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Floristic Study of Al-Orban area in Gharyan District-Libya

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The goal of this study was to investigate the vegetation composition and structure of the Al-Orban area in Gharyan district, Libya over two continues growing seasons from the first of January 2020 to the first of January 2022. During this period, a total of 309 plant species were identified and collected in the field. These species belonged to 43 families, with 39 families of dicotyledons and 4 families of monocotyledons. The most dominant family was *Asteraceae* with 60 species, followed by *Fabaceae* with 32 species, *Poaceae* with 33 species, and *Brassicaceae* with 35 species. The most dominant genera were *Plantago* and *Euphorbia*, each represented by 6 species, followed by *Erodium* and *Chenopodium* with 5 species each, and *Astragalus*, *Centaurea*, *Rumex*, *Convolvulus*, and *Stipa* each represented by 4 species. Life-form spectrum analysis indicated that Therophytes were the most predominant with 189 species, followed by Hemicryptophytes with 47 species, and geophytes with 40 species. Furthermore, chorotype spectrum analysis showed the dominance of Mediterranean species with 128 species, followed by Mediterranean/Iranian-Turanian with 66 species. These findings provide valuable insight into the plant diversity and distribution in the Al-Orban area of Gharyan district, Libya.

1 Introduction

The Mediterranean basin is recognized as one of the most regions vulnerable to climate change, with evidence of significant changes in temperature and precipitation patterns over the last century (Zommers *et al.*, 2016). Dry land ecosystems, which are already subject to natural and anthropogenic pressures such as land-use change, resource demands, and population growth, are particularly impacted by these changes, leading to altered distribution patterns and increased fragmentation of landscapes (Staudinger *et al.*, 2012; Bangash *et al.*, 2013). To address the urgent need for biodiversity conservation in such ecosystems, taxonomic and floristic studies have become increasingly important, providing critical data for understanding biodiversity and ecosystem functioning (Heywood, 2004).

The vegetation of mountainous regions is of particular importance due to its high biodiversity and relative density of vegetation. However, these ecosystems are at risk of degradation and loss due to anthropogenic pressures such as overgrazing and land-use change. In Libya, regions such as the Nafusa Mountains have experienced significant changes in vegetation cover over the last century, leading to the loss of natural habitats and threatened plant species (El-Ahmir *et al.*, 2020).

The present study aims to provide a comprehensive analysis of the vegetation of the Mountains and valleys of the Al 'Orban area, located in the transitional zone between the steppe and mountain regions of Gabel Nafusa. Through detailed spatial

analysis, this study seeks to explore the distribution patterns and ecological features of mountainous vegetation in this region. Ultimately, this study aims to contribute to the conservation and management of natural resources in this area, and to advance our understanding of the biodiversity and ecological functioning of mountainous ecosystems in Libya.

1.1 Study Area

Al-Orban is located 130 km Northwest of the Libyan capital, Tripoli. The study area bordered to the west by Gharyan, to the south by Awlad Bousif, to the north by Tarhuna, and to the east by Bani Walid. ($32^{\circ} 16' 65''$ latitude N and $13^{\circ} 15' 44''$ longitude E) and occupies an area approximately 178 km². It is described as a transitional zone between steppe and mountain regions (Fig 1a,1b). Climatically, this region follows the Mediterranean climate which characterized by hot and dry summers with high summer temperatures. The average annual temperature is 23°C and rainfall, on average ranges between 100-200 mm annually.

December and January are the wettest months while the majority of rainfall occurs in the winter season, with the rainy season addition to the geographic and topographic variation of the region, considerable edaphic variation exists. Much of the area is covered by gravels with sandy clay subsoils at depth, also un weathered granite outcrops, zones of kaolinitic clays and areas of bleached sandy soils with compacted pan-like layers also are present (Salem & Busrewil 1980). These environmental conditions can provide considerable scope for diversity in the floristic composition, adaptive characteristics displayed by the plants, patterns of groupings of plant species and the structural features of the plant communities. Some detailed studies on the vegetation of the North part of Gharyan, were conducted by (El-Ahmir & Abuhadra, 2008), Al-Orban areas have never been investigated apart from few fragmentary and brief reports prepared by (Jafri, & El-Gadi, 1976-1989). In this work, an extensive and thorough floristic survey was made, covering the area of Al-Orban Mountains Gharyan –Libya.

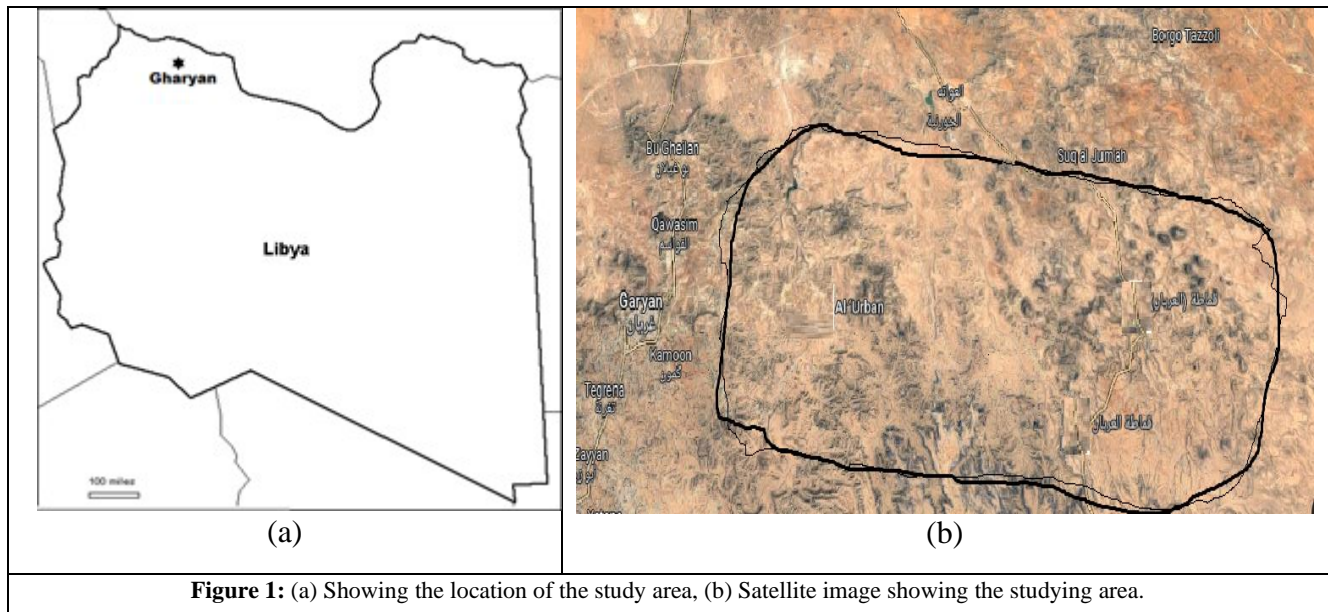


Figure 1: (a) Showing the location of the study area, (b) Satellite image showing the studying area.

