

Floristic study of Pennart in Isfahan province, Iran

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Abstract. Pennart is a rangeland with a mean height of 1922 m, located to the southwest of Ardestan town, Isfahan Province. In this study, a floristic inventory of the Pennart area was prepared. Two hundred and one plant species were identified, belonging to 136 genera and 43 families. *Asteraceae* and *Brassicaceae* were the major plant families. According to the floristic analysis, therophytes (45.27%) were the dominant life forms and chorological characteristics have shown that the Irano-Turanian region is the most important phytochorion in the study area.

Key words: Ardestan, chorology, flora, life forms, Pennart

Introduction

Iran's territory, with an area of 1,648,195 km², comprises diverse topography of mountains, lowlands and plains, which ensure climate diversity. As climate is the main effective factor in the distribution of plants (Zhao & al. 2018), the country is geographically located in the following main phytogeographic regions: Irano-Turanian (Léonard 1981), Euro-Siberian (Zohary 1973; Akhiani 2007) and Saharo-Sindian (Léonard 1981). Climate diversity has also had a considerable impact on the life forms of plants (Tadesse & al. 2017; Khan 2018).

Ardestan is located in the central Iranian plateau, Dasht-e-Kavir, Isfahan Province, with arid and semi-arid climate conditioned by low rainfall and high evaporation. In that area, steppe communities have set in with the dry climate, and xerophyte plants have spread as the dominant vegetation. Nevertheless, great floristic richness can be found at various altitudes and in the piedmonts. Some segments are also covered by rangeland. In the rangelands, anthropogenic activities, overgrazing, and mismanagement have entailed serious ecological degradation (Yazdanshenas & Jafari 2013; Kargar-

Chigani & al. 2017). On the other hand, climate conditions have changed in recent decades resulting in global warming and droughts.

Floristic studies play a crucial role in the conservation and planning of sustainable management policies. These studies also provide important information for evaluation of some ecological issues like biodiversity conservation and regulation (Moradi & al. 2019). Several floristic studies in the Irano-Turanian region in the Isfahan Province have been carried out as follows: Vanak region of Semirrom (Parishani 2005), the no-hunting zone of Hanna (Khajeddin & Yeganeh 2010), Yahya Abad of Natanz (Abbasi & al. 2012), the Badrud north region (Abdi & Afsharzadeh 2012), and the Zar Cheshme protected region (Kharazian & Abaeian 2017).

Pennart is a mountainous rangeland to the southwest of Ardestan, which lies on the edges of the Dasht-e Kavir Desert and is known as the *Prunus scoparia* habitat. The current study is the first-ever investigation of Pennart, with the aim of identifying the floristic composition, life-form spectra and geographical plant distribution, as well as of assorting the plants according to their medicinal and poisonous properties.

Material and methods

Study area

The study area is part of Pennart, with approximately 850 ha located at 36°50'24" to 36°52'48" N and 60°53'59" to 61°12' E, and with a mean altitude of 1922 m. This area comprises a V-shaped valley with westerly and easterly aspects, crossed by a seasonal river leading to the Abdamdad waterfall (Fig. 1). According to the data obtained from the Ardestan Synoptic Station, the mean monthly minimum and maximum temperatures are 5.8°C in January and 33.5°C in July, respectively. The mean annual precipitation is about 123 mm. The climate data show that Pennart has suffered severe and long droughts in recent years (Fig. 2).

Data collection

Data were collected in the 2015–2016 period, at a regular interval covering all seasonal variations. The plant

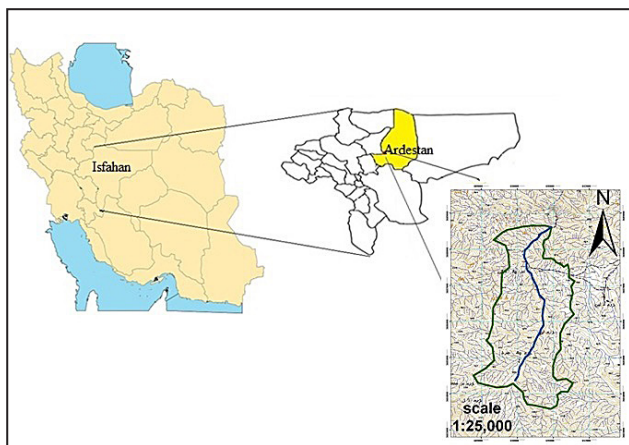


Fig. 1. The position and topographic map of the study area and Abdamdad river in Iran.

