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## The vascular flora of the Marine Protected Area of “Capo Carbonara” (SE-Sardinia)

### Abstract

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This study aims at presenting an updated inventory of the vascular flora of the Capo Carbonara Marine Protected Area, including the Sites of Community Importance “Isola dei Cavoli, Serpentara, Punta Molentis e Campulongu” and partially of “Costa di Cagliari”, in Sardinia (Italy). A total of 653 taxa are reported, 84% of which are native (5% endemics) and 16% non-native (10% neophytes, 6% archaeophytes). The native component includes 406 species, 135 subspecies, two variety and one hybrid, belonging to 75 families and 313 genera. The non-native taxa are 94 species, 13 subspecies, one variety and one hybrid, belonging to 40 families and 81 genera.

Life-form analysis of native species revealed a prevalence of therophytes (49%) followed by hemicryptophytes (21%), geophytes (14%) and chamaephytes (7%). Therophytes (33%) followed by phanerophytes (32%) are prevalent among the non-native taxa. Biogeographically, among native species, the Mediterranean element is largely prevailing (81%), mainly consisting of Circum-Mediterranean (39%) and Euro-Mediterranean (27%) taxa, while the American element (35%) prevails over the Mediterranean species (29%) among the non-native taxa. Among endemics, the Sardo-Corsican taxa are dominant (55%), followed by Sardo-Corsican-Tuscan Archipelago (14%) and Sardinian (10%) taxa.

*Key words:* Alien species, biodiversity, conservation, endemics, marine protected areas, Mediterranean Basin, Sardinia, vascular flora.

### Introduction

The territory of the Marine Protected Area of Capo Carbonara (hereafter MPACC) is known as one of the most important coastal areas in Sardinia. Since 1998, the year of its legal establishment, it is also the only marine protected area in southern Sardinia. The institution of the MPACC, together with the previous establishment of the Sites of Community Importance (SCI) and Special Protection Areas (SPA) of the Natura 2000 Network, increased the protection level of this territory, which is very fragile due to touristic pressure, and have triggered several biodiversity conservation projects (AA.VV. 2014; Acunto & al. 2017; Pinna & al. 2017).

The territory shows a remarkable floristic diversity due to the richness of habitats and has attracted several botanists since the early 1800s. The first reports about the vascular flora of this area, from Capo Carbonara and Porto Giunco, are due to Moris (1827, 1837-1859). Subsequently, between 1894 and 1916, Martelli carried out some herborizations in different sites of south-eastern Sardinia, including the Isola dei Cavoli. The area of Capo Carbonara was frequently visited by botanists because it was accessible by a coastal road which, although defined at that time as very dangerous, allowed to reach this area (Bocchieri & Iiriti 2007a).

Some herborizations along the coast of Villasimius were carried out by Martinoli between 1940 and 1951 (Bocchieri & Iiriti 2007a). More recent investigations have focused on the Cavoli (Corsi 1963; Mossa & Tamponi 1978; Mossa & Fogu 1987) and Serpentara (Bocchieri 1988, 1989; Biondi & al. 1993) islands, Capo Carbonara, and the surrounding areas (Camarda & Ballero 1981; Mossa & al. 2000). Further floristic information for the study area are reported in studies addressing areas of south-eastern Sardinia or carried out at a regional scale (Chiappini & Diana 1978; Ballero 1982; Arrigoni & Bocchieri 1995; Mayer 1995; Bocchieri 2001; Palmese & al. 2001; Mossa & al. 2003; Bacchetta & al. 2005; Arrigoni 2006-2015; Iiriti 2006; Bocchieri & Iiriti 2007a, 2007b, 2008).

To date, however, there is no updated checklist of the vascular flora of this area (Bacchetta & al. 2006, 2007; Bacchetta & al. 2015; Pinna & al. 2017). In the framework of the project “Conservation of Plant Biodiversity in the Marine Protected Area of Capo Carbonara”, funded by the Ministry of the Environment and Territory and Sea Protection (MATM) (Bacchetta & al. 2006, 2007), the project LIFE07 NAT/IT/000519 PROVIDUNE (Durán & al. 2016; Pinna & al. 2015, 2017) and LIFE13 NAT/IT/000433 RES MARIS project (Acunto & al. 2017; Bacchetta & al. 2018), in the years from 2014 to 2018, a study was carried out on the vascular flora of the coastal territory of the municipality of Villasimius, which includes the SCI “Isola dei Cavoli, Serpentara, Punta Molentis and Campulongu”, coinciding with MPACC.

This study brings an overview of the vascular flora in the MPACC and contributes to update the information on the native and exotic flora, thus providing a basis for conservation actions.

## Study area

The study area includes coastal and insular areas of the MPACC in south-eastern Sardinia (Fig. 1). The MPACC, 8.598 hectares in surface, was founded by a Ministerial Decree on 15/09/98 (modified on 3/08/99) with the participation of the Sardinian Region and Villasimius municipality. It encloses the marine area in front of the Cavoli and Serpentara islands and the coast belonging to Villasimius. The coast is 41 km long and includes several beaches as Porto Giunco, Simius, Campu Longu and Campus, where rocky promontories alternate with small bays such as Porto Sa Ruxi or Punta Molentis.

The sea areas are characterized by a continuity of granite forms with emerging spots, while wide sandy expanses connect the islands interrupted by granitic shoals.

The lithologies are essentially referred to the Ercinic batholith of Sarrabus emerged at the end of the Ercinic orogenesis in the Middle Carboniferous (Carmignani & al. 1982). Rocks mainly

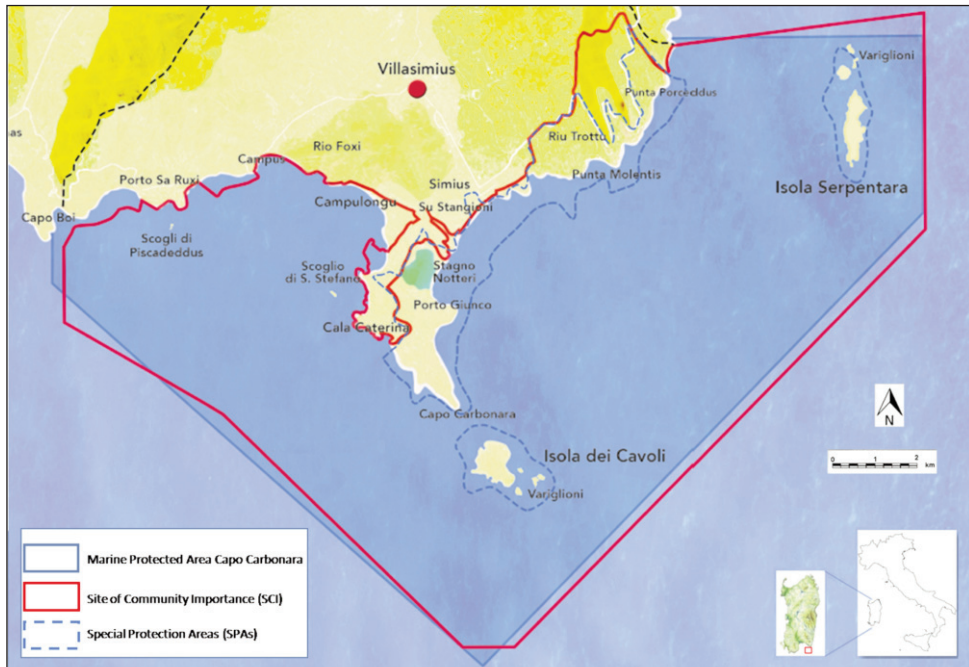


Fig. 1. Geographic position of the Marine Protected Area of Capo Carbonara (MPACC).

derive from granites and granodiorites subjected, during the alpine orogenesis, to tectonic movements that deformed then according to a NW-SE prevalent direction. The veins present the same orientation. They are mainly of a basic nature, dominated by lamprophyric and spessartitic lithologies which are important in shaping the coastal and submarine landscape, the coastline being formed by promontories with the same orientation as those of Capo Carbonara (Orrù & al. 1994). The oldest organogenic deposits are formed by fossiliferous beaches conglomerates known as Tyrrhenian Platform, which appear in various points of Capo Carbonara promontory. One of the most important outcrops is near Cava Usai, in the locality of Portu su Forru, which has a total extension of about 400 m. This formation is surmounted by sandstones of aeolic origin (paleodunes), a reddish paleosoil (palexeralf), and, in the submerged environment, by the sedimentation and cementation of beach-rocks. In the surrounding landscape, ancient shapes of smoothing such as “inselberg” and “tor” ornament the ridges and the plateaux at an elevation ranging from 400 to 500 m (Orrù & al. 1994).

Climate is typically Mediterranean; thermometric data (37 years of observations) from the climatic station of Capo Carbonara, show a strong seasonal trend in temperature, typical of the coast of Sardinia. Annual mean temperature is 21.8°C, mean maximum temperature of the hottest month 30.9°C (August) and mean minimum temperature of the coldest month 9.5°C (February). As for precipitation, the climatic station of Capo Carbonara recorded an annual mean of 238.7 mm, with higher values in autumn; October, with 35 mm on average, is the wettest month (Table 1).

Table 1. Mean monthly and annual temperature (°C) and rainfall (mm), Capo Carbonara station (Italian Air Force National Meteorological Service). Temperature observations: 1960-2007 (37 years); rainfall observations: 1954-2008 (54 years).

	Jan	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<b>Mean Temp</b>	11.6	11.6	12.7	14.4	18.1	22.2	25.3	26.0	23.3	19.8	15.9	12.8	17.8
<b>Max Temp</b>	14.7	14.9	16.6	18.2	22.2	26.7	30.2	30.9	27.6	24.0	19.2	15.7	21.8
<b>Min Temp</b>	9.9	9.5	11.0	12.3	15.8	19.8	22.8	23.8	21.0	18.0	14.1	11.0	15.7
<b>Rainfall</b>	22.6	24.3	23.3	20.0	13.0	3.4	2.5	7.3	27.7	35.0	33.0	26.7	238.7

From a bioclimatic point of view, the study area has a Mediterranean Pluviseasonal Oceanic (MPO) bioclimate, a Thermo-Mediterranean (TME) thermotype and an ombrotype ranging from upper semiarid to lower dry (Bacchetta & al. 2009).

The superficial movable bottom is mainly colonized by beds of *Posidonia oceanica* Delile, being a part of the priority habitat 1120 “*Posidonia* beds (*Posidonium oceanicae*)” (Acunto & al. 2017).

The dune ecosystems are well preserved, hosting in different places the complete psamphilous geosigmatata from the annual herbaceous vegetation to the micro-forest dominated by junipers of the priority habitat 2250 “Coastal dunes with *Juniperus* spp.” and pine of the priority habitat 2270 “Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*” (Acunto & al. 2017). The populations of *Crucianella maritima* L. are of a great value. Even if fragmented, they occupy the back side of the dunes and belong to the habitat 2210 “*Crucianellion maritimae* fixed beach dunes”, as well as the formations of *Achillea maritima* (L.) Ehrend. & Y.P.Guo that can be found only in Cava Usai, Punta Molentis and a few other places along the south-eastern coast of Sardinia. The rocky surfaces and cliffs in front of the sea are occupied by the association *Crithmo maritimi-Limonietum retiramei corr.* (Mossa & Tamponi 1978) attributable to the habitat 1240 “Cliffs with the Mediterranean coastal vegetation with *Limonium* spp. endemic”. The Notteri pond occupies the back side of the dune area of the Porto Giunco beach. It occupies a surface of about 34 ha and hosts an interesting halophyllous vegetation referred to the priority habitat 1510 “Mediterranean salt steppes (*Limonietalia*)”, while the muddy bottom is colonized by the association *Chaetomorpha-Ruppium* Br.-Bl. 1952 being a part of the habitat 1150 “Coastal lagoons” (Mossa & al. 2000).

In the framework of the Italo-Tyrrhenian biogeographic superprovince (Ladero-Alvarez 1987; Bacchetta & al. 2013) and the Sardinian-Corsican biogeographic province (Bacchetta & al. 2012), based on the vascular endemic flora, the study area falls into the Campidanese-Turritano sector and Sarrabense subsector (Fenu & al. 2014).

## Material and Methods

In order to perform the analysis of the vascular flora, floristic data retrieved from literature were implemented by a four years' work that included field investigation during the MATTM, LIFE PROVIDUNE and LIFE RES MARIS projects, and the revision of herbarium and bibliographic material.

The taxonomic treatment of plant species and subspecies follow the last checklists of the native and alien floras of Italy (Bartolucci & al. 2018; Galasso & al. 2018). Plant families have been validated according to the Angiosperm Phylogeny Group IV (APG 2016).