2 Materials and Methods

Due to the drought of the region this study lasted for two consecutive years from (1/1/2020 to 1/1/2022) to investigate the status of plant diversity in the study area. During this period, eighteen trips to the study area were conducted. A total number of 309 plant species were collected upon various field trips during this

period, the collected plant specimens then were brought into the herbarium for further treatments. Identification of plant specimens was authenticated by the authors and confirmed by using dichotomous keys, plant description, illustrations, and photographs, provided by manuals and floras of the region, such as Flora of Libya (Jafri and El-Gadi, 1976 – 1989), Flora Palaestina (Zohary. 1966. & 1972; Feinbrun-Dutan 1976-1986)).

Flora of Egypt (Täckholm, 1974). Flora of Syria, Palestine and Sinai (Post, 1932-1933). Key to The Families of Flora of Libya (F. B. Erteb. 1994). The Grasses of Libya (Sherif, 1995). Finally, the plant specimens were deposited at the Herbarium of the botany department, faculty of sciences, University of Garyan.

3 Results and Discussion

A survey of the study area has done in the period between January 2020 and January 2022 to investigate the status of plant diversity of the study area. This survey has led to collection and identification of 309 plant species, 262 are belonging to dicotyledons and 47 species belong to monocotyledons. The collected plant species represented by 43 families where 39 families belong to Dicotyledons and 4 belong to Monocotyledons (Appendix 1).

After calculation the percentage of each family in relation to the total number recorded. The result showed a predominance of the family *Asteraceae* which itself comprise (19.4 %), with the number of 60

species, followed by the family *Poaceae* which comprise (10.7 %), with the number of 33 species, then the family *Fabaceae* which comprise (8.7 %), with the number of 27 species, followed by *Brassicaceae* which comprise (8.0 %), with the number of 25 species. The rest of the result shown in the (Fig 2).

The dominant genera recorded in this study were *Plantago* and *Euphorbia* both represented by 6 species each, followed by *Erodium* and *Chenopodium* which represented by 5 species each, then *Astragalus*, *Centaurea*, *Rumex*, *Convolvulus* and *Stipa*, each represented by 4 species (Fig 3).

The dominance of the family *Asteraceae* is expectable because most members of this family are Therophytes which are dominating the Mediterranean region which characterizes the study area, in addition it is one of the largest families the flowering plants and with cosmopolitan distribution, so it is expected that it will occupy highest ratio.

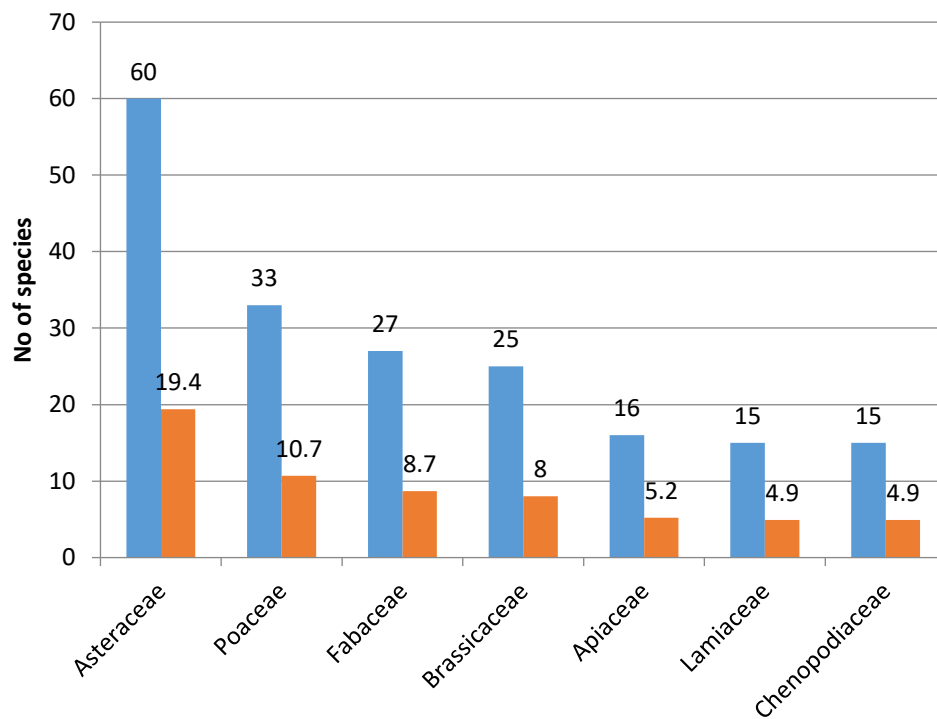


Figure 2: Dominant families with their numbers and percentages.

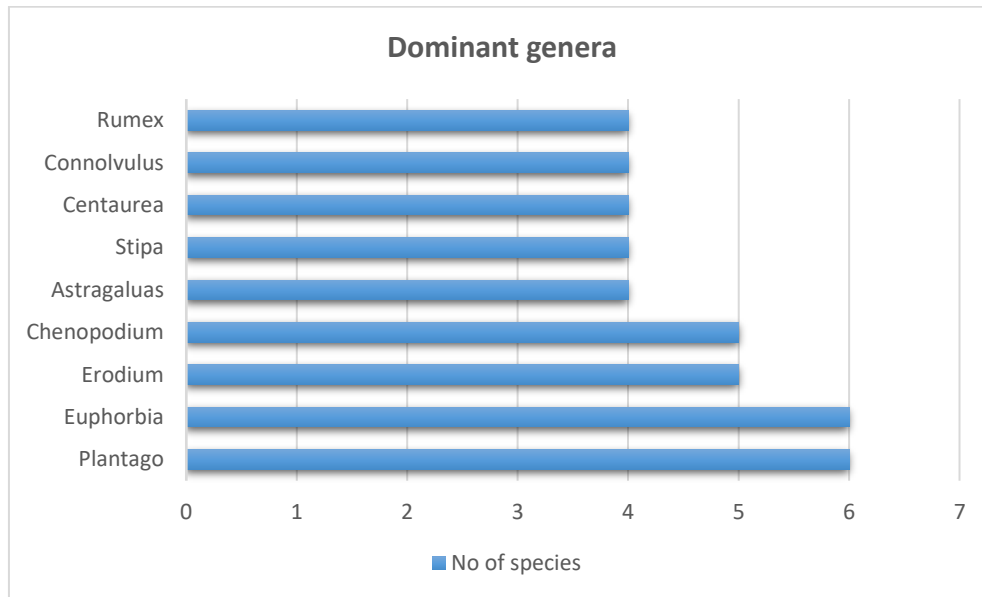


Figure 3: Dominant genera with their numbers.