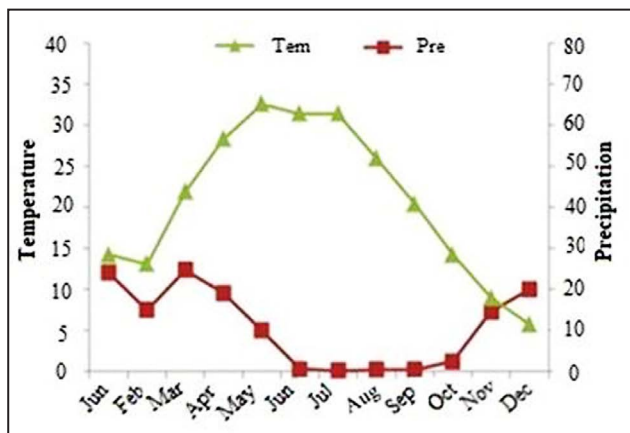


Fig. 2. Ombrothermic diagram for Pennart (1992–2014).

species were identified by using the authentic Floras (Ghahraman 1994; Mobayen 1975–1995; Mozaffarian 2005; Rechinger 1968–2005; Assadi 1988–2016). Life forms were determined following Raunkiaer's method (Raunkiaer 1934) and plant chorotypes were assessed in consultation with botanical literature (Browicz 1983–1996; Akhiani 2005; Jankju & al. 2011; Abbasi & al. 2012; Kolahi & Atri 2014; Rahchamani & al. 2014) and *Flora Iranica* (Rechinger 1968–2005). The properties of plants were determined using the available sources (Zargari 1997; Mozaffarian 2012). The voucher specimens were stored in the Herbarium of University of Isfahan (HUI).

Results

Altogether, 201 plant species belonging to 136 genera from 43 plant families were recorded. Three families were related to *Pteridophyta* and *Gymnospermae*, the remaining were *Angiospermae* (Appendix 1). *Asteraceae* (28 genera, 42 species), *Brassicaceae* (12 genera, 15 species) and *Lamiaceae* (11 genera, 16 species) were the largest plant families presented in the study area (Fig. 3), whereas 20 families were represented by only a single species. *Euphorbia* (9 species) was the largest genus, second came *Papaver* (5 species), followed by *Bromus*, *Veronica*, and *Valeriana* (4 species each). *Chenopodium opulifolium* (*Amaranthaceae*) was recorded for the first time in the Isfahan Province. Therophytes (91 species, 45.27%) were the predominating life forms, followed by hemicryptophytes (69 species, 34.32%), chamaephytes (20 species, 9.95%), phanerophytes (13 species, 6.47%), and cryptophytes (7 species, 3.48%) (Fig. 4). The chorological characteristics of the recorded flora are summarized in Table 1. The Irano-Turanian region is

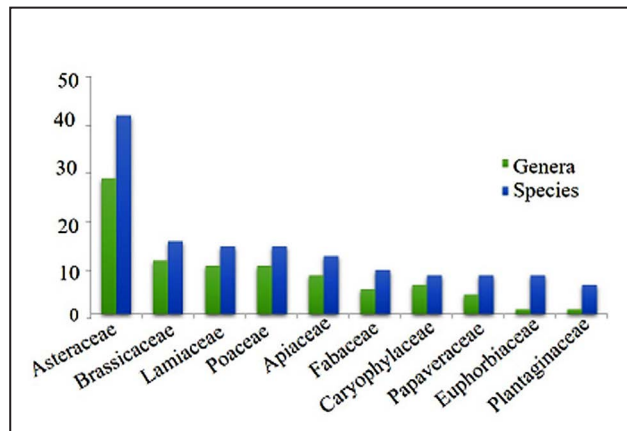


Fig. 3. The largest plant families in the study area.

