Botanica SERBICA

(2023) 47 (2): 205–213

DOI: https://doi.org/10.2298/BOTSERB2302205L
journal homepage: botanicaserbica.bio.bg.ac.rs

Original Scientific Paper

Ferulago brachylobae-Daucetum setifolii J. López-Tirado, ass. nova from southern Spain

Javier López-Tirado

Department of Botany, Ecology and Plant Physiology, University of Córdoba, 14071, Córdoba, Spain
Correspondence: javier.lopez.tirado@uco.es

ABSTRACT:
Ferulago brachylobae-Daucetum setifolii, ass. nova is described from the southern edge of the Sierra Morena in the Córdoba province (Andalusia, Spain). It is characterised by the two hemicryptophytes naming the association, usually located in heliophilous and rupicolous or scree degraded areas, shaping an open community of low cover. Seventeen plots were studied during late summer in the surroundings of Córdoba town (the West Iberian Mediterranean province, the Luso-Extremadurese subprovince and the Marianese-Monchiquese sector). The new association grows in the thermo-Mediterranean and meso-Mediterranean thermotypes belonging to the *Rumici indurati-Dianthion lusitani* alliance, the *Phagnalo saxatilis-Rumicetalia indurati* order and the *Phagnalo-Rumicetea indurati* class.

Keywords:
aestival plants, *Daucus setifolius*, *Ferulago brachyloba*, new association, southern Spain, vegetation.

UDC: 581.55(460.351)

Received: 14 September 2022
Revision accepted: 22 February 2023

INTRODUCTION

Ferulago brachyloba Boiss. & Reut. and *Daucus setifolius* Desf. are two rare or infrequent species in southern Spain (García Martín 1987a, b; Gómez Mercado 2009a, b) which share certain characteristics and particularities. They belong to the Apiaceae family and are hemicryptophytes. These species bloom in summer, from June to August, and are therefore most noticeable when most therophytes and other perennial plants have already withered. Moreover, both species are endemics of the Iberian Peninsula; in fact, *F. brachyloba* only grows in Spain. The latter thrives mainly in western Spain due to its silicicolous preference. *D. setifolius*, on the other hand, grows mainly on the southwestern Iberian Peninsula. Their maximum elevation is also similar, ranging between 1000 and 1100 m a.s.l. (García Martín 2003; Pujadas Salvá 2003).

Their ecology is also alike; they usually behave like rupicolous species in rocky areas, colonizing road embankments and roadsides. In other cases, they can be found in scree areas, grasslands and degraded scrublands. In terms of aspect, these species are heliophilous, generally facing southward slopes (López-Tirado 2018).

From a morphological point of view, both species are easily recognisable. During the blooming period, *F. brachyloba* produces yellow flowers, whereas *D. setifolius* bears white ones. The umbels are normally close to the main stem in the latter in a linear way. By contrast, *F. brachyloba* becomes wider in the middle-upper part. The mericarps are thornless in *F. brachyloba*, whereas setaceous and aculeate spines are present in *D. setifolius* (Fig. 1). Although both species exhibit pinnatisect basal leaves, the final segments are quite different (oblong, elliptical or falcate-elliptical in *F. brachyloba* and filiform in *D. setifolius*) (García Martín 2003; Pujadas Salvá 2003).

In terms of vegetation, several associations such as *Asplenio billotii-Dianthetum lusitani* A.V. Pérez & Cabezudo in A.V. Pérez, P. Navas, D. Navas, Gil & Cabezudo 1998, *Coincyo longirostrae-Dianthetum lusitani* Melendo in Cano, Melendo & F. Valle 1997, *Digitali thapsi-Dianthetum lusitani* Rivas-Martínez ex Fuente 1986, *Jasiono marianae-Dianthetum lusitani* Rivas Goday (1955) 1964, and *Phagnalo saxatilis-Rumicetum indurati* Rivas-Martínez ex F. Navarro & C. Valle in Ruiz 1986, from the alliance *Rumici indurati-Dianthion lusitani* Ri-

Fig. 1. *Ferulago brachyloba* in postanthesis (yellow-greenish colour in the foreground) and *Daucus setifolius* in anthesis (white colour in the background).

