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Rapid Communication

First record of *Iris pseudacorus* L. (Iridaceae) in natural and artificial wetlands of western dryland, Argentina

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Abstract

Iris pseudacorus is an invasive macrophyte in wetland ecosystems around the world. In Argentina, its distribution range covers the eastern and central regions, registering its presence in protected, natural and artificial wetlands. We report its presence in desert natural wetlands and artificial irrigation systems (Mendoza River and Tunuyán River basins, Mendoza). We provide a description of the specimens and photographic material, adding new georeferenced records and the first specimens to scientific reference collections of drylands in western Argentina.

Key words: aridlands, invasive species, Mendoza, wetlands, yellow flag iris

Introduction

Iridaceae is a family of monocotyledonous flowering plants, including ca. 70 genera, with 2000 species widely distributed throughout the world mainly in South Africa, the East Mediterranean, and Central or South America (Goldblatt et al. 1998, Goldblatt and Manning 2008; Xu and Chang 2017). Within the Iridaceae family, *Iris* L. is the largest genus comprising about 300 species distributed in the temperate Northern Hemisphere.

These perennial plant species are cultivated for their high ornamental value and can be found in dry ecosystems, from grasslands, woodland to rocky mountainous areas (Kamenetsky and Okubo 2012). Plants of this genus have actinomorphic flowers with unequal tepals, they are rhizomatous or bulbous plants.

In Argentina, the genus *Iris* is represented by four introduced species: *I. germanica*, *I. pseudacorus*, *I. orientalis* and *I. unguicularis*. So far none have been cited in the western region of the country (Mendoza province) (floraargentina.edu.ar).

Iris pseudacorus L. (yellow flag iris), is a macrophyte native to Europe, North Africa and western Asia. It forms dense patches along streambanks and in shallow water around lakes and ponds (Jacobs et al. 2010). Its potential to occupy different types of soil, its resistance to salinity and its

tolerance to high levels of organic matter and low levels of oxygen (Jacobs et al. 2010) have facilitated its expansion beyond its native range, becoming an invasive species in wetland ecosystems around the world (Minuti et al. 2022).

The presence of *I. pseudacorus* in Argentina has been recorded since 1931 in the humid regions corresponding to the north of the province of Buenos Aires, Delta of Paraná. The probable cause of its introduction is cultivation for ornamental purposes, which could have caused the escape of individuals observed forming dense clumps in canals and ditches (Burkart 1949). Recent studies have documented the notable advance in the distribution of this species in a diversity of habitats reported particularly in the eastern and central region of Argentina (Gervazoni et al. 2020).

In this work we report for the first time the presence of *I. pseudacorus* in natural and modified habitats of the western dryland of Argentina and the deposition of the first specimens in the botanical scientific collections of western Argentina.

Materials and methods

Study area

The specimens were recorded (sites 1, 2 and 3) and collected (site 1 and site 2) in natural and modified habitats located in the north-central region of Mendoza, Argentina (site 1: −32.839067°; −68.601860°, site 2: −33.613952°; −69.083706°, site 3: −33.560715°; −69.016881°, WGS84 coordinate system) (Figure 1). The region belongs to the Monte Desert biome with annual rainfall of less than 200 mm (Morello 1958). Site 1 (La Paloma lagoon) is located in natural wetlands (Leyes-Tulumaya streams) in the Mendoza river basin. This wetland is located within an agricultural landscape with vineyards and vegetable crops. Riparian habitats are characterized by dense formations of *Scirpus californicus*, *Tipha dominguensis* and *Cortaderia selloana*. Flooded halophilic habitats include facies of *Salicornia* sp., *Distichlis* sp., *Juncus* spp., *Xanthium* sp. and *Suaeda* sp. (Contreras and Fernandez 1980). Site 2 and 3 are located in the Tunuyan river basin, in a patchy agricultural landscape with vineyards, orchards, and vegetable crops. The landscape is crossed by water conduction networks for agricultural use and human and industrial consumption, made up of 2,250 km of irrigation canals.

Methods

The collected specimens were deposited in the MERL herbarium (Mendoza Ruiz Leal) IADIZA CONICET Mendoza, with the following numbers: MERL 65261 and MERL 65320. The description is based on two individuals collected during October and November 2022. The taxonomic identification was made through specific bibliography with species keys (Cabrera 1968; Dimitri 1972).

