

# Contributions to the flora and vegetation of Binalood mountain range, NE Iran: Floristic and chorological studies in Fereizi region

Farshid Memariani<sup>1\*</sup>, Mohammad Reza Joharchi<sup>1</sup>, Hamid Ejtehadi<sup>2</sup> and Khatere Emadzade<sup>1</sup>

*Department of Botany, Research Institute of Plant Sciences, Ferdowsi University of Mashhad, Mashhad, Iran<sup>1</sup>*  
*Department of Biology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, Iran<sup>2</sup>*

Received 27 December 2008

Accepted 26 February 2009

## Abstract

The mountainous area of Fereizi is located in northwestern Binalood range, Khorassan, north east of Iran. Special climatic and geographical characteristics of the area make it a suitable habitat for various plant species. As a part of a research project on the flora and vegetation of Binalood mountain range, the floristic composition of this area, life forms and chorology of vascular plants have been determined with emphasis on endemism. During several collection excursions in 2005 to 2007, a total number of 484 vascular plant taxa were identified in the area belonging to 229 genera and 59 plant families. The largest plant families in the area are Asteraceae (63 species), Poaceae (51 species), Fabaceae (50 species) and Brassicaceae (43 species). *Astragalus* (25 species) and *Allium* (13 species) are the richest genera. The dominant life forms are hemicryptophytes and therophytes. The floristic composition of the area is strongly influenced by Irano-Turanian elements (56.8%). The analysis of endemism shows that the area inhabited by 49 subendemic taxa and 21 Iranian endemic species from which 13 species are endemic to northeast of Iran and three rare and threatened species. *Ferula flabelliloba*, *Cousinia termei* and *Sisymbrium integerrimum* are local endemics to Binalood mountain range. *Geranium charlesii* is recorded as a new species for the flora of Iran.

**Key words:** floristic composition, life form, chorology, phytogeography, endemism, new records, Fereizi, Binalood, Khorassan

## Introduction

Iran with *ca.* 7300 plant species (Akhani, 2006), after Turkey, is the second richest country of plant diversity in SW Asia. The rich flora of the country is the consequence of locating among three main phytochoria in the Old World including Irano-Turanian, Euro-Siberian and Sahara-Sindian, and influencing by Mediterranean and Somalia-Masaei species (Zohary, 1973; Léonard, 1988, 1993; White and Léonard, 1991).

In 2004, the former Khorassan province located in northeast and east of Iran with a surface area of 313,335 km<sup>2</sup>, was divided into three smaller provinces viz. North Khorassan, Razavi Khorassan and South Khorassan. Tabas County was recently influenced by this division and joined to Yazd province. The floristic composition of Khorassan is influenced partly by the Hyrcanian elements in northwest, Irano-Turanian desert plants from west and southwest, some Sahara-Sindian elements from south and southeast, eastern Irano-Turanian elements along the borders with Afghanistan, Aralo-Caspian species from north, and many local

endemic and regional endemic taxa specially originated in Khorassan- Kopet Dagh floristic province. According to the Flora Iranica (Rechinger, 1963-2008) and subsequent botanical inventories (Ghahremaninejad *et al.* 2005; Joharchi and Akhani, 2006; Joharchi *et al.* 2007), the total number of vascular plants in the former Khorassan province is *ca.* 2300 species, comprising about 31.5 percent of the Iranian flora.

Flora of Binalood mountain ranges has not been comprehensively studied hitherto. Several occasional plant collections done by foreign and Iranian botanists have been recorded in Flora Iranica (Rechinger, 1963-2008) and Flora of Iran (Assadi *et al.* 1988-2005). In a floristic study, Ghahreman *et al.* (2006) listed 487 plant species from SW slopes of Binalood.

Floristic survey of an area is a prerequisite for any vegetation and ecological surveys and conservation management. This paper provides the floristic composition of vascular plants and phytogeography of Fereizi, an area scarcely studied hitherto, based on 2005-2007 botanical collections as a part of a research program on vegetation and conservation of the flora of Binalood mountain range.

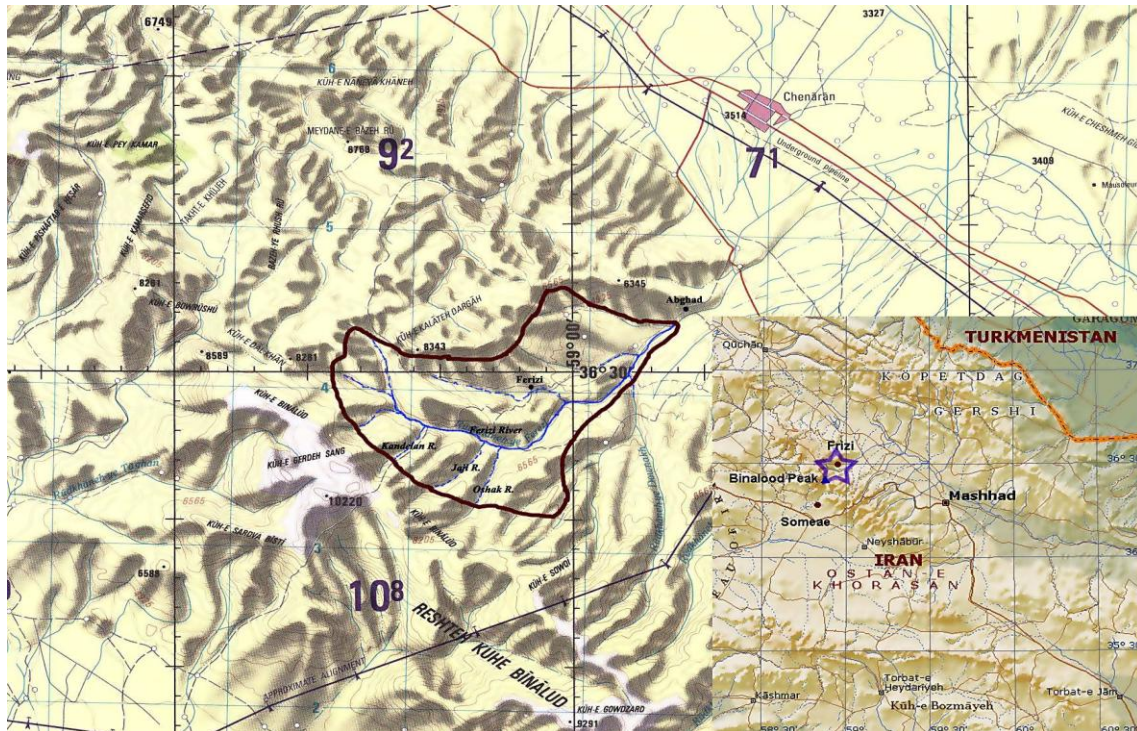
\* Corresponding author, e-mail: [memariani@um.ac.ir](mailto:memariani@um.ac.ir)

## Material and Methods

### Physical geography of the study area

**Geography:** Fereizi village is located in Golmakan section of Chenaran County in northern part of Razavi Khorassan province. The studied area is a mountainous region situated in Fereizi river catchment area between  $36^{\circ} 25'$  and  $36^{\circ} 33'$  northern latitudes and  $58^{\circ} 51'$  and  $59^{\circ} 04'$  eastern longitudes. The area covering *ca.* 20,000 hectares belongs to the north-facing slopes of northwestern

parts of Binalood mountains with a minimum altitude of 1430 m in northeast of the area between Fereizi and Abghad villages and a maximum altitude up to 2500 m in south of Fereizi river on northern slopes of Jaji mount (Figure 1). The main peak of Binalood (3211 m) is located near the southern border of the studied area. Fereizi, Kandelan, Oshak, Kalat and Dermeh are the main deep valleys where in there are many apple, cherry, plum, peach and walnut orchards.

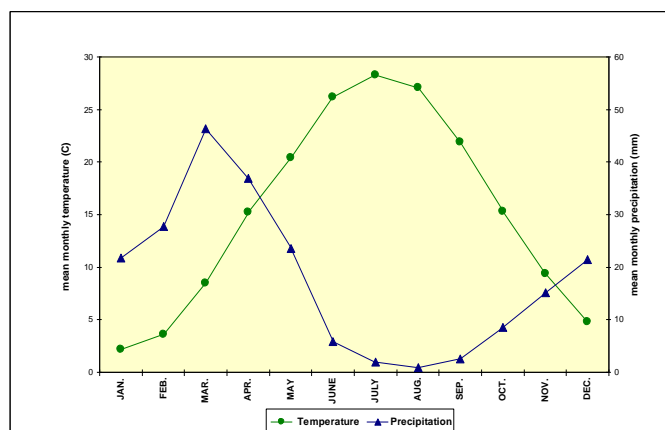


**Figure 1.** Map of Fereizi river catchment area showing its position in Khorassan.

**Geology:** Binalood zone, an eastern segment of Alborz Mountains, is restricted to Paleo-Tethys remnants and metamorphic rocks and Permian turbid sediments from the north, and Neo-Tethys ophiolitic rocks in the south. Binalood mountain range is characterized by thin-skinned tectonics due to NE-SW thrust faulting and composed of thick sequence of slate and phylitic rocks of Triassic-Jurassic age, and over thrust slices of Paleozoic sedimentary rocks, mainly Cambrian-Silurian and Devonian rocks (Darvishzade, 1991; Alavi, 1992). Based on geological maps, the main part of Fereizi river catchment area is composed of Jurassic age shale and dark grey Mashhad phylite, and partly in northeast of Fereizi village toward Abghad with Jurassic sandstone, shale and conglomerate and in upper layer with marl and limestone. Recent

alluvium of Quaternary forms the river beds and water channels (Geological Survey of Iran, 1986).

**Climate:** According to available data from the nearest climatic station in Golmakan during 1987-2005 (Anonymous, 2006), the mean maximum temperature of the warmest month (July) and the mean minimum temperature of the coldest month (January) are  $32.8^{\circ}\text{C}$  and  $-3.1^{\circ}\text{C}$ , respectively. Annual precipitation ranges between 129 mm (in 2000) and 313 mm (in 2003) with the mean annual precipitation of 212.6 mm. Wet season starts late November and lasts until April, and the maximum monthly rain is in March (Figure 2). According to Emberger's method, the station is located in a cold semi-arid area.



