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Research Paper

Flora of Mount Soffeh in Isfahan, Iran

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Abstract

The study area, Mount Soffeh in Isfahan, with an elevation range of 1700 to 2250 m, is situated at the southernmost tip of Isfahan city, making it one of the most significant mountains in Isfahan. This research aimed to discover the botanical diversity and floristic composition of this mountain. Accordingly, plant specimens were collected from various regions of Mount Soffeh during the growing season, from March 2021 to December 2023. According to this study, a total of 258 species were identified, belonging to 189 genera and 46 families. The largest identified families in the area, in order, include: Asteraceae with 57 species, Poaceae with 24 species, Brassicaceae with 18 species, Amaranthaceae with 15 species, Fabaceae with 15 species, Lamiaceae with 15 species, Boraginaceae with 13 species, Apiaceae with 11 species, and Caryophyllaceae with 8 species. The flora comprises 40 dicotyledon families, 4 monocotyledon families, one gymnosperm family, and one pteridophyte family. The life forms, according to the Raunkiaer system, include 37.2% Therophytes, 35.27% Hemicryptophytes, 16.27% Chamaephytes, 5.03% Phanerophytes, 5.41% Cryptophytes (Geophytes and Helophytes), and 0.77% Parasites. Furthermore, in terms of geographical distribution, 45.34% of the plants in this area are related to the Irano-Turanian area, with the rest belonging to two or more geographical points. Forty-four species are also endemic or sub-endemic to Iran. Our research represents a significant leap in understanding the botanical diversity of Mount Soffeh. While historical records documented approximately 100 species on Mount Soffeh until 2021, our study exposes a notable increase, with over 250 species identified. Particularly significant is the discovery of about 190 taxa reported for the first time on Mount Soffeh, emphasizing the importance of ongoing botanical exploration in the region. Additionally, we report the first documentation of *Tanacetum stapfianum* (Rech.f.) Podlech in Isfahan province and specifically on Mount Soffeh, expanding our knowledge of the regional flora. Despite the absence of grazing, Mount Soffeh faces threats from tourism, climbing, and infrastructure development such as roads and cable cars, endangering its delicate ecosystem and species diversity. Conservation measures are essential for the protection of Mount Soffeh's botanical richness for the future.

Keywords: Floristics, Biodiversity, Soffeh, Zagros, Iran

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Introduction

Iran, characterized by its predominantly mountainous topography, hosts two major mountain chains, namely the Alborz and Zagros ranges and isolated peaks such as Karkas, Shirkuh, and Kerman, are recognized for their exceptional species richness and high proportion of endemic species (Zohary, 1973). Vegetation cover in these areas plays a vital role in preserving the integrity of natural ecosystems, warranting studies aimed at protecting endangered species. Furthermore, understanding the patterns of plant diversity at the species level is fundamental for biodiversity conservation efforts in these regions (Naqinezhad *et al.*, 2009). Mountains serve as global biodiversity hotspots, harboring nearly a quarter of terrestrial biodiversity, with half of the world's biodiversity hotspots concentrated in these regions. (Mittermeier *et al.*, 2011). Iran, covering 1.6 million km², is characterized by elevated plateaus in southwest Asia, with approximately half of its landmass comprising highlands, plains, and extensive mountain ranges, including the Alborz, Zagros, Azerbaijan, Kopet Dag, and Makran ranges (Noroozi *et al.*, 2008).

The Zagros mountain range, spanning about 1400 km and covering an area of 323,000 km², is particularly significant, representing 20% of Iran's total land area. Stretching from northwest to southeast, the Zagros range encompasses diverse landscapes and habitats, with Mount Dena standing as its highest peak at 4409 m (Noroozi *et al.*, 2020). Recognized as one of the 35 global biodiversity hotspots, the Zagros range hosts a remarkable array of flora and fauna (Sloan *et al.* 2014). Isfahan province, situated on the eastern flank of the Zagros mountains, boasts rich plant diversity (Noroozi *et al.*, 2019).

Floristic studies play an important role in documenting vegetation diversity, assisting in environmental understanding, and facilitating conservation and management initiatives for natural areas (Memariani *et al.*, 2016). Several floristic studies have been undertaken in central Iran, particularly in Isfahan province, encompassing diverse ecosystems such as the Mouteh Wildlife Refuge, Vanak Semirom area, Chadegan, Afus area, and Golestankooch (Asri, 2008; Parishani, 2005; Yousofi *et al.*, 2011; Shirvani Shahenayati *et al.*, 2020; Akhavan Rooffigar & Bagheri, 2021, Mohammadi *et al.*, 2021).

Mount Soffeh, located south of Isfahan city and reaching an elevation of 2250 m, has historically attracted tourists due to its nearness to Isfahan. Notably, well-known European botanists such as Stapf, Kaempfer, Haussknecht, and Wendelbo have conducted botanical expeditions on Mount Soffeh since the 18th century, resulting in the collection of numerous plant specimens, including type specimens of Iran's flora (Akhavan Rooffigar & Borhani, 2022).

Regarding Mount Soffeh, a comprehensive study has not yet been conducted. Recently, Akhavan Rooffigar & Borhani (2022) compiled a list of plants collected from Mount Soffeh based on relevant literatures or specimens present in the SFAHAN herbarium in a review study. However, there remains a gap in our understanding of the botanical diversity and floristic composition of Mount Soffeh. This research aims to address this gap by preparing a comprehensive list of species and determining the floristic composition through a comparison of the species collected in this study with previous reports.

Materials and Methods

Study Area

Mount Soffeh, situated at an elevation range of 1700 to 2250 m at the southernmost tip of Isfahan city (Figure 1), is regarded as one of the most significant mountains in the province. Climatically, according to the Köppen classification, Mount Soffeh falls within the cold steppe zone. The average precipitation in this area is approximately 115 mm, and the mountain is situated in the steppe region. The average annual temperature ranges between 13 to 15 °C, aligning the plant elements of the region with the dry mountains of steppe areas. The highest precipitation occurs towards the end of winter (February) and the beginning of spring (March), reflecting the area's steppe climate (IRIMO).

Data Collection

Plant specimen collection was conducted throughout the growing season, from March 2021 to December 2023 across various regions of Mount Soffeh. Over 350 plant specimens were collected during this research, representing more than 250 species, all of which are now preserved in the Herbarium of the University of Isfahan (HUI). Specimens were identified using the main botanical references of Iran include: Flora Iranica (Rechinger, 1963–2015) and Flora of Iran (Assadi *et al.*, 1988–2023). Additionally, The International Plant Names Index (IPNI) and Plants of the World Online (POWO) were utilized to compile the list of identified species. The floristic list was then organized alphabetically. Endemic species of Iran found on Mount Soffeh were identified using Flora Iranica (Rechinger, 1963–2015) and the website www.powo.science.kew.org.



FIG. 1. Geographical location of Mount Soffeh in the south of Isfahan. (A) taken from Google Earth, (B) photo by the last author.



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Determining Life Forms and Chorotypes

For the classification of life forms, the Raunkiaer system (Raunkiaer, 1934) was utilized. Chorotypes were identified using authoritative sources (Zohary, 1973; Takhtajan, 1986). Chorotypes were categorized based on their distribution across one, two, or three regions. Those found in more than three regions were classified as pluriregional elements, while those with widespread distribution were categorized as cosmopolitan elements.

Results

The research conducted on the flora of Mount Soffeh exposes the presence of 258 plant species, distributed across 189 genera and 46 families. Of these families, 40 (86.95%) are dicotyledons, 4 (8.69%) are monocotyledons, one (2.17%) is a gymnosperm, and another (2.17%) is a pteridophyte. The most prominent families on Mount Soffeh include the Asteraceae with 57 species, Poaceae with 24 species, Brassicaceae with 18 species, Amaranthaceae, Fabaceae, and Lamiaceae each with 15 species, Boraginaceae with 13 species, Apiaceae with 11 species, and Caryophyllaceae with 8 species. Detailed in Table 1 are the species, categorized by family, alongside details on endemism, phytogeographical elements (chorotypes), life forms, and herbarium vouchers. Figure 2 displays a bar chart illustrating the number of genera within each family, while Figure 3 details the species count per family, including only those families that comprise more than one genus and species.

