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Presentation of Diversity, Life Forms, and Chorology of Plant Species in Galehdar Watershed (Fars Province, Iran)

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ABSTRACT

Aims Floristic survey of an area is a useful tool for identifying the biodiversity, particularly endemic, resistant, and endangered species. In the current study, plant species were classified to describe the flora of Galehdar watershed in Southern Fars Province.

Materials & Methods The environmental data including climate, geology, and topography characteristics were obtained from Iran Meteorological Organization (IMO), Geological Survey & Mineral Explorations of Iran (GSI), and National Cartographic Center (NCC), respectively. The specimens of the study area were collected, identified, and classified according to Raunkiaer's method and life-form class.

Findings The flora of study area includes 164 species belonging to 129 genera and 55 families, which most frequent species belong to Asteraceae (25 species), Papilionaceae (21 species), and Poaceae (11 species).

Conclusion The chorological studies indicated that 57.9%, 12.8%, and 29.3% of species belong to Irano-Turanian, Sahara-Seindian, and Irano-Turanian, Sahara-Seindian zone, respectively.

Keywords Chorology; Flora; Plant Species; Life Form; Fars Province

CITATION LINKS

[1] Climate-change winners and losers: Stream macroinvertebrates of a submontane region in Central Europe [2] Observed and projected climate trends and hotspots across the National Ecological Observatory Network regions [3] Predator control of ecosystem nutrient dynamics [4] Life-forms and phytoclimate [5] Aerophyte, a new life form in Raunkiaer's classification? [6] Presentation of flora, life forms and chorology of plant species in the Jahrom area (Fars province, Iran) [7] Life form spectra of contrasting slopes of the grazed pastures of Northern New Jersey [8] Aims and methods of vegetation ecology [9] A classification of life forms of the Sonoran Desert, with emphasis on the seed plants and their survival strategies [10] Structural niches in plant communities [11] Life forms of plants and statistical plant geography [12] Investigation flora and life form of plants in protected region Sarigol (North Khorasan province, Iran) [13] Floristic study of Ghasemloo (Shohada) valley forest reserve and adjacent area [14] Floristic study of Dalab woodlands, North-East of Ilam province, West Iran [15] Climate data-base [16] Geological map of Shiraz, 1:250000 [17] Flora orientalis [18] Flora Iranica [19] Flora of Iraq [20] Flora Palaestina [21] Flora of Turkey and the East Aegean Islands [22] Flora of Iran, plan of the flora of Iran [23] Ecological diversity [24] Ecological diversity and its measurements [25] Floristic composition, life form and chorology of plant life at Khulais region, Western Saudi Arabia [26] A contribution to some ethnobotanical aspects of Birjand flora (Iran) [27] Plant adaptations in desert dunes [28] Floristic characteristics of the wetland sites on dry Southern slopes of the Alborz Mts., N [29] Floristic regions of the world [30] Geobotanical foundation of Middle-East

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Introduction

Plant biodiversity has been declining during the recent decades all over the world due to the anthropogenic effects such as climate change, habitat destruction, and over-exploitation of natural resources [1]. These significant changes in natural habitats could threat the diversity of plants and affect the ecosystem goods and services [2]. Identification and classification of flora in a specified area could be useful for conservation projects [3].

Based on structural and functional similarities, plant species can be grouped into different life-forms. The life-form study is an important part of vegetation description, ranking next to the floristic composition [4]. A life-form is characterized by the adaptation of the plants to certain ecological conditions [5]. In fact, ecological dominance could be characterized by a combination of different life-forms in plant communities. This classification provides a systematic grouping of plants, indicating the declining or restoring of vegetation in response to management decisions [6]. On the other hand, life-forms show the reaction of plant species to the environmental variables [7, 8] and can be regarded as strategies, using soil water and other environmental resources [9, 10].

Raunkiaer proposed a system to classify plant life-forms based on the position and degree of protection of the renewing buds, which are responsible for the regrowth of the plant's aerial body when the favorable season comes. In this system, the more pronounced the unfavorable season, the more protected the renewing buds [11]. There are, in Raunkiaer's classification, 5 major classes, arranged according to the increased protection of the renewing buds: Phanerophytes, Chamaephytes, Hemicryptophytes, Cryptophytes, and Therophytes. [11, 4, 8].