Life-forms were directly checked in the field and expressed according to the Raunkiaer's classification system (Raunkiaer 1934), using the abbreviations reported in Pignatti (1982). For the biogeographical types we used Pignatti's classification (Pignatti 1982), as modified by Brullo & al. (1996) for Mediterranean chorotypes. For endemic taxa, the categories proposed by Arrigoni & Di Tommaso (1991) were adopted, as modified by Bacchetta & Pontecorvo (2005).

The geographic origin of alien plants was based on Podda & al. (2012) and Puddu & al. (2016). The status of alien species was determined and ordered according to Richardson & al. (2000), Pyšek & al. (2004), and Richardson & al. (2011). Archaeophyte and neophyte taxa were differentiated depending on their introduction before or after the years 1492/1500, respectively.

## Floristic checklist

Db = dubious reporting

Alien taxa: Neo = Neophytes; Arch = Archeophytes; Arch D = cryptogenic; Status alien taxa: Inv = invasive; Nat = naturalised; Cas = casual.

## PTERIDOPHYTA

### *SELAGINELLACEAE*

*Selaginella denticulata* (L.) Spring – Ch rept – Circum-Medit.

### *EQUISETACEAE*

*Equisetum ramosissimum* Desf. – G rhiz – Circumbor.

### *DENNSTAEDTIACEAE*

*Pteridium aquilinum* (L.) Kuhn subsp. *aquilinum* – G rhiz – Cosmop.

### *ASPENIACEAE*

*Asplenium ceterach* L. subsp. *ceterach* – H ros – Eurasiat.

*Asplenium obovatum* subsp. *billotii* (F.W.Schultz) O.Bolòs, Vigo, Masalles & Ninot – H ros – W-Medit.

*Asplenium obovatum* Viv. subsp. *obovatum* – H ros – Circum-Medit.

*PTERIDACEAE*

*Anogramma leptophylla* (L.) Link – T caesp – Subtrop.

*Oeosporangium pteridioides* (Reichard) Fraser-Jenk. & Pariyar – H ros – W-Medit.

*POLYPODIACEAE*

*Polypodium cambricum* L. – H ros – Euro-Medit.

**PINOPHYTA**

*CUPRESSACEAE*

*Cupressus sempervirens* L. – P scap – E-Medit. (Arch – Cas)

*Juniperus macrocarpa* Sm. – P caesp – Circum-Medit.

*Juniperus turbinata* Guss. – P caesp – Euro-Medit.

*PINACEAE*

*Pinus halepensis* Mill. subsp. *halepensis* – P scap – Circum-Medit.

*Pinus pinea* L. – P scap – Euri-Medit. (Arch – Nat)

**MAGNOLIOPHYTA**

**Magnolides**

*ARISTOLOCHIACEAE*

*Aristolochia rotunda* subsp. *insularis* (E. Nardi & Arrigoni) Gamisans – G rhiz – Endem.  
SA-CO

*Aristolochia tyrrhena* E.Nardi & Arrigoni – G rad – Endem. SA

**Monocotyledones**

*ARACEAE*

*Ambrosina bassii* L. – G rhiz – SW-Medit.

*Arisarum vulgare* O.Targ.-Tozz. subsp. *vulgare* – G rhiz – Circum-Medit.

*Arum pictum* L.f. subsp. *pictum* – G rhiz – Endem. SA-CO-AT

*Helicodiceros muscivorus* (L.f.) Engl. – G rhiz – Endem. SA-CO-BL

*Lemna minor* L. – I nat – Boreo-Trop.

*CYMODOCEACEAE*

*Cymodocea nodosa* (Ucria) Asch. – I rad – Medit.-Atl.

*POTAMOGETONACEAE*

*Posidonia oceanica* (L.) Delile – I rad – Circum-Medit.

*Ruppia maritima* L. – I rad – Boreo-Trop.

*AMARYRILLIDACEAE*

*Acis autumnalis* (L.) Sweet – G bulb – Circum-Medit.

*Allium cepa* L. – G bulb – Asia. (Arch – Cas)

*Allium commutatum* Guss. – G bulb – Circum-Medit.

*Allium polyanthum* Schult. & Schult.f. – G bulb – Euro-Medit.

*Allium roseum* L. subsp. *roseum* – G bulb – Circum-Medit.

- Allium sativum* L. – G bulb – Europ. (Arch – Cas)  
*Allium subhirsutum* L. subsp. *subhirsutum* – G bulb – Circum-Medit.  
*Allium triquetrum* L. – G bulb – Circum-Medit.  
*Narcissus miniatus* Donn.-Morg., Koop. & Zonn. – G bulb – Circum -Medit.  
*Narcissus supramontanus* subsp. *cunicularium* Arrigoni – G bulb – Endem. SA-CO  
*Pancratium maritimum* L. – G bulb – Circum-Medit.

#### ASPARAGACEAE

- Agave americana* L. – P caesp – Neotrop. (Neo – Inv)  
*Agave attenuata* Salm-Dyck subsp. *attenuata* – P caesp – Neotrop. (Neo – Cas)  
*Agave fourcroydes* Lem. – P caesp – Neotrop. (Neo – Inv)  
*Agave ingens* Brg. var. *picta* – P caesp – Neotrop. (Neo – Inv)  
*Agave salmiana* Otto ex Salm-Dyck subsp. *ferox* (K.Koch) Hochstätter – P caesp –  
 Neotrop. (Neo – Inv)  
*Asparagus acutifolius* L. – G rhiz – Circum-Medit.  
*Asparagus albus* L. – Ch frut – W-Medit.  
*Asparagus aphyllus* L. – Ch frut – S-Medit.  
*Asparagus horridus* L. – NP – S-Medit.  
*Charybdis pancration* (Steinh.) Speta – G bulb – Circum-Medit.  
*Charybdis undulata* (Desf.) Speta – G bulb – S-Medit.  
*Muscari comosum* (L.) Mill. – G bulb – Euro-Medit.  
*Prospero corsicum* (Boullu) J.-M.Tison – G bulb – Endem. SA-CO  
*Prospero obtusifolium* subsp. *intermedium* (Guss.) Soldano & F.Conti – G bulb – SW-  
 Medit.  
*Ruscus aculeatus* L. – Ch frut – Euro-Medit.  
*Ruscus hypoglossum* L. – G rhiz – Euro-Medit. (Neo – Cas)  
*Urginea fugax* (Moris) Steinh. – G bulb – SW-Medit.  
*Yucca aloifolia* L. – P caesp – Neotrop. (Neo – Cas)  
*Yucca gloriosa* L. – P caesp – Neotrop. (Neo – Cas)

#### IRIDACEAE

- Chamaeiris foetidissima* (L.) Medik. – G rhiz – Euro-Medit.  
*Gladiolus byzantinus* Mill. – G bulb – Circum-Medit. (Arch D – Nat)  
*Iris germanica* L. – G rhiz – Europ. (Arch – Nat)  
*Limniris pseudacorus* (L.) Fuss – G rhiz – Eurasiat.  
*Moraea sisyrrinchium* (L.) Ker Gawl. – G bulb – Circum-Medit.  
*Romulea columnae* Sebast. & Mauri – G bulb – Circum-Medit.  
*Romulea ligustica* Parl. – G bulb – SW-Medit.  
*Romulea ramiflora* Ten. subsp. *ramiflora* – G bulb – Circum-Medit.  
*Romulea requienii* Parl. – G bulb – Endem. SA-CO  
*Romulea rollii* Parl. – G bulb – W-Medit.  
*Xiphion xiphium* (L.) M.B. Crespo, Mart.Azorín & Mavrodie – G bulb – W-Medit. (Arch  
 Db – Nat)

ORCHIDACEAE

- Anacamptis collina* (Banks & Sol. ex Russell) R.M. Bateman, Pridgeon & M.W. Chase – G bulb – Circum-Medit.  
*Anacamptis laxiflora* (Lam.) R.M. Bateman, Pridgeon & M.W. Chase – G bulb – Circum-Medit.  
*Anacamptis longicornu* (Poir.) R.M. Bateman, Pridgeon & M.W. Chase – G bulb – W-Medit.  
*Anacamptis papilionacea* (L.) R.M. Bateman, Pridgeon & M.W. Chase – G bulb – W-Medit.  
*Ophrys apifera* Huds. – G bulb – Euro-Medit.  
*Ophrys bombyliflora* Link – G bulb – Circum-Medit.  
*Ophrys conradiae* Melki & Deschâtres – G bulb – Endem. SA-CO  
*Ophrys exaltata* subsp. *morisii* (Martelli) Del Prete – G bulb – Endem. SA-CO  
*Ophrys incubacea* Bianca – G bulb – W-Medit.  
*Ophrys speculum* Link – G bulb – Circum-Medit.  
*Ophrys tenthredinifera* Willd. subsp. *neglecta* (Parl.) E.G. Camus – G bulb – N-Medit.  
*Orchis* × *bornemanniae* Asch. – G bulb – W-Medit.  
*Serapias lingua* L. – G bulb – Medit.-Atl.  
*Serapias parviflora* Parl. – G bulb – Medit.-Atl.  
*Spiranthes spiralis* (L.) Chevall. – G rhiz – Europ.-Caucas.

ASPHODELACEAE

- Aloe arborescens* Mill. – NP – S-Africa (Neo – Cas)  
*Aloe* × *caesia* Salm-Dyck – NP – Africa (Neo – Cas)  
*Asphodelus fistulosus* L. – H bien – Circum-Medit.  
*Asphodelus ramosus* L. subsp. *ramosus* – G rhiz – Circum-Medit.

DIOSCOREACEAE

- Dioscorea communis* (L.) Caddick & Wilkin. – G rad – Euro-Medit.

SMILACACEAE

- Smilax aspera* L. – P lian – Circum-Medit.

ARECACEAE

- Phoenix canariensis* H. Wildpret – P scap – Macarones. (Neo – Cas)  
*Washingtonia filifera* (Linden ex André) H. Wendl. ex de Bary – P scap – Neotrop. (Neo – Cas)

CYPERACEAE

- Carex distachya* Desf. – H caesp – Circum-Medit.  
*Carex divisa* Huds. – G rhiz – Medit.-Atl.  
*Carex flacca* subsp. *erythrostachys* (Hoppe) Holub – G rhiz – Circum-Medit.  
*Carex halleriana* Asso – H caesp – Euro-Medit.  
*Cyperus capitatus* Vand. – G rhiz – Circum-Medit.  
*Cyperus rotundus* L. – G rhiz – Medit-Trop. (Arch D – Nat)  
*Schoenus nigricans* L. – H caesp – Subcosmop.  
*Scirpoides holoschoenus* (L.) Soják – G rhiz – Euro-Medit.



*JUNCACEAE**Juncus acutus* L. subsp. *acutus* – H caesp – Euro-Medit.*Juncus bufonius* L. – T caesp – Cosmop.*Juncus maritimus* Lam. – G rhiz – Euro-Medit.*Juncus subulatus* Forssk. – G rhiz – S-Medit.*JUNCAGINACEAE**Triglochin barrelieri* Loisel. – G bulb – Circum-Medit.*POACEAE**Aira elegantissima* Schur subsp. *elegantissima* – T scap – Euro-Medit.*Ampelodesmos mauritanicus* (Poir.) T. Durand & Schinz – H caesp – SW-Medit.*Anisantha diandra* (Roth) Tutin ex Tzvelev – T scap – Euro-Medit.*Anisantha madritensis* (L.) Nevski subsp. *madritensis* – T scap – Medit-Atl.*Anisantha rubens* (L.) Nevski – T scap – S-Medit.-Turan.*Anisantha sterilis* (L.) Nevski – T scap – Paleotemp.*Arundo donax* L. – G rhiz – Irano-Turan. (Arch – Inv)*Avena barbata* Pott ex Link – T scap – Euro-Medit.-Turan.*Avena fatua* L. – T scap – Irano-Turan. (Arch – Nat).*Avena sativa* L. subsp. *sativa* – T scap – Irano-Turan. (Arch – Cas)*Avena sterilis* L. – T scap – Circum-Medit. (Arch – Nat)*Brachypodium distachyon* (L.) P. Beauv. – T scap – Medit.-Turan.*Brachypodium retusum* (Pers.) P. Beauv. – H caesp – W-Medit.*Brachypodium sylvaticum* (Huds.) P. Beauv. subsp. *sylvaticum* – H caesp – Paleotemp.*Briza maxima* L. – T scap – Subtrop.*Briza minor* L. – T scap – Subcosmop.*Bromus hordeaceus* L. subsp. *hordeaceus* – T scap – Subcosmop.*Calamagrostis arenaria* subsp. *arundinacea* (Husn.) Banfi, Galasso & Bartolucci – G rhiz  
– Circum-Medit.*Castellia tuberculosa* (Moris) Bor – T scap – Medit.-Irano-Turan. (Db)*Catapodium balearicum* (Willk.) H.Scholz – T scap – Medit.-Atl.*Catapodium rigidum* (L.) C.E. Hubb. subsp. *rigidum* – T scap – Euro-Medit.*Cenchrus longisetus* M.C. Johnst. – H caesp – S-Medit. (Neo – Nat)*Cortaderia selloana* (Schult. & Schult. f.) Asch. & Graebn. – H caesp – S-Amer. (Neo – Cas)*Cutandia divaricata* (Desf.) Barbey – T scap – Circum-Medit.*Cutandia maritima* (L.) Benth. ex Barbey – T scap – Circum-Medit.*Cynodon dactylon* (L.) Pers. – H rept – Subcosmop.*Cynosurus echinatus* L. – T scap – Euro-Medit.*Dactylis glomerata* subsp. *hispanica* (Roth) Nyman – H caesp – Circum-Medit.*Dasyphyrum villosum* (L.) P. Candargy – T scap – Euro-Medit.-Turan.*Elymus repens* (L.) Gould subsp. *repens* – G rhiz – Paleotemp.*Festuca danthonii* Asch. & Graebn. subsp. *danthonii* – T scap – Euro-Medit.*Festuca fasciculata* Forssk. – T caesp – Circum-Medit.*Festuca geniculata* (L.) Lag. & Rodr. subsp. *geniculata* – T caesp – W-Medit.*Festuca ligustica* (All.) Bertol. – T caesp – Circum-Medit.