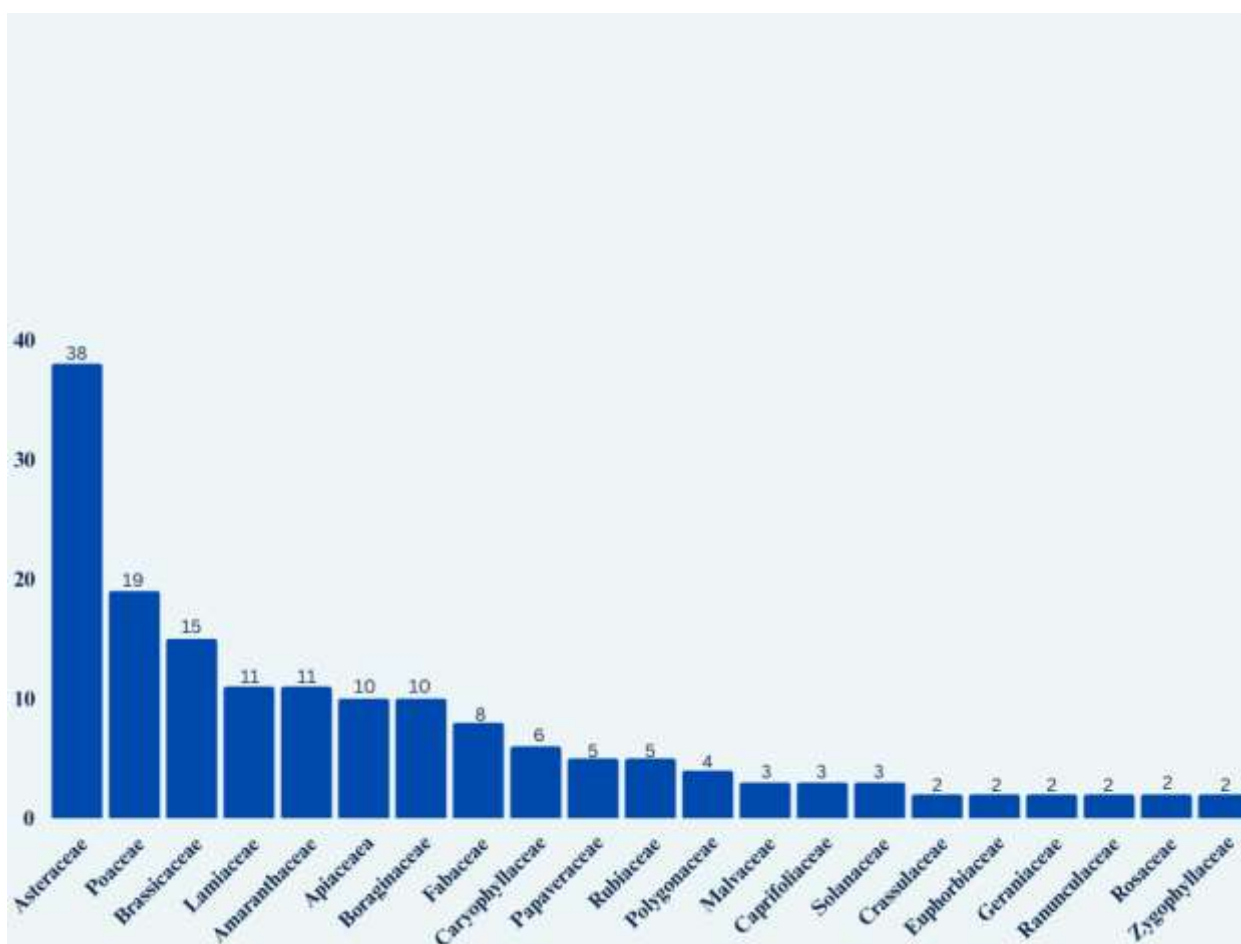


FIG. 2. Bar chart showing the number of genera belonging to each family on Mount Soffeh (only families with more than one genus are indicated).

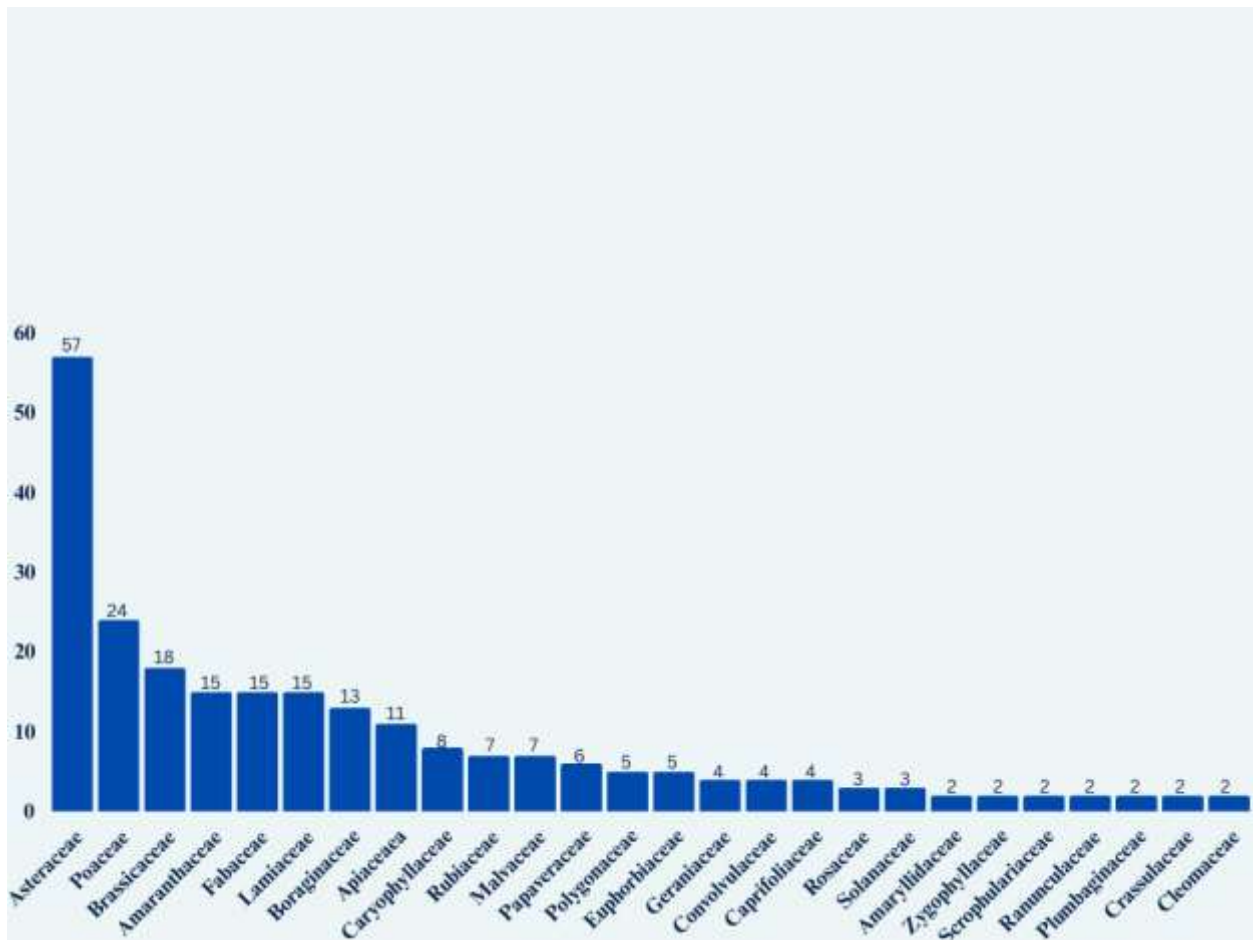


FIG. 3. Bar chart showing the number of species belonging to each family on Mount Soffeh (only families with more than one species are indicated).

The largest plant genera on Mount Soffeh include *Astragalus* L. (with 7 species) and *Atriplex* L., *Bromus* L., *Centaurea* L., *Echinops* L., *Euphorbia* L., *Tragopogon* L. (each with 4 species). In terms of life forms, the plants of the area comprise 96 therophyte species (37.2%), 91 hemicryptophyte species (35.27%), 42 chamaephyte species (16.27%), 13 phanerophyte species (5.03%), 13 geophyte species (5.03%), two parasite species (0.77%), and one helophyte species (0.38%). The geophyte and helophyte species are subcategories of the cryptophyte life form. Figure 4 displays the percentages of life forms in a pie chart.