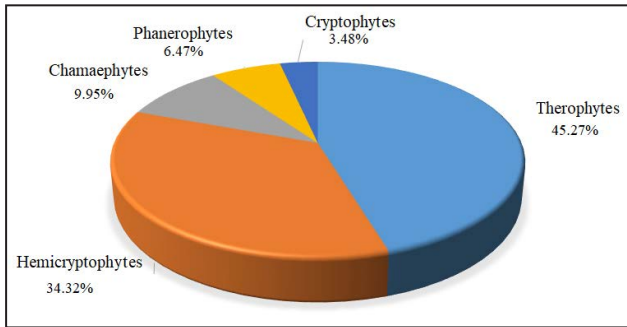


Fig. 4. The pie chart of plant life forms in the study area.

a specific phytogeographic unit with a large number of species (110, 54.72 %). Considering the multi-regional elements influenced by the Irano-Turanian species, 98 % of the flora of Pennart is also affected by it. Of the identified plants, 111 (55.22 %) species were medicinal and a total of 16 plant species had poisonous properties (Appendix 1)

Table 1. Percentage of different chorotypes in the study area. Abbreviations: ES: Euro-Siberian Region, IT: Irano-Turanian Region, M: Mediteranean Region, SS: Saharo-Sindian Region, SA: Saharo-Arabian Region, Pl: Pluriregional, Cosm: Cosmopolite.

Chorotypes	Number of species	Percentage
IT	110	54.72 %
IT, M	20	9.95 %
IT, ES, M	16	7.96 %
IT, SS	12	5.97 %
IT, ES	12	5.97 %
Pl	10	4.97 %
Cosm	7	3.48 %
IT, SS, M	5	2.48 %
M	2	1 %
IT, ES, SS	1	0.5 %
ES	1	0.5 %
SA	1	0.5 %
SS	1	0.5 %

Discussion

Analysis of the phytochorion has shown that Pennart belongs to the Irano-Turanian region with 110 (54.72 %) corresponding species. *Asteraceae*, *Brassicaceae*, and *Lamiaceae* were the dominant families, which is in accordance with some other floristic studies of the Irano-Turanian region (Batouli 2004; Khajeddin & Yeganeh 2010; Yavari & Shahgolzari 2010; Abbasi & al. 2012). Furthermore, 29

endemic species of Iran have been found in the study area, 25 of which belonged to the Irano-Turanian region (Appendix 1). Four monotypic genera, including *Asperugo* (*Boraginaceae*), *Zataria* (*Lamiaceae*), *Euclidium*, and *Moriera* (*Brassicaceae*), have been identified, all of them non-endemic to the flora of Iran (Jalili & Jamzad 1999). The most frequent life forms were the therophytes, followed by hemicryptophytes. The frequency of hemicryptophytes such as *Astragalus*, *Cousinia*, and *Acantholimon*, which are more abundant in the mountainous areas of the Irano-Turanian region (Yousofi 2009), was significantly lower in the study area. A probable explanation could be that the area is located in the vicinity of the Dasht-e Kavir Desert, which means a long period of aridity during the growing season. This has resulted in the spread of drought-resistant plants known to be highly tailored to the adverse environmental conditions. Considering the fact that climate changes are important factors (Kazemian & al. 2004) and in view of the recent droughts, the plant species should either adapt to the climate changes or should be replaced with some more compatible species. Another outcome of this condition is the wide spread of annual plants which are known to adapt to aridity and rainfall shortage because of environmental encouragement of their growth (Asri 2003; Hasanazadeh Gorttapeh & Panahy 2007; Khajeddin & Yeganeh 2012). However, dominance of the therophytes in the mountainous regions could be indicative of damages and destruction (Gurgin & al. 2014).

