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Flora, Life Form and Geographical Distribution of Plants in Meyantangan Mountain Refuge, East Dena Protected Area, Kohkiloye and Boyerahmad Province, Iran

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ABSTRACT

Floristic studies are fundamental for the applied sciences such as rangeland management and conservation. Iran as one of the most attractive place to study plant diversity has been identified, as 22% of its 8000 plant species are endemic. Nevertheless, there are still many parts of the country has have not been studied. And plants in these areas have not been identified. Unique ecological and climatic conditions in the Meyantangan Mountain make it a remarkable habitat for the floristic studies. The purpose of this study was to determine floristic composition and their chorology carrying a central importance in vegetation description and analysis. Therefore, 70 quadrats (100 m2) were located according to the nature of vegetation. The species and their abundance-dominance were recorded. 165 plant species, belonging to 53 families, were identified. Plant classification, based on Raunkiaer's life forms revealed Hemicryptophytes as the most abundant (45% of total) species. Therophytes, Phanerophytes and Chamaephytes contained 21, 20 and 14 percents of total plant species, respectively. Chorological characteristics of the plant species showed,about 73% of the total plant species in Meyantangan Mountain were belonged to the Irano-Turanian Chorotype, whereas Irano-Turanian-Mediterranean, Irano-Turanian-Mediterranean-Euro- Siberian and Irano Turanian-Euro-Siberian plant species respectively contained 7, 6 and 4 percent of all plant species. Less than 10% of total plant species were belonged to the other Chorotypes.

KEYWORDS: Meyantangan Mountain, Floristic composition, Chorology, Life form, Kohkiloye and Boyerahmad Province

1. INTRODUCTION

Organisms are extremely diverse. Probably between 5 million to 50 million species of animals, plants and microbes live on Earth today [8].Less than 2 million of them have been formally identified as species and described in the scientific literature. The rest is presented by specimens in museums waiting to be described, or by individuals in nature waiting to be discovered. Millions of species have lived at some time in the past and are now extinct[6].Just as all individuals eventually die, all species eventually go extinct. It is estimated that 99.9 percent of all species that ever lived are now extinct. This figure is alarming for consideration[14].

Flora identification of each region is fundamental to another pure and applied researches in biology.

The view expressed by Tuxen (1942) that the plant can measure habitat factors better than any instrument is symptomatic of the scepticism with which the sociologist regards intensive ecological investigation, in spite of the fact that the only exact knowledge, which he possesses of the tolerance of species has been obtained by extrapolation (often unjustified) from original instrumental measurements[25]. The knowledge of the floristic composition of an area is a perquisite for any ecological and phytogeographical studies and conservation management activities. In studying any particular element of vegetation, from an ecological viewpoint, the first step should be to determine the facts as they exist on the ground: the facts about the vegetation on the one hand, facts about the habitat, on the other [19].If there is a series of facts, which is more sensitive to direct study and accurate characterization than any other, it is the floristic composition of the vegetation. Therefore, recognition and documentation of plant species and their geographical distribution are essential for further researches and for their protection. Loss of genetic diversity and species through habitat destruction will take many years to correct and restore. Iran as one of the most attractive place to study plant diversity has been identified, as 22% of its 8000 plant species are endemic [3].Nevertheless, there are still many parts of the country has have not been studied. And plants in these areas have not been identified.

Several other studies in Iran have done and also reported higher abundance of Hemicryptophytes. Amiri *et al*. (2008) studied floristic of Tiregan in Hezar Masjed Mts[1]. Memariani, *et al*. 2009.Also studied floristic of Fereizi in Chenaran, and both found higher abundance of Hemicryptophytes as compared to other life forms [15]. In Fereizi at Khorasan Razavi, Therophytes and Hemicryptophytes were commonly the most abundant life forms [15].In Khabr National Park and Rouchoun wildlife refuge [11], and in Meimand [26], both in Kerman, and in Kalat highlands of Gonabad in Khorasan Razavi [27] Hemicryptophytes were the most abundant plant life forms.But in the Meyantangan Mountain, no study has been done in relation to the identification and

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introduction of plant species yet. Considering that Study of plants in this area was conducted. So the purpose of this research was to document the floristic composition and determine the plant species chorology in Meyantangan mountain shelter in Iran which are important aspects of ecological surveys and conservation.