- Gastridium ventricosum* (Gouan) Schinz & Thell. – T scap – Medit.-Atl.  
*Holcus annuus* subsp. *setiglumis* (Boiss. & Reut) M.Seq. & Castrov. – T scap – Circum-Medit.  
*Hordeum murinum* subsp. *leporinum* (Link) Arcang. – T scap – Euro-Medit.  
*Hyparrhenia hirta* (L.) Stapf subsp. *hirta* – H caesp – Paleotrop.  
*Imperata cylindrica* (L.) Raeusch. – G rhiz – Cosmop.  
*Lagurus ovatus* L. subsp. *ovatus* – T scap – Euro-Medit.  
*Lagurus ovatus* L. subsp. *vestitus* (Messeri) Brullo – T scap – S-Medit.  
*Lamarckia aurea* (L.) Moench – T scap – Medit.-Turan.  
*Lolium rigidum* Gaudin – T scap – Paleo-Subtrop.  
*Lygeum spartum* L. – H caesp – S-Medit.  
*Melica ciliata* L. subsp. *ciliata* – H caesp – Euro-Medit.  
*Melica minuta* L. – H caesp – Circum-Medit.  
*Oloptum thomasi* (Duby) Banfi & Galasso – H caesp – Circum-Medit.  
*Parapholis incurva* (L.) C.E.Hubb. subsp. *incurva* – T scap – Medit.-Atl.  
*Parapholis strigosa* (Dumort.) C.E.Hubb. – T scap – Medit.-Atl.  
*Paspalum distichum* L. – G rhiz – Neotrop. (Neo – Nat)  
*Phalaris brachystachys* Link – T scap – Circum-Medit.  
*Phalaris coerulescens* Desf. – H caesp – Medit.-Macarones.  
*Phalaris minor* Retz. – T scap – Medit.-Irano-Turan.  
*Phleum arenarium* subsp. *caesium* H.Scholz – T scap – Circum-Medit.  
*Phragmites australis* (Cav.) Trin. ex Steud. – G rhiz – Subcosmop.  
*Piptatherum coerulescens* (Desf.) P. Beauv. – H caesp – Circum-Medit.  
*Poa annua* L. – T caesp – Cosmop.  
*Poa bulbosa* L. subsp. *bulbosa* – G bulb – Paleotemp.  
*Polypogon monspeliensis* (L.) Desf. – T scap – Subtrop.  
*Polypogon subspathaceus* Req. – T scap – Circum-Medit.  
*Rostraria cristata* (L.) Tzvelev – T scap – Medit.-Irano-Turan.  
*Rostraria pubescens* (Lam.) Trin. – T scap – Circum-Medit.  
*Sporobolus pumilus* (Roth) P.M.Peterson & Saarela – G rhiz – Anfiatl. (Neo – Nat)  
*Sporobolus virginicus* (L.) Kunth – G rhiz – Circum-Medit.  
*Stipellula capensis* (Thunb.) Röser & H.R.Hamasha – T scap – Circum-Medit.  
*Thinopyrum elongatum* (Host) D.R.Dewey – H caesp – Euro-Medit.  
*Thinopyrum junceum* (L.) Á.Löve – G rhiz – Circum-Medit.  
*Triticum neglectum* (Req. ex Bertol.) Greuter – T scap – Medit.-Turan.  
*Triticum ventricosum* (Tausch) Ces., Pass. & Gibelli – T scap – W-Medit. (Arch D – Nat)

TYPHACEAE

- Typha angustifolia* L. – G rhiz – Circumbor.

CANNACEAE

- Canna indica* L. – G rhiz – Neotrop. (Neo-Cas)

**Eudicotyledones**

PAPAVERACEAE

- Fumaria capreolata* L. subsp. *capreolata* – T scap – Euro-Medit.  
*Fumaria flabellata* Gasp. – T scap – Circum-Medit.  
*Fumaria officinalis* L. subsp. *officinalis* – T scap – Subcosmop.  
*Glaucium flavum* Crantz – H scap – Circumbor.  
*Hypocoum procumbens* L. subsp. *procumbens* – T scap – Paleotemp.  
*Papaver hybridum* L. – T scap – Medit.-Turan.  
*Papaver rhoeas* L. subsp. *rhoeas* – T scap – E-Medit. (Arch D – Nat)

## RANUNCULACEAE

- Anemone hortensis* L. subsp. *hortensis* – G bulb – N-Medit.  
*Clematis cirrhosa* L. – P lian – Medit.-Turan.  
*Clematis flammula* L. – P lian – Euro-Medit.  
*Ficaria verna* subsp. *fertilis* (Lawalrée ex Laegaard) Stace – G bulb – Euroasiat.  
*Nigella damascena* L. – T scap – Euro-Medit.  
*Ranunculus bullatus* L. – H ros – Circum-Medit.  
*Ranunculus paludosus* Poir. – H scap – Medit.-Turan.

## AMARANTHACEAE

- Achyranthes sicula* (L.) All. – Ch suffr – W-Medit.  
*Amaranthus albus* L. – T scap – Neotrop. (Neo – Inv)  
*Amaranthus blitum* L. subsp. *blitum* – T scap – Boreo-Trop.

## CHENOPODIACEAE

- Arthrocaulon macrostachyum* (Moric.) Piirainen & G.Kadereit – Ch succ – Medit.-Irano-Turan. (Db)  
*Atriplex prostrata* Boucher ex DC. – T scap – Circumbor.  
*Beta vulgaris* L. subsp. *maritima* (L.) Arcang. – T scap – Euro-Medit.  
*Beta vulgaris* L. subsp. *vulgaris* – H scap – Euro-Medit. (Arch – Cas)  
*Chenopodium album* L. subsp. *album* – T scap – Subcosmop.  
*Chenopodium murale* (L.) S.Fuentes, Uotila & Borsch – T scap – Subcosmop.  
*Halimione portulacoides* (L.) Aellen – Ch frut – Circumbor.  
*Oxybasis glauca* (L.) S. Fuentes, Uotila & Borsch – T scap – Subcosmop. (Db)  
*Salicornia fruticosa* (L.) L. – Ch succ – Boreo-Trop.  
*Salsola squarrosa* subsp. *controversa* (Tod. ex Lojac.) Mosyakin – T scap – Circumbor.  
*Soda inermis* Fourr. – T scap – Paleotemp.  
*Suaeda vera* J.F.Gmel. – Ch suffr – Subcosmop.

## AIZOACEAE

- Carpobrotus acinaciformis* (L.) L.Bolus – Ch suffr – S-Africa (Neo – Inv)  
*Carpobrotus edulis* (L.) N.E.Br. – Ch suffr – S-Africa (Neo – Inv)  
*Drosanthemum floribundum* (Haw.) Schwantes – H scand – S-Africa (Neo – Nat)  
*Malephora crocea* (Jacq.) Schwantes – Ch scap – S-Africa (Neo – Inv)  
*Mesembryanthemum cordifolium* L.f. – H rept – S-Africa (Neo – Inv)  
*Mesembryanthemum cristallinum* L. – T scap – S-Africa (Neo – Nat)  
*Mesembryanthemum nodiflorum* L. – T scap – S-Africa (Neo – Nat)

*CACTACEAE*

- Austrocyllindropuntia subulata* (Mühlenpf.) Backeb. – P succ – Neotrop. (Neo – Inv)  
*Nopalea dejecta* Salm-Dick – P succ – Neotrop. (Neo – Cas)  
*Opuntia dillenii* (Ker Gawl.) Haw. – P succ – Neotrop. (Neo – Nat)  
*Opuntia ficus-indica* (L.) Mill. – P succ – Neotrop. (Neo – Inv)  
*Opuntia puberula* Hort. Vindob. ex Pfeiff. – P succ – Neotrop. (Neo – Cas)  
*Opuntia monacantha* Haw. – P succ – Neotrop. (Neo – Nat)

*CARYOPHYLLACEAE*

- Arenaria leptoclados* (Rchb.) Guss. subsp. *leptoclados* – T scap – Paleotemp.  
*Cerastium glomeratum* Thuill. – T scap – Euro-Medit.  
*Cerastium pumilum* Curtis – T scap – Euro-Medit.  
*Corrigiola telephüifolia* Pourr. – H ros – W-Medit.  
*Eudianthe coeli-rosa* (L.) Fenzl ex Endl. – T scap – W-Medit.  
*Paronychia argentea* Lam. – H caesp – Circum-Medit.  
*Petrorhagia dubia* (Raf.) G.López & Romo – T scap – S-Medit.  
*Petrorhagia nanteuilii* (Burnat) P.W.Ball & Heywood – T scap – W-Medit.  
*Petrorhagia prolifera* (L.) P.W.Ball & Heywood – T scap – Euro-Medit.  
*Polycarpon tetraphyllum* subsp. *alsinifolium* (Biv.) Ball – T scap – S-Medit.  
*Polycarpon tetraphyllum* subsp. *diphyllum* (Cav.) O. Bolòs & Font-Quer – T scap – Euro-Medit.  
*Rhodalsine geniculata* (Poiret) F.N.Williams – Ch suffr – W-Medit.  
*Sagina apetala* Ard. subsp. *apetala* – T scap – Euro-Medit.  
*Sagina maritima* Don – T scap – Medit.-Atl.  
*Silene bellidifolia* Jacq. – T scap – S-Medit.  
*Silene colorata* Poir. – T scap – Circum-Medit.  
*Silene gallica* L. – T scap – Euro-Medit.  
*Silene niceensis* All. – T scap – Circum-Medit.  
*Silene succulenta* subsp. *corsica* (DC.) Nyman – H caesp – Endem. SA-CO  
*Silene valsecchiae* Bocchieri – T scap – Endem. SA  
*Silene vulgaris* subsp. *tenoreana* (Colla) Soldano & F. Conti – H caesp – Circum-Medit.  
*Silene vulgaris* (Moench) Garcke subsp. *vulgaris* – H caesp – Circum-Medit.  
*Spergularia marina* (L.) Besser – T scap – Paleotemp.  
*Spergularia rubra* (L.) J.Presl & C. Presl – Ch suffr – Subcosmop.  
*Stellaria media* (L.) Vill. subsp. *media* – T rept – Cosmop.  
*Stellaria neglecta* Weihe subsp. *neglecta* – T scap – Paleotemp.  
*Stellaria pallida* (Dumort.) Crép. – T scap – Euro-Medit.  
*Velezia rigida* L. – T scap – Medit.-Turan.

*FRANKENIACEAE*

- Frankenia hirsuta* L. – Ch suffr – Subcosmop.  
*Frankenia laevis* L. subsp. *laevis* – Ch suffr – Subcosmop.

*NYCTAGINACEAE*

- Mirabilis jalapa* L. – T caesp – Neotrop. (Neo – Inv)

## PHYTOLACCACEAE

*Phytolacca americana* L. – G rhiz – Neotrop. (Neo – Nat)

## PLUMBAGINACEAE

*Limonium dubium* (Andrews ex Guss.) Litard. – Ch suffr – Endem. SA-CO-SI

*Limonium narbonense* Mill. – H ros – Circum-Medit.

