

## ABOUT THE HALONITROPHILOUS AND NITROPHILOUS FRUTICOSE FORMATIONS PRESENT IN THE VALENCIAN COMMUNITY (SPAIN)

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**ABSTRACT:** This work addresses an in-depth review of the vegetation formed by halonitrophilous steppe scrublands of the *Pegano harmalae-Salsoletea vermiculatae* class and other nitrophilous fruticose formations in the Valencian Community (Spain). Several nomenclatural adjustments are proposed, affecting one class (*Salvietea rosmarini*), as well as three orders, two alliances, one suballiance and ten associations. Furthermore, as a result of our research, we propose the following restructurings and novelties: a new order, *Medicagini citrinae-Malvetalia arboreae* (within the *Pegano-Salsoletea* class), and two new classes: *Helichryso stoechadis-Santolinetea ericoidis* and *Nicotiano glaucae-Ricinetea communis*. Within this latter class, we propose the new order *Malvo subovatae-Anagyretalia foetidae*, the alliance *Malvo subovatae-Anagyryon foetidae* and two new associations: *Nicotiano glaucae-Withanietum somniferae* and *Ricino communis-Leucaenetum glabratae*. **Keywords:** Phytosociology; steppe halonitrophilous vegetation; nitrophilous fruticose formations; syntaxonomy; Spain.

**RESUMEN:** Sobre las formaciones fruticosas halonitrófilas y nitrófilas presentes en la Comunidad Valenciana (España). Este trabajo aborda una revisión en profundidad de la vegetación formada por matorrales esteparios halonitrófilos de la clase *Pegano harmalae-Salsoletea vermiculatae* y otras formaciones fruticosas nitrófilas en la Comunidad Valenciana (España). Se proponen varios ajustes nomenclaturales que afectan a una clase (*Salvietea rosmarini*), así como a tres órdenes, dos alianzas, una subalianza y diez asociaciones. Además, como resultado de nuestra investigación, proponemos las siguientes reestructuraciones y novedades: un nuevo orden, *Medicagini citrinae-Malvetalia arboreae* (dentro de la clase *Pegano-Salsoletea*), y dos nuevas clases: *Helichryso stoechadis-Santolinetea ericoidis* y *Nicotiano glaucae-Ricinetea communis*. Dentro de esta última clase, proponemos el nuevo orden *Malvo subovatae-Anagyretalia foetidae*, la alianza *Malvo subovatae-Anagyryon foetidae* y dos nuevas asociaciones: *Nicotiano glaucae-Withanietum somniferae* y *Ricino communis-Leucaenetum glabratae*. **Palabras clave:** Fitosociología; vegetación halonitrófila esteparia; formaciones fruticosas nitrófilas; sintaxonomía; España.

### INTRODUCTION

Halonitrophilous steppe scrublands show a preference for disturbed sites with disturbed substrates, frequented by humans, livestock, or seabirds. They develop on soils rich in nitrogen and phosphorus salts, with relatively high levels of potassium and are grouped in the class *Pegano harmalae-Salsoletea vermiculatae*, initially created by BRAUN-BLANQUET & BOLÒS (1958) to characterize the peculiar halonitrophilous vegetation of the arid regions of the Ebro Valley and North Africa, although this concept was later expanded by RIVAS MARTÍNEZ & al. (2001) to include in it all the nitrophilous, infra-oromediterranean desert, xeric and pluviseasonal oceanic or continental, hyperarid-subhumid shrub communities widely distributed in the Saharo-North Arabian, Irano-Turanian, Mediterranean and Macaronesian regions.

The aforementioned class has been the subject of a recent revision in several countries of the European Mediterranean region: Italy (BRULLO & al., 2012), France (De FOUCAULT, 2015; GAUDILLAT & LOUVEL, 2015), Portugal (COSTA & al., 2000), and Spain (PEINADO & al., 1991; RIVAS-MARTÍNEZ & al., 2001; MOTA & al., 2009). Some new syntaxonomic contributions have been made,

allowing us to have a broad and up-to-date perspective to analyze and address the different syntaxa present in the Valencian Community and bordering areas. It is precisely in this study that we also propose some syntaxonomic changes and novelties, and where we have identified two new associations for the Valencian territory: *Nicotiano glaucae-Withanietum somniferae* ass. nova hoc loco (Fig. 1), which develops mainly in disturbed environments on Calcisols (and to a lesser extent Luvisols or Fluvisols) sometimes enriched with Technosols, and *Ricino communis-Leucaenetum glabratae* ass. nova hoc loco (Fig. 2), on Fluvisols sometimes enriched with Technosols, which we describe in this article. Both associations fall within the new class *Nicotiano glaucae-Ricinetea communis classis nova hoc loco*, of Macaronesian and Mediterranean chorology, which we propose here.

We also propose to create a new class, *Helichryso stoechadis-Santolinetea ericoidis classis nova hoc loco*, for the (sub)-nitrophilous Mediterranean scrublands dominated by asteraceae of the genera *Helichrysum* Mill., *Santolina* L. or *Artemisia* L., based on their peculiar

flora, edaphic and bioclimatic requirements, dynamism and history.

## MATERIALS AND METHODS

The available literature on the *Pegano-Salsoletea* class was reviewed and analyzed, and relevés of the new plant associations were compiled in various Valencian localities in the provinces of Alicante, Castellón, and Valencia, specifically in the districts of Alto Palancia, Camp de Morvedre, Camp de Túria, l'Horta Nord, l'Horta Sud, la Marina Alta, la Plana Baixa, la Ribera Baixa, la Safor, and Valencia. The standard sigmatist methodology of the Zurich-Montpellier school was applied, following the guidelines in the relevant manuals (BRAUN-BLANQUET, 1979; RIVAS-MARTÍNEZ, 1987). Two phytosociological tables were also created, using a sufficient and representative number of relevés, to visualize and describe these two proposed new plant associations. In these, the subspecies and/or varieties are indicated in a binary way, by omitting the specific epithet, so that only the name of the genus and the adjective of the subspecies or variety that corresponds to each taxon appear.

For the nomenclature of the plants, the criteria followed by the manual “Claves Ilustradas para la Flora Valenciana” by MATEO & CRESPO (2014) have been adopted in general terms, with the exception of *Foeniculum vulgare* Mill. subsp. *pipéritum* (Ucria) Cout., *Lantana ×strigocamara* R.W. Sanders, *Leucaena leucocephala* (Lam.) de Wit subsp. *glabrata* (Rose) Zárate, *Malva arborea* (L.) Webb & Berthel., *Malva multiflora* (Cav.) Soldano, Banfi & Galaso, *Malva subovata* (DC.) Molero & J.M. Monts. subsp. *subovata*, *Oloptum miliaceum* (L.) Röser & Hamasha subsp. *miliaceum*, *Tipuana tipu* (Benth.) Kuntze, *Vachellia caven* (Molina) Seigler & Ebinger, and *Vachellia farnesiana* (L.) Wight & Arn.

In general, we have followed the syntaxonomic framework proposed by RIVAS-MARTÍNEZ & al. and subsequent modifications (2001, 2002a, 2002b, 2011a, 2011b; FERRER & al., 2024), within which the new associations we propose are framed, but expanded and modified in this article with new syntaxonomic proposals. We have also taken into account recent works that revise or provide new data on the *Pegano-Salsoletea* class (PEINADO & al., 1991; BRULLO & al., 2012; DE FOUCAULT, 2015; GAUDILLAT & LOUVEL, 2015; MOTA & al., 2009; MUCINA & al., 2016). For this class, RIVAS-MARTÍNEZ & al. (2001) recognize 5 orders, of which two are exclusive to the Macaronesian region (*Chenoleoidetalia tomentosae* Sunding 1972 *nom. mut.* Rivas-Martínez, T.E. Díaz, Fernández-González, Izco, Loidi, Lousã & Penas 2002 and *Forsskaoleo angustifoliae-Rumicetalia lunariae* Rivas-Martínez, Wildpret, Del Arco, O. Rodríguez, Pérez de Paz, García Gallo, Acebes, T.E. Díaz & Fernández-González 1993), and the other three are present in the Mediterranean region and in the Valencian Community (*Salsolo-Peganetalia* Br.-Bl. & O. Bolòs 1954, circummediterranean arid-dry halonitrophilous; *Nicotiano glaucae-Ricinetalia communis* Rivas-Martínez, Fernández-González & Loidi 1999, Mediterranean-

Macaronesian, of arid humid environments where nano and phanerophytes of nitrophilous origin of tropical origin dominate; and *Helichryso stoechadis-Santolinetalia ericoidis* Peinado & Martínez Parras 1984 *nom. mut. propos.*, which groups subnitrophilous scrublands typical of the western Mediterranean region, in dry-subhumid environments.

To establish soil-vegetation relationships, we followed the edaphic criteria and proposals for the various soil types as set forth in the “World Reference Base for Soil Resources (WRB)” (IUSS WORKING GROUP WRB, 2022). In general, there are several subtypes of nitrophyte scrublands, and in this article, we will relate them to the genesis of the soils where they germinate, grow, develop and bear fruit

## RESULTS AND DISCUSSION

From the study and analysis of the available literature on the *Pegano-Salsoletea* class, it can be deduced that the various territories of the Mediterranean region with soils affected by halonitrophilia or nitrophilia are quite heterogeneous and, in some cases, do not have a continuous distribution area, appearing instead as disjunct and isolated geographical clusters. In general, several subtypes of these halonitrophilous or nitrophilous scrublands have been described, which can be summarized in the following sections, taking into account their syntaxonomic classification and soil-vegetation relationships:

1) Halonitrophilous scrublands developed on internal Solonchaks and Gypsisols (associations belonging to the order *Salsolo-Peganetalia*)

Plant communities belonging to the order *Salsolo-Peganetalia* typically develop on saline soils, characterized by high soluble salt content year-round, and are representative of arid and semi-arid regions worldwide. This group of halophilic soils is highly heterogeneous and diverse, but they are characterized by summer water deficits and differ in their chemical composition, the depth of salt accumulation in the soil, and their mineralogy (IBÁÑEZ & MARTÍNEZ COSIO, 2013). They are generally rich in salts (chlorides or sulfates, sodium, calcium, magnesium, and potassium), sometimes with added nitrogen compounds, thus becoming halonitrophilic soils. It can happen that soluble salts accumulate at a certain depth and rarely reach the surface (internal Solonchaks), or that, through the process of evaporation-transpiration, there is a capillary rise of water loaded with dissolved salts through the soil profile which, after its evaporation on the surface, gives rise to the formation of a characteristic salt crust, these being external Solonchaks, which are located in low or depressed areas of the terrain and generally harbor on them halophytic fruticose scrub of the class *Sarcocornietea fruticosae* Br.-Bl. & Tüxen ex A. & O. Bolòs 1950 *nom. mut.* Rivas-Martínez, T.E. Díaz, Fernández-González, Izco, Loidi, Lousã & Penas 2002, while in somewhat higher, intermediate, and transitional topographic situations between the internal and external Solonchaks, Mediterranean saline steppes of the order *Limonietalia* Br.-Bl. & O. Bolòs 1958 develop (DE LA CRUZ, 2009). In any case, the potential vegetation of these

territories corresponds to various associations dominated by tamarisk (*Tamaricetalia* Br.-Bl. & O. Bolòs 1958 em. Izco, Fernández-González & A. Molina 1984).

Halonitrophilous associations, developed on internal Solonchaks and/or Gypsisols, are characteristic of the order *Salsolo-Peganetalia* Br.-Bl. & O. Bolòs 1954 and are dominated by shrubs (chamaephytes) that prefer disturbed, disturbed, and nitrified sites frequented by humans and livestock. Edaphically, they are characterized by their development on halomorphic soils (those that at some point in their evolution exhibit an excess of soluble salts, high levels of exchangeable sodium, or both), with a highly varied origin of the soluble salts. Their mere presence affects the soil's properties, causing negative effects such as the dispersion of organic matter, decreased colloidal stability, and reduced availability of phosphorus and micronutrients.

