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# Botanical Criteria of Baharkish Rangeland in Quchan, Khorasan Razavi Province, IRAN

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**ABSTRACT:** Rangelands are natural ecosystems containing a range of resources of genetic diversity and numerous plant species and its evaluation has always been essential. However, biodiversity is one of the most important components of habitat assessment and the identification and introduction of the flora of an area is one of the significant operations that can be used in order to optimize the utilization of the available natural resources. Baharkish rangeland is located at a distance of about 60 km south of the city of Quchan. The rangeland's average elevation is about 2069 m above sea level, with its lowest at 1740 m and highest at 2440 m. Baharkish rangland in over a ten year period had the average annual rainfall of 337 mm and 998.2 mm evaporation as well as average annual temperature of 9.4°C, respectivelly. The results of the research conducted in the spring of 2014, showed that the total study area includes 77 species from 22 families with Poaceae, Asteraceae, Lamiaceae, Fabaceae, Apiaceae and Brassicaceae being the dominant families with 18%, 13%, 12%, 9%, 8% and 6% respectively. Classification of life form according to Raunkiaer method showed the dominance of the hemicryptophytes with the greatest abundance 41%, followed by Chamaephytes, Therophytes, Geophytes, Phanerophytes and Cryptophyte with 25%, 23%, 4%, 4% and 3% of species were the dominant life forms of the area. In terms of geographical distribution, the Irano-Turanian plant species with 64% obtained the maximum value. © JASEM

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***Keywords*:** Flora, Geographical distribution, Life form, Raunkiaer.

## INTRODUCTION

Due to the importance of the subject in Iran, a lot of studies have been conducted on the flora and species composition in different regions of the country, all of which centralized on the preparation and measurement of the floristic list (number of species) and plant cover structure in terms of family and life forms. Study on vegetation has been useful in the resolution of ecological problems such as biological conservation and natural resource management. Based on the results, future changes can be predicted. Moreover, the understanding of plant elements contained in one area is considered as the underlying principle for other researches. Iran, due to its remarkable climatic variations, is confronted with different ecosystems each having specific characteristics and different inter-relations. Recognizing the immense resources and understanding the relationships between plants and factors affecting them, are important in order to maintain the consistency and stability of this part of the national wealth. In the case of shrubs and their impact on the community, it suffices to note their role in the expansion of production in the community, providing the possibility to use rangelands multi-purposely, and increasing ecological stability (Koocheki et al., 2008).

Mousavi, (2004) in a floristic study in Khanchay Tarom watershed in Zanjan came to the conclusion that 71 percent of plants belonged to the Irano-Turanian region. Among the life forms Hemicryptophytes and Therophytes respectively had accounted for the highest percentages. Ashrafi et al., (2004) by the assessment of the flora in Varamin region identified 202 plant species, in which Irano-Turanian plants showed the highest dispersion. Kashipazha et al., (2004) by studying the the flora of Bagheshad found that 85.29% of the species belonged to the Irano – Turanian region. In the assessment of life forms, they concluded that Hemicryptophytes and Therophytes were the most frequent life forms of the region. A great deal of previous research could be found on vegetation studies in different climates and locations which testify to the significance of this research, among which the readers are kindly refered to (Atashgahi et al., 2004; Dolatkhahi et al., 2011; Tovichi, 2011; Kazemian et al., 2004; Gholami et al., 2006; Ghollassi Mood et al., 2006; Memariani et al., 2009; Dinarvand et al., 2015).

According to the importance of the botany and identification of the flora in different sciences such as agriculture, biology and pharmacy, this study set out to evaluate vegetation characteristics in Baharkish rangeland which is important in terms of medicine

plants and forage production for a large part of the livestock in Khorasan Razavi Province. These studies are important for accessing specific plant species in a certain time and location, determination of rangeland's potential vegetation growth, the possibility of increasing vegetation density, identification of resistant, threatened or endangered species, determining the country's vegetation, the possibility of achieving new plant species, and identification of destructive factors for vegetation cover of the given area. The aim of this study is to provide basic floristic information to identify plant species for preservation, restoration and development of Quchan Baharkish Pastureland in Khorasan Razavi Province, IRAN.