Floristic list also presented in this study which provides us life forms and chorotypes of collected species. The status of each plant species according to the survey also indicated in the floristic list (Fig 4, Appendix). Analysis of Biological spectrum of collected plant species according to Raunkiaer system of life forms of plants, 1934 (Archibold, 1995) showed a predominance of Therophytes which comprise (61.2 %) with the number of (189) species, followed by Hemicryptophytes, which comprise (15.2 %) with the number of (47) species, then the Geophytes which

comprise (15.2 %) with the number of (40) species. The rest of the result shown in the (Fig 4). As expected Therophytes have greater capacity for growth than other life forms, apparently because of their wider ecological amplitude, greater plasticity in size, and their small growth requirements. In addition, according to the result in (Fig 4), there is a clear positive correlation between Therophytes and Mediterranean chorotype, this explain why Therophytes dominating the study area which falls within the Mediterranean region.

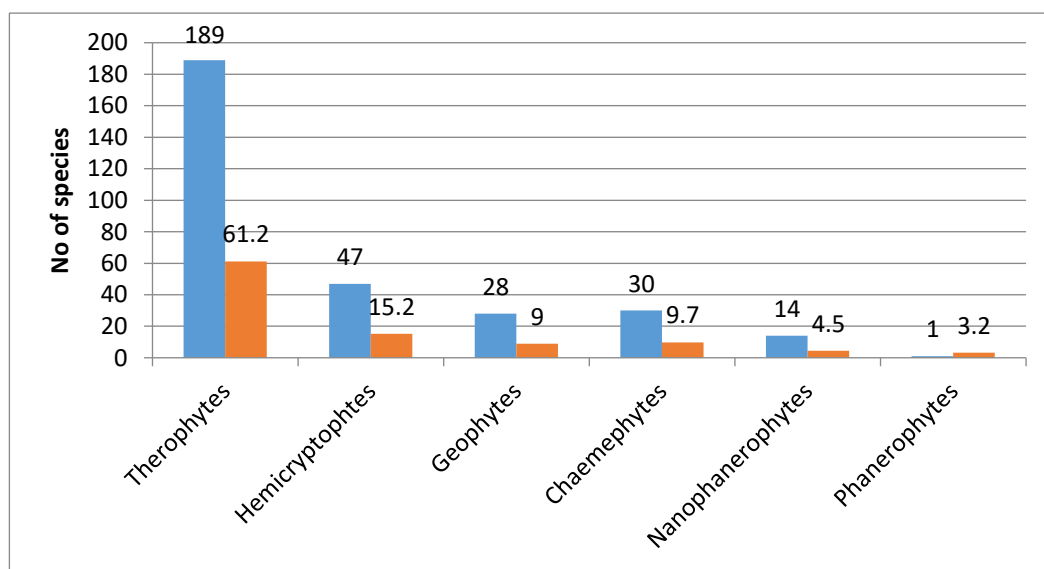


Figure 4: Lifeforms with their numbers and percentages.

Analysis of chorological spectrum of collected plant species showed a predominance of Mediterranean chorotypes which comprise (41.6 %) with the number of (128) species, followed by Mediterranean / Irano-Turanean chorotypes, which comprise (21.4 %) with the number of (66) species. (Fig 5).

This result is expected and not surprising because the study area is located mainly in the Mediterranean region which characterized by sub humid bioclimate, where the temperature is not very high and the moisture remained longer. The presence of

Mediterranean / Irano-Turanean chorotypes with respected ratio because the Iranu-turanean region is overlapped with the east Mediterranean and both with more or less similar climate conditions, instead other chorological types were poorly represented, this may have been due to having been transported or introduced, or because the study area crossed by different wadies and characterized by different slope angles and different altitudes, this may cause the area characterized by different bioclimatic conditions leads to appearance of different chorological types.

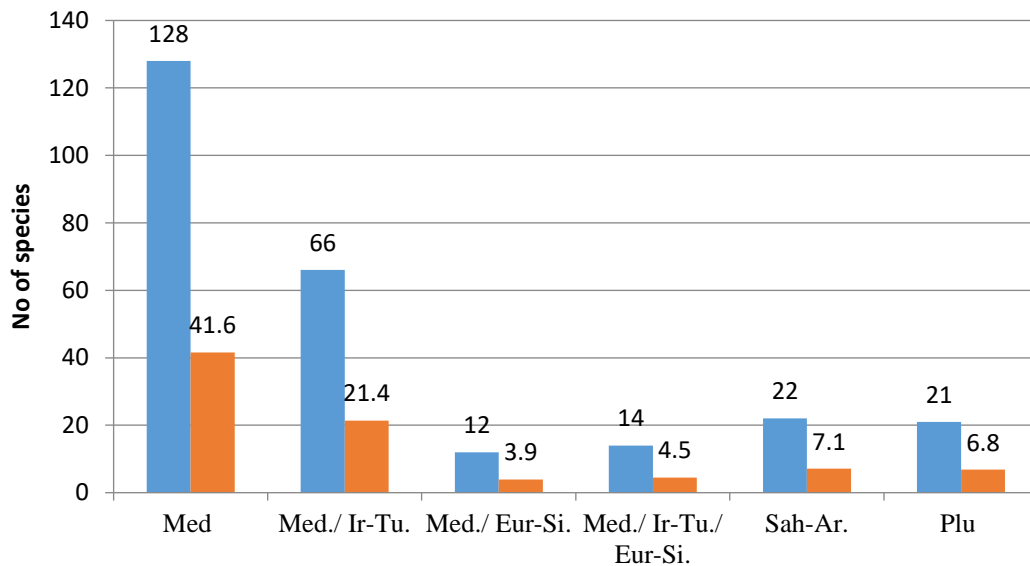


Figure 5: Chorotypes with their numbers and percentages.

4 Conclusions

The findings of this study have important implications for the understanding of plant diversity and distribution in the Al-Orban area of Gharyan district, Libya. The study provides a comprehensive inventory of plant species in the area and sheds light on the relative abundance of different plant families and genera. This information can be used to inform conservation efforts and land management strategies in the region. Furthermore, the study contributes to the broader understanding of plant biodiversity in Libya and provides a valuable resource for future research in this field.

Conflict of Interest: The authors declare that there are no conflicts of interest.