Another reason for the observed degradation of the area might come from early and excessive grazing, which has caused changes in the vegetation. Plenty of thorny and poisonous plants can be regarded as evidence of this fact. *Euphorbia*, the major genus with nine poisonous species, demonstrates degradation caused by grazing pressure (Wu & al. 2015). According to different reports, an increase in the number of some plants such as *Asteraceae* also testifies to degradation of the area (Archibold 1995; Vakili Shahrehabaki & al. 2001; Dolatkahai & al. 2012). The impressive presence of *Asteraceae* as the largest family in the study area confirms this assumption.

Assessment of biodiversity is imperative for describing the ecological status in the management of natural ecosystems (Abbasi & al. 2016). The pattern of species richness as a main factor of biodiversity

differs along the aspects of the mountains (Yang & al. 2016). The results showed that in that area the western aspect with its large number of species is a more important contributor to the species richness than the eastern one. Furthermore, more than half of the identified plants in the study area had medicinal properties. Considering the global interest in the use of medicinal plants, identification of these plants is essential for protection of the environment (Yazdanshenas & al. 2016).

In general, considering the high species richness in a small area, abundance of medicinal plants, presence of a beautiful seasonal river, and the Abdamdad waterfall, Pennart merits great attention in carrying out research, biodiversity investigation and tourist activities. Therefore, adoption of appropriate conservation and management policies by the responsible organizations is inevitable.

Acknowledgments. The authors are grateful to the University of Isfahan for the support rendered to their research.

Appendix 1. Floristic list of Pennart. Abbreviations: Chorotype: **ES:** Euro-Siberian Region, **IT:** Irano-Turanian Region, **M:** Mediterranean Region, **SS:** Saharo-Sindian Region, **SA:** Saharo-Arabian Region, **Pl:** Pluriregional, **Cosm:** Cosmopolite, Life form: **He:** Hemicryptophytes, **Ch:** Chamaephytes, **Th:** Therophytes, **Cr:** Cryptophytes, **Ph:** Phanerophytes.

Taxa	Chorotype	Life form	Properties	Iran endemic
Pteridophyta				
Equisetaceae				
<i>Equisetum arvense</i> L.	Pl	Cr	*	
Pteridaceae				
<i>Adiantum capillus-veneris</i> L.	M	Cr	*	
Gymnospermae				
Ephedraceae				
<i>Ephedra intermedia</i> Schrenk & C.A. Mey.	IT, SS	He	*	
<i>E. major</i> Host	IT, SS	Ch		
Angiospermae				
Amaranthaceae				
<i>Amaranthus retroflexus</i> L.	IT, ES	Th	*	
<i>Chenopodium album</i> L.	Cosm	Th	**	
<i>C. novopokrovskyanum</i> (Aellen) Uotila	IT	Th		
<i>C. opulifolium</i> Schrad. ex W.D.J. Koch & Ziz	IT	Th		
Amaryllidaceae				
<i>Allium leucosphaerum</i> Aitch. & Baker	IT	Cr	*	
Anacardiaceae				
<i>Pistacia atlantica</i> Desf.	IT	Ph	*	
<i>P. khinjuk</i> Stocks	IT	Ph	*	
<i>P. vera</i> L.	IT	Ph	*	
Apiaceae				
<i>Apium nodiflorum</i> (L.) Lag.	IT, M	He	*	
<i>Eryngium bungei</i> Boiss.	IT	He	*	
<i>Ferula</i> sp.	-	He		
<i>F. assa-foetida</i> L.	IT	He	*	
<i>F. ovina</i> Boiss.	IT	He	*	
<i>Pimpinella aurea</i> DC.	IT, SS	He	*	

Appendix 1. Continuation.

