

The update and ecological status of the flora of the Belezma National Park, Algeria

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Abstract. *Benchouala A, Bekdouche F, Si Bachir A. 2023. The update and ecological status of the flora of the Belezma National Park, Algeria. Biodiversitas 24: 6134-6150.* The establishment of national parks and nature-protected areas helps to conserve biodiversity. The conservation and enhancement of the floristic diversity of the Belezma National Park (BNP), Algeria which is also designated as biosphere reserve, require precise knowledge of its flora. To that end, the inventory conducted at BNP at the level of forest massifs, preforests, and mountain grasslands enabled us to identify 562 taxa belonging to 342 genera and 93 families, with a predominance of Asteraceae, Poaceae, and Fabaceae. Based on biological spectrum, hemicryptophytes outnumber other life forms by 44.4%. Zoochory is the most common distribution mode among inventoried species (44.3%). The Mediterranean type dominates the chronological spectrum with proportion of 45.9%. Endemism is represented by 53 species (9.4% of the total flora). According to executive decree No. 12-03 of January 4, 2012, the BNP flora consists of 196 rare species, including 34 endemic species and 26 threatened and protected ones in Algeria. Based on our results, it has been possible to constitute a database of the BNP flora, useful for its protection.

Keywords: Belezma National Park, endemism, flora, inventory, phytogeography

INTRODUCTION

The Mediterranean occupies a high rank in terms of world biodiversity, due to the diversity and richness of its flora. Algeria ranks seventh in the number of the flora taxa reported in this region with 3744 species belonging to 150 families of which 464 species are endemics (Véla and Benhouhou 2007). Its unique geographical location with a transition between tropical and temperate climates and climatic diversity (from perhumid to Saharan), the richness of fauna and flora in Algeria have enabled the establishment of several parks throughout the country; ten national parks, two cultural parks and two natural reserves, oriented toward the conservation of habitats and their biodiversity (Benhouhou et al. 2018). Algeria has ratified an important international convention relating to the conservation on biological diversity (CDB). In this way, biodiversity protection has become a critical ecological concern and the conservation of rare species has been listed as an urgent priority due to the many threatened disappearing species (Bounar et al. 2017).

Biodiversity inventory and assessment are the first step in assessing the wealth of flora and fauna of a country (Treurnicht et al. 2017). Floristic studies, particularly on the aspect of taxonomical diversity and geographical distribution, are required to detect new plant species, protect natural resources and recognize biodiversity. In Algeria, floristic diversity is still poorly known, even for group of trees which is usually more explored than other plant groups. Many species have insufficient data on their life forms, geographic distribution, rarity, endemism, and threats. Only several studies have recently been published

in various regions of this country, such as the study by Miara et al. (2018); Djebbouri and Terras (2019); Gordo and Hadjadj-Aoul (2019); Aouadj et al. (2020a); Touati et al. (2021). Nonetheless, studies on the inventory of endemic flora are extremely rare in Algeria let alone information on their threat status, distribution, or existence (Miara et al. 2018). A list of endemic species is extremely important for national and local conservation policy (Fois et al. 2022).

The Belezma National Park (BNP) is a national park situated in mountain range at the beginning of the Aures massif that is notable for its floristic richness and is one of Algeria important areas for plant diversity (Yahi et al. 2012). It has a typical biogeographical character due to its location at the crossroads of the Saharan and Tellian massifs, where it serves as suitable habitat for plant species' dispersion, distribution and migration. The BNP was established by decree 84-326 on November 3, 1984, and was designated as a UNESCO Biosphere Reserve in 2015. The large expanses of the Atlas Cedar (*Cedrus atlantica*, Endl. Carrière) is distributed in an area with significant Saharan and Mediterranean influences which prompted its classification. This biogeographic position is near close to the desert with mountainous relief and human pressure, threatens its own ecological balance (Benzina et al. 2021). Its altered ecosystems are a significant barrier to the preservation of floristic diversity particularly for the most vulnerable species.

The forest massifs of the BNP are currently diverse and unevenly distributed. They are primarily formed of decaying forest shreds surrounded by maquis or scrublands of Holm oak *Quercus ilex* L. or junipers (Boukerker 2016). Such condition indicates a severe degradation and roughly

covers two-thirds of the BNP's wooded areas. The plant diversity of some areas is still poorly understood, or data are very old. Cedar forests have received the most attention in research related to BNP due to their regression and decline (Abdessemed 1981; Slimani et al. 2014; Bensaci et al. 2015; Boukerker and Si Bachir 2015; Arar et al. 2018; Belloula and Beghami 2018; Beghami et al. 2020). Therefore, the current study aims to characterize the floristic diversity of the BNP, more particularly, to update the taxonomic composition focusing on the bio-ecology of its flora. The results of this study are expected to serve as reference when developing management and conservation programs of this natural resource with great ecologic, socioeconomic, and patrimonial importance.

MATERIALS AND METHODS

Study area

The BNP is located in northwest of Batna (Northeastern Algeria) and covers 26,250 hectares. It is situated between the coordinates 35°32'40" to 35°37'46" North and 5°55'10" to 6°10'45" East (Figure 1). The territory's general topography is North/South, with slopes 75% and uneven elevations. The Mountains of Djebel Tichaou (2136 m asl), Djebel Tuggurt (2090 m asl), and Djebel Bourdjem (2074 m asl) are the highest peaks. Secondary geological formations (Triassic, Jurassic, and Cretacic) are dominated by marl, sandstone, and dolomitic limestone (Laffitte 1939). According to Abdessemed (1981), brown calcareous soils, rendzines, and dolomitic rendzines dominate this territory. The hydrographic network is limited to the tributaries of the Oueds (streams) of Ketami and Hrakta in

the north and those of the Nefla, Hamla, Sken, Eddechera, and Boulef in the south (Benzina et al. 2021). The BNP has a diverse vegetation, where the forest area represents 82% of its total area. The Atlas Cedar in pure or mixed stands with the Common Holly (*Ilex aquifolium* L.) or the Holm Oak are the dominant forest vegetation of the park. The later exhibits pure or mixed Red Juniper (*Juniperus phoenicea* L.) or Prickly Ash (*Fraxinus dimorpha* Coss. & Durieu) stands. The BNP also has Aleppo pine (*Pinus halepensis*) stands.

Precipitation in the BNP varies dramatically from year to year. The annual average rainfall calculated from 1993 to 2022 is 774 mm at its highest altitude of 2140 m asl and 278 mm at its lowest elevation of 900 m asl. Using the gradients prescribed by Seltzer (1946), these data are extrapolated from those of Batna airport meteorological station. Spring is the rainiest season, accounting for nearly 34% of annual pluviometry. The dry season is important at lower elevations and lasts eight months. At higher elevations, the drought is limited to the summer dry season. June, July, and August are deficient, accounting for nearly 13% of the territory's annual rainfall. They are the hottest months, with average maximum temperatures ranging from 33.5 to 37.5°C for the low point and 24.8 to 28.8°C for the high point. In December, January, and February, the minimum temperatures range between -2.8 and -3.8°C for the high point and between 1.1 and 2.2°C for the low point. According to Emberger's classification, the BNP territory has an arid bioclimate with a fresh variant at its lowest altitudinal fringe and a subhumid bioclimate with a very cold variant at its upper altitudinal fringe. The remaining of the territory is in the cold and fresh semi-arid variants.

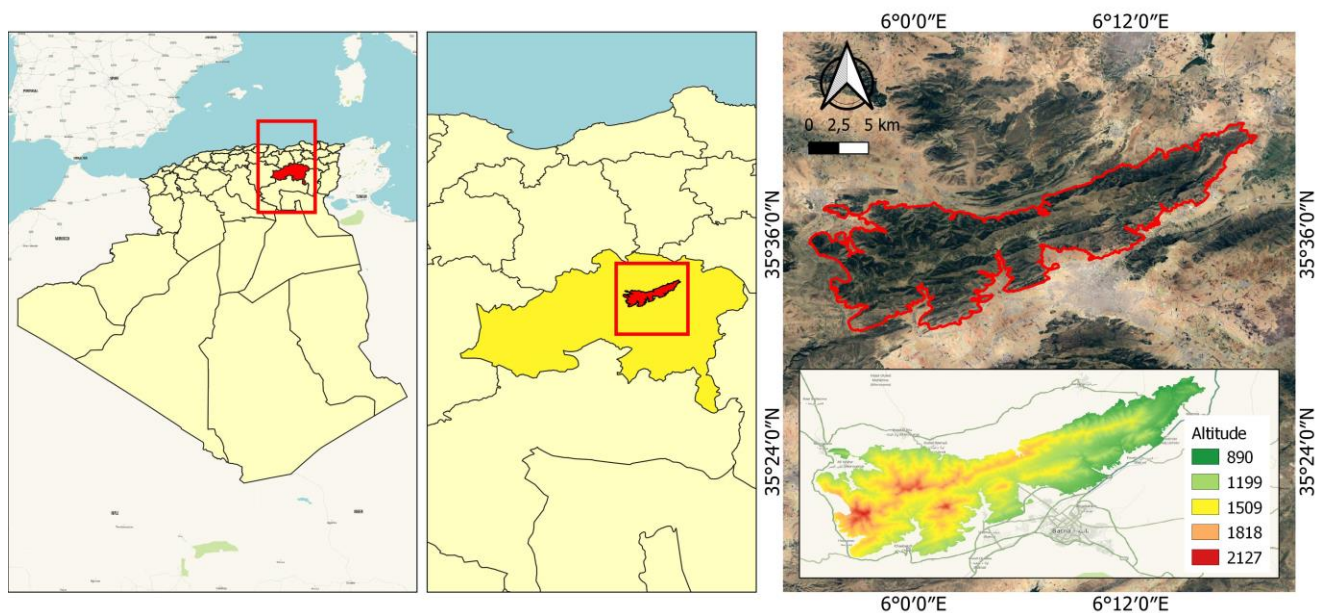


Figure 1. The geographical location of the Belezma National Park, Northeast Algeria

Data collection procedure

As a first step, a floristic list was created (starting matrix) using extensive bibliographic research and a compilation of references relating to BNP's flora (Abdessemed 1981; Boukerker 2016; Sadok et al. 2019; Derradji et al. 2020). In the second step, we made all necessary changes to keep only the present species by removing the ones cited by mistake. Using different references to name the taxa (Maire 1952-1987; Quézel and Santa 1962-1963; Dobignard and Chatelain 2010-2013) created a large synonymic problem. As a result, list remediation of this problem produced a more valid preliminary list. Finally, from February 2019 to July 2022, field visits were conducted on different sectors and plant formations of the BNP. Thus, we completed the list with taxa missing from the starting matrix. The taxa were identified using the floras of Quézel and Santa (1962-1963) and Maire (1952-1987), and the nomenclature used is that of Dobignard and Chatelain's (2010-2013) synonymic index of the flora of North Africa. The flora of Quézel and Santa (1962-1963) was used to establish the chorology of the listed species by grouping nuances of the same big chronological type.

The dissemination mode of the flora species was determined from the floristic database of the Tela Botanica website (<http://www.tela-botanica.org/bdtfx>). The list of threatened species on the site was compiled using the rarity criteria established by Quézel and Santa (1962-1963) and the International Union for Conservation of Nature (IUCN 2021, 2018-2021). We also considered endemics and rare species as species of patrimony interest, though a rare endemic was only counted once.

RESULTS AND DISCUSSION

Floristic richness

The BNP comprises 562 floristic taxa belonging to 342 genera and 93 families (Table 1). This accounts for 14.22% of the total 3951 native Algerian floral taxa (Dobignard and Chatelain 2010-2013). The BNP appears to be more diverse than other forest massifs of northern Algeria, such as the Kabylia of Babors mountain massifs, with 377 inventoried taxa (Bouchibane et al. 2021) and Taza National Park, which counts 420 taxa (Boumar et al. 2013). It is, however, lower than that reported by Meddour and Sahar (2021) for the Djurdjura National Park, with 757 floristic taxa.

A small number of families dominate the flora of the BNP. The Asteraceae, Fabaceae, and Poaceae families encompass the most numerous species and genera in the region. They are among the largest on the planet and rank first in specific and generic richness. The Asteraceae dominate the BNP flora with 93 species and 59 genera, accounting for 16.5% of the total flora, followed by the Poaceae with 11.2% (63 species and 36 genera), the Fabaceae with 8.7% (49 species and 24 genera), the Lamiaceae with 5.7% (32 species and 20 genera), the Apiaceae with 5.5% (31 species and 21 genera) and the Rosaceae with 4.6% (26 species and 13 genera). These eight families account for 60.5% of the total flora identified in the BNP. Only 3 to 4 species are represented in 18% of the families, while only 1 to 2 are represented in 58% (Table 1). The Asteraceae and Poaceae are extremely adaptable to the changing ecological conditions and anthropogenic pressures occurring in the BNP. Rangeland exploitation for pastoral purposes would threaten several taxa from Fabaceae and Poaceae, which have high forage potential. All the species inventoried are listed in Table 2.

