Biological control of invasive climbing plants in South Africa

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Vines and other climbing plants typically invest their resources into growth at the expense of accumulating self-supporting biomass. Adaptive traits that have arisen because of the life history needs of climbing species, such as rapid and extensive growth, as well as resilience to physical damage, make these plants highly competitive. Introduced climbing species therefore have the potential to be particularly damaging in novel ranges where they escape pressure from natural enemies. In South Africa, invasive climbing species negatively influence biodiversity and plant-community structure, and as conventional management is often difficult, biological control (biocontrol) is viewed as the only viable long-term control method. This paper consolidates the work done on biocontrol programmes against climbing species in South Africa, including *Anredera cordifolia* (Ten.) Steenis (Basellaceae), *Cardiospermum grandiflorum* Sw. (Sapindaceae), *Dolichandra unguis-cati* (L.) L.G.Lohmann (Bignoniaceae) and *Pereskia aculeata* Miller (Cactaceae). To date, these programmes have investigated some 27 potential biocontrol agents, of which nine have been approved for release in the country. Since 2010, three new agents have been introduced, and considerable progress made with post-release evaluations of all the introduced agents. Some positive results have been achieved, most notably the successful reduction in seed set of *C. grandiflorum* due to *Cissanthonomus tuberculipennis* Hustache (Curculionidae), but considerable variation in efficacy over time and between infestations has been recorded for many of the other agents. Further work may help explain the factors limiting success, leading to improved control, but in some cases, such as for *A. cordifolia*, new biocontrol agents should be considered.

Key words: Insect natural enemies, invasive vines, *Anredera cordifolia*, *Cardiospermum grandiflorum*, *Dolichandra unguis-cati*, *Pereskia aculeata*, weed biological control.

INTRODUCTION

Vines and other climbing plants typically invest their resources into growth at the expense of accumulating structural biomass or maintaining self-supporting rigidness (Paul & Yavitt 2011; Angyalossy *et al*. 2015). As fewer resources are dedicated to structural support, more can be allocated to reproduction, stem and root elongation, and the production of photosynthetic biomass (Ewers & Fisher 1991; Schnitzer *et al*. 2005; Paul & Yavitt 2011; Asner & Martin 2012). This makes climbing plants adept early successional species by giving them a competitive advantage over self-supporting plants (Pasquini *et al*. 2015; French *et al*. 2017). In addition to this, climbing plants can also negatively affect the growth rates, fecundity, and survivorship of the vegetation they use for support through a combination of resource competition, and mechanical damage (Ladwig & Meiners 2009; Garcia Leon *et al*. 2018). This has the potential to alter the structural makeup of plant communities, and in turn, influence broad-scale ecological processes such as habitat transpiration (Ichihashi *et al*. 2017), soil nutrient and water availability (Powers 2015; De Deurwaerder *et al*. 2018), and carbon storage and sequestration (van der Heijden *et al*. 2013; Magnago *et al*. 2017).

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