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APPENDIX 1

Check List of Collected plant species of the study area

No	Family	Species	Lifeform	Chorotype
Monocotyledons				
1	Alliaceae	<i>Allium ampeloprasum</i> L.	Geo	Med.
2	Alliaceae	<i>Allium oriental</i> Boiss	Geo	Med.
3	Alliaceae	<i>Allium roseum</i> L.	Geo	Med.
4	Iridaceae	<i>Gladiolus byzantinus</i> Miller.	Geo	Med.
5	Iridaceae	<i>Gladiolus segetum</i> Ker.- Gawl.	Geo	Med./ Ir-Tu.
6	Iridaceae	<i>Iris sisyrinchium</i> L.	Geo	Med.
7	Liliaceae	<i>Asparagus stipularis</i> Forsk.	Geo	Med.
8	Liliaceae	<i>Asphodelus tenuifolius</i> Lav	Geo.	Med./ Ir-Tu.
9	Liliaceae	<i>Asphodelus microcarpus</i> Salzm.&Viv.	Geo	Med.
10	Liliaceae	<i>Bellevalia sessiliflora</i> (Viv.)Kunth.	Geo	Med.
11	Liliaceae	<i>Colchicum ritchii</i> R.Br.	Geo	Med.
12	Liliaceae	<i>Dipcadi serotinum</i> (L.) Medic.	Geo	Plu.
13	Liliaceae	<i>Muscari comosum</i> (L.) Mill.	Geo	Plu.
14	Liliaceae	<i>Ornithogalum arabicum</i> .L.	Geo	Plu.
15	Poaceae	<i>Aegilops kotschy</i> Boiss.	Th	Med./ Ir-Tu.
16	Poaceae	<i>Avena barbata</i> Pott exLink.	Th	Med./ Ir-Tu.
17	Poaceae	<i>Avena fatua</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
18	Poaceae	<i>Avena sterilis</i> L.	Th	Med./ Ir-Tu.
19	Poaceae	<i>Bromus diandrus</i> Roth.	Th	Med.
20	Poaceae	<i>Bromus rigidus</i> Roth.	Th	Med./ Eur-Si
21	Poaceae	<i>Cenchrus ciliaris</i> L.	Th	Sah-Ar.
22	Poaceae	<i>Cutandia memphitica</i> (Sprengel.)Rich.	Th	Med./ Ir-Tu.
23	Poaceae	<i>Cynodon dactylon</i> (L.) Pers.	Geo	Boreal-Trop.
24	Poaceae	<i>Dactylis glomerata</i> L.	Th	Med./ Ir-Tu.
25	Poaceae	<i>Dactyloctenium aegyptium</i> (L.)Asch. & Cshw.	Th	Trop.
26	Poaceae	<i>Eleusine indica</i> (L.) Gaertn.	Th	Eur-Si.
27	Poaceae	<i>Hordeum murinum</i> Huds. subsp. <i>glaucum</i>	Th	Plu.
28	Poaceae	<i>Hyparrhenia hirta</i> (L.) Stapf.	H	Plu.
29	Poaceae	<i>Lagurus ovatus</i> L.	Th	Plu.
30	Poaceae	<i>Lamarckia aurea</i> (L.) Moench.	Th	Med./ Ir-Tu./ Sud.
31	Poaceae	<i>Lolium rigidum</i> Gaud.	Th	Plu.
32	Poaceae	<i>Lophochloa salzmannii</i> Boiss & H.Scholz.	Th	Med.
33	Poaceae	<i>Lygeum spartum</i> Loefl.ex Linn.	Geo	Med.
34	Poaceae	<i>Pennisetum setaceum</i> (Forsk.) Chiov.	Geo	Med./ Ir-Tu./ Sud.

No	Family	Species	Lifeform	Chorotype
35	Poaceae	<i>Phalaris minor</i> Retz.	Th	Med./ Ir-Tu.
36	Poaceae	<i>Phragmites australis</i> (Cav.) TrinexSteud.	Geo	Cos.
37	Poaceae	<i>Piptatherum miliaceum</i> (L.) Coss.	H	Med.
38	Poaceae	<i>Poa bulbosa</i> L.	Geo	Med./ Ir-Tu./ Eur-Si.
39	Poaceae	<i>Polypogon monspeliensis</i> (L.) Desf.	Th	Plu.
40	Poaceae	<i>Psilurus incurvus</i> (Gouan.) Schinz et Thell.	Th	Med./ Ir-Tu.
41	Poaceae	<i>Setaria adhaerens</i> (Forsk.) Chiov	Th	Plu.
42	Poaceae	<i>Stipa barbata</i> Desf.	Geo	Med./ Ir-Tu.
43	Poaceae	<i>Stipa capensis</i> Thunb.	Th	Med./ Ir-Tu./ Sah-Ar.
44	Poaceae	<i>Stipa parviflora</i> Desf	Geo	Med./ Ir-Tu.
45	Poaceae	<i>Stipa tenacissima</i> L.	Geo	Med.
46	Poaceae	<i>Stipagrostis ciliata</i> (Desf.) DeWinter.	Th	Med./ Ir-Tu.
47	Poaceae	<i>Trachynia distachya</i> (L.) Link.	Th	Med./ Ir-Tu.
Dicotyledons				
48	Amaranthaceae	<i>Amaranthus hybridus</i> L .	Th	Trop.
49	Amaranthaceae	<i>Amaranthus retroflexus</i> L.	Th	Med./ Eur-Si
50	Amaranthaceae	<i>Amaranthus viridis</i> L.	Th	Trop.
51	Anacardiaceae	<i>Pistacia atlantica</i> Desf.	NP	Med.
52	Anacardiaceae	<i>Rhus tripartita</i> (Ucria.) Grande.	NP	Ir-Tu.
53	Apiaceae	<i>Ammi visnaga</i> (L.) Lam.	Th	Med.
54	Apiaceae	<i>Apium graveolens</i> L.	Th	Med./ Ir-Tu.
55	Apiaceae	<i>Bunium fontainesii</i> (Pers) Maire.	Geo	Med.
56	Apiaceae	<i>Bupleurm lancifoluim</i> Hornem.	Th	Med./ Ir-Tu.
57	Apiaceae	<i>Bupleurm semicompositum</i> L.	Th	Med./ Ir-Tu.
58	Apiaceae	<i>Conium maculatum</i> L.	Geo	Med./ Eur-Si.
59	Apiaceae	<i>Daucus capillifolius</i> Gilli.	Th	Med.
60	Apiaceae	<i>Daucus syrticus</i> Murb.	Th	Med.
61	Apiaceae	<i>Ferula tingitana</i> L.	Th	Med.
62	Apiaceae	<i>Malabaila suaveolens</i> (Del.) Coss.	H	Med.
63	Apiaceae	<i>Pituranthos denudatus</i> Viv. Subsp. <i>battendieri</i>	Ch	Sah-Ar.
64	Apiaceae	<i>Smyrnum olusatrum</i> L.	H	Med./ Eur-Si.
65	Apiaceae	<i>Scandix pecten-veneris</i> L.	Th	Med./ Eur-Si.
66	Apiaceae	<i>Torilis leptophylla</i> (L.) Gaertn.	Th	Med./ Ir-Tu.
67	Apiaceae	<i>Torilis nodosa</i> (L.) Gaertn.	Th	Med./ Ir-Tu./ Eur-Si.
68	Apiaceae	<i>Torilis tenella</i> (Del.) Reichb.	Th	Med.
69	Asclepiadaceae	<i>Caralluma europaea</i> (Guss.) N.E.Br.	NP	Sud./ Sah-Ar.
70	Asclepiadaceae	<i>Periploca angustifolia</i> Labill.	NP	Med.
71	Asteraceae	<i>Anacyclus clavatus</i> (Desf.) Pers.	Th	Med.
72	Asteraceae	<i>Anacyclus monanthos</i> (L.)Thell.	Th	Med.
73	Asteraceae	<i>Anthemis secundiramea</i> Biv.	Th	Med.

