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Anchusa aegyptiaca (*Boraginaceae*), a new species for the Iberian flora

Abstract

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Anchusa aegyptiaca (L.) DC., a taxon considered native to the Eastern Mediterranean has been recognized in the province of Murcia (south-eastern Spain). Its identity was confirmed by a comparative macromorphological study between Spanish individuals and herbarium specimens from other countries, and a scanning electron microscope study of its floral characters. The presence of this species in the Eastern Mediterranean represents an important disjunction of great paleobiogeographic relevance.

Key words: *Anchusa*, chorology, Iberian flora, Mediterranean flora.

Introduction

The Mediterranean Basin is considered a biodiversity hot spot, the principal factors responsible for the high levels of plant diversity and endemism being its biogeography, paleoecological and climatic history, human influence and ecogeographical heterogeneity (Blondel & Aronson 1999). It is therefore no surprise that an increasing number of studies on the distribution patterns of species, phylogeny, biogeography and paleobiogeography of circumMediterranean or even eurosiberian plants (which used Mediterranean zones as refugia during the ice ages) have appeared in the literature in recent decades (e.g. Petit & al. 2005; Thompson & al. 2005).

Within the Western Mediterranean region, south-eastern Spain (Murcian-Almeriense biogeographical province) is considered one of the most singular and richest areas of Europe due to the high number of endemic species and plant communities, and the presence of iberoafrican taxa, which are unique in Europe. Other taxa, mainly belonging to eastern Mediterranean areas, such as *Enneapogon persicus* Boiss. and *Senecio glaucus* L. subsp. *glaucus* (Freitag 1968; Alcaraz & al. 1998; Sánchez-Gómez & al. 2002), find their only foothold in the Western Mediterranean in this area. The particular distribution pattern of these taxa can be explained by the successive historical climatic events that have occurred in Europe (e.g. Messinian Salinity Crisis, Pleistocene Ice ages, etc) so that it is not rare that taxa which nowadays exhibit an Eastern Mediterranean distribution pattern also appear in western

localities. Such is the case with *Anchusa aegyptiaca* (L.) D. C., a new record for Western Mediterranean areas.

Anchusa aegyptiaca is well known throughout the Eastern Mediterranean Basin, (Saharo-Arabian, Eastern Mediterranean and Western Irano-Turanian biogegraphic regions), where it is considered a native species, while it is considered doubtfully native in more Western locations such as Tunisia and even doubtfully present in Sicily (Greuter & al. 1984).

Material and Methods

Several specimens of *Anchusa aegyptiaca* (of different origins) were studied; six accessions from Herbarium of the University of Murcia (SURESTE in MUB) and six from the Herbarium of the Royal Botanical Garden of Madrid (MA). In addition the morphological characters described in the bibliography were consulted (Tutin & al. 1972; Zohary & Feinbrun-Dothan 1977; Pottier-Alapetite 1981; Pignatti 1982; Ali & al. 1989; Boulos 2000; Selvi & Bigazzi 2003).

Specimens examined: **CYPRUS:** Paphos, Entassement de caillous calcaires en bordure des ruines du chateau bizantin, 11.IV.1992, *Lambinon & van den Sande 92/Cy/196* (MA 526440); Kato Paphos, sables ruderalises dans la zone littorale, 1995, *Lambinon 17395* (MA 589065); Ayia-Anna (Larnaca), Coteau aride calcaire et marneux, 15.IV.1991, *Iter Mediterraneum IV 467* (MA 495609). **GREECE:** Dodekanes, Spaltenreiche steilwande und schotterfacher der schluchtsohle kalkgestein, 16.IV.1994, *Raus 9245* (MA 540630). **ISRAEL:** Jerusalem, Mt. Scopus, 11.III.1931, *Amdursky* (MA 95448). **JORDAN:** 22 km NE H-5, along Mafrag road, 9.IV.1974, *Boulos, Jallad & Labbam*, (MA 267787) **SPAIN:** Puertos de Santa Bárbara, road gutters, 27.III.2004, *Vera* (SURESTE 8363); Puertos de Santa Bárbara, road gutters, 20.III.2007, *Vera* (SURESTE 8362); Puertos de Santa Bárbara, road gutters, 20.III.2007, *Vera* (SURESTE 8361); Sierra de los Victorias, margin of ruderal field, 10.III.2007, *Vera & Martínez* (SURESTE 8366); Sierra de los Victorias, fallow field, 23.III.2007, *Sánchez-Gómez, Jiménez & Vera* (SURESTE 8365); Sierra de los Victorias, track margin, near to *Ceratonia siliqua* cultivation, 23.III.2007, *Sánchez-Gómez, Jiménez & Vera* (SURESTE 8348)

