Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 5, No. 2, p. 173-180, 2014
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Alpine wetland flora, species life forms and chorology of the Sabalan Mountain-Iran

Jaber Sharifi[1*], Adel Jalili[2], Shaker Ghasemov[3], Ehsan Zandi Esfahan[2]

[1]*Research Center for Agriculture and Natural Resources, Ardabil, Iran*

[2]*Research Institute of Forests and Rangelands, Tehran, Iran*

[3] *Institute of Botany, Azerbaijan National Academy of Science, Azerbaijan Republic*

Article published on August 09, 2014

Key words: Flora, Life forms, Chrology, Vegetation components, Sabalan Mountain.

Abstract

Alpine rangelands of the Sabalan Mountain, due to the exposure to Siberian cold wet, Hyrcanian and Mediterranean climate flows, have a variety of vegetation types and vegetation components. Knowledge of species life forms and vegetation components is considered as a useful guide for environmental management in the region. The results showed that totally, there are 120 plant species that belong to 73 genera and 30 families in this study area. Poaceae family in cluding 29 species and Fabaceae family cluding 12 species have the highest number of species. In the current study, species life forms were recognized by physiognomy, and conventional floristic studies were applied to determine the vegetation components. Overall, two major vegetation groups were recognized including wet meadow species, with the dominance of *Alopecurus textilis* Boiss., *Festuca sulcata* (Hack.)Beck, *Festuca rubra* L., *Festuca ovina* L., *Trifolium montanum* L., and peat swamp species, with the dominance of *Blysmus campressus* L., *Eremopoa persica* (Trin) Roshev., *Carex strigosa* L., distributed from an altitude of 2500 to 3800 m in the heights of Sabalan. According to the Raunkier's life form, hemicryptophytes and cryptophytes including bulbous geophytes, corm geophytes, rhizome geophytes, hydrophytes and floating species were the most abundant species life forms, respectively. In addition, in terms of chorological spectrum, the vegetation components of this region belong to the European-Siberian and Iran-O-Touranian regions.

***Corresponding Author:** Jaber Sharifi ✉ Sharifnia.j@gmail.com

Introduction

A few researches have been conducted on the wetlands of Sabalan heights as well as on other similar regions. The following studies can be mentioned as example.

Javanshir (1990) in vegetation studies of Sabalan Mountain, stated that vegetation cover of upper altitudes (above 3500 m) included dwarf species such as *Bellis perennis* (Bellis) as well as species from genus *Sedum*. Sharifi *et al* (2009) also studied the vegetation types of Ardabil and showed that in upper altitudes (above 2800 m) of Sabalan northern slopes, cushion species of *Astragalus* were removed totally and replaced by *Alopecrua textilis* L. Akbarlou *et al* (2009) investigated the plant communities of Chldoran northwest grasslands in west Azerbaijan. This research showed that 83 species were observed inside quadrates, belonging to 67 genera and 26 families. Most of the species belonged to the Gramineae and dominant life forms were hemicryptophytes, terophytes and geophytes. Naqinezhad *et al* (2007) in a study on the ecology of wetlands of southern slopes of the Central Alborz Mountains, classified the vegetation cover of the region into two major groups including aquatic and telmatic plant species. The exclusive species of each group were as follows: Aquatic species: *Hippuris vulgaris, Eleocharis palustris* subsp*, palustris, Chara* sp, Telmatic species: *Carex orbicularis* subsp.Kotschyana*, Ranunculus amblyolobus, Juncus inflexus, Blysmus compressus* subsp.*compressus, Poa pratensis, Agrosis stolonifera, Equisetum palustris.* Kamrani *et al* (2011) studied the relationship between environmental factors and vegetation characteristics in the wetlands of the southern slopes of western Alborz Mountain. They showed that geophytes and endemic species increased by increasing altitude but soil pH and EC decreased. Naqinezhad *et al* (2010) investigated species diversity in wetland habitats of dry steppes of Alborz southern slopes, and concluded that wet meadows, wetlands, ponds, and rivers were the main habitats, totally, 226 species were collected and identified and according to the calculations of species frequency, the highest frequency percentage was recorded for *Carex orbicularis*, *Juncus inflexus*, *Mentha longifolia*, and *Juncus articulatus*. Cantero *et al* (2003) studied the effects of climate, soil and topography factors on rangeland vegetation of central Arjentina, they showed that in addition to the altitude, soil nutrients affected the species distribution.