The scientific contribution of this paper are: 1) A lack of comprehensive information on plants of Meyantangan Mountain, was the most important reason behind this research and Introducing plants of this region to researchers is useful for further studies. 2) Result of this study can also be used for the applied researches such as rangeland management and conservation.

The remainder of the paper was organized as follows: In the section 2, the study area and the methodology have been introduced. In section 3, the results of the study have been expressed in the form of graphs, tables or in descriptive terms. In section 4, the results have been discussed.

2. MATERIALS AND METHODS

Study area

The Study area, Meyantangan mountain refuge (1000 ha), is located in East Dena protected area in Kohkiloye and Boyerahmad province in Iran. It is between 51_ 30´- 51_ 35´ longitude and 35_ 45´ - 35_ 50´latitude (Fig. 1). The study area is located above sea level, in 1900-2700 m range. The average annual precipitation in the study area is about 800 mm. The average annual temperature for the region during the past 20 years is 15 ° C. The number of dry months for the region, are 4 months. The study area is located in the vegetal Iranian and Turanian area and contains a large collection of plants and animals known and reported in the country. It is consisted of two terrestrial and aquatic ecosystems. The most important mammals in the study area are the brown bear, wolf, tiger, goats, boar, hyena and Iranian Squirrel...

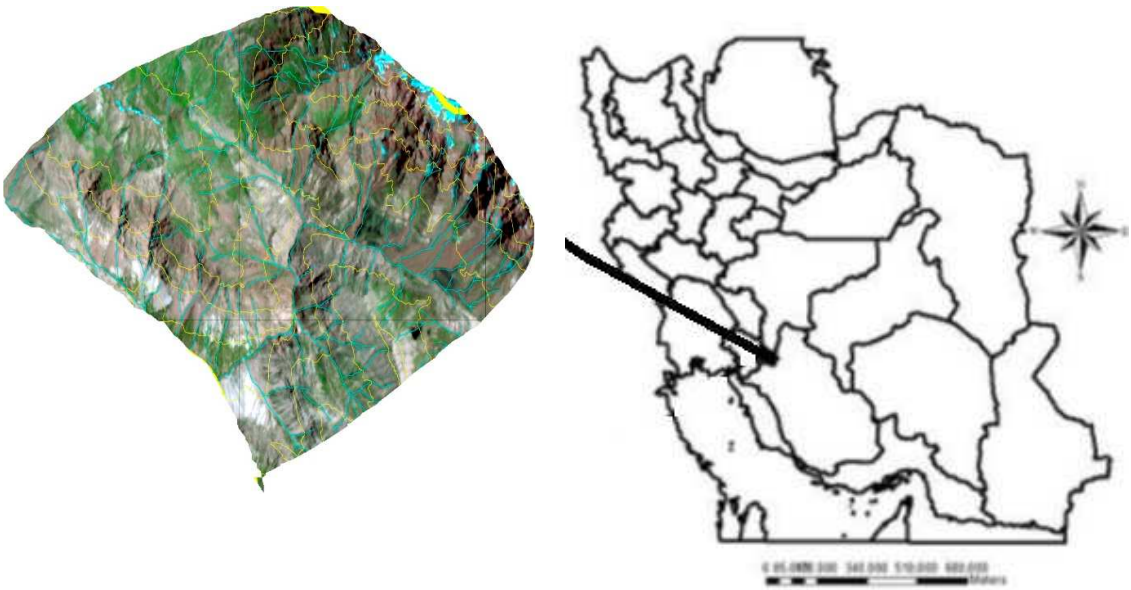


Fig. 1. Meyantangan mountain Refuge,East Dena protected area, Kohkiloye and Boyerahmad Province, Iran