Taxa	Chorotype	Life form	Properties	Iran endemic
<i>Prangos uloptera</i> DC.	IT	He	*	
<i>Scandix aucheri</i> Boiss.	IT	Th		
<i>S. pecten-veneris</i> L.	IT, ES, M	Th		
<i>S. stellata</i> Banks & Sol.	IT, ES, M	Th		
<i>Sium sisarum</i> L.	Pl	He	*	
<i>Torilis arvensis</i> (Huds.) Link	Pl	Th	*	
<i>Zosima absinthifolia</i> (Vent.) Link	IT	He	*	
Asparagaceae				
<i>Leopoldia longipes</i> (Boiss.) Losinsk.	IT	Cr		
Asteraceae				
<i>Achillea santolinoides</i> subsp. <i>wilhelmsii</i> (K.Koch) Greuter	IT, ES	He	*	
<i>Anthemis odontostephana</i> Boiss.	IT, SS	Th	*	
<i>Calendula arvensis</i> M. Bieb.	IT	Th	*	
<i>C. palaestina</i> Boiss.	-	Th	*	
<i>Carduus pycnocephalus</i> L.	IT, M	Th	*	
<i>C. transcaspicus</i> Gand.	IT, ES	He		*
<i>Centaurea benedicta</i> (L.)L.	IT, M	Th	*	
<i>C. ispahanica</i> Boiss.	IT	He	*	*
<i>Cirsium arvense</i> (L.) Scop.	IT	He	*	
<i>C. spectabile</i> DC.	IT	He		*
<i>Cousinia eriobasis</i> Bunge	IT	He		*
<i>C. myriolepis</i> Rech.f. & Köie	IT	He		
<i>Echinops cephalotes</i> DC.	IT	He	*	*
<i>E. macrophyllus</i> Boiss. & Hausskn.	IT, ES	He		*
<i>Filago arenaria</i> (Smoljan.) Chrtek & Holub	IT	Th		
<i>F. eriocephala</i> Guss.	IT, SS, M	Th		
<i>F. hurdwarica</i> (Wall. ex DC.) Wagenitz	IT	Th		
<i>Garhadiolus hedyppnois</i> Jaub. & Spach	Pl	Th		
<i>Helichrysum luteoalbum</i> (L.)Rchb.	Cosm	Th		
<i>Hertia angustifolia</i> Kuntze	IT	Ch	*	*
<i>Jurinea berardioides</i> (Boiss.) O.Hoffm.	IT	He	*	
<i>Koelpinia tenuissima</i> Pavlov & Lipsch.	IT	Th		
<i>Lactuca orientalis</i> Boiss.	IT	He	*	
<i>L. glaucifolia</i> Boiss.	IT	Th	*	
<i>Launaea acanthodes</i> (Boiss.) Kuntze	IT	Ch		
<i>Outerya carduiformis</i> Jaub. & Spach (Cynareae)	IT	He		
<i>Phagnalon nitidum</i> Fresen.	IT	Ch		
<i>P. rupestre</i> (L.) DC.	-	Ch		
<i>Picnomon acarna</i> (L.) Cass.	IT	Th		
<i>Picris strigosa</i> M. Bieb.	IT	Ch		
<i>Pulicaria gnaphalodes</i> (Vent.) Boiss.	IT	Ch		
<i>P. undulata</i> (L.) C.A.Mey.	SA	Ch	*	
<i>Scorzonera mucida</i> Rech.f., Aellen & Esfand.	IT	Cr		*
<i>S. tortuosissima</i> Boiss.	IT	He	*	*
<i>Senecio glaucus</i> L.	IT, SS	Th	*	

Appendix 1. Continuation.

