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Verbascum lydium (*Plantaginaceae*), a new alien species in Spain

Abstract

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Verbascum lydium (*Plantaginaceae*) has recently been found in the Valencian Community, and this population represents a new exotic species for the Spanish flora. *Verbascum lydium* is native to Turkey and East Aegean Islands. In 2023 the species has been located in the port of Castellón, where has successfully reproduced and is forming a stable population in a new urban ecosystem, which opens the possibility to expand in the coming years as other exotic species with invasive potential.

Key words: alien flora, Castellón port, Valencian Community, xenophyte.

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Introduction

Verbascum L. (including *Celsia* L.) is a highly diverse genus of *Scrophulariaceae* (vel *Plantaginaceae* sensu APG 2016). According to Hassler (2022) and Khamar (2022) it is composed by 497 taxa (465 species and 32 subspecies) broadly distributed throughout the Old World, particularly in the temperate northern hemisphere (Murbeck 1925, 1933; Huber-Morath 1978a, 1978b).

Verbascum (excluding *Celsia* L.) includes approximately 360 species (Khamar 2022) and its greatest diversity is located in the Mediterranean region (Murbeck 1939; Heywood 1993; Mabberley 2008; Yilmaz & Dane 2012; Remal 2014; Sotoodeh 2015; Khamar 2022). Further progress on the taxonomy of *Verbascum* has recently been made thanks to molecular studies in the north of the Mediterranean basin and in the Irano-Turanian biogeographic region (Al-Hadeethy & al. 2014; Ghahremaninejad & al. 2014; Remal 2014; Sotoodeh 2015).

In Turkey, 256 *Verbascum* species and 131 additional hybrids occur (Duman 2021). Among them, 201 are Turkish endemic and the endemism ratio is about 80% (Huber-Morath 1978a, 1978b; Özhatay 2006; Karavelioğulları 2012; Yilmaz & Dane 2012; Duman 2021). In 2023 a

population of the Eastern Mediterranean species *V. lydium* Boiss. has been located in the Port of Castellón (Valencian Community, Spain). The native range of this species is East Aegean Islands and West Turkey (Huber-Morath 1978b; Dimopoulos & al. 2013; POWO 2024).

Verbascum lydium was unknown until now in the Valencian and Spanish flora. Its presence is due to the activity of transporting materials (feldspar mineral) from Turkey (via port of Güllük) to Spain for the ceramics industry in the province of Castellón (Port Authority of Castellón, pers. comm.). This communication reports for the first time of the presence of this plant species in Spain.

Materials and methods

The area where the *Verbascum lydium* was found was visited repeatedly during 2023. Herbarium vouchers were collected in May 2023 and deposited in the herbarium of the Jardí Botànic de la Universitat de València (VAL). Plant nomenclature follows Euro+Med PlantBase (Euro+Med 2006).

Results and discussion

Verbascum lydium Boiss., Diagn. Pl. Orient. 1(4): 62. 1844.

Spain: Valencian Community, Castellón Province, Castellón de la Plana, port of Castellón, 39°58'24"N, 0°01'20"E, 4 m, 25 May 2023, *P. Pablo Ferrer-Gallego, Rafael Barrero & Jorge Crespo s.n.* (VAL 253503). – New to Spain.

In May 2023 we found a population of several plants in the port of Castellón, in flower and seeded fruit (Fig. 1). The population grows on the feldspar mineral transported from southwestern Turkey (via port of Güllük) for the manufacture of ceramics in Castellón (Port Authority of Castellón, pers. comm.). The species is accompanied by others such as *Erigeron bonariensis* L., *E. sumatrensis* Retz., *Dysphania botrys* (L.) Mosyakin & Clemants, *Polypogon monspeliensis* (L.) Desf., *Sinapis arvensis* L., *Sonchus tenerrimus* L., *Stellaria media* (L.) Vill., etc.