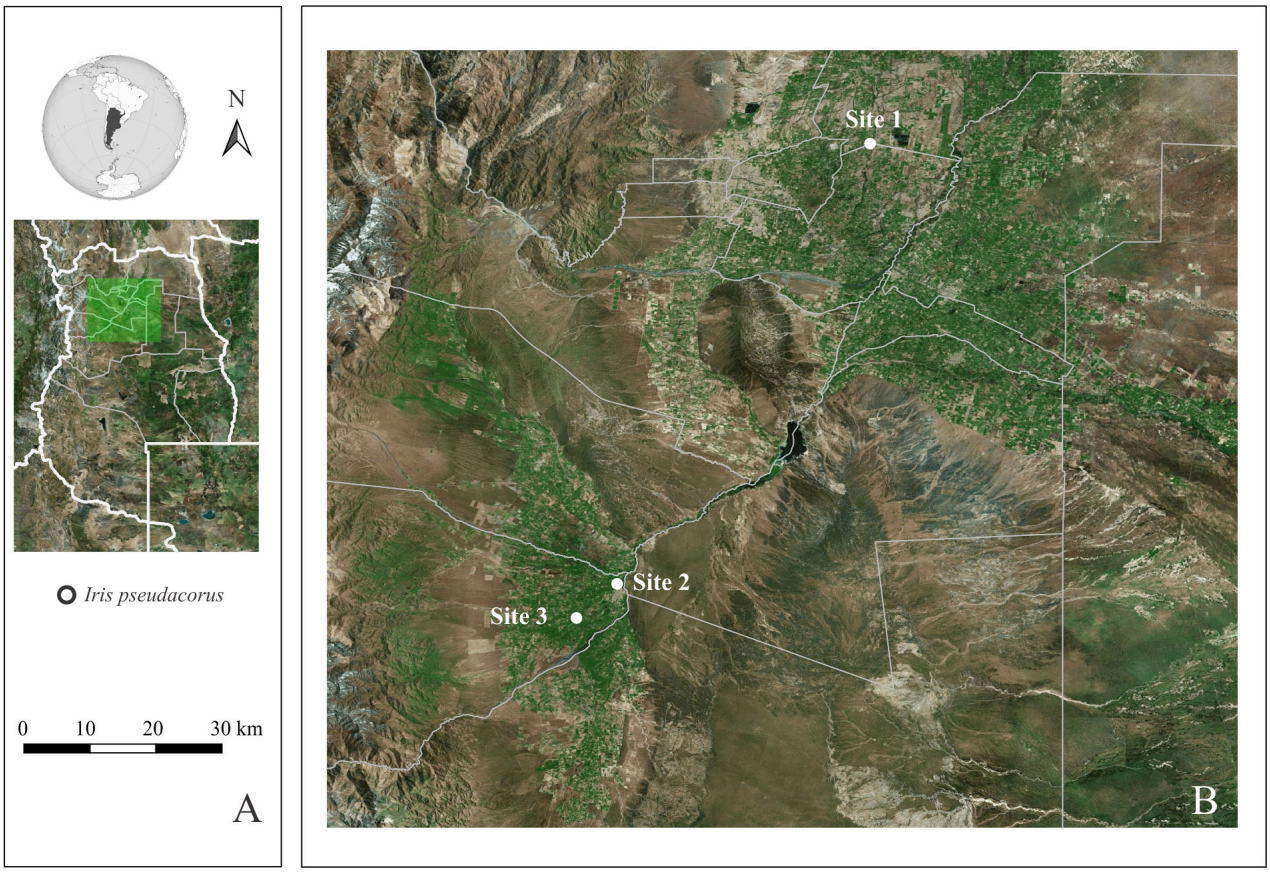

Figure 1. A. Map of the study area showing the presence of *Iris pseudacorus* in Mendoza, Argentina. B. Collection sites of *I. pseudacorus* in the Mendoza River basin (site 1) and Tunuyán River basin (sites 2 and 3) in the western region of Argentina

Results and discussion

Morphological description of I. pseudacorus *in Argentina*

Marsh plants forming dense patches, with rhizomes, from 75 to 230 cm tall. Rhizome thick, branched, 3 to 5 cm in diameter. Roots 10 to 30 cm long. Leaves as long as the stems, dark green, pruinous, ranging from 50 to 100 centimeters. Median veins more prominent, and provided with aerenchyma, 3–3.8 cm wide, somewhat recurved towards the apex. flower stems almost cylindrical or somewhat compressed, often branched. 2–3 solitary spathes located below each flower, 7.5–11.5 cm long, with scarious margins lacking green color. Yellow flowers of 5.7–8 cm in diameter. Outer tepals spatulate, ungulate, 6.5–7 cm long and 2.9–3.5 cm wide; lamina with brown ray striations towards the base. Inner tepals almost obsolete, oblanceolate, erect, about 2.2–3 cm long. Stamens patent below the branches of the style; filaments 11–13 mm long; anthers oblong linear, about 13–16 mm long. Ovary oblong approximately 22–27 mm long. Branches of the patent style, about 3.2–4.2 cm long; ridges 8–11 mm long.