No	Family	Species	Lifeform	Chorotype
74	Asteraceae	<i>Andryala integrifolia</i> L.	Th	Med.
75	Asteraceae	<i>Anvillea garcini</i> (Burm.fil.) DC.	Ch	Sah-Ar.
76	Asteraceae	<i>Artemisa monosperma</i> Delile.	Ch	Sah-Ar.
77	Asteraceae	<i>Artemisia herba-alba</i> Asso.	Ch	Ir-Tu.
78	Asteraceae	<i>Artemisia campestris</i> L.	Ch	Med./ Eur-Si.
79	Asteraceae	<i>Asteriscus pygmaeus</i> (DC.) Cosson & Durieu.	Th	Ir-Tu./ Sah-Ar.
80	Asteraceae	<i>Atractylis carduus</i> (Forsk.) Christensen.	H	Sah-Ar.
81	Asteraceae	<i>Atractylis cancellata</i> L.	Th	Med.
82	Asteraceae	<i>Atractylis delicatula</i> Batt. ex Chevall.	Th	Med.
83	Asteraceae	<i>Atractylis serratuloides</i> Bomel.	H	Sah-Ar.
84	Asteraceae	<i>Bombycilaena discolor</i> (Pers.) Lainz.	Th	Med.
85	Asteraceae	<i>Calendula arvensis</i> L.	Th	Med./ Ir-Tu.
86	Asteraceae	<i>Calendula tripterocarpa</i> Rupr.	Th	Sah-Ar.
87	Asteraceae	<i>Carduncellus eriocephalus</i> Boiss.	H	Sah-Ar.
88	Asteraceae	<i>Carduncellus pinnatus</i> (Desf.) DC.	H	Med.
89	Asteraceae	<i>Carduus getulus</i> Pomel.	Th	Sah-Ar.
90	Asteraceae	<i>Carthamus lanatus</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
91	Asteraceae	<i>Centaurea dimorpha</i> Viv.	H	Med./ Ir-Tu.
92	Asteraceae	<i>Centaurea glomerata</i> Vahl.	Th	Med.
93	Asteraceae	<i>Centaurea maroccana</i> Boiss.	Th	Med.
94	Asteraceae	<i>Centaurea alexandrina</i> Delile.	Th	Med.
95	Asteraceae	<i>Chamomilla aurea</i> Loefl.	Th	Med./ Ir-Tu.
96	Asteraceae	<i>Chrysanthemum segetum</i> L.	Th	Med.
97	Asteraceae	<i>Conyza bonariensis</i> (L.) Cornq.	Th	Med.
98	Asteraceae	<i>Crepis libyca</i> (Pamp.) Shabet.	H	Med.
99	Asteraceae	<i>Crupina crupinastrum</i> (Moris.) Vis.	Th	Med./ Ir-Tu.
100	Asteraceae	<i>Cynara cardunculus</i> L.	H	Med.
101	Asteraceae	<i>Echinops galalensis</i> Schweinf.	H	Med.
102	Asteraceae	<i>Evax libyaca</i> Alavi.	Th	Med. (Endemic)
103	Asteraceae	<i>Filago desertorum</i> Pomel.	Th	Ir-Tu./ Sah-Ar.
104	Asteraceae	<i>Hedypnois cretica</i> (L.) Dum-Courset.	Th	Med.
105	Asteraceae	<i>Helianthus annuus</i> L.	Th	American
106	Asteraceae	<i>Helichrysum stoechas</i> (L.) Moench.	Th	Med.
107	Asteraceae	<i>Hyoseris scabra</i> L.	Th	Med.
108	Asteraceae	<i>Hypochoeris achyrophorus</i> L.	Th	Med.
109	Asteraceae	<i>Hypochoeris glabra</i> L.	Th	Med.
110	Asteraceae	<i>Jasonia rupestris</i> Bomel.	H	Med.
111	Asteraceae	<i>Koelpinia linearis</i> Pallas.	Th	Med./ Eur-Si.
112	Asteraceae	<i>Lactuca saligna</i> L.	Th	Med.
113	Asteraceae	<i>Launaea capitata</i> (Sprengel.) Dandy.	H	Sah-Sind.

