IT	*
Asperula odorata L.	He	IT,ES	*
Asperula trichodes J.Gay.	Th	IT	*

Table 1: Continued

Scientific name	Life form	Chorotype	Medicinal use
Crucianella gilanica Trin.	Ch	IT	-
Galium humifusum Bieb.	He	IT	-
Galium verum L.	Ch	IT,ES	*
Phuopsis styloso (Trin) Hook.F.	He	IT,M	-
Rubia florida Boiss.	Ph	IT(End)	-
Rubia tinctorum L.	Th	IT,M	*
Vaillantia hispida L.	Th	IT,M	-
Rutaceae			
Haplophyllum canaliculatum Boiss.	He	IT,SS(End)	-
Salicaceae			
Populus alba L.	Ph	IT,ES	*
Salix alba L.	Ph	IT,M,ES	*
Scrophulariaceae			
Bellardia trixago (L.) All.	Th	IT	-
Dodartia orientalis L.	He	IT	-
Linaria grandiflora Desf.	He	IT	-
Linaria kopetdaghensis Kuprian.	He	IT	-
Linaria simplex (Willd.) DC.	Th	IT,M	-
Verbascum phlomoides L.	He	IT	*
Verbascum songaricum Schrenk ex Fisch.	He	IT	*
Veronica capillipes Nevski	Th	IT	-
Solanaceae			
Datura stramonium L.	Th	Cosm	*
Hyosyamus niger L.	Ch	Cosm	*
Tamaricaceae			
Tamarix indica Willd.	ph	IT	-
Tamarix kotschyi Bunge	Ph	IT	-
Tamarix ramosissima Ledeb	ph	IT,ES	-
Ulmaceae			
Celtis caucasica Willd.	Ph	IT	*
Urticaceae			
Urtica dioica L.	He	IT,M	*
Zygophyllaceae			
Peganum harmala L.	He	Cosm	*
Zygophyllum atriplicoides F. et M.	Ph	IT,SS	-

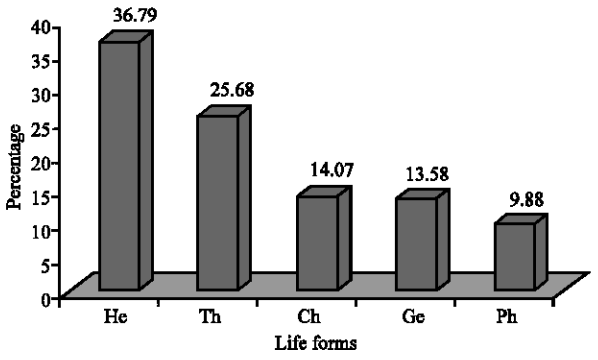

Fig. 5: The column chart of life form of species in Firozeh watershed

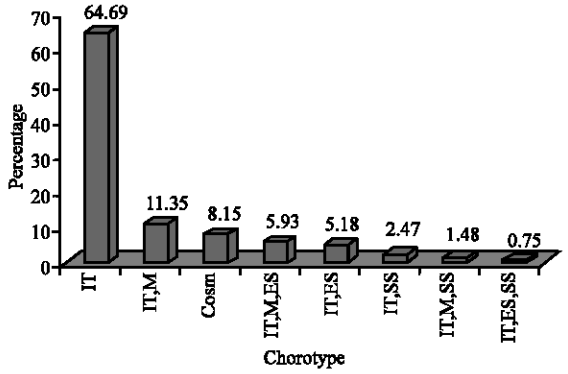

Fig. 6: The column chart of percentage of chorotype of species in Firozeh watershed

studied area, 47 species are endemic to Iran. They compose about 11.6% of the total number of species.

The existence of Compositae family with large diversity is the result of destruction in this region. It is experience understood that the increasing of the number of some plant families including Asteraceae accompanied with destruction in area, following studies support the mentioned fact (Vakili *et al*., 2001; Archibold, 1995).

According to rich biodiversity of study area, which resulted from floristic study, it is quite possible to concentrate the improving practices and reclamation to area again.