METHODS

Species Collection and Identification

Since any detailed vegetation study is based on description and investigation of plant communities or vegetation segments that must first be recognized in the field [17]. Vegetation sampling was performed during the year 2011- 2012. In each vegetation type, considering the nature of vegetation, 10 quadrats of the size 100 m^2, were located and abundance-dominance of each species was recorded [8]. In the present study, the abundance dominance data were not subjected to analysis. Species identification and their chorology were completed using Flora of Iranica [21], Flora of USSR [13], Flora of Turkey [7], Flora of Iraq [24], Flora of Iran [2], Color Flora of Iran [9] as well as the books of [22]and [28]. Life form classification system of Raunkiaer was used to assign the life form of the species [20].

3. RESULTS AND DISCUSSION

The total number of 165 plant species belonging to 53 families were identified in the study area based on (Rechinger, 1963-98), (Komarov, *et al*., 1963-1974), (Davis, 1965-1988), (Townsend and Guest, 1960-1985),

(Assadi, *et al*., 1989-2002) and (Ghahreman, 1984 -2002). Species composition of Meyantangan Mountain along with their families, chorotypes and life forms are presented in Table 1.

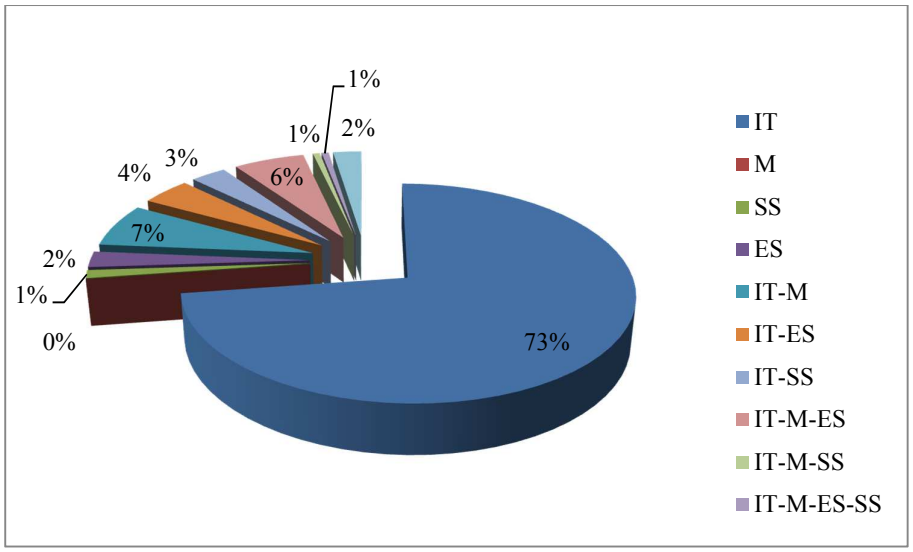
Table 1. Floristic composition of Meyantangan wildlife refuge. Family Name, chorotype and life form of each species have been presented.