Within the *Salsolo-Peganetalia* order, and depending on continentality or coastality, bioclimatology, flora, geomorphology and the soil's genesis and chemical composition where they are located, several alliances are established.

On the one hand, we have the scrublands that develop on semi-continental Mediterranean territories (*Salsolo vermiculatae-Peganion harmalae* Br.-Bl. & O. Bolòs 1954 alliance), and those others that are located in coastal and sublittoral zones (*Salsolo oppositifoliae-Suaedion mollis* Rigual 1972 *nom. mut.* Rivas-Martínez, Penas, Díaz & Fernández-González 2011 and *Hammado articulatae-Atriplicion glaucae* Rivas Goday & Rivas Martínez ex Rigual 1972 *corr.* Alcaraz, P. Gómez, De la Torre, Ríos & J. Álvarez 1991 alliances). In this case, all the associations have in common that they develop in Mediterranean territories on internal Solonchaks, which on many occasions contact Gypsisols, soils with pedogenic gypsum, typical of arid and semi-arid regions, with a horizon of secondary gypsum enrichment in the first meter of the soil profile, so in this case these types of soluble salts from these materials are incorporated.

The plant communities characteristic of the *Salsolo vermiculatae-Peganion harmalae* alliance occupy large areas in Neogene formations with gypsum outcrops (which contribute sulfate, calcium, and magnesium ions) interbedded with marls, which undergo some type of zooanthropogenic alteration. They are distributed primarily in some subcontinental Mediterranean-Iberian areas, such as the Ebro depression, certain areas of the Duero and Tagus basins, with some inland Betic disjunctions, in territories with a semi-arid to dry climate (MOTA & al., 2009). In the Valencian Community, these associations occupy a smaller area than in the aforementioned territories and marginally reach the interior of Valencia (Setabensean Sector) and adjacent areas of Albacete (Manchean Sector). We can locate them in the basins and valleys of the Júcar and Cabriel rivers located between the towns of Jalance (Valencia) and Alcalá del Júcar (Albacete), and between Cofrentes and Casas del Río (Valencia) and Villatoya (Albacete), where the associations *Limonio lobetanicum-Salsoleum vermiculatae* Peris, Stübing & Figuerola 1991 and *Limonio sucronicum-Peganetum harmalae* Peris, Stübing & Figuerola 1991 were described (PERIS & al., 1991).

In some coastal and sub-coastal Mediterranean-Iberian territories, halonitrophilous steppe scrub develops on inland Solonchaks, often adjacent to Gypsisols. These scrublands are enriched with organic matter and subject to aquifer overexploitation, and can cover large areas or appear in disjunct and isolated patches. On the Iberian Peninsula, they are well represented in the semi-arid southeast (Murcian-Almeriensean biogeographic province), in areas with a semi-arid ombroclimate. In the Valencian Community, they affect the southern part of the region, reaching their greatest extent in the Vinalopó river basin and valleys, as well as the central and coastal areas of southern Alicante. The plant communities present in this Alicante region are classified into two alliances: *Salsolo oppositifoliae-Suaedion mollis* and *Hammado articulatae-Atriplicion glaucae*.

The first alliance includes heliophilous, littoral and sublittoral, halonitrophilous steppe shrubby associations that develop on evaporitic materials containing and maintaining a certain degree of salinity. In this case, they grow in topographically higher locations than the purely halophilous scrublands of the class *Sarcoconietea fruticosae*, acting in most cases as their outer fringe (GÉHU & al., 1984: 356). They sometimes tolerate hydromorphism and some temporary surface salinity, although without developing saline efflorescence on the soil surface. These are arid or semi-arid thermomediterranean associations, primarily distributed in the Murcian-Almeriensean biogeographic province. The following associations have been cited for the Valencian territory:

– *Atriplicetum glauco-halimi* Rivas-Martínez & Alcaraz 1984

Limited to the Alicantine Sector (ALCARAZ, 1984; ALCARAZ & al., 1991).

– *Atriplici glaucae-Suaedetum mollis* Rigual 1972 *nom. mut.* Rivas Martínez & al. 2011. Limited to the Alicantine and Setabensean Sectors (RIGUAL, 1972; ALCARAZ & al., 1989).

– *Salsolo oppositifoliae-Atriplicetum halimi* Costa, Peris & Stübing ex Cantó, Loarga & Belmonte 1986 *corr.* Pérez-Badía 1997. Association initially described from the Peñón de Ifach (CANTÓ & al., 1986) that extends through the southern territory of the Setabensean Sector, almost in contact with the Alicantine Sector (PÉREZ BADÍA, 1997).

– *Thymelaeo hirsutae-Salsoleum oppositifoliae* Rivas Goday & Bellot in Rivas Goday & Rivas-Martínez 1959 *nom. inv.* Limited to the Alicantine Sector (DONAT & MARTÍNEZ FORT, 2011).

– *Suaedo verae-Salsoleum oppositifoliae* Rivas Goday & Rigual 1958 *corr. et nom. inv. propos.* Alcaraz, T.E. Díaz, Rivas-Martínez & P. Sánchez 1989. Limited to the Alicantine Sector (RIGUAL, 1972; JUAN & CRESPO, 2003).

– *Whitanio futescentis-Lycietum intricati* Alcaraz, P. Sánchez, De la Torre, Ríos & J. Álvarez 1991. Association with optimal chorological Murcian-Almeriensean, Alpujarrean-Gadoresean and Malacitan-Almijaresean Sectors (through the typical sub-association, *atriplicetosum glaucae* Juan & M.B. Crespo 2001), but which reaches its northern limit in the

archipelago of the Columbretes (Castellón), through the sub-association *lobularietosum columbretensis* Juan & M.B. Crespo 2001 (JUAN & CRESPO, 2001).

As for the *Hammado articulatae-Atriplicion glaucae* alliance, this group comprises associations of heliophilous steppe shrublands in arid-semi-arid climates that develop on compact, halonitrophilous, and somewhat gypsophilous clay soils (Internal Solonchaks-Gypsisols), with a deep water table and therefore lacking seasonal, temporary hydromorphic phenomena. In the Iberian Peninsula, they reach their optimum in the semiarid southeast, in the Murcian-Almeriense biogeographic province. In the Valencian Community it is limited to the Alicante territory (RIVAS GODAY & RIGUAL, 1958; BOLÒS, 1967; MARTÍN & CLIMENT, 1990; DE LA TORRE, 1991; DE LA TORRE & al., 1991; ALONSO, 1996; JUAN & CRESPO, 2003) and is represented by the following associations:

- *Atriplici glaucae-Salsoletum genistoidis* O. Bolòs 1957
- *Plantagini albicantis-Capparietum canescentis* O. Bolòs 1967
- *Zygophyllo fabaginis-Atriplicetum glaucae* Rivas Goday, Esteve & Rigual in Rigual 1972
- *Hammado articulatae-Atriplicetum glaucae* Rigual 1972 *corr.* Alcaraz, P. Gómez, De la Torre, Ríos & J. Álvarez 1991

In general, the flora of these sub-steppe halonitrophilous scrublands grouped in the order *Salsolo-Peganelalia* is adapted to harsh climatic conditions, with dominant arid-semiarid or dry ombroclimates, thermomediterranean and mesomediterranean thermotypes, in anthropized and ruderalized areas (urban areas or areas with clear agricultural abandonment), and subject to a particular edaphics, characterized by the presence of richly mineralized soils (with a high concentration of  $K^+$ ,  $Na^+$ ,  $Cl^-$ ,  $SO_4^{2-}$ ,  $Ca^{2+}$  o  $Mn^{2+}$  ions), with alkaline pH (or very alkaline, which would show the presence of the sodium ion), low levels of soil moisture, some water deficit in the summer and almost always poor drainage, since the sodium ion destroys the soil aggregates and the components of the clay and silt fraction become compacted. This chemical richness is favorable for the entry of taxa from some families adapted to these halonitrophilous conditions: *Amaranthaceae* (including *Chenopodiaceae*), *Plumbaginaceae*, *Frankeniaceae*, *Asteraceae*, *Malvaceae*, *Solanaceae* and *Lamiaceae*. The hard climatic and soil conditions sometimes lead to the acquisition of physiological characteristics typical of pure halophytes, such as succulence in both stems (*Suaeda* sp. pl., *Salsola* sp. pl., *Hammada* sp. pl.) and leaves (*Atriplex* sp. pl., *Zygophyllum* sp. pl.), or mechanisms for eliminating salts in their vegetative organs, secreting them through epidermal glands or vesicular hairs, as occurs in species of the genera *Frankenia* L. or *Limonium* Mill. In addition, the ashes of many of these species, popularly known as "barrilleras plants" have a high content of  $Na^+$  and  $K^+$  ions, which is why they have been used in soap making (MOTA & al., 2009).

From a syntaxonomic point of view, the order *Pegano-Salsoletalia* is quite heterogeneous and presents entire alliances lacking class-characteristic taxa (MOTA & al., 2009). The phytosociological characterization of the numerous associations that make up the order at the Iberian Peninsula level is unclear, as they are not well floristically differentiated. This makes them difficult to distinguish from one another, and in some alliances, there are more associations than species that could characterize them, hindering their correct identification and appropriate conservation (MOTA & al., 2009). DE FOUCAULT (2015) expresses the same opinion: "A vrai dire, cette classe est très loin d'être homogène, des ordres et des alliances entiers étant dépourvus de taxons caractéristiques de classe" (sic). ("In truth, this class is very far from homogeneous, with orders and alliances lacking class-characteristic taxa").

We have also been able to observe that halophilic and halonitrophilic species of the genus *Limonium*, which has numerous Iberian endemic species that could facilitate the correct identification of some of these associations, being characteristic and differential taxa of them, have only been used by a few Spanish botanists: CIRUJANO (1981) used *Limonium dichotomum* (Cav.) Kuntze, to characterize his *Limonio dichotomi-Atriplicetum halimi* Cirujano 1981, while PERIS & al. (1991) use *Limonium sucronicum* Erben and *Limonium lobeticum* Erben respectively to characterize *Limonio sucronici-Peganelium harmalae* Peris, Stübing & Figuerola 1991 and *Limonio lobeticum-Salsoletum vermiculatae* Peris, Stübing & Figuerola 1991. The Italian authors (BRULLO & al., 2012), on the other hand, do use several endemic species of the genus *Limonium* in order to floristically characterize the various associations present in said territory of this order, the *Limonium opulentum* (Lojac.) Brullo for their *Limonio opulenti-Salsoletum oppositifoliae* Brullo & al. 1980; the *L. catanzaroi* Brullo, for the *Limonio catanzaroi-Salsoletum oppositifoliae* Brullo & al. 1985; the *L. calcarae* (Tod. ex Janka) Pignatti for the *Limonio calcarae-Suaedetum verae* Brullo & al. 2012, or *L. optimae* Raimondo for *Limonio optimae-Salsoletum oppositifoliae* Brullo & al. 2012. Iberian botanists should reflect on this matter, in order to adequately characterize the various associations described in the Iberian Peninsula.

2) Semi-arid-dry, heliophilous scrublands, made up of nitrophytes, which develop on soils of ornithogenic origin (island guano): *Medicago citrinae-Malvion arboreae* O. Bolòs, Folch & Vigo in O. Bolòs & Vigo 1984 *nom. mut. propos.*

Currently, the Iberian Mediterranean associations that develop on island guano are included in the alliance *Medicagini citrinae-Malvion arboreae* O. Bolòs, Folch & Vigo in O. Bolòs, Vigo, Cardona, Folch, Masalles & Terradas 1984 *nom. mut. propos.*, where the nitrophilous ornithocoprophilous shrubby fruticose communities present in Mediterranean micro-islands with a semiarid ombroclimate, but subject to the spray effect of the tides and marine winds, as well as to cryptoprecipitation, are gathered. It includes three associations described in Spain of islets adjacent to the Iberian Peninsula and Balearic Islands (BOLÒS & VIGO, 1984; BOLÒS, 1989; JUAN &

CRESPO, 1999, 2001), all from the Balearic-Catalan-Provençal vegetation province.