Floristic survey of an area is an essential tool for identifying the floristic composition, particularly endemic, resistant, and endangered species [12]. Gathering the information about plant composition is the first step toward determining the production potential of a region, planning for increasing the density of vegetation [13], managing ecosystems for long-term viability and sustainability, and preventing the destruction of habitats [14]. Then, this research was conducted to study the floral composition, life-forms, and chorology of plant species in Galehdar Watershed, an interesting and diverse area in southern Fars Province.

There is no comprehensive study focusing on the structure and flora of Galehdar Watershed. The present study aimed at providing an overview of biodiversity among vascular plants of southern Fars province with a special emphasis on flora, life-forms, and chorology aspects.

Materials and Methods

Study area: Galehdar watershed with 52,250 ha is located between 52° 28′ to 52° 44′ east longitudes and 27° 34′ to 27° 50′north latitudes in southern Fars Province near Mohr area with a minimum and maximum altitude from 480 m to 1600 m above sea level. The present study was conducted in the Galehdar Watershed during 2 years of field survey (Figure 1).

Figure 1) Location map of the study area in Iran and Fars Province

Climatic data including rainfall and temperature were obtained from the Islamic Republic of Iran Meteorological Organization (IRIMO) [15]. The mean annual precipitation and temperature were 215.4 mm and 25.4°C, respectively.

According to Geological Survey of Iran [16], the study area is covered by several geological formation including, salt, grey, and red anhydrite marl with limestone (Gachsaran formation), massive forming conglomerate and sandstone (Bakhtiari formation), red marl and sandstone (Aghajari formation), dolomite limestone, limestone and argillaceous limestone (Asmari formation), and sediment fan and valley terrace deposits (Quaternary period).

Plant collection: The specimens of the study

area were collected in several field trips during 2 years of study the area from floristically point of view. The plant specimens were identified, using valid references [17-22] and deposited into the herbarium of Fars Agricultural and Natural Resources Research and Education Center.

Life-form classes were constructed by following Raunkiaer's method. The species were classified as phanerophytes, chamaephytes, hemicryptophytes, cryptophytes, and therophytes. We computed the proportion of species in each life-form class. Also, the species were classified based on their chorological types.

Findings

The results showed that the flora of this region included 164 species belonging to 129 genera and 55 families (Table 1). Asteraceae with 25 species, Papilionaceae with 21 species and Poaceae with 11 species were the main families of this area (Diagram 1).

The life-form spectrum showed that therophytes with 34.8% of the species, hemicryptophytes with 27.5% of the species, chamaephytes with 14.6% of the species, and phanerophytes with 14.0% of the species had the dominant life-forms of area, while the least frequent life-form class was geophytes with 9.1% of the species (Diagram 2). The chorological studies showed that 57.9% of the species belonged to Irano-Turanian zone. Moreover, 12.8% and 29.3% of the species belonged to Sahara-Sindian zone and Irano-Turanian, Sahara-Sindian zones, respectively (Diagram 3).

Table 1) List of species, families, their life-forms, and chorotypes in the study area. Life-forms: Ch–chamaephytes, Cr–cryptophytes: (Gb–geophytes bulb, Gr- geophytes rhizome, and Gt-geophytes tuber), He–hemicryptophytes, Ph–phanerophytes, and Th–therophytes; Chorotypes: Irano-Turanian (IT), Sahara-Seindian (SS), Irano-Turanian, Sahara-Seindian (IT-SS)