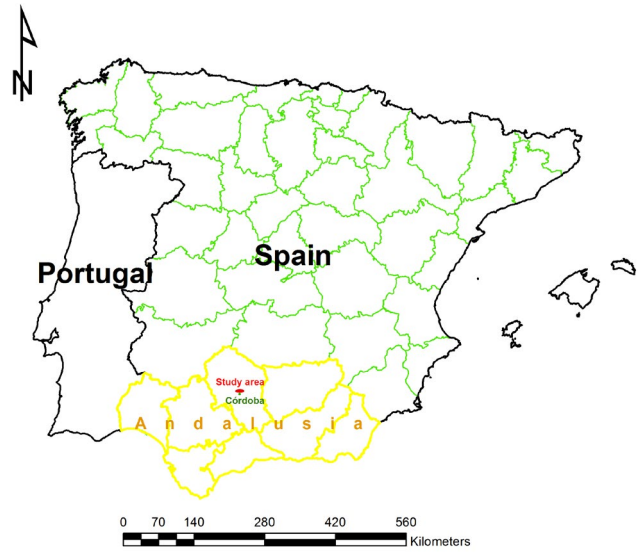

Fig. 2. Location of the study area on the Iberian Peninsula.

vas-Martínez, Izco & Costa ex Fuente 1986, belong to heliophilous rocky outcrops, where vegetation cannot thrive (Muñoz Álvarez 2010). The most typical life-forms are geophytes and chamaephytes, together with hemicryptophytes like *F. brachyloba* and *D. setifolius*, finding suitability in this kind of habitat.

The present work aims to describe a new association of two perennial and aestival Apiaceae species from southern Spain: *Ferulago brachylobae-Daucetum setifolii* J. López-Tirado, ass. nova. by means of a comparison with other similar associations from rocky outcrops.

MATERIALS AND METHODS

Study area. This work has been carried out on the southern edge of the Sierra Morena in the surroundings of Córdoba town (Fig. 2), within the West Iberian Mediterranean province, the Luso-Extremadurese subprovince and the Marianese-Monchiquese sector (Rivas-Martínez *et al.* 2014). The Sierra Morena is characterised by acidic soils and rocks with quartzites, schists, and granites in the main, although limestone outcrops can also be found. These Apiaceae species have not been found nearby on the other side of Córdoba, i.e. in the Guadalquivir Valley (the Betic province, the Hispalese sector), a more anthropised area dominated by crops and other substrates mainly composed of marls (López-Tirado 2018).

Methodology. Observations over the last decade have led to the identification of several localities, and similar topographical and ecological patterns, of the two target species growing together. Phytosociological plots of 10 m^2 (5 × 2 m) were studied between August 29th 2021 and September 3rd 2021. The modified Braun-Blanquet method was followed (Mueller-Dombois & Ellenberg 1974) to estimate the percentage cover and abundance (Table 1). Taxonomic nomenclature was followed according to Rivas-Martínez *et al.* (2002), García Martín (2003) and Pujadas Salvá (2003).

Table 1. The modified Braun-Blanquet method by Mueller Dombois & Ellenberg (1974).

Code	Description
5	75–100% plot cover
4	50–75% plot cover
3	25–50% plot cover
2b	15–25% plot cover
2a	5–15% plot cover
2m	1–5% plot cover, over 50 individuals
1	1–5% plot cover, 6–50 individuals
+	Less than 1% plot cover, 3–5 individuals
r	Less than 1% plot cover, 1–2 individuals
(+)	Out of the plot

Withered species were also recorded when identifiable regardless of life-form. The following parameters were also identified: altitude, aspect, slope, cover (only flowering/fruiting species and flowering/fruiting plus withered species), flowering/fruiting species number and total species number (flowering/fruiting and withered). Life-form classification by Raunkiaer (1934) was retrieved from Blanca *et al.* (2009). The new association was named according to the International Code of Phytosociological Nomenclature (Theurillat *et al.* 2020).

A data matrix was generated consisting of 208 taxa and 94 phytosociological plots. Six associations were