No	Family	Species	Lifeform	Chorotype
114	Asteraceae	<i>Launaea nudicaulis</i> L.	H	Sah-Ar./ Sud. /Ir-Tu.
115	Asteraceae	<i>Launaea resedifolia</i> (L.). O.Kuntze.	H	Med.
116	Asteraceae	<i>Leontodon simplex</i> (Viv.) Widder.	Th	Med./ Eur-Si.
117	Asteraceae	<i>Nolletia chrysocomides</i> (Desf.) Cass.	H	Med.
118	Asteraceae	<i>Onopordum espiniae</i> Cosson ex Bonnet.	H	Med.
119	Asteraceae	<i>Pallenis spinosa</i> (L) Cass.	H	Med.
120	Asteraceae	<i>Phagnalon rupestre</i> (L.) DC.	Ch	Med./ Ir-Tu.
121	Asteraceae	<i>Picris asplenoides</i> L.	Th	Sah-Ar.
122	Asteraceae	<i>Reichardia tingitana</i> (L.) Rorh.	Th	Ir-Tu./ Sah-Ar.
123	Asteraceae	<i>Rhagadiolus stellatus</i> (L.) Gaertner.	Th	Med./ Ir-Tu.
124	Asteraceae	<i>Scorzonera undulata</i> Vahl.	Geo	Med.
125	Asteraceae	<i>Senecio gallicus</i> Chiaux	Th	Med.
126	Asteraceae	<i>Silybum marianum</i> Moench.	Th	Med./ Ir-Tu./ Eur-Si
127	Asteraceae	<i>Sonchus oleraceus</i> L.	Th	Cos.
128	Asteraceae	<i>Tripleurospermum fuscatum</i> (Desf.) Schultz.	Th	Med.
129	Asteraceae	<i>Urospemum dalechampii</i> L.	H	Med.
130	Asteraceae	<i>Xanthium spinosum</i> L.	Th	Boreal-Trop.
131	Boraginaceae	<i>Alkanna tinctoria</i> (L.) Tausch. subsp. <i>tripolitana</i> (Bornm) Jafri.	H	Med.
132	Boraginaceae	<i>Asperugo procumbens</i> L.	Th	Plu.
133	Boraginaceae	<i>Cynoglossum cheirifolium</i> L.	Th	Med.
134	Boraginaceae	<i>Echiochilon fruticosum</i> Desf.	Ch	Med.
135	Boraginaceae	<i>Echium angustifolium</i> Mill.	H	Med.
136	Boraginaceae	<i>Echium sabulicola</i> Pomel.	Th	Med.
137	Boraginaceae	<i>Elizaldia calycina</i> (Roem.&Schultes.) Maire.	Th	Med.
138	Boraginaceae	<i>Gastrocotyle hispida</i> (Forsk.) Bunge.	Th	Med./ Ir-Tu./ Sah-Ar.
139	Boraginaceae	<i>Heliotropium europaeum</i> L.	Th	Med.
140	Boraginaceae	<i>Nonea viviani</i> DC.	Th	Med. (Endemic)
141	Brassicaceae	<i>Alyssum montanum</i> L.	H	Med.
142	Brassicaceae	<i>Biscutella didyma</i> L.	Th	Med./ Ir-Tu.
143	Brassicaceae	<i>Brassica tournefortii</i> Gouan.	Th	Med./ Sah-Ar.
144	Brassicaceae	<i>Cardaria draba</i> (L.) Desv.	Th	Med./ Eur-Si.
145	Brassicaceae	<i>Carrichtera annua</i> (L.) DC.	Th	Med./ Ir-Tu./ Eur-Si.
146	Brassicaceae	<i>Clypeola jonthlaspi</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
147	Brassicaceae	<i>Didesmus bipinnatus</i> (Desv.) DC.	Th	Med.
148	Brassicaceae	<i>Diplotaxis harra</i> (Forsk.) Boiss.	Th	Med./ Ir-Tu.
149	Brassicaceae	<i>Diplotaxis muralis</i> (L.) DC subsp. <i>muralis</i>	Th	Med./ Eur-Si.
150	Brassicaceae	<i>Enarthrocarpus clavatus</i> Del .ex Godr.	Th	Med.
151	Brassicaceae	<i>Eruca longirostris</i> Uechtr.	Th	Med.
152	Brassicaceae	<i>Eruca sativa</i> Mill.	Th	Med./ Ir-Tu.
153	Brassicaceae	<i>Farsetia aegyptia</i> Turra	Ch	Sah-Ar.

No	Family	Species	Lifeform	Chorotype
154	Brassicaceae	<i>Hussonia pinnata</i> (Viv.) Jafri.	H	Med.
155	Brassicaceae	<i>Lobularia libyca</i> (Viv.) Meisner.	Th	Med./ Ir-Tu.
156	Brassicaceae	<i>Lobularia maritima</i> (L.) Desv.	H	Med.
157	Brassicaceae	<i>Malcolmia africana</i> (L.) R.Br.	Th	Ir-Tu./ Sah-Ar.
158	Brassicaceae	<i>Matthiola longipetola</i> (Vent.) DC.	Th	Med./ Ir-Tu.
159	Brassicaceae	<i>Matthiola parviflora</i> (Schouboe.) R.Br.	Th	Sah-Ar.
160	Brassicaceae	<i>Matthiola tricuspidata</i> (L.) R.Br.	Th	Med.
161	Brassicaceae	<i>Neslia apiculata</i> Fisch.	Th	Med./ Ir-Tu.
162	Brassicaceae	<i>Notoceras bicornis</i> (Ait.) Caruel.	Th	Med.
163	Brassicaceae	<i>Sinapis alba</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
164	Brassicaceae	<i>Sisymbrium erysimoides</i> Desf.	Th	Med./ Ir-Tu.
165	Brassicaceae	<i>Sisymbrium irio</i> L.	Th	Med./ Ir-Tu.
166	Caesalpiniaceae	<i>Ceratonia siliqua</i> Desf	Ph	Med.
167	Capparaceae	<i>Capparis spinosa</i> L	NP	Med.
168	Caryophyllaceae	<i>Dianthus crinitus</i> Sm.	H	Ir-Tu.
169	Caryophyllaceae	<i>Gypsophila pilosa</i> Huds.	Th	Ir-Tu.
170	Caryophyllaceae	<i>Minuartia geniculata</i> (Poiret.) Thell.	H	Med.
171	Caryophyllaceae	<i>Silene colorata</i> Poiret	Th	Med.
172	Caryophyllaceae	<i>Silene rubella</i> L.	Th	Med.
173	Caryophyllaceae	<i>Silene vulgaris</i> (Moench.) Garcke.	H	Eru-Si./ Med./ Ir-Tu.
174	Caryophyllaceae	<i>Spergula fallax</i> (Lowe) E.H.L.Krause.	H	Med./ Ir-Tu.
175	Caryophyllaceae	<i>Vaccaria pyramidata</i> Medik.	Th	Med.
176	Chenopodiaceae	<i>Anabasis articulata</i> (Forsk.) Moq. subsp. <i>oropediorum</i>	Ch	Sah-Ar.
177	Chenopodiaceae	<i>Arthrocnemum macrostachyum</i> (Moric) Moris.	Ch	Med./ Sah-Ar.
178	Chenopodiaceae	<i>Atriplex coriacea</i> Forsk.	Ch	Med./ Sah-Ar.
179	Chenopodiaceae	<i>Atriplex halimus</i> L.	NP	Med.
180	Chenopodiaceae	<i>Chenopodium ambrosioides</i> L.	Th	Plu.
181	Chenopodiaceae	<i>Chenopodium album</i> L.	Th	Plu.
182	Chenopodiaceae	<i>Chenopodium botrys</i> L.	Th	Plu.
183	Chenopodiaceae	<i>Chenopodium murale</i> L.	Th	Plu.
184	Chenopodiaceae	<i>Chenopodium vulvaria</i> L.	Th	Eru-Si./ Med./ Ir-Tu
185	Chenopodiaceae	<i>Hammada scoparia</i> (Pomel) Ijtin.	Ch	Sah-Ar./ Ir-Tu.
186	Chenopodiaceae	<i>Kochia indica</i> Wight.	Th	Med./ Ir-Tu.
187	Chenopodiaceae	<i>Salsola kali</i> L.	Th	Plu.
188	Chenopodiaceae	<i>Salsola tetrandra</i> Forsk.	Ch	Sah-Ar.
189	Chenopodiaceae	<i>Salsola vermiculata</i> L. var. <i>vermiculata</i>	Ch	Sah-Ar./ Ir-Tu.
190	Chenopodiaceae	<i>Suaeda aegyptiaca</i> (Hasselq.) Zoh.	Th	Sah-Ar.
191	Cistaceae	<i>Helianthemum ciliatum</i> (Desf.)Pers	Ch	Sah-Ar.
192	Cistaceae	<i>Helianthemum hirtum</i> (L.) Mill.	Ch	Med.
193	Convolvulaceae	<i>Convolvulus althaeoides</i> L.	Th	Med.

