



Communication Could the Roadside Shrines Be a Source of Alien Plant Introductions? The Example of the 'Difunta Correa' Shrine in Almería (Spain)

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Abstract: Ornamental gardens are probably the most important source of invasive alien plants. However, the role of roadside shrines as a source of alien plant introductions remains unexplored. Herein, we are reporting the cultivated alien flora of a roadside shrine (devoted to the 'Difunta Correa') in south-eastern Spain, while making a prior assessment of the risk of spreading in the surroundings. In an area of less than 50 m², up to 20 plant taxa were identified, with the vast majority of them being alien. Some of the observed alien taxa can be very problematic (e.g., *Kalanchoe* × *houghtonii*) and are even included in the Spanish catalogue of invasive species (such as *Opuntia ficus-indica*). Although the shrine is not affecting the local biodiversity yet (though a few taxa are showing the first signs of spread), it is located just 1 km away from a valuable protected area (included within the Natura 2000 network of the European Union and also recognized as a Ramsar site). Roadside shrines and similar places (e.g., memorials or calvaries) should be, thus, regarded as a potential source of alien plant introductions; thus, monitoring is recommended, particularly when close to protected areas.

Keywords: cultivated plants; escaping; invasive alien species; protected areas; religion; sacred places

1. Introduction

Most of the current and recent plant invasions are of ornamental flora [1]. Plants often escape from their cultivation place and can even become established and spread further (i.e., behaving as invasive species). Thus, sites showing high ratios of cultivated plant taxa per square meter are well-known sources for the introduction of invasive plants. It is not surprising that recent studies have demonstrated that botanical gardens have played and continue to play a major role in facilitating alien plant introductions [1–3]; more than half of the world's so-called worst invasive species have been introduced through botanical gardens [4], although the role of domestic gardens cannot be dismissed [1,5]. Cemeteries have also been demonstrated to work as 'hubs' for alien plant species dispersal [6], which is very likely connected to the fact that cemetery floras often contain high proportions of alien species [7]. However, the role of other areas rich in cultivated plant species, such as shrines, sanctuaries or sacred places as sources of alien plant introductions is poorly known at best.

While doing fieldwork for inventorying alien flora in Almería Province (south-eastern Spain), one of the authors of the present paper (J. López-Pujol) found by chance a strange group of small-sized chapel-like buildings and rough constructions on a roadside (Figure 1A). In addition to its strange appearance, it drew attention for its unusual concentration of cultivated plant species, with most of them being of ornamental origin. This place proved to be a shrine devoted to the 'Difunta Correa', a semi-pagan legendary figure in Argentine folk-religion (extended now to some parts of Chile and Uruguay). It is believed that the



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Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). legend of the 'Difunta Correa' (the 'Deceased Correa' in English) came from the story of a woman (Deolinda Correa) who died in the desert following the tracks of her captured military husband around 1830–1840, but her newborn baby survived thanks to her endless breast milk, even after death [8]. To calm the thirst of Deolinda Correa, devotees offer her water, so shrines devoted to the 'Difunta Correa' are almost invariably surrounded by many plastic bottles [9]. Probably linked to the growing community of migrants from Argentina in Spain, the shrine harbored its first buildings in 2010 [10], and it is probably the only of its kind outside South America. It is estimated that this folk belief has up to seven million followers across the world [11].



Figure 1. General view of the 'Difunta Correa' roadside shrine: (**A**) in Almería, south-eastern Spain; (**B**) plantlets of *Kalanchoe* \times *houghtonii* established in nearby rock cracks; (**C**) dispersal of *Opuntia ficus-indica* cladodes down the cliff.

