ABSTRACT

Introduced plants will lose interactions with natural enemies, mutualists and competitors from their native ranges, and possibly gain interactions with new species, under new abiotic conditions in their new environment. The use of biocontrol agents is based on the premise that introduced species are liberated from their natural enemies, although in some cases introduced species may not become invasive because they acquire novel natural enemies. In this study I consider the potential for the biocontrol of *Bryophyllum delagoense*, a Madagascan endemic, and hypothesize as to why this plant is invasive in Australia and not in South Africa.

Of the 33 species of insects collected on *B. delagoense* in Madagascar, three species, *Osphilia tenuipes*, *Eurytoma bryophylli*, and *Rhembastus* sp. showed potential as biocontrol agents in Australia. Surveys in southern Africa revealed that *B. delagoense* had acquired 14 species of insects, compared to only two in Australia, which supported the hypothesis that an introduced plant is less likely to become invasive in regions where there are many closely related species. A beetle, *Alcidodes sedi*, was found to be widespread and damaging in South Africa and also sufficiently host specific for release in Australia.

Studies were also undertaken to determine the biology of *B. delagoense* and characteristics of the recipient environments in Australia and South Africa. Analysis of soils in South Africa found that *B. delagoense* has the ability to grow on a range of soils and is tolerant of moderate shade. *Bryophyllum delagoense* exhibited phenotypic plasticity by re-allocating resources to stem production in light-limited; and to root production in nutrient- or water limited, environments. Competition trials indicated that *B. delagoense* is a weak competitor with overgrazing and the concomitant reduction in fires facilitating invasions. The absence of damaging natural enemies and characteristics of the Australian environment may make it more prone to *B. delagoense* invasions than in southern Africa.

The study indicates that no single trait or group of traits can completely explain the invasive ability of a plant species because the success of an invader often depends on complex interactions between the species and its recipient environment. This has widespread implications for predicting the invasibility of imported plants.

Keywords: *Alcidodes sedi*, biological control, *Bryophyllum delagoense*, Crassulaceae, *Eurytoma bryophylli*, fire, invasions, Madagascar, *Osphilia tenuipes*, *Rhembastus* sp., soil.