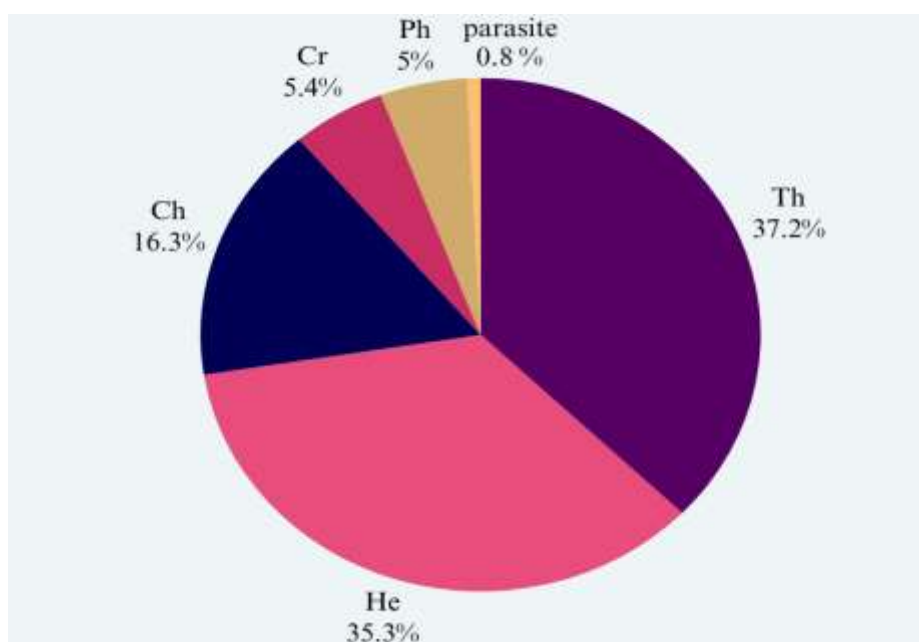


FIG. 4. Pie chart of the life form percentages of the species studied on Mount Soffeh.

Of the studied plants, 117 species (45.34%) belong to the Irano-Turanian phytogeographical region, 19 species (7.36%) to the Irano-Turanian, Saharo-Sindian regions, 18 species (6.97%) to the Irano-Turanian, Euro-Siberian regions, 17 species (6.58%) to the Irano-Turanian, Mediterranean regions, 20 species (7.75%) to the Irano-Turanian, Euro-Siberian, Mediterranean regions, 7 species (2.71%) to the Irano-Turanian, Saharo-Sindian, Mediterranean regions, 6 species (2.32%) to the Irano-Turanian, Euro-Siberian, Saharo-Sindian regions, 36 species (13.95%) belong to more than three phytogeographical regions (pluriregional), and 18 species (6.97%) are cosmopolitan. Figure 5 demonstrates the percentage of species belonging to each phytogeographical region in a pie chart.

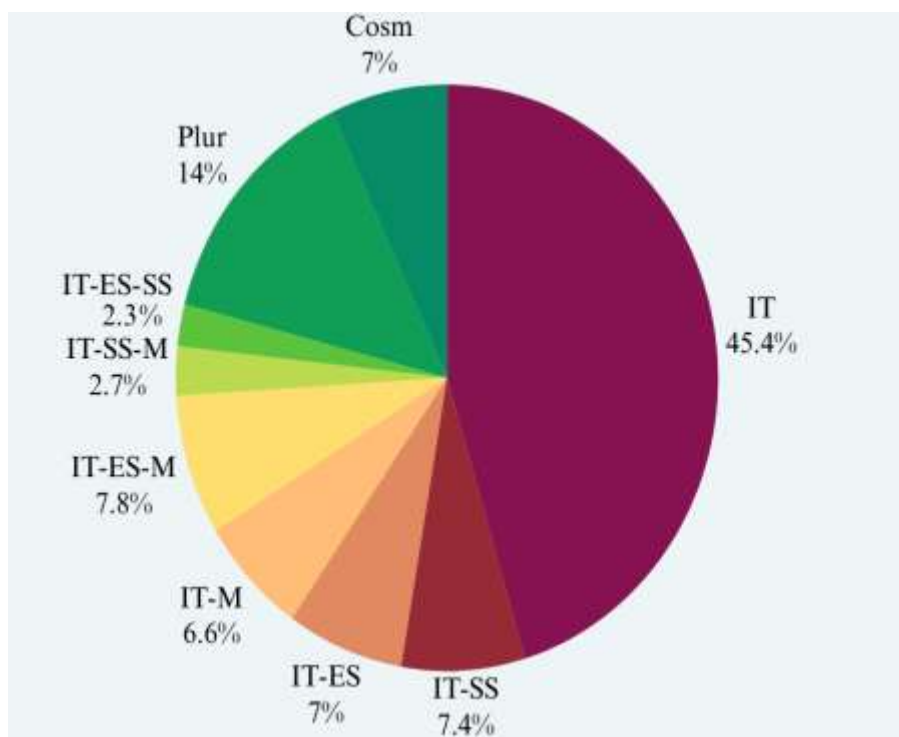


FIG. 5. Percentage of species belonging to each phytogeographic region: Irano-Turanian (IT), Irano-Turanian, Saharo-Sindian (IT-SS), Irano-Turanian, Euro-Siberian (IT-ES), Irano-Turanian, Mediterranean (IT-M), Irano-Turanian, Euro-Siberian, Mediterranean (IT-ES-M), Irano-Turanian, Saharo-Sindian, Mediterranean (IT-SS-M), Irano-Turanian, Euro-Siberian, Saharo-Sindian (IT-ES-SS), pluriregional (Plur), and cosmopolitan (Cosm).

Additionally, 45 species (17.44%) of the plants on Mount Soffeh are endemic or sub-endemic to Iran, accounting for 1.73% of all endemic and sub-endemic plants (2597 species) in Iran (Noroozi *et al.*, 2019). These species are distributed among families as follows: Asteraceae (14 species), Fabaceae and Apiaceae (each with 6 species), Lamiaceae and Brassicaceae (each with 3 species), Caryophyllaceae, Rosaceae, and Plumbaginaceae (each with 2 species), and Amaranthaceae, Amaryllidaceae, Boraginaceae, Malvaceae, Papaveraceae, Ranunculaceae, and Phyllanthaceae (each with one species). Among the endemic species, *Tanacetum stapfianum* (Rech.f.) Podlech, previously reported only in central regions of Fars province, was collected for the first time in Isfahan province and Mount Soffeh. Figure 6 shows some species in this mountain.



FIG. 6. Pictures of a number of species in Mount Soffeh. All photos are taken by the last author. A: *Allium bungei* Boiss., B: *Prangos uloptera* DC., C: *Pycnocycla spinosa* Decne., D: *Zosima absinthiifolia* (Vent.) Link, E: *Anthemis gayana* Boiss., F: *Centaurea ispahantica* Boiss., G: *Echinops cephalotes* DC., H: *Jurinea carduiformis* (Jaub. & Spach) Boiss.