In vegetation studies and environmental assessments, life form and species diversity are considered as one of the most important and fast indicators in determination of ecosystem condition (Wilson. S.D. & D. Tilman, 2002)**.** This research was aimed to study the flora, life forms and chorology of existing plants in the wetland of Sabalan Mountain and obtained results could be used to evaluate the condition of these ecosystems.

Materials and methods

Location and characteristics of the study area

The study area is located in northeastern Iran, in the northern and eastern slopes of the Sabalan Mountain, between longitudes 47°, 23´ and 48° ,42´ E and latitudes 37° ,55´ and 37°, 55´ and 38°, 53´ N, with an altitude of 2500-3500 m a.s.l., according to the Emberger classification, the climate of the region is cold semi-humid to extremely cold (ultra cold). Mean annual precipitation is about 620 mm and maximum precipitation occurs in autumn and winter as snow, Light and dark brown soils are the most common soil type of the region, spread associated with tuff and volcanic sands.

Methods

To study the species life form and vegetation components in the heights of Sabalan, initially, vegetation types were identified by field visits the locations were determined on base map with a scale of 1:50000.

Afterward, the dominant species of each vegetation type were determined by random systematic method, using transects and quadrates, species life forms were

recognized by physiognomy based upon Raunkiaer classification, and conventional floristic studies were applied to determine the vegetation components, using Flora Iranica, Flora of Turkey, Flora of Iraq, Flora of the Soviet Union, and Flora of Iran.

In addition, the geographical distribution of vegetation components were determined by Flora Iranica and Takhtajan classification., all collected species samples are recorded and kept in the herbarium of Research Center for Agriculture and Natural Resources, Ardabil, Iran.

Results

Alpine wetlands of Sabalan Mountain, include two major vegetation groups namely meadow species and peat swamp species.

Meadow species: This group of species is observed as grass communities (grassland), this type of vegetation community is usually distributed in water catchment areas, nourished by the drainage water of rivers or surrounding springs., the soil texture is generally loamy to sandy-loam and in some site is clay-loam, soil pH varies between 5.97 and 8.43 but some sites have an alkaline soil due to the high soil pH.

The most dominant species of this group are as follows:

Alopecurus aequalis Sobol.,. *Astragalus odoratus* Lam. *Cyperus longus* L., *Carex divisa* Huds., *Eremopyrum distans* (C.Koch)Nevski., *Festuca ovina* L., *Festuca sulcata* L,. *Festuca rubra* L,. *Trifolium montanum L., Trisetum flavescens*(L) P.Beauv., *Trifolium pratense* L., *Taraxacum hydrophilum* V.Soes., *Hordeum violaceum* Boiss.etHuet., *Phleum phleoides* H. Karst,. *Plantago atrata* Hoppe,. *Medicago sativa* L., *Poa pratensis* L., *Poa trivialis* L. *Orcis mascula*(L.) L.,

Peat swamp species: This group of species is observed in topographic valleys and or in U-shaped valleys, located in mountainous areas. Peat swamps have higher moisture storage as compared to wet meadows and survive for a longer period of time, due to the low temperature, litter decomposition is performed later; therefore, the amounts of soil organic matter are greater in these communities.

The important species of this group are as follows:

*Blysmus campressus*L (Panzer)Subsp.campressus., *Eremopoa persica* (Trin)Roshev.,*Carex strigosa* L. *Carex songorica* Kar & Kir., *Carex orbicularis* L,. *Hipporis vulgaris* L., *Trifolium repense* L,. *Agrostis stolonifera* L., *Ranunculus lateriflorus* DC., *Trisetum bungei*Boiss., *Grostis stolonifera* L,.

The species life forms in alpine wetlands of Sabalan Mountain included %18 Therophytes, %35.2 Cryptophytes, % 46 Hemicryptophytes and % 0.8 Chamaephytes (Fig. 1).

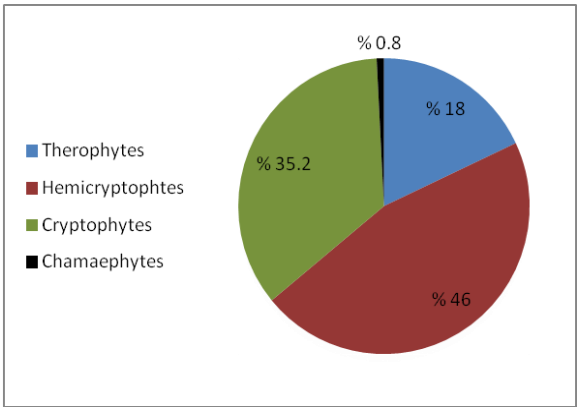

Fig. 1. Species life forms in the heights of Sabalan Mountain.