2. Materials and Methods

An inventory of the cultivated plants within and in the immediate surrounding of the shrine (located at the roadside of AL-9006 in El Ejido, 36.706° N, 2.786° W) was performed

in late March 2024. As cultivated plants, we considered all these species that had clear signs of cultivation within or nearby the shrine (i.e., they were planted in pots or flowerbeds, or their planting site was delimited with stones). Fieldwork in a buffer area (of about 50 m) around the shrine was also carried out in order to search for possible escapees. Vouchers were not collected, given the sacred nature of the place. However, all cultivated individuals were profusely photographed (Supplementary Figure S1; additional pictures are available upon request) in order to facilitate ex situ identifications, which were based on either the authors' expertise (most of the species are common alien plants in Spain) or on relevant floras or monographs. The names of taxa have been updated according to Tropicos (https://tropicos.org/name/Search; accessed on 25 March 2024) and Plants of the World Online (https://powo.science.kew.org/; accessed on 25 March 2024). Authorities of plant names follow the International Plant Names Index (https://www.ipni.org/; accessed on 27 March 2024).

For each of the identified plant taxa, we are providing the family (based on the APG IV [12]), the native status (alien/native) and the geographic origin if alien (mostly obtained from Plants of the World Online) and finally, the invasion stage (i.e., casual, naturalized or invasive) at national level. Information on the invasion stage was based on (1) the *Atlas of Invasive Alien Plants of Spain* [13], an excellent account which today should be regarded as outdated, and (2) a preliminary unpublished list that is the backbone of the future *Catalogue of Alien Plants of Spain* (Gómez-Bellver, C.; López-Pujol, J.; Martínez, F.; Novoa, A.; Nualart, N.; Patiño, J.; Sáez, L., unpubl. data).

3. Results and Discussion

Up to 20 plant taxa were identified in an area of less than 50 m² (Table 1), with the vast majority of them being introduced non-native plants (18 out of 20). Some of the observed alien plant taxa are behaving as invasive in Spain, particularly Kalanchoe × houghtonii and Opuntia ficus-indica (the latter is listed in the Spanish National Catalogue of Invasive Species [14], which is the list of species banned by the Spanish authorities; Table 1). These two taxa perform very well in the semi-arid, rocky places of Spain, as in the 'Divina Correa' shrine location. Indeed, K. × *houghtonii* is already producing vigorous offspring and is showing the first signs of spread (Figure 1B). In addition, detached cladodes of O. ficus*indica* can already be found nearby (and could root easily; Figure 1C). These two taxa have been demonstrated to produce significant ecological damage in Spain [15,16] and, indeed, O. ficus-indica is the object of eradication actions in, e.g., the Costa Brava, in NE Spain (https://lifemedcliffs.org/en/project/; accessed on 28 March 2024). Lonicera *japonica* (if further confirmed—qualified as *confer* in Table 1) is also a well-known invader in Spain with a high potential of escaping from cultivation, as recently reported [17]; this species seems to be absent in Almería Province, so a hypothetical escape from the shrine is highly concerning. The case of *Ficus carica*, however, is likely different. This species, despite behaving as an invasive species in Spain (Table 1) in strictly biological terms (i.e., a naturalized species that can spread over a large area [18]), is an archaeophyte that has been present in southern Spain since at least the 8th century BC [19] and today occurs in almost every corner of Mediterranean Spain (https://www.gbif.org/species/5361909; accessed on 29 June 2024). Other taxa listed in Table 1, though not categorized as currently invasive at country level, have been observed proliferating locally; these are the cases of Mesembryanthemum × vascosilvae and Opuntia monacantha (J. López-Pujol and C. Gómez-Bellver, pers. obs.). Even plants listed as just 'casual' can be locally problematic; for example, Aloe vera has been recently listed as an 'incipient invader' in the geographically close Alboran Coast [20], which includes the coastlines of Granada and Málaga, also in southern Spain.