**Figure 2.** The climatic diagram based on data from Golmakan meteorological station during 1987-2005.

**Methods:** During several botanical excursions in growing seasons from 2005 to 2007, about 1200 vascular plant specimens were collected using normal random collecting method in different habitat types and elevations of the area. The exact coordinates and elevation were registered using GPS for collecting locations. The plants were dried and labeled in laboratory for providing herbarium specimens and then were identified using available Floras and literature (Rechinger, 1963-2008; Assadi *et al.*, 1988-2008; Davis, 1965-1988, Komarov, 1934-1958; Maassoumi, 1986-2006). All voucher specimens are available in Herbarium of Ferdowsi University of Mashhad (FUMH) under sheet numbers 35840 to 37038. The life forms were classified based on Raunkiaer (1934) and the chorology of each taxon was determined by using distribution data in the Floras and other published literature (Akhani, 1998; Browicz, 1983-1996; Léonard, 1988).

## Results

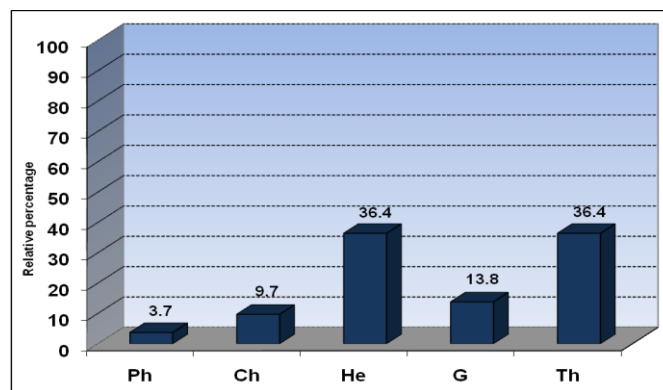
**Flora:** A total number of 484 species/infraspecific vascular plant taxa has been identified in the study area which belong to 229 genera and 59 families. In appendix of the paper, a checklist of all vascular plants identified in Fereizi region is listed with information about their life forms and chorological types. The Dicotyledons with 49 families, 177 genera and 396 species/infraspecific taxa are the most diverse plant group followed by Monocotyledons with 7 families (considering Liliaceae in its wider concept *sensu* Flora Iranica

(Rechinger, 1963-2008)), 49 genera and 84 species/infraspecific taxa, Gymnosperms with 2 families, 2 genera and 3 species and Pteridophytes with only one family, genus and species.

The important rich families are Asteraceae (63 species), Poaceae (51 species), Fabaceae (50 species) and Brassicaceae (43 species), Lamiaceae (29 species), Apiaceae (28 species), Boraginaceae (23 species), Liliaceae *s.l.* (22 species) and Caryophyllaceae (21 species). These 9 families compose about 70 percent of the flora in the area. The genera *Astragalus* (25 species) and *Allium* (13 species) are the richest followed by *Silene* and *Polygonum* (each with 8 species), *Artemisia* and *Bromus* (each with 6 species), and *Geranium* and *Vicia* (each with 5 species).

*Geranium charlesii*, a tuberous geophyte species hitherto known from Afghanistan, Pakistan (Chitral) and southern Pamir-Alai mountains, is recorded as a new species for the flora of Iran. *Marrubium procerum*, a critically endangered plant, is reported after 150 years from *locus classicus*.

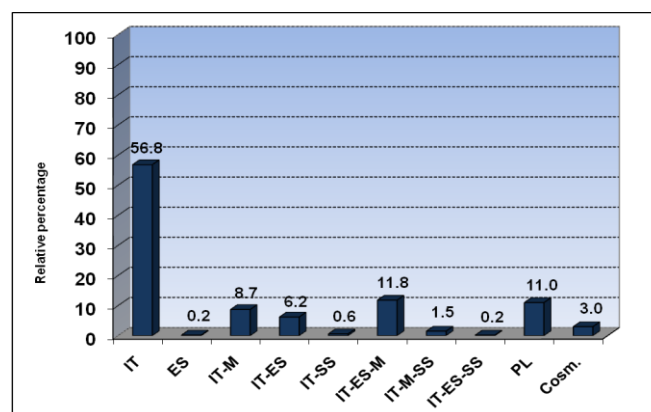
**Life forms:** The dominant life forms in the flora of study area are hemicryptophytes (176 species) including rosettes and small stemmed plants, tall herbs and Umbelliferae-like herbs and graminoids, and therophytes or annual plants (176 species), each composes 36.4% of the flora. 13.8% of the flora consists of geophytes mainly including bulbous, tuberous and rhizomatous species. Chamaephytes comprise 9.7% of the flora (Figure 3).



**Figure 3.** Life form spectrum of plants in Fereizi region (Ph: Phanerophytes, Ch: Chamaephytes, He: Hemicryptophytes, G: Geophytes, Th: Therophytes).

**Chorology:** A considerable number of species (56.8%) belongs to Irano-Turanian (IT) phytochorion. The flora of the area is influenced by Pluri-regional and common Irano-Turanian, Euro-Siberian and Mediterranean elements.

Mediterranean (M) and Euro-Siberian (ES) regions have more influence on these two- or three-regional chorological types than Sahara-Sindian (SS) (Figure 4).



**Figure 4.** Different chorological types and their relative percentage in flora of Fereizi region (IT: Irano-Turanian, ES: Euro-Siberian, SS: Sahara-Sindian, PL: Pluri-regional, Cosm.: Cosmopolitan).

**Endemism:** Among 484 recorded vascular plant taxa, 21 species (4.3%) are endemic to Iran and 49 taxa (10.1%) are subendemics or regional endemics:

**a)** The Iranian endemic species belong to 10 families and 16 genera and genus *Astragalus* has the most number of endemic species in the area. Among the Iranian endemic species, *Ferula flabelliloba* (Apiaceae), *Cousinia termei* (Asteraceae) and *Sisymbrium integerrimum* (Brassicaceae) are narrow local endemics to Binalood mountains. Several taxa have a restricted distribution mostly in NE Iran, including *Tanacetum khorassanicum*, *Aethionema trinervium* var. *apterocarpum*, *Graellsia integrifolia*, *Dianthus binaludensis*, *Diaphanoptera khorasanica*, *Astragalus assadii*, *A. nephtonensis*, *A. meschedensis*, *Allium kuhshorkhense* (a very recently

described *Allium* species by Fritsch *et al.* 2006) and *Acantholimon pterostegium*. So, overall 13 taxa (more than 60%) of the Iranian endemics of the area are only found in NE Iran. The other endemics occur in a wider geographical extent in Iran: *Zeravschania aucheri*, *Scorzonera stenocephala*, *Scabiosa flavida*, *Astragalus pseudoindurascens*, *A. sumbari*, *A. campylotrichus*, *Marrubium procerum* and *Nepeta glomerulosa*.

**b)** Endemic to Iran and Turkmenistan (mainly in Khorassan- Kopet Dagh floristic province): *Chaerophyllum khorassanicum*, *Cephalorrhynchus kossinskyi*, *Cousinia freynii*, *Crepis turcomanica*, *Jurinea monocephala* subsp. *sintenisi*, *Onosma longilobum*, *Cleome khorassanica*, *Astragalus fuhsii*, *A. raddei*, *Nepeta ucrainica* subsp. *kopetdaghensis*, *Salvia chloroleuca*, *Allium monophyllum*, *Tulipa micheliana*, *Bromus*



*kopetdaghensis*, *Delphinium turkmenum*, *Amygdalus spinosissima* subsp. *turcomanica*, *Cruciata taurica* subsp. *persica*, and *Hymenocrater calycinus*.

c) Endemic to Iran and Afghanistan: *Eryngium bungei*, *Pseudotrachydium vesiculosulo-alatum*, *Artemisia khorassanica*, *Senecio paulsenii* subsp. *khorassanicus*, *Trichodesma bamianicum*, *Cicer chorassanicum* and *Eremostachys labiosiformis*.

d) Endemic to Iran, Afghanistan and Turkmenistan: *Artemisia ciniformis*, *Artemisia kopetdaghensis*, *Artemisia turcomanica*, *Chamaegeron bungei*, *Erysimum ischnostylum*, *Stroganowia affghana*, *Dianthus crinitus* subsp. *turcomanicus*, *Lagochilus cabulicus*, *Nepeta saccharata*, *Phlomis cancellata*, *Salvia nemorosa*, *Eremurus luteus*, *Ranunculus leptorrhynchus*, *Cerasus pseudoprostrata*, *Asperula glomerata* subsp. *turcomanica*, *Iris kopetdaghensis* and *Onobrychis chorassanica*.

e) Endemic to Iran and the Middle Asia: *Clausia turkestanica*, *Acantholimon raddeanum*, *Rumex tianschanicus*, *Hyoscyamus turcomanicus*, *Allium oschaninii*, *Allium barsczewskii* and *Allium tenuicaule*. The later two *Allium* species have been recently recorded as new species for the flora of Iran (Memariani *et al.* 2007). All of these species group, in their southwestern distribution extent, occur in Khorassan, NE Iran.

## Discussion

Among 484 identified plants of the study area, 107 taxa which have not been reported in previous published works are newly recorded for the flora of Binalood mountains (see the appendix). Ghahreman *et al.* (2006) recorded 487 taxa from the same altitude range but from southwestern slopes of Binalood in an area between Baghshangach village and Kharv town with very larger surface area of 50,000 hectares and with more characteristic xerophytic plant species. 49.5 percent of plant species identified in the present study from northern slopes of Binalood were not recorded by Ghahreman *et al.* (2006). These results indicate the difference of floristic composition between north and south slopes of Binalood.

Dominant life forms of plant species clearly reflect the climate of the study area. According to cold semi-arid climate of the area, hemicryptophytes can survive in cold season by their buds below and near soil surface or in dried rosette leaves at soil surface, and therophytes complete their life-cycle during favorable season and survive in the form of seeds in the arid condition of summer and the cold winter. Geophytes survive with resting buds on their subterranean stems in dry and cold seasons.