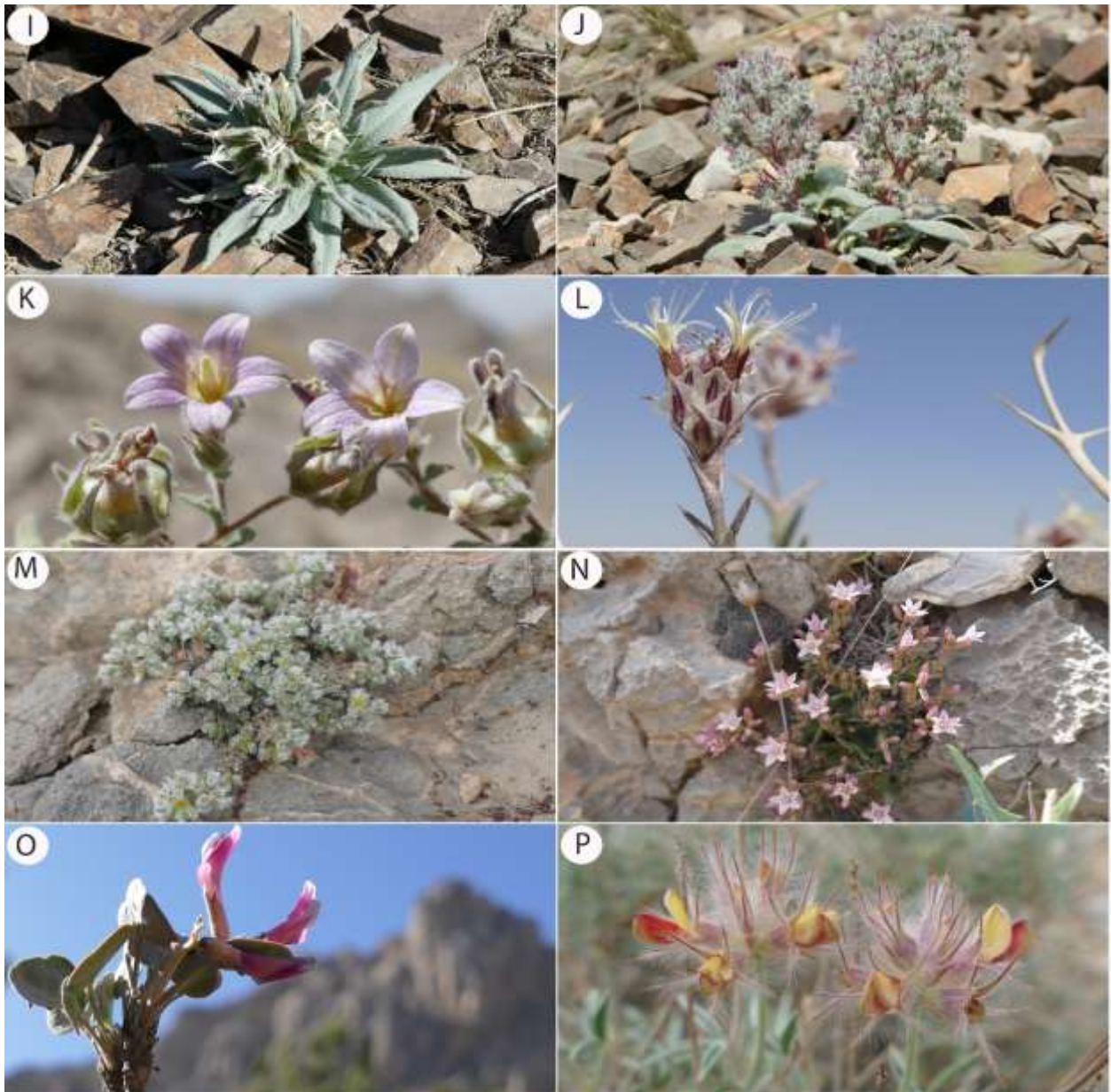


FIG. 6. continued. I: *Caccinia macranthera* Brand, J: *Heliocarya monandra* Bunge, K: *Campanula incanescens* Boiss., L: *Acanthophyllum bracteatum* Boiss., M: *Paronychia kurdica* Boiss., N: *Rosularia elymaitica* A.Berger, O: *Astragalus supervisus* E.Sheld., P: *Ebenus stellata* Boiss.

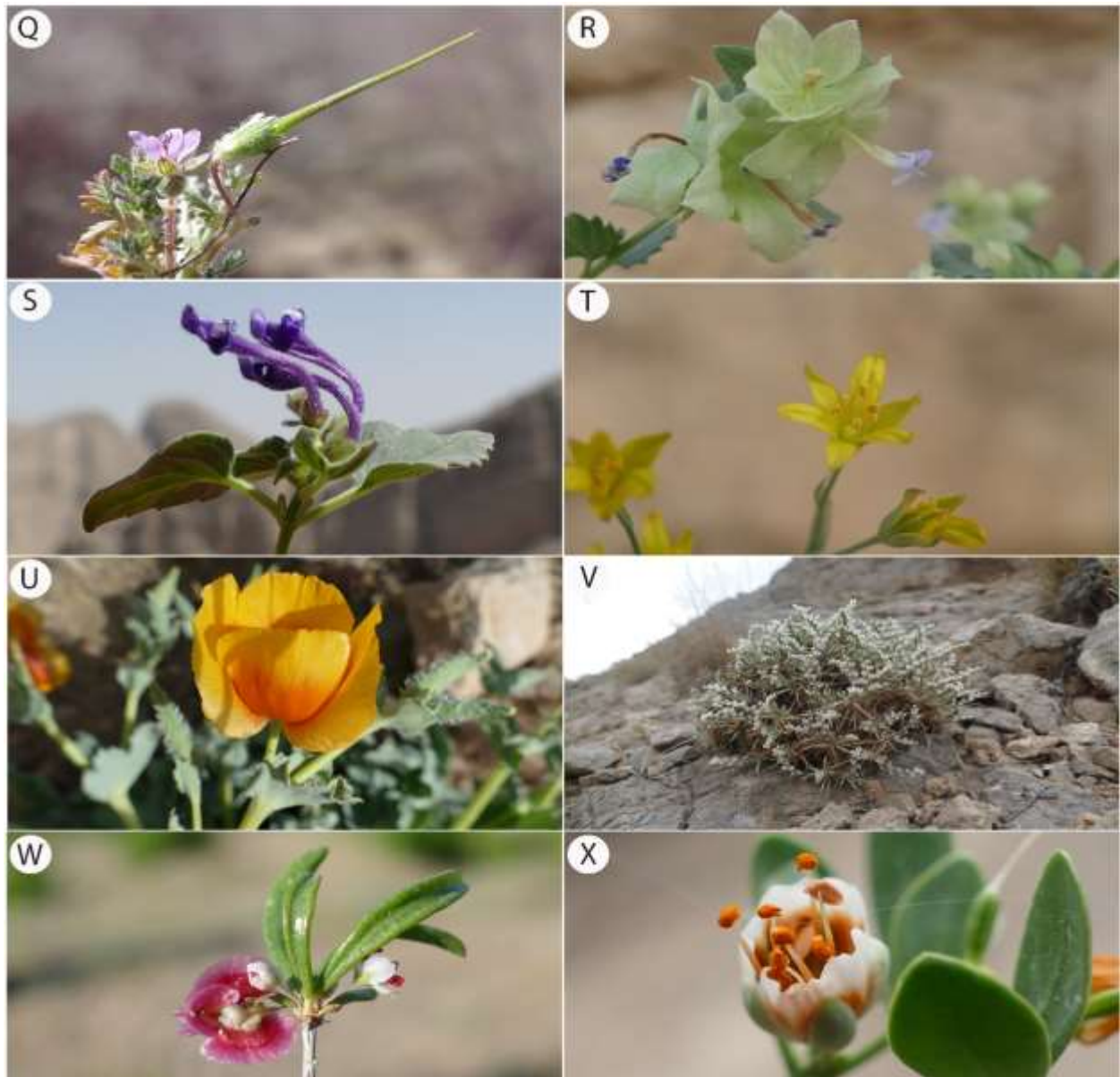


FIG. 6. continued. Q: *Erodium cicutarium* (L.) L'Hér., R: *Nepeta bituminosa* (Fisch. & C.A.Mey.) Jamzad & Serpoosh., S: *Scutellaria xylorrhiza* Bornm., T: *Gagea gageoides* (Zucc.) Vved., U: *Glaucium calycinum* Boiss., V: *Acantholimon aspadanum* Bunge, W: *Pteropyrum aucheri* Jaub. & Spach, X: *Zygophyllum fabago* L.

Discussion

This research on Mount Soffeh's flora, which reports the presence of 258 species across 189 genera and 46 families, indicates the high species richness of this area. Comparing these results with other floristic studies in Isfahan province shows that the order of families mentioned is more or less consistent across studies, indicating the dominance of these families in the region. The genus *Astragalus*, with 7 species, is the largest on Mount Soffeh, attributed to its adaptation to mountainous regions and cold, dry climatic conditions (Bagheri *et al.*, 2023). This genus is also the largest genus in Isfahan province with 202 taxa (Akhavan *et al.*, 2019). The dominance of therophytes (37.2%) is influenced by various factors, with human intervention in vegetation cover being a significant contributor. Activities such as deforestation and urbanization often lead to a decline in plant abundance, subsequently affecting soil moisture levels (Ghahremaninejad & Agheli, 2009). Given the dry seasons and insufficient rainfall on Mount Soffeh, hemicryptophytes (35.3%) are abundantly observed and represent the most resilient life form, constituting a substantial proportion of the perennial and persistent vegetation of Mount Soffeh. The prevalent presence of Asteraceae species indicates environmental degradation (Pairanj *et al.*, 2011; Saberi *et al.*, 2010).

Another recent study related to Mount Soffeh's vegetation is a review study that examines and reports all plants collected from Mount Soffeh in relevant sources (Akhavan & Borhani, 2022). According to this, prior to the current research, the number of plant



species collected by old botanists (such as Wendelbo, Stapf, Kapherr) from Mount Soffeh, according to Flora Iranica and Flora of Iran, is 51 species. Additionally, the list of plant species from Mount Soffeh available in Isfahan's herbaria is 68 species, totaling about 100 species reported from Mount Soffeh since the 18th century until 2021.

During the present research, the number of identified species has increased to more than 2.5 times, with approximately 190 species reported for the first time on Mount Soffeh, a significant increase. However, about 30 species previously documented (Akhavan & Borhani, 2022) from Mount Soffeh were not found in this study, indicating their disappearance likely due to factors such as drought, land-use changes from mountainous areas to green spaces, destruction of native species' habitats, construction activities across Mount Soffeh, and pressure from the tourist population. Despite being free from grazing, Mount Soffeh faces excessive pressure from tourism, climbing, hiking, road construction, and building activities for tourists, such as cable car installations, which could potentially lead to a decrease in species diversity in this area (Figure 7).