*Limonium retirameum* Greuter & Burdet subsp. *retirameum* – Ch suffr – Endem. SA

*Plumbago europaea* L. – Ch frut – Circum-Medit.

## POLYGONACEAE

*Polygonum maritimum* L. – Ch rept – Subcosmop.

*Rumex bucephalophorus* L. subsp. *bucephalophorus* – T scap – Medit.-Macarones.

*Rumex crispus* L. – H scap – Paleotemp.

*Rumex pulcher* L. subsp. *pulcher* – H scap – Euro-Medit.

*Rumex spinosus* L. – T scap – Circum-Medit.

## PORTULACACEAE

*Portulaca sardoa* Danin, Bagella & Marrosu – T scap – Endem. SA-CO

## TAMARICACEAE

*Tamarix africana* Poir. – P scap – W-Medit.

*Tamarix gallica* L. – P caesp – W-Medit.

## SANTALACEAE

*Osyris alba* L. – NP – Euro-Medit.

*Thesium humile* Vahl – T scap – Medit.-Atl.

## CRASSULACEAE

*Aeonium haworthii* (Webb & Berthel.) Webb & Berthel. – NP – Macarones. (Neo – Cas)

*Bulliarda vaillantii* (Willd.) DC. – T scap – Medit.-Trop.

*Crassula tillaea* Lest.-Garl. – T scap – Medit.-Atl.

*Kalanchoë daigremontiana* Raym.-Hamet & H. Perrier – Ch succ – Africa (Neo – Cas)

*Petrosedum sediforme* (Jacq.) Grulich subsp. *sediforme* – Ch succ – Circum-Medit.

*Phedimus stellatus* (L.) Raf. – T scap – Circum-Medit.

*Sedum album* subsp. *micranthum* (Bast. ex DC.) Syme – Ch succ – Euro-Medit.

*Sedum caeruleum* L. – T scap – SW-Medit.

*Sedum litoreum* Guss. – T scap – Circum-Medit.

*Sedum rubens* L. – T scap – Euro-Medit.

*Umbilicus horizontalis* (Guss.) DC. – G bulb – Circum-Medit.

*Umbilicus rupestris* (Salisb.) Dandy – G rhiz – Medit.-Atl.

GERANIACEAE

- Erodium chium* (L.) Willd. – T scap – Circum-Medit.  
*Erodium ciconium* (L.) L'Hér. – H bien – Euro-Medit.  
*Erodium cicutarium* (L.) L'Hér. – H ros – Subcosmop.  
*Erodium malacoides* (L.) L'Hér. subsp. *malacoides* – T scap – Medit.-Macarones.  
*Erodium moschatum* (L.) L'Hér. – T scap – Circum-Medit.  
*Geranium molle* L. – T scap – Subcosmop.  
*Geranium purpureum* Vill. – T scap – Euro-Medit.  
*Geranium rotundifolium* L. – T scap – Paleotemp.

LYTHRACEAE

- Punica granatum* L. – P caesp – E-Medit.-Turan. (Arch – Cas)

MYRTACEAE

- Eucalyptus camaldulensis* Dehnh. – P scap – Australia (Neo – Nat)  
*Eucalyptus globulus* Labill. – P scap – Australia (Neo – Cas)  
*Myrtus communis* L. – P caesp – Circum-Medit.

ZYGOPHYLLACEAE

- Tribulus terrestris* L. – T rept – Asiat. (Arch – Nat)

CELASTRACEAE

- Euonymus japonicus* Thunb. – P caesp – Asiat. (Neo – Cas)

CUCURBITACEAE

- Bryonia marmorata* E. Petit – G rhiz – Endem. SA-CO  
*Cucumis melo* L. – T scap – Paleotrop. (Arch – Cas)  
*Cucumis sativus* L. – T scap – Paleotrop. (Arch – Cas)  
*Cucurbita maxima* Duchesne subsp. *maxima* – T scap – Neotrop. (Neo – Cas)  
*Cucurbita pepo* L. subsp. *pepo* – T scap – Neotrop. (Neo – Cas)  
*Ecballium elaterium* (L.) A.Rich. – G bulb – Euro-Medit.

FABACEAE

- Acacia saligna* (Labill.) H.L.Wendl. – P caesp – Australia (Neo – Inv)  
*Anagyris foetida* L. – P caesp – S-Medit.  
*Astragalus hamosus* L. – T scap – Medit.-Turan.  
*Astragalus pelecinus* (L.) Barneby subsp. *pelecinus* – T scap – Circum-Medit.  
*Bituminaria bituminosa* (L.) C.H.Stirt. – H scap – Euro-Medit.  
*Cytisus laniger* DC. – P caesp – Circum-Medit.  
*Cerantonia siliqua* L. – P scap – E-Medit. (Arch – Nat)  
*Ervilia hirsuta* (L.) Opiz – T scap – Paleotemp.  
*Ervum gracile* DC. – T scap – Euro-Medit.  
*Ervum pubescens* DC. – T scap – Euro-Medit.  
*Genista corsica* (Loisel.) DC. – NP – Endem. SA-CO  
*Lathyrus annuus* L. – T scap – Euro-Medit.  
*Lathyrus cicera* L. – T scap – Euro-Medit.

- Lathyrus clymenum* L. (sensu Gallego 1999) – T scap – Circum-Medit.  
*Lathyrus oleraceus* subsp. *biflorus* (Raf.) H. Schaeff., Coulot & Rabaute – T scap – Medit.-Turan.  
*Lathyrus oleraceus* Lam. subsp. *oleraceus* – T scand – Circum-Medit. (Arch – Cas)  
*Lotus angustissimus* L. – T scap – Euro-Medit.  
*Lotus cytisoides* subsp. *conradiae* Gamisans – Ch suffr – Endem. SA-CO  
*Lotus edulis* L. – T scap – Circum-Medit.  
*Lotus ornithopodioides* L. – T scap – Circum-Medit.  
*Lotus parviflorus* Desf. – T scap – Circum-Medit.  
*Lupinus angustifolius* L. – T scap – Circum-Medit.  
*Lupinus gussoneanus* J. Agardh. – T scap – Circum-Medit.  
*Medicago italica* (Mill.) – T scap – W-Medit.  
*Medicago littoralis* Loisel. – T scap – Euro-Medit.  
*Medicago marina* L. – Ch rept – Medit.-Atl.  
*Medicago minima* (L.) L. – T scap – Eurasiat.  
*Medicago orbicularis* (L.) Bartal. – T scap – Euro-Medit.  
*Medicago polymorpha* L. – T scap – Subcosmop.  
*Medicago praecox* DC. – T scap – Circum-Medit.  
*Medicago rugosa* Desr. – T scap – W-Medit.  
*Medicago truncatula* Gaertn. – T scap – Circum-Medit.  
*Medicago turbinata* (L.) All. – T scap – Circum-Medit.  
*Trigonella elegans* (Salzm. ex Ser.) Coulot & Rabaute – T scap – S-Medit.  
*Trigonella italica* (L.) Coulot & Rabaute – T scap – N-Medit.  
*Trigonella officinalis* (L.) Coulot & Rabaute – H bien – Subcosmop.  
*Trigonella sicula* (Turra) Coulot & Rabaute – T scap – S-Medit. (Arch – Inv)  
*Trigonella smalii* Coulot & Rabaute – T scap – Subcosmop.  
*Trigonella sulcata* (Desf.) Coulot & Rabaute – T scap – Circum-Medit.  
*Ononis diffusa* Ten. – T scap – Circum-Medit.  
*Ononis natrix* subsp. *ramosissima* (Desf.) Batt. – H suffr – Circum-Medit.  
*Ononis reclinata* L. – T scap – Circum-Medit.  
*Ononis variegata* L. – T scap – Circum-Medit.  
*Ornithopus compressus* L. – T scap – Euro-Medit.  
*Ornithopus pinnatus* (Mill.) Druce – T scap – Medit.-Atl.  
*Robinia pseudacacia* L. – P caesp – Neotrop. (Neo – Nat)  
*Scorpiurus muricatus* L. – T scap – Euro-Medit.  
*Spartium junceum* L. – P caesp – Euro-Medit. (Arch – Cas)  
*Sulla coronaria* (L.) Medik. – H scap – W-Medit. (Arch – Nat)  
*Trifolium angustifolium* L. subsp. *angustifolium* – T scap – Euro-Medit.  
*Trifolium arvense* L. subsp. *arvense* – T scap – Euro-Medit.-Irano-Turan.  
*Trifolium campestre* Schreb. – T scap – W-Paleotemp.  
*Trifolium cherleri* L. – T scap – Euro-Medit.  
*Trifolium glomeratum* L. – T scap – Euro-Medit.  
*Trifolium scabrum* L. – T scap – Euro-Medit.  
*Trifolium spumosum* L. – T scap – Circum-Medit.  
*Trifolium stellatum* L. – T scap – Euro-Medit.

- Trifolium subterraneum* L. subsp. *subterraneum* – T rept – Euro-Medit.  
*Trifolium suffocatum* L. – T scap – Circum-Medit.  
*Trifolium tomentosum* L. – T rept – W-Paleotemp.  
*Tripodion tetraphyllum* (L.) Fourr. – T scap – Circum-Medit.  
*Vachellia karroo* (Hayne) Banfi & Galasso – P caesp – S-Africa (Neo – Inv)  
*Vicia bithynica* (L.) L. – T scap – Euro-Medit.  
*Vicia angustifolia* L. – T scap – Subcosmop.  
*Vicia faba* L. – T scap – S-Medit. (Arch – Cas)  
*Vicia pseudocracca* Bertol. – T scap – Circum-Medit.  
*Vicia sativa* L. – T scap – Medit.-Turan.  
*Vicia villosa* Roth – T scap – Euro-medit.

CYTINACEAE

- Cytinus hypocistis* (L.) L. – G rad – Medit.-Macarones.

EUPHORBIACEAE

- Euphorbia characias* L. – NP – Circum-Medit.  
*Euphorbia dendroides* L. – NP – C-Medit.  
*Euphorbia exigua* L. subsp. *exigua* – T scap – Euro-Medit.  
*Euphorbia helioscopia* L. subsp. *helioscopia* – T scap – Cosmop.  
*Euphorbia paralias* L. – Ch frut – Medit.-Atl.  
*Euphorbia peplis* L. – T rept – Euro-Medit.  
*Euphorbia peplus* L. – T scap – Cosmop.  
*Euphorbia pithyusa* L. subsp. *pithyusa* – Ch suffr – W-Medit.  
*Euphorbia pterococca* Brot. – T scap – W-Medit.-Macarones.  
*Euphorbia segetalis* L. – Ch suffr – W-Medit.  
*Euphorbia terracina* L. – H scap – Circum-Medit.  
*Mercurialis annua* L. – T scap – Paleotemp.  
*Ricinus communis* L. – P scap – Paleotrop. (Arch – Inv)

LINACEAE

- Linum usitatissimum* subsp. *angustifolium* (Huds.) Thell. – H bienn – Euro-Medit.-Atl.  
*Linum corymbulosum* Rchb. – T scap – Circum-Medit.  
*Linum strictum* L. – T scap – Circum-Medit.  
*Linum tenuifolium* L. – Ch suffr – S-Medit.  
*Linum trigynum* L. – T scap – Euro-Medit.

SALICACEAE

- Populus alba* L. – P scap – Paleotemp.

OXALIDACEAE

- Oxalis corniculata* L. – H rept – Cosmop. (Arch D – Nat)  
*Oxalis pes-caprae* L. – G bulb – S-Africa (Neo – Inv)  
*Oxalis articulata* Savigny – G bulb – Neotrop. (Neo – Nat)



## MORACEAE

*Ficus carica* L. – P scap – Medit.-Turan. (Arch D – Nat)

## RHAMNACEAE

*Rhamnus alaternus* L. subsp. *alaternus* – P caesp – Circum-Medit.

## ROSACEAE

*Aphanes australis* Rydb. – T scap – W-Medit. (Db)

*Malus domestica* (Borkh.) Borkh. – P scap – Euroasiat. (Arch – Cas)

*Poterium sanguisorba* subsp. *balearicum* (Bourg. ex Nyman) Stace – H scap – Medit.

*Prunus dulcis* (Mill.) D.A. Webb – P scap – Medit.-Turan. (Arch – Cas)

*Pyrus spinosa* Forssk. – P caesp – Circum-Medit.

*Rubus ulmifolius* Schott – NP – Euro-Medit.