No.	Family	Species	Life-form	Chorotype
1	Amaranthaceae	*Amaranthus retroflexus* L.	Th	IT
2	Amaryllidaceae	*Narcissus tazetta* L.	Gb	IT
3	Anacardiaceae	*Pistacia khinjuk* Stocks	Ph	IT
4	Apiaceae	*Anisosciadium orientale* DC.	Th	IT, SS
5	Apiaceae	*Dicylophora persica* Boiss.	Th	IT
6	Apiaceae	*Ducrosia anethifolia* (DC.) Boiss.	He	IT
7	Apiaceae	*Lagoecia cuminoides* L.	Th	IT, SS
8	Apiaceae	*Pimpinella eriocarpa* Banks & Soland	Th	IT
9	Apiaceae	*Pycnocycla nodiflora* Decne. ex Boiss.	Ch	SS
10	Apocynaceae	*Nerium indicum* Miller	Ph	SS
11	Asclepiadaceae	*Marsdenia erecta* (L). R. Br. ex DC.	Ch	IT, SS
12	Asclepiadaceae	*Periploca aphylla* Dence.	Ph	SS
13	Asteraceae	*Achillea eriophora* DC.	He	IT
14	Asteraceae	*Achillea whilhelmsii* C. Koch	He	IT
15	Asteraceae	*Anthemis altissima* L.	Th	IT
16	Asteraceae	*Anthemis rhodocentra* Iranshahr	Th	IT
17	Asteraceae	*Anvillea Garcini* (Burm.) DC.	Ch	IT
18	Asteraceae	*Calendula persica* C. A. Mey.	Th	IT
19	Asteraceae	*Carduus arabicus* Jacq. ex Murray	Th	IT, SS
20	Asteraceae	*Carthamus oxyacantha* M. B.	Th	IT
21	Asteraceae	*Centurea bruguieriana* (DC.) Hand- Mzt	Th	IT,SS
22	Asteraceae	*Centaurea depressa* M. B.	Th	IT
23	Asteraceae	*Centanrea intricata* Boiss.	Th	IT
24	Asteraceae	*Centaurea solstitialis* L.	Th	IT, SS
25	Asteraceae	*Crepis sancta* (L.) Babcock	Th	IT
26	Asteraceae	*Echinops aucheri* Boiss.	He	IT
27	Asteraceae	*Echinops glanduloso-* punctatus Rech. f	He	IT
28	Asteraceae	*Grantia aucheri* Boiss.	Ch	SS
29	Asteraceae	*Gundelia tournefortii* L.	He	IT
30	Asteraceae	*Helichrysum leucoephalum* Boiss.	He	IT
31	Asteraceae	*Matricaria aurea* (Loefl.)Schultz- Bip.	Th	IT, SS
32	Asteraceae	*Onopordon leptolepis* DC.	He	IT
33	Asteraceae	*Outreya carduiformis* Jaub. &Spach	He	IT
34	Asteraceae	*Platychaete aucheri* (Boiss.) Boiss.	Ch	IT, SS
35	Asteraceae	*Platychaete mucronifolia* (Boiss.) Boiss.	Ch	IT, SS
36	Asteraceae	*Senecio glaucus* L.	Th	IT
37	Asteraceae	*Tragopogon longirostris* Bisch.	Gt	IT
38	Bignoniaceae	*Tecomella undulate* (Roxb.) Seem.	Ph	IT, SS
39	Boraginaceae	*Anchusa strigosa* Labilla.	He	IT

Continue of Table 1) List of species, families, their life-forms, and chorotypes in the study area. Life-forms: Ch–chamaephytes, Cr–cryptophytes: (Gb–geophytes bulb, Gr- geophytes rhizome, and Gt-geophytes tuber), He–hemicryptophytes, Ph–phanerophytes, and Th–therophytes; Chorotypes: Irano-Turanian (IT), Sahara-Seindian (SS), Irano-Turanian, Sahara-Seindian (IT-SS)