Table 1. Distribution of floristic taxa (species and subspecies) by families and genera in the Belezma National Park, Algeria

Family	Total species	Genera	Family	Total species	Genera	Family	Total species	Genera
Asteraceae	93	59	Convolvulaceae	3	1	Araliaceae	1	1
Poaceae	63	36	Hypericaceae	3	1	Berberidaceae	1	1
Fabaceae	49	24	Juncaceae	3	1	Cactaceae	1	1
Lamiaceae	32	20	Linaceae	3	1	Colchicaceae	1	1
Apiaceae	31	21	Plumbaginaceae	3	1	Discoreaceae	1	1
Rosaceae	26	13	Apocynaceae	2	2	Dryopteridaceae	1	1
Brassicaceae	25	21	Asphodelaceae	2	2	Ericaceae	1	1
Caryophyllaceae	21	11	Cucurbitaceae	2	2	Fagaceae	1	1
Plantaginaceae	14	3	Dipsacaceae	2	2	Fumariaceae	1	1
Boraginaceae	12	8	Liliaceae	2	2	Gentianaceae	1	1
Cistaceae	12	3	Malvaceae	2	2	Globulariaceae	1	1
Ranunculaceae	11	7	Orobanchaceae	2	2	Grossulariaceae	1	1
Geraniaceae	10	2	Pinaceae	2	2	Heliotropiaceae	1	1
Rubiaceae	8	5	Solanaceae	2	2	Lythraceae	1	1
Orchidaceae	7	6	Adoxaceae	2	1	Moraceae	1	1
Iridaceae	7	5	Asparagaceae	2	1	Onagraceae	1	1
Polygonaceae	6	3	Cyperaceae	2	1	Portulacaceae	1	1
Rhamnaceae	5	2	Ephedraceae	2	1	Ruscaceae	1	1
Oleaceae	4	4	Euphorbiaceae	2	1	Santalaceae	1	1
Hyacinthaceae	4	3	Papaveraceae	2	1	Saxifragaceae	1	1
Valerianaceae	4	3	Polygalaceae	2	1	Scrophulariaceae	1	1
Crassulaceae	4	2	Resedaceae	2	1	Smilacaceae	1	1
Thymelaeaceae	4	2	Rutaceae	2	1	Tamaricaceae	1	1
Amaranthaceae	3	2	Salicaceae	2	1	Ulmaceae	1	1
Campanulaceae	3	2	Violaceae	2	1	Urticaceae	1	1
Cupressaceae	3	2	Acanthaceae	1	1	Verbenaceae	1	1
Primulaceae	3	2	Aceraceae	1	1	Vitaceae	1	1
Anacardiaceae	3	1	Alliaceae	1	1	Zannichelliaceae	1	1
Aspleniaceae	3	1	Amaryllidaceae	1	1	Zygophyllaceae	1	1
Caprifoliaceae	3	1	Aquifoliaceae	1	1	Total	562 taxa	342 genera

Table 2. List of flora species inventoried in Belezma National Park. The nomenclature of species and families follows Dobignard and Chatelain (2010-2013)

Taxa	Family	Abundance / rarity	Biological type	Chorology	Mode de dissemination
<i>Acanthus mollis</i> subsp. <i>platyphyllus</i> Murb.	Acanthaceae	CC	H	Med	Autochore
<i>Acer monspessulanum</i> L.	Aceraceae	C	P	Med	Anémochore
<i>Sambucus ebulus</i> L.	Adoxaceae	AR	H	Euras	Endozochore
<i>Sambucus nigra</i> L.	Adoxaceae	R	P	Eur	Endozochore
<i>Allium ampeloprasum</i> L.	Alliaceae	AC	G	Med	Barochore
<i>Beta vulgaris</i> L.	Amaranthaceae	C	H	Euras-Med	Barochore
<i>Chenopodium album</i> L.	Amaranthaceae	C	T	Cosmop	Barochore
<i>Chenopodium vulvaria</i> L.	Amaranthaceae	C	T	Med-Eur	Barochore
<i>Agave americana</i> L.	Amaryllidaceae	C	NP	Naturalized-Cosmop	Barochore
<i>Pistacia atlantica</i> Desf.	Anacardiaceae	AC	P	End N Afr	Endozochore
<i>Pistacia lentiscus</i> L.	Anacardiaceae	CC	NP	Med	Endozochore
<i>Pistacia terebinthus</i> L.	Anacardiaceae	R	NP	Med	Endozochore
<i>Ammi majus</i> L.	Apiaceae	CC	T	Med	Barochore
<i>Ammoides atlantica</i> (Coss. et Dur.) Wolf.	Apiaceae	AC	H	End	Barochore
<i>Bunium macuca</i> Boiss.	Apiaceae	CC	G	Med	Barochore
<i>Bupleurum atlanticum</i> subsp. <i>algeriense</i> Cauwet & Carbonnier	Apiaceae	AR	C	End N Afr	Barochore
<i>Bupleurum fruticosum</i> L.	Apiaceae	RR	NP	Med	Barochore
<i>Bupleurum spinosum</i> Gouan.	Apiaceae	AC	C	Ibero-Maur	Epizochore
<i>Caucalis platycarpus</i> L.	Apiaceae	R	T	Eur	Epizochore
<i>Chaerophyllum temulum</i> L.	Apiaceae	R	H	Eur	Epizochore
<i>Coriandrum sativum</i> L.	Apiaceae	CC	T	Med	Barochore
<i>Daucus carota</i> L.	Apiaceae	C	H	Med	Epizochore
<i>Eryngium campestre</i> L.	Apiaceae	RR	H	Eur-Med	Epizochore
<i>Eryngium ilicifolium</i> Lamk.	Apiaceae	CC	T	Ibero-Maur	Epizochore
<i>Eryngium tricuspdatum</i> L.	Apiaceae	CC	H	W Med	Epizochore
<i>Eryngium triquetrum</i> Vahl. subsp. <i>triquetrum</i>	Apiaceae	CC	H	N Afr-Sicilian	Epizochore
<i>Ferula communis</i> L.	Apiaceae	CC	H	Med	Anémochore
<i>Foeniculum vulgare</i> subsp. <i>piperitum</i> (Ucria) Bég.	Apiaceae	CC	H	Med	Barochore
<i>Heracleum sphondylium</i> subsp. <i>aurasiacus</i>	Apiaceae	RR	H	Paleo-temp	Anémochore
<i>Petroselinum crispum</i> (Mill.) Fuss	Apiaceae	C	H	Eur	Barochore
<i>Pimpinella tragium</i> Vill.	Apiaceae	AC	H	Med	Barochore
<i>Scandix australis</i> L.	Apiaceae	CC	T	Med	Epizochore
<i>Scandix pecten-veneris</i> L. subsp. <i>pecten-veneris</i>	Apiaceae	CC	T	Eur-Med	Epizochore
<i>Scandix stellata</i> Banks & Soland	Apiaceae	R	T	Med	Epizochore
<i>Selinopsis montana</i> Coss. & Durieu ex Batt.	Apiaceae	AR	H	End	Barochore
<i>Smyrniium olusatrum</i> L.	Apiaceae	CC	H	Med	Barochore
<i>Thapsia garganica</i> L.	Apiaceae	AC	H	Med	Anémochore
<i>Thapsia villosa</i> L.	Apiaceae	AC	H	Med	Anémochore
<i>Torilis elongata</i> (Hoffmanns. & Link) Samp.	Apiaceae	AC	T	End	Epizochore
<i>Torilis elongata</i> (Hoffmanns. & Link) Samp.	Apiaceae	R	T	Ibero-Maur	Epizochore
<i>Torilis leptophylla</i> (L.) Rchb. f.	Apiaceae	CC	T	Eur-Med	Epizochore
<i>Turgenia latifolia</i> (L.) Hoffm.	Apiaceae	C	T	Med	Epizochore
<i>Visnaga daucooides</i> Gaertn.	Apiaceae	CC	T	Med	Barochore
<i>Nerium oleander</i> L.	Apocynaceae	CC	NP	Med	Anémochore
<i>Vinca difformis</i> Pourr.	Apocynaceae	AC	C	W Med	Barochore
<i>Ilex aquifolium</i> L.	Aquifoliaceae	R	P	Eur	Endozochore
<i>Hedera helix</i> L.	Araliaceae	CC	P	Eur-Med	Endozochore
<i>Asparagus acutifolius</i> L.	Asparagaceae	AR	NP	Med	Endozochore
<i>Asparagus albus</i> L.	Asparagaceae	C	C	W Med	Endozochore
<i>Asphodeline lutea</i> (L.) Rchb.	Asphodelaceae	C	G	E Med	Barochore
<i>Asphodelus ramosus</i> L.	Asphodelaceae	CC	G	W Med	Barochore
<i>Asplenium adiantum nigrum</i> L.	Aspleniaceae	C	H	Subcosmop	Anémochore
<i>Asplenium ceterach</i> L.	Aspleniaceae	C	H	Euras-temp	Anémochore
<i>Asplenium ruta-muraria</i> L.	Aspleniaceae	C	H	Circumbor	Anémochore
<i>Anacyclus clavatus</i> (Desf.) Pers.	Asteraceae	CC	T	Eur-Med	Anémochore
<i>Anacyclus pyrethrum</i> (L.) Cass.	Asteraceae	C	H	Ibero-Maur	Anémochore
<i>Anthemis confusa</i> Pomel	Asteraceae	R	T	Med	Barochore
<i>Anthemis maritima</i> L.	Asteraceae	AC	H	W Med	Barochore
<i>Anthemis pedunculata</i> subsp. <i>pedunculata</i>	Asteraceae	AR	H	Ibéro-Maur	Barochore
<i>Arctium atlanticum</i> (Pomel) H. Lindb.	Asteraceae	R	H	Eur	Epizochore
<i>Artemisia campestris</i> L.	Asteraceae	C	G	Circumbor	Barochore

<i>Artemisia herba-alba</i> Asso.	Asteraceae	AR	C	Med	Barochore
<i>Asteriscus aquaticus</i> (L.) Less.	Asteraceae	AC	T	Med	Anémochore
<i>Atractylis caespitosa</i> Desf.	Asteraceae	CC	G	Ibero-Maur	Epizoochore
<i>Atractylis cancellata</i> L.	Asteraceae	CCC	T	Circummed	Epizoochore
<i>Atractylis serratuloides</i> Sieb. ex Cass.	Asteraceae	C	C	Sah	Epizoochore
<i>Bellis sylvestris</i> Cirillo	Asteraceae	R	H	Circummed	Barochore
<i>Bombycilaena discolor</i> (Pers.) M. Laínz	Asteraceae	CCC	T	Euras-N Afr-Trop	Anémochore
<i>Calendula arvensis</i> (Vaill.) L.	Asteraceae	CCC	T	Sub Med	Epizoochore
<i>Calendula suffruticosa</i> subsp. <i>boissieri</i> Lanza	Asteraceae	R	C	Sicilian-Malta-Alg-Mor	Epizoochore
<i>Carduus macrocephalus</i> Desf.	Asteraceae	C	H	Euro-Sib-N Afr	Anémochore
<i>Carduus pycnocephalus</i> subsp. <i>pycnocephalus</i>	Asteraceae	CCC	H	Euras	Anémochore
<i>Carduus tenuiflorus</i> Curt.	Asteraceae	CC	H	Euras	Anémochore
<i>Carlina lanata</i> L.	Asteraceae	AC	T	Circummed	Anémochore
<i>Carthamus lanatus</i> L.	Asteraceae	CCC	T	Eur-Med	Epizoochore
<i>Carthamus pinnatus</i> Desf.	Asteraceae	R	T	Sicilian-Afr N-Libya	Epizoochore
<i>Catananche caerulea</i> L.	Asteraceae	CC	H	W Med	Epizoochore
<i>Catananche caespitosa</i> Desf.	Asteraceae	AR	H	End Alg-Mor	Epizoochore
<i>Catananche montana</i> Coss. & Durieu	Asteraceae	AR	H	End Alg-Mor	Epizoochore
<i>Centaurea acaulis</i> L.	Asteraceae	CC	H	End Alg-Mor	Anémochore
<i>Centaurea benedicta</i> (L.) L.	Asteraceae	R	T	Med-As	Anémochore
<i>Centaurea djebel-amouri</i> Greuter	Asteraceae	RR	H	Iber-Russ-Ital	Anémochore
<i>Centaurea pubescens</i> Willd.	Asteraceae	CC	H	Ibero-Maur	Anémochore
<i>Centaurea pullata</i> L.	Asteraceae	CCC	H	Med	Anémochore
<i>Centaurea resupinata</i> subsp. <i>Lagascae</i> Fern. Casas & Susanna	Asteraceae	C	H	Ibero-Maur	Anémochore
<i>Centaurea solstitialis</i> L.	Asteraceae	CC	T	Med-As	Epizoochore
<i>Centaurea tougourensis</i> B. et R.	Asteraceae	R	C	End	Anémochore
<i>Cichorium intybus</i> L.	Asteraceae	CC	H	Euras-Merid	Barochore
<i>Cirsium echinatum</i> (Desf.) DC.	Asteraceae	CCC	H	W Med	Anémochore
<i>Cirsium monspessulanum</i> (L.) Hill.	Asteraceae	R	H	W Med	Anémochore
<i>Crepis vesicaria</i> L.	Asteraceae	C	H	Eur-Med	Anémochore
<i>Crupina vulgaris</i> Cass.	Asteraceae	RRR	T	Med	Anémochore
<i>Cyanus segetum</i> Hill	Asteraceae	C	T	Subcosmop	Anémochore
<i>Cynara cardunculus</i> L.	Asteraceae	C	H	Med	Anémochore
<i>Echinops bovei</i> Boiss.	Asteraceae	CC	H	S Med-Sah	Epizoochore
<i>Filago asterisciflora</i> (Lam.) Chrtek & Holub	Asteraceae	CCC	T	Circummed	Anémochore
<i>Filago germanica</i> (L.) Huds.	Asteraceae	CC	T	Eur-Med	Anémochore
<i>Filago pyramidata</i> L.	Asteraceae	CC	T	Med	Anémochore
<i>Hedypnois rhagadioloides</i> (L.) F.W. Schmidt	Asteraceae	CC	T	Med	Epizoochore
<i>Helichrysum fontanesii</i> Cambess.	Asteraceae	CCC	C	W Med	Barochore
<i>Helichrysum lacteum</i> Coss. & Durieu	Asteraceae	R	H	End Alg-Mor	Barochore
<i>Hieracium amplexicaule</i> subsp. <i>atlanticum</i> (Fr.) Zahn	Asteraceae	RRR	H	End	Anémochore
<i>Hieracium amplexicaule</i> subsp. <i>peyerinhoffii</i> (Maire) Zahn	Asteraceae	RRR	H	End Alg	Anémochore
<i>Hieracium faurelianum</i> Maire	Asteraceae	RR	H	End	Anémochore
<i>Hieracium humile</i> Jacq.	Asteraceae	RRR	H	Oro Alpine	Anémochore
<i>Hyoseris radiata</i> L.	Asteraceae	CC	H	Eur-Med	Epizoochore
<i>Hyoseris scabra</i> L.	Asteraceae	C	T	Circummed	Epizoochore
<i>Hypochoeris laevigata</i> (L.) Ces. Pas. et Gig.	Asteraceae	CC	H	Circummed	Anémochore
<i>Inula montana</i> L.	Asteraceae	AC	H	W Med-Sub Atl	Anémochore
<i>Jacobaea gigantea</i> (Desf.) Pelsner	Asteraceae	CC	H	End N Afr	Anémochore
<i>Jurinea humilis</i> (Desf.) DC.	Asteraceae	AC	H	W Med	Anémochore
<i>Lactuca muralis</i> (L.) Gaertn.	Asteraceae	R	H	Eur-Alg-Mor	Epizoochore
<i>Lactuca viminea</i> (L.) J. Presl & C. Presl	Asteraceae	CC	H	Med	Anémochore
<i>Lapsana communis</i> L.	Asteraceae	CC	T	Eur	Barochore
<i>Launaea fragilis</i> (Asso) Pau	Asteraceae	CC	H	Med-Sah-Sind	Anémochore
<i>Leontodon balansae</i> Boiss.	Asteraceae	AR	H	End Alg-Mar	Anémochore
<i>Mantiscalca salmantica</i> (L.) Briq. et Cavill.	Asteraceae	CC	H	Eur-Med	Epizoochore
<i>Matricaria chamomilla</i> L.	Asteraceae	C	T	Euras-Macar-Mor	Barochore
<i>Mauranthemum reboudianum</i> (Pomel) Vogt & Oberpr.	Asteraceae	RR	H	End	Anémochore
<i>Pallenis spinosa</i> (L.) Cass.	Asteraceae	AC	H	Euro-Med	Anémochore
<i>Petasites pyrenaicus</i> (L.) G. López	Asteraceae	AC	H	France-Sicilian	Anémochore
<i>Phagnalon rupestre</i> (L.) DC.	Asteraceae	RR	C	Circummed	Anémochore
<i>Phagnalon saxatile</i> (L.) Cass.	Asteraceae	CC	C	W Med	Anémochore
<i>Phagnalon sordidum</i> (L.) Rchb.	Asteraceae	AC	C	W Med	Anémochore
<i>Picnomon acarna</i> (L.) Cass.	Asteraceae	AC	T	Med	Anémochore
<i>Pilosella pseudopilosella</i> (Ten.) Soják	Asteraceae	CC	H	Eur-Med	Anémochore