Taxa	Chorotype	Life form	Properties	Iran endemic
<i>S. vernalis</i> Waldst. & Kit.	IT	He		
<i>Seriphidium sieberi</i> (Besser)	IT	Ch	*	
<i>Tanacetum pinnatum</i> Boiss.	IT	He		
<i>Taraxacum roseum</i> Bornm.	IT	He		*
<i>Tragopogon caricifolius</i> Boiss.	IT, SS	He	*	*
<i>T. collinus</i> DC.	IT	He	*	
<i>Zoegea purpurea</i> Fresen.	IT, SS	Th	*	
Berberidaceae				
<i>Berberis integerrima</i> Bunge	IT, M	Ph	*	
Boraginaceae				
<i>Asperugo procumbens</i> L.	IT, ES, M	Th	*	
<i>Nonea caspica</i> (Willd.) G. Don	IT, ES	Th	*	
<i>Rochelia disperma</i> (L.f.) K. Koch	IT	Th	*	
Brassicaceae				
<i>Chorispora persica</i> Boiss.	IT	Th	*	*
<i>C. tenella</i> (Pall.) DC.	IT, M	Th		
<i>Clypeola jonthlaspi</i> L.	IT, M	Th		
<i>Descurainia sophia</i> (L.) Webb ex Prantl	IT, ES, M	Th	*	
<i>Draba minima</i> (C.A. Mey.) Steud.	IT, ES	Th		
<i>Euclidium syriacum</i> (L.) R. Br.	IT, M	Th		
<i>Lepidium draba</i> L.	IT, M	Cr	*	
<i>Malcolmia africana</i> (L.) R. Br.	IT	Th		
<i>Meniocus linifolius</i> (Stephan ex Willd.) DC.	IT	Th	*	
<i>Moriera spinosa</i> Boiss.	IT	Ch	*	
<i>Pseudocamelina glaucophylla</i> (DC.) N. Busch	IT, M	He		
<i>Sisymbrium integerrimum</i> Rech. f. & Aellen	IT	He	*	*
<i>S. loeselii</i> L.	IT	Th		
<i>Sterigmostemum sulphureum</i> Bornm.	IT	Th		
<i>Strigosella strigosa</i> (Boiss.) Botsch	IT	Th		
Capparaceae				
<i>Capparis spinosa</i> L.	IT, SS, M	Ch	*	
Caprifoliaceae				
<i>Lomelosia olivieri</i> (Coul.) Greuter & Burdet	IT	He	*	
<i>Valeriana oxyrhyncha</i> (Fisch. & C.A. Mey.) Christenh. & Byng	IT	Th		
<i>V. plagiostephana</i> (Fisch. & C.A. Mey.) Christenh. & Byng	IT, ES	Th		
<i>V. szovitsiana</i> (Fisch. & C.A. Mey.) Christenh. & Byng	IT	Th		
<i>V. tuberculata</i> (Boiss.) Christenh. & Byng	IT	Th		
Caryophyllaceae				
<i>Acanthophyllum crassifolium</i> Boiss.	IT	Ch	*	*
<i>A. laxiusculum</i> Schiman-Czeika	IT	Ch		
<i>Cerastium dichotomum</i> L.	IT	Th		
<i>Holosteum umbellatum</i> L.	IT, M	Th		
<i>Lepyrodiclis holosteoides</i> (C.A. Mey.) Fenzl ex Fisch. & C.A. Mey.	IT	Th		
<i>L. stellarioides</i> Schrenk	IT	Th		
<i>Minuartia meyeri</i> (Boiss.) Bornm.	IT	Th		

Appendix 1. Continuation.