## MATERIALS AND METHODS

*Geographical location and climatic conditions of the region***:** Baharkish rangeland lies between 58 40 and 58 36 E and 36 44 and 36 42 N, 60 Km away from south Quchan and the central part of Doghaei rural district, with an area of 1035 ha (Figure 1). The average height of the area is about 2069 meters above sea level (with minimum of 1740 m maximum of 2440 m). To undertake this study, an area of approximately 200 ha was selected in Baharkish rangeland.

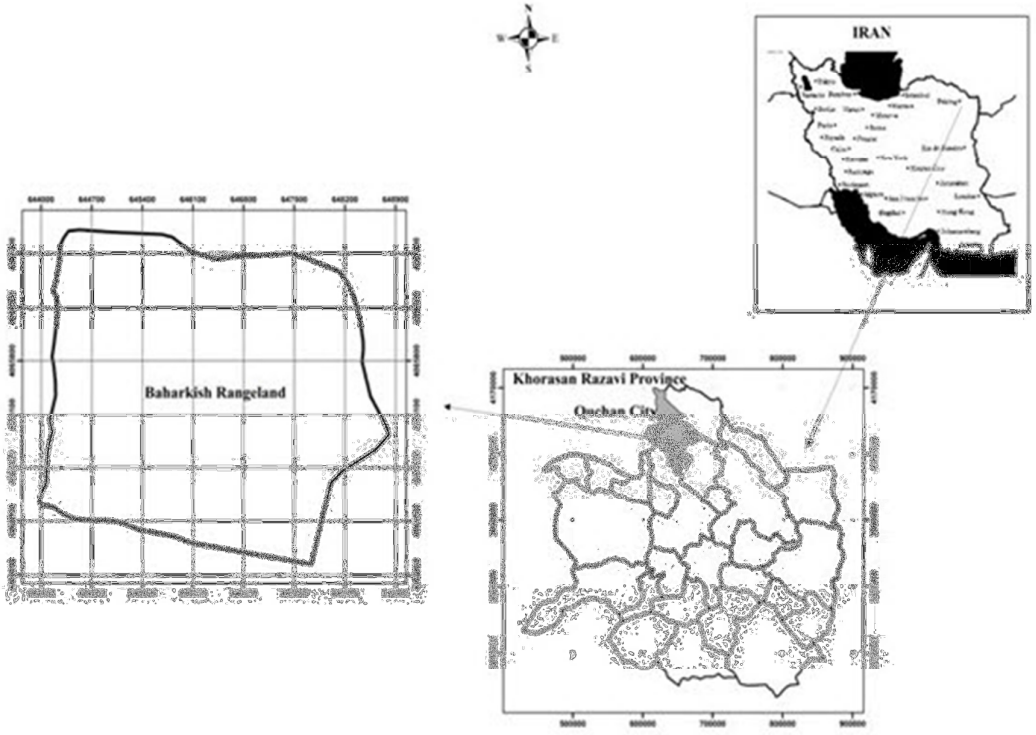


**Fig. 1-** Location of Baharkish rangeland in Quchan, Khorasan Razavi Province, IRAN

According to the long-term climate data from synoptic stations of Quchan city (data record from 25 years period in Evaporation measuring station of Aryeh and rain gauge station of Akhlamad), average annual precipitation and annual evaporation were estimated at 337 mm and 998.2 mm, respectively. Average annual temperature is 9.4°C with the lowest and highest monthly values in January as well as July and August. Figure 2 shows the Ombrothermic diagram of Baharkish pasture. It can be seen that the dry period in Baharkish pasture is about 5 months, which starts from mid-May until late October (Annual report meteorological organization, 2013; Ministry of energy, 2013).