<i>Podospermum laciniatum</i> (L.) DC.	Asteraceae	C	H	Euro-Med	Anémochore
<i>Pulicaria odora</i> (L.) Rchb.	Asteraceae	CC	H	Circummed	Anémochore
<i>Reichardia picroides</i> (L.) Roth.	Asteraceae	CCC	H	Med	Barochore
<i>Rhaponticoides alpina</i> (L.) M.V. Agab. & Greuter	Asteraceae	RRR	H	Ital	Anémochore
<i>Rhaponticum coniferum</i> (L.) Greuter	Asteraceae	AC	H	W Med	Anémochore
<i>Santolina africana</i> Jord. & Fourr.	Asteraceae	AC	C	End N Afr	Anémochore
<i>Santolina pectinata</i> Lag.	Asteraceae	R	C	Ibéro-Maur	Anémochore
<i>Scolymus grandiflorus</i> Desf.	Asteraceae	CC	H	W Med	Epizoochore
<i>Scolymus hispanicus</i> L.	Asteraceae	CC	H	Med	Epizoochore
<i>Scorzonera undulata</i> Vahl.	Asteraceae	CC	H	Med	Anémochore
<i>Senecio squalidus</i> L.	Asteraceae	AC	C	Med	Anémochore
<i>Seseli atlanticum</i> Boiss.	Asteraceae	R	H	Eur	Barochore
<i>Silybum marianum</i> (L.) Gaertn.	Asteraceae	CCC	H	Cosmop	Anémochore
<i>Solidago virgaurea</i> L.	Asteraceae	AR	H	Circumbor	Anémochore
<i>Sonchus maritimus</i> L.	Asteraceae	AC	G	Euras - Circummed	Barochore
<i>Taraxacum obovatum</i> (Willd.) DC.	Asteraceae	C	H	W Med	Anémochore
<i>Tragopogon porrifolius</i> L.	Asteraceae	R	H	Circummed	Anémochore
<i>Tussilago farfara</i> L.	Asteraceae	R	G	Euras	Anémochore
<i>Urospermum dalechampii</i> (L.) Schmidt	Asteraceae	CC	H	Circummed	Anémochore
<i>Xanthium spinosum</i> L.	Asteraceae	C	T	Subcosmop	Epizoochore
<i>Xeranthemum inapertum</i> (L.) Mill.	Asteraceae	CC	T	Euras-N Afr	Epizoochore
<i>Berberis hispanica</i> Boiss. & Reut.	Berberidaceae	R	NP	Ibero-Maur	Endozoochore
<i>Alkanna tinctoria</i> Tausch subsp. <i>tinctoria</i>	Boraginaceae	AC	H	Med	Epizoochore
<i>Anchusa italica</i> Retz.	Boraginaceae	CC	H	Eur-Med	Epizoochore
<i>Anchusa undulata</i> L.	Boraginaceae	RR	H	Med	Epizoochore
<i>Asperugo procumbens</i> L.	Boraginaceae	AC	T	Euras	Epizoochore
<i>Borago officinalis</i> L.	Boraginaceae	CC	T	W Med	Epizoochore
<i>Cynoglossum cheirifolium</i> L.	Boraginaceae	C	H	Med	Epizoochore
<i>Cynoglossum creticum</i> Miller	Boraginaceae	CC	H	Med	Epizoochore
<i>Echium asperrimum</i> Lam.	Boraginaceae	AC	H	Med	Barochore
<i>Echium humile</i> Desf. subsp. <i>humile</i>	Boraginaceae	R	H	Med-Sah	Barochore
<i>Echium trygorrhizum</i> Pomel	Boraginaceae	R	H	End-Sah	Barochore
<i>Lithospermum arvense</i> L.	Boraginaceae	CC	T	Med	Barochore
<i>Myosotis ramosissima</i> Rochel	Boraginaceae	CC	T	Med	Epizoochore
<i>Aethionema saxatile</i> (L.) R. Br.	Brassicaceae	R	H	Oro Med	Anémochore
<i>Alliaria petiolata</i> (M. Bieb.) Cavara & Grande	Brassicaceae	AC	T	Euras	Barochore
<i>Alyssum atlanticum</i> Desf.	Brassicaceae	AR	H	Oro Med	Anémochore
<i>Alyssum granatense</i> Boiss. & Reut.	Brassicaceae	C	H	Euras	Barochore
<i>Alyssum serpyllifolium</i> Desf.	Brassicaceae	AR	H	Oro Med	Anémochore
<i>Arabidopsis thaliana</i> (L.) Heynh.	Brassicaceae	C	T	Cosmop	Anémochore
<i>Arabis auriculata</i> Lamk	Brassicaceae	AC	T	Med	Anémochore
<i>Arabis pubescens</i> (Desf.) Poir.	Brassicaceae	AC	H	End N Afr	Anémochore
<i>Arabis verna</i> (L.) R. Br.	Brassicaceae	AR	T	Med	Anémochore
<i>Biscutella raphanifolia</i> Poiret	Brassicaceae	AR	H	End E N Afr	Anémochore
<i>Brassica nigra</i> (L.) Koch.	Brassicaceae	R	T	Euras	Barochore
<i>Capsella bursa-pastoris</i> (L.) Medik.	Brassicaceae	CC	T	Med	Anémochore
<i>Conringia orientalis</i> (L.) Andr.	Brassicaceae	C	T	Euras	Barochore
<i>Diplotaxis erucoides</i> (L.) DC.	Brassicaceae	CC	T	Med	Anémochore
<i>Draba hispanica</i> Boiss.	Brassicaceae	AR	H	Ibéro-Maur	Anémochore
<i>Erophila verna</i> (L.) Chevall.	Brassicaceae	R	T	Euras	Anémochore
<i>Eruca vesicaria</i> (L.) Car.	Brassicaceae	C	T	Med	Barochore
<i>Erysimum grandiflorum</i> Desf.	Brassicaceae	AC	H	Oro Med	Anémochore
<i>Guenthera gravinae</i> (Ten.) Gómez-Campo	Brassicaceae	AC	H	Ital-Alg	Barochore
<i>Hormatophylla cochleata</i> (Coss. & Durieu) Küpfer	Brassicaceae	AR	H	End N Afr	Barochore
<i>Hornungia petraea</i> (L.) Rchb.	Brassicaceae	AR	T	Eur-Med	Anémochore
<i>Iberis balansae</i> Jord.	Brassicaceae	R	T	Med	Anémochore
<i>Sinapis pubescens</i> L.	Brassicaceae	C	H	W Med	Epizoochore
<i>Sisymbrium officinale</i> (L.) Scop.	Brassicaceae	C	T	Cosmop	Anémochore
<i>Thlaspi perfoliatum</i> L.	Brassicaceae	C	T	Eur-Med	Anémochore
<i>Opuntia maxima</i> Mill.	Cactaceae	C	C	Cosmop	Endozoochore
<i>Asyneuma rigidum</i> subsp. <i>aurasiacum</i> (Batt. & Trab.) Damboldt	Campanulaceae	RRR	H	End	Barochore
<i>Campanula jurjurenensis</i> Pomel	Campanulaceae	AR	H	Eur-Med	Barochore
<i>Campanula rapunculus</i> L.	Campanulaceae	C	H	Eur-Med	Barochore
<i>Lonicera arborea</i> Boiss.	Caprifoliaceae	AR	NP	W Med	Endozoochore
<i>Lonicera etrusca</i> Santi.	Caprifoliaceae	AR	NP	S Eur	Endozoochore

<i>Lonicera implexa</i> Ait.	Caprifoliaceae	CC	NP	Med	Endozoochore
<i>Arenaria grandiflora</i> subsp. <i>grandiflora</i>	Caryophyllaceae	R	C	Oro Med	Barochore
<i>Arenaria serpyllifolia</i> L.	Caryophyllaceae	AR	T	Euras	Anémochore
<i>Bufonia duvaljouvii</i> Batt. & Trab.	Caryophyllaceae	R	H	End N Afr	Barochore
<i>Cerastium atlanticum</i> Dur.	Caryophyllaceae	AR	H	End N Afr	Barochore
<i>Cerastium brachypetalum</i> Desportes ex Pers.	Caryophyllaceae	R	T	Paléo-temp	Anémochore
<i>Cerastium gibraltarium</i> Boiss.	Caryophyllaceae	AR	H	Ibero-Maur	Barochore
<i>Dianthus sylvestris</i> subsp. <i>boissieri</i> (Willk.) Dobignard	Caryophyllaceae	AR	H	Eur-Med	Epizoochore
<i>Dianthus vulturius</i> Guss. & Ten.	Caryophyllaceae	R	H	Oro Med	Epizoochore
<i>Herniaria fontanesii</i> J. Gay	Caryophyllaceae	AC	T	Ibero-Maur-Cent	Barochore
<i>Minuartia verna</i> (L.) Hiern.	Caryophyllaceae	R	H	Euras	Anémochore
<i>Paronychia argentea</i> Lam.	Caryophyllaceae	C	H	Med	Barochore
<i>Paronychia chlorothyrsa</i> Murb	Caryophyllaceae	C	H	Med	Barochore
<i>Paronychia echinulata</i> Chater	Caryophyllaceae	C	H	Med	Epizoochore
<i>Paronychia kapela</i> subsp. <i>serpyllifolia</i> (Chaix) Graeben.	Caryophyllaceae	AR	H	Med	Barochore
<i>Polycarpon polycarpoides</i> (Biv.) Zodda	Caryophyllaceae	C	H	Afr N-Sicilian	Barochore
<i>Saponaria sicula</i> Rafin	Caryophyllaceae	R	H	End Alg-Sicilian	Anémochore
<i>Silene atlantica</i> Coss. & Durieu	Caryophyllaceae	AC	H	End	Anémochore
<i>Silene conica</i> L.	Caryophyllaceae	R	T	Euras	Anémochore
<i>Silene latifolia</i> subsp. <i>alba</i> (Mill.) Greuter & Burdet	Caryophyllaceae	AR	H	Paleo-temp	Barochore
<i>Silene patula</i> Desf.	Caryophyllaceae	R	H	Med	Anémochore
<i>Stellaria media</i> (L.) Vill.	Caryophyllaceae	C	T	Cosmop	Barochore
<i>Cistus albidus</i> L.	Cistaceae	AC	C	Med	Epizoochore
<i>Cistus creticus</i> L.	Cistaceae	R	C	Med	Epizoochore
<i>Cistus monspeliensis</i> L.	Cistaceae	CCC	C	Med	Epizoochore
<i>Cistus salviifolius</i> L.	Cistaceae	CC	C	Euras-Med	Epizoochore
<i>Fumana ericoides</i> (Cav.) Gand.	Cistaceae	CC	C	Euras-Alg-Mor	Barochore
<i>Fumana thymifolia</i> (L.) Spach ex Webb	Cistaceae	CC	H	Euras-Afr-sept	Epizoochore
<i>Helianthemum apenninum</i> (L.) Mill.	Cistaceae	RR	C	Med	Epizoochore
<i>Helianthemum cinereum</i> subsp. <i>rotundifolium</i> (Dunal) Greuter & Burdet	Cistaceae	C	C	Eur-N Afr	Epizoochore
<i>Helianthemum croceum</i> (Desf.) Pers.	Cistaceae	AR	C	W Med	Epizoochore
<i>Helianthemum ledifolium</i> subsp. <i>apertum</i> (Pomel) Greuter & Burdet	Cistaceae	AR	T	End N Afr	Epizoochore
<i>Helianthemum lippii</i> (L.) Dum. Cours.	Cistaceae	R	C	Med-Sah	Epizoochore
<i>Helianthemum pergamaceum</i> Pomel	Cistaceae	AR	C	Med	Epizoochore
<i>Colchicum lusitanum</i> Brot.	Colchicaceae	C	G	Europ-temp	Barochore
<i>Convolvulus arvensis</i> L.	Convolvulaceae	CC	G	Euras	Barochore
<i>Convolvulus cantabrica</i> L.	Convolvulaceae	C	C	Med	Epizoochore
<i>Convolvulus humilis</i> Jacq.	Convolvulaceae	CC	H	Med	Barochore
<i>Sedum acre</i> subsp. <i>neglectum</i> (Ten.) Arcang.	Crassulaceae	AR	C	Euras	Anémochore
<i>Sedum amplexicaule</i> subsp. <i>tenuifolium</i> (Sm.) Greuter	Crassulaceae	R	H	Oro Med	Anémochore
<i>Sedum sediforme</i> (Jacq.) Pau.	Crassulaceae	C	C	Med	Anémochore
<i>Umbilicus rupestris</i> (Salisb.) Dandy	Crassulaceae	AC	G	Med-Atl	Anémochore
<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	R	H	Trop-Med	Endozoochore
<i>Ecballium elaterium</i> (L.) A. Rich.	Cucurbitaceae	C	H	Med	Autochore
<i>Cupressus sempervirens</i> L.	Cupressaceae	C	P	Med-As	Anémochore
<i>Juniperus oxycedrus</i> L.	Cupressaceae	CC	NP	Atl-Circum-Med	Endozoochore
<i>Juniperus phoenicea</i> L.	Cupressaceae	C	P	Circummed	Endozoochore
<i>Carex distachya</i> Desf.	Cyperaceae	C	H	Circummed	Hydrochore
<i>Carex halleriana</i> Asso.	Cyperaceae	C	H	Med	Epizoochore
<i>Knautia mauritanica</i> Pomel	Dipsaceae	AC	H	Eur-As	Epizoochore
<i>Lomelosia stellata</i> (L.) Raf.	Dipsaceae	CC	T	W Med	Anémochore
<i>Dioscorea communis</i> (L.) Caddick & Wilkin	Discoraceae	C	G	Atl-Med	Endozoochore
<i>Dryopteris filix-mas</i> (L.) Schott.	Dryopteridaceae	RR	H	Subcosmop	Anémochore
<i>Ephedra altissima</i> Desf.	Ephedraceae	C	NP	End N Afr	Endozoochore
<i>Ephedra major</i> Host.	Ephedraceae	AC	NP	Macar-Med-Asia occid	Endozoochore
<i>Erica multiflora</i> L.	Ericaceae	CC	C	Med	Barochore
<i>Euphorbia bupleuroides</i> subsp. <i>luteola</i> (Kralik) Maire	Euphorbiaceae	AC	C	Ibéro-Maur	Myrmécochore
<i>Euphorbia helioscopia</i> L.	Euphorbiaceae	CC	T	Euras	Myrmécochore
<i>Anthyllis vulneraria</i> L.	Fabaceae	AR	H	Eur-Med	Anémochore
<i>Argyrolobium zanonii</i> (Turra) P.W. Ball	Fabaceae	C	C	Med	Barochore
<i>Astragalus armatus</i> Willd.	Fabaceae	AC	C	End N Afr	Barochore
<i>Astragalus monspessulanus</i> L.	Fabaceae	AC	H	Eur-Med	Barochore
<i>Bituminaria bituminosa</i> (L.) C.H. Stirt.	Fabaceae	C	H	Med	Epizoochore

