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Relationship between recruitment and mother plant vitality in the alien species *Acacia cyclops* A. Cunn. ex G. Don

Badalamenti Emilio [a], Gristina Luciano [a], La Mantia Tommaso [a,*], Novara Agata [a], Pasta Salvatore [b], Lauteri Marco [c], Fernandes Patricia [d], Correia Otilia [d], Máguas Cristina [d]

[a] Agricultural and Forest Sciences Department, University of Palermo, Viale delle Scienze Ed. 4, 90128 Palermo, Italy
[b] National Research Council, Institute of Biosciences and BioResources, Corso Calatafimi nr. 414, 90129 Palermo, Italy
[c] National Research Council, Institute of Agro-environmental and Forest Biology, Via Guglielmo Marconi n. 2, 05010 Porano, TR, Italy
[d] Centre for Environmental Biology, Faculty of Sciences, University of Lisbon, Campo Grande, 1749-016 Lisbon, Portugal

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ABSTRACT

Acacia cyclops is a widespread invader in Mediterranean-climate regions. However, although its naturalization in the Mediterranean Basin dates back only a few years ago, and the invasion process has not been studied hitherto. We investigated seedlings recruitment strategy adopted by *A. cyclops* in a small island (Lampedusa, Italy) where its natural regeneration was strictly confined under mother plants canopy. Healthy plants (DCP), plants at incipient senescence (SCP) and dead plants (DP) were distinguished according to vitality and canopy status. Living plants were also characterized in relation to leaf C and N isotope composition. Regeneration pattern (seedlings and saplings abundance) was related to the microclimatic differences (soil temperature, air temperature and humidity, soil nutrients, light) observed between canopies and adjacent open areas, and among canopy types. Living canopies ensure milder conditions, reducing extreme values as well as fluctuations between night and day. However, beneath canopies (DP, SCP and DCP) seedlings may benefit from significantly higher soil nutrients content than in the outside, while light availability was much higher under DP. Saplings to seedlings ratio was found to be around 12 under DP, while under SCP it was slightly higher than 1, and just less than 0.5 under DCP. Moreover, saplings growth was significantly higher under SCP and DP, suggesting a prominent role of light in driving seedlings recruitment. Stable isotope analyses of C and N provided ecophysiological information in relation to changes in canopies structure. Thus, while seedling stage appears to be more nutrient-limited, subsequent sapling stage is much more light-limited. Although the species is not yet displaying an invasive spreading on the island, our study provides clear evidence that senescent canopies are better facilitators than healthy in preserving the invasive potential of *A. cyclops*. This finding suggests some best practices in order to gradually reduce the presence of the alien species within its pristine nuclei of introduction.

1. Introduction

Species belonging to the genus *Acacia* have proven to be some of the most aggressive invading species, with vastly negative effects over terrestrial ecosystems. Australian Acacias (also termed 'wattles') are a group of leguminous woody plants that include some of the most important plant invaders globally (Richardson et al., 2011). The Italian peninsula has also been concerned; eight *Acacia* species are currently naturalized, and four of them already showed an invasive behavior (Celesti-Grapow et al., 2010; Pasta et al., 2012a). Natural regeneration, establishment and recruitment of these species are key issues in understanding the spatial and temporally component of dynamic biological and chemical processes associated with plant invasions. Indeed, the study of both environmental factors and plant traits that modify the regeneration capability of *Acacia cyclops* is crucially important to understand its invasive potential at an early stage outside of its native area. *A. cyclops* natural regeneration in the semi-arid Mediterranean island of Lampedusa was dependent on the structure of covering canopy, leaf traits and vitality conditions.

Wattles are among the most widespread and prominent invaders within Mediterranean-type ecosystems, where they are able to produce major changes in species composition and ecosystem

* Corresponding author. Tel.: +39 091 23861240; fax: +39 091 7049025.
E-mail address: tommaso.lamantia@unipa.it (La Mantia T.).

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