

Rapid Communication**First record of *Sphaeralcea bonariensis* (Cav.) Griseb. (*Malvaceae*) as a casual alien species in the Mediterranean area**Michele Aleo¹, Salvatore Cambria^{2,*}, Pietro Minissale² and Giuseppe Bazan³¹Via S. Safina, 1 – 91100 Rillievo, Trapani, Italia²Department of Biological, Geological and Environmental Sciences, University of Catania, Via A. Longo 19, 95125, Catania, Italy³Dipartimento di Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche (STEBICEF), Università di Palermo, 90123, Palermo, Italy

*Corresponding author

E-mail: cambria_salvatore@yahoo.it

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OPEN ACCESS**Abstract**

Sphaeralcea bonariensis (Cav.) Griseb. is here reported for the first time as alien species in Italy and in the Mediterranean area. It is a perennial shrub native to Southern America, where it is often considered a ruderal species frequent in cultivated areas. It was found in a population of a few individuals within *Opuntia ficus-indica* groves of Rocca Palumba territory (Western Sicily). Actually, due to short-term observational period and the low number of plants, *Sphaeralcea bonariensis* should be considered as a casual species in Italy. The ecological characteristics of the growing stand and the consistency of the population, as well as the possible causes of its introduction, are briefly discussed.

Key words: alien species, vascular flora, xenophytes, Italy, Sicily, invasive species**Introduction**

The ongoing spread of invasive alien species is a major environmental issue for global biodiversity and ecosystem degradation (Pyšek et al. 2020), representing a particular serious concern in the Mediterranean area, one of the world's most diverse biodiversity hotspots (Médail and Quézel 1999). The increasingly globalised trade and transport networks have greatly favored the spread of alien species from different areas of the world (Seebens et al. 2017). Accidental introduction represents the main source of invasive plants and the progressive environmental degradation of natural ecosystems can represent a further support for their rapid spread. Consequently, the monitoring of these species assumes an essential role to understanding their dynamics in new habitats, and to plan control strategies (Pyšek and Richardson 2010).

During floral surveys in the territory of Western Sicily few individuals of *Sphaeralcea bonariensis* (Cav.) Griseb. have been observed in the countryside near the village of Rocca Palumba (Palermo). This species is native to

South America. In particular, it is reported from Bolivia, Paraguay, Uruguay, Chile and Argentina (Degen and Mereles 1996; Rodriguez and Rainero 2004; Zuloaga et al. 2008; Sobrero et al. 2014; Jørgensen et al. 2014). In its natural range it often behaves like a weed linked to ruderal environments, roadsides, fallows, and arable land, also thanks to its resistance to glyphosate (Ghersa et al. 2002; Rodriguez and Rainero 2004; Sobrero and Chaila 2006). In recent years, the species has been reported as an invasive species in areas outside its range, such as South Africa (Wells et al. 1991), Brazil (Grings and Iob Boldrini 2011) and United Arab Emirates (UAE) (Gairola et al. 2015). In Europe this species was recorded only in Belgium as a very rare and ephemeral alien near Verviers and Merksem (Verloove 2006, 2021). It was considered as casual, being reported from a demolition site of a former oilseed mill and as a wool alien. According to Gairola et al. (2015), the introduction of *S. bonariensis* in the UAE was probably accidental and may have been derived from imported agricultural products from South America or Southern Africa.

As regards the Italian territory, *S. bonariensis* is not reported in the national alien flora checklist by Galasso et al. 2018, nor it is ever recorded in the literature from other Mediterranean countries. Therefore, this new record confirms the significant increase in the spread of potentially invasive alien species in the flora of Mediterranean area and particularly in Sicily where several new xenophytes have been recorded in recent years (Cambria et al. 2015; Sciandrello et al. 2016; Badalamenti 2021; Guarino et al. 2021). The only related species recorded in Europe and in particular in Sweden (Karlsson 1997) is *S. angustifolia* (Cav.) G. Don, a North American plant with very tall stems (up to 2 m), leaves long and narrow, usually unlobed, with a prominent midvein, flowers clusters near the tops of the stems and with a very variable color (red, pink or orange).

Materials and methods

The identification of the species was realized on living material and dry specimens. The specimens are stored in the Herbarium of the University of Catania (CAT, herbarium acronyms follow Thiers 2021). We have consulted the available literature and websites (Krapovickas 1948, 1966; De Marzi 2006; Grings and Iob Boldrini 2011; Aceñolaza et al. 2019; Anton and Zuloaga 2021), useful for the identification of this taxon, as well as some herbarium specimens stored in www.gbif.org.

The plant communities in which the species is present have been studied with the phytosociological method (Braun-Blanquet 1964). Furthermore, the risk assessment protocol for invasive alien species was used to identify the risk class (Weber and Gut 2004). The global distribution of *S. bonariensis* was represented on basemap by ESRI (2002).