According on the results of chorological species, in terms of chronological spectrum, from 119 species , were formed in: % 42 Pluriregional,. % 16 Europa-Siberian, Irano-Turanian,. % 8.4 Europa-Siberian, Mediterranean,. % 4.3 Europa-Siberian (Caucasian),. % 4.3 Mediterranean, Irano-Turanian,. % 15 Europa-Siberian, Irano-Turanian, Mediterranean,. % 7.5 Indemic for Iran and % 2.5 of species were not identified (Fig. 2).

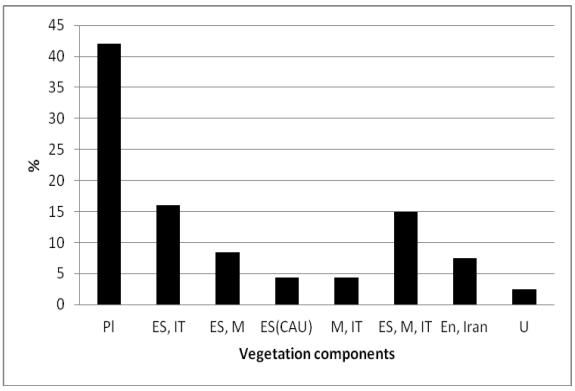

Fig. 2. Vegeation components in the heights of Sabalan Mountain.

ES= Europa-Siberian, IT= Irano-Turanian, M= Mediterranian, Pl= Pluriregional, EN (Iran)= Iran Endemic U= Uncertain

Discussion

Alpine rangelands of the Sabalan Mountain, due to the exposure to Siberian cold wet, Hyrcanian and Mediterranean climate flows, have a variety of vegetation types and vegetation components. Knowledge of species life forms and vegetation components is considered as a useful guide for environmental management in the region. Based on the results of conducted studies, overall, 120 plant species belonging to 73 genera and 30 families have been identified and recorded in the studied habitats (Table 1). Poaceae and Fabaceae are considered as the largest families in the study area with 29 and 12 species, respectively.

The species life forms included annual specie (18%, therophytes), cryptophytes (35.2%), hemicrypto-phytes (46%), and chamaephytes (0.8%). Hemicryptophytes and cryptophytes were the most abundant species life forms, respectively.

The abundance of hemicryptophytes and cryptophytes indicates the cold and mountainous climate of a region (Archibold, 1995), which is in accordance with our findings. A relatively high percentage of hemicryptophytes and cryptophytes in mountainous wetlands shows moisture retention by these species until the growth stage.

In the group of wet meadow species, from 2500-3800 m a.s.l., *Alopecurus textiles*, *Festuca rubra*, *Festuca sulcata* and *Festuca ovina* togethwr with *Trifolium montanum* are observed widespread, especially in the northern and eastern slopes of Sabalan, indicating the high potential of the region. Due to the cold climate and being mountainous as well as difficult access to the region, the mentioned species are in a climax condition and hemicryptophytes and cryptophytes were the most abundant species life forms, respectively.

In the group of swamp species, from 2200 to 3000 m a.s.l, *Blysmus campressus* L (Panzer) Subsp.campressus., *Eremopoa* persica (Trin)Roshev., and *Carex strigosa* L. were abundant especially in topographic and or U-shaped valleys. Peat swamps have higher moisture storage as compared to wet meadows and survive for a longer period of time. Due to the low temperature, litter decomposition is performed later; therefore, the amounts of soil organic matter are greater in these communities.

Overall, it can be concluded that the geographical distribution of plant species is dependent on environmental and climate conditions of the region. Due to the exposure to Siberian cold wet, Hyrcanian and Mediterranean climate flows, the vegetation components of this region belong to the European-Siberian and Iran-O-Touranian regions.

References

Akbarlou M, Sepehri A, Ejtehadi H, Mesdaghi M. 2009. Study on different utilizattio methods on forage production of mountain meadows, The Scientific and Research Journal of Iranian Range Management Society, **p. 3.** 17-28. (In Persian).

Archibold OW. 1995. Ecology of world vegetation. Champmun and Hall Inc. London.

Javanshir A. 1990. Study on vegetation cover of Sabalan Mountain, Organization Jahad Sazandegi

Azarbayjan E Province, Tabriz, p. 63-152. (In Persian).