The plants found in Castellón are biennial, up to 150 cm, densely covered with long branched floccose hairs and shorter persistent glandular hairs; with a robust stem, terete and branched. Basal leaves oblong to obovate-oblong and lanceolate, 10–45 × 4–16 cm, coarsely crenate, sessile or with winged petiole to 5 cm; upper cauline leaves rounded or auriculate at base, crenate-dentate, acute or acuminate. Inflorescence lax, branched, floccose, with cluster of 2(–7) flowers. Lower bracts lanceolate, acuminate, denticulate, upper linear-setaceous. Pedicels 2–7 mm; bracteoles lanceolate. Calyx 5–8 mm, lobes lanceolate, acute. Corolla yellow, 25–40 mm diameter, sparsely tomentose outside. Stamens 5, anthers reniform with 2 anterior decurrent, filaments with purple-violet wool, 2 anterior glabrous near apex. Capsule broadly elliptic to subglobose, 5–6 × 4–5 mm, glabrescent.

Specifically, and according to the intraspecific treatment adopted by Huber-Morath (1978b) we believe that the plants found in Castellón can be identified as belonging to *V. lydium* var. *heterandrum* Murb., showing anthers of 2 lower stamens decurrent and cauline



Fig 1. *Verbascum lydiium* in the Port of Castellón (Valencian Community, Spain), May 2023.

leaves shortly decurrent. However, this name is treated as a heterotypic synonym according to POWO (2024).

The port of Castellón has a typical Mediterranean climate. The average temperature is 18°C. The absolute maximum temperatures have reached 30.7°C, while the absolute minimum temperatures have reached 6.4°C. In Castellón, an average of 470 mm of rain falls per year (see <https://www.aemet.es/es/portada>).

The flowering period of this population in the port of Castellón is from the end of March to the beginning of July. In May 2023 the population of Castellón included c. 25 flowering individuals and c. 10 vegetative plants.

Our results confirm that this species reproduces successfully in Castellón and could be a potentially invasive species in this area. In the coming years we will continue to monitor this population and nearby areas to check its possible expansion in the territory. In this sense, outside its native distribution area, several species of the genus *Verbascum* are naturalized in other regions around the world, i.e. the United States of America, Canada, South Africa, Hawaii, Mexico, Chile, Hispaniola, Argentina, Australia, New Zealand, the Indian Ocean island of La Reunion, and Japan (Gross & Werner 1978; Gross 1980; Mito & Uesugi 2004; Baret & al. 2006; Williams 2010; Alba 2011; Jaca 2017; Scaramuzzino & al. 2018; Nesom 2019). These biological invasions constitute a risk not only to ecosystems but also to the genetic integrity of some local species due to hybridization between species of this genus, a frequent and well-studied biological process in *Verbascum* (see Kölreuter 1784; Franchet 1868; Halácsy 1898; Kotov 1960; Alba 2011; Stace & Easy 2015). There are many cases in which hybridization between native and alien species has led to the creation of new taxa with colonization and dispersal capacities much greater than those of the parental species, and can therefore cause a serious risk to ecosystems (Ellstrand & Schierenbeck 2006; Blair & Hufbauer 2010; Staudé & Ebersbach 2023).

In addition to the transport of feldspars from Turkey, the presence and *in situ* germination of *V. lydiium* in Castellón can be explained by the presence of a threatened bird, the Audouin's gull (*Ichthyaeetus audouinii* (Payraudeau, 1826)), in the same area. In this sense, this species began nesting in the port of Castellón in 2011, although it was in 2020 when the first nests -around 250- were detected for the first time in the accumulated feldspar deposits. In 2023, the total number of Audouin's gull breeding pairs in the port was 2.661, of which 126 were located in the stockpiles area. This seabird is listed as 'Vulnerable' in the Spanish Catalogue of Endangered Species (Real Decreto 139/2011, BOE-A-2011-3582) and the Valencian Catalogue of Endangered Fauna Species (Decreto 32/2004, DOGV 4705; Orden 2/2022, de la Conselleria de Agricultura, Desarrollo Rural, Emergencia Climática y Transición Ecológica), so during the breeding season (from early April to mid-July), industrial activity and movement of people in the nesting areas are restricted. The non-use of these deposits for a certain period of time favors the germination of the seeds that carry as stowaways the feldspars coming from Turkey. Without the presence of this bird, the feldspars are usually used almost immediately without being detained for long periods of time, which does not allow time for the seeds to germinate or, at least, for the plants to complete their biological cycle.

Another question that remains to be resolved is, if wherever the migratory birds that pass through Castellón go, they carry with them seeds of this species that come from Turkey, that is, is the port of Castellón a springboard (or stepping stone) for the alien species such as *V. lydiium* to reach Africa through the Audouin's gull?

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