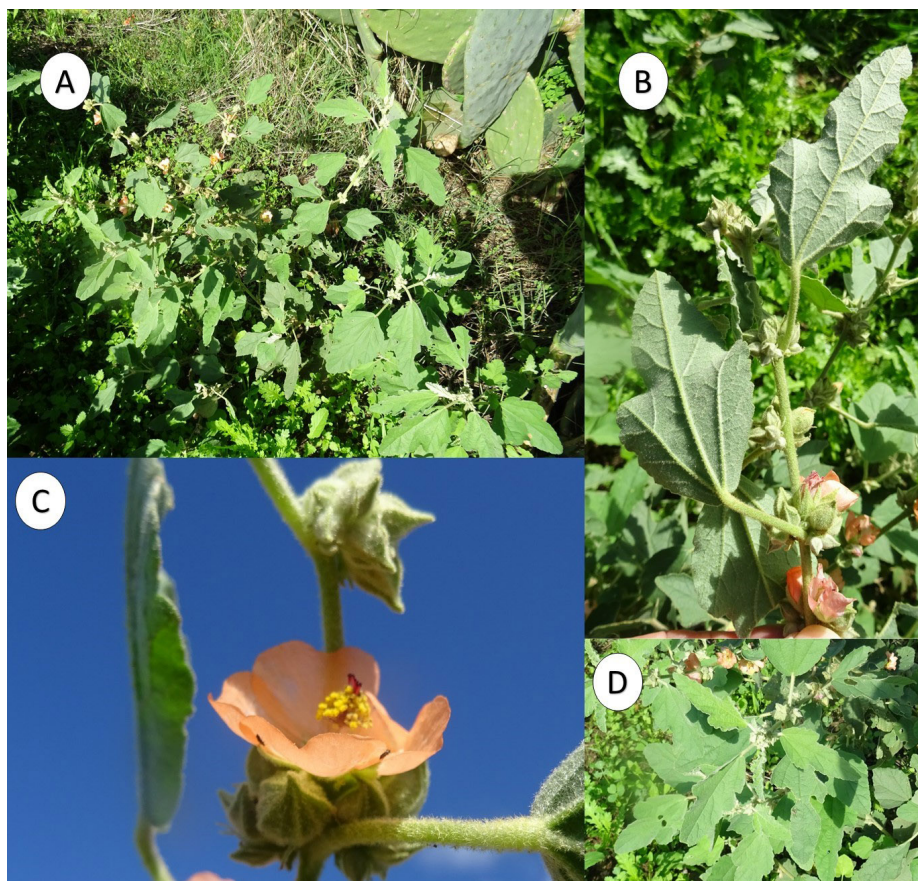


Figure 1. *Sphaeralcea bonariensis* from Sicily: habitus (A); lower surface of leaves (B); details of flower (C); upper surfaces of leaves (D). Photos by M. Aleo.

Results and discussion

Sphaeralcea bonariensis (Cav.) Griseb. in Abh. Königl. Ges. Wiss. Göttingen 19: 92 (1874)

Main synonyms: *Malva bonariensis* Cav. in Diss. 2, Secunda Diss. Bot. 69 (t. 22, f. 1) (1786); *Malva incana* C.Presl in Reliq. Haenk. ii. 121; *Sphaeralcea cisplatina* A.St.-Hil. in Fl. Bras. Merid. (A. St.-Hil.). i. 210; *Sphaeralcea rhombifolia* Griseb. in Abh. Königl. Ges. Wiss. Göttingen 19: 92 (1874).

Sphaeralcea bonariensis (Figure 1) is a shrub or sub-shrub until 1–1.50 m high, erect, covered by greyish stellate hairs. The leaves have a peduncle 2–6 cm long and a rhomboidal blade, 3-lobed, with toothed or crenulated margins. Both faces are covered with stellate hairs, mostly in the lower one. The flowers are axillary, generally shorter than the leaves and with filiform bracts. The calyx is campanulate and tomentose. Petals are 10 mm long, pinkish-orange to light pink. The fruits are mericarps with 1–3 seeds, 4 mm × 2 mm (De Marzi 2006; Aceñolaza et al. 2019; Anton and Zuloaga 2021).

The surveyed population consists of about ten plants growing within prickly pear groves located in Contrada Le Rocche near Rocca Palumba (PA) (Figures 2, 3). This stand has an altitude of 335 m a.s.l. and is characterized by flat surfaces and clayey soils of the thermomediterranean dry bioclimatic belt (Bazan et al. 2015). The species is part of a weed vegetation



Figure 2. Location of *S. bonariensis* in Sicily (red square) at 37°48'25.68"N; 13°40'27.51"E. Basemap by European Environment Agency (2018).