<i>Calicotome spinosa</i> (L.) Link	Fabaceae	CC	NP	W Med	Barochore
<i>Colutea atlantica</i> Browicz	Fabaceae	AC	NP	Med	Barochore
<i>Coronilla juncea</i> L.	Fabaceae	C	C	Med	Epizoochore
<i>Coronilla minima</i> L.	Fabaceae	AC	C	Med-Eur	Epizoochore
<i>Coronilla scorpioides</i> (L.) W.D.J. Koch	Fabaceae	C	T	Med	Epizoochore
<i>Cytisus balansae</i> (Boiss.) Ball	Fabaceae	R	NP	Oro W Med	Barochore
<i>Ebenus pinnata</i> Aiton	Fabaceae	C	T	End N Afr	Anémochore
<i>Erinacea anthyllis</i> Link.	Fabaceae	AR	C	Oro W Med	Barochore
<i>Galega officinalis</i> L.	Fabaceae	RR	H	Med-Eur	Barochore
<i>Genista cinerea</i> (Vill.) DC.	Fabaceae	AR	C	W Med	Barochore
<i>Genista microcephala</i> Coss. et Dur.	Fabaceae	R	C	End N Afr	Barochore
<i>Genista pseudopilosa</i> Coss.	Fabaceae	R	C	Ibéro-Maur	Barochore
<i>Hippocrepis atlantica</i> Ball	Fabaceae	C	H	Ibéro-Maur	Epizoochore
<i>Hippocrepis multisiliquosa</i> L.	Fabaceae	C	T	Med	Epizoochore
<i>Lathyrus aphaca</i> L.	Fabaceae	R	T	Med-Euras	Anémochore
<i>Lathyrus latifolius</i> L.	Fabaceae	CC	H	Med	Barochore
<i>Lathyrus nissolia</i> L.	Fabaceae	R	T	Med	Barochore
<i>Lotus corniculatus</i> subsp. <i>corniculatus</i>	Fabaceae	AC	H	Eur-As	Barochore
<i>Medicago laciniata</i> (L.) Mill.	Fabaceae	AC	T	Med-Sah Sind	Epizoochore
<i>Medicago lupulina</i> L.	Fabaceae	C	H	Med-Eur	Barochore
<i>Medicago minima</i> (L.) L.	Fabaceae	C	T	Eur-Med	Epizoochore
<i>Medicago orbicularis</i> (L.) Bartal.	Fabaceae	R	T	Med	Anémochore
<i>Medicago rigidula</i> (L.) All.	Fabaceae	R	T	Med	Epizoochore
<i>Medicago sativa</i> L.	Fabaceae	CC	H	sub-cosmop	Barochore
<i>Melilotus neapolitanus</i> Ten.	Fabaceae	R	T	Med	Epizoochore
<i>Melilotus sulcatus</i> Desf.	Fabaceae	C	T	Med	Epizoochore
<i>Onobrychis kabylica</i> (Bornm.) Širj.	Fabaceae	AR	H	End N Afr	Epizoochore
<i>Ononis cristata</i> Mill.	Fabaceae	AR	C	Oro W Med	Epizoochore
<i>Ononis fruticosa</i> L.	Fabaceae	R	C	W Med	Epizoochore
<i>Ononis natrix</i> L.	Fabaceae	C	C	Med	Epizoochore
<i>Ononis pusilla</i> L.	Fabaceae	AC	C	Med	Epizoochore
<i>Retama retam</i> (Forssk.) Webb	Fabaceae	C	C	Sah Sind	Endozoochore
<i>Retama sphaerocarpa</i> (L.) Boiss.	Fabaceae	C	NP	Ibéro-Maur	Endozoochore
<i>Tetragonolobus maritimus</i> (L.) Roth.	Fabaceae	R	H	Eur	Barochore
<i>Trifolium fragiferum</i> L.	Fabaceae	AC	H	Euras-Med	Epizoochore
<i>Trifolium ochroleucon</i> Huds.	Fabaceae	R	H	Euras	Epizoochore
<i>Trifolium pratense</i> L.	Fabaceae	AR	H	Euras	Epizoochore
<i>Trifolium stellatum</i> L.	Fabaceae	RR	T	Med	Epizoochore
<i>Trifolium tomentosum</i> L.	Fabaceae	CC	T	Med	Epizoochore
<i>Trigonella fenum-graecum</i> L.	Fabaceae	C	T	Med	Epizoochore
<i>Vicia lathyroides</i> L.	Fabaceae	AR	T	Med	Anémochore
<i>Vicia onobrychioides</i> L.	Fabaceae	AC	H	Med	Anémochore
<i>Vicia sativa</i> L.	Fabaceae	R	T	Eur-Med	Barochore
<i>Vicia tetrasperma</i> (L.) Schreb.	Fabaceae	AC	T	Med	Barochore
<i>Quercus ilex</i> subsp. <i>ballota</i> (Desf.) Samp.	Fagaceae	C	P	Med	Dyszoochore
<i>Fumaria capreolata</i> L.	Fumariaceae	C	T	Med	Barochore
<i>Blackstonia perfoliata</i> subsp. <i>grandiflora</i> (Viv.) Maire	Gentianaceae	CC	T	Med	Barochore
<i>Erodium trifolium</i> (Cav.) Guitt.	Geraniaceae	R	T	End	Barochore
<i>Erodium aethiopicum</i> (Lam.) Brumh. & Thell.	Geraniaceae	C	T	Med	Autochore
<i>Erodium cheilanthifolium</i> Boiss.	Geraniaceae	R	H	Ibero-Maur	Barochore
<i>Erodium crassifolium</i> subsp. <i>hirtum</i> (Forssk.) Guitt.	Geraniaceae	R	H	End N Afr	Barochore
<i>Erodium glaucophyllum</i> (L.) L'Herit.	Geraniaceae	C	T	E Med	Barochore
<i>Erodium laciniatum</i> (Cav.) Willd.	Geraniaceae	C	T	Med	Barochore
<i>Geranium pusillum</i> Burm. f.	Geraniaceae	RR	T	Euras	Autochore
<i>Geranium pyrenaicum</i> Burm.	Geraniaceae	R	H	Euras	Epizoochore
<i>Geranium robertianum</i> L.	Geraniaceae	CC	T	Cosmop	Autochore
<i>Geranium rotundifolium</i> L.	Geraniaceae	R	T	Eur	Autochore
<i>Globularia alypum</i> L.	Globulariaceae	CC	C	Med	Epizoochore
<i>Ribes uva-crispa</i> L.	Grossulariaceae	RR	NP	Euras	Epizoochore
<i>Heliotropium europaeum</i> L.	Heliotropiaceae	CC	T	Eur-Med	Barochore
<i>Muscari comosum</i> (L.) Mill.	Hyacinthaceae	C	G	Med	Barochore
<i>Muscari neglectum</i> Guss. ex Ten.	Hyacinthaceae	AC	G	Eur-Med	Barochore
<i>Oncostema peruviana</i> (L.) Speta	Hyacinthaceae	C	G	Madeirare-W Med	Barochore
<i>Ornithogalum algeriense</i> Jord. & Fourr. subsp. <i>algeriense</i>	Hyacinthaceae	C	G	Atl-Med	Barochore
<i>Hypericum humifusum</i> L.	Hypericaceae	AC	C	Eur-Med	Epizoochore

<i>Hypericum montanum</i> L.	Hypericaceae	R	H	Eur-As	Epizoochore
<i>Hypericum perforatum</i> L.	Hypericaceae	C	H	Euras	Epizoochore
<i>Crocus nevadensis</i> Amo & Campo	Iridaceae	R	G	Alg-Mor	Barochore
<i>Gladiolus italicus</i> Mill.	Iridaceae	C	G	Med	Barochore
<i>Iris pseudacorus</i> L.	Iridaceae	C	G	Euras	Barochore
<i>Iris unguicularis</i> Poirlet	Iridaceae	CC	G	End Alg-Tun	Barochore
<i>Moraea sisyrinchium</i> (L.) Ker Gawl	Iridaceae	CC	G	Paleo-subtrop	Barochore
<i>Romulea bulbocodium</i> (L.) Seb. & Maur.	Iridaceae	C	G	Med	Barochore
<i>Romulea vaillantii</i> Quézel	Iridaceae	RR	G	End	Barochore
<i>Juncus bufonius</i> subsp. <i>bufonius</i>	Juncaceae	C	T	Cosmop	Epizoochore
<i>Juncus effusus</i> L.	Juncaceae	AC	G	Eur	Epizoochore
<i>Juncus maritimus</i> Lamk.	Juncaceae	C	G	Subcosmop	Epizoochore
<i>Acinos alpinus</i> subsp. <i>meridionalis</i> (Nyman) P.W. Ball	Lamiaceae	C	H	Ibero-Maur	Epizoochore
<i>Ajuga chamaepitys</i> (L.) Schreb	Lamiaceae	AR	T	Euras-Med	Epizoochore
<i>Ballota nigra</i> L.	Lamiaceae	CC	H	Med	Barochore
<i>Clinopodium vulgare</i> L.	Lamiaceae	CC	H	Euras	Epizoochore
<i>Hyssopus officinalis</i> L.	Lamiaceae	RR	C	Euras	Barochore
<i>Lamium amplexicaule</i> L.	Lamiaceae	CC	T	Cosmop	Barochore
<i>Lamium garganicum</i> subsp. <i>longiflorum</i> (Ten.) Kerguélen	Lamiaceae	AR	H	Circummed	Barochore
<i>Maropsis deserti</i> (de Noé) Pomel	Lamiaceae	C	H	Sah	Epizoochore
<i>Marrubium alysson</i> L.	Lamiaceae	CC	H	Ibero-Maur	Epizoochore
<i>Marrubium vulgare</i> L.	Lamiaceae	CC	H	Cosmop	Epizoochore
<i>Melissa officinalis</i> L.	Lamiaceae	AR	H	Med	Epizoochore
<i>Mentha ×piperita</i> L.	Lamiaceae	CC	H	Eur	Epizoochore
<i>Mentha aquatica</i> L.	Lamiaceae	AR	G	Paleo-Temp	hydrochore
<i>Mentha longifolia</i> (L.) L.	Lamiaceae	RR	H	Paleo-Temp	Epizoochore
<i>Mentha pulegium</i> L.	Lamiaceae	AC	H	Euras	Epizoochore
<i>Mentha suaveolens</i> Ehrh.	Lamiaceae	CC	H	Atl-Med	Epizoochore
<i>Ocimum basilicum</i> L.	Lamiaceae	CC	H	subtropical	Barochore
<i>Origanum vulgare</i> subsp. <i>glandulosum</i> (Desf.) Ietsw.	Lamiaceae	C	H	End Alg-Tun	Epizoochore
<i>Phlomis herba venti</i> L.	Lamiaceae	R	H	Med	Epizoochore
<i>Prunella vulgaris</i> L.	Lamiaceae	AR	H	Eur-Med	Barochore
<i>Rosmarinus officinalis</i> L.	Lamiaceae	C	C	Med	Barochore
<i>Salvia argentea</i> L.	Lamiaceae	C	H	Med	Barochore
<i>Salvia lavandulifolia</i> Vahl	Lamiaceae	AR	H	Med	Barochore
<i>Salvia verbenaca</i> L.	Lamiaceae	CC	H	Med-Atl	Barochore
<i>Sideritis montana</i> L.	Lamiaceae	CC	T	Med	Epizoochore
<i>Stachys circinnata</i> l'Her.	Lamiaceae	AC	H	Ibero-Maur	Epizoochore
<i>Teucrium chamaedrys</i> L.	Lamiaceae	AC	C	Eur-Med	Epizoochore
<i>Teucrium compactum</i> Lag.	Lamiaceae	RR	C	W Med	Epizoochore
<i>Teucrium polium</i> L.	Lamiaceae	AC	C	Eur-Med	Epizoochore
<i>Thymus munbyanus</i> subsp. <i>ciliatus</i> (Desf.) Greuter & Burdet	Lamiaceae	CC	C	End N Afr	Epizoochore
<i>Thymus algeriensis</i> Boiss. & Reut.	Lamiaceae	CC	C	End N Afr	Epizoochore
<i>Thymus willdenowii</i> Boiss.	Lamiaceae	C	C	Ibero-Maur	Epizoochore
<i>Gagea foliosa</i> (J. Presl & C. Presl) Schult. & Schult.f.	Liliaceae	AC	G	W Med	Barochore
<i>Tulipa sylvestris</i> subsp. <i>australis</i> (Link.) Pamp.	Liliaceae	CC	G	Eur-Med	Barochore
<i>Linum austriacum</i> subsp. <i>mauritanicum</i> (Pomel) Greuter & Burdet	Linaceae	AC	H	Eur-Med	Barochore
<i>Linum corymbiferum</i> Desf.	Linaceae	R	H	End N Afr	Barochore
<i>Linum usitatissimum</i> L.	Linaceae	CC	T	Med	Barochore
<i>Punica granatum</i> L.	Lythraceae	C	P	Med	Endozoochore
<i>Malope malachoides</i> subsp. <i>asterotricha</i> (Pomel) Greuter & Burdet	Malvaceae	R	H	Med	Barochore
<i>Malva sylvestris</i> L.	Malvaceae	CC	H	Euras	Barochore
<i>Ficus carica</i> L.	Moraceae	C	P	Med	Endozoochore
<i>Fraxinus dimorpha</i> Coss. & Durieu	Oleaceae	R	P	Oro S Med-As	Anémochore
<i>Jasminum fruticans</i> L.	Oleaceae	CC	NP	Med	Endozoochore
<i>Olea europaea</i> subsp. <i>europaea</i>	Oleaceae	CC	P	Med	Endozoochore
<i>Phillyrea angustifolia</i> L.	Oleaceae	CC	NP	Med	Endozoochore
<i>Epilobium parviflorum</i> Schreb.	Onagraceae	RR	H	Paleo-temp	Anémochore
<i>Anacamptis papilionacea</i> (L.) R.M. Bateman, Pridgeon & Chase	Orchidaceae	AR	G	Med	Anémochore
<i>Cephalanthera damasonium</i> (Mill.) Druce	Orchidaceae	RR	G	Euras	Anémochore