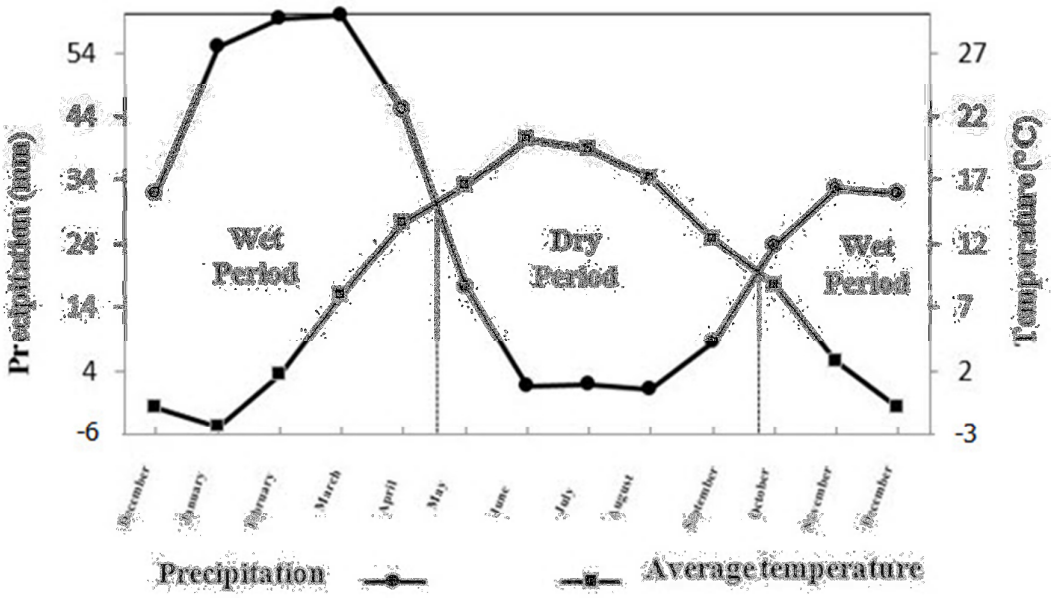


**Fig. 2-** Ombrothermic curve of Baharkish rangeland in Quchan based on long-term climatic data

*Sampling Method***:** All maps (topographic map in the scale of 1:25000; geological map in the scale of 1:100000; Aerial photos in the scale of 1:20,000; and satellite images related to Baharkish rangeland in Quchan) were superimposed on four maps of slope gradient, aspect, hypsometry, and geological formations in the GIS software Arcmap 10.2 software environment, to produce working unit map, and 13 working units were determined. During the field surveys and vegetation sampling in spring 2014 a total of 10 plots were placed random systematicly in each unit. Plots with 2 square meters were used according to the Minimal area method (Aghaalikhani & Qushchi, 2005). Plot positions were also recorded using GPS in the U.T.M (Universal Transverse Mercator) Corrdination system.

*Identification of Life form and chorology of plant species:* During the field surveys in the spring of 2014, plants were collected, and dried using newspaper under pressure, then transfered to Natural Resources organization, Khorasan Razavi Province for further identification. This stage was accomplished according to the available resources and conventional methods using identification keys. (Rechinger, 1967-1998، Townsend & Guest, 1966-1985، Zohary, 1966-1972، Davis, 1965-1988 ، Boissier, 1867-1888، Komarov, 1934-1954 ،Assadi et al., 1988-2011 ، Ghahreman, 1979-1992، Maassoumi, 1986-2000 ، Ghahreman, 1994، Mobayen, 1975-1996 ، Mozaffarian, 2003 & Mozaffarian, 2005). Classification of plant life forms was performed based on the Raunkiaer (1934) system. In this system, plants are classified into five categories of phanerophytes Chamephytes, Hemicryptophytes, Geophytes and Therophytes. In addition, the geographical distribution of plants were obtained following (Léonard, 1988), (Zohary, 1963-1973) and (Takhtajan, 1986).

## RESULTS AND DISCUSSION

The floristic study in baharkish rangelands resulted in the identification of 22 families and 77 species. These families include poaceae (18%), Asteraceae (13%), Laminaceae (12%), Fabaceae (9%), Apiaceae (8%) and Brassicaceae (6%). Hemicryptophytes represent the most frequent life form in the area, with the Cryptophytes as the least frequent life form. Roughly 41% of the plant species are hemicryptophytes, 25% Chamaephytes, 23% Therophytes, 4% Geophytes, 4% Phanerophytes and 3% Cryptophytes. In terms of geographical distribution, 64% of the plant species belong to the Irano-Turanian geographical growth form, while other species could be found in other vegetation growth areas throughout the country. Based on the findngs of this study, 77 plant species have been identified which have formed different plant communities in reaction to their ecological conditions and applied managements over the years (Table 1).