Sharifi J, Faiiz M, Rostami Kia Y. 2009. Vegetation Types of Ardebil & Astara Area. Research Institute of Forests and Rangelands, Tehran,**409**, 39-57. (in Persian).

Naqinezhad AR. 2007. Study on the ecology of wetlands of southern slopes of the Central Alborz Mountains. PhD Thesis, Tehran University, p. 173-195. (in Persian).

Assadi M, Maassoumi AA, Khatamsaz M, Mozaffarian V. 2003. Flora of Iran. Research Institute of Forests & Rangelands Publication, Tehran (in Persian).

Cantero JJ. 2003. Species richness, alien species and plant traits in central Argentine m ountain grasslands. Vegetation Science **14,** 129-136.

Davis PH.(ed). 1965-1988. Flora of Turkey, Vols: 1-10. Endinburgh university Press, Endiburgh.

Komarov VL (ed.). 1934-1954. Flora of the U.S.S.R, Vols: 1-21, Izdatelstvo Akademii Nauk SSSR, Leningrad (English traslation from Russian, Israel program for Scientific Tranlations, Jeursalem, 1968-1977.

Kamrani A, Jalili A, Naqinezhad A, Attar F, Maassoum AA, Sue C, Shaw. 2011. Relationships between environmental variables and vegetation across mountain wetland sites, N. Iran. Biologia **66.1**. 76-87.

Klein JC, Lacoste A. 1995. Lespozzinesa Carex orbicularis Boott subsp. kotschyana de l'Alborzcentral (Iran):groupe- ment a` la charnie`re desre´gions euro-sibe´rienne etirano- touranienne. Ecol. Medit. **12**, 75-86.

Naqinezhad A, Jalili A, Attar F, Ghahreman A, Wheeler BD, Hodgson JG, Shaw SC, Maassoumi A. 2009. Floristic characteristics of the wetland sites on dry southern slopes of the Alborz Mts, N Iran: The role of altitude in floristic composition, Flora, **204**, 254-269.

Rechinger KH. 1963-2005. Flora Iranica (ed.), Akademische Druk-u verlagsanstalt, Graz, 1-176.

Raunkiaer C. 1934. The life forms of plants and statistical plant geography. Charendon Press, Oxford.

Townsend CC, Guest E, Al-Rawi A.(ed.). 1966-1985. Flora of Iraq, Vols: 1-10, Ministry of Agriculture of the Republic of Iraq.

Takhtajan A. 1986. Floristic regions of the word, University of California Press. Berkley, Los Angeles, London, 522 p.

Wilson S D, Tilman D. 2002. Quadratic variation in old– field species richness along gradient of disturbance and nitrogen, Ecology, **83**, 492-504.

Appendix 1. Plant Checklist of alpine wetlands of Sabalan Mountain-Iran.