Chamaephytes are adapted to dry, high radiation and windswept conditions in high altitudes of the area as thorny and cushion-like growth forms.

Excluding cultivated orchard tree and shrub species, phanerophytes make up a small portion of life forms (3.7%) in natural flora of the area, mainly as *Lonicera-Cotoneaster-Cerasus* shrubland belt in northern slopes of Jaji Mount, scattered *Berberis* and *Rosa* shrubs in valleys and very scattered *Juniperus* trees in western part of the area. So the life form spectrum of the flora thoroughly demonstrates the dominant montane and subalpine steppe vegetation type of the area.

Considering the considerable number of Irano-Turanian species (56.8%), according to Léonard (1988, 1993) the study area is situated in "Irano-Turanian regional centre of endemism". The influence of Sahara-Sindian regional zone in chorotypes gradually decreases when traveling from the south to north of Iran and from low elevations to montane and alpine zones (Léonard, 1988, 1993; White and Léonard, 1991). Joharchi & Memariani (2006) recorded almost similar phytogeographical spectra in flora of Tandooreh National Park in mountainous areas of central Kopet-Dagh.

Pluriregional (PL, 11%) and cosmopolitan (Cosm., 3%) species are mainly invasive and ruderals or weeds which reflect the anthropogenic origin of some habitats in the area specially agricultural and horticultural locations in several valleys of the Fereizi. The proportion of these two chorotypes is usually low in well protected natural areas such as Tandooreh National Park (Joharchi & Memariani, 2006). Hydrophytes or truly aquatic plant species do not occur in the study area, although some subaquatic or hygrophilous species of the area have been included into the other groups like graminoid hemicryptophytes and rhizomatous geophytes.

According to Jalili & Jamzad (1999), the average number of endemics per million hectares of the whole country is 10.46 species. Presence of 21 Iranian endemic species demonstrates a high plant endemism in such a small studied area as well as 31 plant taxa (6.4% of the flora) endemic to Khorassan- Kopet Dagh floristic province in mountainous areas of NE Iran and S Turkmenistan. Binalood mountain range, with its rich flora and high number of endemic and subendemic plants, has a considerable significance in plant diversity of Khorassan. Local endemics with narrow distributions and Khorassan-Kopet Dagh floristic elements show an important role in its flora and vegetation. Moreover, several plant species occurring mainly in Alborz mountain range or in the Middle Asian mountains, especially Pamir and

Tien Shan, have isolated disjunct populations in Binalood. Regarding the unique plant diversity and endemism, the urgent conservation of the area is suggested because of human settlements, extensive agricultural activities, increasing overgrazing of vegetation, gathering medicinal species, and absence of any protected area especially in north-facing slopes.

### Acknowledgements

We would like to thank the Research Council of Ferdowsi University of Mashhad for financial support and staff assistance of FUMH. The expert botanists in different plant groups are acknowledged for identification or confirmation of some plant specimens: Dr. H. Akhaneh and Dr. F. Attar (University of Tehran), Mrs. Y. Nasseh (FUMH), Dr. F. Ghahremani-nejad (University of Tarbiat Moallem), Dr. A. R. Khosravi (University of Shiraz), Dr. F. O. Khassanov (Uzbekistan Academy of Science), Dr. A. A. Maassoumi and Dr. V. Mozaffarian (Research Institute of Forests and Rangelands). We gratefully acknowledge Dr. H. Akhaneh for his very helpful notes on the first draft of the paper.

### References

- Akhaneh H. (1998). Plant Biodiversity of Golestan National Park. *Staphia*, 53: 1-411.
- Akhaneh H. (2006). Flora Iranica: facts and figures and a list of publications by K. H. Rechinger on Iran and adjacent areas. *Rostaniha*, 7(Suppl. 2): 19-61.
- Alavi M. (1992). Thrust tectonics of the Binalood region, NE Iran. *Tectonics*, 11(2): 360-370.
- Anonymous (2006). Climatic Statistics. Iran Meteorological Organization website ([www.weather.ir](http://www.weather.ir)).
- Assadi M., Maassoumi A. A., Khatamsaz M. and Mozaffarian V. (eds.). (1988-2008). Flora of Iran. Vols. 1-60. Research Institute of Forests and Rangelands Publications. Tehran (in Persian).
- Browicz K. (1983-1996). Chorology of trees and shrubs in South-West Asia and adjacent regions, vol. 1-10. and supplement. Polish Academy of Science, Institute of Dendrology. Poznan.
- Darvishzade A. (1991). Geology of Iran. Sepehr Press. Tehran.
- Davis P. H. (ed.) (1965-1988). Flora of Turkey and East Aegean Island. Vols. 1- 10. Edinburgh University Press. Edinburgh.
- Fritsch R. M., Salmaki Y., Zarre Sh. and Joharchi M. R. (2006). The genus *Allium* L. (Alliaceae) in Iran: Current state, new taxa, and new records. *Rostaniha*, 7(Suppl. 2): 255-281.
- Ghahreman A., Heydari J., Attar F. and Hamzeh'ee B. (2006). A floristic study of southwestern slopes of Binalood elevations (Iran: Khorassan province). *Journal of Science (University of Tehran) (JUST)*, 32(1): 1-12.
- Gahremaninejad F., Joharchi M. R. and Vitek E. (2005). New plant records for Khorassan province, Iran.[I], *Ann. Naturhist. Mus. Wien*, 106B: 255-293.
- Geological Survey of Iran. (1986). Geological Quadrangle Map of Iran, No. K-4, Mashhad. Scale: 1:250,000.
- Jalili A. and Jamzad Z. (1999). Red Data Book of Iran. Research Institute of Forests and Rangelands Publications. Tehran.
- Joharchi M. R. and Akhaneh H. (2006). Notes on the flora of Iran 6: Eight new plant records from Iran collected from Khorassan and Golestan provinces (NE Iran). *Rostaniha*, 7(Suppl. 2): 132-141.
- Joharchi M. R. and Memariani F. (2006). A Floristic Survey of Tandooreh National Park, NE Iran. Final Research Report. Ferdowsi University of Mashhad, Mashhad. 118 pp. (Unpublished).
- Joharchi M. R., Gahremaninejad F. and Vitek E. (2007). New plant records for Khorassan province, Iran.[II], *Ann. Naturhist. Mus. Wien*, 108B: 277-301.
- Komarov V. L. (ed.) (1934-1958). Flora of USSR. Vols. 1-24. Izdatel'stvo Akademi Nauk SSSR, Leningrad (English translation from Russian, JPST & Keter Press. 1968-1977).
- Léonard J. (1988). Contribution a l'étude de la flore et de la végétation des desert d'Iran, Fascicule 8: Étude des aries de distribution, Les phytochories, Les chorotypes. Bulletin of the Jardin Botanique National de Belgique, 190 pp., Meise.
- Léonard J. (1993). Comparisons between the phytochorological spectra of three Iranian deserts and those of various surrounding regions. *Bull. Jard. Bot. Nat. Belg.*, 62: 389-396.
- Maassoumi A. A. (1986-2006). The Genus *Astragalus* in Iran. Vol. 1-5. Research Institute of Forests and Rangelands Publications. Tehran. (in Persian).
- Memariani F. and Joharchi M. R. (2007). Taxonomic revision and notes on species diversity and phytogeography of the genus *Allium* L. (Alliaceae) in NE Iran. Abstract book of the 1<sup>st</sup> National Plant Taxonomy Conference of Iran. 6<sup>th</sup> of September, Tehran, pp. 3-4.
- Memariani F., Joharchi M. R. and Khassanov F. O. (2007). *Allium* L. subgen. *Rhizirideum* sensu lato in Iran: Two new records and a synopsis of taxonomy and phytogeography. *Iranian J. Bot.*, 13(1): 12-20.
- Raunkiaer C. (1934). The life form of plants and statistical plant geography. Clarendon Press, Oxford.
- Rechinger K. H. (ed.) (1963-2008). Flora Iranica, No. 1-177. Akademische Druck-U. Verlagsanstalt, Graz.
- White F. and Léonard J. (1991). Phytogeographical links between Africa and Southwest Asia. *Flora Veg. Mundi*, 9: 229-246.
- Zohary M. (1973). Geobotanical Foundations of the Middle East. 2 vols. Gustav Fischer Verlag.