Island guano originates from the accumulation of seabird excrement deposited in nesting and resting areas, where it fosters and generates a profound modification of the pre-existing soils. This results in a type of ornithogenic, idiosyncratic soil rich in nitrogen salts (ammonium oxalate and uric acid), phosphorus, calcium, and potassium. However, human impact on coastlines, micro-islands, and migratory seabirds has led to these soil types becoming endangered or extinct, and they now only survive in isolated areas. The unique nature of these soils implies a distinctive floristic expression, manifested in a particular halonitrophilous vegetation that thrives on them.

In the Valencian Community, only the *Medicagini citrinae-Malvetum arboreae* O. Bolòs, Folch & Vigo in O. Bolòs & Vigo 1984 *nom. mut. propos.* association occurs in Columbretes Isles (Castellón), an archipelago of volcanic origin floristically characterized by the presence of the microendemism *Medicago citrina* (Font Quer) Greuter (GONZÁLEZ-ANDRÉS & al., 1999), the *Malva durieui* Spach (= *Lavatera mauritanica* Durieu), *Malva arborea* (L.) Webb & Berthel (= *Lavatera arborea* L.), *Patellifolia patellaris* (Moq.) A.J. Scott, Ford-Lloyd & J.T. Williams, *Sonchus tenerrimus* L. subsp. *dianae* (Lacaita ex Willk.) Ballester, Figuerola, Peris & Stübing, or *Reseda hookeri* Guss. The association acts as the first stage of replacement of *Chamaeropo humilis-Rhamnetum lycioidis* O. Bolòs 1957, with which it sometimes contacts, and the supporting materials of the guano are Plioquaternary Lithosols, mainly basalts, of volcanic origin (BOLÒS, 1989; JUAN & CRESPO, 1999).

RIVAS-MARTÍNEZ & al. (2011) include the *Medicagini citrinae-Malvion arboreae* alliance, along with the *Brassicion oleraceae* Rivas-Martínez, Fernández-González & Loidi 1999 alliance, in the order *Brassicion oleraceae-Lavaterietalia arboreae* Rivas-Martínez 2011. However, these are two quite disparate alliances, from a floristic, ecological and biogeographical point of view (MUCINA & al., 2016), and in addition, the *Brassicion oleraceae* alliance is primarily dominated by hemicryptophyte elements that distance them from the clearly chamaephytic formations of the *Medicagini citrinae-Malvion arboreae* alliance. Other authors, however, have chosen to include it in the order *Pegano-Salsoletalia* (DE FOUCAULT, 2015; MUCINA & al., 2016). We believe that its unique soil formation and distinctive flora, with its own endemic species present in the associations included within it, among them *Medicago citrina*, *Limonium minutum* (L.) Chaz., *Malva × columbretensis* (Juan & M.B. Crespo) Juan & M.B. Crespo, *Sonchus tenerrimus* subsp. *dianae*, *Reseda hookeri*, *Diploaxis ibicensis* (Pau) Gómez Campo, *Limonium pseudobusitanum* Erben, among others, deserve to create a new order that we propose, *Medicagini citrinae-Malvetalia arboreae ordo novus, hoc loco* (Typus *Medicagini citrinae-Lavaterion arboreae* O. Bolòs, Folch & Vigo in O. Bolòs, Vigo, Cardona, Folch, Masalles & Terradas in Arxius Ci. Inst. Catalans 73: 184. 1984).

From the micro-islands of the Aegean Sea (eastern Mediterranean, Greece), BERGMIEIER & DIMOPOULOS (2003) provisionally described a nitrophilous-fruticose community of *Lavatera arborea* and *Medicago arborea*, with its own endemic elements, which we believe could be geovicarian to the associations included in the *Medicago citrinae-Malvion arboreae* order, characteristic of the micro-islands of the western Mediterranean.

Therefore, the proposed new order represents the nitrophilous and aerohaline ornithocoprofilous chamaephytic and nanophanerophytic communities typical of infra-thermomediterranean marine islets and promontories. *Malva arborea* and *Medicago citrina* can be cited as characteristic and bioindicator species.

3) Nitrophytic nanophanerophyte scrublands developed on Anthrosols. (*Malvo subovatae-Anagyretum foetidae* Costa, Peris in Estesó, Pérez Badia & Soriano 1988 *nom. mut. propos.*).

The Anthrosols on which these nanophanerophyte scrublands develop are a type of soil that has originated, formed, or been significantly modified due to short or long term human activity (IBÁÑEZ, 2015). In the Valencian Community, there are several subtypes of Anthrosols: soils disturbed by burials in a bioarchaeological context (referred to by archaeologists as Necrosols); Urbic Anthrosols or Technosols (originating through the addition of waste or debris) (IBÁÑEZ & MARTÍNEZ, 2015) and, according to most soil scientists, the soils of rice fields, where a phytosociological class (*Oryzetea sativae* Miyawaki 1960) is developed that is unique and exclusive to this type of soil.

Anthrosols, specifically Necrosols, which include not only ancient burial sites but also old animal remains, are characterized by a higher total phosphorus content compared to undisturbed soils, confirming their zooanthropogenic origin. Phosphorus is slowly incorporated into the soil through the action of biotic agents (insects, plant roots, microscopic soil flora, etc.), which break down very small bone fragments that are slowly incorporated, giving rise to and contributing to new properties such as increased porosity and water retention capacity. In addition to a high concentration of phosphates, indicators of slow decomposition of bones and other tissues, they are also rich in organic matter and trace elements such as lead, iron, zinc, chromium, arsenic, copper, aluminum, and mercury (VÉLEZ & al., 2019).

In the surroundings of Iberian, Roman and medieval fortress ruins that include in their surroundings old cemetery soils (Necrosols) of some localities with maritime influence of the thermo and lower mesomediterranean zones of the Valencian Community, with semi-arid dry-subhumid ombroclimate, the association *Malvo subovatae-Anagyretum foetidae* Costa, Peris in Estesó, Pérez Badia & Soriano 1988 *nom. mut. propos.* Develops (Fig. 3), which acts as a paraseries in the climatic domain of *Rubio longifoliae-Quercus rotundifoliae sigmetum*. It is dominated by the stinking lupin (*Anagyris foetida* L.) (Fig. 4a), a Mediterranean and Irano-Turanian taxon that forms dense deciduous nanophanerophytic groves, between 1 and 4 meters high,

with a tendency to be monospecific as a result of the production of allelopathic substances that inhibit the germination and growth of other taxa that could act as competitors. It is considered a relict species of the subtropical Mediterranean flora of the Tertiary period (ORTEGA & CATALÁN, 2009) that has survived in these enclaves of fortress ruins to this day and is pollinated by ornithophily through some species of passerine birds (ORTEGA & al., 2005), it has axillary or cauliflorous racemose inflorescences, it has hardly any capacity for autonomous self-pollination, it is deciduous in the summer and late winter or early spring flowering (VALTUEÑA & al., 2008).

Although RIVAS-MARTÍNEZ & al. (2001) include this association in the *Salsolo-Peganion harmalae* alliance, the very different genesis of the soils where it thrives, its ombroclimatic requirements (it sometimes develops in subhumid ombroclimates), its edaphic characteristics, its dominant biotype (phanerophytes), and its flora, make this inclusion, in our opinion, inappropriate. We believe it is more appropriate to include it in a new order, *Malvo subovatae-Anagyretalia foetidae ordo novo hoc loco*, where the circummediterranean nitrophilous and heliophilous phanerophytic vegetation, currently dominated by relict tropicaloid elements from the Tertiary, can be grouped, for the time being, with a single alliance that we also propose as *Malvo subovatae-Anagyryon foetidae all. nova hoc loco*, which would group the formations of anthropozoogenic nanophanerophytes and chamaephytes in which the stinking lupin (*Anagyris foetida*) is present, with a semiarid, dry, or subhumid ombroclimate, in the lower thermo and mesomediterranean zone, is currently only recognized in the Valencian-Tarraconensian and Setabensean Sectors of the Balearic-Catalan-Provençal vegetation province. Characteristic and bioindicator species include *Anagyris foetida*, *Malva subovata* and *Ballota hirsuta* Benth. With a single association, *typus (holotypus hoc loco): Malvo subovatae-Anagyretum foetidae* Costa, Peris in Esteso, Pérez Badia & Soriano 1988 *nom. mut. propos.* (Fig. 3) [*Lavatero maritimae-Anagyretum foetidae* Costa, Peris in Esteso, Pérez Badia & Soriano 1988 in Acta Bot. Barc. 37: 162, tb. 4. 1988].

Both order and alliance are part of the new class *Nicotiano glaucae-Ricinetea communis classis nova hoc loco* that we propose and discuss later.

4) Fruticose scrublands of nano and phanerophyte nitrophytes developed on Calcisols, Luvisols and rarely Fluvisols (in contact with the former), nitrified, with occasional contributions of Urbic Anthrosols or Technosols (scrap heaps). *Nicotiano glaucae-Whithanietum somniferae ass. nova hoc loco*.

Calcisols are a group of reference mineral soils (WRB), conditioned by a semiarid climate. They are characterized by a substantial accumulation of calcium carbonate (secondary carbonates) and their parent material consists of alluvial, colluvial, or aeolian deposits of base-rich materials. They develop on flat or hilly terrain and require good drainage to prevent salinization when used for agricultural purposes (IBÁÑEZ & MARTÍNEZ, 2013). Luvisols, or clay soils, are characterized by marked textural differentiation. In our

region, they develop on limestone, acquire a high cation exchange capacity, making them very fertile and suitable for agriculture, and develop in areas with gentle slopes or plains, in places where dry and wet seasons alternate. Occasionally, as in the Camp de Morvedre region, especially in the Sagunto city, these soils are found at the base of the Castle mountain and its surroundings, in abandoned fields where these Calcisols and Luvisols were once cultivated using irrigated agriculture. Today, many of these fields have become abandoned due to a lack of economic viability and, in some cases, even receive industrial and construction waste, resulting in soils recognized by the WRB as Urbic Anthrosols or Technosols. From this soil network, we describe a new association for the Valencian territory: *Nicotiano glaucae-Whithanietum somniferae ass. nova hoc loco* (Table 1, relevés 1-23, *holosyntypus* rel. n. 1). (Fig. 1).

It is a heliophilic, nitrophilic and thermophilic association, dominated by xerophytic nanophanerophytes and mesophanerophytes that develop in altered biotopes, frequently removed and nitrified, on dry calcareous soils, in anthropized environments. It is characterized by the dominant and guiding presence of the winter cherry (*Withania somnifera* (L.) Dunal subsp. *somnifera*), (Fig. 4b) accompanied by invasive tropical neophytes, frequently by tobacco tree (*Nicotiana glauca* R.C. Graham), and less frequently by castor bean (*Ricinus communis* L.) and other taxa such as lantana (*Lantana ×strigocamara*), (Fig. 4c) the sweet acacia (*Vachellia farnesiana*), the prickly pear (*Opuntia ficus-indica* (L.) Miller) or *Austrocyllindropuntia subulata* (Muehlenpf.) Backeb., and various formations of the *Bromo-Oloption* O. Bolòs 1970 corr. P.P. Ferrer, J.R. Vázquez. R. Roselló & J.B. Peris 2024 alliance acting as replacement stages. We have detected and inventoried it in the vicinity of (sub)-coastal populations of some localities in the provinces of Castellón and Valencia (see Table 1), although where it is best represented and reaches a very extensive area is in the municipal territory of Sagunto.