**Table 1**- List of scientific names of species, life forms and geographical distribution of plants in Baharkish rangeland Quchan

| Scientific name | Plant family | Life forms | Chorology |
|---|---|---|---|
| ***Acantholimon avenaceum*** | plumbaginaceae | Ch | IT |
| ***Acanthophyllum bracteatum*** | Caryophyllaceae | Ch | IT |
| ***Acroptilon repens*** | Asteraceae | He | PL |
| ***Aeluropus littorallis*** | Poaceae | He | IT, M, SS |
| ***Allium xiphopetalum*** | Alliaceae | Cr | IT |
| ***Alyssum linifolium*** | Brassicaceae | Th | IT, M |
| ***Anchusa arvensis*** | Boraginaceae | He | IT, M |
| ***Arrhenatherum kotschyi*** | Poaceae | Ge | IT |
| ***Artemisia aucheri*** | Asteraceae | Ch | IT |
| ***Artemisia khorassanica*** | Asteraceae | Ch | IT |
| ***Asperula glomerata*** | Rubiaceae | Ch | IT |
| ***Astragalus podolobus*** | Fabaceae | Ch | IT |
| ***Astragalus verus*** | Fabaceae | Ch | IT |
| ***Atraphaxis spinosa*** | Polygonaceae | Ch | IT |
| ***Avena fatua*** | Poaceae | Th | IT,ES |
| ***Boissiera squarrosa*** | Poaceae | Th | IT, M |
| ***Brassica napus*** | Brassicaceae | He | PL |
| ***Bromus tectorum* L.** | Poaceae | Th | PL |
| ***Bupleorum exaltatum*** | Apiaceae | Ch | IT |
| ***Carex stenophylla*** | Cyperaceae | He | PL |
| ***Carthamus lanatus*** | Asteraceae | Th | IT |
| ***Ceratocarpus arenarius*** | Chenopodiaceae | Th | IT |
| ***Cichorium intybus*** | Asteraceae | He | PL |
| ***Colutea buhsei*** | Fabaceae | Ph | IT, ES |
| ***Convolvulus arvensis*** | Convolvulaceae | Th | SCO |
| ***Cotoneaster ovatus*** | Rosaceae | Ph | IT |
| ***Cousinia eryngiodes*** | Asteraceae | He | IT |
| ***Crambe kotschyana*** | Brassicaceae | He | IT |
| ***Dactylis glomerata*** | Poaceae | He | PL |
| ***Dianthus orientalis*** | Caryophyllaceae | Ch | IT |
| ***Dorema amoniacum*** | Apiaceae | He | IT |
| ***Echinops ritrodes*** | Asteraceae | He | IT |
| ***Elymus hispidus*** | Poaceae | He | IT, ES, M |
| ***Ephedra major*** | Ephedraceae | Ph | IT, ES, M |
| ***Eremurus luteus*** | Liliaceae | Ge | IT |
| ***Eruca sativa*** | Brassicaceae | Th | IT, M, ES |
| ***Eryngium caucasicum*** | Apiaceae | He | IT |
| ***Euphorbia aucheri*** | Euphorbiaceae | Th | IT |
| ***Ferula ovina*** | Apiaceae | He | IT |
| ***Festuca valesiaca*** | Poaceae | He | IT,ES |
| ***Glycyrrhiza glabra*** | Fabaceae | He | IT,M |
| ***Gundelia tournefortii*** | Asteraceae | He | IT |
| ***Heliotropium khorassanicum*** | Boraginaceae | Th | IT |
| ***Hordeum bulbosum* L.** | Poaceae | Cr | IT, M |
| ***Hulthemia persica*** | Rosaceae | Ch | IT |
| ***Kraschenikovia ceratoides*** | Chenopodiaceae | Ch | IT |
| ***Lagochilus cabulicus*** | Lamiaceae | Ch | IT |
| ***Linaria lineolata*** | Scrophulariaceae | He | IT |
| ***Malcolmia strigosa*** | Brassicaceae | Th | IT |
| ***Medicago rigidula*** | Fabaceae | Th | IT |
| ***Melica persica* Kunth** | Poaceae | He | IT |
| ***Nepeta bracteata*** | Lamiaceae | Th | IT |
| ***Noaea mucronata*** | Chenopodiaceae | Ch | IT, ES, M |
| ***Nonea caspica*** | Boraginaceae | Th | IT |
| ***Onopordon leptolepis*** | Asteraceae | He | IT |
| ***Perovskia abrotanoides*** | Lamiaceae | Ch | IT |
| ***Phalaris minor*** | Poaceae | Th | Cosm. |
| ***Phlomis cancellata*** | Lamiaceae | He | IT |
| ***Pimpinella tragium*** | Apiaceae | Ch | IT, ES, M |
| ***Plantago major*** | Plantaginaceae | He | SCO |
| ***Poa bulbosa*** | Poaceae | Ge | IT,ES,M |
| ***Prangos latiloba*** | Apiaceae | He | IT |
| ***Reseda lutea*** | Resedaceae | Th | IT,SS |
| ***Salvia limbata*** | Lamiaceae | He | IT |
| ***Sanguisorba minor*** | Rosaceae | He | IT,M,ES |
| ***Scariola orientalis*** | Asteraceae | Ch | IT |
| ***Serratula latifolia*** | Lamiaceae | He | IT |
| ***Silene chaetodonta*** | Caryophyllaceae | He | IT |
| ***Stachys lavandulifoia*** | Lamiaceae | He | IT |
| ***Stipa arabica*** | Poaceae | He | IT |
| ***Teucrium polium*** | Lamiaceae | Ch | IT,M |
| ***Thymus transcaspicus*** | Lamiaceae | Ch | IT |