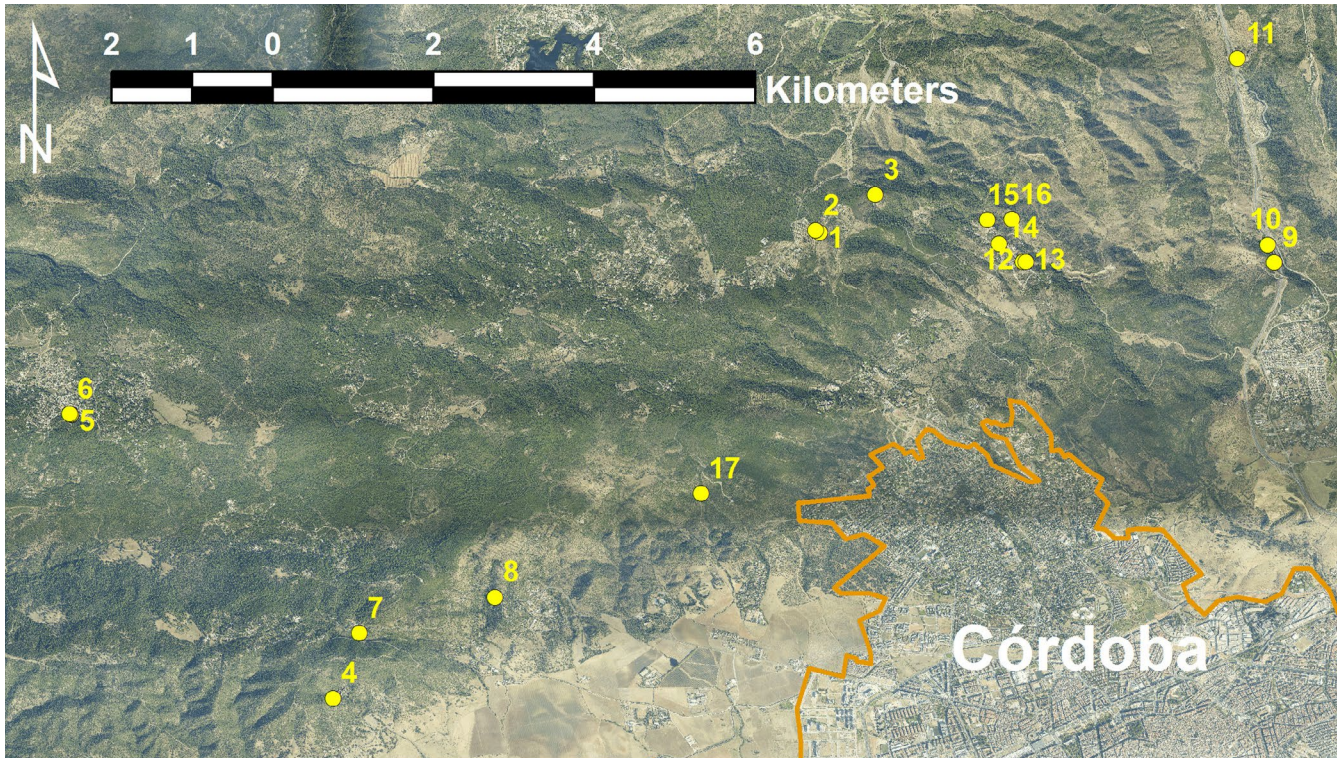

Fig. 3. Location of the sampled plots.

considered; 5 of them already described and belonging to the *Rumici indurati-Dianthion lusitani* alliance: *Asplenio billotii-Dianthetum lusitani* (3 plots), *Coincyo longirostrae-Dianthetum lusitani* (25 plots), *Digitali thapsi-Dianthetum lusitani* (3 plots), *Jasiono marianae-Dianthetum lusitani* (24 plots), and *Phagnalo saxatilis-Rumicetum indurati* (22 plots). The data were retrieved from the REDIAM (*Red de Información Ambiental de Andalucía*) environmental download portal, specifically from the VEGE10 project (*Cartografía y evaluación de la vegetación y flora a escala de detalle 1:10.000 de los ecosistemas forestales de Andalucía*). Seventeen phytosociological plots from *Ferulago brachylobae-Daucetum setifolii* J. López-Tirado, ass. nova (Table 2) were added to the matrix for comparison with the rest of the associations.

In order to manage the data matrix, the values from Braun–Blanquet's original abundance–dominance scale were transformed into those of the van der Maarel numerical scale (van der Maarel 1979) as follows: r = 1, + = 2, 1 = 3, 2 = 4, 3 = 5, 4 = 6 and 5 = 7. The data matrix was subjected to UPGMA (unweighted pair group method with arithmetic mean), with the Bray-Curtis dissimilarity index, using R software (R Core Team 2022) and the vegan package (Oksanen *et al.* 2022). The output was a cluster dendrogram (Supplementary Material 1), where the Y axis (defined by height ranging from 0.0 to 1.0) measures the distance among the clusters. Thus, the seventeen vegetation plots of the new association were separated from the others at the beginning of the cluster dendrogram. A first classification by numerical analysis followed by the determination of diagnostic species with the highest concentration in particular vegetation units is frequently used (Chytrý *et al.* 2002). JUICE 7.1 software was then used including the 94 phytosociological plots of the 6 associations belonging to the *Rumici indurati-Dianthion lusitani* alliance. A percentage synoptic table was built (Supplementary Material 2) and the thresholds for establishing the diagnostic and dominant species were: fidelity = 70, frequency = 50 and cover = 20. Canonical Correspondence Analysis (CCA) was also carried out, showing how the new association was clearly separated from the rest in the upper-right part of the figure (Supplementary Material 3).