| Таха | Family | Native Status (and Geographic Origin if Alien) ¹ | Invasion Stage ² |
|---|----------------|--|-----------------------------|
| <i>Agave</i> sp. | Asparagaceae | Alien | |
| Aloe vera (L.) Burm. f. | Asphodelaceae | Alien—Asia Temperate (Oman) | C, N |
| Artemisia arborescens L. | Asteraceae | Alien—Africa, Asia Temperate and Europe | —, N |
| Cereus hildmannianus K. Schum. | Cactaceae | Alien—Southern America (Brazil) | I, C |
| <i>Crassula ovata</i> (Mill.) Druce | Crassulaceae | Alien—Africa | С, С |
| Delosperma echinatum (Lam.) Schwantes | Aizoaceae | Alien—Africa (South Africa) | <u> </u> |
| Dracaena trifasciata (Prain) Mabb. | Asparagaceae | Alien—Africa | —, C |
| Ficus benjamina L. | Moraceae | Alien—Asia Temperate, Asia Tropical and Australasia | —, C |
| Ficus carica L. | Moraceae | Alien—Asia Temperate and Europe (Greece) | N, I |
| Haemanthus albiflos Jacq. | Amaryllidaceae | Alien—Africa (South Africa) | —,— |
| Kalanchoe blossfeldiana Poelln. | Crassulaceae | Alien—Africa (Madagascar) | —,— |
| Kalanchoe \times houghtonii D.B. Ward | Crassulaceae | Alien—Artificial hybrid | —, I |
| Kroenleinia grusonii (Hildm.) Lodé | Cactaceae | Alien—Northern America (Mexico) | —,— |
| Lonicera cf. japonica | Caprifoliaceae | Alien—Asia Temperate | I, I |
| <i>Mentha</i> $	imes$ <i>rotundifolia</i> (L.) Huds. | Lamiaceae | Native | <u> </u> |
| <i>Mesembryanthemum</i> \times <i>vascosilvae</i> (Gideon F. Sm., | | | |
| E. Laguna, F. Verloove & P.P. Ferrer) L. Sáez & | Aizoaceae | Alien—Artificial hybrid | —, N |
| Aymerich | | | |
| Nerium oleander L. | Apocynaceae | Native | —,— |
| <i>Opuntia ficus-indica</i> (L.) Mill. | Cactaceae | Alien—Northern America (Mexico) | I, I *,** |
| Opuntia monacantha (Willd.) Haw. | Cactaceae | Alien—Southern America | I, N |
| Pelargonium $	imes$ hybridum (L.) L'Hér. | Geraniaceae | Alien—Artificial hybrid | С, С |

Table 1. Cultivated plant taxa observed within the 'Difunta Correa' shrine in Almería (Spain).

¹ The native status and geographic origin are obtained mostly from Plants of the World Online (http://www. plantsoftheworldonline.org/; accessed on 25 March 2024). In spite of the fact that hybrids do not have a truly native range, they are routinely included in the lists and catalogues of alien floras, as these taxa cannot be regarded as truly native species [18]. ² Invasion stage at country level (excluding the Canary Islands), which is based on (1) the *Atlas of Invasive Alien Plants of Spain* [13] (first capital letter in the column); and (2) a preliminary unpublished list that is the backbone of the future *Catalogue of Alien Plants of Spain* (Gómez-Bellver, C.; López-Pujol, J.; Martínez, F.; Novoa, A.; Nualart, N.; Patiño, J.; Sáez. L., unpubl. data) (the second capital letter in the column). A single asterisk denotes taxa listed in the *Spanish National Catalogue of Invasive Species* [14]; two asterisks denote taxa listed as invasive for Andalusia [21], the autonomous community where the Almería Province is located. Meaning of the capital letters: C, casual; N, naturalized; I, invasive. A dash instead of a capital letter means that the taxon is not present in the *Atlas of Invasive Alien Plants of Spain* or in the future *Catalogue of Alien Plants of Spain*.