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| | | | |
|---|---|---|---|
| ***Trifolium repens*** | Fabaceae | He | IT |
| ***Trigonella monantha*** | Fabaceae | Th | IT,ES,M |
| ***Verbascum agrimoniifolium*** | Scrophulariaceae | He | IT |
| ***Veronica khorassanica*** | Scrophulariaceae | He | IT |
| ***Vulpia persica*** | Poaceae | Th | IT |

Ch: Chamaephyte, Cr: Cryptophyte, Ge: Geophytes, He: Hemicryptophyte, Ph: Phanerophyte, Th: Therophyte
Cosm. : Cosmopolite (cosmopolitan), ES: Euro-Siberian, M: Mediterranean, PL: Pluriregional,
SCO: Subcosmopolitan, SS: Saharo-Sindian, IT: Irano-Turanian

There have been identified 22 families and 77 plant species in the floristic list for the area. On account of geographical distribution identified plants could be categorized in Irano-Turanian with 64% (greatest proportion); Irano-Turanian and Euro-Siberian and Mediteranian with 8%; Irano-Turanian and Mediterranian with 8%; Pluriregional with 8%; Irano-Turanian and Euro-Siberian with 4%; Irano-Turanian and Mediterranian and Euro-Siberian with 2%; Subcosmopolitan with 2%; Irano-Turanian and Mediterranian and Saharo-Sindian with 1%; cosmopolitan with 1%; Irano-Turanian and Saharo-Sindian with 1% of the total area (Figure 3).