RESULTS AND DISCUSSION

Seventeen vegetation plots were studied on the southern edge of the Sierra Morena, specifically in the Sierra de Córdoba, close to Córdoba town (Fig. 3). In total, 95 species were recorded, most of them withered therophytes, which spend the hot and dry summer as seeds in the Mediterranean climate (Devesa Alcaraz & Carrión García 2012). The latter have been found very useful for identifying the prior type of annual grass present in spring. The phenological period of the new association, reaching its optimum in summer, should be highlighted. The total life-form percentage is shown in Fig. 4. In

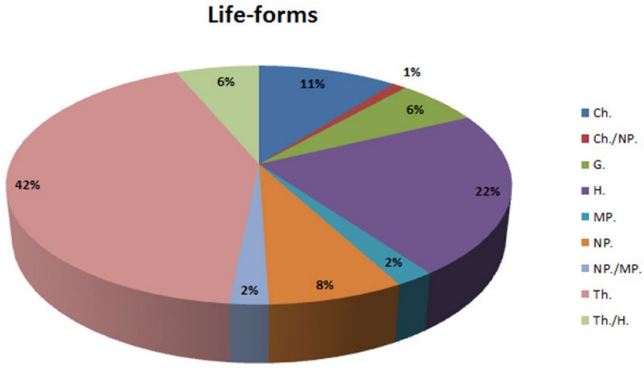

Fig. 4. Life-forms (Ch.: chamaephyte; G.: geophyte; H.: hemicryptophyte; MP.: microphanerophyte; NP.: nanophanerophyte; Th.: therophyte).

addition to therophytes, hemicryptophytes and chamaephytes were also abundant in the plots and well adapted to the chasmo-chomophytic conditions (Canas *et al.* 2021); in fact, equal numbers of both *F. brachyloba* and *D. setifolius* are hemicryptophytes. Nano- and microphanerophytes were less represented, and were mainly found outside the sampled plots. Therefore, the target association grows in more altered areas than scrub/bush communities.

The association concept has been largely discussed among phytosociologists due to the controversy of the criteria to be considered (Willner 2006). In any case, the presence of diagnostic species is crucial for establishing a new association (Dengler *et al.* 2005). This work describes a new association, in which two diagnostic species (*F. brachyloba* and *D. setifolius*) are established. They have been sampled in the 17 vegetation plots studies, whilst they have not been recorded in the remaining 77 vegetation plots belonging to other associations of the *Rumici indurati-Dianthion lusitani* alliance. This trait is consistent with Chytrý *et al.* (2002) and Willner (2011) to determine diagnostic species.

The cluster dendrogram separated into a single cluster *Ferulago brachylobae-Daucetum setifolii*, ass. nova at the beginning of the classification with a height value close to 0.95 (see Supplementary Material 1). This finding was confirmed by the CCA ordination method (Supplementary Material 2), in which the new association was separated from the other 5 biogeographically close associations belonging to the *Rumici indurati-Dianthion lusitani* alliance.

Ferulago brachylobae-Daucetum setifolii J. López-Tirado, ass. nova hoc loco
Holotypus: plot 8 (Table 2)

Ferulago brachyloba Boiss. & Reut. 2b, *Daucus setifolius* Desf. 2a, *Allium paniculatum* L. 1, *Avena barbata* Link +, *Dianthus crassipes* R. de Roemer +, *Hyparrhenia sinaica* (Delile) G. López 1, *Paronychia argentea* Lam. 2a, *Sedum amplexicaule* DC. 2a, *Trachynia distachya* (L.) Link 2b, *Umbilicus rupestris* (Salisb.) Dandy +, *Cistus albidus* L. +, *Genista hirsuta* Vahl 1, *Lavandula pedunculata* (Mill.) Cav. (+), *Phagnalon saxatile* (L.) Cass. +.