Oblong capsules of 6–8 cm long and 18–22 mm wide. Seeds discoid, colored brown, light, about 7.5 mm wide. Based on the morphological attributes analyzed, the species described corresponds to *Iris pseudacorus* L. Figure 2 shows photographs of a specimen collected and analyzed in this study.

Figure 2. A. Patches of *Iris pseudacorus* in dryland wetlands of Mendoza, western Argentina. B. *I. pseudacorus* specimen collected in the Mendoza River basin and deposited in the MERL herbarium (IADIZA, CONICET - Mendoza). C. Detail of branch with flowers of *I. pseudacorus.* Photographs by Tabeni S. and Bender B.

Key to the Iris *species present in Argentina:*

1. Outer tepals devoid of ridges or wattles, though sometimes pubescent..2
–. Outer tepals hairy, bearded or crested .....*I. germanica*
2. Linear leaves..... *I. unguicularis*
–. Ensiform leaves.....3

3. Flowers generally white, with a golden-yellow spot on the outer tepals, terrestrial plants ..... *I. orientalis*
–. Yellow flowers, stems with several well-developed leaves, marsh plants... .....*I. pseudacorus*

Habitat and management

In our study *I. pseudacorus* was found forming patches along channel edges and riparian areas within agroecosystems. There is currently no information about the time of its introduction in the region, but the construction works of the canal network, the modification of the natural course of the rivers and agricultural development in the western region of Argentina date from at least the 19th century (Prieto et al. 2012) and could suggest the presence of *I. pseudacorus* in the landscape even before our discovery. Recently it has been proposed that biological invasion and climate change, can act synergistically and accelerate degradation of drylands and wetlands in particular (Ravi et al. 2022). In arid zones, the demand for water consumption and changes in land use are exerting unprecedented pressure on aquatic and aquifer ecosystems, which favors scenarios of plant invasions (Parra et al. 2021). Due to the fact that in arid landscapes, water management strategies form networks linking natural water bodies (i.e., rivers, streams, lagoons) with man-made systems, the resulting spatial connectivity can be a catalyst for the establishment of exotic plants, facilitating their propagation through the landscape (Hood and Naiman 2000). Connection between water network is particularly important for aquatic plants, such as the *Iridaceae*, since they present a rapid dispersal and growth that increases invasiveness in riparian zones (Urrutia-Estrada and Hauenstein 2021; Matema et al. 2022). In addition, our first record in the Leyes-Tulumaya wetland system constitutes an alarming signal about the degradation processes affecting these ancient wetlands since the 18th century, where the modification of the landscape by channeling, agricultural effluents, loss of biodiversity and ecological connectivity has increased notoriously (Prieto et al. 2008).

The evidence provided here agrees with the expected patterns of *I. pseudacorus* expansion in the southern hemisphere (Minuti et al. 2022), also suggesting that the advance of human activity in proximity to wetlands and water conduction infrastructures would constitute an important factor to consider when monitoring the presence of *I. pseudacorus* in drylands. Many works have highlighted the biological traits of *I. pseudacorus* that give it great plasticity allowing to occupy a wide range of habitats and to withstand high levels of disturbance (Sutherland 1990). These traits make its management a challenge in different regions of the world. In South America, particularly in Argentina, *I. pseudacorus* lacks a current policy on its management, however a recent study (Gervazoni et al. 2023) has explored new tools, through citizen science databases, in order to obtain

complementary information to traditional methods of sampling to build invasion risk maps and detect vulnerable areas where management and prevention actions can be carried out.

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Ethics and permits

Permit details: Research permit, Dirección de Recursos Naturales Renovables (Mendoza, Argentina) RIT-2022-1221-GDEMZA-DRNR.

Authors' contribution

ST, research conceptualization; ST, LB, BB, data collection; LB, herbarium consult and evaluation of taxonomical and systematic aspects; ST, writing – review and editing the manuscritpt; BB, LB review and editing figures; ST, funding provision

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