The “winter cherry” (*W. somnifera*) is a nanophanerophyte belonging to the Solanaceae family, widely used in traditional Ayurvedic medicine, where it is known as *ashwagandha* (DATTA & al., 2011). It has a Mediterranean and paleosubtropical distribution, extending across southern Europe, North and East Africa, Macaronesia, and Southwest Asia as far as India (GALLEGO, 2012), although in some Mediterranean countries such as Italy it is considered a naturalized archaeophyte (CELESTI & al., 2009). In the Valencian Community, the plant was already observed by Cavanilles at the base of the Sagunto mountains (CAVANILLES, 1793), where it still persists and has its best populations; however, after consulting the online publications of the citations and distribution maps in the Biodiversity Data Bank of the Valencian Community (BDBC, 2025) and ANTHOS (2025), we can confirm that its presence is currently disjunct, with small population nuclei scattered throughout the Valencian territory, from north to south.

From a phytographic point of view (RIVAS MARTÍNEZ, 2007), the association we propose forms part of the Balearic-Catalan-Provençal vegetation province

(Valencian-Tarraconensian and Setabensean Sectors), within the thermomediterranean and lower mesomediterranean thermotype, with a semiarid (Camp de Túria-València) or dry ombroclimate. This community acts as a degradation stage of kermes oak-mastic oak woodlands (*Quercus cocciferae-Pistascietum lentisci* Br.-Bl., Font Quer, G. Braun-Blanquet, Frey, Jansen, & Moor 1935 *nom. mut. propos.* Rivas-Martínez & al. 2002) or of coastal thermal holm oak woodlands (*Rubio longifoliae-Quercus rotundifoliae sigmetum*) on nitrified soils.

For this type of nitrophilous (nano)-phanerophytic fruticose formations, RIVAS-MARTÍNEZ & al. (1999) proposed the order *Nicotiano glaucae-Ricinetalia communis* Rivas-Martínez, Fernández-González & Loidi 1999, circummediterranean and arid-subhumid Macaronesian, dominated by neophytes, nitrophytic xenophytes of tropical origin (both paleotropical and neotropical), although they only mentioned *Nicotiana glauca*, *Ricinus communis* and *Tropaeolum majus* L. as their own floristic characteristics. The tobacco tree is of Neotropical origin, naturalized in the Mediterranean region, and extends from the thermomediterranean zone to the upper mesomediterranean zone, while the castor bean is of Paleotropical origin, also naturalized in the Mediterranean region, although at present in our territory it behaves exclusively in thermomediterranean conditions and requires deep soils that maintain a certain level of soil moisture. BRULLO & al. (2012) expand the floristic characteristics of this order by including *Boheravia repens* L. and *Solanum linneanum* Hepper & Jaeger, while DE FOUCAULT (2015) proposes also incorporating into this order the Saharo-Sindian phanerophyte *Calotropis procera* (Aiton) W.T. Aiton, which has successfully established itself in this type of nitrophilous fruticose formations in the North African Mediterranean region. We propose that the following taxa also be included in this order: *Lantana ×strigocamara*, *Tipuana tipu*, *Vachellia caven*, *Vachellia farnesiana*, *Araujia sericifera* Brot. and *Solanum bonariense* L. (Fig. 4d).

Within this framework, the same authors (RIVAS-MARTÍNEZ & al., 1999) described a new alliance, *Nicotiano glaucae-Ricinion communis* Rivas-Martínez, Fernández-González & Loidi 1999, with two associations previously described for Spain (RIVAS-MARTÍNEZ & al., 2011a). To these, we must add the association we propose and the following one as new. However, based on current knowledge, their unique non-native flora, chorology, bioclimatology, distinct soil genesis, dynamism, and the history of these communities, make them very different from the other associations of the *Pegano-Salsoletea* class. If we add to all this the abandonment of land for agricultural purposes and the tropicalization of flora and vegetation occurring in the Mediterranean region, especially in the thermomediterranean zone, we can expect that new nitrophilous tropical neophytes will be incorporated into this territory in the coming decades. Therefore, if this phenomenon continues, a new vegetation and landscape will be shaped by the incorporation of these non-native taxa. As an example, from 1970 to 2020, 600 new non-native species, many of them tropical, were cataloged in the Valencian Community and neighboring territories (Catalonia and

the Balearic Islands), making the Mediterranean basin one of the main hotspots for invasion (GÓMEZ BELLVER, 2023). For all these reasons, we propose to create the new class *Nicotiano glaucae-Ricinetalia communis classis nova hoc loco*, which includes the anthropogenic phanerophytic nitrophilous communities formed by pantropical, paleotropical and neotropical neophytes and tropicaloid archaeophytes that develop in the arid-subhumid infra-thermo-mesomediterranean zones in circummediterranean and Canary Islands territories, taking as the *typus* order *Nicotiano glaucae-Ricinetalia communis* Rivas-Martínez, Fernández-González & Loidi 1999 [Itinera Geobot. 13: 380], with an alliance in the Iberian Peninsula: *Nicotiano glaucae-Ricinion communis* Rivas-Martínez, Fernández-González & Loidi 1999.

As characteristic species of the new class we propose the same ones that we have indicated for the order, also adding *Acacia saligna* (Labill.) H.L. Wendl., *Cercis siliquastrum* L. and *Parkinsonia aculeata* L.

5) Scrublands of tropical nitrophytic phanerophytes on deep and humid soils: *Ricino communis-Leucaenetum glabratae ass. nova hoc loco*. (Fig. 2).

In most of the Valencian Quaternary coastal territory, Fluvisols dominate (PERIS & al., 1994), soils very suitable for intensive and early agriculture. Historically, these fields were used for rotational agricultural techniques that allowed for several harvests per year. However, due to a lack of economic profitability, many of these fields are currently abandoned, allowing not only the introduction of neophytic nitrophilous arable and ruderal flora (see VÁZQUEZ & al., 2022, 2023a, 2023b; ROSELLÓ & al., 2018, 2024), but also of allochthonous nitrophilous phanerophytic flora from the Pantropical, Neotropical, and Paleotropical realms (*Leucaena leucocephala* subsp. *glabrata* (Figs. 4f, 4g), *Parkinsonia aculeata*, *Lantana ×strigocamara* (Fig. 4c), *Tipuana tipu*, *Ricinus communis*, *Nicotiana glauca*, *Vachellia farnesiana*, etc.), sometimes accompanied by climbing-lianoid plants of tropical origin (*Ipomoea cairica* (L.) Sweet. (Fig. 4e), *I. indica* (Burm.) Merr., *I. purpurea* (L.) Roth., *I. sagittata* Poir., or *Araujia sericifera* Brot.). In this environment, we have detected the new association *Ricino communis-Leucaenetum glabratae ass. nova hoc loco* (Table 2, relevés 1-23, *holosyntypus* rel. n. 15) (Fig. 2). It occurs along roadsides and highways, but also in vacant lots and abandoned fields in this territory, and is currently expanding. The dominant taxon in this new association is giant leucaena, (*Leucaena leucocephala* subsp. *glabrata*), a neotropical flowering plant native to southern North America and Central America (from Mexico to Honduras) (POWO, 2025) (Figs. 4f, 4g). It has recently been introduced to warm Mediterranean climates, where it behaves as an aggressive neophyte and is, in fact, included in the IUCN list of the 100 most harmful invasive species in the world (LOWE & al., 2004). Furthermore, the “Spanish Catalogue of Invasive Alien Species” prohibits its introduction into the natural environment, its transport, possession, and trade in the Canary Islands (Royal Decree 630/2013). This keystone plant is often accompanied by castor bean (*Ricinus communis*) and, to a lesser extent, by other invasive nitrophilous taxa such as *Lantana ×strigocamara* (Fig.

4c), *Araujia sericifera*, *Parkinsonia aculeata*, *Washingtonia filifera* (Lindl.) H. Wendl., etc. (see Table 2). In the thermomediterranean coastal zone of southern Valencia and northern Alicante, it is further enriched by the presence of the neotropical neophyte *Solanum bonariense* L (Fig. 4d).

We also propose the subassociation *phragmitetosum altissimae subass. nova hoc loco*, a contact association of *Ricino communis-Leucaenetum glabratae* with the helophytic association dominated by giant reed (*Typha domingensis-Phragmitetum altissimae* Costa, Boira, Peris & Stübing 1986 *nom. mut.* Gómez 2011) (Table 2, relevés 19-23, holosyntypus rel. n. 19), typical of marshy environments (COSTA & al., 1986). We propose the following as characteristic and differentiating species of the subassociation: *Phragmites australis* (Cav.) Trin. ex Steud. subsp. *altissimus* (Benth.) W.D. Clayton, *Typha domingensis* Pers., *Phragmites australis* (Cav.) Trin. ex Steud. subsp. *australis*, *Ipomoea sagittata* Poir. and *Cynanchum acutum* L.

From a biogeographical perspective (RIVAS-MARTÍNEZ, 2007), the proposed association is part of the Balearic-Catalan-Provençal vegetation province, specifically the Valencian-Tarraconensian and Setabensean Sectors, within the thermomediterranean thermotype with a dry-subhumid ombroclimate. This association acts as a successional stage for the elm grove (*Hedero heliis-Ulmo minoris sigmetum*). We include this new association, along with the previous one, in the new class *Nicotiano glaucae-Ricinetea communis* and the order *Nicotiano glaucae-Ricinetalia communis*.

6) Within the *Pegano-Salsoletea* class, the order *Helichryso stoechadis-Santolinetalia squarrosae* has also been included, proposed by PEINADO & MARTÍNEZ (1984), in which the nitrophilous and subnitrophilous shrubs (chamaephytes) of western Mediterranean distribution are grouped, which are located on the edges of paths and roads, acting as a border of the Mediterranean shrubs of the classes *Salvietea rosmarini* Rivas-Martínez, T.E. Díaz, F. Prieto, Loidi & Penas 2002 *nom. mut. propos.* and *Cisto-Lavanduletea stoechadis* Br.-Bl. in Br.-Bl., Molinier & Wagner 1940, and which extend secondarily due to excessive grazing (PEINADO & MARTÍNEZ, 1984). The aforementioned order, in turn, groups two alliances: *Artemisio glutinosae-Santolinion rosmarinifoliae* Costa 1975 (on siliceous soils) and *Santolinion pectinato-canescens* Peinado & Martínez Parras 1984 (on calcareous, gypsiferous, dolomitic or marly substrates), with subnitrophilous and nitrophilous associations that develop on the edges of roads and highways, margins of abandoned dryland farming fields or in overgrazed scrubland (especially on paths and cattle trails) of much of the Iberian territory, as a result of the transhumance of livestock that is established in the spring-summer periods in the various mountainous Mediterranean areas, being during the end of the Middle Ages, with the creation of the Mesta (MANZANO & CASAS, 2020), when agricultural routes and royal drove roads were opened that favored the extension and expansion of this type of fruit-bearing communities in Spain. Its distribution is western Mediterranean, centered on the Iberian Peninsula (VALLE & al., 1987; PEINADO &

al., 1988; ALCARAZ & al., 1988) with radiations towards the south of the Italian peninsula and its islands, from where the geovicariant alliance *Artemisio variabilis* Biondi, Ballelli, Allegrezza, Taffetani & Francalancia 1994 has been described, with a single association described at the moment, *Artemisio variabilis-Helichrysetum italici* Brullo & Spampinato 1990 (BIONDI & al., 2014). On the other hand, and in the absence of studies that confirm it, we suspect that it may also extend through the Rif, Atlas and subsidiary mountain ranges, where transhumance routes also exist, although they are not as well organized as the Iberian ones (MAHDI & DOMÍNGUEZ, 2009), and share characteristic taxa of the order with those of the western Mediterranean part of Europe, as is the case of *Santolina rosmarinifolia* L. or *Santolina chamaecyparissus* L., but at the same time there are vicariant species that are unique and endemic to that territory such as *Santolina africana* Jord. & Fourr. or *Santolina razanae* Bakali, Chambouleyron & Léger (APD, 2025; BAKALI & al., 2025), which could act as guidelines for new North African communities.