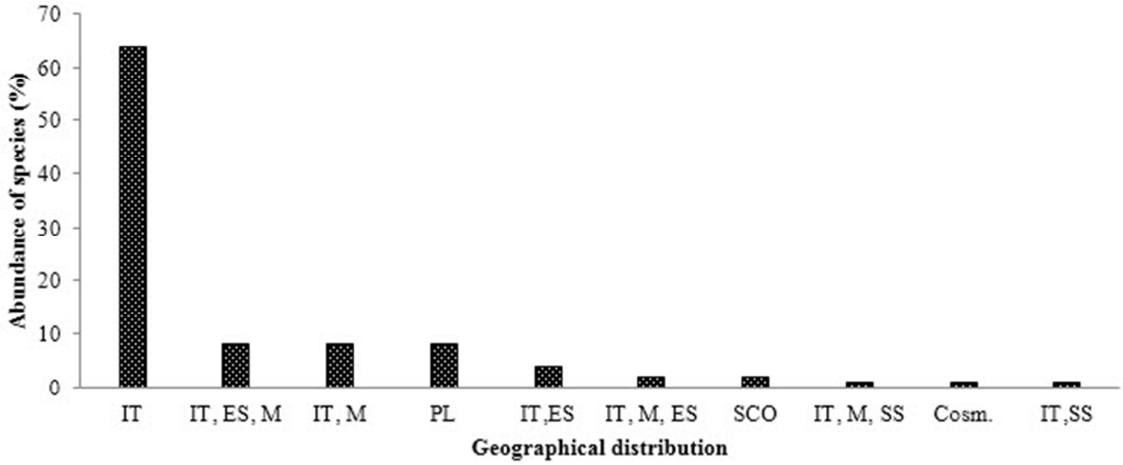


**Fig. 3-** Abundance of geographical distribution of plants in Baharkish rangeland
ES: Euro-Siberian, IT: Irano-Turanian, M: Mediterranean, Cosm: Cosmopolite (cosmopolitan),
SS: Saharo-Sindian

Classification of vegetation types according to the Raunkiaer (1934) showed that Hemicryptophytes plants accounted for the largest share with 41%, followed by Chamaephytes 25%, Therophytes 23%, Geophytes 4%, Phanerophytes 4% and Cryptophytes 3%. (Figure 4).

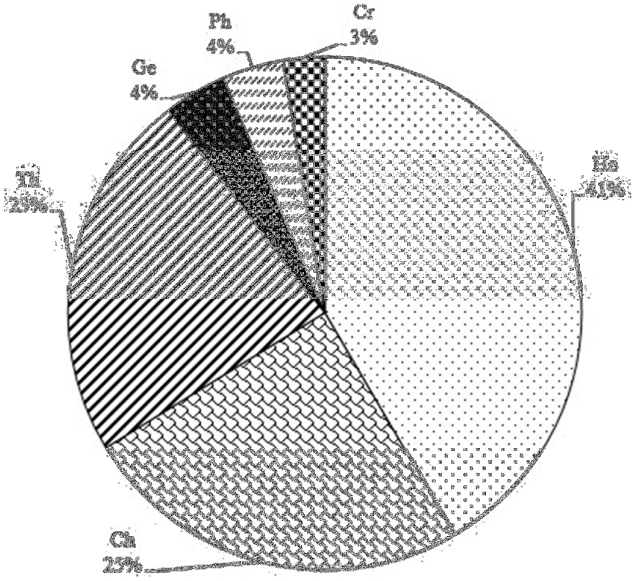


**Fig. 4**- Pie chart of life forms percentage of the species in Baharkish rangeland
Ph: Phanerophyte, Ge: Geophytes, Cr: Cryptophyte, Ch: Chamaephyte, Th: Therophyte, He: Hemicryptophyte

From the 77 species identified, 22 families were prevalent in the study area, including Poaceae with 18%, Asteraceae 13%, Lamiaceae 12%, Fabaceae 9%, Apiaceae 8%, Brassicaceae 6% followed by 5 families included Boraginaceae, Caryophyllaceae, Chenopodiaceae, Rosaceae , Scrophulariaceae with 4%, and 11 families included Alliaceae, Convolvulaceae, Cyperaceae, Euphorbiaceae, Ephedraceae, Liliaceae, Plantaginaceae, plumbaginaceae, Polygonaceae, Resedaceae and Rubiaceae with 1% (Figure 5).