	Species	Family	Life forms	Chorotype
	Alchemilla filipendula Lam.	Asteraceae	He	ES (CAU), IT
	Adonis dentata Delile	Fabaceae	Th	ES(CAU), M, IT
	Agrostis stolonifera L.	Poaceae	Cr(GR)	ES, IT, M
	Alchemilla persica Rothm.	Rosaceae	Cr(GR)	IT, ES(CAU)
*	*Alchemilla citrina* Frohner	Rosaceae	He	EN(Iran)
	Allium ampeloprasum L.	Alliaceae.	Cr(GB)	ES(CAU), M
	Alopecurus arundinaceus Poir.	Poaceae	Cr(GR)	PL
	Anthemis sp.	Asteraceae	Th	U
	Arenaria gypsophiloides Willd. ex ledeb.	Caryophyllaceae	Th	PL
	Asparagus persicus Baker	Liliaceae	He	PL
	Astragalus hamosus L.	Fabaceae	Th	PL
	Astragalus odoratus Lam.	Fabaceae	He	IT, CAU
	Barbarea plantaginea DC.	Brassicaceae	He	ES(CAU), M
	Bromus danthoniae *Trin. ex C.A.Mey.*	Poaceae	Th	PL
	Bromus tomentellus Boiss.	Poaceae	He	PL
	Capsella bursa-pastoris Medik.	Brassicaceae	Th	PL
	Cardamine uliginosa *M.Bieb.*	Brassicaceae	Th	ES(CAU)
	Carex riparia Poir.	Cyperaceae	Cr(GR)	IT, ES(CAU)
	Carex distans L.	Cyperaceae	Cr(GR)	ES, M ,IT
	Carex divulsa *Gaudin*	Cyperaceae	Cr(GR)	ES, M ,IT
	Carex orbicularis Boott subsp. kotschyana (Boiss. & Hohen.) Kukkonen	Cyperaceae	Cr(GR)	IT, ES(CAU)
	Carex songorica *Kar. & Kir.*	Cyperaceae	Cr(GR)	E,IT, ES(CAU)
	Carex stenophylla Wahlenb.	Cyperaceae	Cr(GR)	ES(CAU), IT
	Carex strigosa *Willd. ex Kunth*	Cyperaceae	Cr(GR)	ES(CAU), IT
	Catabrosa aquatica P.Beauv.	Poaceae	Cr(GR)	PL
*	*Centaurea cheiranthifolia* Willd.	Asteraceae	He	EN(Iran)
	Chenopodium ambrosioides L.	Chenopodeacea	Th	ES, M
	Cynodon dactylon (L.) pers.	Poaceae	Cr(GR)	PL
	Cyperus longus L.	Cyperaceae	Cr(GR)	ES(CAU), IT
	Cyperus sp.	Cyperaceae	He	U
	Dactylis glomerata L.	Poaceae	He	PL
*	*Deyeuxia parsana* Bor	Poaceae	He	EN(Iran)
	Dianthus pachypetalus Stapf	Caryophyllaceae	He	ES, M, IT
	Equisetum palustre L.	Equisetaceae	Cr(GR)	PL
	Equisetum arvense L.	Equisetaceae	Cr(GR)	PL
	Eremopoa persica (Trin.) Roshev.	Poaceae	Th	IT, M
	Eremopyrum distans (K.Koch) Nevski	Poaceae	He	PL
	Euphrasia juzepczukii Denissova	Scrophulariaceae	Th	ES(CAU), M, IT
	Festuca heterophylla Wahlenb.	Poaceae	He	PL
	Festuca ovina L.	Poaceae	He	PL
	Festuca pratensis Huds.	Poaceae	Cr(GR)	ES(CAU)
	Festuca rubra L.	Poaceae	He	PL
	Festuca sulcata (Hack.)Beck	Poaceae	He	PL
	Galium verum L.	Rubiaceae	Cr(GR)	PL
	Geranium albanum M.Bieb.	Geraniaceae	Th	ES(CAU), M
	Geranium pyrenaicum Burm.f.	Geraniaceae	Th	ES(CAU), M
	Geum rivale L.	Rosaceae	Cr(GR)	PL
	Hippuris vulgaris L.	Hippuridaceae.	Cr(Hy)	ES
	Hordeum bulbosum L.	Poaceae	Cr(GB)	PL
	Hordeum violaceum *Boiss. & Hohen.*	Poaceae	He	IT, ES(CAU)
	Iris caucasica Hoffm.	Iridaceae	Cr(GC)	M, IT
	Iris pseudocaucasica Grossh.	Iridaceae	Cr(GC)	PL
	Juncus gerardii Loisel.	Juncaginaceae	Cr(GR)	IT
	Jurinella sp.	Asteraceae	He	U
	Juncus Littoralis C.A.Mey.	Juncaginaceae	He	PL