Taxa	Chorotype	Life form	Properties	Iran endemic
<i>Silene conoidea</i> L.	M	Th	*	
<i>Stellaria apetala</i> Ucria	IT, SS, M	Th		
Cyperaceae				
<i>Scirpoides holoschoenus</i> (L.) Soják	IT	He		
Euphorbiaceae				
<i>Chrozophora tinctoria</i> (L.) A. Juss.	IT	Th		
<i>Euphorbia densa</i> Schrenk	IT	Th	**	
<i>E. granulata</i> Forssk.	SS	He	***	
<i>E. helioscopia</i> L.	IT	Th	***	
<i>E. heteradena</i> Jaub. & Spach	IT	He	***	
<i>E. microsciadia</i> Boiss.	IT	He	***	*
<i>E. microsphaera</i> Boiss.	IT	Th	**	
<i>E. peplus</i> L.	IT, M	Th	***	
<i>E. szovitsii</i> Fisch. & C.A. Mey.	IT	Th	**	
<i>E. teheranica</i> Boiss.	IT	Th	**	*
Fabaceae				
<i>Alhagi maurorum</i> Medik.	IT	He	*	
<i>Astragalus</i> sp.	IT	-		
<i>A. verus</i> Olivier	IT	Ch	*	*
<i>Ebenus stellata</i> Boiss.	IT, SS	Ch	*	
<i>Glycyrrhiza glabra</i> L.	IT, ES, M	He	*	
<i>Medicago lupulina</i> L.	Pl	He		
<i>M. persica</i> (Boiss.) E. Small	IT	He		*
<i>M. sativa</i> L.	IT	He	***	
<i>Trigonella aphanoneura</i> Rech.f.	IT	Th	*	*
<i>T. spicata</i> Sm.	IT, M	Th		
Geraniaceae				
<i>Erodium pulverulentum</i> (Cav.) Willd.	IT, M	Th	*	
<i>E. cicutarium</i> (L.) L'Hér.	Pl	Th	*	
Iridaceae				
<i>Iris songarica</i> Schrenk	IT	Cr	*	
Juncaceae				
<i>Juncus inflexus</i> L.	Pl	He	**	
Lamiaceae				
<i>Eremostachys molucelloides</i> Bunge	IT, SS	He	*	
<i>Hymenocrater bituminosus</i> Fisch. & C.A. Mey.	IT	He	*	
<i>Lamium amplexicaule</i> L.	IT, ES, SS	Th	*	
<i>Marrubium vulgare</i> L.	Pl	He	*	
<i>Mentha longifolia</i> (L.) L.	IT	He	*	*
<i>M. spicata</i> L.	ES	He	*	
<i>Nepeta bracteata</i> Benth.	IT	Th	*	
<i>N. ispahanica</i> Boiss.	IT	Th	*	*
<i>N. prostrata</i> Benth.	IT	He		*
<i>Salvia ceratophylla</i> L.	IT	He		
<i>S. eremophila</i> Boiss.	IT	Ch	*	*

Appendix 1. Continuation.

Taxa	Chorotype	Life form	Properties	Iran endemic
<i>S. palaestina</i> Benth.	IT, SS	He		
<i>Stachys inflata</i> Benth.	Cosm	He	*	
<i>Teucrium polium</i> L.	IT	Ch	*	
<i>Zataria multiflora</i> Boiss.	IT, SS	Ch	*	
<i>Ziziphora tenuior</i> L.	IT	Th	*	
Lythraceae				
<i>Lythrum salicaria</i> L.	Pl	He	*	
Malvaceae				
<i>Alcea kurdica</i> (Schltdl.) Alef.	IT, ES, M	He	*	
<i>Malva neglecta</i> Wallr.	IT, ES, M	He	*	
<i>M. sylvestris</i> L.	IT	He	*	
Moraceae				
<i>Ficus johannis</i> Boiss.	IT, M	Ph	*	
<i>Morus alba</i> L.	IT	Ph	*	
Nitrariaceae				
<i>Peganum harmala</i> L.	IT, SS, M	He	***	
Oleaceae				
<i>Fraxinus angustifolia</i> Vahl	IT, ES, M	Ph	*	*
Orobanchaceae				
<i>Orobanche aegyptiaca</i> Pers.	IT, ES, M	Th		
Papaveraceae				
<i>Fumaria vaillantii</i> Loisel.	IT	Th	*	
<i>F. asepala</i> Boiss.	IT, ES, M	Th	*	
<i>Glaucium elegans</i> Fisch. & C.A. Mey.	IT	Th		
<i>Hypecoum pendulum</i> L.	IT, M	Th		
<i>Papaver decaisnei</i> Hochst. & Steud. ex Elkan	IT	Th	*	
<i>P. dubium</i> L.	IT	Th	*	
<i>P. tenuifolium</i> Boiss. & Hohen.	IT	Th		*
<i>P. dodecandrum</i> (Forsk.) Medik.	IT, SS, M	Th	*	
<i>P. refractum</i> (DC.) K.- F.Gunther	IT	Th		
Plantaginaceae				
<i>Plantago evacina</i> Boiss.	IT	Th		*
<i>P. lanceolata</i> L.	Cosm	He	*	
<i>P. major</i> L.	IT, ES	He	*	
<i>Veronica campylopoda</i> Boiss.	IT	Th		
<i>V. hederifolia</i> L.	IT, ES, M	Th		
<i>V. anagalloides</i> Guss.	IT, ES	Th	*	
<i>V. anagallis-aquatica</i> L.	IT, ES	Th	*	
Plumbaginaceae				
<i>Acantholimon aspadanum</i> Bunge	IT	Ch	*	*
Poaceae				
<i>Bromus danthoniae</i> Trin.	IT	Th		
<i>B. madritensis</i> L.	IT, M	Th		

