

Attempts to establish the boneseed leaf buckle mite in Australia for the biological control of boneseed

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Summary The boneseed leaf buckle mite *Aceria* sp. (BLBM) is the eighth biological control agent released against boneseed *Chrysanthemoides monilifera* ssp. *monilifera* in Australia.

From 2008 to 2012, 165 BLBM field releases were made in south-eastern Australia by inoculating vegetative boneseed shoot tips with one to several mite-bearing BLBM galls on 998 boneseed plants. Very few of these boneseed plants developed BLBM colonies that could be regarded as established populations.

A new release method was deployed in autumn 2011. One hundred and twenty BLBM-colonised potted boneseed plants were planted to existing boneseed infestations at 16 sites.

Observations after one year suggest that the new release method is four to five times better for establishing BLBM colonies than the original method.

Keywords *Aceria* sp., *Chrysanthemoides monilifera*.

INTRODUCTION

Boneseed (*Chrysanthemoides monilifera* ssp. *monilifera* (L.) T. Norl.) is a South African shrub that invades native vegetation of southern Australia, where it is a major threat to the integrity of natural ecosystems. The boneseed leaf buckle mite (*Aceria* sp. (Eriophyidae:Acari)) (BLBM) is the eighth biological control agent released against boneseed in Australia (Adair *et al.* 2012). It is a biotype of the species (Morley 2004a) that induces on boneseed the formation of erineum galls (abnormal felt-like growths of hairs from the leaf epidermis) in which it feeds and reproduces. Erineum formation is induced by feeding of mites only at the vegetative meristem of an elongating boneseed shoot tip. If a shoot tip is not elongating when it is occupied by BLBM erineum formation does not occur and the mites die.

Between September 2008 and January 2012, 165 BLBM field releases were made in South Australia, Tasmania and Victoria by inoculating vegetative boneseed shoot tips with one to several mite-bearing erineum on 998 boneseed plants. Very few of these boneseed plants developed BLBM colonies that could be

regarded as established populations. Factors that may have contributed to this very low release success rate include shoot tip dormancy, low mite inoculum numbers, low mite fecundity and predation. In order to try to address these factors and improve the release success rate a new release method was deployed in autumn 2011. BLBM-colonised potted boneseed plants were planted to existing boneseed infestation at 16 sites. The success of the new release method is currently being assessed and this article presents a preliminary comparison of the two methods.

RELEASE METHODS

The BLBM was reared on potted boneseed plants in shade and glass houses at Waite in South Australia, New Town in Tasmania and Frankston in Victoria by inoculating the vegetative shoot tips with BLBM erineum harboring mite colonies (Morley 2004b).

Shoot tip inoculation releases Erineum were harvested from the rearing stock above. One to fifty, usually four or five, boneseed plants were inoculated per release site. Inoculation involved placing one to several BLBM erineum within five to 20 mm of a vegetative shoot tip, with one or more shoots per plant being inoculated. Erineum were secured in the shoot tip by loosely cupping terminal leaves with elastic bands to form a vessel or by anchoring them in such a way that when the mites abandoned the drying inoculum they were likely to encounter the shoot tip. No other husbandry was applied to the inoculated plants.

Colonised potted plant releases Potted boneseed plants were inoculated with or were spontaneously colonised by BLBM in a shade house at Frankston and monitored for at least 18 months to ensure that each sustained a viable mite colony. From April to June 2011 eight to ten colonised potted boneseed plants were planted within boneseed infestations at 16 sites in Victoria. The plants were watered with 2 to 5 L of water immediately after being planted. No other husbandry was applied.

BLBM colony survival monitoring Release sites were visited one to several times each from 2008 to 2012 to check for signs of active BLBM colonies. The number of inoculated or transplanted boneseed plants sustaining signs of a BLBM colony was recorded. Notes of BLBM dispersal to neighboring plants were also made. As there were often many months between observations at each site, these observations were used conservatively to determine the minimum known total duration of survival of the colony on each boneseed plant in the months following release. The proportion of plants with signs of an active BLBM colony was calculated for each ‘duration of months after release’, up to 38 months for the shoot tip releases and up to 12 months for the colonised plant releases. Missing data occurred in the data set for each boneseed plant where there were two or more months between the most recent observation of a boneseed plant with a surviving BLBM colony and a succeeding observation of that boneseed plant with an extinct BLBM colony. Available data were used to plot indicative BLBM colony survival curves.

RESULTS AND DISCUSSION

BLBM colony survival is shown in Figure 1. Only 4.3% (34/783) and 0.75% (6/800) of inoculated shoot tip plants sustained a BLBM colony after 12 and 38 months respectively whereas 28% (30/109) and 19% (14/73) of colonised potted plants sustained a colony after 11 and 12 months respectively. This suggests that 12 months after release the colonised plant method is four to five times better for sustaining BLBM colonies

than the shoot tip method. While it is not possible to suggest with certainty how the two methods would compare after a longer period it might be expected that if better husbandry (particularly watering to reduce the effects of planting shock) was applied to the colonised plants in the first few weeks after planting even greater BLBM survival could be achieved.

The most prosperous BLBM colony was at a shoot tip release site near Hobart. At 38 months more than 1000 erinea were observed on a release plant in January 2012 and dispersal was observed to 60 m. In Victoria there was a colony at a shoot tip inoculation release site at Anglesea that comprised several hundred erinea dispersed up to 10 m 36 months after release. There was also an isolated garden plant in Frankston that was colonised by BLBM when it was planted in autumn 2009 and sustained more than 500 erinea in May 2012.

These observations show that the BLBM can prosper in Australia but that colonisation and dispersal was hampered by exceedingly low release success rates. Maintaining adequate soil moisture after field planting of colonised potted plants may further improve this method.

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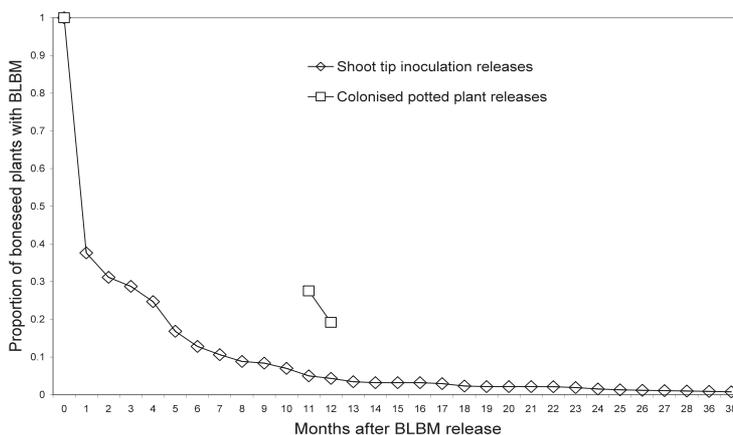


Figure 1. BLBM colony survival curves. The proportion of boneseed plants sustaining a colony of the boneseed leaf buckle mite in relation to months following field release by inoculating shoot tips of field plants (diamonds) or by planting BLBM colonised potted boneseed plants (squares). No data points could be calculated for the colonised potted plant releases from months 1 to 10. Month zero is the month of release.

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