Area: 10 m^2; altitude: 326 m a.s.l.; aspect: 255° SW; slope: 70%; flowering/fruiting cover: 40%; flowering/fruiting and withered cover: 75%; date: August 30th 2021; flowering species number: 3; total species number: 14; locality: Santa María de Trassierra road (CO-3402, km 3); coordinates: WGS84, N 37.905055°, E -4.850245°.

Diagnostic species: *F. brachyloba* and *D. setifolius*.

Structure: open perennial grasslands dominated by the hemicryptophytes *F. brachyloba* and *D. setifolius*, which normally do not exceed 20% of cover per species. Other hemicryptophytes, chamaephytes and more rarely nanophanerophytes are also present. Some geophytes complete the distribution of life-forms. Therophytes are withered in the optimal period of this association.

Sinecology: it is found inland, either on calcareous or siliceous substrates. The plots were sampled from 246 to 561 m a.s.l., although its presence cannot be ruled out outside this range. It thrives in the Mediterranean Pluviseasonal Oceanic (MPO) bioclimate, from the upper thermo-Mediterranean to the lower meso-Mediterranean thermotype and from the upper dry to lower sub-humid ombrotype (Valle 2004). Saxicolous communities of exposed silicious rock shelves of the central and western Iberian Peninsula are included on EUNIS list of endangered natural habitats. A recent study reveals new findings within these communities (Canas *et al.* 2021).

Syndynamics: in most of the cases, this association represents a more mature community than the annual grasslands belonging to *Brachypodietalia distachyi* Rivas-Martínez 1978 (*Trachynietalia distachyae*). It can be replaced by *Scillo maritimae-Lavanduletum pedunculatae* Ladero 1970 in heliophilous outcrops and by *Phlomido purpureae-Cistetum albidi* Rivas-Martínez, Lousã, T. E. Díaz, Fernández-González & J. C. Costa 1990 in well-developed soils. Sometimes it is in catenal contact with *Dauco criniti-Hyparrhenietum sinaicae* Rivas-Martínez in Rivas-Martínez, Fernández-González & Sánchez-Mata 1986 corr. Díez-Garretas & Asensi 1999.

Syntaxonomy: the new association belongs to the class *Phagnalo-Rumicetea indurati* (Rivas Goday & Esteve 1972) Rivas-Martínez, Izco & Costa 1973, the order *Phagnalo saxatilis-Rumicetalia indurati* Rivas Goday & Esteve 1972 and the alliance *Rumici indurati-Dianthion lusitani* Rivas-Martínez, Izco & Costa ex Fuente 1986. The latter alliance has been synonymised by Mucina *et al.* (2016) with *Gymnogrammo-Scrophularion* Rivas Goday 1964.

Synchorology: *Ferulago brachylobae-Daucetum setifolii* is described from the southern edge of the Sierra Morena, biogeographically from the West Iberian

Table 2. *Ferulago brachylobae-Daucetum setifolii ass. nova* (*holotypus*: plot no. 8) [*Rumici indurati-Dianthion lusitani*, *Phagnalo saxatilis-Rumicetalia indurati, Phagnalo-Rumicetea indurati*]. The flowering/fruiting species are in bold. Life-form abbreviations: Ch.: chamaephyte; G.: geophyte; H.: hemicryptophyte; MP.: microphanerophyte; NP.: nanophanerophyte; Th.: therophyte.