These factors have altered the ecological balance of the region's vegetation. For example, artificial irrigation in natural habitats has led to an increase in non-native species such as *Bidens bipinnata* L., *Erigeron bonariensis* L., and *Erigeron canadensis* L., which typically grow in the high-rainfall areas of the northern country. Additionally, the destruction of natural habitats has increased invasive species such as *Echinops sphaerocephalus* L. and *Tribulus terrestris* L.. These species, which are mostly cosmopolitan, grow in degraded soils and over time replace the native species of the region. The extensive planting of coniferous trees such as *Pinus* spp., *Hesperocyparis arizonica* (Greene) Bartel, *Platycladus orientalis* (L.) Franco and *Juniperus sabina* L. in various parts of Mount Soffeh has changed the soil acidity, preventing the growth of native species in the understory of these trees (Figure 7).

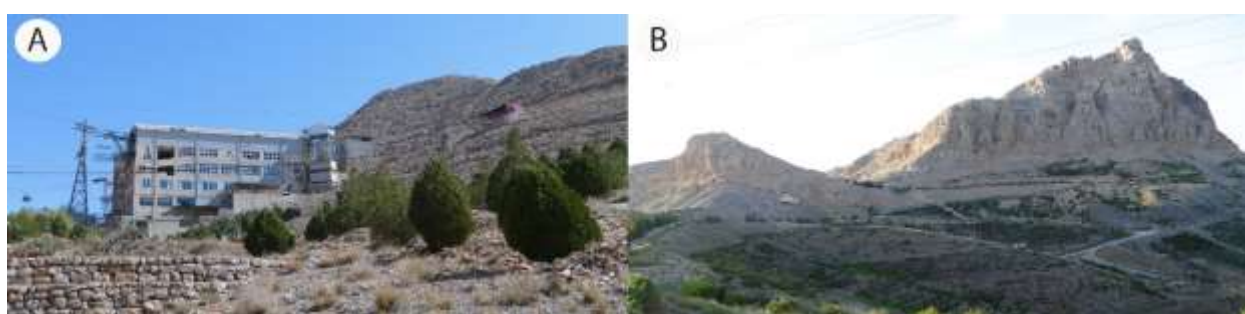


FIG. 7. Human activities in Mount Soffeh: A) building related to the cable car B) routes available for climbers.

The vegetation types reported on Mount Soffeh are *Stipa hohenackeriana* Trin. & Rupr., *Artemisia sieberi* Besser, and *Acantholimon Scorpius* Boiss. (Feizi et al., 2018). During field surveys in 2021-2022, due to the lack of rainfall, the vegetation types of the mentioned species were not observed, but others were documented in spring 2023 following suitable winter rainfall. The main composition of these vegetation types includes the perennial plants *Stipa hohenackeriana* and *Demavendia pastinacifolia* (Boiss. & Hausskn.) Pimenov (Figure 8).

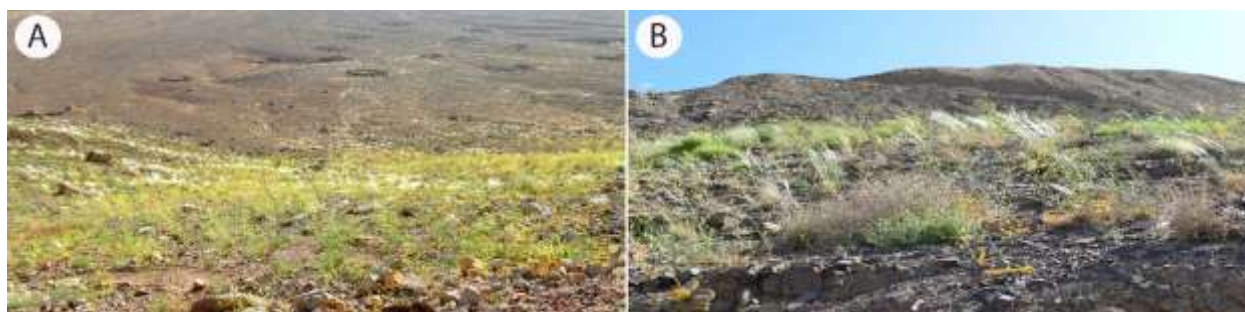


FIG. 8. The main vegetation types in Mount Soffeh. (A) *Demavendia pastinacifolia* and (B) *Stipa hohenackeriana*.

In conclusion, the comprehensive botanical study of Mount Soffeh has significantly expanded our understanding of its flora, revealing a rich biodiversity with a variety of life forms adapted to its unique climatic conditions. These findings highlight the serious need for conservation efforts to preserve this unique ecological treasure and highlight the importance of Mount Soffeh as a key area for biodiversity in Isfahan. Given its closeness to the urban center of Isfahan, it is imperative to implement measures for the protection and sustainable management of species in Mount Soffeh, balancing the demands of urban development with the preservation of its natural habitats.

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Table 1 - Floristic list, chorotypes, life forms, and herbarium numbers of the plants of Mount Soffeh. Species marked with * are endemic and sub-endemic to Iran. All herbarium specimens are kept at HUI.

No.	Taxon	Chorotype	Life form	Voucher No.
Amaranthaceae				
1	<i>Amaranthus spinosus</i> L.	Cosm	Th	23698
2	<i>Anabasis haussknechtii</i> Bunge ex Boiss. (= <i>Anabasis iranica</i> Iljin)	IT	Ch	23699
3	<i>Atriplex canescens</i> (Pursh) Nutt.	Plur	Ch	23700-23701
4	<i>Atriplex griffithii</i> Moq.	IT	Ch	23702-23703
5	<i>Atriplex lentiformis</i> (Torr.) S.Watson	Plur	Ch	23704
6	<i>Atriplex turcomanica</i> (Moq.) Boiss. (= <i>Atriplex leucoclada</i> Boiss.)	IT/SS	Ch	23705
7	<i>Bassia eriophora</i> (Schrad.) Asch. (= <i>Londesia eriantha</i> Fisch. & C.A.Mey.)	IT/SS/M	Th	23706
8	<i>Bassia scoparia</i> (L.) A.J.Scott (= <i>Kochia scoparia</i> (L.) Schrad.)	Plur	Th	23707
9	<i>Chenopodium album</i> L.	Plur	Th	23710-23711
10	<i>Halothamnus auriculus</i> (Moq.) Botsch. (= <i>Aellenia auricula</i> (Moq.) Ulbr.)	IT	Ch	23712-23713
11	<i>Kaviria tomentosa</i> (Moq.) Akhani (= <i>Salsola tomentosa</i> (Moq.) Spach)	IT/SS	He	23708-23709
12	<i>Noaea mucronata</i> (Forssk.) Asch. & Schweinf.	IT/M	He	23714
13	<i>Oreosalsola montana</i> (Litv.) Akhani (= <i>Salsola montana</i> Litv.)	IT	Ch	23715
14	<i>Salsola kali</i> L.	IT/ES/SS	Th	23716-23717
15	<i>Soda kernerii</i> (Wol.) Akhani*	IT	Ch	25697
Amaryllidaceae				
16	<i>Allium atroviolaceum</i> Boiss.	IT	Ge	25700
17	<i>Allium bungei</i> Boiss.*	IT	Ge	23718
Anacardiaceae				
18	<i>Pistacia vera</i> L.	IT	Ph	23719
Apiaceae				
19	<i>Demavendia pastinacifolia</i> (Boiss. & Hausskn.) Pimenov*	IT	He	23720-23721
20	<i>Echinophora platyloba</i> DC.*	IT	He	23722
21	<i>Elwendia persica</i> (Boiss.) Pimenov & Kljuykov (= <i>Bunium persicum</i> (Boiss.) B.Fedtsch.)	IT	Ge	23723(A-B)
22	<i>Eryngium bungei</i> Boiss.	IT	He	23724-23725(A-B)
23	<i>Ferula assa-foetida</i> L. *	IT	He	23726
24	<i>Pimpinella deverroides</i> Boiss.*	IT	He	23727(A-B)-23728
25	<i>Prangos cheilanthifolia</i> Boiss.*	IT	He	23729
26	<i>Prangos uloptera</i> DC.	IT	He	23730-23731
27	<i>Pycnocycla spinosa</i> Decne.*	IT	Ch	23732(A-B)-23733(A-B)
28	<i>Scandix stellata</i> Banks & Sol.	IT/M	Th	23734-23735
29	<i>Zosima absinthiifolia</i> (Vent.) Link	IT/ES	He	23736-23737
Apocynaceae				
30	<i>Cynanchum acutum</i> L.	Plur	Ch	23738(A-B)
Asteraceae				
31	<i>Achillea wilhelmsii</i> K.Koch	IT	He	23739
32	<i>Anthemis gayana</i> Boiss.*	IT	Th	23740
33	<i>Anthemis odontostephana</i> Boiss.	IT	Th	23741-23742
34	<i>Artemisia sieberi</i> Besser	IT/SS	Ch	23743