As recommended by Selvi & Bigazzi (2003), scanning electron microscopy (SEMs) was used to show taxonomically important characters of fruits (mericarpids) and flower morphology (faucal scales at the throat of the corolla) of *Anchusa* in detail. Fresh floral structures were fixed in 3% glutaraldehyde with 0.1 M cacodylate buffer at 4 ºC, washed in cacodylate and saccharose buffer dehydrated in a increasing acetone gradients (30%, 50%, 70%, 90% and 100%), critical point dried and sputtered with a gold layer 200-300 Å thick. Fruits were sputtered directly with a gold layer 200-300 Å thick. A Jeol JSM-6100 scanning electron microscope was used in this analysis.

Original drawing was prepared for *A. aegyptiaca* individuals from the newly located populations of SE Spain.

Results and Discussion

According to the morphological and morphometric characters of the herbarium specimens studied, the bibliography, and the comparisons made of fruit (mericarpids) and flower morphology by SEM, our results suggest that the material collected from southeastern Spain corresponds to *Anchusa aegyptiaca* (L.) D.C.

Description (Fig. 1-2)

Annual (or biannual), stems 5-65 cm, erect-ascending, often branched from the base, branches prostrate (often in the most vigorous individuals) or ascending. Indumentum hispid with short hairs and trichomes inserted on basal tubercles. Leaves 20-120 x 10-50 mm, oblongo-ovate to oblongo-lanceolate, with denticulate or dentate margins. Lower leaves petiolate, upper leaves sessile, shorter than the former. Inflorescences cymous, leafy, lax, few-flowered. Pedicels 2-3 mm shorter than calyx, elongated and recurved in fruit. Calyx hispid 3-5 mm, lobes linear-lanceolate, accrescent. Corolla pale yellow, hipocrateriform, 4-6 mm, limb 5-7 mm in diameter, tube as long as calyx. Stamens inserted in the lower half of the tube. Faucal scales exerted, oblong, white-hairy and curved outwards (fig 2). Mericarpids 2-4 x 4-5 mm, dark brown, ovoid, erect, with a subvertical acute beak, and a thick basal ring, reticulate-ribbed and granulate between ribs. Flowering in (December) January-May.

This taxon usually inhabits dry fallow fields, waste and ruderal plains within the termomediterranean belt in semiarid ombroclimate (Sánchez-Gómez & Guerra 2003). Accompanying plants include *Atractylis cancellata, Stipa capensis, Ajuga iva, Hyparrhenia synaica, Medicago littoralis*.

We observed that individuals sampled in more humid places are larger (branches up to 65 cm) and usually have prostrate-ascending branches, as well as a thick axonomorphous root, which suggests vegetative grow in autumn or in early winter. Individuals from drier habitats are usually smaller (from 5 cm) and have a short life cycle with rapid fructification. In this case, flowers usually produce one sole viable mericarpid (the remaining fruits abort). This fact suggests good adaptation to adverse climatic conditions.