<i>Dactylorhiza munbyana</i> (Boiss. & Reut.) Aver.	Orchidaceae	AC	G	Sicilian	Anémochore
<i>Epipactis tremolsii</i> Pau	Orchidaceae	R	G	W Med	Anémochore
<i>Ophrys tenthredinifera</i> Willd.	Orchidaceae	C	G	Circummed	Anémochore
<i>Orchis mascula</i> (L.) L.	Orchidaceae	AR	G	Euras	Anémochore
<i>Orchis purpurea</i> Huds.	Orchidaceae	R	G	Euras	Anémochore
<i>Odontites purpureus</i> subsp. <i>purpureus</i>	Orobanchaceae	CC	T	eIbero-Maur	Anémochore
<i>Orobanche crenata</i> Forssk.	Orobanchaceae	C	T	Med	Barochore
<i>Papaver dubium</i> L.	Papaveraceae	C	T	Med	Anémochore
<i>Papaver rhoeas</i> L.	Papaveraceae	C	T	Paleo-temp	Anémochore
<i>Cedrus atlantica</i> (Endl.) Carrière	Pinaceae	AC	P	End Alg-Mor	Anémochore
<i>Pinus halepensis</i> Mill.	Pinaceae	CC	P	Med	Anémochore
<i>Linaria decipiens</i> Batt.	Plantaginaceae	R	H	End	Barochore
<i>Linaria multicaulis</i> (L.) Mill.	Plantaginaceae	CC	H	Ital N Afr	Barochore
<i>Linaria reflexa</i> (L.) Chaz.	Plantaginaceae	CCC	T	Circummed	Barochore
<i>Linaria simplex</i> Willd. ex Desf.	Plantaginaceae	AC	T	Med	Barochore
<i>Plantago afra</i> L.	Plantaginaceae	CC	T	Med	Barochore
<i>Plantago albicans</i> L.	Plantaginaceae	CC	H	Med	Barochore
<i>Plantago cupanii</i> Guss.	Plantaginaceae	AR	H	Euras	Barochore
<i>Plantago lanceolata</i> L.	Plantaginaceae	AC	H	Euras	Barochore
<i>Plantago major</i> L.	Plantaginaceae	CC	H	Euras	Barochore
<i>Veronica agrestis</i> L.	Plantaginaceae	AC	T	Eur	Myrméochore
<i>Veronica anagallis-aquatica</i> L.	Plantaginaceae	CCC	H	Circumbor	Barochore
<i>Veronica arvensis</i> L.	Plantaginaceae	CCC	T	Euras	Barochore
<i>Veronica hederaefolia</i> L.	Plantaginaceae	AC	T	Paleotemp	Myrméochore
<i>Veronica rosea</i> Desf.	Plantaginaceae	R	H	End N Afr	Myrméochore
<i>Armeria atlantica</i> Pomel	Plumbaginaceae	AC	H	W Eur	Epizoochore
<i>Armeria choulettiana</i> Pomel	Plumbaginaceae	AR	H	W Eur	Epizoochore
<i>Armeria alliacea</i> (Cav.) Hoffmanns. & Link	Plumbaginaceae	R	H	Ibero-Maur	Epizoochore
<i>Aegilops geniculata</i> Roth subsp. <i>geniculata</i>	Poaceae	C	T	Med-Irano-Tour	Epizoochore
<i>Aegilops geniculata</i> subsp. <i>gibberosa</i> (Zhuk.) Hammer	Poaceae	AR	T	Med-Irano-Tour	Epizoochore
<i>Aegilops ventricosa</i> Tausch	Poaceae	C	T	W Med	Epizoochore
<i>Agropyropsis lolium</i> (Balansa ex Coss. & Durieu) A. Camus	Poaceae	AC	G	End	Endozoochore
<i>Agrostis reuteri</i> Boiss.	Poaceae	C	H	Ibero-Maur	Barochore
<i>Ampelodesmos mauritanicus</i> (Poir.) Durand & Schinz	Poaceae	CC	H	W Med	Anémochore
<i>Anisantha madritensis</i> (L.) Nevski	Poaceae	CC	T	Eur-Med	Epizoochore
<i>Anisantha rigida</i> (Roth) Hyl.	Poaceae	CC	T	Paleo-sub-trop	Epizoochore
<i>Anisantha rubens</i> (L.) Nevski	Poaceae	C	T	Med	Epizoochore
<i>Anisantha sterilis</i> (L.) Nevski	Poaceae	AC	T	Paleotemp	Epizoochore
<i>Anisantha tectorum</i> (L.) Nevski	Poaceae	C	T	Paleotemp	Epizoochore
<i>Anthoxanthum odoratum</i> L.	Poaceae	C	H	Circumbor	Epizoochore
<i>Arrhenatherum album</i> (Vahl) Clayton	Poaceae	AC	H	Atl-Sah	Epizoochore
<i>Avena macrostachya</i> Coss & Durieu	Poaceae	AR	T	End	Epizoochore
<i>Avenula bromoides</i> (Gouan) H. Scholz	Poaceae	AC	H	Med	Epizoochore
<i>Brachypodium phoenicoides</i> (L.) Roem. & Schult.	Poaceae	C	H	W Med	Epizoochore
<i>Brachypodium retusum</i> (Pers.) P. Beauv.	Poaceae	C	H	W Med	Epizoochore
<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	Poaceae	C	H	Eur	Epizoochore
<i>Bromopsis erecta</i> (Huds.) Fourr.	Poaceae	AC	H	Euras	Epizoochore
<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Poaceae	C	T	Paleotemp	Epizoochore
<i>Bromus lanceolatus</i> subsp. <i>lanceolatus</i> Roth.	Poaceae	CC	T	Paleotemp	Epizoochore
<i>Bromus squarrosus</i> L.	Poaceae	C	T	Paleotemp	Epizoochore
<i>Ctenopsis pectinella</i> (Del.) De Not.	Poaceae	AC	T	S Med	Barochore
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	CC	G	Cosmop	Barochore
<i>Cynosurus balansae</i> Coss. & Dur.	Poaceae	AC	H	End Alg-Mor	Epizoochore
<i>Cynosurus elegans</i> Desf.	Poaceae	C	T	Med-Macar	Epizoochore
<i>Dactylis glomerata</i> L.	Poaceae	C	H	Paleotemp	Epizoochore
<i>Echinaria capitata</i> (L.) Desf.	Poaceae	C	T	Med-Atl	Epizoochore
<i>Festuca algeriensis</i> Trab.	Poaceae	R	H	End	Epizoochore
<i>Festuca atlantica</i> Duval-Jouve ex Clauson	Poaceae	AC	H	End Alg-Mor	Epizoochore
<i>Festuca aurasiaca</i> Trab.	Poaceae	R	H	End Alg-Mor	Epizoochore
<i>Festuca circummediterranea</i> Patzke	Poaceae	R	H	Circumbor	Epizoochore
<i>Festuca deserti</i> (Coss. & Dur.) Trab.	Poaceae	R	H	End Alg-Mor	Epizoochore
<i>Festuca durandoi</i> Clauson	Poaceae	AR	H	Ibero-Maur	Epizoochore
<i>Festuca numidica</i> (Trab.) Romo	Poaceae	R	H	Circumbor	Epizoochore
<i>Hordeum bulbosum</i> L.	Poaceae	AC	H	Med	Epizoochore

<i>Hordeum murinum</i> L.	Poaceae	CC	T	Circumbor	Epizoochore
<i>Koeleria vallesiana</i> (Honck.) Gaud.	Poaceae	AC	H	S W Eur	Epizoochore
<i>Lolium perenne</i> L.	Poaceae	C	H	Circumbor	Barochore
<i>Lolium rigidum</i> Gaud.	Poaceae	C	T	Paléo-subtrop	Barochore
<i>Macrochloa tenacissima</i> (L.) Kunth	Poaceae	C	H	Ibéro-Maur	Anémochore
<i>Melica ciliata</i> L.	Poaceae	R	H	Mac-Euras	Anémochore
<i>Melica cupani</i> Guss.	Poaceae	AC	H	Med-Irano-Tour	Anémochore
<i>Oropetium africanum</i> (Coss. & Dur.) Chiov.	Poaceae	R	H	W S Sah	Barochore
<i>Phalaris truncata</i> Guss. Ex Bertol.	Poaceae	AC	H	Med	Epizoochore
<i>Piptatherum coeruleum</i> (Desf.) P. Beauv.	Poaceae	R	H	Med	Anémochore
<i>Piptatherum miliaceum</i> (L.) Coss.	Poaceae	C	H	Med-Irano-Tour	Anémochore
<i>Piptatherum paradoxum</i> (L.) P. Beauv.	Poaceae	C	H	Madeira-W Med	Anémochore
<i>Poa bulbosa</i> subsp. <i>bulbosa</i>	Poaceae	R	H	Paléotemp	Barochore
<i>Poa flaccidula</i> B. & R.	Poaceae	R	H	Ibero-Maur	Barochore
<i>Poa nemoralis</i> L.	Poaceae	RR	H	Circumbor	Barochore
<i>Poa trivialis</i> L.	Poaceae	C	H	Euras	Barochore
<i>Psilurus incurvus</i> (Gouan.) Sch. & Thell.	Poaceae	R	T	Med	Epizoochore
<i>Puccinellia festuciformis</i> subsp. <i>convoluta</i> (Hornem.) W.E. Hughes	Poaceae	RR	H	Paleotemp	Barochore
<i>Roegneria canina</i> subsp. <i>hispanica</i> (Boiss.) Kerguélen	Poaceae	R	G	E Med	Endozoochore
<i>Schedonorus arundinaceus</i> (Schreb.) Dumort. subsp. <i>arundinaceus</i>	Poaceae	CC	H	Circumbor	Epizoochore
<i>Schismus barbatus</i> (Loefl. ex L.) Thell.	Poaceae	C	T	Macar-Med	Epizoochore
<i>Sclerochloa dura</i> (L.) P.B.	Poaceae	C	T	Med	Barochore
<i>Stipa apertifolia</i> subsp. <i>longiglumis</i> (H. Scholz) Vásquez & Devesa	Poaceae	R	H	Euras	Anémochore
<i>Stipa parviflora</i> Desf.	Poaceae	C	H	Med	Anémochore
<i>Trachynia distachya</i> (L.) Link	Poaceae	CC	T	Paleo-subtrop	Epizoochore
<i>Trisetum flavescens</i> (L.) P. Beauv.	Poaceae	AR	H	Paleo Neo-temp	Epizoochore
<i>Vulpia sicula</i> (Presl.) Link.	Poaceae	C	T	W Med	Epizoochore
<i>Polygala nicaeensis</i> subsp. <i>mediterranea</i>	Polygalaceae	C	H	Med	Anémochore
<i>Polygala rupestris</i> Pour.	Polygalaceae	AC	H	W Med	Anémochore
<i>Persicaria bistorta</i> (L.) Samp.	Polygonaceae	R	G	Circumbor	Barochore
<i>Polygonum aviculare</i> L.	Polygonaceae	CC	T	Cosmop	Barochore
<i>Rumex acetosella</i> subsp. <i>angiocarpus</i> (Murb.) Murb.	Polygonaceae	AC	H	Cosmop	Barochore
<i>Rumex bucephalophorus</i> L.	Polygonaceae	CC	T	Med	Epizoochore
<i>Rumex pulcher</i> L.	Polygonaceae	CC	H	Med	Epizoochore
<i>Rumex tuberosus</i> L.	Polygonaceae	C	G	Med	Anémochore
<i>Portulaca oleracea</i> L.	Portulacaceae	C	T	Cosmop	Barochore
<i>Androsace maxima</i> L.	Primulaceae	AR	T	Euras	Barochore
<i>Lysimachia arvensis</i> (L.) U. Manns & Anderb.	Primulaceae	CC	T	Sub cosmop	Barochore
<i>Lysimachia monelli</i> (L.) U. Manns & Anderb.	Primulaceae	CC	H	W Med	Barochore
<i>Adonis aestivalis</i> L.	Ranunculaceae	AC	T	Euras	Epizoochore
<i>Adonis annua</i> L.	Ranunculaceae	AC	T	Euras	Epizoochore
<i>Clematis flammula</i> L.	Ranunculaceae	RR	NP	Med	Anémochore
<i>Consolida pubescens</i> (DC.) Soó	Ranunculaceae	AC	T	Ibero-Maur	Epizoochore
<i>Delphinium balansae</i> Boiss. & Reut.	Ranunculaceae	R	C	End N Afr	Epizoochore
<i>Ficaria verna</i> Huds.	Ranunculaceae	C	G	Euras	Myrmécochore
<i>Ranunculus arvensis</i> L.	Ranunculaceae	C	T	Paleotemp	Epizoochore
<i>Ranunculus aurasiacus</i> Pomel	Ranunculaceae	R	H	Oro S Eur	Epizoochore
<i>Ranunculus repens</i> L.	Ranunculaceae	R	H	Paleotemp	Epizoochore
<i>Ranunculus spicatus</i> Desf.	Ranunculaceae	C	G	Ibero-Maur-Sicilian	Epizoochore
<i>Thalictrum minus</i> L.	Ranunculaceae	R	H	Euras	Epizoochore
<i>Reseda alba</i> L.	Resedaceae	AC	H	Euras	Barochore
<i>Reseda lutea</i> L.	Resedaceae	AC	H	Eur	Epizoochore
<i>Rhamnus alpina</i> L.	Rhamnaceae	AR	NP	Oro W Med	Endozoochore
<i>Rhamnus cathartica</i> L.	Rhamnaceae	RR	NP	Euras	Endozoochore
<i>Rhamnus lycioides</i> L.	Rhamnaceae	AC	C	W Med	Endozoochore
<i>Rhamnus myrtifolia</i> Willk.	Rhamnaceae	AR	P	Med	Endozoochore
<i>Ziziphus lotus</i> (L.) Lam.	Rhamnaceae	CC	C	Med	Endozoochore
<i>Agrimonia eupatoria</i> L.	Rosaceae	AC	H	Euras	Epizoochore
<i>Amelanchier ovalis</i> Medik subsp. <i>ovalis</i>	Rosaceae	R	NP	Med	Endozoochore
<i>Aphanes floribunda</i> (Murb.) Rothm.	Rosaceae	AC	T	Med	Barochore
<i>Cotoneaster granatensis</i> Boiss.	Rosaceae	AR	NP	Med-As	Endozoochore
<i>Crataegus azarolus</i> L.	Rosaceae	AR	P	E Med	Endozoochore
<i>Crataegus laciniata</i> Ucria	Rosaceae	AR	P	Med-As	Endozoochore
<i>Crataegus monogyna</i> Jacq.	Rosaceae	C	P	Eur-Med	Endozoochore