No	Family	Species	Lifeform	Chorotype
194	Convolvulaceae	<i>Convolvulus supinus</i> Coss. et. Kral.	Th	Med.
195	Convolvulaceae	<i>Convolvulus arvensis</i> L.	Geo	Plu.
196	Convolvulaceae	<i>Convolvulus oleifolius</i> Desr.	Ch	Med.
197	Crassulaceae	<i>Umbilicus horizontalis</i> (Guss.) DC.	H	Med.
198	Cucurbitaceae	<i>Citrullus colocynthis</i> (L.) Schrad.	H	Sah-Ar.
199	Cucurbitaceae	<i>Ecballium elaterium</i> (L.) A. Rich.	Th	Eru-Si./ Med.
200	Cuscutaceae	<i>Cuscuta planiflora</i> Ten.	Th	Med./ Ir-Tu.
201	Dipsacaceae	<i>Scabiosa arenaria</i> Forskal.	Th	Med.
202	Dipsacaceae	<i>Scabiosa monspeliensis</i> Jacq.	Th	Med.
203	Euphorbiaceae	<i>Chrozophora obliqua</i> (Vahi.) Juss.	Th	Med./ Ir-Tu.
204	Euphorbiaceae	<i>Euphorbia chamaesyce</i> L.	Th	Med./ Ir-Tu.
205	Euphorbiaceae	<i>Euphorbia falcata</i> L.	Th	Trop.
206	Euphorbiaceae	<i>Euphorbia helioscopia</i> L.	Th	Plu.
207	Euphorbiaceae	<i>Euphorbia parvula</i> Del.	Th	Med.
208	Euphorbiaceae	<i>Euphorbia retusa</i> Cav.	Th	Sah-Ar.
209	Euphorbiaceae	<i>Euphorbia serrata</i> L.	H	Med.
210	Euphorbiaceae	<i>Mercurialis annua</i> L.	Th	Med.
211	Euphorbiaceae	<i>Ricinus communis</i> L.	NP	Sud.
212	Fabaceae	<i>Anthyllis henoniana</i> Coss. ex Batt.	Ch	Med.
213	Fabaceae	<i>Astragalus hamosus</i> L.	Th	Med.
214	Fabaceae	<i>Astragalus sinaicus</i> Boiss.	Th	Med./ Ir-Tu.
215	Fabaceae	<i>Astragalus tribuloides</i> Del.	Th	Med./ Ir-Tu.
216	Fabaceae	<i>Calicotome villosa</i> (Poir.) Link.	NP	Med.
217	Fabaceae	<i>Coronilla scorpioides</i> (L.) Koch.	Th	Med.
218	Fabaceae	<i>Ebenus pinnata</i> Ait.	H	Med.
219	Fabaceae	<i>Genista microcephala</i> Coss & Dur.	NP	Med.
220	Fabaceae	<i>Hedysarum spinosissimum</i> L.	Th	Med.
221	Fabaceae	<i>Hippocrepis ciliata</i> Willd.	Th	Med.
222	Fabaceae	<i>Hippocrepis multisiliquosa</i> L.	Th	Med.
223	Fabaceae	<i>Hymenocarpus circinatus</i> L.	Th	Med./ Ir-Tu.
224	Fabaceae	<i>Lathyrus cicera</i> L.	Th	Med./ Ir-Tu.
225	Fabaceae	<i>Lotus edulis</i> L.	Th	Med.
226	Fabaceae	<i>Lotus glinoides</i> Del.	Th	Sud.
227	Fabaceae	<i>Medicago minima</i> (L.) Bart.	Th	Med./ Ir-Tu.
228	Fabaceae	<i>Medicago turbinata</i> (L.) All.	Th	Med.
229	Fabaceae	<i>Medicago polymorpha</i> L.	Th	Med./ Ir-Tu.
230	Fabaceae	<i>Melilotus sulcatus</i> Desf.	Th	Med.
231	Fabaceae	<i>Onobrychis caput-galli</i> (L.) Lam.	Th	Med.
232	Fabaceae	<i>Ononis reclinata</i> L.	Th	Med./ Ir-Tu.
233	Fabaceae	<i>Ononis viscosa</i> L.	Th	Med.