## URTICACEAE

*Parietaria judaica* L. – H scap – Euro-Medit.

*Parietaria lusitanica* L. subsp. *lusitanica* – T rept – Circum-Medit.

*Urtica membranacea* Poir. – T scap – S-Medit.

*Urtica pilulifera* L. – T scap – S-Medit.

*Urtica urens* L. – T scap – Boreo-Trop.

## BRASSICACEAE

*Arabidopsis thaliana* (L.) Heynh. – T scap – Cosmop.

*Biscutella morisiana* Raffaelli – T scap – Endem. SA-CO

*Brassica insularis* Moris – Ch suffr – Endem. SA-CO-SI-TN

*Brassica napus* L. – H scap – Asiat. (Arch – Nat)

*Brassica nigra* (L.) W.D.J.Koch – T scap – Euro-Medit. (Arch D – Nat)

*Brassica rapa* subsp. *campestris* (L.) A.R.Clapham – H scap – Euro-Medit. (Arch – Cas)

*Brassica tournefortii* Gouan – T scap – S-Medit.

*Bunias erucago* L. – T scap – Euro-Medit.

*Cakile maritima* Scop. subsp. *maritima* – T scap – Circum-Medit.

*Capsella bursa-pastoris* (L.) Medik. subsp. *bursa-pastoris* – H bienn – Cosmop.

*Cardamine hirsuta* L. – T scap – Cosmop.

*Diplotaxis viminea* (L) DC. – T scap – W-Medit.-Atl.

*Eruca vesicaria* (L.) Cav. – T scap – Euro-Medit.-Irano-Turan. (Arch D – Nat)

*Erysimum cheiri* (L.) Crantz – Ch suffr – Euro-Medit. (Arch – Cas)

*Hirschfeldia incana* (L.) Lagr.-Foss. subsp. *incana* – H scap – W-Medit.

*Lepidium graminifolium* L. subsp. *graminifolium* – Ch suffr – W-Medit.

*Lobularia maritima* (L.) Desv. – H scap – Circum-Medit.

*Marcus-kochia ramosissima* (Desf.) Al-Shehbaz – T scap – W-Medit.

*Matthiola tricuspidata* (L.) R.Br. – T scap – Circum-Medit.

*Raphanus raphanistrum* L. subsp. *raphanistrum* – T scap – Euro- Medit.

*Rapistrum rugosum* (L.) All. – T scap – Euro-Medit.

*Sinapis alba* L. subsp. *alba* – T scap – E-Medit. (Arch – Nat)

*Sinapis arvensis* L. subsp. *arvensis* – T scap – Circum-Medit.

*Sisymbrium erysimoides* Desf. – T scap – S-Medit.

*Sisymbrium officinale* (L.) Scop. – T scap – Subcosmop.

*Succowia balearica* (L.) Medik. – T scap – W-Medit.

*Teesdalia coronopifolia* (J.P. Bergeret) Thell. – T scap – Euro-Medit.

#### RESEDACEAE

*Reseda alba* L. – H scap – Circum-Medit.

*Reseda luteola* L. – H scap – Circumbor.

#### CISTACEAE

*Cistus creticus* subsp. *eriocephalus* (Viv.) Greuter & Burdet – NP – Circum-Medit.

*Cistus monspeliensis* L. – NP – Medit.-Macarones.

*Cistus salvifolius* L. – NP – Circum-Medit.

*Fumana thymifolia* (L.) Spach. ex Webb – Ch suffr – Circum-Medit.

*Helianthemum salicifolium* (L.) Mill. – T scap – Euro-Medit.

*Tuberaria guttata* (L.) Fourr. – T scap – Euro-Medit.

#### MALVACEAE

*Alcea rosea* L. – H scap – E-Medit. (Arch – Cas).

*Malva arborea* (L.) Webb & Berthel. – H bienn – Euro-Medit.

*Malva multiflora* (Cav.) Soldano, Banfi & Galasso – T scap – Circum-Medit.

*Malva nicaeensis* All. – T scap – Circum-Medit.

*Malva olbia* (L.) Alef. – P caesp – Circum-Medit.

*Malva parviflora* L. – T scap – Euro-Medit.

*Malva sylvestris* L. – H scap – Subcosmop.

#### THYMELAEACEAE

*Daphne gnidium* L. – P caesp – Medit.-Macarones.

*Thymelaea hirsuta* (L.) Endl. – NP – Circum-Medit.

*Thymelaea tartonraira* (L.) All. subsp. *tartonraira* – NP – Circum-Medit.

#### ANACARDIACEAE

*Pistacia lentiscus* L. – P caesp – Circum-Medit.

*Schinus molle* L. – P scap – Neotrop. (Neo – Cas).

#### RUTACEAE

*Ruta chalepensis* L. – Ch suffr – S-Medit.

#### SIMAROUBACEAE

*Ailanthus altissima* Mill. – P scap – Asiat. (Neo – Cas).

#### ERICACEAE

*Erica arborea* L. – P caesp – Circum-Medit.

*Erica scoparia* L. subsp. *scoparia* – P caesp – Circum-Medit.

## PRIMULACEAE

- Lysimachia arvensis* subsp. *latifolia* (L.) Peruzzi – T rept – Euro-Medit.  
*Lysimachia foemina* (Mill.) U. Manns & Anderb. – T rept – Subcosmop.  
*Lysimachia linum-stellatum* L. – T scap – Circum-Medit.  
*Lysimachia nardii* Arrigoni – T rept – Circum-Medit. (Arch – Nat).  
*Samolus valerandi* L. – H scap – Subcosmop.

## BORAGINACEAE

- Borago officinalis* L. – T scap – Euro-Medit.  
*Cynoglossum creticum* Mill. – H bienn – Euro-Medit.  
*Echium creticum* L. subsp. *creticum* – H bien – W-Medit.  
*Echium italicum* L. – H bienn – Euro-Medit.  
*Echium plantagineum* L. – H bienn – Euro-Medit.  
*Echium vulgare* L. – H bienn – Europ.  
*Heliotropium europaeum* L. – T scap – Euro-Medit.-Turan.  
*Myosotis arvensis* (L.) Hill subsp. *arvensis* – T scap – Euroasiat.  
*Myosotis ramosissima* Rochel ex Schult. subsp. *ramosissima* – T scap – Euroasiat.

## APOCYNACEAE

- Nerium oleander* L. subsp. *oleander* – P caesp – S-Medit.  
*Vincetoxicum hirsutinaria* Medik. subsp. *hirsutinaria* – H scap – Euroasiat.

## GENTIANACEAE

- Centaurium erythraea* Raf. subsp. *erythraea* – T scap – Paleotemp.  
*Centaurium maritimum* (L.) Fritsch – T scap – W-Medit.  
*Centaurium tenuiflorum* (Hoffmanns. & Link) Fritsch subsp. *tenuiflorum* – T scap –  
 Medit.-Atl.  
*Schenkia spicata* (L.) G.Mans. – T scap – Euro-Medit.

## RUBIACEAE

- Crucianella maritima* L. – Ch suffr – Circum-Medit.  
*Galium aparine* L. – T scap – Eurasiat.  
*Galium murale* (L.) All. – T scap – Circum-Medit.  
*Galium spurium* L. – T scap – Euro-Medit.-Irano-Turan.  
*Galium verrucosum* Huds. subsp. *verrucosum* – T scap – Circum-Medit.  
*Rubia peregrina* L. – P lian – Circum-Medit.  
*Sherardia arvensis* L. – T scap – Subcosmop.  
*Thelygonum cynocrambe* L. – T scap – Circum-Medit.  
*Valantia muralis* L. – T scap – Circum-Medit.

## ACANTHACEAE

- Acanthus mollis* L. subsp. *mollis* – H scap – W-Medit. (Arch – Cas).

## BIGNONIACEAE

- Tecomaria capensis* (Thunb.) Spach – T scap – S-Africa (Neo – Cas).

LAMIACEAE

- Ajuga iva* (L.) Schreber subsp. *iva* – Ch suffr – Circum-Medit.  
*Clinopodium vulgare* subsp. *arundanum* (Boiss.) Nyman – H scap – Circumbor.  
*Lamium amplexicaule* L. – T scap – Paleotemp.  
*Lavandula stoechas* L. subsp. *stoechas* – NP – Circum-Medit.  
*Marrubium vulgare* L. – H scap – Subcosmop.  
*Melissa officinalis* subsp. *altissima* (Sm.) Arcang. – H scap – Euro-Medit.  
*Mentha pulegium* L. subsp. *pulegium* – H scap – Subcosmop.  
*Micromeria graeca* (L.) Benth. ex Rchb. subsp. *graeca* – Ch suffr – Circum-Medit.  
*Salvia rosmarinus* Spenn. – NP – Circum-Medit.  
*Salvia verbenaca* L. – H scap – Medit.-Atl.  
*Stachys major* (L.) Bartolucci & Peruzzi – Ch frut – Circum-Medit.  
*Stachys romana* (L.) E.H.L. Krause – T scap – Circum-Medit.  
*Teucrium marum* L. – Ch suffr – Endem. SA-CO-BL-AT-H  
*Vitex agnus-castus* L. – P caesp – Circum-Medit.

OLEACEAE

- Olea europaea* var. *sylvestris* Brot. – P scap – Circum-Medit.  
*Phillyrea angustifolia* L. – P caesp – W-Medit.  
*Phillyrea latifolia* L. – P scap – Circum-Medit.  
*Phillyrea latifolia* var. *media* L. C.K. Schneid – P scap – Circum-Medit.

OROBANCHACEAE

- Bellardia trixago* (L.) All. – T scap – Euro-Medit.  
*Bellardia viscosa* (L.) Fisch. & C.A. Mey. – T scap – Medit.-Atl.  
*Orobanche amethystea* Thuill. – T par – Euro-Medit.  
*Orobanche minor* Sm. – T par – Subcosmop.  
*Phelipanche ramosa* (L.) Pomel – T par – Circum-Medit.

PLANTAGINACEAE

- Callitriche palustris* L. – I rad – Circumbor.  
*Cymbalaria aequitriloba* (Viv.) A.Chev. subsp. *aequitriloba* – Ch rept – Endem. SA-CO-BL-AT  
*Linaria arvensis* (L.) Desf. – T scap – Medit-Atl.  
*Linaria pelisseriana* (L.) Mill. – T scap – Medit.-Atl.  
*Linaria simplex* (Willd.) Desf. – T scap – Euro-Medit.  
*Misopates orontium* (L.) Raf. – T scap – Paleotemp.  
*Plantago afra* L. – T scap – Euro-Medit.  
*Plantago bellardii* All. subsp. *bellardii* – T scap – S-Medit.  
*Plantago coronopus* L. – T scap – Euro-Medit.  
*Plantago crassifolia* Forssk. – H ros – Circum-Medit.  
*Plantago lagopus* L. – T scap – Circum-Medit.  
*Plantago lanceolata* L. – H ros – Cosmop.  
*Plantago macrorrhiza* Poir. – H ros – W-Medit.  
*Plantago major* L. – H ros – Euroasiat.

*Plantago weldenii* Rchb. – T scap – Euro-Medit.

*Veronica cymbalaria* Bodard subsp. *cymbalaria* – T scap – Euro-Medit.

*Veronica persica* Poir. – T scap – Irano-Turan. (Neo – Nat).

#### SCROPHULARIACEAE

*Myoporum insulare* R. Br. – P caesp – Australia (Neo – Nat).

*Myoporum tetrandrum* (Labill.) Domin – P caesp – Australia (Neo – Nat).

*Scrophularia trifoliata* L. – H scap – Endem. SA-CO-AT

*Verbascum conocarpum* Moris subsp. *conocarpum* – H bienn – Endem. SA-CO-AT

*Verbascum sinuatum* L. – H bienn – Euro-Medit.

#### VERBENACEAE

*Lantana camara* L. – NP – Neotrop. (Neo – Cas).

*Verbena officinalis* L. – H scap – Neotrop.

#### CONVOLVULACEAE

*Convolvulus althaeoides* L. – H scand – W-Medit.

*Convolvulus arvensis* L. – G rhiz – Cosmop.

*Convolvulus sepium* L. – H scand – Paleotemp.

*Convolvulus siculus* subsp. *elongatus* Batt. – T scap – S-Medit.

*Convolvulus soldanella* L. – G rhiz – Cosmop.

*Cuscuta epithimum* (L.) L. subsp. *kotschyi* (Des Moul.) Arcang. – T par – Circum-Medit.

#### SOLANACEAE

*Datura innoxia* Mill. – T scap – Neotrop. (Neo – Nat)

*Datura stramonium* L. – T scap – Neotrop. (Neo – Nat)

*Datura wrightii* Regel – T scap – Neotrop. (Neo – Nat)

*Hyoscyamus albus* L. – H bienn – Euro-Medit.