No.	Family	Species	Life-form	Chorotype
40	Boraginaceae	*Heliotropium ramosissimum* (Lehm.) DC.	He	IT
41	Brassicaceae	*Biscutella didyma* L.	Th	SS
42	Brassicaceae	*Cardaria draba* (L) Desv	Th	IT, SS
43	Brassicaceae	*Descurainia sophia* (L.) Schur	Th	IT, SS
44	Brassicaceae	*Diplotaxis harra* (Forssk.) Boiss.	He	IT, SS
45	Brassicaceae	*Erucaria hispanica* (L.) Druce	Th	IT, SS
46	Brassicaceae	*Erysimum oleifolium* J. Gay	He	IT
47	Brassicaceae	*Hirschfeldia incana* (L.) Lag.	Th	IT, SS
48	Brassicaceae	*Matthiola longipetala* (Vent.) DC.	Th	IT
49	Brassicaceae	*Physorrhynchus chamaerapistrum* (Boiss.) Boiss.	He	SS
50	Brassicaceae	*Sinapis arvensis* L.	Th	IT
51	Caesalpinaceae	*Caesalpinia gilliesii* (Hook.) Dietr	Ph	SS
52	Capparidaceae	*Capparis spinosa* L.	Ch	IT
53	Caryophyllaceae	*Silene spergulifolia*. (WIilld.) M. B.	He	IT
54	Caryophyllaceae	*Acantophyllum caespitosum* Boiss.	Ch	IT
55	Caryophyllaceae	*Dianthus crinitus* Sm.	He	IT
56	Caryophyllaceae	*Gymnocarpus decander* Forssk.	Ch	IT
57	Chenopodiaceae	*Atriplex leucoclada* (Boiss) Aellen	He	IT
58	Chenopodiaceae	*Noaea mucronata* (Forsk.) Aschers. et Schweinf.	He	IT
59	Cistaceae	*Helianthemum lippii* (L.) Pers.	Ch	SS
60	Convolvulaceae	*Convolvulus acanthocladus* Boiss.	Ch	IT, SS
61	Convolvulaceae	*Convolvulus argyracanthus* Rech. f.	He	IT
62	Convolvulaceae	*Convolvulus arvensis* L.	Th	IT, SS
63	Convolvulaceae	*Convolvulus leiocalycinus* Boiss.	Ch	IT
64	Convolvulaceae	*Convolvulus spinosus* Burm.	Ch	IT, SS
65	Cuscutaceae	*Cuscuta planiflora* Ten	T	SS
66	Cyperaceae	*Cyperus rotundus* L.	Gr	IT, SS
67	Dipsacaceae	*Cephalaria* sp.	He	IT
68	Ephedraceae	*Ephedra foliate* Boiss. et Ky.	Ph	IT, SS
69	Ephedraceae	*Ephedra laristanica* Assadi.	Ph	SS
70	Euphorbiaceae	*Chrozophora obliqua* (vahl) juss.exspreng	Th	IT
71	Euphorbiaceae	*Euphorbia helioscopia* L.	Th	IT, SS
72	Euphorbiaceae	*Ricinus communis* L.	Th	IT
73	Fumariaceae	*Fumaria asepala* Boiss.	Th	IT, SS
74	Gentianaceac	*Gentiana olivieri* Griseb.	He	IT
75	Geraniaceae	*Erodium gruinum* L.	Th	IT
76	Hypericaceae	*Hypericum hirsutum* L.	He	IT
77	Iridaceae	*Gladiolus* sp.	Gt	IT
78	Iridaceae	*Gynandriris sisyrinchium* (L.) Parl.	Gt	IT, SS
79	Juncaceae	*Juncus inflexus* L.	Gr	IT
80	Lamiaceae	*Ajuga chamaecistus* Ging.	Ch	IT
81	Lamiaceae	*Mentha longifolia* (L.) Huds	Gr	IT, SS
82	Lamiaceae	*Otostegia persica* (Burm.) Boiss.	Ch	IT
83	Lamiaceae	*Salvia macrosiphon* Boiss.	He	IT
84	Lamiaceae	*Stachys inflata* Benth.	He	IT
85	Lamiaceae	*Teucrium orientale* L.	He	IT
86	Lamiaceae	*Teucrium polium* L.	He	IT
87	Lamiaceae	*Zataria multiflora* Boiss.	Ch	IT
88	Liliaceae	*Allium eriophyllum* Boiss.	Gb	IT
89	Liliaceae	*Asphodelus tenuifolius* Cav.	Th	IT, SS
90	Liliaceae	*Colchicum persicum* Baker	Gb	IT
91	Liliaceae	*Gagea* sp.	Gb	IT
92	Liliaceae	*Muscari neglecta* Guss.	Gb	IT
93	Malvaceae	*Malva neglecta*. Wallr.	He	IT
94	Malvaceae	*Malva sylvestris* L.	He	SS
95	Mimosaceae	*Acacia salicina* Lindl.	Ph	SS
96	Mimosaceae	*Acacia tortilis* (Forssk.) Hayne	Ph	SS
97	Mimosaceae	*Prosopis farcta* (Banks &Soland.) Macbr	Ch	IT, SS
98	Moraceae	*Ficus johannis* Boiss.	Ph	IT
99	Moraceae	*Morus nigra* L.	Ph	IT
100	Myrtaceae	*Callistemon salignus* Sweet	Ph	IT, SS
101	Myrtaceae	*Myrtus communis* L.	Ph	IT
102	Palmaceae	*Phoenix dactylifera* L.	Ph	SS
103	Papilionaceae	*Alhagi Pseudoalhagi* (M.B.) Desf.	He	IT