	family	species	Chorotype	Life form
1	*Aceraceae*	*Acer monspesolanum L*	IT	**PH**
2	*Anacardiaceae*	*Pistacia atlanticaDesf*	IT	**PH**
3		*Pistacia khinjuk*	IT	**PH**
4		*Rhus coriaria*	IT, M	**PH**
5	*Araceae*	*Biarum sp*	IT	**HE**
6	*Aristolichiaceae*	*Aristolochia olivieri*	IT	**HE**
7		*Aristolochia bottae*	IT	**HE**
8	*Asclepidaceae*	*Marsdenia erecta*	IT, M	**PH**
9	*Asteraceae*	*Achillea wilhelmsii*	IT	**HE**
10		*Artemisia lehmsnniana*	IT	**CH**
11		*Picnomon acarna*	IT, M	**HE**
12		*Taraxicum kotschyi*	IT	**HE**
13		*Achillea tenuifolia*	IT	**HE**
14		*Aegopordon berardioides*	IT	**HE**
15		*Anthemis haussknechtii*	IT	**TH**
16		*Artemisia aucheri*	IT	**CH**
17		*Artemisia dracuneulus*	IT	**CH**
18		*Artemisia sieberi*	IT	**CH**
19		*Artemisia vulgaris*	IT	**CH**
20		*Carthamus oxyacantha*	IT	**CH**
21		*Centaurea aucheri*	IT	**HE**
22		*Centaurea gaubae*	IT	**HE**
23		*Centaurea intricata*	IT	**HE**
24		*Centaurera virgata*	IT	**HE**
25		*Cichorium intybus*	IT	**HE**
26		*Cirsium vulgare*	IT	**HE**
27		*Cousina cylindracea*	IT	**HE**
28		*Cousina multiloba*	IT	**HE**
29		*Cousinia bachtiarica*	IT	**HE**
30		*Cousinia eriobasis*	IT	**HE**
31		*Echinops cephalotes*	IT	**HE**
32		*Echinops kotschyi*	IT	**HE**
33		*Echinops macrophyllus*	IT	**HE**
34	*Berberidaceae*	*Berberis integerrima*	IT, M	**PH**
35	*Boraginaceae*	*Arnebia decumbens*	IT, SS	**TH**
36		*Lappula sinaica*	IT	**TH**
37		*Lithospermum officinale*	IT	**HE**
38		*Alkanna frigida*	IT	**HE**
39		*Anchusa italica*	IT	**TH**
40		*Anchusa strigosa*	IT	**TH**
41	*Brassicaceae*	*Aubrietia parvifolia*	IT	**HE**
42		*Fibigia suffruticosa*	IT	**HE**
43		*Neslia aoiclata*	IT	**HE**
44		*Peltaria angustifolia*	IT, SS	**TH**
45		*Alyssum bracteatum*	IT	**TH**
46	*Camponulaceae*	*Asyneuma multicaule*	ES, IT	**HE**
47	*Caprifoliace*	*Lonicera nummulariifolia*	IT	**PH**
48	*Caryophyllaceae*	*Silene daenensis*	IT	**TH**
49		*Silene spergulifolia*	IT	**TH**
50		*Aconthophyllum spinosum*	IT	**CH**
51		*Dianthus denaicus*	IT	**CH**
52	*Chenopodiaceae*	*Ceratocarpus arenarius*	IT	**TH**
53		*Kokhia prostrate*	IT	**TH**
54		*Noaea mucronata*	IT, SS	**CH**
55		*Chenopodium album*	IT	**TH**
56		*Chenopodum foliosum*	IT	**TH**