Although the presence of roadside shrines is common in Spain (as elsewhere; [9,22,23]), these are mostly memorials devoted to vehicle-related deaths and they contain one or very few species of plants that are generally cut flowers and not individuals planted in a pot or, in some cases, even plants made of plastic ([24]; Figure 2). Thus, these kinds of shrines rarely constitute sources for the dispersal of alien species, and they can thus be regarded as a negligible agents of change to native biodiversity. In contrast, shrines and similar places (e.g., roadside crosses) containing planted individuals capable to reproduce (and further spread), such as the case study presented here, might be potentially significant in terms of alien species spread. In contrast to cemeteries and private gardens that have walls providing some degree of containment, plant species in roadside shrines can freely disperse. This can be particularly problematic if they are located in places favoring dispersal, such as in the case of the 'Difunta Correa' shrine in Almería, which is located on the edge of a cliff. It is an open place without any sort of fences, being very exposed to the action of animals acting as dispersers and the strong winds that blow in the area (https://globalwindatlas.info/en; accessed on 30 March 2024). The observed detached cladodes of O. ficus-indica at the base of the cliff (Figure 1C) have likely been dispersed there thanks to the strong winds. In addition, the shrine is located at only 1 km from the 'Punta Entinas-Sabinar', which is a Site of Community Interest (SCI) within the Natura 2000 network of the European Union (https://natura2000.eea.europa.eu/natura2000/SDF.aspx?site=ES0000048; accessed on 30

March 2024) and a Ramsar site (https://rsis.ramsar.org/ris/1677?language=en; accessed on 30 March 2024). Alien species surrounding protected areas (PAs) are a risk to the native biodiversity that cannot be dismissed; in a recent study, the alien species were recorded in PAs, on average, just 4.5 years after being recorded in the 0–5 km surrounding belts [25].



Figure 2. Two examples of roadside shrines (devoted to vehicle-related deaths) in Spain. (**A**) Shrine on the C-14 road (Reus, Tarragona Province, Spain) with the name of the dead blurred; (**B**) shrine on the N-340 road (Bellvei, Tarragona Province, Spain). The latter road is one of the most dangerous of Spain and regrettably saw probably the deadliest accident in the history of road transportation (the 'Alfacs accident', with >200 deaths).

Although the 'Difunta Correa' shrine in Almería is not posing a measurable threat to the local biodiversity yet, it can be an example of a possible source of alien plant introductions which has not received much attention, if any. As it has been acknowledged in the last IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) report, the importance of sociocultural values (and other indirect drivers) in shaping biological invasion remains understudied, compared to the direct drivers [26]. The damage of invasive alien species in sacred and/or historical sites is an issue of growing interest, e.g., in the monuments of Rome [27], in shrine forests in Japan [28] or in sacred groves in India [29]; these studies, however, have detected invasive species that have reached the site but not species that escaped from it.

One could suggest regulating the setting up of this kind of shrines (and even banning the planting of both declared and potentially invasive alien plants—at least for those included in legal texts); however, this would not be feasible, given the fact that the selection of plants in sacred places is often guided by aesthetic, symbolic and anthropological values (e.g., [30,31]), rather than by more 'modern' concepts of biological conservation (and the related dichotomy native/alien; see [32,33]). In spite of this, the monitoring of roadside shrines and similar roadside sacred places (e.g., through concentric circular plots) is desirable and should be incorporated into the duties of nature wardens (or the authority in charge of nature conservation), particularly in those cases that are close to protected areas.

Supplementary Materials: The following supporting information can be downloaded at: https: //www.mdpi.com/article/10.3390/ecologies5030023/s1, Figure S1: Pictures of all 20 cultivated taxa observed within the 'Difunta Correa' shrine in Almería (Spain). (A) *Agave* sp.; (B) *Aloe vera*; (C) *Artemisia arborescens*; (D) *Cereus hildmannianus*; (E) *Crassula ovata*; (F) *Delosperma echinatum*; (G) *Dracaena trifasciata*; (H) *Ficus benjamina*; (I) *Ficus carica*; (J) *Haemanthus albiflos*; (K) *Kalanchoe blossfeldiana*; (L) *Kalanchoe* × *houghtonii*; (M) *Kroenleinia grusonii*; (N) *Lonicera* cf. *japonica*; (O) *Menta* × *rotundifolia*; (P) *Mesembryanthemum* × *vascosilvae*; (Q) *Nerium oleander*; (R) *Opuntia ficus-indica*; (S) *Opuntia monacantha*; and (T) *Pelargonium* × *hybridum*.

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