35	<i>Atractylis cancellata</i> L.	IT/M	Th	23744
36	<i>Bidens bipinnata</i> L.	Plur	Th	23745-23746
37	<i>Carduus arabicus</i> Jacq.	IT/SS	Th	23747
38	<i>Carthamus oxyacanthus</i> M.Bieb.	IT	Th	23748
39	<i>Centaurea bruguieriana</i> (DC.) Hand.-Mazz.	IT/SS	Th	23749
40	<i>Centaurea depressa</i> M.Bieb.	IT/ES	Th	23750
41	<i>Centaurea gaubae</i> (Bornm.) Wagenitz*	IT	He	23751
42	<i>Centaurea ispahanica</i> Boiss.*	IT	He	23752
43	<i>Cicerbita persica</i> Beauverd (= <i>Steptorhamphus persicus</i> O.Fedtsch. & B.Fedtsch.)	IT	He	23753
44	<i>Cousinia cylindracea</i> Boiss.*	IT	He	23755
45	<i>Crepis kotschyana</i> Boiss.	IT	Th	23756-23757
46	<i>Echinops acantholepis</i> Jaub. & Spach (= <i>Acantholepis</i> <i>orientalis</i> Less.)	IT	Th	23758-23759
47	<i>Echinops cephalotes</i> DC.*	IT	He	23760
48	<i>Echinops ceratophorus</i> Boiss.*	IT	He	23761
49	<i>Echinops sphaerocephalus</i> L.	Plur	He	23762
50	<i>Erigeron bonariensis</i> L. (= <i>Conyza bonariensis</i> (L.) Cronquist)	Plur	Th	23763
51	<i>Erigeron canadensis</i> L. (= <i>Conyza canadensis</i> (L.) Cronquist)	Cosm	Th	23764-23765
52	<i>Filago arenaria</i> (Smoljan.) Chrtek & Holub	IT	Th	23766
53	<i>Helichrysum artemisioides</i> Rech.f.*	IT	Ch	23767
54	<i>Hertia angustifolia</i> Kuntze*	IT	Ch	23768
55	<i>Jurinea berardioides</i> (Boiss.) O.Hoffm. (= <i>Aegopordon</i> <i>berardioides</i> Boiss.)	IT	He	23769
56	<i>Jurinea carduiiformis</i> (Jaub. & Spach) Boiss. (= <i>Outreya carduiiformis</i> Jaub. & Spach)	IT	He	23770
57	<i>Lactuca orientalis</i> Boiss. (= <i>Scariola orientalis</i> (Boiss.) Soják)	IT/ES/M	He	23771
58	<i>Lactuca serriola</i> L.	IT/ES/M	Th	23772
59	<i>Lactuca undulata</i> Ledeb.	IT/ES	Th	23773
60	<i>Launaea acanthodes</i> (Boiss.) Kuntze	IT/SS	Ch	23774
61	<i>Leuzea repens</i> (L.) D.J.N.Hind (= <i>Acroptilon repens</i> (L.) DC.)	Cosm	Th	23775
62	<i>Lophiolepis spectabilis</i> (DC.) Bureš, Del Guacchio, Iamónico & P.Caputo (= <i>Cirsium spectabile</i> DC.)*	IT	He	23754
63	<i>Onopordum heteracanthum</i> C.A.Mey.	IT	Ch	23776
64	<i>Pentanema persicum</i> (DC.) D.Gut.Larr., Santos-Vicente, Anderb., E.Rico & M.M.Mart.Ort. (= <i>Varthemia persica</i> DC.)	IT	He	23777
65	<i>Phagnalon nitidum</i> Fresen.	IT	He	23778-23779
66	<i>Picris strigosa</i> M.Bieb.	IT	He	23780-23781
67	<i>Pseudopodospermum mucidum</i> (Rech.f., Aellen & Esfand.) Zaika, Sukhor. & N.Kilian (= <i>Scorzonera mucida</i> Rech.f., Aellen & Esfand.)	IT	Ge	23790
68	<i>Psychrogeton amorphoglossus</i> (Boiss.) Novopokr.	IT	He	23782
69	<i>Pulicaria gnaphalodes</i> (Vent.) Boiss.	IT/SS	Ch	23784
70	<i>Pulicaria undulata</i> (L.) C.A.Mey. (= <i>Francoeuria undulata</i> (L.) Lack)	Plur	Ch	23785
71	<i>Ramaliella intricata</i> (Boiss.) Zaika, Sukhor. & N.Kilian (= <i>Scorzonera intricata</i> Boiss.)*	IT/SS	Ch	23786
72	<i>Ramaliella tortuosissima</i> (Boiss.) Zaika, Sukhor. & N.Kilian (= <i>Scorzonera tortuosissima</i> Boiss.)	IT/SS	Ch	23787-23788-23789



73	<i>Scorzonera paradoxa</i> Fisch. & C.A.Mey. ex DC.	IT	He	25699
74	<i>Senecio vernalis</i> Waldst. & Kit.	IT/ES	Th	23791-23792
75	<i>Siebera nana</i> (DC.) Bormm.	IT	Th	23793
76	<i>Sonchus maritimus</i> L.	IT/ES/M	He	23794
77	<i>Sonchus oleraceus</i> L.	Plur	He	23795
78	<i>Symphyotrichum squamatum</i> (Spreng.) G.L.Nesom (= <i>Conyzanthus squamatus</i> (Spreng.) Tamamsch.)	Plur	He	23796
79	<i>Tanacetum parthenium</i> Sch.Bip.	Cosm	He	23797(A-B)
80	<i>Tanacetum stapfianum</i> (Rech.f.) Podlech*	IT	He	23798(A-B)
81	<i>Tanacetum uniflorum</i> Sch.Bip.	IT	Ch	23799
82	<i>Tragopogon caricifolius</i> Boiss.*	IT	He	23800
83	<i>Tragopogon collinus</i> DC.	IT	He	23801-23802(A-B)
84	<i>Tragopogon graminifolius</i> DC.	IT	He	23803
85	<i>Tragopogon vvedenskyi</i> Popov	IT	He	23804
86	<i>Xylanthemum lingulatum</i> (Boiss.) K.Bremer & Humphries (= <i>Tanacetum lingulatum</i> (Boiss.) Bormm.)*	IT	He	23805-23806
87	<i>Zoegea purpurea</i> Fresen.	IT/SS	Th	23807
Boraginaceae				
88	<i>Anchusa azurea</i> var. <i>azurea</i> (= <i>Anchusa italica</i> Retz.)	Plur	He	23809
89	<i>Anchusa ovata</i> Lehm.(= <i>Anchusa arvensis</i> subsp. <i>orientalis</i> (L.) Nordh.)	IT/ES	Th	23808(A-B)
90	<i>Asperugo procumbens</i> L.	Cosm	Th	23828
91	<i>Caccinia macranthera</i> Brand	IT	He	23810
92	<i>Heliocarya monandra</i> Bunge*	IT	He	23811-23812
93	<i>Heliotropium aucheri</i> DC.	IT/ES	He	23813
94	<i>Lappula barbata</i> Gürke	IT/ES	Th	23814-23815
95	<i>Lappula semiglabra</i> (Ledeb.) Gürke	IT/ES/M	Th	23829
96	<i>Lappula spinocarpos</i> (Forssk.) Asch. ex Kuntze	IT/SS	Th	23816
97	<i>Myosotis stricta</i> Link ex Roem. & Schult.	Plur	Th	23817
98	<i>Nonea caspica</i> G.Don	IT	Th	23818-23819-23820
99	<i>Paracaryum rugulosum</i> Boiss.	IT/ES/SS	He	23821-23822-23823-23824
100	<i>Pseudolappula sinaica</i> (A.DC.) Khoshokhan, Sherafati & Kaz.Osaloo (= <i>Lappula sinaica</i> (A.DC.) Asch. & Schweinf.)	IT/SS	Th	23825-826-827
Brassicaceae				
101	<i>Alyssum desertorum</i> Stapf	Cosm	Th	23830
102	<i>Brassica deflexa</i> Boiss.	IT	Th	23831-23832-23833
103	<i>Clypeola jonthlaspi</i> L.	IT/ES/M	Th	23834-23835
104	<i>Descurainia sophia</i> (L.) Webb ex Prantl	IT/ES/M	He	23836
105	<i>Eruca sativa</i> Mill.	Plur	Th	23837
106	<i>Goldbachia laevigata</i> DC.	IT/ES	Th	23838
107	<i>Isatis glastifolia</i> (Fisch. & C.A.Mey.) Al-Shehbaz, Moazzeni & Mumm. (= <i>Sameraria stylophora</i> (Jaub. & Spach) Boiss.)	IT	Th	23839-23840
108	<i>Lepidium draba</i> L. (= <i>Cardaria draba</i> (L.) Desv.)	IT/ES	He	23841
109	<i>Lepidium latifolium</i> L.	IT/ES/SS	Th	23842
110	<i>Matthiola chenopodiifolia</i> Fisch. & C.A.Mey.	IT	Th	23843
111	<i>Matthiola tomentosa</i> Bél. (= <i>Matthiola ovatifolia</i> Boiss.)*	IT	He	23844-23845-23846
112	<i>Moriera spinosa</i> Boiss. (= <i>Aethionema spinosum</i> (Boiss.) Prantl)	IT	Ch	23847