*Nicotiana glauca* Graham – NP – Neotrop. (Neo – Inv)

*Solanum dulcamara* L. – NP – Paleotemp.

*Solanum linnaeanum* Hepper & P.-M. L. Jaeger – NP – S-Africa (Neo – Nat)

*Solanum lycopersicum* L. – T scap – Neotrop. (Neo – Cas)

*Solanum nigrum* L. – T scap – Cosmop.

#### APIACEAE

*Ammi majus* L. – T scap – Euro-Medit.-Irano-Turan.

*Ammoides pusilla* (Brot.) Breistr. – T scap – Circum-Medit.

*Bupleurum odontites* L. – T scap – Medit.-Irano-Turan.

*Bupleurum semicompositum* L. – T scap – Circum-Medit.

*Bupleurum tenuissimum* L. – T scap – Euro-Medit.-Irano-Turan.

*Crithmum maritimum* L. – Ch suffr – Euro-Medit.

*Daucus carota* L. subsp. *carota* – H scap – Cosmop.

*Daucus carota* subsp. *hispanicus* (Gouan) Thell. – H bien – W-Medit.

*Daucus carota* subsp. *maritimus* (Lam.) Batt. – H bien – W-Medit.

*Daucus carota* subsp. *maximus* (Desf.) Ball – H bien – Euro-Medit.

- Daucus pumilus* (L.) Hoffmanns. & Link – T scap – Circum-Medit.  
*Echinophora spinosa* L. – H scap – Euro-Medit.  
*Eryngium campestre* L. – H scap – Euro-Medit.  
*Eryngium maritimum* L. – G rhiz – Medit.-Atl.  
*Ferula arrigonii* Bocchieri – H scap – Endem. SA-CO  
*Ferula communis* L. subsp. *communis* – H scap – S-Medit.  
*Foeniculum vulgare* Mill. – H scap – S-Medit.  
*Scandix pecten-veneris* L. subsp. *pecten-veneris* – T scap – Subcosmop.  
*Smyrniolum olusatrum* L. – H bienn – Medit.-Atl.  
*Thapsia garganica* L. subsp. *garganica* – H scap – S-Medit.  
*Tordylium apulum* L. – T scap – Circum-Medit.  
*Torilis nodosa* (L.) Gaertn. subsp. *nodosa* – T scap – Euro-Medit.-Turan.

#### ASTERACEAE

- Achillea maritima* (L.) Ehrend. & Y.P.Guo subsp. *maritima* – Ch suffr – Medit.-Atl.  
*Andryala integrifolia* L. – T scap – Euro-Medit.  
*Anthemis arvensis* L. – T scap – Subcosmop.  
*Artemisia arborescens* (Vaill.) L. – NP – SW-Medit.  
*Bellis annua* L. subsp. *annua* – T scap – Medit.-Macarones.  
*Bellis perennis* L. – H ros – Circumbor.  
*Calendula arvensis* (Vaill.) L. – T scap – Euro-Medit.  
*Calendula officinalis* L. – T scap – Medit.-Turan. (Arch – Cas)  
*Carduus fasciculiflorus* Viv. – H bien – Endem. SA-CO-AT  
*Carduus pycnocephalus* L. subsp. *pycnocephalus* – H bienn – Euro-Medit.-Turan.  
*Carlina corymbosa* L. – H scap – Circum-Medit.  
*Carlina gummifera* (L.) Less. – H ros – S-Medit.  
*Carlina lanata* L. – T scap – Circum-Medit.  
*Carthamus lanatus* L. – T scap – Euro-Medit.  
*Centaurea calcitrapa* L. – H bien – Medit.-Atl.  
*Centaurea napifolia* L. – T scap – SW-Medit.  
*Centaurea sphaerocephala* L. subsp. *sphaerocephala* – H scap – Circum-Medit.  
*Chamaemelum fuscatum* (Brot.) Vasc. – T scap – W-Medit.  
*Chondrilla juncea* L. – H scap – Euro-Medit.  
*Cichorium intybus* L. – H scap – Cosmop.  
*Cirsium vulgare* (Savi) Ten. subsp. *sylvaticum* (Tausch) Arènes – H bien – Subcosmop.  
*Cladanthus mixtus* (L.) Chevall. – T scap – Circum-Medit.  
*Crepis bellidifolia* Loisel. – T scap – W-Medit.  
*Crepis hyemalis* (Biv.) Ces., Pass. & Gibelli – T scap – Endem. SA-SI  
*Crepis vesicaria* L. subsp. *vesicaria* – T scap – Medit.-Atl.  
*Crupina crupinastrum* (Moris) Vis. – T scap – Circum-Medit.  
*Cynara cardunculus* L. subsp. *cardunculus* – H scap – Circum-Medit.

- Dimorphotheca ecklonis* DC. – Ch scap – S-Africa (Neo – Cas)  
*Dittrichia graveolens* (L.) Greuter – T scap – Medit.-Turan.  
*Dittrichia viscosa* (L.) Greuter subsp. *viscosa* – H scap – Euro-Medit.  
*Erigeron bonariensis* L. – T scap – Neotrop. (Neo – Inv)  
*Erigeron canadensis* L. – T scap – Neotrop. (Neo – Inv)  
*Erigeron sumatrensis* Retz. – T scap – Neotrop. (Neo – Inv)  
*Eriocephalus africanus* L. – P – S Africa (Neo – Cas).  
*Filago asterisciflora* (Lam.) Sweet – T rept – Circum-Medit.  
*Filago germanica* (L.) Huds. – T scap – Paleotemp.  
*Filago pygmaea* L. – T rept – Circum-Medit.  
*Filago pyramidata* L. – T scap – Euro-Medit.  
*Galactites tomentosus* Moench – H bienn – Circum-Medit.  
*Galatella pannonica* (Jacq.) Galasso, Bartolucci & Ardenghi – H bien – Euro-Medit.-  
 Irano-Turan.  
*Glebionis coronaria* (L.) Spach. – T scap – Circum-Medit. (Arch – Inv)  
*Hedypnois rhagadioloides* (L.) F.W.Schmidt – T scap – Circum-Medit.  
*Helianthus annuus* L. subsp. *annuus* – T scap – Neotrop. (Neo – Cas)  
*Helichrysum italicum* subsp. *tyrrhenicum* (Bacch., Brullo & Giusso) Herrando,  
 J.M.Blanco, L.Sáez & Galbany – Ch suffr – Endem. SA-CO  
*Helminthotheca echioides* (L.) Holub – T scap – Euro-Medit.  
*Hyoseris scabra* L. – T ros – Circum-Medit.  
*Hypochoeris achyrophorus* L. – T scap – Circum-Medit.  
*Hypochoeris glabra* L. – T scap – Euro-Medit.  
*Hypochoeris radicata* L. – T scap – Circum-Medit.  
*Lactuca sativa* L. subsp. *sativa* – H bienn – Medit. (Arch – Cas)  
*Lactuca sativa* subsp. *serriola* (L.) Galasso, Banfi, Bartolucci & Ardenghi – T scap –  
 Euro-Medit.  
*Leontodon tuberosus* L. – H ros – Circum-Medit.  
*Limbarda crithmoides* subsp. *longifolia* (Arcang.) Greuter – Ch suffr – Circum-Medit.  
*Logfia gallica* (L.) Cosson & Germ. – T scap – Euro-Medit.  
*Onopordum illyricum* L. – H bien – NE-Medit.  
*Pallenis spinosa* (L.) Cass. subsp. *spinosa* – H bienn – Euro-Medit.  
*Phagnalon rupestre* subsp. *illyricum* (H.Lindb.) Ginzb. – Ch suffr – W-Medit.  
*Phagnalon saxatile* (L.) Cass. – Ch suffr – W-Medit.  
*Pulicaria odora* (L.) Rchb. – H scap – Euro-Medit.  
*Pulicaria sicula* (L.) Moris – T scap – Circum-Medit.  
*Reichardia picroides* (L.) Roth – H scap – Circum-Medit.  
*Rhagadiolus stellatus* (L.) Gaertn. – T scap – Euro-Medit.  
*Scolymus hispanicus* L. – H bienn – Euro-Medit.  
*Scolymus maculatus* L. – T scap – S-Medit.  
*Senecio leucanthemifolius* Poir. subsp. *leucanthemifolius* – T scap – Circum-Medit.  
*Senecio lividus* L. – T scap – Circum-Medit.  
*Senecio transiens* (Rouy) Jeanm. – T scap – Endem. SA-CO  
*Senecio vulgaris* L. subsp. *vulgaris* – T scap – Cosmop.  
*Silybum marianum* (L.) Gaertn. – H bienn – Medit.-Turan.

*Sonchus asper* (L.) Hill subsp. *asper* – T scap – Subcosmop.

*Sonchus bulbosus* (L.) N. Kilian & Greuter subsp. *bulbosus* – G bulb – Circum-Medit.

*Sonchus oleraceus* L. – T scap – Subcosmop.

*Sonchus tenerrimus* L. – T scap – Circum-Medit.

*Symphytotrichum squamatum* (Spreng.) G.L.Nesom – T scap – Neotrop. (Neo – Inv).

*Tolpis umbellata* Bertol. – T scap – Circum-Medit.

*Tolpis virgata* (Desf.) Bertol. subsp. *virgata* – H scap – Circum-Medit.

*Urospermum dalechampii* (L.) F.W. Schmidt – H scap – Euro-Medit.

*Urospermum picroides* (L.) Scop. ex F.W. Schmidt – T scap – Euro-Medit.

*Xanthium italicum* Moretti – T scap – Neotrop. (Neo – Nat).

*Xanthium spinosum* L. – T scap – Neotrop. (Neo – Inv).

#### CAMPANULACEAE

*Campanula erinus* L. – T scap – Circum-Medit.

*Jasione montana* L. – H bienn – Euro-Medit.

#### DIPSACACEAE

*Dipsacus ferox* Loisel. – H bienn – Endem. SA-CO

*Lomelosia rutifolia* (Vahl) Avino & P.Caputo – H scap – W-Medit.

*Sixalis atropurpurea* (L.) Greuter & Burdet – H bien – Circum-Medit.

#### VALERIANACEAE

*Centranthus calcitrapae* (L.) Dufr. subsp. *calcitrapae* – T scap – Circum-Medit.

*Valerianella dentata* (L.) Pollich – T scap – Medit.-Atl.

*Valerianella microcarpa* Loisel. – T scap – Circum-Medit.

#### FAGACEAE

*Quercus calliprinos* Webb. – P scap – E-Medit.

*Quercus ilex* L. – P scap – Circum-Medit.

*Quercus suber* L. – P scap – Circum-Medit.

## Results

The inventory of the vascular flora consists of 653 taxa, 84% of which are native (5% of them being endemic) and 16% non-native (10% neophytes, 6% archaeophytes) (Fig. 2), including 500 species, 148 subspecies, three varieties and two hybrids, from 89 families and 374 genera.

The native component includes 406 species, 135 subspecies, two variety and one hybrid, belonging to 75 families and 313 genera. The best represented phylum (Table 2) is *Magnoliophyta* (532 taxa), in which *Eudicotyledones* represent the largest systematic group, with 402 taxa, followed by 128 *Monocotyledones* taxa. The phylum *Pteridophyta* is represented by nine taxa, *Pinophyta* only by three taxa.

Among alien taxa, the best represented phylum (Table 2) is *Magnoliophyta* (107 taxa), in which *Eudicotyledones* represent the largest systematic group with 79 taxa, followed by *Monocotyledones* (28 taxa) and *Pinophyta* (two taxa).



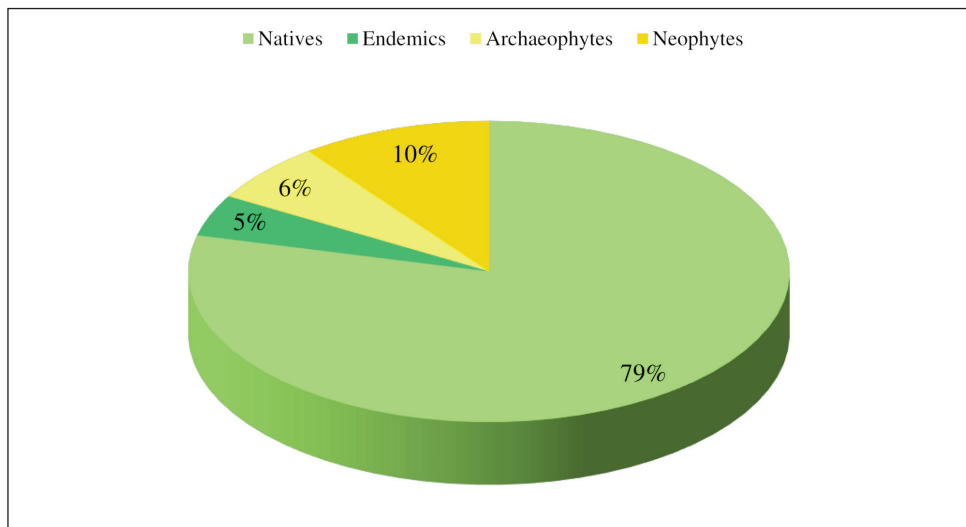


Fig. 2. The total vascular flora of the MPACC.