No	Family	Species	Lifeform	Chorotype
234	Fabaceae	<i>Psoralea bituminosa</i> L.	H	Med.
235	Fabaceae	<i>Retama raetam</i> (Forsk.) Webb.	NP	Sah-Ar.
236	Fabaceae	<i>Scorpiurus muricatus</i> L.	Th	Med.
237	Fabaceae	<i>Trifolium arvensis</i> L.	Th	Eru-Si./ Med./ Ir-Tu.
238	Fabaceae	<i>Vicia monantha</i> Retz.	Th	Med.
239	Geraniaceae	<i>Erodium hirtum</i> (Forsk.) Will.	Th	Sah-Ar.
240	Geraniaceae	<i>Erodium cicutarium</i> (L.) L.Herit.	Th	Med.
241	Geraniaceae	<i>Erodium malacoides</i> (L.) L.Herit.	Th	Med./ Ir-Tu.
242	Geraniaceae	<i>Erodium moschatum</i> (L.) L.Herit.	Th	Med.
243	Geraniaceae	<i>Erodium neuradifolium</i> Delile.	Th	Med./ Ir-Tu.
244	Geraniaceae	<i>Geranium molle</i> L.	Th	Med./ Eur-Si
245	Illecebraceae	<i>Gymnocarps decander</i> Forsk.	Ch	Med./ Ir-Tu.
246	Illecebraceae	<i>Herniaria cinerea</i> DC.	Th	Med./ Ir-Tu.
247	Illecebraceae	<i>Herniaria fontanesii</i> J.Gay.	H	Med.
248	Illecebraceae	<i>Paronychia chlorothyrsa</i> Murb.	Ch	Med.
249	Illecebraceae	<i>Pteranthus dichotomus</i> Forsk.	Th	Med./ Ir-Tu.
250	Illecebraceae	<i>Sclerocephalus arabicus</i> Boiss.	Th	Med./ Ir-Tu.
251	Lamiaceae	<i>Ajuga iva</i> (L.) Schreber.	H	Med./ Ir-Tu.
252	Lamiaceae	<i>Lamium amplexicaule</i> L.	Th	Med.
253	Lamiaceae	<i>Lavandula multifida</i> L.	Ch	Med./ Ir-Tu.
254	Lamiaceae	<i>Marrubium alysson</i> L.	H	Med.
255	Lamiaceae	<i>Marrubium vulgare</i> L.	H	Med./ Ir-Tu.
256	Lamiaceae	<i>Micromeria nervosa</i> (D,Urv.)Benth.	Ch	Med.
257	Lamiaceae	<i>Prasium majus</i> L.	NP	Med.
258	Lamiaceae	<i>Rosmarinus officinalis</i> L.	Ch	Med.
259	Lamiaceae	<i>Salvia aegyptiaca</i> L.	Ch	Sah-Ar.
260	Lamiaceae	<i>Salvia verbenaca</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
261	Lamiaceae	<i>Teucrium compactum</i> L.	Ch	Med.
262	Lamiaceae	<i>Teucrium fruticans</i> L.	H	Med.
263	Lamiaceae	<i>Teucrium polium</i> L.	Ch	Med./ Ir-Tu./ Eur-Si.
264	Lamiaceae	<i>Thymus algeriensis</i> Boiss. et Reut.	Ch	Med.
265	Lamiaceae	<i>Thymus capitatus</i> (L.) Hoffm.& Link.	Ch	Med.
266	Malvaceae	<i>Malva parviflora</i> L.	Th	Med./ Eur-Si.
267	Malvaceae	<i>Malva sylvestris</i> L.	H	Med./ Ir-Tu.
268	Oxalidaceae	<i>Oxalis articulata</i> Savig.	Geo	Plu.
269	Oxalidaceae	<i>Oxalis pes-carpae</i> L.	Geo	Plu.
270	Papaveraceae	<i>Glaucium corniculatum</i> (L.) Rud.	Th	Med./ Ir-Tu.
271	Papaveraceae	<i>Papaver hybridum</i> L.	Th	Med.
272	Papaveraceae	<i>Papaver rhoeas</i> L.	Th	Med./ Ir-Tu.
273	Plantaginaceae	<i>Plantago albicans</i> L.	H	Med./ Ir-Tu.

No	Family	Species	Lifeform	Chorotype
274	Plantaginaceae	<i>Plantago arenaria</i> Waldst. & Kit.	Th	Med./ Ir-Tu./ Eur-Si.
275	Plantaginaceae	<i>Plantago coronopus</i> L.	Th	Med./ Ir-Tu.
276	Plantaginaceae	<i>Plantago amplexicaulis</i> Cav.	Th	Med./ Ir-Tu.
277	Plantaginaceae	<i>Plantago lanceolata</i> L.	H	Med./ Ir-Tu./ Sah-Ar.
278	Plantaginaceae	<i>Plantago ovata</i> Forskal.	H	Med./ Ir-Tu.
279	Polygonaceae	<i>Polygonum equisetiforme</i> Sibth & Sm.	Ch	Plu.
280	Polygonaceae	<i>Rumex bucephalophorus</i> L.	Th	Med.
281	Polygonaceae	<i>Rumex pulcher</i> L.	H	Temp.
282	Polygonaceae	<i>Rumex tingitanus</i> L.	Th	Ir-Tu.
283	Polygonaceae	<i>Rumex vesicarius</i> L.	Th	Sah-Ar.
284	Primulaceae	<i>Anagallis arvensis</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
285	Ranunculaceae	<i>Adonis dentata</i> Delile.	Th	Med./ Ir-Tu.
286	Ranunculaceae	<i>Delphinium halteratum</i> Sibth & Smith.	Th	Med.
287	Resedaceae	<i>Reseda alba</i> L.	Th	Med./ Ir-Tu./ Eur-Si.
288	Resedaceae	<i>Reseda arabica</i> Boiss.	Th	Med./ Ir-Tu.
289	Resedaceae	<i>Reseda lutea</i> L.	Th	Med./ Ir-Tu.
290	Rhamnaceae	<i>Ziziphus lotus</i> (L.) Lam	NP	Med./ Sud.
291	Rubiaceae	<i>Galium tricornutum</i> Dandy.	Th	Med.
292	Rubiaceae	<i>Galium aparine</i> L.	Th	Med.
293	Rutaceae	<i>Haplophyllum tuberculatum</i> (Forsk.) Juss.	H	Sah-Ar./ Sud.
294	Rutaceae	<i>Ruta chalepensis</i> L.	Th	Ir-Tu./ Sah-Ar.
295	Scrophulariaceae	<i>Kickxia aegyptica</i> L. subsp <i>fruticosa</i>	H	Med./ Sah-Ar.
296	Scrophulariaceae	<i>Linaria tarhunensis</i> Pamp.	Th	Med.
297	Scrophulariaceae	<i>Linaria virgata</i> (Poir.) Desf.	Th	Med.
298	Scrophulariaceae	<i>Scrophularia arguta</i> Aiton.	Th	Med./ Sah-Ar.
299	Solanaceae	<i>Datura innoxia</i> Mill.	Th	American
300	Solanaceae	<i>Hyoscyamus albus</i> L.	H	Med./ Ir-Tu.
301	Solanaceae	<i>Lycium europaeum</i> L.	NP	Med.
302	Solanaceae	<i>Nicotiana glauca</i> R.C.Graham.	NP	Plu.
303	Solanaceae	<i>Solanum nigrum</i> L.	Th	Cos.
304	Thymelaeaceae	<i>Thymelaea hirsuta</i> (L.) Endl.	Ch	Med.
305	Urticaceae	<i>Urtica pilulifera</i> L.	Th	Med./ Ir-Tu./ Eur-Si
306	Urticaceae	<i>Urtica urens</i> L.	Th	Med./ Ir-Tu.
307	Valerianaceae	<i>Centranthus calcitrapae</i> (L.) Dufresne.	Th	Med.
308	Valerianaceae	<i>Valerianella discoidea</i> (L.) Loisel.	Th	Med./ Ir-Tu.
309	Zygophyllaceae	<i>Peganum harmala</i> L.	Th	Med./ Ir-Tu.

APPENDIX 2

Definitions of lifeforms

Chaemephytes	Subshrubs
Geophytes	Perennial herbs with bulbs, corms, tubers or rhizomes
Hemicryptophytes	Perennial herbs
Nanophanerophytes	Shrubs
Phanerophytes	Trees
Therophytes	Annual herbs

APPENDIX 3

Definitions of Chorotypes

Cos.	Cosmopolitan
Eur-Si.	Eurosiberian
Ir-Tu.	Iranutuanean
Med	Mediterranean
Plu.	Pluriregional
Sah-Ar.	Saharabian
Temp	Temperate
Trop.	Tropical



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