<i>Filipendula vulgaris</i> Moench	Rosaceae	R	H	Euras	Epizoochore
<i>Geum heterocarpum</i> Boiss.	Rosaceae	RR	H	Oro Med	Epizoochore
<i>Geum sylvaticum</i> Pourret	Rosaceae	AC	H	W Med	Epizoochore
<i>Geum urbanum</i> L.	Rosaceae	AC	H	Eur	Epizoochore
<i>Potentilla hispanica</i> Zimm.	Rosaceae	RR	H	Circumbor	Barochore
<i>Potentilla recta</i> L.	Rosaceae	AC	H	Euras	Anémochore
<i>Potentilla reptans</i> L.	Rosaceae	AC	H	Euras	Barochore
<i>Prunus dulcis</i> (Mill.) D.A. Webb	Rosaceae	C	P	Med-As	Endozoochore
<i>Prunus prostrata</i> Labil.	Rosaceae	C	C	Med-As	Endozoochore
<i>Pyrus cordata</i> Desv.	Rosaceae	R	p	Euras	Endozoochore
<i>Rosa canina</i> L.	Rosaceae	R	NP	Euras	Endozoochore
<i>Rosa micrantha</i> Borrer ex Sm.	Rosaceae	AR	NP	Eur-Med	Endozoochore
<i>Rosa montana</i> Chaix	Rosaceae	R	NP	S Eur	Endozoochore
<i>Rosa sempervirens</i> L.	Rosaceae	R	NP	Med	Endozoochore
<i>Rosa sicula</i> Tratt.	Rosaceae	R	NP	Oro Med	Endozoochore
<i>Rubus caesius</i> L.	Rosaceae	RR	NP	Euras	Endozoochore
<i>Rubus ulmifolius</i> Schott.	Rosaceae	C	NP	Eur-Med	Endozoochore
<i>Sanguisorba ancistroides</i> (Desf.) Ces.	Rosaceae	AR	H	Ibero-Maur	Barochore
<i>Sanguisorba minor</i> Scop.	Rosaceae	R	H	Euras	Barochore
<i>Asperula aristata</i> L. f.	Rubiaceae	CC	H	Eur-Med	Barochore
<i>Asperula hirsuta</i> Desf.	Rubiaceae	CC	H	W Med	Barochore
<i>Crucianella angustifolia</i> L.	Rubiaceae	AC	T	Eur-Med	Barochore
<i>Galium aparine</i> L.	Rubiaceae	AC	T	Paleotemp	Epizoochore
<i>Galium lucidum</i> All.	Rubiaceae	CC	H	Euras	Barochore
<i>Galium odoratum</i> (L.) Scop.	Rubiaceae	RR	G	Euras	Epizoochore
<i>Rubia peregrina</i> L.	Rubiaceae	CC	H	Med-Atl	Endozoochore
<i>Sherardia arvensis</i> L.	Rubiaceae	CC	T	Euras	Epizoochore
<i>Ruscus aculeatus</i> L.	Ruscaceae	C	C	Atl-Med	Endozoochore
<i>Ruta chalepensis</i> L.	Rutaceae	C	C	Med	Barochore
<i>Ruta montana</i> (L.) L.	Rutaceae	C	H	Med	Barochore
<i>Salix pedicellata</i> Desf.	Salicaceae	C	P	Med	Anémochore
<i>Salix purpurea</i> L.	Salicaceae	AC	P	Euras	Anémochore
<i>Arceuthobium oxycedri</i> (DC.) M.Bieb.	Santalaceae	AR	C	Paléotemp	Endozoochore
<i>Saxifraga bulbifera</i> L.	Saxifragaceae	R	H	W Med	Barochore
<i>Verbascum rotundifolium</i> Ten.	Scrophulariaceae	AR	H	Med	Epizoochore
<i>Smilax aspera</i> L.	Smilacaceae	C	NP	Macar-Med- Ethiopia-India	Endozoochore
<i>Atropa belladonna</i> L.	Solanaceae	R	H	Euras	Endozoochore
<i>Datura stramonium</i> L.	Solanaceae	AC	T	Cosmop	Epizoochore
<i>Tamarix gallica</i> L.	Tamaricaceae	C	P	Trop	Barochore
<i>Daphne gnidium</i> L.	Thymelaeaceae	C	NP	Med	Endozoochore
<i>Daphne oleoides</i> Schreb.	Thymelaeaceae	R	C	Ital-Alg	Endozoochore
<i>Thymelaea virescens</i> Meisn.	Thymelaeaceae	R	C	End N Afr	Endozoochore
<i>Thymelaea virgata</i> (Desf.) Endl.	Thymelaeaceae	AR	C	Ibéro-Mor	Endozoochore
<i>Ulmus minor</i> Mill.	Ulmaceae	AR	P	Euras	Anémochore
<i>Urtica dioica</i> L.	Urticaceae	AC	H	Cosmop	Epizoochore
<i>Centranthus calcitrapae</i> (L.) Dufr.	Valerianaceae	CC	H	Med	Barochore
<i>Centranthus nevadensis</i> Boiss.	Valerianaceae	RR	H	W Med	Barochore
<i>Valeriana tuberosa</i> L.	Valerianaceae	AC	G	Med	Anémochore
<i>Valerianella locusta</i> (L.) Laterr.	Valerianaceae	CC	T	Euras	Barochore
<i>Verbena officinalis</i> L.	Verbenaceae	CC	H	Paléotemp	Barochore
<i>Viola kitaibeliana</i> Schult.	Violaceae	AR	T	Euro	Myrmécochore
<i>Viola odorata</i> L.	Violaceae	C	H	Med-Atl	Myrmécochore
<i>Vitis vinifera</i> L.	Vitaceae	C	p	Med	Endozoochore
<i>Zannichellia palustris</i> L.	Zannichelliaceae	AC	G	Cosmop	Hydrochore
<i>Peganum harmala</i> L.	Zygophyllaceae	CC	C	Irano-Tour-Eur	Barochore

Notes: AR: quite rare, R: Rare, RR: very rare, RRR: extremely rare, AC: fairly common, C: common, CC: very common, CCC: particularly widespread. Notes: H: Hemicryptophytes, G: Geophytes, C: Chamephytes, T: Therophytes, P: Phanerophytes. Med: Mediterranean, Ital: Italian, Ibero-Maur: Ibero-Mauretanian, Ibero-Mor: Ibero-Moroccan, Macar: Macaronesian, Cosmop: Cosmopolitan, Eur: European, Atl: Atlantic, Euras: Eurasian, As: Asian, Irano-Tour: Irano-Touranian, Paleo-Trop: Paleo-Tropical, Circumbor: Circumboreal, Paleotemp: Paleotemperate, End: Endemic, Alg: Algerian, N Afr: North African, Mor: Moroccan, Tun: Tunisian, Sah: Saharan, Sah-Sind: Sahara-Sindian, Sic: Sicilian, Trop: Tropical, W: West, E: East, S: South, N: North, Temp: Temperate, Oro: Montagnard

Chorological spectrum and endemism

The Mediterranean setting dominates the BNP flora with a proportion of 45.9%, corresponding to 258 species, followed by northern and broadly distributed taxa with 127 and 120 species, respectively (Figure 2). In Algeria, the Mediterranean set dominates several studies (Bounar et al. 2013, 2018; Sarri et al. 2014). The importance of cosmopolitans and wide-distribution species can be explained by the fact that, unlike other national parks, BNP is subject to some anthropogenic pressure, particularly agricultural activity.

The endemism is well represented in the BNP by 53 species (Table 3), or 9.4% of the total flora identified. According to Véla and Benhouhou (2007), the PNB accounts for 27.7% of the endemic species of the biogeographical sectors Tell Constantinois (C1), Hauts-Plateaux Constantinois (H2), and Saharan Atlas Constantinois (AS3). According to the same authors, the number of endemic species reported in the BNP (53 species) represents nearly 13% of northern Algeria's endemic flora, totaling 407 species. The BNP's endemism is close to that Taza National Park, with 52 species (Bounar et al. 2013). This endemism is more significant than that reported in Gouraya National Park, which presents only 27 species (Rebbas 2014), and Ouled Yagoub in Chelia, with 28 species (Beghami 2013).

Only four species represent the Saharan element. There are 22 North African endemics, among which 16 species are strictly Algerian, 11 Algerian-Moroccan species, 2 Algerian-Tunisian species, 1 Algerian-Sicilian species, and 1 Saharan species (Table 3). The importance of Algerian-Moroccan endemics along with North African endemics can be explained by the Aurès region's homology with Moroccan Atlas territory in terms of dominant plant formation. Indeed, these two regions are distinguished by sparse low vegetation and forest formations dominated by Atlas cedar and Aleppo pine, both absent among the Tunisian territory. The BNP contains endemic elements in 19 of its 93 botanical families. The Asteraceae and Poaceae rank first and second, with 12 and 7 endemic plants, respectively, at a rate of 22.6% and 13.2%. Apiaceae, Caryophyllaceae, and Fabaceae are represented by four species, while Brassicaceae, Iridaceae, and Lamiaceae are represented by three species.

Biological spectrum

Biological spectra can be used to predict the distribution of plant's morphological and physiological characteristics. Various environmental factors can influence the evolution of the vegetation's biological types. Each geographical region has its spectrum. The overall biological spectrum of the BNP's flora is dominated by Hemicryptophytes (H), which count 250 species (44.4%), followed by Therophytes (T), with 143 species (25.4%). The Champhytes (C) come third with 66 species (11.7%); 59 species (10.5%) and 45 species (8.0%) represent phanerophytes (P) and geophytes (G), respectively (Figure 3).