Several circumstances lead us to believe that the inclusion of this type of community in the *Pegano-Salsoletea* class is somewhat forced, since, in our view, it presents a different ecology, edaphics, bioclimatology, dynamism, history, and floristics, far removed from the parameters that define the *Pegano-Salsoletea* class. PITARCH (2002) already questioned the inclusion of the order *Helichryso stoechadis-Santolinetalia* in the *Pegano-Salsoletea* class due to its different edaphic genesis, based on the type of soils on which the associations present in the territory he studied develop. These associations are found on calcareous materials on eroded Mediterranean brown and red soils, but subject to less anthropogenic pressure than those of the *Pegano-Salsoletea*, since they suffer almost exclusively seasonal zoogenic pressure. It also highlights the order's distinct chorology, with a western Mediterranean optimum, compared to the *Pegano-Salsoletea* class., which is Irano-Turanian, Saharo-Sindian and circummediterranean. It emphasizes the origin, history, and dynamic role of these subnitrophilous mediterranean formations, largely arose from nomadic grazing, in contrast to the typical halonitrophilous fruticose formations of the class. Furthermore, from an edaphic perspective, these subnitrophilous or nitrophilous scrublands develop on both base-rich and base-poor soils, while the scrublands of the rest of the *Pegano-Salsoletea* class are typically halonitrophilous and always occupy soils with a basic pH. Even the order's typical alliance, *Artemisio glutinosae-Santolinion rosmarinifoliae*, includes associations that develop exclusively on base-poor, acidic soils.

Another important discrepancy is that the *Helichryso-Santolinetalia* order reaches its optimum in the supramediterranean zone (although it can also reach the oromediterranean and mesomediterranean zones), generally with a dry or subhumid ombroclimate and, from an ecological point of view, they frequently develop among the serial scrublands of the classes *Cisto-Lavanduletea stoechadis* or *Salvietea rosmarini*, acting as replacement stages of mediterranean forests of the class

*Quercetea ilicis* Br.-Bl. ex A. & O. Bolòs, 1950 and even of the *Querceto-Fagetetea sylvaticae* Br.-Bl. & Vlioger in Vlioger 1937 more xeric (*Quercetalia pubescentis-petraeae* Klika 1933 order). If we consider their physiognomic appearance and biological type, the communities that are part of the order *Helichryso-Santolinetalia* are generally made up of subshrub species, (with hardly any species characteristic of the class *Pegano-Salsoletea*), rich in asteraceae of the genera *Helichrysum* Mill., *Santolina* L. or *Artemisia* L., many of them endemic, compared to the halo-nitrophilous fruticose formations typical of the class *Pegano-Salsoletea*.

For all these reasons, we propose the new class *Helichryso stoechadis-Santolinetea ericoidis classis nova hoc loco* for this type of plant communities, typifying as the order *typus (typus ordinis)*, *Helichryso stoechadis-Santolinetalia squarrosae* Peinado & Martínez Parras 1984 (*Helichryso stoechadis-Santolinetalia ericoidis* Peinado & Martínez Parras 1984 *nom. mut. propos.*) [Anales Jard. Bot. Madrid 40(2): 438] and as a type alliance the *Artemisio glutinosae-Santolinion rosmarinifoliae* Costa 1975 [Anales Inst. Bot. Cavanilles 32(2): 1093].

The new class represents nitrophilous and subnitrophilous communities, rich in chamaephytic asters of the genera *Santolina*, *Helichrysum*, *Artemisia*, etc., which colonize abandoned fields, slopes, roadsides, livestock resting areas, and generally heavily grazed soils, etc., on any type of substrate, with a Mediterranean (central)-western thermo-oromediterranean distribution (with an optimum in the supramediterranean zone) in dry-humid conditions. The characteristic species are the same as those listed in the order *typus*.

– *Artemisio glutinosae-Gypsophiletum hispanicae* Roselló 1994, found on soils derived from gypsiferous marls in the Alto Mijares region (ROSELLÓ, 1994).

– *Artemisio glutinosae-Hyssopetum canescentis* Roselló 1994 *nom. mut. propos.*, found in the Maestracensean and Valencian-Tarraconensian Sectors of the Valencian Community (ROSELLÓ, 1994).

– *Plantagini sempervirentis-Santolinetum ericoidis* G. López 1976 *nom. mut. propos.*, with a distribution in the Maestracensean, Setabensean and Valencian-Tarraconensian Sectors of the Valencian Community (ROSELLÓ, 1994; VÁZQUEZ, 2021).

– *Paronychio capitatae-Artemisetum assoanae* Rivas Goday & Borja 1961 corr. Rivas-Martínez 2011, a supra and oromediterranean association present in the Valencian Community in the Rincón de Ademuz region (MATEO & FIGUEROLA, 1987). Although RIVAS-MARTÍNEZ & al. (2011) include this association in the class *Festuco hystricis-Ononidetea striatae* Rivas-Martínez, T.E. Díaz, F. Prieto, Loidi & Penas 2002, its ecological niche always grazed, its nitrophilous character, due to zoogenic pressure, and its floristic composition lead us to its inclusion in the order *Helichryso-Santolinetalia*, as already demonstrated by MATEO & FIGUEROLA (1987).

### Proposed nomenclatural changes

The proposed nomenclatural adjustments and the article of the International Code of Phytosociological

Nomenclature that serves as the basis for the change are noted and commented on below (THEURILLAT & al., 2020):

Molecular studies carried out in the subfamily *Malvoideae* (RAY, 1995; TATE & al., 2005) have shown that some species traditionally assigned to the genus *Lavatera* L., such as *Lavatera arborea* L. or *Lavatera maritima* Gouan, should be included within the genus *Malva* L., and in this case, they have been renamed *Malva arborea* (L.) Webb & Berthel. and *Malva subovata* (DC.) Molero & J.M. Monts., respectively (JUAN & CRESPO, 2011).

– Ord. ***Brassico oleraceae-Malvetalia arboreae* Rivas-Martínez & al. 2011 *nom. mut. propos.* (art. 45)**

Original name of the syntaxon: *Brassico oleraceae-Lavateretalia arboreae* Rivas-Martínez & al. 2011

– Al. ***Medicagini citrinae-Malvion arboreae* O. Bolòs, Folch & Vigo in O. Bolòs, Vigo, Cardona, Folch, Masalles & Terradas 1984 *nom. mut. propos.* (art. 45).** Original name of the syntaxon: *Medicagini citrinae-Lavaterion arboreae* O. Bolòs, Folch & Vigo in O. Bolòs, Vigo, Cardona, Folch, Masalles & Terradas 1984.

– As. ***Medicagini citrinae-Malvetum arboreae* O. Bolòs, Folch & Vigo in O. Bolòs & Vigo 1984 *nom. mut. propos.* (art. 45)**

Original name of the syntaxon: *Medicagini citrinae-Lavateretum arboreae* O. Bolòs, Folch et Vigo in O. Bolòs & Vigo 1984

– As. ***Malvo subovatae-Anagyretum foetidae* Costa, Peris in Esteso, Pérez Badia & Soriano 1988 *nom. mut. propos.* (art. 45) (Fig. 3).**

Original name of the syntaxon: *Lavatero maritima-Anagyretum foetidae* Costa, Peris in Esteso, Pérez Badia & Soriano 1988

On the other hand, the name *Santolina chamaecyparissus* L. subsp. *squarrosa* (DC.) Nyman has been used to designate a specimen that is mainly distributed in the central and eastern parts of the Iberian Peninsula; however, recent studies on the *Santolina chamaecyparissus* L. complex, have motivated the need to treat this taxon with species rank, and it is now called *S. ericoides* Poir. (CARBAJAL & al., 2019; GIACÒ & al., 2021; FERRER GALLEGÓ, 2021).

– Ord. ***Helichryso stoechadis-Santolinetalia ericoidis* Peinado & Martínez Parras 1984 *nom. mut. propos.* (art. 45)**

Original syntaxon name: *Helichryso stoechadis-Santolinetalia squarrosae* Peinado & Martínez Parras 1984

– As. ***Plantagini sempervirentis-Santolinetum ericoidis* G. López 1976 *nom. mut. propos.* (art. 45)**

Original syntaxon name: *Plantagini sempervirentis-Santolinetum squarrosae* G. López 1976

In the case of *Hyssopus officinalis* L., there are 5 accepted subspecies, and the correct name for the subspecies that inhabits the Valencian Community is *Hyssopus officinalis* L. subsp. *canescens* (DC.) Nyman (WFO, 2025; MATEO & CRESPO, 2014).

– As. ***Artemisio glutinosae-Hyssopetum canescentis* Roselló 1994 *nom. mut. propos.* (art. 45).**

Original name of the syntaxon: *Artemisio glutinosae-Hyssopetum cinerei* Roselló 1994

Finally, the data provided by molecular phylogenetic studies carried out on the genus *Salvia* L. (*Lamiaceae*) have led to other genera, such as *Rosmarinus* L., being incorporated into the genus *Salvia*. Therefore, the species *Rosmarinus officinalis* L. has been renamed *S. rosmarinus* (L.) Schleid. (DREW & al., 2017), and the various syntaxa that incorporate this name must be corrected:

– Cl. ***Salvietea rosmarini* Rivas-Martínez, T.E. Díaz, F. Prieto, Loidi & Penas 2002 nom. mut. propos.** (art. 45)  
= *Rosmarinetea officinalis* Rivas-Martínez, T.E. Díaz, F. Prieto, Loidi & Penas 2002

– Ord. ***Salvietalia rosmarini* Br.-Bl. ex Molinier 1934 nom. mut. propos.** (art. 45)

= *Rosmarinetalia officinalis* Br.-Bl. ex Molinier 1934

– Al. ***Salvio rosmarini-Ericion multiflorae* Br.-Bl. in Br.-Bl., Font Quer, G. Braun-Blanquet, Frey, Jansen & Moor 1935 nom. mut. propos.** (art. 45)

Original name: *Rosmarino officinalis-Ericion multiflorae* Br.-Bl. in Br.-Bl., Font Quer, G. Braun-Blanquet, Frey, Jansen & Moor 1935 *nom. conserv.*

– Subal. ***Salvio rosmarini-Ericenion multiflorae* Stübing, Peris & Costa 1989 nom. mut. propos.** (art. 45)

= *Rosmarino officinalis-Ericenion multiflorae* Stübing, Peris & Costa 1989

– As. ***Salvio rosmarini-Lithospermetum fruticosi* Br.-Bl. ex Molinier 1934 nom. mut. propos.** (art. 45)

Original name of the syntaxon: *Rosmarino officinalis-Lithospermetum fruticosi* Br.-Bl. ex Molinier 1934

– As. ***Salvio rosmarini-Linetum suffruticosi* Br.-Bl. & O. Bolòs 1958 nom. mut. propos.** (art. 45)

Original name of the syntaxon: *Rosmarino officinalis-Linetum suffruticosi* Br.-Bl. & O. Bolòs 1958

– As. ***Centaureo spachii-Salvietum rosmarini* Alcaraz & Delgado 1988 nom. mut. propos.** (art. 45)

Original name of the syntaxon: *Centaureo spachii-Rosmarinetum officinalis* Alcaraz & Delgado 1988 *corr.* M.B. Crespo 2001

– As. ***Salvio rosmarini-Cistetum ladaniferi* Rivas-Martínez 1968 nom. mut. propos.** (art. 45)

Original name of the syntaxon: *Rosmarino-Cistetum ladaniferi* Rivas-Martínez 1968

– As. ***Cisto clusii-Salvietum rosmarini* Rivas-Martínez & Izco in Izco 1969 nom. mut. propos.** (art. 45)

Original name of the syntaxon: *Cisto clusii-Rosmarinetum officinalis* Rivas-Martínez & Izco in Izco 1969

#### Syntaxonomic scheme for the associations present in the Valencian Community

Cl. ***Pegano harmalae-Salsoletea vermiculatae* Br.-Bl. & Bolòs 1958**

Ord. *Salsolo-Peganetalia* Br.-Bl. & O. Bolòs 1954

Al. *Salsolo vermiculatae-Peganion harmalae* Br.-Bl. & O. Bolòs 1954

As. *Limonio lobetanicus-Salsoletum vermiculatae* Peris, Stübing & Figuerola 1991

As. *Limonio sucronici-Peganetum harmalae* Peris, Stübing & Figuerola 1991

Al. *Salsolo oppositifoliae-Suaedion mollis* Rigual 1972 *nom. mut.* Rivas-Martínez, Penas, Díaz & Fernández-González 2011

As. *Atriplicetum glauco-halimi* Rivas-Martínez & Alcaraz in Alcaraz 1984

As. *Atriplici glaucae-Suaedetum mollis* Rigual 1972 *nom. mut.* Rivas Martínez & al. 2011

As. *Salsolo oppositifoliae-Atriplicetum halimi* Costa, Peris & Stübing ex Cantó, Loarga & Belmonte 1986 *corr.* Pérez-Badia 1997

As. *Thymelaeo hirsutae-Salsoletum oppositifoliae* Rivas Goday & Bellot in Rivas Goday & Rivas-Martínez 1959 *nom. inv.*

As. *Whitanio futescentis-Lycietum intricati* Alcaraz, P. Sánchez, De la Torre, Ríos & J. Álvarez 1991.