57	*Convulvulaceae*	*Convolvulus acanthocladus*	IT	**CH**
58	*Cucurbitaceae*	*Bryonia dioica*	IT	**HE**
59	*Cupressaceae*	*Juniperus excelsa*	IT	**PH**
60	*Cyperaceae*	*Carex stenophylla*	ES	**HE**
61	*Dipsacaceae*	*Pterocephalus canus*	ES, IT, M	**TH**
62		*Peterocephalus kurdicus*	IT	**CH**
63		*Scabiosa olivieri*	IT	**TH**
64	*Elaeagnaceae*	*Elaeaganis angustifolia*	IT	**PH**
65	*Ephedraceae*	*Ephedra strobilacea*	IT	**CH**
66	*Euphorbiaceae*	*Chrozophora tinctoria*	IT, M	**CH**
67		*Euphorbia microsciadia*	IT	**HE**
68		*Euphorbia helioscopia*	IT	**HE**
69		*Euphorbia heteradenia*	IT	**HE**
70	*Fabaceae*	*Lens culinaris*	IT	**HE**
71		*Medicago minima*	IT	**HE**
72		*Medicago rigidula*	IT, M, ES	**HE**
73		*Trifolium campestre*	IT	**HE**
74		*Trifoliumrepens*	IT	**HE**
75		*Astragalus albispinus*	IT	**HE**
76		*Astragalus campylanthus*	IT	**HE**
77		*Onobrychis cornuta*	IT	**CH**
78		*Onobrychis melanotricha*	IT	**CH**
79		*Sophora japonica*	IT	**HE**
80		*Vicia kootschyana*	IT, M	**TH**
81		*Vicia hirsute*	IT, M	**TH**
82	*Fagaceae*	*Quercuspersica*	IT	**PH**
83	*Hypericaceae*	*Hypericum helianthemoides*	ES	**PH**
84	*Labiatae*	*Marrubium vulgare*	IT, M	**HE**
85		*Ziziphora capitata*	IT	**TH**
86		*Ajuga chamaecistus*	IT	**CH**
87		*Nepeta glomerulosa*	IT	**TH**
88		*Phlomis olivieri*	IT	**TH**
89		*Stachys lavandulifolia*	IT	**CH**
90		*Stachys pilifera*	IT	**CH**
91		*Teucrium orientale*	IT	**CH**
92		*Thymus daenensis*	IT	**CH**
93	*Liliaceae*	*Fritillaria persica*	IT	**HE**
94	*Linacea*	*Linum album*	IT, M, SS	**TH**
95	*Malvaceae*	*Althea officinalis*	IT	**HE**
96		*Malva neglecta*	IT, M, ES	**HE**
97	*Moraceae*	*Ficus carica*	IT, M, ES	**PH**
98		*Ficus johannis*	IT, M, ES	**PH**
99		*Morus nigra*	IT, M, ES	**PH**
100	*Morinaceae*	*Morina persica*	IT, ES	**HE**
101	*Oleaceae*	*Fraxcius rotundifolia*	ES	**PH**
102	*Papaveraceae*	*Hypecoum pendulum*	IT	**HE**
103	*Plantaceae*	*Plantanus oreintalis*	IT	**PH**
104	*Plantaginaceae*	*Plantago lanceolata*	IT	**HE**
105		*Plantago major*	IT	**HE**
106		*Plantago psyllium*	IT	**HE**
107	*Plumbaginaceae*	*Acantholimon asphodelnum*	IT	**CH**
108		*Acantholimon erinaceum*	IT	**CH**
109	*Poaceae*	*Aegilos crassa*	Cosm	**TH**
110		*Festuca ovina*	Cosm	**HE**
111		*Heteranthelium peliferum*	IT, M	**HE**
112		*Melica persica*	IT	**HE**
113		*Oryzopsis holciformis*	IT	**HE**
114		*Poa bulbosa*	IT, M, ES	**TH**
115		*Poa pratensis*	IT, M	**TH**
116		*Stipa barbata*	IT	**HE**
117		*Stipa hohenackeriana*	IT	**HE**
118		*Stipa lagascae*	IT	**HE**
119		*Alopecurus apiatus*	IT, ES	**TH**