**Appendix.** Checklist of vascular plant taxa in Fereizi region, Binalood mountain range, NE Iran.

Species / Infraspecific taxa	Chorotype <sup>1</sup>	Life form <sup>1</sup>	Herbarium No. (FUMH) <sup>2</sup>	Records from Binalood Mnts. <sup>3</sup>
<b>Amaranthaceae</b>				
<i>Amaranthus retroflexus</i> L.	PL	Th	37012	4
<b>Amaryllidaceae</b>				
<i>Ixiolirion tataricum</i> (Pall.) Herb.	IT-M	G.b	35977	1, 4
<b>Anacardiaceae</b>				
<i>Rhus coriaria</i> L.	PL	Ph	s.n.	4, 5
<b>Apiaceae</b>				
<i>Astrodaucus orientalis</i> (L.) Drude	IT-ES	G.t	36666, 36844	2, 5
<i>Bunium cylindricum</i> (Boiss. & Hohen.) Drude	IT	G.t	36050	1, 4, 5
<i>B. persicum</i> (Boiss.) B.Fedtsch.	IT	G.t	36160, 36664	1, 4
<i>B. wolffii</i> Kljuykov	IT	G.t	36567	*
<i>Bupleurum exaltatum</i> M.Bieb.	IT	Ch	36835	1, 4, 5
<i>B. rotundifolium</i> L.	IT-M	Th	36827	1
<i>Caucalis platycarpus</i> L.	IT-M	Th	36170, 36293	2, 4
<i>Chaerophyllum khorassanicum</i> Czerniak. ex Schischk.	IT	He	36566	1, 5
<i>Ch. macrospermum</i> (Spreng.) Fisch. & C.A.Mey.	IT	He	36935	5
<i>Conium maculatum</i> L.	IT-ES	He	36397, 36618	4, 5
<i>Eryngium bungei</i> Boiss.	IT	He	36759, 36823	1, 4, 5
<i>Ferula flabelliloba</i> Rech.f. & Aell.	IT	He	36024, 36072, 36652	1, 4, 5
<i>F. ovina</i> (Boiss.) Boiss.	IT	He	36071, 36665	1, 4, 5
<i>F. szowitsiana</i> DC.	IT	He	36432	1, 5
<i>Galagania platypoda</i> (Aitch. & Hemsl.) M.G.Vassiljeva & Pimenov	IT	G.t	36555	*
<i>Heracleum persicum</i> Desf. ex Fischer	IT	He	36378, 36677	1, 5
<i>Johreniopsis seseloides</i> (C.A.Mey.) Pimenov	IT-ES	He	36721	2, 5
<i>Pimpinella affinis</i> Ledeb.	IT-ES	G.t	36668, 36750	1, 4, 5
<i>Prangos bungei</i> Boiss.	IT	G.t	35915	5
<i>Pr. latiloba</i> Korov.	IT	He	35937, 35985, 36148	1, 4, 5
<i>Scandix aucheri</i> Boiss.	IT-ES	Th	35991	1, 4
<i>S. pectin-veneris</i> L.	IT-ES-M	Th	35982B, 36015	*
<i>S. stellata</i> Banks & Sol.	IT-M	Th	35990, 36049, 36146	1, 4
<i>Torilis leptophylla</i> Rech.f.	IT-ES	Th	36171, 36419, 36579	4, 5
<i>Pseudotrachydium vesiculososo-alatum</i> (Rech.f.) Pimenov & Kljuykov	IT	Ch	36542	5
<i>Turgenia latifolia</i> (L.) Hoffm.	IT-M	Th	36328, 36459, 36606	1, 4, 5
<i>Zeravschania aucheri</i> (Boiss.) Pimenov	IT-ES	He	36646,	5
<i>Zosima absinthifolia</i> (Vent.) Link.	IT	He	35913, 36033, 36319	1, 4
<b>Araceae</b>				
<i>Arum kotschyi</i> Boiss. & Hohen. ex Boiss.	IT-ES	G.t	36138	4
<b>Asclepiadaceae</b>				
<i>Cynanchum acutum</i> L.	IT-M-SS	He	36876	4
<i>Vincetoxicum pumilum</i> Decne.	IT	He	36546	1, 4, 5
<b>Asteraceae</b>				
<i>Achillea biebersteinii</i> Afan.	IT-ES	He	36209, 36341, 36789	1, 4
<i>A. wilhelmsii</i> K.Koch	IT	He	36554	1
<i>Acroptilon repens</i> (L.) DC. subsp. <i>australe</i> (Iljin) Rech.f.	IT	He	36768	1, 4
<i>Arctium lappa</i> L.	IT-ES	He	36942	*
<i>Artemisia biennis</i> Willd.	PL	He	36972	1
<i>A. ciniformis</i> Krasch. & Popov ex Poljakov	IT	Ch	36988, 37006, 37021	*
<i>A. khorassanica</i> Podl.	IT	Ch	36986, 37033	1

<i>A. kopetdaghensis</i> Krasch., Popov & Lincz. ex Poljakov	IT	Ch	36989, 36991, 37005	1
<i>A. scoparia</i> Waldst. & Kit.	IT-ES-M	Ch	36993	1, 4
<i>A. turcomanica</i> Gand.	IT	Ch	36987	*
<i>Carduus pycnocephalus</i> L.	IT-M	Th	35971	4
<i>Centaurea behen</i> L.	IT	He	36833	1
<i>Centaurea depressa</i> M.Bieb.	IT	Th	36418	4
<i>Centaurea virgata</i> Lam.	IT	He	36549	1, 4
<i>Cephalorrhynchus kossinskyi</i> (Krasch.) Kirp.	IT	G.t	36139	1
<i>C. polycladus</i> (Boiss.) Kirp.	IT	He	36617	1, 4
<i>Chamaegeron bungei</i> (Boiss.) Botsch.	IT	He	37036	*
<i>Chardinia orientalis</i> Kuntze	IT	Th	35999, 36064, 36306	4
<i>Chondrilla juncea</i> L.	IT-ES-M	He	36880, 36976	4
<i>Cichorium intybus</i> L.	PL	He	36774, 36881	4
<i>Cirsium arvense</i> (L.) Scop. var. <i>incanum</i> (S.G.Gmel.) Ledeb.	PL	He	36607, 36769	1, 4
<i>C. strigosum</i> M.Bieb.	IT	He	36975	1
<i>Cnicus benedictus</i> L.	IT-M	Th	35844, 35970	4
<i>Codonocephalum peacockianum</i> Aitch. & Hemsl.	IT	He	36594	1
<i>Cousinia freynii</i> Bornm.	IT	He	36762	1
<i>C. microcarpa</i> Boiss.	IT	He	36686, 36776	1, 4
<i>C. ternei</i> Rech.f.	IT	He	36974	1
<i>C. umbrosa</i> Bunge	IT	He	36616	1, 4
<i>Crepis pulchra</i> L. subsp. <i>turkestanica</i> Babcock	IT	Th	35995, 36094, 36767	1, 4
<i>Cr. sancta</i> (L.) Babcock subsp. <i>iranica</i> Rech.f.	IT	Th	35889, 35969	4
<i>Cr. turcomanica</i> Krasch.	IT	G.r	36662	*
<i>Cymbolaena griffithii</i> (A.Grey) Wagenitz	IT	Th	36448	1
<i>Filago arvensis</i> L.	IT-ES-M	Th	36444	1
<i>F. pyramidata</i> L.	IT-ES-M	Th	35981, 36446	1, 4
<i>Garhadiolus angulosus</i> Jaub. & Spach	IT	Th	35896	4
<i>Gundelia tournefortii</i> L.	IT	He	36452	4
<i>Heteropappus altaicus</i> (Willd.) Novopokr. var. <i>canescens</i> (Nees) Serg.	IT	He	36999	1, 4
<i>Jurinea monocephala</i> Aitch. & Hemsl. subsp. <i>sintenisii</i> (Bornm.) Wagenitz	IT	He	36404	1
<i>Koelpinia linearis</i> Pall.	IT-SS	Th	35996, 36436, 36450	1, 4
<i>Lactuca serriola</i> L.	IT-ES-M	He	37025	4
<i>Lapsana communis</i> L.	IT-ES	He	36971	2
<i>Leontodon asperrimus</i> (Willd.) Boiss. ex Ball.	IT	He	36547	1, 4
<i>Pulicaria gnaphalodes</i> (Vent.) Boiss.	IT	Ch	37003	4
<i>Scariola orientalis</i> (Boiss.) Sojak subsp. <i>orientalis</i>	IT	Ch	36926, 36981	1, 4
<i>Scorzonera laciniata</i> L.	IT-ES-M	He	36592	*
<i>Sc. stenocephala</i> Boiss.	IT	G.t	35968, 36059, 36181	**
<i>Senecio paulsenii</i> O.Hoffm. subsp. <i>khurasanicus</i> (Rech.f. & Aell.) B.Nord.	IT	He	36363, 36187	*
<i>Serratula latifolia</i> Boiss.	IT	He	36484, 36584	1
<i>Sonchus asper</i> (L.) Hill	IT-M	He	36602	*
<i>So. oleraceus</i> L.	PL	Th	36892, 36963, 37032	4
<i>Steptorhamphus persicus</i> O.Fedtsch. & B.Fedtsch.	IT	G.t	36076	1, 4
<i>Tanacetum khorassanicum</i> (Krasch.) Parsa	IT	He	36633	1
<i>T. partheninm</i> (L.) Sch.Bip.	PL	He	36304, 36627, 36679	1, 4
<i>Taraxacum montanum</i> (C.A.Mey.) DC.	IT	He	36920, 36980	2
<i>T. nevskii</i> Juz.	IT	He	36389	*
<i>T. pseudo-calcephalum</i> Soest	IT	He	36108	*
<i>T. wallichii</i> DC.	IT	He	35894	*
<i>Tragopogon gaudanicus</i> Boriss.	IT	He	36361	*
<i>Tr. graminifolius</i> DC.	IT	He	35972	4
<i>Tr. longirostris</i> Bisch.	IT-M-SS	He	36104, 36175, 36308	4