	Plot nº	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Altitude (m)	544	561	521	364	383	384	417	326	266	246	375	322	317	339	344	309	389
	Aspect (º)	SE	SE	SW	SE	NE	W	SW	SW	E	NE	E	NE	NE	NE	NE	E	E
	Slope (%)	20	35	25	90	35	40	90	70	75	70	75	20	15	65	80	30	15
	Flowering/fructifying species cover (%)	40	20	15	40	30	40	40	40	30	35	25	35	30	10	35	30	20
	Flowering/fructifying and withered species cover (%)	95	90	80	90	100	100	70	75	80	85	80	75	70	20	60	60	85
	Surface (m^2)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Flowering/fructifying species number	3	2	3	4	3	2	3	3	4	2	3	3	2	2	3	2	2
	Total species number (including withered)	22	25	19	20	24	23	14	14	26	18	19	18	20	11	14	15	9
Life-form	Diagnostic species of *Ferulago brachylobae-Daucetum setifolii*																	
H.	***Daucus setifolius*** Desf.	**3**	**2a**	**(+)**	**1**	**2a**	**3**	**2b**	**2a**	**1**	**2a**	**1**	**2a**	**2b**	**1**	**2b**	**3**	**+**
H.	***Ferulago brachyloba*** Boiss. & Reut.	**1**	**2a**	**2a**	**3**	**2a**	**2a**	**2a**	**2b**	**2a**	**2a**	**2a**	**2b**	**2a**	**1**	**2a**	**1**	**2a**
	Dominant species of *Ferulago brachylobae-Daucetum setifolii*																	
H.	*Dactylis glomerata* L.	.	(+)	2b	.	3	2a	2a	.	+	1	1	.	.	.	1	.	1
	Other species																	
NP.	*Adenocarpus telonensis* (Loisel.) DC.	.	(+)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Aegilops geniculata* Roth	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	.	.
G.	*Allium guttatum* Steven subsp. *sardoum* (Morin) Stearn	.	.	.	.	1	.	.	.	.	(+)	.	.	.	.	.	+	.
G.	*Allium paniculatum* L.	.	.	.	.	.	.	.	1	+	.	.	.	.	.	.	.	.
H.	*Anarrhinum bellidifolium* (L.) Willd.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Th.	*Andryala arenaria* (DC.) Boiss. & Reut.	2b	+	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
H.	*Andryala integrifolia* L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
MP.	*Arbutus unedo* L.	.	.	.	.	(+)	.	.	.	.	.	.	.	.	.	.	.	.
NP.	*Asparagus acutifolius* L.	.	.	.	.	.	.	.	.	(+)	.	.	.	.	.	.	.	.
NP.	*Asparagus albus* L.	(+)	(+)	.	+	.	.	+	.	(+)	1	.	.	.	.	.	.	.
G.	*Asphodelus serotinus* Wolley–Dod	.	+	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Atractylis cancellata* L.	.	.	.	.	.	.	.	.	2a	.	.	.	.	.	.	.	.
Th.	*Avena barbata* Link	1	+	1	1	1	1	+	+	1	+	1	+	+	.	+	+	.
Ch.	*Brachypodium retusum* (Pers.) P. Beauv.	.	.	.	.	.	.	.	.	(+)	.	.	.	.	.	.	.	.
Th.	*Briza maxima* L.	1	.	.	+	+	+	.	.	.	.	.	1	1	.	+	+	.
H.	*Campanula rapunculus* L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
H.	*Carlina corymbosa* L. subsp. *hispanica* (Lam.) O. Bolòs & Vigo	.	.	+	.	3	2a	.	.	2a	.	.	1	+	.	.	.	.
Th.	*Carlina racemosa* L.	.	.	.	.	.	1	.	.	+	.	+	.	+	.	.	2a	.
H.	*Centaurea cordubensis* Font Quer	.	.	.	.	(+)	+	.	.	.	.	.	.	.	.	.	.	.