Continue of Table 1) List of species, families, their life-forms, and chorotypes in the study area. Life-forms: Ch–chamaephytes, Cr–cryptophytes: (Gb–geophytes bulb, Gr- geophytes rhizome, and Gt-geophytes tuber), He–hemicryptophytes, Ph–phanerophytes, and Th–therophytes; Chorotypes: Irano-Turanian (IT), Sahara-Seindian (SS), Irano-Turanian, Sahara-Seindian (IT-SS)

No.	Family	Species	Life-form	Chorotype
104	Papilionaceae	*Astragallus cephalanthus* DC.	Ch	IT
105	Papilionaceae	*Astragalus fasciculifolius* Bornm. &Gauba.	Ch	IT, SS
106	Papilionaceae	*Astragalus meridianus* Bunge	He	IT
107	Papilionaceae	*Astragalus microphysa* Boiss.	He	IT
108	Papilionaceae	*Astragalus perspolitanus* Boiss.	Th	IT
109	Papilionaceae	*Astragalus podolobus* Boiss.	He	IT
110	Papilionaceae	*Astragalus pseudoibicinus* Maasoumi & Podl	He	IT
111	Papilionaceae	*Ebenus stellata* Boiss.	Ch	IT
112	Papilionaceae	*Glycyrrhiza glabra* L.	He	IT, SS
113	Papilionaceae	*Hippocrepis unisiliquosa* L.	Th	IT, SS
114	Papilionaceae	*Medicago coronata* (L.) Bartalini	Th	IT, SS
115	Papilionaceae	*Medicago polymorpha* L.	Th	IT, SS
116	Papilionaceae	*Medicago radiate* L.	Th	IT
117	Papilionaceae	*Medicago rigidula* (L.) All.	Th	IT, SS
118	Papilionaceae	*Onobrychis crista-* galli (L.) Lam.	Th	IT, SS
119	Papilionaceae	*Trigonella anguina* Delile	Th	IT
120	Papilionaceae	*Trigonella monantha* Boiss.	Th	IT
121	Papilionaceae	*Trigonella stellate* Forssk.	Th	IT
122	Papilionaceae	*Trigonella uncata* Boiss. &Nöe.	Th	IT
123	Papilionaceae	*Vicia peregrine* L.	Th	IT
124	Plantaginaceae	*Plantago coronupus* L.	Th	IT, SS
125	Plantaginaceae	*Plantago lagopus* L.	Th	IT, SS
126	Plantaginaceae	*Plantago lanceolata* L.	He	IT, SS
127	Plantaginaceae	*Plantago ovate* Forssk.	Th	IT, SS
128	Plantaginaceae	*Plantago psyllium* L.	Th	IT, SS
129	Plumbaginaceae	*Acantholimon bracteatum* (Girard.) Boiss	Ch	IT
130	Poaceae	*Aristida caerulescens* Desf.	He	IT
131	Poaceae	*Bromus tectorum* L.	Th	IT
132	Poaceae	*Cenchrus ciliaris* L.	He	SS
133	Poaceae	*Cymbopogon olivieri* (Boiss.) Bor	Gr	IT, SS
134	Poaceae	*Lolium rigidum* Gaudin	Th	IT,SS
135	Poaceae	*Lophochloa phleoides* (Vill.) Reichenb.	Th	IT
136	Poaceae	*Poa bulbosa* L.	Gb	IT
137	Poaceae	*Stipa barbata* Desf.	He	IT
138	Poaceae	*Stipa capensis* Thunb.	Th	SS
139	Poaceae	*Stipa hohenacheriana* Trin. &Rupr.	He	IT
140	Poaceae	*Stipa parviflora* Desf.	He	IT
141	Podophyllaceae	*Leontice leontopetalum* L.	Gt	IT
142	Polygonaceae	*Pteropyrum olivieri* Jaub &Spach	Ch	IT
143	Polygonaceae	*Rheum ribes* L.	Gr	IT
144	Polygonaceae	*Rumex vesicarius* L.	Th	IT, SS
145	Portulacaceae	*Portulaca oleracea* L.	He	IT, SS
146	Primulaceae	*Anagalis arvensis* L.	Th	IT
147	Ranunculaceae	*Ranunculus arvensis* L.	Th	IT
148	Resedacae	*Reseda lutea* L.	He	IT
149	Resedaceae	*Ochradenus baccatus* Delile.	Ch	SS
150	Rhamnaceae	*Ziziphus nummularia* (Burm.f.) Wighth & Arn.	Ph	SS
151	Rhamnaceae	*Ziziphus spina*-chrsti (L.) Willd.	Ph	SS
152	Rhamnaceae	*Zygophyllum atriplicoides* Fisch.	Ph	IT
153	Rosaceae	*Amygdalus eburnean* Spach.	Ph	IT
154	Rosaceae	*Amygdalus communis* L.	Ph	IT
155	Rosaceae	*Amygdalus scoparia* Spach.	Ph	IT
156	Rubiaceae	*Gaillonia curcianelloides* Jaub. &Spach.	Ch	SS
157	Rutaceae	*Haplophyllum tuberculatum* (Forssk.) Juss.	He	IT
158	Sapindaceae	*Dodonaea viscose* (L) jacq.	Ph	SS
159	Scrophulariaceae	*Veronica* sp.	Th	IT
160	Solaneceae	*Datura stramonioum* L.	Th	IT, SS
161	Tamaricaceae	*Tamarix hispida* Willd.	Ph	IT, SS
162	Verbenaceae	*Vitex pseudo*-negundo (Hausskn). Hand- Mzt.	Ph	IT, SS
163	Zygophyllaceae	*Fagonia acerosa* Boiss.	He	IT, SS
164	Zygophyllaceae	*Fagonia brugueri* DC.	He	IT, SS