Subas. *atriplicetosum glaucae* Juan & M.B. Crespo 2001

Subas. *lobularietosum columbretensis* Juan & M.B. Crespo 2001

Al. *Hammado articulatae-Atriplicion glaucae* Rivas Goday & Rivas Martínez ex Rigual 1972 *corr.* Alcaraz, P. Gómez, De la Torre, Ríos & J. Álvarez 1991

As. *Atriplici glaucae-Salsoletum genistoidis* O. Bolòs 1957

As. *Plantagini albicantis-Capparietum canescentis* O. Bolòs 1967

As. *Zygophyllo fabaginis-Atriplicetum glaucae* Rivas Goday, Esteve & Rigual in Rigual 1972

As. *Hammado articulatae-Atriplicetum glaucae* Rigual 1972 *corr.* Alcaraz, P. Gómez, De la Torre, Ríos & J. Álvarez 1991

Ord. ***Medicagini citrinae-Malvetalia arboreae* Vázquez, Peris, Roselló, Ferrer Gallego, Sanchis & Stübing ord. novo hoc loco**

Al. *Medicagini citrinae-Malvion arboreae* O. Bolòs, Folch & Vigo in O. Bolòs, Vigo, Cardona, Folch, Masalles & Terradas 1984 *nom. mut. propos.* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing

As. *Medicagini citrinae-Malvetum arboreae* O. Bolòs, Folch & Vigo in O. Bolòs & Vigo 1984 *nom. mut. propos.* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing

Cl. ***Nicotiano glaucae-Ricinetea communis* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing cl. nova hoc loco**

Ord. ***Malvo subovatae-Anagyretalia foetidae* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing ord. novo hoc loco**

Al. ***Malvo subovatae-Anagyron foetidae* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing all. nova hoc loco**

As. *Malvo subovatae-Anagyretum foetidae* Costa, Peris in Estesó, Pérez Badia & Soriano 1988 *nom. mut. propos.* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing (Fig. 3).

Ord. *Nicotiano glaucae-Ricinetalia communis* Rivas-Martínez, Fernández-González & Loidi 1999

Al. *Nicotiano glaucae-Ricinon communis* Rivas-Martínez, Fernández-González & Loidi 1999

As. ***Nicotiano glaucae-Withanietum somniferae* Vázquez, Peris, Roselló, Ferrer Gallego, Sanchis & Stübing ass. nova hoc loco** (Fig. 1)

As. ***Ricino communis-Leucaenetum glabratae* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing ass. nova hoc loco** (Fig. 2).

Subas. *leucaenetosum glabratae typicum*

Subas. *phragmitetosum altissimae* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing *subass. nova hoc loco*

Cl. *Helichryso stoechadis-Santolinetea ericoidis* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing *cl. nova hoc loco*

Ord. *Helichryso stoechadis-Santolinetalia ericoidis* Peinado & Martínez Parras 1984 *nom. mut. propos.* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing

Al. *Santolinion pectinato-canescens* Peinado & Martínez Parras 1984

As. *Artemisio glutinosae-Gypsophiletum hispanicae* Roselló 1994

As. *Artemisio glutinosae-Hyssopetum canescens* Roselló 1994 *nom. mut. propos.* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing

As. *Plantagini sempervirentis-Santolinetum ericoidis* G. López 1976 *nom. mut. propos.* Peris, Vázquez, Roselló, Ferrer Gallego, Sanchis & Stübing

As. *Paronychio capitatae-Artemisetum assoanae* Rivas Goday & Borja 1961 *corr.* Rivas-Martínez 2011

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**Table 1.** Association *Nicotiano glaucae-Withanietum somniferae* Vázquez & al. *ass. nova hoc loco* (*Nicotiano-Ricinion, Nicotiano-Ricinetalia, Nicotiano-Ricinetea*).

Number of the relevé	1	2	3	4	5	6	7	8	9	10	11	12
<b>Location UTM 1 × 1 km (30S)</b>	YJ 3394	YJ 3394	YJ 3395	YJ 3393	YJ 3498	YJ 3495	YJ 3394	YJ 2784	YK 3603	YJ 3496	YJ 3496	YJ 3496
<b>Coverage (%)</b>	80	80	80	80	90	90	80	90	90	100	90	90
<b>Surface (m<sup>2</sup>)</b>	100	100	50	60	100	100	100	60	30	30	30	40
<b>Date (day/month/year)</b>	29/0 3/24	29/0 3/24	22/0 5/24	08/0 4/24	25/0 4/24	28/0 4/24	04/0 5/24	11/0 5/24	16/0 5/24	21/0 5/24	21/0 5/24	21/0 5/24
<b>Altitude (m a.s.l.)</b>	40	38	42	20	34	39	31	30	24	42	41	41
<b>Characteristic taxa of the association and of the higher units</b>												
<i>Withania somnifera</i>	3	3	2	4	3	2	3	3	1	3	4	3
<i>Nicotiana glauca</i>	+	1	2	.	.	+	+	2	.	1	+	2
<i>Ricinus communis</i>	+	.	.	+	.	.	.	.	1	2	.	.
<i>Lantana ×strigocamara</i>	1	.	.	.	.	+	.	.	.	.	.	.
<i>Ecbalium elaterium</i>	.	.	.	.	.	.	.	.	.	+	.	+
<b>Companions</b>												
<i>Oloptum miliaceum</i>	2	.	.	.	1	3	3	3	3	1	1	1
<i>Phagnalon saxatile</i>	+	3	.	.	+	1	2	+	.	1	2	1
<i>Foeniculum piperitum</i>	+	.	1	.	.	+	1	1	1	1	1	+
<i>Dittrichia viscosa</i>	.	.	.	1	+	.	.	1	.	1	+	.
<i>Oxalis pes-caprae</i>	1	1	.	+	1	1	+	.	+	.	.	.
<i>Euphorbia terracina</i>	.	.	.	.	.	.	.	1	.	.	.	.
<i>Citrus reticulata</i> (cult.)	+	1	.	.	.	.	+	.	.	.	.	.
<i>Echium granatense</i>	2	.	+	.	.	.	.	+	.	.	.	.
<i>Sonchus tenerrimus</i>	.	.	.	.	.	.	.	.	.	.	+	.
<i>Asparagus acutifolius</i>	1	.	+	.	.	1	+	.	.	.	+	.
<i>Hirschfeldia incana</i>	.	.	.	.	1	.	.	.	.	1	.	+
<i>Olea europaea</i> (cult.)	.	.	.	+	.	+	.	.	.	.	.	.
<i>Bituminaria bituminosa</i>	.	.	.	.	+	.	+	.	.	.	.	.
<i>Asphodelus fistulosus</i>	.	.	.	.	1	.	.	.	.	+	.	.
<i>Salsola tragus</i>	.	.	.	.	.	1	.	.	.	.	.	.
<i>Beta vulgaris</i>	.	.	.	.	.	.	.	2	.	.	.	.
<i>Hyparrhenia hirta</i>	1	.	2	.	.	.	.	.	.	.	.	.
<i>Rubus ulmifolius</i>	1	.	.	1	.	.	.	.	.	.	.	.
<i>Smilax aspera</i>	1	.	.	+	.	.	.	.	.	.	.	.
<i>Asparagus horridus</i>	+	.	.	.	.	.	+	.	.	.	.	.
<i>Celtis australis</i>	1	.	.	.	.	.	.	.	.	.	.	.
<i>Ajuga iva</i>	.	.	.	.	.	.	.	+	.	.	.	.
<i>Solanum nigrum</i>	.	.	.	.	.	.	.	+	.	.	.	.
<i>Antirrhinum litigiosum</i>	.	.	.	.	.	.	.	.	.	.	1	.

**Table 1.** Continuation.

Number of the relevé	13	14	15	16	17	18	19	20	21	22	23
<b>Location UTM 1 × 1 km (30S)</b>	YJ 3189	YJ 3189	YJ 2486	YJ 2880	YJ 3494	YK 1313	YJ 0688	YJ 0688	YJ 2073	YJ 3190	YJ 3394
<b>Coverage (%)</b>	70	40	60	100	90	90	70	80	90	60	90
<b>Surface (m<sup>2</sup>)</b>	30	70	20	30	100	50	30	50	10	60	100
<b>Date (day/month/year)</b>	23/0 5/24	23/0 5/24	23/0 5/24	26/0 5/24	22/0 6/25	25/0 8/25	07/1 0/25	07/1 0/25	25/1 0/25	31/1 0/25	14/1 1/25
<b>Altitude (m a.s.l.)</b>	14	12	74	15	36	374	145	165	32	17	37
<b>Characteristic taxa of the association and of the higher units</b>											
<i>Withania somnifera</i>	1	2	1	1	4	1	2	2	2	2	4
<i>Nicotiana glauca</i>	1	3	3	+	1	.	.	3	.	+	1
<i>Ricinus communis</i>	.	.	.	.	1	.	1	.	.	.	.
<i>Lantana ×strigocamara</i>	.	.	.	.	.	.	.	.	.	+	.

<i>Ecbalium elaterium</i>	.	.	.	.	+	.	.	.	.	.	.
<b>Companions</b>											
<i>Oloptum miliaceum</i>	2	.	.	2	1	3	2	3	1	2	+
<i>Phagnalon saxatile</i>	2	.	1	.	+	+	+	.	.	1	.
<i>Foeniculum piperitum</i>	.	.	1	.	.	2	.	.	.	.	+
<i>Dittrichia viscosa</i>	1	.	1	.	+	1	+	.	.	.	.
<i>Oxalis pes-caprae</i>	.	.	.	.	.	.	.	.	.	2	2
<i>Euphorbia terracina</i>	+	1	.	2	.	1	+	.	.	1	+
<i>Citrus reticulata</i> (cult.)	.	1	.	.	+	.	.	.	.	1	+
<i>Echium granatense</i>	.	.	1	.	+	.	1	1	.	.	.
<i>Sonchus tenerrimus</i>	.	.	.	2	1	1	2	1	.	+	.
<i>Asparagus acutifolius</i>	.	.	.	.	.	.	.	.	.	.	1
<i>Hirschfeldia incana</i>	+	.	.	1	.	.	.	.	.	.	.
<i>Olea europaea</i> (cult.)	.	.	.	.	+	.	.	.	.	.	+
<i>Bituminaria bituminosa</i>	.	.	.	.	+	1	.	.	.	.	.
<i>Asphodelus fistulosus</i>	.	.	.	+	.	+	.	.	.	.	.
<i>Salsola tragus</i>	.	.	.	.	.	1	.	.	+	+	.
<i>Beta vulgaris</i>	.	.	.	2	.	1	.	1	.	.	.
<i>Hyparrhenia hirta</i>	.	.	+	.	.	.	.	.	.	.	.
<i>Rubus ulmifolius</i>	.	.	.	.	.	.	.	.	.	.	+
<i>Smilax aspera</i>	.	.	.	.	.	.	.	.	.	.	+
<i>Asparagus horridus</i>	.	.	+	.	.	.	.	.	.	.	.
<i>Celtis australis</i>	.	.	.	.	+	.	.	.	.	.	+
<i>Ajuga iva</i>	.	+	.	.	.	.	.	.	.	.	+
<i>Solanum nigrum</i>	.	.	.	.	.	1	.	.	.	+	.
<i>Antirrhinum litigiosum</i>	2	.	.	.	.	1	.	.	.	.	.