<i>Tripleurospermum disciforme</i> (C.A.Mey.) Sch.Bip.	IT	He	36208, 36406	*
<i>Varthemia persica</i> DC.	IT	Ch	36922, 36977	1
<i>Xeranthemum longipapposum</i> Fisch. & C.A.Mey.	IT	Th	36603, 36683	4
<b>Berberidaceae</b>				
<i>Berberis integerrima</i> Bunge	IT	Ph	35966	1, 4
<b>Boraginaceae</b>				
<i>Anchusa arvensis</i> (L.) M.Bieb. subsp. <i>orientalis</i> (L.) Nordh.	IT-M	Th	36394, 36423, 36784	*
<i>A. italica</i> Retz.	IT-M	He	36006	4, 5
<i>Asperugo procumbens</i> L.	PL	Th	35867	4, 5
<i>Buglossoides arvensis</i> (L.) Johnston	IT-ES	Th	36017, 36107	1
<i>Caccinia macranthera</i> (Banks & Soland.) Brand var. <i>crassifolia</i> (Vent.) Brand	IT	He	35887	4
<i>Echium italicum</i> L.	IT-M	He	36593, 37023	1, 2, 4, 5
<i>Heliotropium europaeum</i> L.	IT-ES-M	Th	36697	4, 5
<i>Heterocaryum laevigatum</i> A. DC.	IT	Th	36358	*
<i>H. subsessile</i> Vatke	IT	Th	35850, 36053	*
<i>Lappula barbata</i> Gürke	IT	He	36421, 36657	4, 5
<i>L. microcarpa</i> Gürke	IT	Th	35918, 36152	1, 5
<i>L. sinaica</i> (A.DC.) Asch. ex Schweinf.	IT	Th	35849, 36291, 36656	5
<i>Lithospermum officinale</i> L.	IT-ES-M	He	36375, 36783, 36895	1, 5
<i>Nonnea caspica</i> (Willd.) G.Don	IT	Th	35914, 36185	4
<i>Onosma dichroanthum</i> Boiss.	IT	He	36194	1, 5
<i>Onosma longilobum</i> Bunge.	IT	He	36178, 36724	1, 4, 5
<i>Rochelia bungei</i> Trautv.	IT	Th	35861, 36031	*
<i>R. cardiosepala</i> Bunge.	IT	Th	35984, 36057, 36420	1, 4, 5
<i>R. disperma</i> (L.f.) K.Koch	IT	Th	35866	*
<i>R. persica</i> Bunge. ex Boiss.	IT	Th	36068, 36386, 36624	1
<i>Solenanthus circinnatus</i> Ledeb.	IT	He	36137	1
<i>Trichodesma bamianicum</i> Rech.f. & Riedl	IT	He	36647, 36696	4, 5
<i>Trichodesma incanum</i> (Bunge.) A.DC.	IT	He	36722, 36930	1, 5
<b>Brassicaceae</b>				
<i>Aethionema carneum</i> (Banks & Soland.) B.Fedtsch.	IT	Th	35873, 36056	1
<i>Ae. trinervium</i> (DC.) Boiss. var. <i>apterocarpum</i> (Rech.f. & Aell.) Hedge	IT	Ch	35951	*
<i>Alliaria petiolata</i> (M.Bieb.) Cavara & Grande	IT-ES-M	He	36009, 36112	1
<i>Alyssum meniocoides</i> Boiss.	IT	Th	36069	4
<i>A. stapfii</i> Vierh.	IT	Th	35854, 35945, 36086	1, 4
<i>Barbarea plantaginea</i> DC.	IT	He	35878, 36113, 36712	1, 4
<i>Brassica napus</i> (L.) Koch	PL	He	35874, 36894	2
<i>Br. rapa</i> L. subsp. <i>campestris</i> (L.) A.R.Clapham	PL	He	36121, 37011, 37037	*
<i>Buchingera axillaris</i> Boiss.	IT	Th	35931, 36120	1
<i>Camelina rumelica</i> Velen.	IT-ES-M	Th	35974, 36000, 36327	*
<i>Capsella bursa-pastoris</i> (L.) Medicus	Cosm.	Th	35934, 36143	1, 4
<i>Cardaria draba</i> (L.) Desv.	Cosm.	He	35973, 36343	1, 4
<i>Chorispora tenella</i> (Pall.) DC.	IT	Th	35884, 36106, 36622	4
<i>Clausia turkestanica</i> Lipsky	IT	He	35933, 36371	*
<i>Clypeola jonthlaspi</i> L.	IT-M	Th	35977	1, 4
<i>C. microcarpa</i> Moris.	IT-M	Th	35855, 36614	*
<i>Conringia perfoliata</i> (C.A.Mey.) Busch	IT	Th	35998, 36101	4
<i>Crambe kotschyana</i> Boiss.	IT	He	36025	1, 4
<i>Crucihimalaya wallichii</i> (Hook.f. & Thoms.) Al-Shehbaz, O'Kane & R.A.Price (Syn.: <i>Arabidopsis wallichii</i> )	PL	He	36631	1, 4
<i>Descurainia sophia</i> (L.) Webb & Berth.	IT-ES-M	Th	36345	4
<i>Diptychocarpus strictus</i> (Fisch.) Trautv.	IT	Th	35856	1
<i>Drabopsis verna</i> K.Koch	IT	Th	35857, 36619	4
<i>Erophila verna</i> (L.) Besser	IT-ES-M	Th	36620	1

<i>Erysimum ischnostylum</i> Freyn. & Sint.	IT	He	36020, 36189	1
<i>Euclidium syriacum</i> (L.) R.Br.	IT	Th	36578	1
<i>Eu. tenuissimum</i> (Pall.) B.Fedtsch.	IT	Th	35954, 36193, 36422	4
<i>Fibigia suffruticosa</i> (Vent.) Sweet	IT	He	36407	1
<i>Goldbachia laevigata</i> (M.Bieb.) DC.	IT	Th	36580	4
<i>Graellsia integrifolia</i> (Rech.f.) Rech.f.	IT	He	35935, 36131	1
<i>Lepidium latifolium</i> L.	IT-ES-M	He	36779	4
<i>Nasturtium officinale</i> R.Br.	PL	He	36562	4
<i>Neotorularia dentata</i> (Kitam) Hedge & J.Léonard	IT	Th	35872	*
<i>Neslia apiculata</i> Fisch., C.A.Mey. & Avé-Lall.	IT-ES-M	Th	36008, 36192	4
<i>Olimarabidopsis pumila</i> (Stephan) Al-Shehbaz, O'Kane & R.A.Price (Syn.: <i>Arabidopsis pumila</i> )	PL	Th	35880, 35975, 36147	1
<i>Pachypterygium brevipes</i> Bunge.	IT	Th	36200, 36651	1, 4
<i>Sisymbrium integerrimum</i> Rech.f. & Aell.	IT	He	36190	1
<i>S. loeselii</i> L.	IT-ES	He	36114, 36928	4
<i>S. septulatum</i> DC.	IT	Th	35853, 35876	4
<i>Strigosella africana</i> (L.) Botsch. var. <i>africana</i> (Syn.: <i>Malcolmia africana</i> var. <i>africana</i> )	IT-M-SS	Th	35882	4
<i>Stroganowia affghana</i> (Boiss.) Pavlov	IT	He	36719, 36979	1
<i>Tauscheria lasiocarpa</i> Fisch. ex DC.	IT	Th	36188, 36356	1
<i>Thlaspi arvense</i> L.	PL	Th	36144, 36376	2
<i>Th. perfoliatum</i> L.	IT-ES-M	Th	35932, 36655	2, 4
<b>Capparidaceae</b>				
<i>Buhsea trinervia</i> Fresen	IT	G.r	36550	5
<i>Capparis spinosa</i> L.	PL	He	36434	4, 5
<i>Cleome khorassanica</i> Bunge. & Bien. ex Boiss.	IT	Th	36824	4, 5
<b>Caprifoliaceae</b>				
<i>Lonicera nummulariifolia</i> Jaub. & Spach	IT	Ph	36318, 36924	5
<b>Caryophyllaceae</b>				
<i>Acanthophyllum glandulosum</i> Bunge ex Boiss.	IT	Ch	36890	1, 4
<i>A. mucronatum</i> C.A.Mey.	IT	Ch	36755	1
<i>Arenaria leptoclados</i> (Rechb.) Guss.	IT-ES-M	Th	35976, 36684	1, 4
<i>Cerastium inflatum</i> Link ex Desf.	IT	Th	35886, 36126	1, 4
<i>Dianthus binaludensis</i> Rech.f.	IT	Ch	36481, 36552	1, 4
<i>D. crinitus</i> Sm. subsp. <i>turcomanicus</i> (Schischk.) Rech.f.	IT	Ch	36553	1
<i>D. orientalis</i> Adams	IT	Ch	36653	1, 4
<i>Diaphanoptera khorasanica</i> Rech.f.	IT	Ch	36430	*
<i>Lepyrodiclis stellaroides</i> Schrenk ex Fisch. & C.A.Mey.	IT	Th	35960, 36401	1, 4
<i>Mesostemma kotschyanum</i> (Schischk.) Vved. subsp. <i>kotschyanum</i>	IT	He	36307	1, 4
<i>Minuartia meyeri</i> (Boiss.) Bornm.	IT	Th	36095, 36337	*
<i>Saponaria orientalis</i> L.	IT	Th	36297	1
<i>Silene brahuica</i> Boiss.	IT	Ch	36551	**
<i>S. chaetodonta</i> Boiss.	IT	Th	36454	4
<i>S. coniflora</i> Nees ex Oth	IT-M	Th	36346	*
<i>S. conoidea</i> L.	IT-M	Th	36331	1, 4
<i>S. latifolia</i> Poir. subsp. <i>persica</i> (Boiss. & Buhse) Melzh.	IT-ES-M	He	36005, 36136, 36352	1, 4
<i>S. noctiflora</i> L.	IT-ES-M	He	36882	3
<i>S. swertiifolia</i> Boiss.	IT	He	36310, 36557	1, 4
<i>S. viscosa</i> (L.) Pers.	IT-ES	He	s.n.	*
<i>Stellaria media</i> (L.) Vill.	Cosm.	Th	36116	1, 4
<b>Chenopodiaceae</b>				
<i>Chenopodium botrys</i> L.	PL	Th	36925	1, 4
<i>Ch. foliosum</i> Asch.	PL	Th	36703	*
<i>Krascheninnikovia ceratoides</i> (L.) Gueldenst.	IT-M	Ch	36556, 36997	*
<i>Noaea mucronata</i> (Forssk.) Asch. & Schweinf.	IT-M-SS	Ch	36899	1, 4
<i>Salsola kali</i> L.	PL	Th	37004	1, 4

**Convolvulaceae**

<i>Convolvulus pseudocantabricus</i> Schrenk	IT	He	36558	*
<i>C. arvensis</i> L.	Cosm.	G.r	36722	4
<i>C. lineatus</i> L.	IT-ES-M	He	36372, 36591	4, 5

**Crassulaceae**

<i>Pseudosedum multicaule</i> (Boiss. & Buhse) Boriss.	IT	He	s.n.	1, 5
--	----	----	------	------

**Cupressaceae**

<i>Juniperus excelsa</i> M. Bieb.	IT	Ph	s.n.	1
-----------------------------------	----	----	------	---

**Cyperaceae**

<i>Bolboschoenus affinis</i> (Roth) Drob.	PL	G.r	36471	1
<i>Carex stenophylla</i> Wahlenb.	PL	He	35859	*
<i>Scirpoides holoschoenus</i> (L.) Sojak	PL	G.r	36475	4

