Phytotaxa 141 (1): 40–54 (2013)
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.141.1.3

Genetic structure of *Ipomoea imperati* (Convolvulaceae) in the Mediterranean region and implications for its conservation

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Abstract

In this paper, we studied the relationships of the only surviving Italian population of *Ipomoea imperati* (Convolvulaceae), a pantropical sandy coastal species, in Sicily and other populations in the Mediterranean region. Herbarium samples which are representative of extinct populations growing in Campania (Italy) were also investigated together with populations from various Atlantic and Mediterranean localities. Chloroplast DNA microsatellites (cp-SSR) and nuclear ribosomal Internal Transcribed Spacer (ITS) sequences were jointly employed, in order to detect relationships among populations. Our aims were several-fold: (1) to clarify if the species is autochthonous in the Mediterranean basin or a post-Columbian introduction; (2) to investigate phylogeographic patterns in the species and (3) to establish the possible role of dispersal in explaining the patterns observed. Chloroplast microsatellite variation indicates that extinct Italian mainland populations of *I. imperati* from Campania are not closely related to the extant Sicilian one, as they do not share haplotypes. Chloroplast DNA microsatellite variation is largely between populations, and the within populations component accounts for only approximately 10%. CpDNA data is consistent with a single Mediterranean entry point hypothesis or with the notion that some populations display plesiomorphic variability. ITS data is congruent with the possibility that the presence of *I. imperati* in the Mediterranean is the result of transatlantic dispersal. The population from Sicily and extinct populations from Campania share an ITS type. A Bayesian analysis employing clock calibration data on an expanded ITS dataset with appropriate outgroups indicates that dates of transoceanic distribution are probably earlier than historical times.

Key words: *Ipomoea imperati*, chloroplast DNA microsatellites, ITS sequences, Mediterranean region

Introduction

Ipomoea imperati (Vahl 1790:17) Grisebach (1866:203) (Convolvulaceae) is a pioneer coastal strand species of tropical and subtropical coastal regions. It is common in dune systems, where it is regarded as a dominant species, as it rapidly produces stolons and traps shifting sand (Judd *et al.* 1977, Judd & Sides 1983).

Ipomoea imperati is generally considered native of tropical Central America and of part of southeastern North America (Texas and Florida) (Lonard & Judd 1999; Silvestre 2012). However, it has a pantropical distribution, being present also in Asia, Pacific Islands and Australia, as well as in the Canary Islands, the Azores and the Mediterranean (Lonard & Judd 1999; Fang & Staples 1995, Austin et al. 2001), where the question of its origin is considered still open (McDonald 1991, Silvestre 2012, USDA 2012). In the Mediterranean basin, *I. imperati* is infrequently recorded for the Iberian peninsula (also in Balearic islands),

 Accepted by Mark Carine: 12 Sept. 2013; published: 30 Oct. 2013

Our ITS sequence results suggest that anthropogenic dispersal is not involved in the presence of *I. imperati* in the Mediterranean, which, therefore is not related to exchanges between the Europe and the Americas in the period after Columbus' voyages. Our conclusion is at odds with the opinion of Silvestre (2012), who considered the species to be of recent introduction in Spain (the author excludes it altogether from the Balearic Islands).

Even if chloroplast microsatellite data would support one single transatlantic event, whereas ITS data would suggest that the event occurred more than once, both datasets indicate that long range dispersal is likely involved. We do not attempt here to reconcile the evidence obtained from chloroplast DNA with that from nuclear DNA; an expanded data set, with large samples from the extramediterranean locations here represented by single sequences and from the Asian part of the range which was not taken into account here will be needed to accomplish such a task. At present, however, the hypothesis that occasional, remote hybridisation events between individuals at distant sites (e.g., Sicily and Israel), followed by severe contraction of populations may have influenced the pattern indicated by chloroplast microsatellites (Figure 2) cannot be ruled out.

Protection of the Sicilian locality and reintroduction into the Naples/Ischia area appear appropriate. However, the habitat *I. imperati* (i.e., sandy coasts) is one of the most prone to human impact and severe degradation. Human activities in coastal areas, often lead to massive urbanization, including the building of large infrastructures/ industrial facilities, as well as to expanded tourism. A further disturbance is the steady erosion of the coastline in addition to changes in the morphology of the coastlines. These disturbances may cause, in extreme conditions, the almost total disappearance of the vegetation. In the case of the Neapolitan coast (Bagnoli), the construction of new buildings was directly responsible for the disappearance of *I. imperati* from the location (the only one recorded in the Italian mainland) already by the end of 19th century (Migliorato 1896, sub *Convolvulus imperati*). As far as Ischia island is concerned, the expansion of tourism, in the form of lidos, has deeply transformed the coast and caused the local extinction of the plant (Ricciardi *et al*. 2004). Restoration of these areas will certainly involve the reintroduction of plant species such as *I. imperati*, which were once are spontaneous in these coastal environments. In the absence of specimens having chloroplast haplotypes identical to those formerly present in Campania, our research suggests that the reintroduction of *I. imperati* into the Neapolitan coast, should be carried out using individuals from Sicily, which have identical ITS sequences.

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