113	<i>Odontarrhena bracteata</i> (Boiss. & Buhse) Španiel, Al-Shehbaz, D.A.German & Marhold (= <i>Alyssum bracteatum</i> Boiss. & Buhse)*	IT	He	23848
114	<i>Pseudocamelina campylocarpa</i> (Boiss.) N.Busch*	IT	He	25694(A-B)
115	<i>Rapistrum rugosum</i> (L.) All.	IT/SS/M	Th	23849(A-B)
116	<i>Sisymbrium irio</i> L.	Plur	Th	23850-23851-23852-23853-23854
117	<i>Sisymbrium loeselii</i> L.	IT	He	23855
118	<i>Strigosella africana</i> (L.) Botsch.	Plur	Th	23856-23857-23858
Campanulaceae				
119	<i>Campanula incanescens</i> Boiss.	IT/ES	He	23856-857
Capparaceae				
120	<i>Capparis spinosa</i> L.	Plur	Ch	23858
Caprifoliaceae				
121	<i>Lomelosia flavida</i> (Boiss. & Hausskn.) Soják (= <i>Scabiosa flavida</i> Boiss. & Hausskn.)	IT	Th	23859
122	<i>Lomelosia olivieri</i> (Coul.) Greuter & Burdet (= <i>Scabiosa olivieri</i> Coul.)	IT	Th	23860-861
123	<i>Ptercephalus canus</i> Coult. ex DC.	IT	He	23783
124	<i>Valeriana dentata</i> All.	IT/M/ES	Th	23862-23863(A-B)
Caryophyllaceae				
125	<i>Acanthophyllum bracteatum</i> Boiss.	IT	Ch	23864-23865
126	<i>Acanthophyllum glandulosum</i> Bunge ex Boiss.	IT	Ch	23866-23867
127	<i>Gypsophila acantholimoides</i> Bornm.*	IT	Ch	23868
128	<i>Gypsophila pilosa</i> Huds.	IT	Th	23869
129	<i>Holosteum umbellatum</i> subsp. <i>glutinosum</i> (M.Bieb.) Nyman (= <i>Holosteum glutinosum</i> (M.Bieb.) Fisch. & C.A.Mey.)	IT/SS	Th	23870-23871
130	<i>Minuartia meyeri</i> Bornm.	IT/ES/SS	Th	23872
131	<i>Paronychia kurdica</i> Boiss.	IT	He	23873
132	<i>Silene elymaitica</i> Bornm.*	IT	Ch	23874
Cistaceae				
133	<i>Helianthemum ledifolium</i> (L.) Mill.	IT/M	Th	25695
Cleomaceae				
134	<i>Cleome coluteoides</i> Boiss. (= <i>Buhsea trinervia</i> (DC.) Stapf)	IT	He	23875
135	<i>Cleome iberica</i> DC.	IT/M	Th	23876(A-B)
Convolvulaceae				
136	<i>Convolvulus arvensis</i> L.	Cosm	Th	23877
137	<i>Convolvulus fruticosus</i> Pall.	IT	Ph	23878
138	<i>Convolvulus pilosellifolius</i> Desr.	IT/SS/M	Ch	23879
139	<i>Cuscuta campestris</i> Yunck.	Plur	Parasite	25698
Crassulaceae				
140	<i>Rosularia elymaitica</i> A.Berger	IT	He	23880-23881
141	<i>Umbilicus tropaeolifolius</i> Boiss.	IT	Ge	23882
Cyperaceae				
142	<i>Scirpoides holoschoenus</i> (L.) Soják	Plur	Hel	23883
Ephedraceae				
143	<i>Ephedra sarcocarpa</i> Aitch. & Hemsl.	IT	Ph	23884



Euphorbiaceae				
144	<i>Chrozophora tinctoria</i> (L.) A.Juss.	IT/SS	Th	23885
145	<i>Euphorbia chamaesyce</i> L.	IT/M	Th	23886
146	<i>Euphorbia helioscopia</i> L.	Plur	Th	23887-23888
147	<i>Euphorbia heteradena</i> Jaub. & Spach	IT/M	He	23889
148	<i>Euphorbia microsciadia</i> Boiss.	IT	He	23890
Fabaceae				
149	<i>Alhagi maurorum</i> Medik. (= <i>Alhagi persarum</i> Boiss. & Buhse)	IT	He	23891
150	<i>Astragalus glaucacanthos</i> Fisch.*	IT	Ch	23892-23894
151	<i>Astragalus gossypinus</i> Fisch.	IT	Ch	23893
152	<i>Astragalus mucronifolius</i> Boiss.*	IT	Ch	23895
153	<i>Astragalus myriacanthus</i> Boiss.*	IT	Ch	23896
154	<i>Astragalus supervisus</i> E.Sheld.*	IT	Ch	23897-23898
155	<i>Astragalus tribuloides</i> Delile	IT/M	Th	23899
156	<i>Astragalus vanillae</i> Boiss.*	IT	Ch	23900-23901
157	<i>Chesneya astragalina</i> Jaub. & Spach*	IT	He	23902
158	<i>Ebenus stellata</i> Boiss.	IT	Ch	23903
159	<i>Medicago sativa</i> L.	Plur	He	23904
160	<i>Melilotus indicus</i> (L.) All.	IT	Th	23905
161	<i>Sophora mollis</i> (Royle) Graham ex Baker	IT/china	Ph	23906
162	<i>Vicia michauxii</i> Biehler	IT	Th	23907
163	<i>Vicia sativa</i> L.	Cosm	Th	23910
Geraniaceae				
164	<i>Erodium cicutarium</i> (L.) L'Hér.	IT/ES/M	Th	23912-23913
165	<i>Erodium neuradifolium</i> Delile ex Godr.	Plur	Th	23914
166	<i>Erodium oxyrhinchum</i> M.Bieb.	IT/M	Th	23911
167	<i>Geranium rotundifolium</i> L.	IT/ES/M	Th	23915-23916
Lamiaceae				
168	<i>Clinopodium graveolens</i> Kuntze (= <i>Acinos graveolens</i> (M.Bieb.) Link)	IT/ES	Th	23917
169	<i>Marrubium vulgare</i> L.	IT/ES	He	23918-23919
170	<i>Mentha longifolia</i> (L.) Huds.	Plur	He	23920
171	<i>Nepeta bituminosa</i> (Fisch. & C.A.Mey.) Jamzad & Serpoosh. (= <i>Hymenocrater bituminosus</i> Fisch. & C.A.Mey.)	IT/ES	Ch	23921-23922
172	<i>Nepeta bracteata</i> Benth.	IT	Th	23958
173	<i>Nepeta persica</i> Boiss.*	IT	He	23923-23924-23925
174	<i>Phlomooides molucelloides</i> (Bunge) Salmaki (= <i>Eremostachys macrophylla</i> Montbret & Aucher ex Benth.)	IT/ES	Ge	23926
175	<i>Salvia reuteriana</i> Boiss.*	IT	He	23927-23928
176	<i>Salvia spinosa</i> L.	IT/SS/M	He	23931-23932-23933
177	<i>Scutellaria xylorrhiza</i> Bornm.*	IT	He	23929-23930
178	<i>Stachys inflata</i> Benth.	IT/ES/SS	He	23934-23935
179	<i>Teucrium polium</i> L.	IT/M	He	23936
180	<i>Zataria multiflora</i> Boiss.	IT/SS	Ch	23937-23938
181	<i>Ziziphora clinopodioides</i> Lam.	IT/ES	Ch	23939(A-B)
182	<i>Ziziphora tenuior</i> L.	IT/ES/M	Th	23940