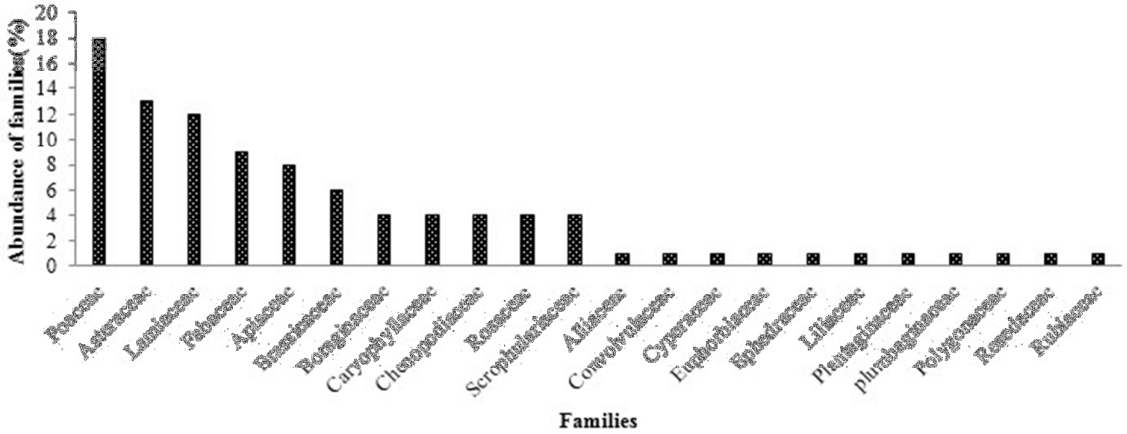


**Fig. 5**- Abundance of plant species distribution for different families in Baharkish rangeland

Actual floristic composition of a vegetation community forms in response to different environmental conditions and vegetation's reactions based on its ecological potential. The flora of Baharkish rangeland in Quchan has been firstly evaluated in this study and 77 species from 22 families have been identified.

There are remarkable differences in terms of precipitation, temperature, and other climatic parameters. This remarkable variation has resulted in current species richness, since climatic, edaphic, and topographic factors are the major influencers for vegetation cover in different natural domains (Moghadam, 2005; Baghestani Meibodi, 1997). The study of vegetation and geographical distribution of different plant species could help identify the area's ecological potential from different aspects, and yet is an influential factor in the assessment of status future condition, and hence it could inform a better management. Baharkish rangeland is located in the southern boundaries of Quchan urban district and in the central parts of the Doghaei rural distric. Given the 22 families identified, current study has show that Poaceae with 18% and Asteraceae with 13% are the

dominant plant families in the area. These families, at the same time, constitute a major share of plant communities in Iran. Studies conduceted by Naghipour Bourj et al., (2011) on the floristic condition of desert rangeland in arid parts of Iran has showed the relative dominance of these two families. Mehrnia et al., (2014) by applying the Raunkiaer life form assessment method showed the important share of the Hemicryptophytes. In this regard Archibold, (1995) relates the existence of Hemicryptophytes to the cold and mountaneous climate the area which could partly explain the dominance of this life form in Baharkish rangeland. Zarezade et al., (2007) also found that Hemicryptophytes shape a large part of life forms in Damgahan rangelands in Yaz Province. In terms of geographical distribution, Irano-Turanian region with 63% had the largest proportion. Javanshir, (1980) belived that geographical distribution of a plant community reflects the influence of different vegetation growth areas. Basaed on the chorological study, Irano-Turanian plant species forms the largest proportion, Habibi et al., (2013) which is consistent with the findings of Vaseghi et al., (2008). In the latter study on the life-forms and geographical distribution of plant species in the highlands of Kalat-Zirjan, Gonabad, it was shown the prevalence of Therophytes and Hemicryptophytes life forms and Irano-Turanian vegetation growth area.

*Conclusion:* Iran with a wide diversity of topography, geology and climate conditions is considered as one of the most important areas in terms of plant diversity and speciation. In general, the study results showed that Baharkish region has a diversity flora of pasture, medicinal and industrial plants. Most of these plants are very important in terms of health benefits. The domestication of these plants can not only eliminate the pharmaceutical industry's need for natural active ingredients, but can also reduce the risk of extinction by decreasing the utilization pressure.

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