NP.	*Cistus albidus* L.	(+)	(+)	(+)	2a	(+)	(+)	.	+	.	2a	.	+	+	+	+	.	.
NP./MP.	*Cistus ladanifer* L.	.	.	(+)	.	.	.	.	.	.	.	.	.	r	.	.	.	.
NP.	*Cistus monspeliensis* L.	.	.	.	.	.	(+)	.	.	.	.	.	r	.	.	.	.	.
NP.	*Cistus salviifolius* L.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.
Th.	*Cleonia lusitanica* (L.) L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
H.	*Corrigiola* sp.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
H.	*Crambe filiformis* Jacq.	.	.	.	+	.	.	1	.	.	.	.	.	.	.	.	.	.
Th.	*Crepis capillaris* (L.) Wallr.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.
H.	*Crepis vesicaria* L.	.	.	.	.	1	.	.	.	+	.	.	.	+	.	.	.	.
Th.	*Crucianella angustifolia* L.	.	.	.	.	.	.	.	.	.	.	+	+	+	.	.	+	.
H.	*Cynara humilis* L.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Th.	*Cynosurus echinatus* L.	.	.	.	+	+	+	.	.	+	1	+	+	.	.	2b	.	1
H.	*Daucus carota* L.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.
Ch.	***Dianthus crassipes*** R. de Roemer	.	.	.	**1**	.	.	.	+	.	.	.	.	.	.	.	.	.
Th.	*Diplotaxis catholica* (L.) DC.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
Th.	*Echium plantagineum* L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
G.	*Erophaca baetica* (L.) Boiss.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
H.	*Eryngium campestre* L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Euphorbia exigua* L.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
Th.	*Filago gallica* L.	+	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
H.	***Foeniculum vulgare*** Mill.	(+)	.	.	.	.	.	**2a**	.	+	.	**1**	.	.	.	**1**	.	.
Th.	*Galactites tomentosa* Moench	r	(+)	1	.	.	.	.	.	+	.	+	.	.	+	.	.	.
Th.	*Gastridium phleoides* (Nees & Meyen) C.E.Hubb.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch./NP.	*Genista hirsuta* Vahl	.	(+)	1	1	.	.	+	1	.	.	.	.	.	.	.	+	.
Ch.	*Halimium umbellatum* (L.) Spach subsp. *viscosum* (Willk.) O. Bolòs & Vigo	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
Th.	*Hedypnois rhagadioloides* (L.) F.W. Schmidt	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.	.	+
Th.	*Heliotropium europaeum* L.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
Th.	*Hirschfeldia incana* (L.) Lagr.–Foss.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
H.	*Hyparrhenia sinaica* (Delile) G. López	(+)	.	.	.	.	.	.	1	(+)	.	.	.	.	.	.	.	.
Th./H.	*Jasione montana* L.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.	.	.
H.	***Lactuca viminea*** (L.) J. & C. Presl	.	.	**r**	**+**	.	.	.	.	.	.	.	.	.	.	.	.	.
Ch.	*Lavandula pedunculata* (Mill.) Cav.	(+)	(+)	.	.	.	.	.	(+)	.	.	.	+	+	.	+	.	.
Th.	*Leontodon longirrostris* (Finch & P. D. Sell) Talavera	.	+	.	+	+	.	.	.	.	.	.	+	1	+	.	+	.
Th./H.	*Linum tenue* Desf.	.	.	.	.	.	.	.	.	1	.	+	.	.	.	.	.	.
Th./H.	*Misopates orontium* (L.) Raf.	.	r	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Th.	*Ononis pubescens* L.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Th./H.	*Pallenis spinosa* (L.) Cass.	.	.	.	.	.	.	1	.	.	.	+	.	.	.	.	.	.
H.	*Paronychia argentea* Lam.	r	.	.	.	.	.	.	2a	.	.	.	.	.	.	.	.	.
Th.	*Paronychia echinulata* A. O. Chater	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Petrorhagia nanteuilii* (Burnat) P. W. Ball & Heywood	+	+	1	.	.	+	.	.	+	.	.	+	+	+	.	+	.

Ch.	*Phagnalon saxatile* (L.) Cass.	.	.	r	.	.	.	1	+	+	+	2a	.	.	+	+	.	.
NP.	*Phlomis purpurea* L.	.	.	(+)	.	.	.	.	.	.	(+)	.	.	.	.	.	.	.
H.	***Pimpinella villosa*** Schousb.	.	.	.	.	**1**	(+)	.	.	.	.	.	.	.	.	.	.	.
NP./MP.	*Pistacia lentiscus* L.	.	.	.	.	(+)	.	.	.	.	.	.	.	.	.	.	.	.
MP.	*Pistacia terebinthus* L.	.	.	(+)	.	.	.	.	.	.	.	.	.	.	.	.	.	(+)
Th.	*Plantago afra* L.	+	.	1	.	.	.	+	.	.	.	.	.	.	.	.	.	.
Th./H.	*Plantago lagopus* L.	+	.	.	.	1	+	.	.	+	.	.	.	.	.	.	+	.
H.	*Poa bulbosa* L.	.	.	.	.	.	2b	.	.	.	.	.	.	.	.	.	.	.
Th.	*Reichardia intermedia* (Sch. Bip.) Samp.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
Ch.	*Rumex induratus* Boiss. & Reut.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2a	.	.
Ch.	*Sanguisorba rupicola* (Boiss. & Reut.) A. Braun & C. D. Bouché	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
H.	*Sanguisorba verrucosa* (G. Don) Ces.	.	.	.	r	.	.	.	.	.	.	.	r	.	+	+	.	.
Th./H.	*Scabiosa atropurpurea* L.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
Th.	*Scabiosa galianoi* Devesa, Ortega–Olivencia & J. López	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Ch.	*Sedum amplexicaule* DC.	.	+	.	+	+	.	.	2a	.	+	.	.	.	.	+	.	.
Ch.	*Selaginella denticulata* (L.) Spring	.	.	.	1	.	.	.	.	.	3	.	.	.	.	.	.	.
Th.	*Silene colorata* Poir.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.
Th.	*Taeniatherum caput-medusae* (L.) Nevski	.	.	.	.	+	1	.	.	.	.	.	.	.	.	.	.	.
Ch.	*Teucrium haenseleri* Boiss.	.	.	(+)	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Tolpis barbata* (L.) Gaertn.	2a	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	+
Th.	*Torilis arvensis* (Huds.) Link	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
Th.	*Trachynia distachya* (L.) Link	3	4	2a	.	.	.	2b	2b	.	.	4	.	1	+	.	+	1
Th.	*Trifolium angustifolium* L.	+	+	1	+	+	+	.	.	.	.	+	.	.	.	.	.	.
Th.	*Trifolium arvense* L.	+	(+)	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Trifolium campestre* Schreb.	.	.	.	+	.	1	.	.	.	+	.	+	.	.	.	.	.
Th.	*Trifolium cherleri* L.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Trifolium hirtum* All.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
Th.	*Trifolium stellatum* L.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Tuberaria guttata* (L.) Fourr.	.	+	.	.	.	.	.	.	.	.	.	3	2b	.	.	2b	.
G.	*Umbilicus rupestris* (Salisb.) Dandy	.	.	.	+	.	.	.	+	.	+	.	.	.	+	+	.	.
G.	***Urginea maritima*** (L.) Baker	.	.	.	.	.	.	.	.	**r**	.	.	.	.	.	.	.	.
Th.	*Vulpia bromoides* (L.) S. F. Gray	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Th.	*Vulpia geniculata* (L.) Link	.	.	.	.	.	.	.	.	2a	1	.	.	.	.	.	.	.