Among the native flora, the best represented family is *Asteraceae* (68 taxa) followed by *Poaceae* (60 taxa) and *Fabaceae* (59 taxa; Fig. 3).

Life-form analysis (Fig. 4) of native species revealed dominance of therophytes (49%) followed by hemicryptophytes (21%), geophytes (14%) and chamaephytes (7%). Phanerophytes are 5%, nano-phanerophytes 3%, hydrophytes only 1%.

As concerns chorology of native taxa (Fig. 5), the Mediterranean element is largely prevailing (81%, 440 taxa), followed by the Subcosmopolitan (6%, 33 taxa), Paleotemperate (4%, 22 taxa) and Cosmopolitan (3%, 17 taxa) elements.

In the chorological spectrum of the native Mediterranean species (Fig. 6a) most represented are the Circum-Mediterranean (37%, 162 taxa) and Euro-Mediterranean (27%, 119 taxa), followed by W-Mediterranean (9%, 40 taxa) and Endemic (6%, 29 taxa).

Table 2. Taxa numbers and percentages per phylum in the native and alien vascular flora of the MPACC.

Phylum	Native	Alien	Native	Alien
	N°	N°	%	%
<i>Magnoliophyta - Eudicotyledones</i>	402	79	73,90	72,48
<i>Magnoliophyta - Monocotyledones</i>	128	28	23,53	25,69
<i>Magnoliophyta - Magnolides</i>	2	0	0,37	0
<i>Pinophyta</i>	3	2	0,55	1,83
<i>Pteridophyta</i>	9	0	1,65	0
<b>Total</b>	<b>544</b>	<b>109</b>	<b>100</b>	<b>100</b>

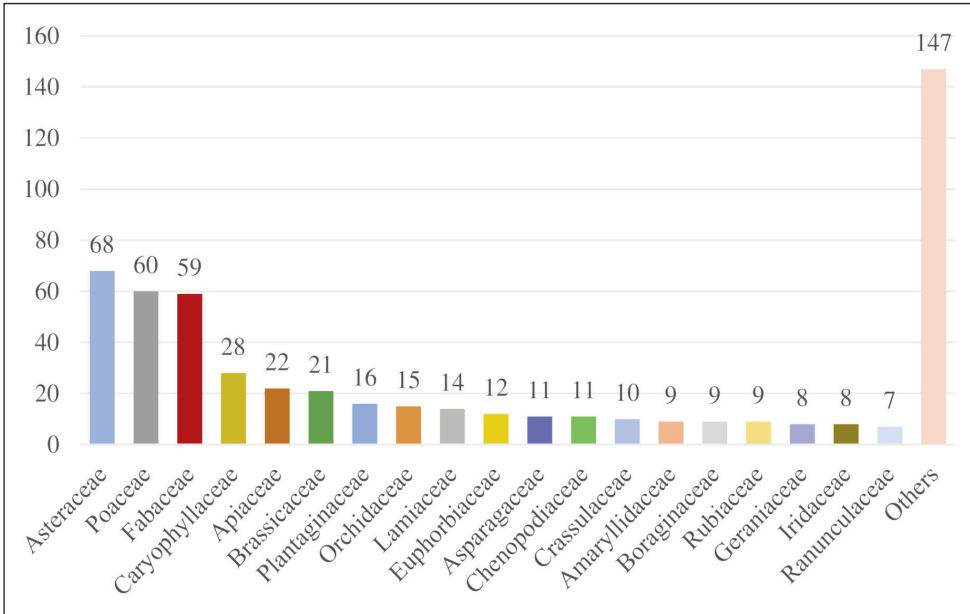


Fig. 3. Taxa numbers in the main families of the native vascular flora of the MPACC.

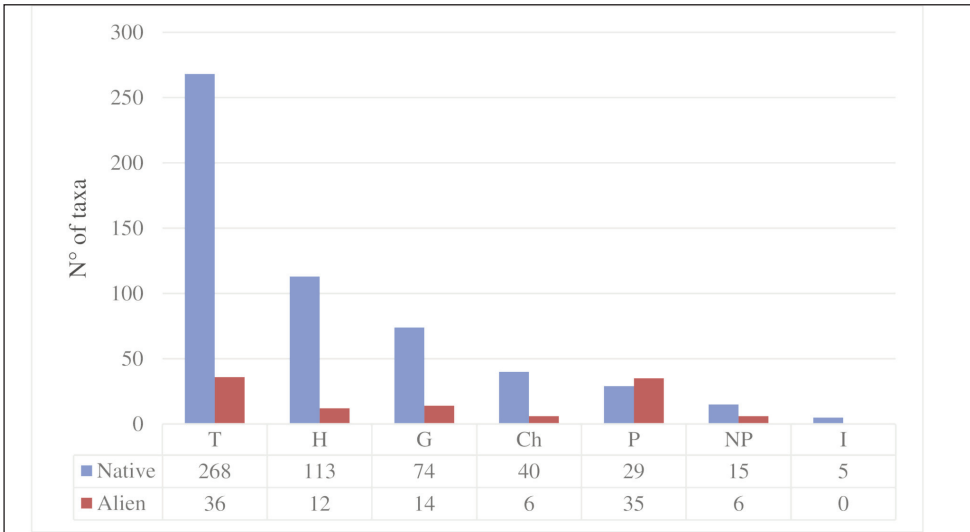


Fig. 4. Comparison of taxa numbers per life-form in the native and alien vascular flora of the MPACC.

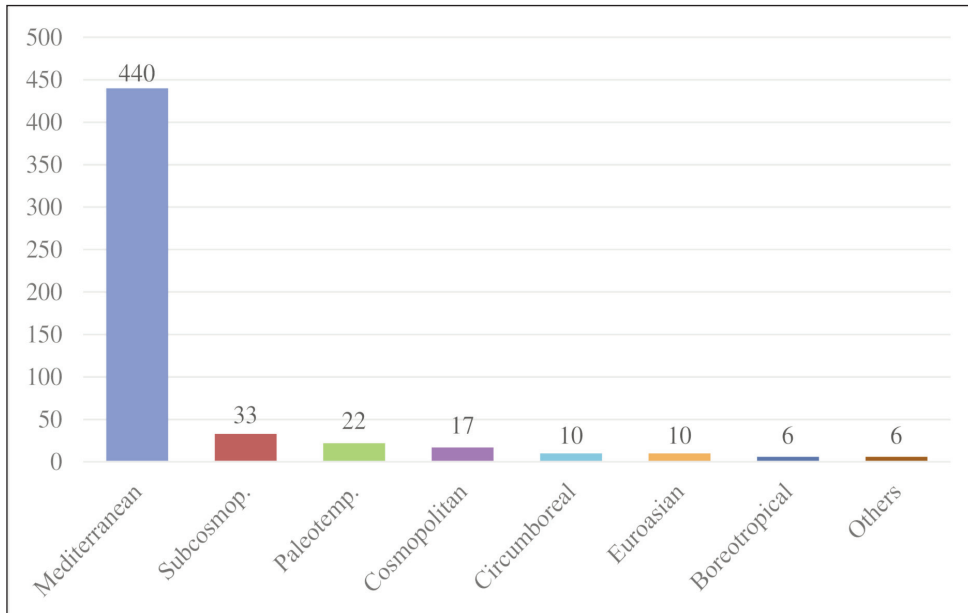


Fig. 5. Taxa numbers in the chorological types of the native vascular flora of the MPACC.

Among endemic plants (Fig. 6b), Sardo-Corsican taxa are predominant (55%, 16 taxa), followed by Sardo-Corsican-Tuscan Archipelago (14%, four taxa) and Sardinian taxa (10%, three taxa).

The non-native component includes 94 species, 13 subspecies, one variety and one hybrid, belonging to 40 families and 81 genera. Of the 109 alien taxa (Fig. 7), 25 (23%) are invasive, 40 (37%) naturalized and 44 (40%) casual. Among neophytes (67 taxa) the number of invasive taxa is 21 (19%), naturalized taxa are 20 (18%) and casual 26 (24%). Archaeophytes (42 taxa) have four invasive taxa (4%), 20 naturalized (19%) and 18 casual taxa (16%).

In the alien flora, the most represented family is *Asteraceae* (12 taxa) followed by *Fabaceae* (nine taxa) and *Poaceae* (nine taxa) (Fig. 8).

The best represented life-forms (Fig. 4) among alien taxa are therophytes (33%) and phanerophytes (32%), followed by geophytes (13%), hemicryptophytes (11%), chamaephytes (6%) and nano-phanerophytes (5%). There are no alien hydrophytes.

As concerns the geographic origin of alien species (Fig. 9), the American element (35%, 38 taxa) prevails, followed by the Mediterranean (27%, 30 taxa), the South African (13%, 14 taxa) and Asian (9%, 10 taxa) elements.

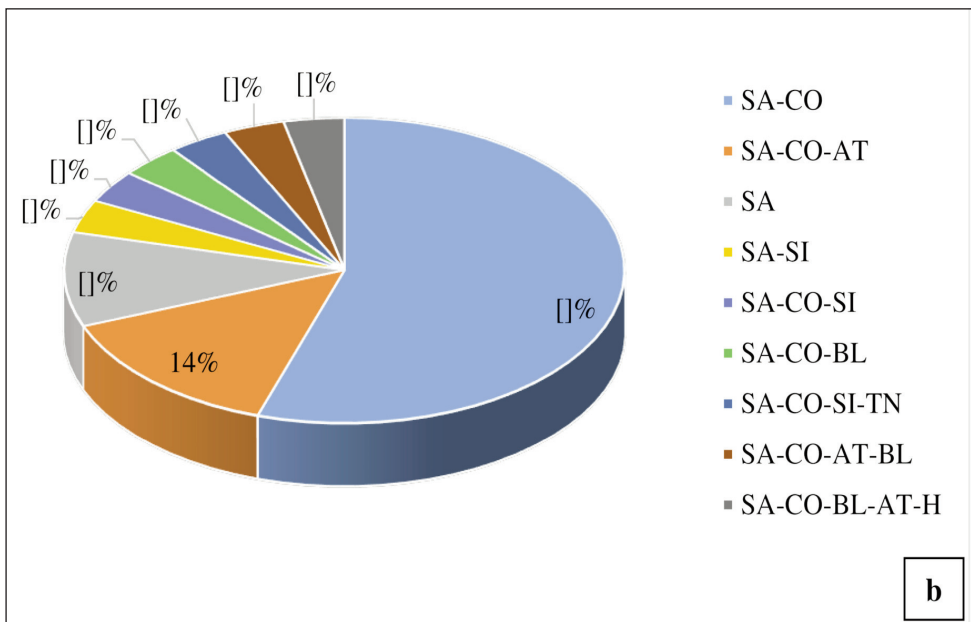
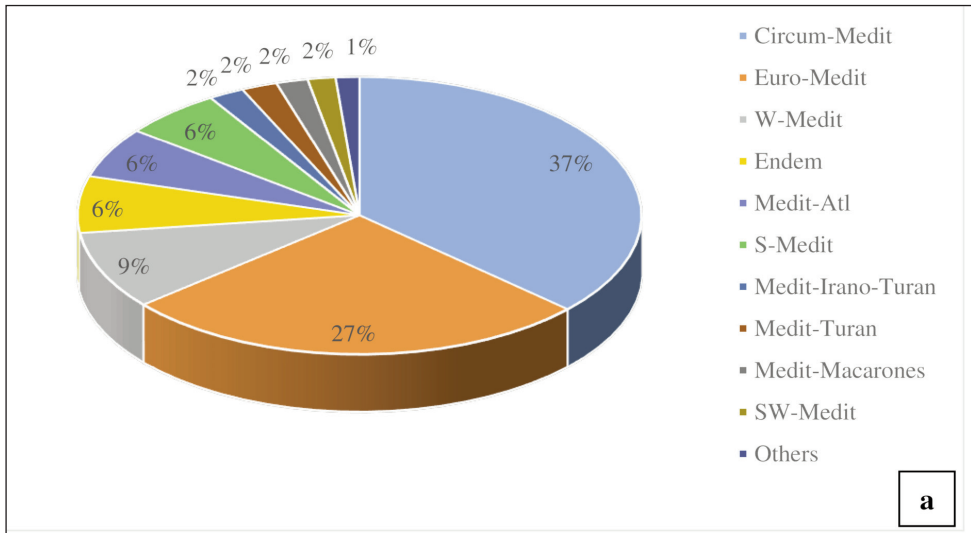


Fig. 6. Chorological spectrum of the Mediterranean (a) and Endemic (b) component of the native vascular flora of the MPACC.