Liliaceae				
183	<i>Gagea gageoides</i> (Zucc.) Vved.	IT	Ge	23941
Malvaceae				
184	<i>Alcea aucheri</i> Alef.	IT	He	23942
185	<i>Alcea koelzii</i> I.Riedl*	IT	He	23943
186	<i>Alcea rosea</i> L.	Plur	He	25701
187	<i>Hibiscus trionum</i> L.	Cosm	Th	23947
188	<i>Malva ludwigii</i> (L.) Soldano, Banfi & Galasso (= <i>Althaea ludwigii</i> L.)	IT/SS/cape	He	23944
189	<i>Malva neglecta</i> Wallr.	IT/ES/M	He	23945
190	<i>Malva sylvestris</i> L.	IT/ES/M	He	23946
Moraceae				
191	<i>Ficus carica</i> subsp. <i>rupestris</i> (Hausskn. ex Boiss.) Browicz	IT/ES/M	Ph	23948
Nitrariaceae				
192	<i>Peganum harmala</i> L.	IT/ES/M	He	23949
Orobanchaceae				
193	<i>Orobanche aegyptiaca</i> Pers.	Plur	Parasite	23680(A-B)
Papaveraceae				
194	<i>Fumaria vaillantii</i> Loisel.	IT/ES/M	Th	23950
195	<i>Glaucium calycinum</i> Boiss.*	IT	He	23953
196	<i>Glaucium elegans</i> Fisch. & C.A.Mey.	IT	Th	23951-23952
197	<i>Hypecoum pendulum</i> L.	IT/ES	Th	23954
198	<i>Papaver decaisnei</i> Hochst. & Steud. ex Elkan	IT/SS/M	Th	23955-23956
199	<i>Roemeria hybrida</i> (L.) DC.	IT/SS	Th	23957
Phyllanthaceae				
200	<i>Andrachne fruticulosa</i> Boiss.*	IT	Ch	23959
Plantaginaceae				
201	<i>Plantago lanceolata</i> L.	Plur	He	23960
Plumbaginaceae				
202	<i>Acantholimon aspadanum</i> Bunge*	IT	Ch	23961
203	<i>Acantholimon scorpius</i> Boiss.*	IT	Ch	23962-23963
Poaceae				
204	<i>Achnatherum parviflorum</i> (Desf.) M.Nobis (= <i>Stipa parviflora</i> Desf.)	IT/M	He	23964-23965
205	<i>Aeluropus littoralis</i> (Gouan) Parl.	Cosm	Ge	23966
206	<i>Avena fatua</i> L.	Plur	Th	23967
207	<i>Bromus danthoniae</i> Trin. ex C.A.Mey.	IT/SS	Th	23968
208	<i>Bromus madritensis</i> L.	IT/ES/SS	Th	23969
209	<i>Bromus pumilio</i> (Trin.) P.M.Sm. (= <i>Boissiera squarrosa</i> (Banks & Sol.) Nevski)	IT	Th	23970
210	<i>Bromus tectorum</i> L.	Cosm	Th	23971
211	<i>Cenchrus orientalis</i> (Rich.) Morrone (= <i>Pennisetum orientale</i> Rich.)	IT	He	23972
212	<i>Eragrostis barrelieri</i> Daveau	Plur	Th	23973
213	<i>Eremopyrum orientale</i> Jaub. & Spach	IT/M	Th	23974
214	<i>Festuca maritima</i> L. (= <i>Nardurus maritimus</i> (L.) Murb.)	IT/M	Th	23975



215	<i>Hordeum murinum</i> subsp. <i>glaucum</i> (Steud.) Tzvelev (= <i>Hordeum glaucum</i> Steud.)	IT/M	Th	23976
216	<i>Lolium persicum</i> Boiss. & Hohen.	IT/ES	Th	23977
217	<i>Melica persica</i> Kunth	IT	Ge	23978
218	<i>Phalaris minor</i> Retz.	IT/ES	Th	23979
219	<i>Phragmites australis</i> (Cav.) Steud.	Cosm	Ge	23980
220	<i>Piptatherum holciforme</i> Roem. & Schult. (= <i>Oryzopsis</i> <i>holciformis</i> Hack.)	IT/SS/M	He	23981
221	<i>Poa sinaica</i> Steud.	IT	Ge	23982-23983
222	<i>Polypogon fugax</i> Nees ex Steud.	Plur	He	23984
223	<i>Polypogon monspeliensis</i> (L.) Desf.	Plur	Th	23985
224	<i>Sorghum halepense</i> Pers.	Cosm	Ge	23986-23987
225	<i>Stipa arabica</i> Trin. & Rupr.	IT	He	23988
226	<i>Stipa hohenackeriana</i> Trin. & Rupr.	IT/ES/M	He	23989
227	<i>Taeniatherum caput-medusae</i> (L.) Nevski (= <i>Taeniatherum</i> <i>crinitum</i> (Schreb.) Nevski)	Plur	Th	23990
Polygalaceae				
228	<i>Polygala hohenackeriana</i> Fisch. & C.A.Mey.	IT	He	23991
Polygonaceae				
229	<i>Atraphaxis spinosa</i> L.	IT	He	23992-23993
230	<i>Polygonum arenastrum</i> Boreau	Cosm	Th	23994
231	<i>Polygonum paronychioides</i> C.A.Mey.	IT	He	23995-23996
232	<i>Pteropyrum aucheri</i> Jaub. & Spach	IT	Ph	23997-23999
233	<i>Rumex chalepensis</i> Mill.	IT/SS/M	Th	23998
Pteridaceae				
234	<i>Adiantum capillus-veneris</i> L.	Plur	Ge	24000
Ranunculaceae				
235	<i>Clematis isfahanica</i> Boiss.*	IT	Ph	24001
236	<i>Ranunculus falcatus</i> L. (= <i>Ceratocephala falcata</i> (L.) Cramer)	IT/ES/M	Th	24002
Resedaceae				
237	<i>Reseda lutea</i> L.	IT/M	He	24003-24004-24005-24006- 24007
Rhamnaceae				
238	<i>Rhamnus persica</i> Boiss.	IT	Ph	24008
Rosaceae				
239	<i>Prunus lycioides</i> C.K.Schneid. (= <i>Amygdalus lycioides</i> Spach)*	IT/M	Ph	24009-24010-24011
240	<i>Prunus scoparia</i> Schneider (= <i>Amygdalus scoparia</i> Spach)*	IT	Ph	24012
241	<i>Sanguisorba minor</i> Scop.	IT/ES/M	He	24013-24014
Rubiaceae				
242	<i>Callipeltis cucullaris</i> (L.) DC.	IT	Th	24015
243	<i>Crucianella ciliata</i> Lam.	IT/SS	Th	24016-24017
244	<i>Galium aparine</i> L.	Cosm	Th	24018
245	<i>Galium setaceum</i> Lam.	IT/M	Th	24019
246	<i>Galium tricoratum</i> Dandy	Cosm	Th	24020-24021
247	<i>Plocama bruguieri</i> (A.Rich. ex DC.) M.Backlund & Thulin (= <i>Gaillonia bruguieri</i> A.Rich. ex DC.)	IT	He	24022
248	<i>Rubia tinctorum</i> L.	Plur	He	24023

Salicaceae				
249	<i>Salix alba</i> L.	IT/ES/M	Ph	24024
Scrophulariaceae				
250	<i>Scrophularia hypericifolia</i> Wydler (= <i>Scrophularia syriaca</i> Benth.)	IT	Ch	24025
251	<i>Scrophularia striata</i> Boiss.	IT	He	24026-24027
Solanaceae				
252	<i>Hyoscyamus pusillus</i> L.	IT	Th	25696
253	<i>Lycium depressum</i> Stocks	IT	Ph	24028
254	<i>Solanum nigrum</i> L.	Cosm	He	24029
Tamaricaceae				
255	<i>Tamarix ramosissima</i> Ledeb.	Plur	Ph	24030
Urticaceae				
256	<i>Parietaria judaica</i> L.	Plur	Ch	24031-24032
Zygophyllaceae				
257	<i>Tribulus terrestris</i> L.	Cosm	Th	24033
258	<i>Zygophyllum fabago</i> L.	Plur	He	24034