**Characteristic taxa of the higher units present in one or two relevés:** *Araujia sericifera* + in 1 and in 10; *Kalanchoe ×houghtonii* 1, *Opuntia ficus-indica* and *Anagyris foetida* + in 3; *Schinus molle* and *Washingtonia filifera* + in 6; *Vachellia farnesiana* + in 10; *Opuntia ficus-indica* + in 11; *Austrocyliodropuntia subulata* and *Malva subovata* 1 in 20; *Opuntia stricta* 1 in 22; *Mirabilis jalapa* + in 23.

**Companion taxa present in one or two relevés:** *Punica granatum* and *Ceratonía siliqua* + in 1; *Arundo donax* + in 2; *Ballota hirsuta* 2 and *Yucca gigantea* 1 in 3; *Ficus carica* 1 in 4; *Convolvulus arvensis* 2, *Cenchrus ciliaris* 1, *Allium ampeloprasum*, *Calendula arvensis*, *Brassica fruticulosa*, *Convolvulus althaeoides*, *Diploaxis erucoides* and *Emex spinosa* + in 5; *Salsola vermiculata* + in 6; *Convolvulus althaeoides*, *Malva multiflora*, *Erodium malacoides*, *Crepis taraxacifolia*, *Mercurialis ambigua* and *Prunus dulcis* + in 8; *Cynoglossum creticum* + in 10; *Euphorbia segetalis*, *Cercis siliquastrum* and *Cenchrus clandestinus* + in 11; *Ulmus minor* + in 12; *Cynodon dactylon* 1 in 13; *Datura innoxia* 1, *Solanum lycopersicum* + in 14; *Emex spinosa* and *Malva multiflora* + in 16; *Salsola vermiculata* 1, *Avena sterilis*, *Melica magnolii* and *Galactites tomentosus* + in 17; *Amaranthus viridis*, *Chenopodium album*, *Symphyotrichum squamatum*, *Conyza sumatrensis* and *Centaurea aspera* 1, *Lactuca serriola*, *Clematis vitalba*, *Chondrilla juncea*, *Reseda luteola*, *Cynodon dactylon*, *Alcea rosea*, *Asteriscus spinosus* and *Salvia verbenaca* + in 18; *Arundo donax* and *Hyoscyamus albus* 1, *Lactuca serriola*, *Carduus tenuiflorus*, *Verbascum sinuatum* and *Onopordum macracanthum* + in 19; *Bassia scoparia* + in 20; *Cyperus rotundus*, *Panicum repens* and *Imperata cylindrica* 2, *Chenopodium album*, *Amaranthus viridis*, *Diospyros kaki* (cultivated) and *Brachypodium phoenicoides* 1, *Xanthium italicum*, *Symphyotrichum squamatum*, *Convolvulus arvensis* and *Conyza sumatrensis* + in 21; *Chloris gayana* and *Atriplex halimus* 2, *Erodium malacoides*, *Emex spinosa* and *Portulaca oleracea* 1, *Cenchrus ciliaris* and *Diploaxis erucoides* + in 22; *Punica granatum* 1, *Solanum lycopersicum*, *Heliotropium europaeum* and *Brassica fruticulosa* + in 23.

**Localities of the relevés:** **1.-2. Sagunto**, abandoned orange groves beside the Gausa road; **3. Sagunto** landfill in the Raval neighborhood; **4. Sagunto**, abandoned farmland between the Braç del Mig and the railway line; **5. Sagunto**, abandoned farmland between the Valls road and the 340 National Highway; **6. Sagunto**, abandoned farmland next to the Vallesa road; **7. Sagunto**, abandoned farmland beside 340 National Highway; **8. Massamagrell**, El Bovalar industrial estate, plot of land on Industrias street; **9. Almenara**, slope on the Palmera Alta road; **10. Sagunto**, slope of the margins of a plot of land on Pintor Ximo Michavila street; **11. Sagunto**, margins of building plots in the Valladeta district; **12. Sagunto**, margins of land between Pintor Ximo Michavila street and the 340 National Highway; **13. Puçol**, plot of land on Les Llimeres street; **14. Puçol**, abandoned farmland next to the bridge on the W-7014 road, Arenals district; **15. Náquera**, abandoned farmland next to the CV-305 road, in the els Plans area; **16. Albalat dels Sorells**, plot margins in the La Macaria district; **17. Sagunto**, plot of land next to José Domínguez Roca street; **18. Altura**, vacant lot with rubble next to El Toro street, La Olivera industrial estate; **19. Lliria**, plot of land next to the Valencia road; **20. Lliria**, rubble in the vicinity of Station Street; **21. Quart de Poblet**, slope between the Turia riverbed and the Tormos irrigation ditch, **22. Puçol**, abandoned orange grove, Els Alacrans area; **23. Sagunto**, abandoned farmland between the Gausa road and the railway line.

**Table 2.** Association *Ricino communis-Leucaenetum glabratae* Peris & al. *ass. nova hoc loco*.  
(*Nicotiano-Ricinion, Nicotiano-Ricinetalia, Nicotiano-Ricinetea*).

Number of the relevé	1	2	3	4	5	6	7	8	9	10	11	12
<b>Location UTM 1 × 1 km (30S)</b>	YK 4823	YK 3709	YJ 2474	YJ 2966	YJ 2173	YJ 3189	YJ 2776	YJ 3495	YJ 3495	YJ 2670	YJ 2869	YJ 2970
<b>Coverage (%)</b>	80	70	100	80	80	80	80	100	80	90	90	80
<b>Surface (m<sup>2</sup>)</b>	100	60	30	40	60	60	80	50	100	60	50	50
<b>Date (day/month/year)</b>	08/0 9/25	08/0 9/25	15/0 9/25	16/0 9/25	16/0 9/25	18/0 9/25	22/0 9/25	25/0 9/25	25/0 9/25	25/0 9/25	25/0 9/25	25/0 9/25
<b>Altitude (m a.s.l.)</b>	29	80	20	1	28	12	2	34	30	7	2	1
<b>Characteristic taxa of the association and of the higher units</b>												
<i>Leucaena glabrata</i>	1	3	4	3	3	2	4	4	4	3	3	2
<i>Ricinus communis</i>	+	.	.	1	1	.	2	1	1	.	1	+
<i>Lantana ×strigocamara</i>	3	.	.	1	+	.	.	.	.	.	.	.
<i>Araujia sericifera</i>	+	.	.	1	.	.	.	.	.	1	.	.
<i>Mirabilis jalapa</i>	+	.	+	+	.	.	.	+	.	1	.	.
<i>Parkinsonia aculeata</i>	.	.	.	.	1	.	.	.	.	1	1	.
<i>Washingtonia filifera</i>	.	.	.	.	.	1	.	.	.	1	.	+
<i>Acacia saligna</i>	.	.	.	2	.	.	.	.	.	.	.	.
<i>Melia azedarach</i>	.	.	.	.	.	.	.	.	.	+	.	.
<i>Ipomoea indica</i>	+	.	.	.	+	.	.	.	.	2	.	.
<b>Subassociation differentials</b>												
<i>Phragmites altissima</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Ipomoea sagittata</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Cynanchum acutum</i>	.	.	.	.	.	.	.	.	.	.	.	.
<i>Phragmites australis</i>	.	.	.	.	.	.	.	.	.	.	.	.
<b>Companions</b>												
<i>Oloptum miliaceum</i>	+	2	1	.	+	3	+	2	.	+	1	1
<i>Foeniculum piperitum</i>	.	1	.	+	+	1	+	.	.	1	+	1
<i>Hyparrhenia hirta</i>	+	1	.	+	+	.	.	+	.	+	.	.
<i>Amaranthus viridis</i>	.	+	.	.	.	+	+	.	.	+	+	.
<i>Arundo donax</i>	.	.	.	.	1	.	.	.	.	.	1	1
<i>Dittrichia viscosa</i>	.	.	.	+	.	1	.	.	+	.	.	1
<i>Symphyotrichum squamatum</i>	.	.	.	.	+	.	.	.	.	+	+	1
<i>Sonchus tenerrimus</i>	.	.	.	.	.	.	+	+	.	+	+	.
<i>Sorghum halepense</i>	+	+	.	.	.	.	.	.	.	.	.	.
<i>Coryza sumatrensis</i>	+	.	.	.	.	+	.	.	.	.	.	.
<i>Cynodon dactylon</i>	.	+	.	.	.	2	.	.	.	.	.	.
<i>Celtis australis</i>	.	+	.	.	.	.	+	.	.	+	.	.
<i>Cenchrus setaceus</i>	.	.	.	1	.	.	.	.	.	1	1	.
<i>Equisetum ramosissimum</i>	.	.	.	.	.	.	1	.	.	.	.	1
<i>Morus alba</i>	.	.	.	.	.	.	.	1	1	.	.	.
<i>Hirschfeldia incana</i>	.	+	.	.	.	.	1	+	.	.	.	.
<i>Cortaderia selloana</i>	.	.	.	.	.	+	.	.	.	+	.	+
<i>Ficus carica</i>	.	.	.	.	.	.	.	1	+	.	.	.
<i>Bituminaria bituminosa</i>	.	.	.	.	.	.	.	1	.	.	.	.
<i>Coryza canadensis</i>	.	.	.	.	.	.	.	.	.	+	+	.
<i>Parietaria judaica</i>	.	.	.	.	.	.	.	.	.	.	.	.