About 141 medicinal species were determined in this area that was shown in Table 1. Some of most important species are as follow: *Capsella bursa-pastoris, Descurainia sophia, Ephedra intermedia, Glycyrrgiza*

Table 2: Plants species list of rare and endangered of firozeh watershed

Scientific name	Species position	Life form
Alliaceae		
Allium monophyllum Vved.	DD	Ge
Apiaceae		
Actinolema macrolema Boiss	LR	He
Ferula gummosa Boiss	LR	He
Ferula stenocarpa Boiss.	LR	He
Ferulago angulata (Schlecht) Boiss.	LR	He
Malabaila porphyrodiscus Staph et Wettstein	LR	He
Prangos gaubae (Bornm.) Herrnstadt et Heya	LR	He
Araceae		
Arum orientale M.B	VU	Ge
Asclepiadaceae		
Vincetuxicum pumilum Decne.	LR	Ch
Boraginaceae		
Onosma koschyi Boiss.	LR	He
Paracaryum persicum (Boiss.)	DD	He
Brassicaceae		
Alyssum bracteatum Boiss. et Buhse	LR	He
Matthiola ovatifolia Boiss.	LR	He
Caryophyllaceae		
Acanthophyllum crassifolium Boiss.	LR	Ch
Acanthophyllum chloroleucum Rech. F . and Aell.	DD	Ch
Dianthus orietalis Adams	LR	Ch
Dianthus macranthoides Hausskn. ex Bornm.	LR	Ch
Compositea		
Achillea millefolium L.	LR	He
Anthemis kotschyana Boiss	LR	He
Cousinia iranica C. Winkl. and Sttauss	LR	He
Echinops polygamus Bunge	LR	He
Jurinea stenocalathia Rech.f.	LR	Ch
Scorzonera persica Boiss. et Buhse	LR	Ge
Varthemia persica DC.	LR	Ch
Crassulaceae		
Sempervivum iranicum Bornm. and Gauba	LR	Ge
Labiatae		
Dracocephalum kotschyi Boiss.	EN	He
Perovskia artemisioides Boiss.	VU	Ch
Phlomis persica Boiss.	LR	He
Salvia reuterana Boiss.	LR	Ch
Stachys laxa Boiss. and Buhse	LR	Ch
Stachys pilifera Benth.	LR	Ch
Thymus kotschyanus Boiss. et Hohen.	LR	
Liliaceae		
Eremurus spectabilis M.B.	LR	Ge
Tulipa montana Lindl.	LR	Ge
Linaceae		
Linum album Ky.	LR	Ge
Orchidaceae		
Orchis mascula L.	LR	Ge
Papaveraceae		
Papaver gaubae Cullen et Rech	DD	Th
Papaver tenuifolium Boiss. and Hohen.	LR	Th
Papilionceae		
Astragalus effuses Bunge.	LR	He
Astragalus magistratus Maass.	LR	He
Astragalus semnanensis Bornm. et Rech.F.	VU	He
Astragalus Senilis Bornm.	VU	He
Colutea persica Boiss.	LR	Ph
Glycyrrhiza glabra L.	LR	Ch
Hedysarum callithrix Bunge et Boiss.	DD	He
Onobrychis gaubae Bornm.	DD	He
Plumbaginaceae		
Acantholimon acmostegium Boiss. et Buhse	LR	Ch
Acantholimon aspadanum Buge.	DD	Ch
Acantholimon oliganthum Boiss.	DD	Ch
Acantholimon scorpius (Jaub. et Sp.) Boiss.	LR	Ch

Table 2: Continued

Scientific name	Species position	Life form
Poaceae		
Bromus scoparius L.	LR	Th
Phleum pratense Commoni	LR	He
Polygonaceae		
Rumex elbursensis Boiss.	LR	He
Rhamnaceae		
Rhamnus pallasii Fisch. and C.A. Mey.	LR	Ph
Rhamnus persica Boiss.	LR	Ph
Rosaceae		
Amygdalus spinosissima Buge.	LR	Ph
Rubiaceae		
Rubia florida Boiss.	LR	Ph
Rubia tinctorum L.	LR	Th
Rutaceae		
Haplophyllum canaliculatum Boiss.	LR	He
Tamaricaceae		
Tamarix indica Willd.	LR	Ph

Vu = Vulnerable, LR = Lower Risk and DD = Data Deficient

glabra, *Ziziphora clinopodioides*, *Ferula gummosa*, *Thymus kotschyanus*, *Dracocephalum kotschyi*, *Stachys lavandulifolia*, *Eremurus olgae*.

CONCLUSION

The study area is very rich with refer to plant diversity. This conclusion is supported by the existence 56 families, 243 genera and 405 species.

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