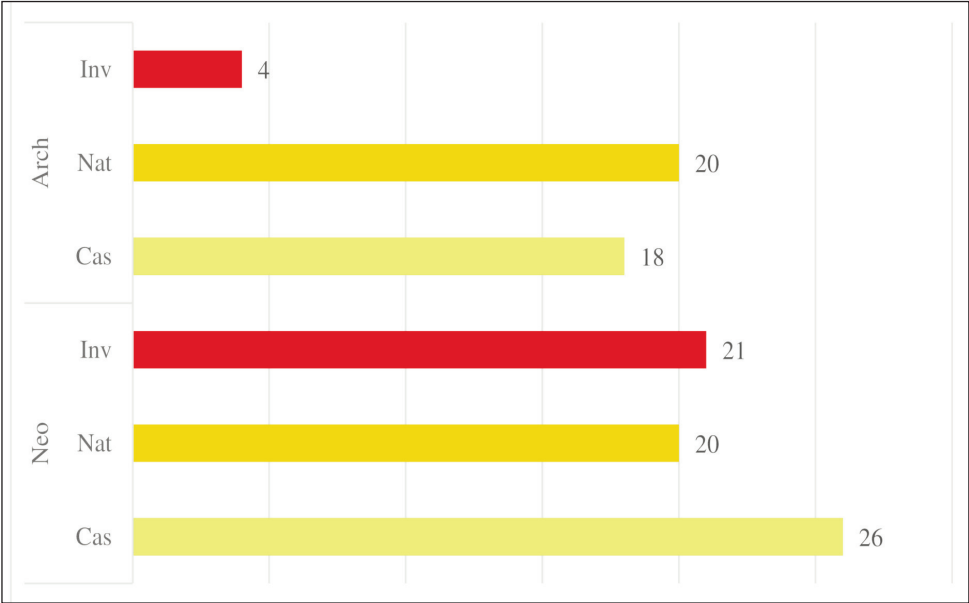


Fig. 7. Number of taxa per diffusion status among archaeophytes (Arch) and neophytes (Neo) of the MPACC.

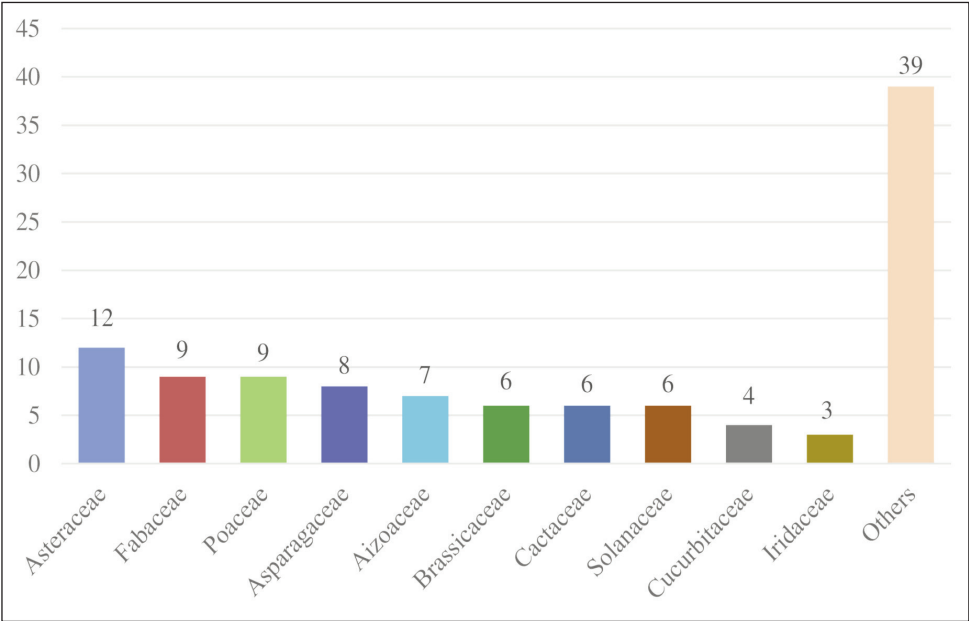


Fig. 8. Taxa numbers in the main families of the alien vascular flora of the MPACC.

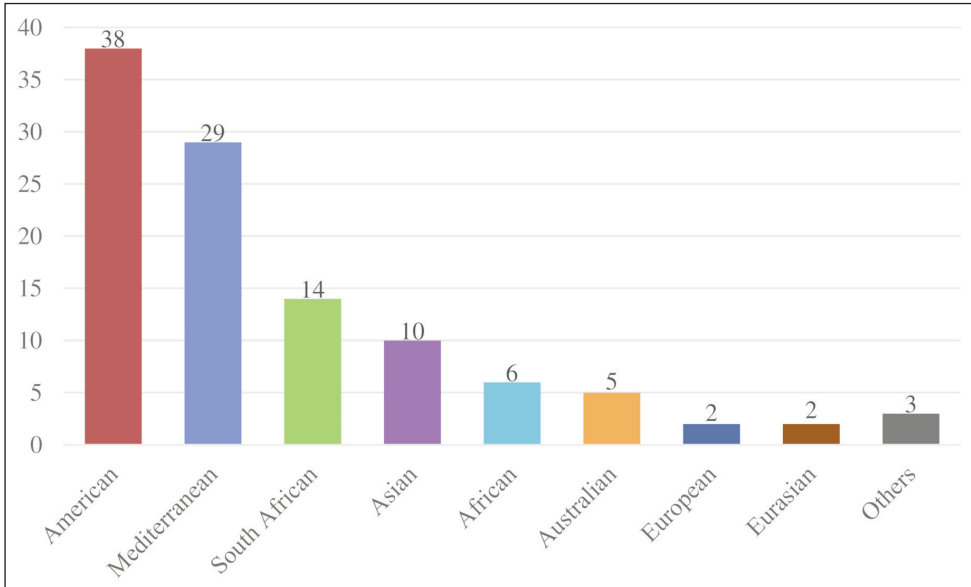


Fig. 9. Number of alien vascular taxa of the MPACC grouped by geographic origin.

## Discussion

The floristic composition of the territory is similar to that of other Sardinian territories, especially as regards native families (e.g. Bacchetta 2006). Predominant are *Asteraceae*, *Poaceae* and *Fabaceae* which make up more than a third (34%) of the species in the MPACC's flora (together with *Caryophyllaceae*, *Apiaceae* and *Brassicaceae* almost 50%). As regards the alien component, after the three families that have the greatest number of taxa (*Asteraceae*, *Poaceae* and *Fabaceae*), there are also families such as *Aizoaceae* and *Cactaceae* that are exclusively represented by alien species.

The life-form spectrum of the MPACC's flora is consistent with those of other floras of neighbouring territories and highlights the Mediterranean nature of the climate in which therophytes (49%) and hemicryptophytes (21%) have a clear dominance over perennial biological forms (Bocchieri & al. 2008). The high percentage of geophytes (14%) appears to be linked to the anthropogenic use of the territory, in particular to the practice of fires and to agro-pastoral activities, but also proves the abundance of psammophilous habitats in which geophytes are important for the creation of dunes. The low percentage of phanerophytes (5%) and nano-phanerophytes (3%) reflects the low degree of woody cover.

The low percentage of hydrophytes is related to the almost absence of freshwater habitats, the five species present being related to sea, or pond water. As regards the alien component, the greater percentage of phanerophytes (32%) is emphasized, which, together with nano-phanerophytes (5%) become the prevalent biological form, testifying the use of species mainly introduced for reforestation, forestation and ornamental use, as already found for the alien vascular flora of Sardinia (Puddu & al. 2016).

Our analyses highlight the high floristic diversity of the investigated area, as testified by the presence of plants of high phytogeographical value, including 29 endemic species mainly confined in the two islands. Among the endemics, three species are exclusive to Sardinia: *Aristolochia tyrrhena* E. Nardi & Arrigoni, *Limonium retirameum* Greuter & Burdet subsp. *retirameum* and *Silene valsecchia* Bocchieri. The latter two are also exclusive to eastern Sardinia. Most of the endemics (16 taxa) consist of Sardo-Corsican elements: *Aristolochia rotunda* subsp. *insularis* (E.Nardi & Arrigoni) Gamisans; *Biscutella morisiana* Raffaelli; *Bryonia marmorata* E. Petit; *Dipsacus ferox* Loisel.; *Ferula arrigonii* Bocchieri; *Genista corsica* (Loisel) DC.; *Helichrysum italicum* subsp. *tyrrhenicum* (Bacch., Brullo & Giusso) Herrando, J. M. Blanco, L. Sáez & Galbany; *Lotus cytisoides* subsp. *conradiae* Gamisans; *Narcissus supramontanus* Arrigoni subsp. *cunicularium* Arrigoni; *Ophrys conradiae* Melki & Deschâtres; *O. exaltata* Ten. subsp. *morisii* (Martelli) Del Prete; *Portulaca sardoa* Danin, Bagella & Marrosu; *Prospero corsicum* (Boullu) J.-M. Tison; *Romulea requienii* Parl.; *Senecio transiens* (Rouy) Jeanm.; *Silene succulenta* subsp. *corsica* (DC.) Nyman. *S. valsecchia* and *F. arrigonii* have the *locus classicus* on the island of Serpentara. The endemics shared with Corsica and the Tuscan Archipelago are *Arum pictum* L. f. subsp. *pictum*, *Carduus fasciculiflorus* Viv., *Scrophularia trifoliata* L. and *Verbascum conocarpum* Moris subsp. *conocarpum*. Noteworthy is the abundance of the endemic *Brassica insularis* Moris, listed in Annexes II and IV of the Habitats Directive 92/43/EEC. This species, considered a Tyrrhenian endemic, is found only on the island of Cavoli, where one of the most important populations of Sardinia is present, the island taking its name from this species. The island of Serpentara is also probably a phytotoponym, which seems to take its name from *Helicodiceros muscivorus* (L. f.) Engl. (Biondi & al. 1993), endemic to Sardinia, Corsica, and the Balearic Islands.

Like most of the coastal territories of the Mediterranean area, also the study area is not immune from the spread of alien plant species, which make up 17% of the total flora. In particular, the high presence of invasive species is alarming, above all because they are a threat to the biodiversity of the most sensitive habitats, such as those of coastal dunes (Podda & al. 2018; Mayoral & al. 2020). In fact, among the 25 invasive species, the most common are neophytes introduced in gardens and public greenery as ornamental species, which escaped cultivation and become invasive in coastal habitats, such as *Carpobrotus acinaciformis* (L.) L. Bolus, *Carpobrotus edulis* (L.) N. E. Br., *Malephora crocea* (Jacq.) Schwantes and *Mesembryanthemum cordifolium* L.f., all belonging to the South African family *Aizoaceae*. In addition, several American plant species belonging to the *Agave* genus [*Agave americana* L., *Agave fourcroydes* Lem., *Agave ingens* Brg. var. *picta* (Salm.) Bgr., *Agave salmiana* subsp. *ferox* (K.Koch) Hochstätter], two *Fabaceae* [*Acacia saligna* (Labill.) H. L. Wendl. and *Vachellia karroo* (Hayne) Banfi & Galasso] and two *Cactaceae* [*Opuntia ficus-indica* (L.) Mill. e *Austrocyllindropuntia subulata* (Mühlenpf.) Backeb] occur. There are also other species which are considered invasive in other territories, that have not yet shown their potential, but which could become so in the future such as *Ailanthus altissima* (Mill.) Swingle, *Cortaderia selloana* (Schult.) Asch. & Graebn. and *Cenchrus longisetus* M.C. Johnst. Differently, the archaeophytes of the study area are naturalized species, integrated with the flora, that show very little invasiveness since only four taxa [*Arundo donax* L., *Glebionis coronaria* (L.) Spach, *Ricinus communis* L., *Trigonella sicula* (Turra) Coulot & Rabaute] can be considered as invasive, especially in wetlands and synanthropic habitats.

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