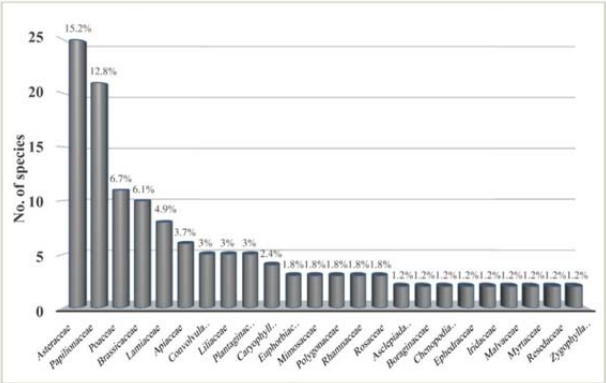

Diagram 1) Frequency of plant families in Galehdar Watershed

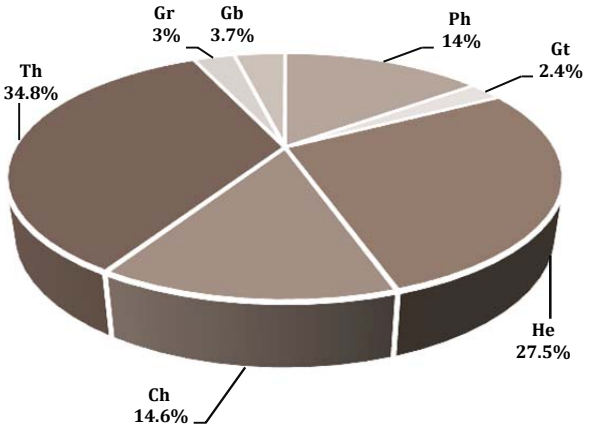

Diagram 2) Life-forms in Galehdar watershed area**,** Ph: phanerophytes, Ch: chamaephytes, He: hemicryptophytes, Th: therophytes, Gb: Geophytes bulb, Gr: Geophytes rhizome, and Gt: Geophytes tuber