Origin of populations in SE Spain

Taking into account the distribution areas of the natural populations (thousands of kilometres away), the Spanish populations may have an adventitious origin. However, both Spanish populations are located in traditionally cultivated lands (almond and carob), which would reduce the probability of receiving invasive exotic species, unlike other zones with intensive crops. The Sierra de los Victorias mountain population is especially isolated and there are no nearby roads. This population was located about three years ago, since when the number of individuals has remained stable. Such findings reinforce the natural origin of this population, which could be considered a latemediterranean species, as indicated in the introduction.

Given the rarity and paleobiogeographical importance of *A. aegyptiaca* in SE Iberia, we recommend it be included in the Regional Catalogue of Threatened Species of the province of Murcia. We also recommend its inclusion in the Red Book of Threatened Vascular Flora of Spain (Bañares & al. 2004).

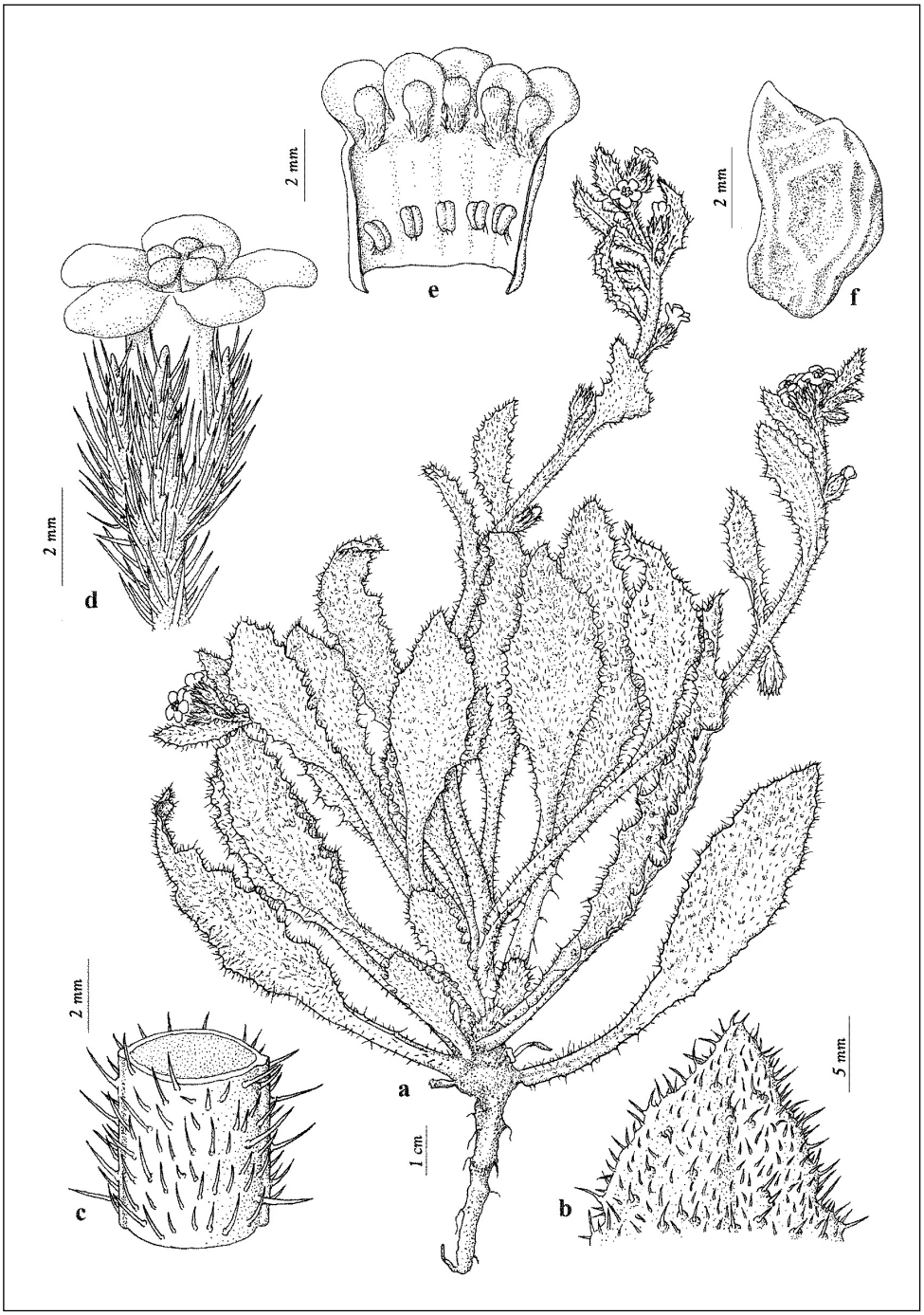

Fig. 1. *Anchusa aegyptiaca*: **a,** Habit; **b,** Leaf apex; **c,** Section of stem; **d,** Flower; **e,** Corolle opened longitudinally; **f,** Mericarpid.

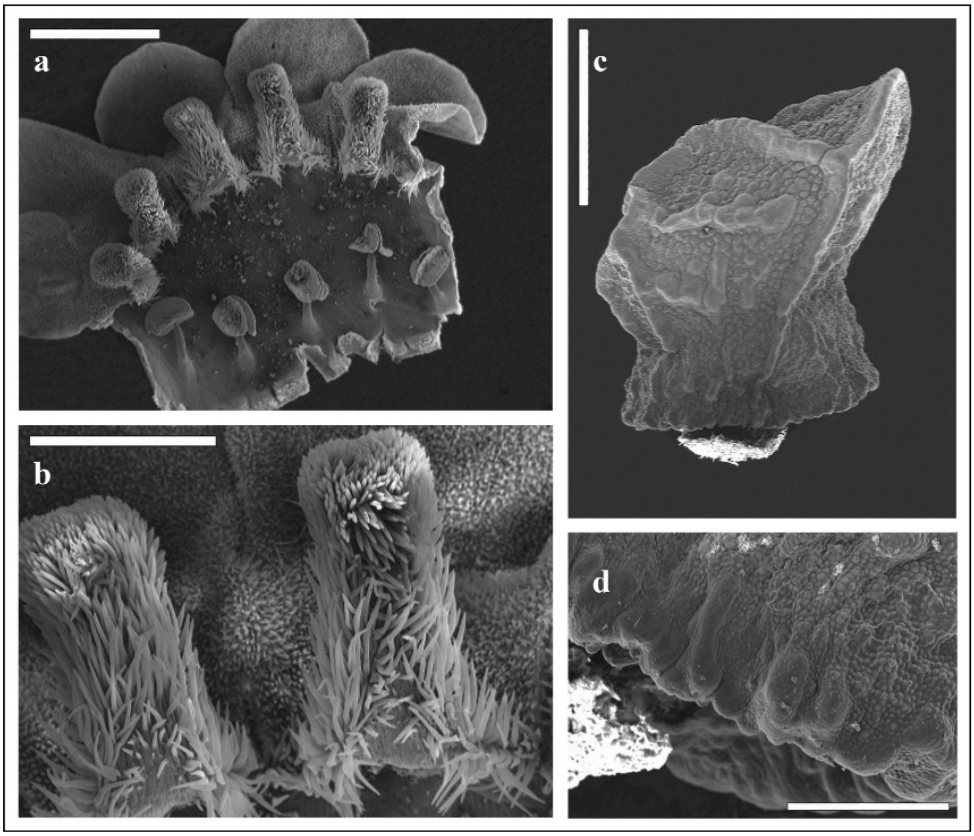

Fig. 2. SEM microphotographs of *Anchusa aegyptiaca*: **a,** Corolle opened longitudinally, scale = 2 mm; **b,** Detail of faucal scales, scale = 1 mm; **c,** Mericarpid, scale = 2 mm; **d,** Detail of mericarpid base. Scale = 500 μm.

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