	Species	Family	Life forms	Chorotype
	Jurinella moschus (Hablitz) Bobrov	Asteraceae	He	PL
	Koeleria cristata Pers.	Poaceae	He	PL
	Koeleria eriostachya Pančić	Poaceae	He	ES(CAU), IT
	Lathyrus pratensis L.	Fabaceae	Cr(GR)	PL
	Lolium persicum Boiss. & Hohen.	Poaceae	He	PL
	Lotus angustissimus L.	Fabaceae	He	ES, M, IT
	Lotus corniculatus L.	Fabaceae	He	ES, M, IT
	Mentha aquatica L.	Lamiaceae	He	ES, M
	Mentha longifolia Host	Lamiaceae	He	ES, M
	Medicago sativa L.	Fabaceae	He	ES,IT
	Melilotus officinalis (L.) Lam.	Fabaceae	He	PL
	Minuartia hybrida (vill.) Schischk.	Caryophyllaceae	Th	ES, IT, M
	Muscari caucasicum Baker	Liliaceae	Ge(B)	M, IT, ES(CAU)
	Muscari comosum (L.) Mill.	Liliaceae	Ge(B)	ES, M, IT
	Muscari racemosum (L.) Mill.	Liliaceae	Ge(B)	PL
	Myosotis asiatica (Vestergr.) Schischk. & Serg.	Boraginaceae	Th	PL
*	*Myosotis olympica* Boiss.	Boraginaceae	Th	EN(Iran)
	Nasturtium officinale R.Br.	Brassicaceae	He	ES, IT
	Orchis latifolia L.	Orchidaceae	Ge(C)	ES(CAU), M
	Pedicularis sibthorpii Boiss.	Scrophulariaceae	He	PL
	Phalaris minor Retz.	Poaceae	Cr(GR)	PL
	Phleum paniculatum Huds.	Poaceae	Th	ES(CAU), M, IT
	Phleum phleoides H.Karst.	Poaceae	He	PL
	Pimpinella tragium Vill.	Apiaceae	He	ES(CAU), M, IT
	Plantago lagopus L.	Plantaginaceae	Th	PL
	Plantago atrata Hoppe	Plantaginaceae	He	ES(CAU), IT
	Plantago lanceolata L.	Plantaginaceae	He	ES, M, WIT
	Plantago major L.	Plantaginaceae	He	PL
	Plantago maritima L.	Plantaginaceae	He	ES, IT
	Poa araratica Trautv.	Poaceae	Cr(GR)	PL
	Poa bulbosa L.	Poaceae	Cr(GB)	PL
	Poa pratensis L.	Poaceae	Cr(GR)	PL
	Poa trivialis L.	Poaceae	Cr(GR)	PL
	Polygonum alpestre C.A.Mey.	Polygonaceae	He	ES(CAU), M, IT
	Polygonum amphibium L.	Polygonaceae	He	PL
	Potamogeton nodosus Poir.	Potamogetonacea	Cr(Hy)	PL
	Potamogeton pectinatus L.	Potamogetonacea	Cr(Hy)	PL
	Potentilla canescens Besser	Rosaceae	He	PL
*	*Potentilla persica* Boiss. & Hausskn. ex Boiss.	Rosaceae	He	EN(Iran)
	Potentilla recta L.	Rosaceae	He	PL
	Ranunculus arvensis L.	Ranunculaceae	Th	ES, M
	Ranunculus lateriflorus DC.	Ranunculaceae	Th	PL
*	*Ranunculus persicus* DC.	Ranunculaceae	He	EN(Iran)
	Rumex acetosa L.	Polygonaceae	Cr(GR)	PL
	Salvia aethiopis L.	Lamiaceae	He	PL
	Sanguisorba minor Scop.	Rosaceae	He	PL
	Sedum pallidum M.Bieb.	Crassulaceae	He	ES(CAU)
	Sedum pilosum M.Bieb.	Crassulaceae	He	ES(CAU)
	Sonchus asper (L.) Hill	Asteraceae	He	IT, M
	Sparganium erectum L.	Sparganiaceae	Ch	PL
*	*Taraxacum azerbaijanicum* Soest	Asteraceae	He	EN(Iran)
	Taraxacum bessarabicum Fisch.	Asteraceae	He	ES, NIT
*	*Taraxacum hydrophilum* Soest	Asteraceae	He	EN(Iran)
	Taraxacum montanum DC.	Asteraceae	He	M, ES(CAU)
	Thelypteris palustris Schott	Thelypteridaceae	Cr(GR)	PL
	Trifolium montanum L.	Fabaceae	Cr(GR)	ES, IT, M
	Trifolium pratense L.	Fabaceae	He	ES, M, IT
	Trifolium repense L.	Fabaceae	Cr(GR)	ES, IT, M

	Species	Family	Life forms	Chorotype
	Trifolium alpestre L.	Fabaceae	Cr(GR)	PL
	Tripleurospermum decipiens (Fich. & C.A.Mey) Bornm.	Asteraceae	Th	ES(CAU), M
	Trisetum flavescens (L.) P.Beauv.	Poaceae	He	PL
*	*Urtica dioica* L.	Urticaceae	Cr(GR)	En(Iran, Irag)
	Veronica orientalis Mill.	Scrophulariaceae	He	ES, IT
	Vicia cracca L.	Fabaceae	He	ES, IT
	Viola arvensis Murray	Violaceae	He	ES, IT

*= Iran Endemic

ES= Europa-Siberian, IT= Irano-Turanian, M= Mediterranian, Pl= Pluriregional, EN (Iran)= Iran Endemic, U= Uncertain。 Th = Therophytes, Cr= Cryptophytes (GB, GC, GR, Hy) He= Hemicryptophytes, Ch= Chamaephytes. GB= Geophytes (Bulbs) , GC= Geophytes (Cum mastex), GR= Geophytes (Rhizome), Hy= Hydrophytes.