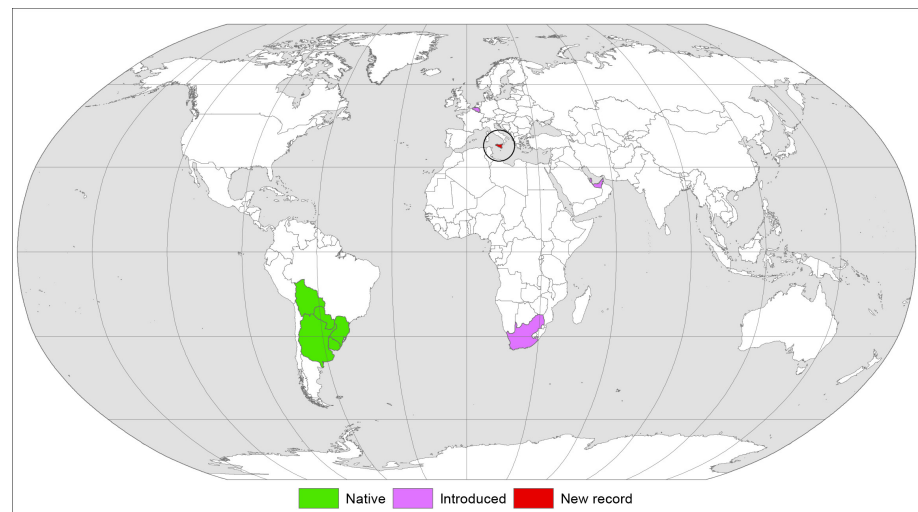


Figure 3. Global distribution of *S. bonariensis*. Basemap by ESRI (2002).

with a prevalent summer-autumn phenology linked to irrigated surfaces, characterized by the high coverage of *Amarathus retroflexus*, *A. viridis*, *Chenopodium album*, *Mercurialis annua*, *Urtica membranacea*, etc. From the phytosociological point of view, this community can be referred to the class *Chenopodietea* Br.-Bl. in Br.-Bl. et al. 1952 (Table 1).

According to the methodology described by Weber and Gut 2004, the sum of points for *S. bonariensis* in Italy amounts to 26/39, and the species can be categorized as intermediate risk, it requires further observation. Following the classification by Pyšek et al. (2004), *S. bonariensis* in Italy should be considered as a casual alien plant. The species therefore deserves careful monitoring, evaluating the dynamics of the population and its possible expansion in other areas with similar ecological features.

Table 1. Phytosociological relief of plant community with *S. bonariensis* in Sicily.

Date	8 December 2021
Area (mq)	50
Altitude (m a.s.l.)	336
Slope %	5
<i>Sphaeralcea bonariensis</i> (Cav.) Griseb	1
Char. Chenopodietea	
<i>Amaranthus retroflexus</i> L.	3
<i>Chenopodium album</i> L.	2
<i>Diploaxis erucooides</i> (L.) DC.	1
<i>Mercurialis annua</i> L.	1
<i>Urtica membranacea</i> Poir.	1
<i>Amaranthus viridis</i> L.	+
<i>Borago officinalis</i> L.	+
<i>Erigeron bonariensis</i> L.	+
<i>Malva sylvestris</i> L.	+
<i>Oxalis pes-caprae</i> L.	+
<i>Sonchus oleraceus</i> L.	+
Other species	
<i>Solanum villosum</i> Mill.	+
<i>Convolvulus arvensis</i> L.	+
<i>Glebionis coronaria</i> (L.) Spach	+

It can be assumed that its presence derives from an accidental introduction, perhaps linked to the presence of its seeds in compost or batches of seeds intended for agricultural use. Alternatively, it can be hypothesized that the arrival of the species may be linked to the railway occurring in the immediate vicinity of the agricultural land, since at least in some cases this transport network can play a role in the spread of invasive species (Ascensão and Capinha 2017; Gianguzzi and Bazan 2020). Conversely, it can be reasonably excluded that the species was introduced as an ornamental plant and then escaped from the gardens, both because the species does not result to be used for this purpose in Italy and also for the significant distance from inhabited areas.

However, we presume a very recent introduction, as the species was first seen by the farm owners about 2 years ago and since that moment, despite the use of herbicides, the small population has persisted and slowly expanded. However, we strongly advised the farmer to proceed with the mechanical eradication of the specimens present to prevent their further spread and avoid the use of additional resources for its future management. Besides, the occurrence of other populations in the nearby areas cannot be excluded, also because the area is characterized by extensive private properties that are difficult to access.

In conclusion, this first record about the spread of *S. bonariensis* in the Mediterranean area need to be immediately contained and adequately monitored, since it may represent a future threat for native flora, particularly for autochthonous ruderal species, as well as for economic performance of agricultural lands in consideration of its particular tolerance to pesticides.

Specimina visa

Italy: Sicily, Contrada Le Rocche, Rocca Palumba (Palermo), ruderal vegetation within *Opuntia ficus-indica* groves, 37°48'25.68"N; 13°40'27.51"E, 28 November 2021, Legavit: M. Aleo. Determinavit: S. Cambria, *s.n.* (CAT).

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Authors' contribution

M. Aleo: investigation and data collection; S. Cambria: sample design and methodology; data analysis and interpretation; original draft; review and editing; P. Minissale: sample design and methodology; data analysis and interpretation; review and editing; G. Bazan: sample design and methodology; data analysis and interpretation; review and editing.

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