**Dipsacaceae**

<i>Cephalaria kotschy</i> Boiss. & Hohen.	IT	He	36720	*
<i>Dipsacus strigosus</i> Willd.	ES	He	36936	1
<i>Scabiosa flavida</i> Boiss. & Hauskn.	IT	Th	36958	2
<i>S. olivieri</i> Coult.	IT	Th	35848, 36451	1, 4, 5
<i>S. rotata</i> M.Bieb.	IT	Th	35957, 36158, 36445	4, 5

**Elaeagnaceae**

<i>Elaeagnus angustifolia</i> L.	IT-M	Ph	36435	4
----------------------------------	------	----	-------	---

**Ephedraceae**

<i>Ephedra intermedia</i> Schrenk & C.A.Mey.	IT	Ch	36753	*
<i>E. major</i> Host	IT-ES-M	Ph	36947	1

**Equisetaceae**

<i>Equisetum palustre</i> L.	PL	G.r	36470, 36787	*
------------------------------	----	-----	--------------	---

**Euphorbiaceae**

<i>Euphorbia buhsei</i> Boiss.	IT	He	36440	*
<i>E. bungei</i> Boiss.	IT	He	35942, 36204, 36340	1, 4
<i>E. szovitsii</i> Fisch. & Mey.	IT	Th	36058, 36295, 36681	1

**Fabaceae**

<i>Astragalus (Alopecuroidei) schahrudensis</i> Bunge	IT	He	36339	1
<i>A. (Annulares) campylorrhynchus</i> Fisch. & C.A.Mey.	IT	Th	35899, 36124, 36437	4
<i>A. (Anthylloidei) fuhsii</i> Freyn. & Sint.	IT	Ch	36344, 36578	*
<i>A. (Anthylloidei) raddei</i> Basil.	IT	He	36545	1
<i>A. (Astragalus) basineri</i> Trautv.	IT	He	36002	1, 4
<i>A. (Astragalus) sieversianus</i> Pall.	IT	He	35928, 36218	1, 4
<i>A. (Caprini) assadii</i> Maassoumi & Podlech	IT	He	36323, 36673	5
<i>A. (Caprini) nephtonensis</i> Freyn	IT	He	35851	4
<i>A. (Caprini) pseudoindurascens</i> Sirj. & Rech.f.	IT	He	36476	1
<i>A. (Cremoceras) ochreatus</i> Bunge	IT	He	35907, 36400, 36669	4
<i>A. (Dipelta) dipelta</i> Bunge	IT	Th	36196, 36765	1, 4
<i>A. (Dissitiflori) sumbari</i> Popov	IT	He	36544	6
<i>A. (Erioceras) anacamptus</i> Bunge	IT	He	35908, 36573	**
<i>A. (Heterodontus) campylotrichus</i> Bunge	IT	Th	36047	*
<i>A. (Hymenostegis) chrysostachys</i> Boiss.	IT	Ch	36588	1
<i>A. (Incani) ackerbergensis</i> Freyn	IT	He	36021, 36206, 36333	6
<i>A. (Malacothrix) suluklensis</i> Freyn & Sint.	IT	He	36159, 36438	6
<i>A. (Onobrychioidei) brevidens</i> Bunge	IT	He	36582	6
<i>A. (Oxyglottis) oxyglottis</i> Steven	IT-M	Th	36052	1
<i>A. (Oxyglottis) schmalhauseni</i> Bunge	IT	Th	36355	1
<i>A. (Oxyglottis) vicarius</i> Lipsky	IT	Th	36001, 36167	5
<i>A. (Platonychium) meschedensis</i> Bunge	IT	Ch	36477	6
<i>A. (Platyglottis) camptoceras</i> Bunge	IT	Th	35898, 36166, 36205	*
<i>A. (Sesamei) persopolitanus</i> Boiss.	IT	Th	35906	1
<i>A. (Theiochrus) siliquosus</i> Boiss. subsp. <i>siliquosus</i>	IT	He	36385	1

<i>Cicer chorassanicum</i> Popov	IT	Th	36164, 36460	4
<i>C. tragacanthoides</i> Jaub. & Spach var. <i>tragacanthoides</i>	IT	Th	36695	1, 4, 5
<i>Colutea buhsei</i> (Boiss.) Shapar.	IT-ES	Ph	36316, 36671	1, 4
<i>Glycyrrhiza glabra</i> L. var. <i>glandulifera</i> (Waldst. & Kit.) Boiss.	IT-ES-M	G.r	36877	4
<i>Lathyrus aphaca</i> L. var. <i>aphaca</i>	IT-ES-M	Th	36568	1, 4
<i>L. inconspicuus</i> L.	IT-M	Th	36098, 36179	4
<i>Lens cyanea</i> (Boiss. & Hohen.) Alef.	IT	Th	35905, 36091	5
<i>L. orientalis</i> (Boiss.) Hand. -Mzt.	IT	He	36153, 36680	1
<i>Lotus corniculatus</i> L. subsp. <i>corniculatus</i>	PL	He	36382, 36756	4
<i>Medicago lupulina</i> L.	PL	He	36311	4
<i>Melilotus indicus</i> (L.) All.	PL	Th	37030	*
<i>M. officinalis</i> (L.) Pall.	IT-ES-M	He	36388, 36771	1, 4
<i>Meristotropis xanthioides</i> Vassilcz.	IT	G.r	36480	1
<i>Onobrychis chorassanica</i> Bunge	IT	He	36548	1
<i>O. cornuta</i> (L.) Desv.	IT	Ch	s.n.	*
<i>Pisum sativum</i> L.	PL	Th	36299	*
<i>Trifolium pratense</i> L.	IT-ES-M	He	36127	1, 4
<i>T. repens</i> L.	IT-ES-M	He	36048	1
<i>Trigonella monantha</i> C.A.Mey. subsp. <i>noeana</i> (Boiss.) Huber. -Morath	IT	Th	35900	*
<i>Vicia ervilia</i> (L.) Willd.	IT-M	Th	36169	*
<i>V. hyrcanica</i> Fisch. & C.A.Mey.	IT	Th	36413	1
<i>V. peregrina</i> L.	IT-ES	Th	35901, 36336	1, 4
<i>V. sativa</i> L. var. <i>angustifolia</i> L.	IT-ES-M	Th	36157	1
<i>V. sativa</i> L. var. <i>sativa</i>	IT-ES-M	Th	36165	*
<i>V. subvillosa</i> (Ledeb.) Trautv.	IT	Th	35927, 36685	1, 4
<b>Fumariaceae</b>				
<i>Fumaria asepala</i> Boiss.	IT-M	Th	35891	*
<i>F. vaillantii</i> Loisel.	IT-ES-M	Th	36090	1, 4
<b>Geraniaceae</b>				
<i>Biebersteinia multifida</i> DC.	IT	G.t	35940	1, 4
<i>Erodium ciconium</i> (Jusl.) L'Her. ex Aiton	IT-M	Th	35917, 35962	*
<i>E. cicutarium</i> (L.) L'Her. ex Aiton	IT-ES-M	He	35910	1, 4
<i>Geranium charlesii</i> (Aitch. & Hemsl.) Vved. ex Nevski	IT	G.t	35909, 35986	***
<i>G. divaricatum</i> Ehrh.	IT-ES-M	Th	35963	*
<i>G. kotschyi</i> Boiss.	IT	G.t	35925	1, 4
<i>G. pusillum</i> L.	IT-ES-M	Th	36466, 37038	**
<i>G. rotundifolium</i> L.	IT-ES-M	Th	36485	1, 4
<b>Hypericaceae</b>				
<i>Hypericum perforatum</i> L.	PL	He	36780	4, 5
<i>H. scabrum</i> L.	IT	He	36314	1, 4, 5
<b>Iridaceae</b>				
<i>Gladiolus atrovioleaceus</i> Boiss.	IT-M	G.c	36060	5
<i>Iris fosteriana</i> Aitch. & Baker	IT	G.r	35840	1, 5
<i>I. kopetdagensis</i> (Vved.) B.Mathew & Wendelbo	IT	G.r	35862	1, 4, 5
<b>Juglandaceae</b>				
<i>Juglans regia</i> L.	PL	Ph	36927	1, 4
<b>Juncaceae</b>				
<i>Juncus bufonius</i> L.	Cosm.	Th	36623, 36709	*
<i>J. rigidus</i> Desf.	PL	G.r	36788	*
<b>Lamiaceae</b>				
<i>Acinos graveolens</i> (M.Bieb.) Link.	IT-M	Th	36066, 36140, 36302	1
<i>Drepanocaryum sewerzowii</i> (Regel) Pojark.	IT	Th	35979, 36041	1
<i>Eremostachys labiosa</i> Bunge	IT	He	35890, 36054	1
<i>E. labiosiformis</i> (Popov.) Knorr.	IT	He	35987	1, 4