120		*Sorghum halepens*	IT, M	**HE**
121	*Polygonaceae*	*Polygonum dumosum*	IT	**TH**
122		*Pteropyrum aucheri*	IT	**PH**
123	*Primulaceae*	*Anagallis arvensis*	ES, IT, M	**TH**
124	*Punicaceae*	*Punica granutum*	IT	**PH**
125	*Ranunculaceae*	*Thalictrum isopyroides*	IT	**HE**
126	*Rhamnaceae*	*Rhamnus kurdica*	IT	**PH**
127		*Rhamnus cornifolia*	IT	**PH**
128		*Rhamnus persica*	IT	**PH**
129		*Sageretia thea*	IT, SS	**CH**
130	*Rosaceae*	*Amygdalus haussknechtit*	IT	**PH**
131		*Amygdalus scoparia*	IT, SS	**PH**
132		*Amygdulus lycioides*	IT	**PH**
133		*Armeniaca vulgaris*	IT	**PH**
134		*Cerasus brachypetala*	ES	**PH**
135		*Cratagus persica*	IT	**PH**
136		*Cydonia oblonga*	IT	**PH**
137		*Potentilla nuda*	IT	**HE**
138	*Rubiaceae*	*Asperula orientalis*	IT	**HE**
139		*Callipetalis cucullaria*	IT	**TH**
140		*Cruciata tauica*	IT	**HE**
141		*Galium verum*	IT	**TH**
142	*Rununculaceae*	*Nigella sp*	IT	**HE**
143	*Salicaceae*	*Salix aegyptiaca*	IT	**PH**
144		*Salix excela*	IT	**PH**
145	*Santalaceae*	*Thesium kotschyanum*	IT	**HE**
146	*Scropholariuceae*	*Digitalis purpurea*	IT	**HE**
147		*Verbascum speciosum*	IT	**HE**
148	*Solanaceae*	*Datura sp*	Cosm	**TH**
149		*Datura stramonium*	Cosm	**TH**
150		*Solanum dulcamara*	SS	**PH**
151	*Thymelaceae*	*Daphne mucronata*	ES, IT	**PH**
152	*Umbelliferae*	*Smyrnium cordifolium*	IT, ES	**HE**
153		*Chaerophyllum sp*	IT, M, ES	**HE**
154		*Petroselinum hortense*	IT	**HE**
155		*Dacus carota*	SS	**HE**
156		*Dorema aucheri*	IT	**HE**
157		*Echinophora cinerea*	IT	**HE**
158		*Eryngium billardieri*	IT	**HE**
159		*Ferula assa foetida*	IT	**HE**
160		*Ferulago angulata*	IT	**HE**
161		*Prangos ferulacea*	IT	**HE**
162		*Torilis leptophylla*	ES, IT, M	**TH**
163	*Urticaceae*	*Parietaria judaica*	ES, IT, M, SS	**TH**
164	*Valerianaceae*	*Valeriana officinalis*	ES, IT	**TH**
165	*Verbenaceae*	*Vitis vinifer*	ES, IT	**PH**

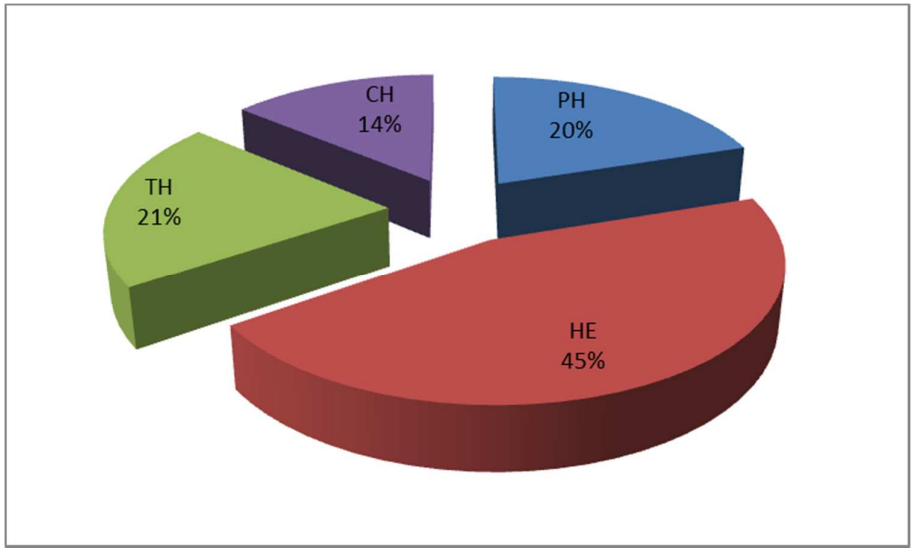
About 73% of the total plant species in Meyantangan Mountainwere belonged to the Irano-Turanian Chorotype, whereas Irano-Turanian-Mediterranean, Irano-Turanian-Mediterranean-Euro- Siberian and Irano Turanian-Euro-Siberian plant species respectively contained 7, 6 and4 percent of all plant species. Less than 10% of total plant species were belonged to the other Chorotypes. (Fig. 2).