Table 3. List of endemic species of the Belezma National Park, Algeria

Species name	Endemism
<i>Hormatophylla cochleata</i> (Coss. et Durieu) Küpfer	End N Afr
<i>Arabis pubescens</i> (Desf.) Poir.	End N Afr
<i>Astragalus armatus</i> Willd.	End N Afr
<i>Biscutella raphanifolia</i> Poiret	End N Afr
<i>Buffonia duvaljouvii</i> Batt. et Trab.	End N Afr
<i>Bupleurum atlanticum</i> Murb. subsp. <i>algeriense</i> Cauwet et Carbonnier	End N Afr
<i>Cerastium atlanticum</i> Dur.	End N Afr
<i>Delphinium balansae</i> Boiss. et Reut.	End N Afr
<i>Ebenus pinnata</i> Aiton	End N Afr
<i>Ephedra altissima</i> Desf.	End N Afr
<i>Erodium crassifolium</i> subsp. <i>hirtum</i> (Forssk.) Guitt.	End N Afr
<i>Genista microcephala</i> Coss. et Durieu	End N Afr
<i>Helianthemum ledifolium</i> subsp. <i>apertum</i> (Pomel) Greuter et Burdet	End N Afr
<i>Linum corymbiferum</i> Desf.	End N Afr
<i>Onobrychis kabylica</i> (Bornm.) Širj.	End N Afr
<i>Santolina africana</i> Jord. et Fourr.	End N Afr
<i>Pistacia atlantica</i> Desf.	End N Afr
<i>Jacobaea gigantea</i> (Desf.) Pelser	End N Afr
<i>Thymelaea virescens</i> Meisn.	End N Afr
<i>Thymus algeriensis</i> Boiss. et Reut.	End N Afr
<i>Thymus munbyanus</i> subsp. <i>ciliatus</i> (Desf.) Greuter et Burdet	End N Afr
<i>Veronica rosea</i> Desf.	End N Afr
<i>Agropyropsis lolium</i> (Balansa ex Coss. et Durieu) A. Camus	End Alg
<i>Ammoides atlantica</i> (Coss. et Dur.) Wolf.	End Alg
<i>Avena macrostachya</i> Coss et Durieu	End Alg
<i>Asyneuma rigidum</i> subsp. <i>aurasiacum</i> (Batt. et Trab.) Damboldt	End Alg
<i>Selinopsis montana</i> Coss. et Durieu ex Batt.	End Alg
<i>Torilis elongata</i> (Hoffmanns et Link) Samp.	End Alg
<i>Centaurea tougourensis</i> B. et R.	End Alg
<i>Mauranthemum reboudianum</i> (Pomel) Vogt et Oberpr.	End Alg
<i>Hieracium amplexicaule</i> subsp. <i>peyerimhoffii</i> (Maire) Zahn	End Alg
<i>Erodium trifolium</i> (Cav.) Guitt.	End Alg
<i>Festuca algeriensis</i> Trab.	End Alg
<i>Hieracium amplexicaule</i> subsp. <i>atlanticum</i> (Fr.) Zahn	End Alg
<i>Hieracium faurelianum</i> Maire	End Alg
<i>Linaria decipiens</i> Batt.	End Alg
<i>Romulea vaillantii</i> Quézel	End Alg
<i>Silene atlantica</i> Coss. et Durieu	End Alg
<i>Catananche caespitosa</i> Desf.	End Alg-Mor
<i>Catananche montana</i> Coss. et Durieu	End Alg-Mor
<i>Cedrus atlantica</i> (Endl.) Carrière	End Alg-Mor
<i>Centaurea acaulis</i> L.	End Alg-Mor
<i>Crocus nevadensis</i> Amo et Campo	End Alg-Mor
<i>Cynosurus balansae</i> Coss. et Dur.	End Alg-Mor
<i>Festuca atlantica</i> Duval-Jouve ex Clauson	End Alg-Mor
<i>Festuca deserti</i> (Coss. et Dur.) Trab.	End Alg-Mor
<i>Festuca aurasiaca</i> Trab.	End Alg-Mor
<i>Helichrysum lacteum</i> Coss. et Dur.	End Alg-Mor
<i>Leontodon balansae</i> Boiss.	End Alg-Mor
<i>Iris unguicularis</i> Poiret	End Alg-Tun
<i>Organum vulgare</i> subsp. <i>glandulosum</i> (Desf.) Ietsw.	End Alg-Tun
<i>Saponaria sicula</i> Rafin	End Alg-Sicilian
<i>Echium trygorrhizum</i> Pomel	End Sah

Notes: End N Afr: Endemic North African, End Alg: Endemic Algerian, End Alg-Mor: Endemic Algerian-Moroccan, End Alg-Tun: Endemic Algerian-Tunisian, End Alg-Sicilian: Endemic Algerian-Sicilian, End Sah: Endemic Saharan

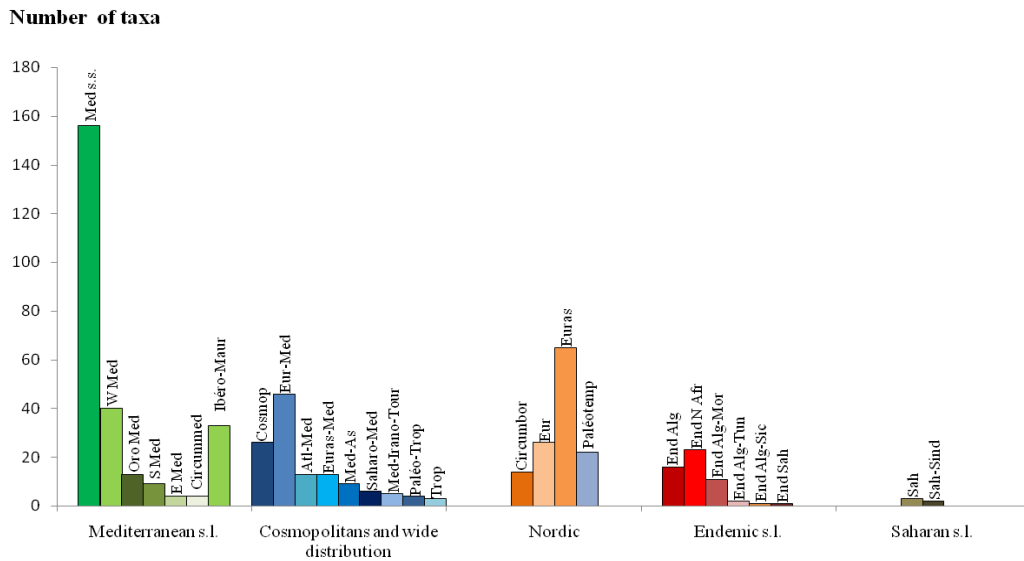


Figure 2. Distribution of the flora of the Belezma National Park by chronological types. Notes: Med: Mediterranean, Ibero-Maur: Ibero-Mauretanian, Cosmop: Cosmopolitan, Eur: European, Atl: Atlantic, Euras: Eurasian, As: Asian, Irano-Tour: Irano-Touranian, Paleo-Trop: Paleo-Tropical, Circumbor: Circumboreal, Paleotemp: Paleotemperate, End: Endemic, Alg: Algerian, N Afr: North African, Mor: Moroccan, Tun: Tunisian, Sah: Saharan, Sah-Sind: Sahara-Sindian, Sic: Sicilian, W: West, E: East, S: South, Oro: Montagnard.

The proportion of hemicryptophytes (44.4%) is similar to that reported by Beghami (2013) for the flora of Chélia (46%), by Bouchibane et al. (2021) for the mountains of the Kabylia of Babors (43.8%), and higher than that reported by Touati et al. (2021). Several researchers have explained hemicryptophytes' dominance by rainfall, cold, particularly in winter (Floret et al. 1990), by soils rich in organic matter, and high altitudes. Rainfall and vegetation cover are also beneficial to this biological type, as is the importance of mycorrhizae.

Therophytes also hold a significant position with nearly 25.4%. This percentage is comparable to those reported by Bouchibane et al. (2021) for the Kabylia of Babors (22.8%). It is, however, lower than those reported by Rebbas (2014) for the Gouraya National Park (37.3%), and Beghami (2013) for the flora of the Chelia massif (41%). The disturbance index for the BNP is 38%, represented by the rate of therophytes and chamaephytes. It is lower than that reported by Beghami (2013) for the nearby Chélia massif. The therophytization of forest formations is linked to their generalized invasion by annual species, which are frequently sub-necrophilous and spread primarily through herds. Overgrazing, fires, overexploitation of the environment, and strong anthropic and climatic action all favor the development and appearance of this type of biology. Therophytes are the most recent manifestations of adaptation to productive and disturbed habitats. Their dominance is an important feature of the vegetation in arid areas, such as the Tiaret or the Saida Mountains (Aouadj et al. 2020a; Belgacem et al. 2021), where therophytes outnumber other biological types.

Therophity is considered an adaptive strategy in unfavorable circumstances. When compared to other biological types, champhytes have better acclimatization to aridity. They can adapt to drought by reducing their leaf

surface and developing their root system (Floret et al. 1990). Their numbers increase as the environment becomes more arid and open. When a vegetation cover is cleared, champhytes infiltrate and form transitional species between vegetal groups. They colonize after the gaps left by the shrubby and herbaceous species of the initial ecosystem are disturbed. Phanerophytes are hardy plants that can dominate by their cover and thus play an important role in establishing floristic procession unique to forest environments. Finally, some authors such as Aouadj et al. (2020b, c) believe that the low proportion of geophytes can be attributed to their low germination rate. Geophytes preferentially reproduce in a vegetative way and prefer poorly worked soils. This biological type favors open environments, particularly scrubs and mountain grasslands.

Dispersal modes of the flora species

Plants have developed a variety of dispersal strategies, including abiotic vectors such as anemochory, hydrochory and barochory, as well as biotic vectors such as zoochory. Seed dispersal connects genetically isolated plant populations and allows the colonization of new favorable habitats (Howe and Smallwood 1982). It is a critical ecological process determining how vegetal populations are structured. Quantitative and qualitative dispersal components determine the success of dispersal or vector efficiency (Schupp et al. 2010). Its impediment affects species distribution. The grains of the BNP flora are dispersed in various ways. The dissemination modes reveal a predominance of zoochory taxa (250 taxa), of which 181 are epizoochore. Barochory and anemochory are also significant, accounting for 30.1% and 24.0% of the total BNP flora, respectively (Figure 4).

The zoochory accounts for 44.5% of all floristic species inventoried, which demonstrates the close relationship

between plants and animals. It primarily consists of two dispersal modes: epizoochory (32.46%), which involves seeds transport via animal adhesion, and endozoochory (10.53%), which is the dispersal of seeds after they have passed through the digestive tract of animals. These two dissemination types account for 96.4% of zoochory and are critical for ecosystem ecological balance. Among the remaining taxa, 3.2% are myrmecochory (distribution ensured by ants), and one species (about 4%) is dyszoochore (the grains germinate in caches of reserves formed by animals and are then forgotten).

Zoochory allows grains to travel long distances and promotes species' expansion and diversification of its genetic heritage. Barochory, which comes in second (30.1%), disperses diaspores, grains, or pollen through simple gravity. The wind disperses the anemochores, accounting for 24.0% of the total flora in the BNP. Because of their great height, some trees are affected by this dispersal mode. Certain Asteraceae and Poaceae are particularly prolific in diaspores and have anemochory (aigrette of Asteraceae) and/or floatability, making runoff transport easier (spikes and glumes of Poaceae).

Abundance, rare and threatened flora species

The results show that common (C) is the most common status, with 134 species (23.8%), followed by very common status (CC) with 121 species (21.5%), and particularly widespread (CCC) and fairly common (AC) status combined for 111 species (19.8%, Figure 5). Rare species are those with a low abundance and/or a limited range (Rebbas 2014). According to Quézel and Santa (1962-1963), the analyzed flora contains 196 (34.9%) rare species. This percentage is higher than Rebbas's (11.2%) for Gouraya National Park but comparable to those advanced by Bouchibane et al. (2021) for the Kabylia of Babors mountain massifs (32.2%).

There are 63 quite rare, 98 rare, 29 very rare, and 6 extremely rare species among the 196 rare floristic species of all categories. In addition, 35 of the rare species are endemic (Figure 5). The presence of both endemic and rare

species demonstrates the significance of the BNP's biogeographic area in terms of biological diversity and patrimonial species in global conservation and sustainable development framework. These *trigger species*, according to Yahi et al. (2012), are useful for assessing and identifying important biodiversity zones. In this regard, BNP is recognized as one of Algeria's important plant zones (Yahi et al. 2012). The patrimony value of the BNP represented by the total of rare taxa and common endemics is 214 species, representing a very significant rate of 38.1% of the total flora. The IUCN red list (IUCN 2021) includes 134 Algerian species that are rare or threatened. Among them, 5 are present in BNP (*Selinopsis montana* Coss. and Durieu ex Batt.), *Asyneuma rigidum* subsp. *aurasiacum* (Batt. and Trab.) Damboldt, *Erodium aethiopicum* (Lam.) Brumh. and Thell., *Agropyropsis lolium* (Balansa ex Coss. and Durieu) A. Camus and *Linaria decipiens* Batt.). Furthermore, 26 taxa present at BNP are listed in Algeria as non-cultivated and protected plant species (JORA 2012, Table 4).

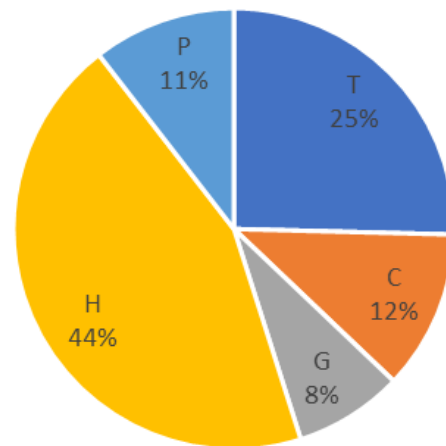


Figure 3. Distribution of flora taxa in the Belezma National Park by biological types. Notes: H: Hemicryptophytes, G: Geophytes, C: Chamephytes, T: Therophytes, P: Phanerophytes

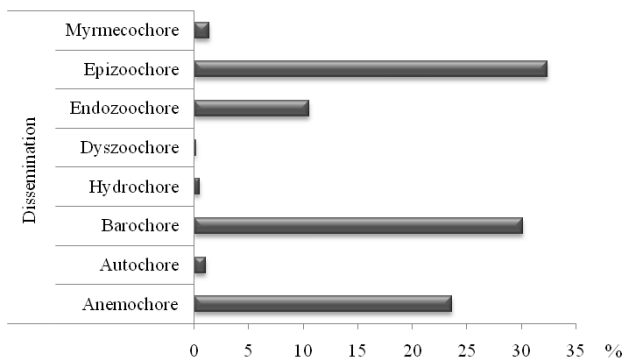


Figure 4. Frequency of the different modes of dispersal of the floristic species recorded in the Belezma National Park

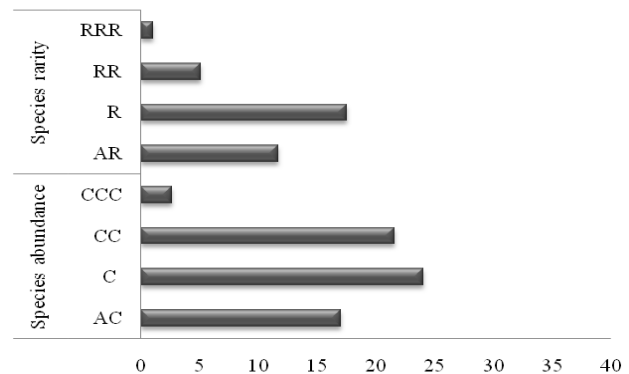


Figure 5. Abundance and rarity of floristic taxa in the Belezma National Park. Notes: AR: quite rare, R: Rare, RR: very rare, RRR: extremely rare, AC: fairly common, C: common, CC: very common, CCC: particularly widespread