<i>E. macrophylla</i> Montbr. & Auch.	IT	He	35841	*
<i>Hymenocrater calycinus</i> (Boiss.) Benth.	IT	Ch	36051, 36300, 36639	1, 4
<i>Lagochilus cabulicus</i> Benth.	IT	Ch	36543	1
<i>Lallemantia baldschuanica</i> Gontsch.	IT	Th	35983	*
<i>L. iberica</i> (Stev.) Fisch. & C.A.Mey.	IT-M	Th	36305, 36399, 36690	2
<i>L. royleana</i> Benth.	IT	Th	36141	1
<i>Lamium amplexicaule</i> L.	Cosm.	Th	35922, 36142	1, 4
<i>Marrubium anisodon</i> K.Koch	IT	He	36800	1, 4
<i>M. procerum</i> Bunge	IT	He	36932	1
<i>Mentha longifolia</i> (L.) Hudson	PL	He	36764, 37028	4
<i>Nepeta bracteata</i> Benth.	IT	Th	36301, 36609	1, 4
<i>N. glomerulosa</i> Boiss.	IT	He	36796	1, 4
<i>N. saccharata</i> Bunge	IT	Th	35846, 36172, 36467	*
<i>N. ucrainica</i> L. subsp. <i>kopetdaghensis</i> (Pojark.) Rech.f.	IT	He	36583	*
<i>Perovskia abrotanoides</i> Karel.	IT	Ch	36763, 36829	1, 4
<i>Phlomis cancellata</i> Bunge	IT	He	36431, 36717	1, 4
<i>Salvia ceratophylla</i> L.	IT	He	36207	*
<i>S. chloroleuca</i> Rech. f. & Aell.	IT	He	36186, 36309, 36670	1, 4
<i>S. nemorosa</i> L.	IT-ES	He	36414, 36605	1
<i>Scutellaria litwinowii</i> Bornm. & Sint. ex Bornm.	IT	Ch	36154, 36676	1, 4
<i>Stachys lavandulifolia</i> Vahl.	IT	Ch	36014	1, 4
<i>St. setifera</i> C.A.Mey.	IT	He	36654, 36834	4
<i>Teucrium polium</i> L.	IT-M	Ch	s.n.	1, 4
<i>Ziziphora clinopodioides</i> Lam.	IT	Ch	36838	1
<i>Z. tenuior</i> L.	IT	Th	35847, 36029	1
<b>Liliaceae s.l.</b>				
<i>Allium altissimum</i> Regel	IT	G.b	36379	1
<i>A. ampeloprasum</i> L.	IT-ES-M	G.b	36757	*
<i>A. atroviolaceum</i> Boiss.	IT-ES	G.b	36773	1, 4
<i>A. barsczewskii</i> Lipsky	IT	G.b	26072A	7
<i>A. fibrosum</i> Regel	IT	G.b	36034	4
<i>A. iranicum</i> (Wendelbo) Wendelbo	IT	G.b	36642	*
<i>A. kuhnsorkhense</i> R.M.Fritsch & Joharchi	IT	G.b	35978, 36335	8
<i>A. monophyllum</i> Vved.	IT	G.b	36026	*
<i>A. oschaninii</i> O.Fedtsch.	IT	G.b	36663, 36840	1
<i>A. rubellum</i> M.Bieb.	IT	G.b	36070	4
<i>A. tenuicaule</i> Regel	IT	G.b	26072B	7
<i>A. umbilicatum</i> Boiss.	IT	G.b	36585	1
<i>A. xiphopetalum</i> Aitch. & Baker	IT	G.b	36087, 36405	1, 4
<i>Colchicum kotschyi</i> Boiss.	IT	G.b	37009, 37027	*
<i>Eremurus luteus</i> Baker	IT	G.r	36028	1, 4
<i>E. spectabilis</i> M.Bieb.	IT	G.r	36370	*
<i>Fritillaria gibbosa</i> Boiss.	IT	G.b	36199, 36360	1, 4
<i>Gagea stipitata</i> Merckl. ex Bunge	IT	G.b	35852, 35936	4
<i>Muscari neglectum</i> Guss.	IT-ES-M	G.b	35920, 36027	1, 4
<i>Polygonatum sewerzowii</i> Regel	IT	G.r	36641	*
<i>Tulipa biebersteinia</i> Schult. f.	IT-ES	G.b	35858	*
<i>T. micheliana</i> Hoog	IT	G.b	35916, 36381	1, 4
<b>Malvaceae</b>				
<i>Alcea angulata</i> (Freyn & Sint.) Freyn & Sint. ex Iljin	IT	He	36716	*
<i>Althaea cannabina</i> L.	IT-M	He	36843	1
<i>Malva sylvestris</i> L.	PL	He	36395	*
<b>Onagraceae</b>				
<i>Epilobium hirsutum</i> L.	PL	G.r	36777	1, 4, 5
<i>E. minutiflorum</i> Hausskn.	IT	G.r	36961	1, 5



<i>E. tetragonum</i> L.	IT-ES-M	G.r	36628	*
<b>Orchidaceae</b>				
<i>Epipactis persica</i> (Soó) Nannf.	IT-ES	G.r	36883	2
<i>Listera ovata</i> (L.) R.Br.	PL	G.r	36135	*
<b>Orobanchaceae</b>				
<i>Orobanche mutelii</i> F.W.Schultz	IT-M	G.p	36324	*
<b>Papaveraceae</b>				
<i>Glaucium elegans</i> Fisch. & C.A.Mey.	IT	Th	35870	4
<i>Hypocoum pendulum</i> L.	IT-M	Th	35868, 36063	4
<i>Papaver dubium</i> L.	PL	Th	35989, 36330	1, 4
<i>Roemeria hybrida</i> (L.) DC. subsp. <i>dodecandra</i> (Forssk.) Maire	IT-M-SS	Th	35912, 36329	1, 4
<i>R. refracta</i> DC.	IT	Th	36040, 36338	1, 4
<b>Plantaginaceae</b>				
<i>Plantago lanceolata</i> L.	IT-ES-M	He	36184, 36934	4
<i>P. major</i> L.	Cosm.	He	36960, 37034	4
<b>Plumbaginaceae</b>				
<i>Acantholimon erinaceum</i> (Jaub. & Spach) Lincz.	IT	Ch	36982	4, 5
<i>Ac. raddeanum</i> Czernjak.	IT	Ch	36896	4, 5
<i>Ac. pterostegium</i> Bunge	IT	Ch	36161, 36348	1, 4, 5
<b>Poaceae</b>				
<i>Aegilops tauschii</i> Coss.	IT	Th	36457	4
<i>Ae. triuncialis</i> L.	IT-M	Th	37417	4
<i>Aeluropus littoralis</i> (Gouan) Parl.	IT-M-SS	He	36879	*
<i>Alopecurus arundinaceus</i> Poir. var. <i>arundinaceus</i>	PL	He	36469, 36706	1, 4
<i>Arrhenatherum kotschyi</i> Boiss.	IT	He	36080, 36162, 36392	1, 4
<i>Avena sativa</i> L.	Cosm.	Th	36785	*
<i>Boissiera squarrosa</i> (Banks & Sol.) Nevski	IT	Th	36151	1
<i>Bothriochloa ischaemum</i> (L.) Keng	PL	He	36898	1, 4
<i>Bromus danthoniae</i> Trin.	IT	Th	35994, 36598	1, 4
<i>Br. japonicus</i> Thunb. var. <i>japonicus</i>	PL	Th	36426	4
<i>Br. kopetdaghensis</i> Drobov	IT	He	36368, 36571	1
<i>Br. pseudodanthoniae</i> Drobov	IT	Th	36130, 36409	*
<i>Br. scoparius</i> L.	IT-ES-M	Th	36428	1, 4
<i>Br. sterilis</i> L.	IT-ES-M	Th	36042, 36315, 36700	4
<i>Br. tectorum</i> L.	PL	Th	36082, 36458	4
<i>Calamagrostis epigejos</i> (L.) Roth	PL	He	36761	2
<i>C. pseudophragmites</i> (Hall.f.) Koeler	IT-ES-M	He	36713, 36793	4
<i>Catabrosa aquatica</i> (L.) P.Beauv.	PL	He	36704	*
<i>Dactylis glomerata</i> L.	PL	He	36210	1, 4
<i>Echinochloa crus-galli</i> (L.) P.Beauv. var. <i>crus-galli</i>	Cosm.	Th	37015	4
<i>Elymus hispidus</i> (Opiz.) Melderis subsp. <i>hispidus</i>	IT-ES-M	He	36599	*
<i>El. repens</i> (L.) Gould subsp. <i>elongatiformis</i> (Drobov) Melderis	PL	He	36940	4
<i>El. transhyrcanus</i> (Nevski) Tzvelev	IT	He	36586	*
<i>Eremopoa persica</i> (Trin.) Roshev.	IT-M	Th	36374, 36638	*
<i>Eremopyrum bonaepartis</i> (Spreng.) Nevski var. <i>bonaepartis</i>	IT-M	Th	36043	4
<i>E. distans</i> (K.Koch) Nevski	IT	Th	35845, 36044	*
<i>Festuca arundinacea</i> Schreb.	IT-ES	He	36464	*
<i>F. pratensis</i> Huds.	IT-ES	He	36212, 36778	1
<i>Glyceria plicata</i> (Fries) Fries	IT-ES-M	He	36702	*
<i>Henrardia persica</i> (Boiss.) C.E.Hubb.	IT	Th	36453	*
<i>Heterantherium piliferum</i> Hochst. ex Jaub. & Spach	IT	Th	36213, 36569	4
<i>Hordeum murinum</i> L. subsp. <i>leporinum</i> (Link) Arcang.	IT-M	Th	36037	**
<i>H. murinum</i> L. subsp. <i>glaucum</i> (Steud.) Tzvelev	IT-M	Th	36801	4
<i>Lolium rigidum</i> Gaudin	IT-ES-M	Th	37026	1