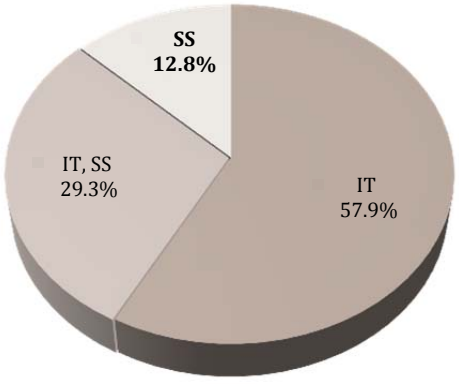

Diagram 3) Chorotypes of Galehdar Watershed, Irano-Turanian (**IT**), Sahara-Seindian (**SS**), Irano-Turanian, Sahara-Seindian (**IT-SS**)

Discussions

The study of the herbaceous flora, chorology, and life-forms of the plant species in Galehdar watershed area showed that some of the plant species are scarce and this study represents the value and importance of the herbaceous plants in this area. Asteraceae, Papilionaceae, and Poaceae were among the richest families in the present study and represented mainly by herbaceous species. It can be attributed to their wide ecological range of endurance and also to their effective seed dispersal capability. A number of 28 families or 50.9% of the total number of families are represented by one species per family. This is a common characteristic of desert regions and considered an indication that only a few of a large number of species that belong to these old plant families have adapted and survived in this harsh environment, while other species that could not survive have become extinct.

The number of species per genus in the present study is 1.27 (164/129). Pielou [23], and Magurran [24] explained that in intuitive terms, taxonomic diversity will be higher in an area, in which the species are divided among many genera as opposed to one, in which most species belong to the same genus and still higher as these genera are divided among many families as opposite few families.

The most frequent life-form was Therophytes with the maximum number of species, followed by hemicryptophytes, chamaephytes, and phanerophytes, while the least frequent life-form class was geophytes.

Life-form spectrum in the present study is characteristic of an arid desert region with the dominance of therophytes and study support the concept of Cain [4], Dechenes [7], and Alsherif *et al*. [25], that dry climate is so prevalent on grasslands, tends to increase the percentage of therophytes through the introduction, and spread of weedy grasses and forbs of this life-form. Therophytes usually bloom and form luxurious growth at the base of stable dunes, where moisture accumulates after sufficient rain. Therophytes are resistant to low rainfall and continuous drought. They finish their life cycle in a short time [26] and spend a vegetative period in the form of seed [27].

According to Naqinezhad *et al*. [28], the presence of therophytes as dominant life-forms of the region can be partly explained by the seasonal character of water supply that supports the annual plants**.**

The chorological studies indicated that 57.9% of species belong to Irano-Turanian zone, 12.8% of species belong to Sahara-Seindian

zone, and 29.3% of common species belong to Irano-Turanian, Sahara-Seindian zone [29, 30].

The phytocorya distribution of plants reflects the climate conditions. Galehdar watershed with 57.9% species belongs to the Irano-Touranian region, characterized by low rainfall and a long dry season.

The appearance of several genera such as Achillea, Alhagi, Amygdalus, Astragalus, Centaurea, Dianthus, Echinops, Euphorbia, Glycyrrhiza, Gundelia, Helichrysum, Onobrychis, Pistatia, and Stipa, which are main elements of Irano-Turanian zone showed that the region belongs to this zone. We can see the low appearance of some genera such as Anvillea, Capparis, Cenchrus, Gymnocarpus, Heliotropium, Ochradenus, Periploca, Ochradenus, Helianthemum, Prosopis, and Ziziphus, which are main elements of Sahara-Seindian zones. It shows that this region is affected by this zone. These elements in this region showed the usual ways of adaptation to aridity and very high temperature in such a harsh region. The plant species distribution mainly concentrated around stream beds and low land areas, where water is usually accumulated.

Conclusion

The aim of the current study was an overview of biodiversity among vascular plants of Galedar Watershed in southern Fars Province with special emphasis to flora, life-forms, and chorology of plant species. Among all collected species, 57.9% of them belong to Irano-Turanian, 12.8% of species belong to Sahara-Seindian zone, and 29.3% of common species belong to Irano-Turanian, Sahara-Seindian zone. The life-form spectrum includes therophytes (34.8%), hemicryptophytes (27.5%), chamaephytes (14.6%), and phanerophytes (14.0%), while the least frequent life-form class was geophytes (9. 1%). The results of this study could prepare a useful tool for biodiversity conservation agencies as well as natural resources managers to plan for protecting the endemic and vulnerable plant species in the study area.

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