IT= Irano-Turanian, SS= Sahra-Sidian
M= Mediterranean, IT-M= Irano-Turanian, Mediterranean.
ES= Euro-Siberian, IT-SS= Irano- Turanian, Sahra-Sidian.
ES= Euro- Siberian IT-M-ES= Irano- Turanian, Mediterranean, Euro-Siberian.
Cos= Cosmopolid. IT-M-SS= Irano- Turanian, Mediterranean, Sahra-Sidian.

Fig. 2. Plant life forms and their relative contribution (percent) in flora in Meyantangan Mountain

Plant classification, based on Raunkiaer's life forms revealed Hemicryptophytes as the most abundant (45% of total) species. Therophytes, Phanerophytes and Chamaephytescontained 21, 20 and 14 percents of total plant species, respectively (Fig. 3).



He: Hemicryptophytes,
Th: Therophytes,
Ch: Chamaephytes,
Ph: Phanerophytes,

Fig. 3. Plant Life forms and their relative percentage in flora in Meyantangan Mountain

It was explained at the top of figure

Among the 53 plant families found in the Meyantangan Mountain, *Asteraceae* and *Poacea*were the most abundant. These families respectively contained 25(15%) and12 (7.2%)species.

Hemicryptophytes was the most abundant life form in Meyantangan Mountain.

4. Conclusion

Documenting floristic composition of a habitat is valuable for continuing ecological research, management and conservation of plants and animals. Resources available for conservation of species and ecosystems are in short supply relative to the needs for those resources. Targeting conservation and management actions toward the species and ecosystems require clearly established priorities such as study of floristic composition as a principle tool in biodiversity which was considered in the study. So, in this research, identification of 165 plant species in Meyantangan Mountain Refuge along with their chorology, plant family and life form are of central importance for further ecological investigation, conservation and management of wildlife refuge of Iran.

Any life forms, in each plant communities vary. That this difference is the basis of the structure of plant communities [16]. Higher frequency of Therophytes and Hemicryptophytes in Meyantangan Mountaincan be related to their high adaptation to the Mediterranean climate conditions [29]. The classification was based on Ranker system, Hemicryptophytes having 45% share of the total number, make up the dominant life form, that it is common in cold and mountainous climate and shows its adaptability with Regional ecological conditions [10]. Therophytes with 21 percent of the frequencies in the region are next. Therophytes prevalence in the region is related to factors such as human intervention, which decreases perennial plants and increases the chance for developing Annual plants[10] Overall, Hemicryptophytes and Phanerophytes, make up 66 percent of the plants in the region. This shows that the climatic conditions of the region are suitable for growing in temperate regions [12]. This type of life forms, have an important role in stabilizing soil [5]. Iranian- Turanian elements, with 73%, are in first place. A large percentage of Iranians - Turanian, ia related to the increase in the height range[18].

During most of the summer and all winter times, Hemicryptophytes lose their aboveground parts while Therophytes remain as seed. Therefore, these plants avoid summer drought and winter cold stresses [4]. In conclusion, rangelands of Meyantangan Mountain confer a relatively rich floristic composition, which is a result of plant responses to Mediterranean climate as well as intense livestock grazing. A combination of climate and land use impact has led to dominance of Hemicryptophytes and Therophytes. The active growth periods of these life forms are concurrent with the rainy season in early spring [23]. Climateand humanhave significant effect on the flora of all habitats in the Meyantangan Mountain.

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