<i>Melica persica</i> Kunth subsp. <i>canescens</i> (Regel) P.H.Davis	IT	He	36163, 36390	*
<i>M. persica</i> Kunth subsp. <i>jacquemontii</i> (Decne. ex Jaquem.) P.H.Davis	IT	He	36802	*
<i>Pennisetum orientale</i> Rich.	IT-SS	He	36878	1, 4
<i>Poa angustifolia</i> L.	IT-ES	He	36211, 36391	4
<i>P. bulbosa</i> L.	IT-ES-M	He	35923, 36111	1, 4
<i>P. pratensis</i> L.	PL	He	36110	1, 4
<i>P. trivialis</i> L.	PL	He	36132, 36403, 36707	1
<i>Polypogon monspiliensis</i> (L.) Desf.	PL	Th	36781	*
<i>Rostraria cristata</i> (L.) Tsvelev (Syn.: <i>Lophochloa phleoides</i> (Vill.) Rchb.)	PL	Th	36455	4
<i>Setaria glauca</i> (L.) P.Beauv.	PL	Th	36968, 37010	1, 4
<i>S. viridis</i> (L.) P.Beauv.	PL	Th	36943	4
<i>Stipa arabica</i> Trin. & Rupr.	IT	He	36347, 36570	1
<i>St. hohenackeriana</i> Trin. & Rupr.	IT	He	36797	*
<i>Taeniatherum caput-medusae</i> (L.) Nevski	IT-M	Th	36045, 36215, 36798	1
<i>Triticum aestivum</i> L.	Cosm.	Th	36795	*
<i>Vulpia myuros</i> (L.) C.C.Gmel.	IT-M	Th	36442	4
<i>V. persica</i> (Boiss. & Buhse) V.I.Krecz. & Bobr.	IT	Th	36202	*
<b>Podophyllaceae</b>				
<i>Bongardia chrysogonum</i> (L.) Spach	IT	G.t	35947	1, 4
<i>Leontice leontopetalum</i> L. subsp. <i>ewersmannii</i> (Bunge) Coode	IT	G.b	35949, 36125	*
<b>Polygonaceae</b>				
<i>Atraphaxis spinosa</i> L.	IT	Ch	35964, 36987	1, 4
<i>Polygonum arenastrum</i> Boreau	Cosm.	Th	36705, 37002	*
<i>P. argyrocoleon</i> Steud. ex Kunze	IT	Th	36939	*
<i>P. aviculare</i> L.	Cosm.	Th	36799, 37035	*
<i>P. convolvulus</i> L.	PL	Th	36884, 36970	2, 4
<i>P. mite</i> Schrank	IT-ES-M	Th	37016	2
<i>P. paronychioides</i> C.A.Mey. ex Hohen.	IT	He	36478	*
<i>P. patulum</i> M.Bieb.	IT-M	Th	36790	4
<i>P. polycnemoides</i> Jaub. & Spach	IT	Th	36298, 36692, 36938	1, 4
<i>Rheum ribes</i> L.	IT	G.r	36078, 36667	1, 4
<i>Rumex tianschanicus</i> Los.-Losinsk.	IT	G.r	36380	1
<i>R. tuberosus</i> L.	IT-M	G.t	36079, 36668	1, 4
<b>Primulaceae</b>				
<i>Anagalis arvensis</i> L. subsp. <i>arvensis</i> var. <i>caerulea</i> (L.) Gouan	PL	Th	36629	4
<i>Androsace maxima</i> L.	IT-ES-M	Th	35956	4
<b>Ranunculaceae</b>				
<i>Adonis aestivalis</i> L.	IT-ES-M	Th	35843, 36410	*
<i>A. scorbiculata</i> Boiss. subsp. <i>scorbiculata</i>	IT	Th	35952, 36065	1
<i>Anemone petiolulosa</i> Juz.	IT	G.t	35950	4
<i>Ceratocephala falcata</i> (L.) Pers.	IT-ES-M	Th	35842, 36097	4
<i>C. testiculata</i> (Crantz) Roth	IT-ES	Th	35941, 36145	4
<i>Clematis orientalis</i> L.	IT	Ch	36842, 37007	4
<i>Consolida orientalis</i> (J.Gay) Schrödinger	IT-M	Th	36424	1, 4
<i>Delphinium turkmenum</i> Lipsky	IT	Th	36449, 36636	1, 4
<i>Nigella integrifolia</i> Regel	IT	Th	36575	*
<i>Ranunculus arvensis</i> L.	IT-ES-M	Th	36004, 36174, 36411	*
<i>R. leptorrhynchus</i> Aitch. & Hemsl.	IT	G.r	35943, 35980	1
<i>R. oxyspermus</i> Willd.	IT-ES	G.r	36003, 36173	4
<i>Thalictrum isopyroides</i> C.A.Mey.	IT	G.r	35926	4
<b>Resedaceae</b>				
<i>Reseda lutea</i> L.	IT-ES-M	He	35885, 36439	1, 4, 5
<b>Rhamnaceae</b>				

<i>Rhamnus pallasii</i> Fisch. & C.A.Mey.	IT-ES	Ph	s.n.	*
<b>Rosaceae</b>				
<i>Agrimonia eupatoria</i> L.	IT-ES-M	He	36766, 36830	1, 4
<i>Amygdalus spinosissima</i> Bunge. subsp. <i>turcomanica</i> (Lincz.) Browicz	IT	Ph	36085, 36441	4
<i>Cerasus microcarpa</i> (C.A.Mey.) Boiss. subsp. <i>microcarpa</i>	IT	Ph	36077, 36367, 36775	4
<i>C. pseudoprostrata</i> Pojark.	IT	Ch	36387, 36660, 36931	4
<i>Cotoneaster nummularius</i> Fisch. & C.A.Mey.	IT	Ph	36364, 36839	5
<i>Crataegus pseudoheterophylla</i> Pojark. subsp. <i>turkestanica</i> (Pojark.) K.I.Chri.	IT-ES	Ph	36923	4
<i>Geum urbanum</i> L.	IT-ES	He	36119, 36682	2, 4
<i>Rosa beggeriana</i> Schrenk	IT	Ph	36416, 37024	1, 4
<i>R. canina</i> L.	IT-ES-M	Ph	36415, 36675, 36836	1, 4
<i>R. persica</i> Michx. ex Juss.	IT	Ch	35967, 36201	1, 4
<i>Rubus caesius</i> L.	IT-ES-M	Ch	36672	4
<i>Sanguisorba minor</i> Scop.	IT-ES-M	He	36134	4
<b>Rubiaceae</b>				
<i>Asperula glomerata</i> (M.Bieb.) Griseb. subsp. <i>turcomanica</i> (Pobed.) Ehrend.	IT	He	36155, 36342	4
<i>Asperula setosa</i> Jaub. & Spach	IT	Th	36067, 36577	1
<i>Callipeltis cucullaria</i> (L.) DC.	IT-M	Th	36099, 36197	1, 4
<i>Crucianella gilanica</i> Trin.	IT	He	36590	1
<i>Cruciata taurica</i> (Pall. ex Willd.) Ehrend. subsp. <i>persica</i> (DC.) Ehrend.	IT	Ch	36384	1
<i>Galium aparine</i> L.	PL	Th	36122	1, 4
<i>G. humifusum</i> M. Bieb.	IT-M	He	36600, 36725	*
<i>G. spurium</i> L.	IT-ES-M	Th	36635	1
<i>G. tricornutum</i> Dandy	IT-ES-SS	Th	36123, 36156	1, 4
<i>Rubia florida</i> Boiss.	IT	Ch	35965, 36828	1
<b>Rutaceae</b>				
<i>Haplophyllum acutifolium</i> (DC.) G.Don	IT	He	36317, 36758	5
<b>Salicaceae</b>				
<i>Salix pycnostachya</i> N.J.Andersson	IT	Ph	35953, 36219	1, 4
<b>Santalaceae</b>				
<i>Thesium kotschyanum</i> Boiss.	IT	G.r	36604	1
<b>Scrophulariaceae</b>				
<i>Euphrasia pectinata</i> Ten.	IT-M	G.p	35877, 36176	*
<i>Leptorhabdos parviflora</i> (Benth.) Benth.	IT	Th	36596	4
<i>Linaria simplex</i> (Willd.) DC.	IT-M	Th	35893, 35959	*
<i>Scrophularia striata</i> Boiss.	IT	Ch	36644, 36941	1, 4
<i>S. umbrosa</i> Dumort.	IT-ES	Ch	36643, 36933	1, 4
<i>S. variegata</i> M.Bieb.	IT	Ch	36296	1, 4
<i>Verbascum cheiranthifolium</i> Boiss.	IT	He	36595, 36825	4
<i>V. macrocarpum</i> Boiss.	IT	He	36473, 37014	1
<i>Veronica anagallis-aquatica</i> L.	IT	G.r	36313, 36564, 36944	1, 4
<i>V. hederifolia</i> L.	IT-ES-M	Th	35929, 36115	1
<i>V. rubrifolia</i> Boiss.	IT	Th	35863	4
<b>Solanaceae</b>				
<i>Hyoscyamus pusillus</i> L.	IT-SS	He	35892	1, 4
<i>H. turcomanicus</i> Pojark.	IT	He	36023, 36294	*
<i>Solanum nigrum</i> L.	Cosm.	Th	37029	4, 5
<b>Tamaricaceae</b>				
<i>Myricaria germanica</i> (L.) Desv.	IT-ES	Ph	36626	4
<i>Tamarix ramosissima</i> Ledeb.	PL	Ph	36658	4, 5
<b>Thymelaeaceae</b>				
<i>Diarthron vesiculosum</i> C.A.Mey.	IT	Th	s.n.	1, 5
<b>Urticaceae</b>				

<i>Parietaria judaica</i> L.	IT-ES-M	Ch	s.n.	1, 4, 5
<i>Urtica dioica</i> L. subsp. <i>dioica</i>	Cosm.	He	36320	4, 5
<b>Valerianaceae</b>				
<i>Valeriana ficariifolia</i> Boiss.	IT	He	36198, 36351	1, 5
<i>Valerianella tuberculata</i> Boiss.	IT	Th	36012, 36092	5
<b>Verbenaceae</b>				
<i>Verbena officinalis</i> L.	PL	He	36841	4, 5
<b>Violaceae</b>				
<i>Viola occulta</i> Lehm.	IT	Th	35946, 36019	*
<b>Zygophyllaceae</b>				
<i>Peganum harmala</i> L.	IT-M-SS	He	s.n.	4
<i>Zygophyllum atriplicoides</i> Fisch. & C.A.Mey.	IT	Ch	s.n.	*

- Abbreviations as text and Figures 3 and 4, Geophytes more subdivided to G.b: bulbous, G.c: with corms, G.p: root parasit, G.r: rhizomatous, G.t: tuberous.
- Main collectors: F. Memariani, H. Zangoeei and Kh. Emadzade
- The numbers and symbols refer to: 1: Rechinger (1963-2008), 2: Ghahremaninejad *et al.* (2005), 3: Joharchi *et al.* (2007), 4: Ghahreman *et al.* (2006), 5: Assadi *et al.* (1988-2008), 6: Maassoumi (1986-2006), 7: Memariani *et al.* (2007), Fritsch *et al.* (2006), \* new records for Binalood mountain range, \*\* new records for Khorassan, \*\*\* new record for Iran.