Localities: 1-2, La Alberquilla, 29/08/2021; 3, Los Villares road, 14% (CO-3408), 29/08/2021; 4, San Jerónimo monastery, 30/08/2021; 5-6, Santa María de Trassierra, 30/08/2021; 7, Santa María de Trassierra road, cortijo de San José (CO-3402), 30/08/2021; 8, Santa María de Trassierra road (CO-3402), km 3, 30/08/2021; 9, dismantled Córdoba-Almorchón railway, close to cortijo Uribebajo, 31/08/2021; 10, Los Pradillos, 31/08/2021; 11, Cerro Muriano road (N-432a), km 259, 31/08/2021; 12, Santo Domingo urbanization, 01/09/2021; 13, Santo Domingo urbanization, 01/09/2021; 14, Santo Domingo Hermitage, 01/09/2021; 15, Santo Domingo Hermitage, 01/09/2021; 16, Santo Domingo stream, 01/09/2021; 17, Las Ermitas, 03/09/2021.

Mediterranean province, the Luso-Extremadurese subprovince and the Marianese-Monchiquese sector (Rivas-Martínez *et al.* 2014).

CONCLUSION

Ferulago brachylobae-Daucetum setifolii is a new association from degraded areas between annual grasslands and hemicryptophyte/chamaephyte communities in the succession process. It is characterised by a low cover, colonising road embankments and roadsides, usually linked to rupicolous environments. Its phenology is strongly marked, as observed in other associations (Fernández Casas 1970), with its optimal period being summer.

Acknowledgements – I would like to extend my gratitude to Dr. Diego Nieto Lugilde for its help with the numerical analysis.

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REZIME

Botanica SERBICA

Ferulago brachylobae-Daucetum setifolii J. López-Tirado, ass. nova iz južne Španije

Javier López-Tirado

Ferulago brachylobae-Daucetum setifolii, ass. nova je opisana sa južnog oboda Sijera Morene u provinciji Kordoba (Andaluzija, Španija). Asocijaciju opisuju dve hemikriptofite, koje najčešće naseljavaju heliofilna staništa i pukotine stena ili sipare degradiranih oblasti, oblikujući niske otvorene zajednice. Sedamnaest snimaka je napravljeno tokom kasnog leta u okolini grada Kordobe (zapadno Iberijsko Mediteranska provincija, Luso-Ekstremadurska potprovincija i Marijansko-Mončiški sektor). Nove asocijacije se javljaju u termo- i mezo-Mediteranskom termotipu, i pripadaju svezi *Rumici indurati-Dianthion lusitani*, redu *Phagnalo saxatilis-Rumicetalia indurati* i klasi *Phagnalo-Rumicetea indurati*.

Ključne reči: estivalne vrste, *Daucus setifolius*, *Ferulago brachyloba*, nova asocijacija, južna Španija, vegetacija