**Table 2.** Continuation.

Number of the relevé	13	14	15	16	17	18	19	20	21	22	23
<b>Location UTM 1 × 1 km (30S)</b>	BC 5598	BC 5598	YJ 4123	YJ 4520	YJ 4318	YJ 2874	YJ 3451	YJ 2866	YJ 3282	YJ 3186	YJ 2975
<b>Coverage (%)</b>	70	60	90	90	90	90	100	90	90	100	100
<b>Surface (m<sup>2</sup>)</b>	50	50	40	50	50	70	50	50	30	30	60
<b>Date (day/month/year)</b>	18/10 /25	18/10 /25	20/10 /25	20/10 /25	20/10 /25	25/10 /25	15/08 /25	16/09 /25	11/09 /25	21/09 /25	22/09 /25

Altitude (m a.s.l.)	15	19	1	4	11	4	1	1	3	7	2
<b>Characteristic taxa of the association and of the higher units</b>											
<i>Leucaena glabrata</i>	3	4	3	3	2	2	3	3	4	1	2
<i>Ricinus communis</i>	1	1	1	1	3	2	2	+	.	.	3
<i>Lantana ×strigocamara</i>	1	2	2	2	1	1	.	1	.	2	.
<i>Araujia sericifera</i>	.	+	1	+	+	2	.	1	.	.	1
<i>Melia azedarach</i>	+	.	+	.	.	+	.	.	.	.	.
<i>Acacia saligna</i>	.	+	.	1	.	1	.	.	.	.	.
<i>Parkinsonia aculeata</i>	.	.	.	+	.	1	.	.	.	.	.
<i>Washingtonia filifera</i>	.	.	.	.	.	1	.	.	.	.	+
<i>Mirabilis jalapa</i>	.	.	.	.	.	+	.	.	.	.	+
<i>Ipomoea indica</i>	.	.	.	.	.	.	.	.	.	.	.
<b>Subassociation differentials</b>											
<i>Phragmites altissima</i>	.	.	.	.	.	.	2	1	+	.	1
<i>Phragmites australis</i>	.	.	.	.	.	.	.	.	1	2	1
<i>Ipomoea sagittata</i>	.	.	.	.	.	.	+	.	.	.	.
<i>Cynanchum acutum</i>	.	.	.	.	.	.	+	.	.	.	.
<b>Companions</b>											
<i>Oloptum miliaceum</i>	+	1	1	.	1	.	.	1	1	.	2
<i>Foeniculum piperitum</i>	.	1	.	.	1	1	.	+	1	1	+
<i>Hyparrhenia hirta</i>	+	1	+	1	.	.	.	+	1	.	.
<i>Amaranthus viridis</i>	1	.	1	.	1	1	+	.	1	.	.
<i>Arundo donax</i>	.	.	1	1	+	1	.	1	1	+	+
<i>Dittrichia viscosa</i>	+	.	.	.	+	1	.	+	.	+	+
<i>Symphytotrichum squamatum</i>	.	+	.	+	.	.	.	+	+	.	.
<i>Sonchus tenerrimus</i>	.	.	.	+	+	.	+	.	.	.	+
<i>Sorghum halepense</i>	+	.	1	.	1	1	.	.	.	.	.
<i>Conyza sumatrensis</i>	.	.	.	+	.	.	.	1	.	2	+
<i>Cynodon dactylon</i>	+	.	+	.	.	.	.	.	.	.	+
<i>Celtis australis</i>	.	+	.	+	.	.	.	.	.	.	.
<i>Cenchrus setaceus</i>	+	.	.	.	.	+	.	.	.	.	.
<i>Equisetum ramosissimum</i>	.	.	+	.	.	1	.	.	.	2	.
<i>Morus alba</i>	.	.	.	.	.	+	+	.	.	.	.
<i>Hirschfeldia incana</i>	.	.	.	.	.	.	.	.	.	.	.
<i>Cortaderia selloana</i>	.	.	.	.	.	.	.	.	.	.	.
<i>Ficus carica</i>	1	.	.	.	.	.	.	.	.	.	.
<i>Bituminaria bituminosa</i>	.	.	.	.	+	+	.	.	.	.	.
<i>Conyza canadensis</i>	.	+	.	.	.	.	.	.	.	.	.
<i>Parietaria judaica</i>	.	.	.	.	+	+	+	.	.	.	.

**Characteristic taxa of the higher units present in one or two relevés:** *Schinus molle* 1 and *Anredera cordifolia* + in 2; *Kalanchoe ×houghtonii* 1 in 7, and 2 in 8; *Vachellia caven* + in 9; *Ipomoea purpurea* 1 in 10; *Nicotiana glauca* 2 and *Tipuana tipu* 1 in 12; *Solanum bonariense* 2 in 13; *Austrocylindropuntia subulata* + in 18; *Ipomoea cairica* 1 in 20; *Nicotiana glauca* + in 23.

**Companion taxa present in one or two relevés:** *Convolvulus arvensis* and *Lactuca serriola* 1, *Olea europaea*, *Salsola tragus*, *Conyza bonariensis* and *Citrus aurantium* + in 1; *Convolvulus althaeoides*, *Heliotropium europaeum*, *Emex spinosa*, *Chamaesyce prostrata*, *Centaurea aspera*, *Plantago lagopus* and *Tribulus terrestris* 1, *Chondrilla juncea*, *Verbascum sinuatum*, *Asphodelus fistulosus* and *Amaranthus albus* + in 2; *Phalaris stenoptera* 1 in 4; *Mentha suaveolens* 2, *Olea europaea*, *Paspalum dilatatum* and *Juncus subulatus* 1, *Salsola tragus*, *Xanthium italicum*, *Torilis neglecta* and *Scrophularia pseudoauriculata* + in 6; *Beta vulgaris* and *Laurus nobilis* 1, *Sedum sediforme* and *Echium granatense* + in 7; *Nerium oleander* 1 and *Acer negundo* + in 9; *Rubus ×assurgens* 1 and *Sonchus asper* + in 10; *Bassia scoparia* and *Cenchrus clandestinus* 1, *Ailanthus altissima*, *Robinia pseudoacacia* and *Chenopodium album* + in 11; *Rubus ulmifolius* and *Chloris gayana* 1 and *Lobularia maritima* + in 12; *Lobularia maritima* + in 13; *Rubus ulmifolius* and *Jacaranda mimosifolia* + in 14; *Oxalis pes-caprae* 1 and *Solanum nigrum* and *Amaranthus blitoides* + in 16; *Convolvulus arvensis* and *Ulmus pumila* 1, *Parthenocissus quinquefolia*, *Solanum nigrum* and *Ligustrum lucidum* + in 18; *Hibiscus rosa-sinensis* and *Hibiscus syriacus* + in 20; *Phoenix canariensis* and *Aloe ×delaetii* + in 23.

**Localities of the relevés:** **1. Vila-real**, surroundings of the La Plana Hospital roundabout; **2. La Vall d'Uixó**, between the wall next to Alfons el Magnànim street and Cerverola rambla, Fluvisol; **3. Valencia**, Marchalenes neighborhood, plot of land between Guillem Ferrer Street and Portugal Avenue; **4. Pinedo**, roundabout; **5. Quart de Poblet**, surroundings of the Military Hospital; **6. Puçol**, plot of land between Mossen Vicent Valero street and the Vallet ravine, Fluvisol; **7. Almàssera**, left bank of the Carraixet ravine, Fluvisol; **8. Sagunto**, Rodamilans street margin next to the Palancia riverbed, Fluvisol; **9. Sagunto**, Palancia riverbed near the Valencia-Barcelona railway bridge; **10. Valencia**, Na Rovella neighborhood, plot of land on Hermanos Maristas avenue; **11. Valencia**, La Punta neighborhood, surroundings of the La Punta Church; **12. Valencia**, Nazaret neighborhood, plot of land on the Moreras road, between Quatretonda and Suiza streets; **13. Jávea**, plot of land on Botánico Cavanilles avenue; **14. Jávea**, margins of Altea street; **15. Xeraco**, Les Marjals street, Fluvisol; **16. Gandia**, surroundings of the UPV, Fluvisol; **17. Gandia**, Alcodar industrial park, on the side of the Valencia road, Fluvisol + Technosol; **18. Valencia**, Camí de Vera neighborhood, on the banks of the Vera road; **19. Sueca**, Nazaret-Oliva road next to the Gola del Perelló; **20. Valencia**, margin of the Nazaret-Oliva road, at km 2; **21. Massamagrell**, margins of the road from the Massalfassar Bridge to the Puebla de Farnals beach; **22. Between Puçol and El Puig de Santa Maria**, left bank of the Calderona ravine; **23. Alborai**a, access road to Les Casetes dels Peixets, next to the V-21 viaduct, Fluvisol.



Fig. 1. *Nicotiano glaucae-Withanietum somniferae* in Sagunto (Valencia, Spain).



Fig. 2. *Ricino communis-Leucaenetum glabratae* in Sagunto (Valencia, Spain).

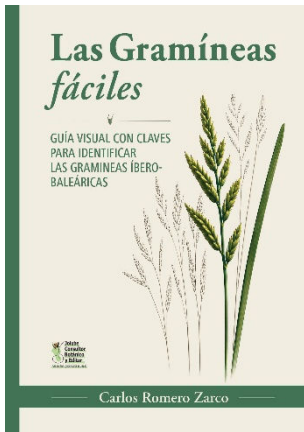


Fig. 3. *Malvo subovatae-Anagyretum foetidae* in Sagunto (Valencia, Spain).



Fig. 4. a) *Anagyris foetida*; b) *Withania somnifera*; c) *Lantana × strigocamara*; d) *Solanum bonariense*; e) *Ipomoea cairica*; f and g) *Leucaena leucocephala* subsp. *glabrata*. Images: J.R. Vázquez, R. Roselló and G. Stübing.

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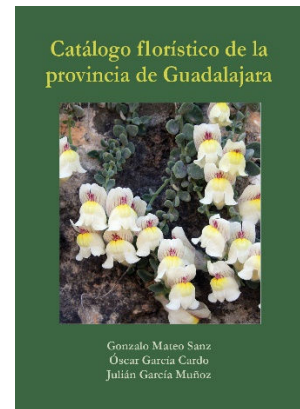
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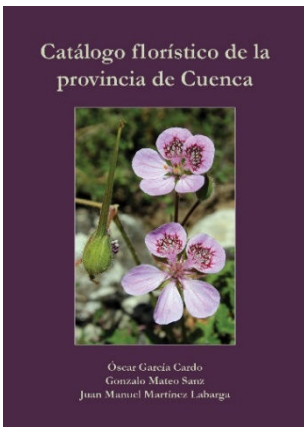
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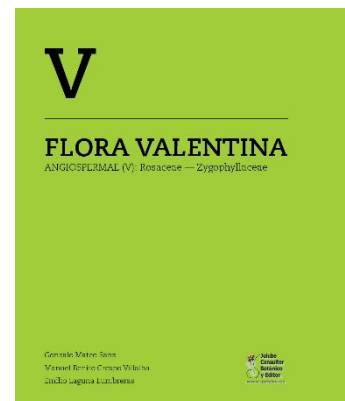
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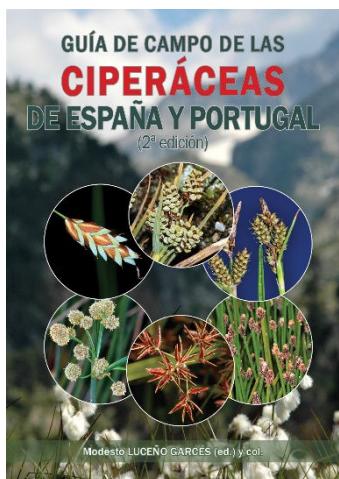
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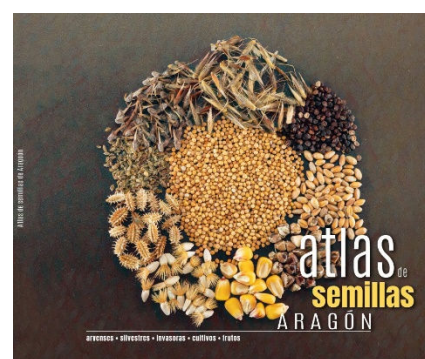
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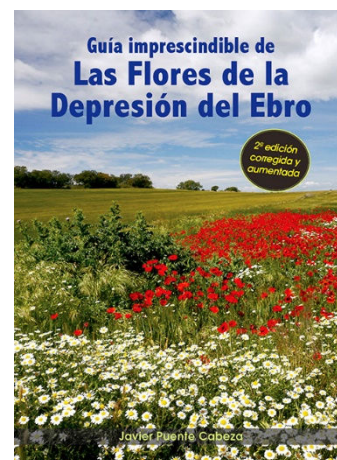
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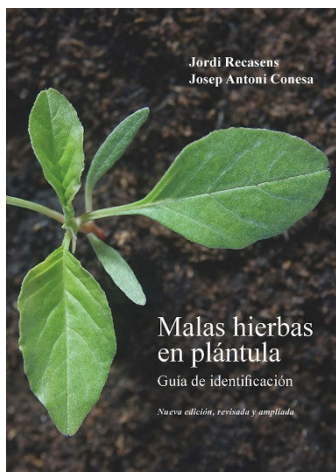
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