Appendix 1. Continuation.

Taxa	Chorotype	Life form	Properties	Iran endemic
<i>B. tectorum</i> L.	IT, ES, M	Th		
<i>B. tomentosus</i> Trin.	IT	He		
<i>Cenchrus orientalis</i> (Rich.) Morrone	IT, SS	He		
<i>Henrardia persica</i> (Boiss.) C.E. Hubb.	IT	Th		
<i>Hordeum murinum</i> subsp. <i>glaucum</i> (Steud.) Tzvelev	IT, ES, M	Th		
<i>Lolium rigidum</i> Gaudin	IT, M	He		
<i>Poa nemoralis</i> L.	Cosm	He		
<i>Schismus arabicus</i> Nees	IT	Th		
<i>Setaria viridis</i> (L.) P. Beauv.	IT, M	Th	*	
<i>Stipa barbata</i> Desf.	IT	He	*	
<i>S. hohenackeriana</i> Trin. & Rupr.	IT	He		
<i>Taeniatherum caput-medusae</i> (L.) Nevski	IT	Th		
<i>Vulpia myuros</i> (L.) C.C. Gmel.	IT, M	Th		
Polygonaceae				
<i>Pteropryum aucheri</i> Jaub. & Spach	IT	Ph	*	*
<i>Rheum ribes</i> L.	IT	He	*	
<i>Rumex conglomeratus</i> Murray	IT, ES	He	*	
Primulaceae				
<i>Samolus valerandi</i> L.	Cosm	He	*	
Ranunculaceae				
<i>Ranunculus chius</i> DC.	IT, ES, M	Th	**	
<i>R. macropodoides</i> Briq.	IT	Th	***	
Resedaceae				
<i>Reseda buhseana</i> Müll. Arg.	IT	He	*	*
Rosaceae				
<i>Prunus scoparia</i> (Spach) C.K. Schneid.	IT	Ph	*	
<i>Sanguisorba minor</i> Scop.	IT, ES, M	He	*	
Rubiaceae				
<i>Galium tricornutum</i> Dandy	IT, M	Th		
Salicaceae				
<i>Salix alba</i> L.	IT, ES, M	Ph	*	
Scrophulariaceae				
<i>Scrophularia leucoclada</i> Bunge	IT	Ch		
<i>Verbascum speciosum</i> Schrad.	IT	He		
Simaroubaceae				
<i>Ailanthus altissima</i> (Mill.) Swingle	Pl	Ph	*	
Solanaceae				
<i>Lycium depressum</i> Stocks	IT	Ph	*	
<i>Solanum americanum</i> Mill.	Cosm	Th	***	
Tamaricaceae				
<i>Tamarix ramosissima</i> Ledeb.	IT, ES	Ph	*	

*: medicinal plants, **: poisonous plants, ***: medicinal and poisonous plants

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