Table 4. List of threatened, non-cultivated and protected floristic species in the Belezma National Park according to executive decree No. 12-03 of January 4, 2012. The species nomenclature follows Dobignard and Chatelain (2010-2013)

Taxa	Family
<i>Pistacia atlantica</i> Desf.	Anacardiaceae
<i>Rhaponticoides alpina</i> (L.) M.V. Agab. and Greuter	Asteraceae
<i>Centaurea tougourensis</i> Boiss. and Reut.	Asteraceae
<i>Mauranthemum reboudianum</i> (Pomel) Vogt and Oberpr.	Asteraceae
<i>Crupina vulgaris</i> Cass.	Asteraceae
<i>Hieracium amplexicaule</i> subsp. <i>atlanticum</i> (Fr.) Zahn	Asteraceae
<i>Hieracium faurelianum</i> Maire	Asteraceae
<i>Hieracium humile</i> Jacq.	Asteraceae
<i>Tragopogon porrifolius</i> L.	Asteraceae
<i>Asyneuma rigidum</i> subsp. <i>aurasiacum</i> (Batt. and Trab.) Damboldt	Campanulaceae
<i>Helianthemum lippii</i> (L.) Dum. Cours.	Cistaceae
<i>Juniperus oxycedrus</i> L.	Cupressaceae
<i>Juniperus phoenicea</i> L.	Cupressaceae
<i>Lomelosia stellata</i> (L.) Raf	Dipsaceae
<i>Ononis natrix</i> L.	Fabaceae
<i>Erodium trifolium</i> (Cav.) Guitt.	Geraniaceae
<i>Romulea vaillantii</i> Quézel	Iridaceae
<i>Fraxinus dimorpha</i> Coss. and Durieu	Oleaceae
<i>Dactylorhiza munbyana</i> (Boiss. and Reut.) Aver.	Orchidaceae
<i>Orchis mascula</i> (L.) L.	Orchidaceae
<i>Anacamptis papilionacea</i> (L.) R.M. Bateman, Pridgeon and Chase	Orchidaceae
<i>Orchis purpurea</i> Huds.	Orchidaceae
<i>Cedrus atlantica</i> (Endl.) Carrière	Pinaceae
<i>Agropyropsis lolium</i> (Balansa ex Coss. and Durieu) A. Camus	Poaceae
<i>Poa nemoralis</i> L.	Poaceae
<i>Rhamnus cathartica</i> L.	Rhamnaceae

Twenty-six rare and/or endemic species are protected in Algeria (executive decree No. 12-03 of January 4, 2012, establishing the list of protected non-cultivated plant species in Algeria). Other extremely rare species not listed on our inventory should be given more attention. Protection measures are required to avoid the deterioration of this territory's biodiversity. Because of its location at the crossroads of the Saharan and Tellian massifs, the findings confirm that the BNP has a diverse flora with a typical biogeographic character. It functions as a biological reservoir, facilitating plant species dispersal, distribution, and migration. The bioclimatic variability has also enabled the establishment of a diverse and unique biodiversity with a high rate of endemism. The biological spectrum confirms the regressive evolution of the plant cover, as evidenced by the low rate of phanerophytes and the importance of hemicryptophytes and therophytes. Indeed, bioclimatic conditions favor the appearance of therophytes, particularly at low altitudes and on the southern slope with semi-arid and arid bioclimatic scales. Furthermore, the status of the inventoried species highlights several endemic, protected, rare, and endangered species, emphasizing the importance of BNP in conservation within the context of sustainable development. The patrimony value of BNP is reflected in its 214 rare and/or endemic taxa, prompting us to propose urgent protection measures to conserve not only these taxa but also their habitats, particularly forest landscapes and high-altitude grasslands.

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REFERENCES

- Abdessemed K. 1981. The cedar of the Atlas (*Cedrus atlantica*, Mannetti) in the massifs of Aures and Belezma- Phytosociological study and problem of conservation and development. [Dissertation]. Aix Marseille III, France. [French]
- Aouadj SA, Nasrallah Y, Hasnaoui O, Khatir H. 2020a. Rare, endemic and threatened flora of the mounts of Saida (Algeria). *Agrobiologia* 10 (1): 1986 -1998. www.agrobiologia.net
- Aouadj SA, Nasrallah Y, Hasnoui O. 2020b. Ecological characterization and evaluation of the floristic potential of the forest of Doui Thabet (Saida Western Algeria) in the context of the restoration. *Ecol Environ Conserv* 26 (1): 266-278.
- Aouadj SA, Nasrallah Y, Hasnoui O. 2020c. Regional phytogeographic analysis of the flora of the Mounts of Saida (western Algeria): Evaluation-restoration report. *Biodivers J* 11 (1): 25-34. DOI: 10.31396/Biodiv.Jour.2020.11.1.25.34.
- Arar A, Tabet S, Nouidjem Y, Bounar R, Chenchoune H. 2018. Projected small-scale range reductions of *Cedrus atlantica* forests due to climate change at the Belezma National Park (Algeria). In *Exploring the Nexus of Geoecology, Geography, Geoarchaeology and Geotourism: Advances and Applications for Sustainable Development in Environmental Sciences and Agroforestry Research: Proceedings of the 1st Springer Conference of the Arabian Journal of Geosciences (CAJG-1)*, Tunisia 2018. Cham: Springer International Publishing.

- Beghami Y. 2013. Ecology and dynamics of the Aurès vegetation: spatio-temporal analysis and study of forest and mountain flora. [Dissertation]. Biskra Univ, Algeria.
- Beghami R, Bertella N, Laamari M, Bensaci OA. 2020. Bark beetle and woodborer insects' outbreak as a potent driver of Atlas cedar (*Cedrus atlantica* (Endl.) Carrière) forests dieback in Aures-East Algeria. For Sci Technol 16 (2): 75-85. DOI: 10.1080/21580103.2020.1756929.
- Belgacem N, Benchohra M, Hicham B, Mohammed S, Okkacha H, Abdelkader N. 2021. Diversity and floristic composition of Djebel Nessara region (Tiaret -Algeria). Biodivers J 12 (3): 729-732. DOI: 10.31396/Biodiv.Jour.2021.12.3.729.732.
- Belloula S, Beghami Y. 2018. Assessment of the Dynamics of Atlas Cedar Decline (*Cedrus atlantica* Manetti) by Remote Sensing in the Aurès area, Algeria. The Arab World Geogr 21(2-3): 154-167.
- Benhouhou S, Yahi N, Véla E. 2018. Status of threatened flora: Algeria. Pp. 25-27 in Valderrábano M, Gil T, Heywood V, De Montmollin B. (ed.), Conserving wild plants in the south and east Mediterranean region. Malaga: IUCN, Centre for Mediterranean Cooperation.
- Bensaci OA, Harzallah D, Gouare K. 2015. Endophytic mycoflora of *Cedrus atlantica*: diversity patterns and determinism of the phytosanitary situation of Atlas cedar forests in Belezma massif (Algeria). For Sci Technol 11 (1): 36-43. DOI: 10.1080/21580103.2014.957352.
- Benzina I, Si Bachir A, Santoul F, Céréghino R. 2021. Macroinvertebrate functional trait responses to environmental gradients and anthropogenic disturbance in arid-land streams of North Africa. J Arid Environ 195: 104626. DOI: 10.1016/j.jaridenv.2021.104626.
- Boukerker H. 2016. Autoecology and biodiversity assessment in cedar forests of *Cedrus atlantica* Manetti in Belezma National Park (Batna, Algeria). [Dissertation]. Biskra Univ, Algeria.
- Boukerker H, Si BA. 2015. Biodiversity of xylophagous insects and their role in the *Cedrus atlantica* forests decline in the national park of Belezma-Batna- (Algeria). Courrier du Savoir 20: 79-90.
- Bounar R, Rebbas K, Gharzouli R, Djellouli Y, Abbad A. 2013. Ecological and medicinal interest of Taza National Park flora (Jijel - Algeria). Global J Res Med Plants Indigen Med 2: 89-101.
- Bounar R, Rebbas K, Ghabbane M, Dahia M, Miara MD. 2017. Flora and medicinal plants in the green spaces of Bousaâda (Algeria) and surroundings. Global J Res Med Plants Indigen Med 6 (1): 01-14.
- Bounar R, Nouidjem Y, Arar A. 2018. Ecology and Floristic Diversity of Takoucht Massif Chain in Babors (Bejaia, Algeria). Entomol Appl Sci Lett 5 (2): 26-35.
- Bouchibane M, Zemouri M, Toumi R. 2021. Contribution to the study of the vegetation of some mountains to the Kabylia of Babors (Northeastern Algeria). Bull Soc R Sci Liege 91: 317-360. DOI: 10.25518/0037-9565.10696.
- Djebbouri M, Terras M. 2019. Floristic diversity with particular reference to endemic, rare or endangered flora in forest formations of Saïda (Algeria). Intl J Environ Stud 76: 990-1003. DOI: 10.1080/00207233.2019.1620541.
- Dobignard A, Chatelain C. 2010-2013. Synonymical index of the flora of North Africa (5V) (eds). Conservatory and Botanical Garden, Geneva. <http://www.ville-ge.ch/musinfo/bd/cjb/africa/>
- Derradji M, Ghenai K, Yahia M. 2020. Contribution to the inventory of medicinal plants in Belezma National Park (Batna). [Master's Dissertation]. Batna 2 Univ, Algeria.
- Floret C H, Galan M J, Le floe H, Orshan G, Romane F. 1990. Growth forms and phenomorphology traits along an environmental gradient: Tools for studying vegetation. J Veg Sci 1: 71-80. DOI: 10.2307/3236055.
- Fois M, Farris E, Calvia G, Campus G, Fenu G, Porceddu M, Bacchetta G. 2022. The endemic vascular flora of Sardinia: a dynamic checklist with an overview of biogeography and conservation status. Plants 11 (5): 601. DOI: 10.3390/plants11050601.
- Gordo B, Hadjadj-Aoul S. 2019. The Algerian-Moroccan floristic endemism in the Ksour mountains (Naâma, Algeria). Fl Medit 29: 129-142. DOI: 10.7320/FIMedit29.129.
- Howe HF, Smallwood J. 1982. Ecology of Seed Dispersal. Annu Rev Ecol Evol Syst 1: 201-228. DOI: 10.1146/annurev.es.13.1.10182.001221.
- IUCN. 2018-2021. Contribution to the conservation and sustainable management of the biodiversity of the National Park of Belezma (Batna). OSCAN PPI project. International Union for Conservation of Nature (IUCN). <https://urlz.fr/kODI>.
- IUCN. 2021. Plantes Natives D'Algérie. <https://urlz.fr/kTmR>
- JORA. 2012. Executive Decree 12/03 of January 4, 2012 fixing the list of uncultivated and protected plant species. Official Journal of the Algerian Republic, n° 03 of 18-01-2012. [French]
- Laffitte R. 1939. Geological study of the Aurès. [Dissertation]. Paris Univ, France. [French]
- Maire R. 1952-1987. Flora of North Africa Volume 16. Lechevalier, Paris.
- Meddour R, Sahar O. 2021. Floristic inventory of Djurdjura National Park, northern Algeria: A first checklist of its vascular flora. Phytotaxa 490 (3): 221-238. DOI: 10.11646/phytotaxa.490.3.1.
- Miara MD, Ait Hammou M, Dahmani W, Negadi M, Djellaoui A. 2018. New data on endemic flora of the sub-sector of the Tellian Atlas Oranais "O3" (Western Algeria). Acta Bot Malacit 43: 63-69. DOI: 10.24310/abm.v43i0.4453.
- Quézel P, Santa S. 1962-1963. New Flora of Algeria and Southerly Desert Regions. CNRS, Paris.
- Rebbas K. 2014. Sustainable Development of the protected spaces in Algeria, the case of Gouraya National Park of biological and ecological sites of interests in the Region of Bejaia. [Dissertation]. Sétif Univ, Algérie.
- Sadok M, Belounnas M, Delhoume D. 2019. Databases and enhancement of plant biodiversity in Belezma National Park (Batna, Algeria). [Master's dissertation]. Batna 2 Univ, Algérie.
- Sarri D, Djellouli Y, Allatou D. 2014. Biological diversity of the National Park of El-Kala (Algeria), valorization and protection. Biodivers J 5 (4): 525-532.
- Seltzer P. 1946. The climate of Algeria. Trav Instit mét phys globe Alg. Alger, Carbonel. Algérie. [French]
- Schupp E. W, Jordano P, Gómez J.M. 2010. Seed dispersal effectiveness revisited: A conceptual review. New Phytol 188: 333-353.
- Slimani S, Derridj A, Gutierrez E. 2014. Ecological response of *Cedrus atlantica* to climate variability in the Massif of Guetiane (Algeria). For Syst 23 (3): 448-460. DOI: 10.5424/fs/2014233-05175.
- Touati L, Hamel T, Meddad-Hamza A, de Bélair G. 2021. Analysis of rare and endemic flora in northeastern Algeria: the case of the wilaya of Souk Ahras. Bull Soc R Sci Liege 90: 213-240. DOI: 10.25518/0037-9565.10514.
- Treurnicht H, Colville J F, Joppa G, Huyser J, Manning J. 2017. Counting complete? Finalising the plant inventory of a global biodiversity hotspot. Peer J 5: e2984. DOI: 10.7717/peerj.2984.
- Véla E, Benhouhou S. 2007. Evaluation of a new hotspot for plant biodiversity in the Mediterranean basin (North Africa). C R Biol 330 (8): 589-605. DOI: 10.1016/j.crvi.2007.04.006.
- Yahi N, Véla E, Benhouhou S, De Bélair G, Gharzouli R. 2012. Identifying important plants area (Key Biodiversity Area for Plants) in northern Algeria. J Threat Taxa 4 (8): 2753-2765. DOI: 10.11609/JoTT.o2998.2753-65.