

## Control of wards weed (*Carrichtera annua*) on rare species translocation sites at Westonia in the eastern wheatbelt of Western Australia

Bob Dixon

Kings Park and Botanic Garden, Fraser Avenue, West Perth WA 6005

(marsep9@hotmail.com)

**Summary** Control of invasive environmental weeds amongst rare and endangered species, requires significant financial and human resources to ensure the weeds are adequately controlled whilst avoiding serious off-target damage to the rare plants. The use of isoxaben 750 g kg<sup>-1</sup> Gallery™, a pre-emergent herbicide, at 500 g ha<sup>-1</sup> for the control of wards weed *Carrichtera annua* (L.) DC. provided effective control in degraded sites for up to 2 years as long as the soil surface remained intact. When applied over *Eremophila resinosa* (Ebdl.) F.Muell. seedlings, in both glasshouse and field trials, Gallery™ is a safe and cost effective herbicide for controlling wards weed. Applications are best applied before germination events in autumn to ensure the first and subsequent germinants are controlled. As Gallery™ has a major impact on germinating *Eremophila resinosa* seed, avoid spraying directly under mature plants where the majority of seed falls. The use of the post-emergent herbicide metosulam 100 g L<sup>-1</sup> Eclipse™ (which is very effective on wards weed), causes significant damage to *Eremophila resinosa* and should not be used unless careful spot spraying of weeds can be achieved.

**Keywords** Wards weed, *Carrichtera annua*, weed control, Gallery™, isoxaben, Eclipse™, metosulam, *Eremophila resinosa*, translocation sites, rare species.

### INTRODUCTION

Wards weed, *Carrichtera annua* (Brassicaceae) is a significant and highly competitive annual weed in degraded areas of bushland in the eastern wheatbelt and Goldfields of Western Australia. Plants are capable of producing 30 000 seeds per square metre. Two seedbanks are present: seed held in lignified pods on dead adult plants between growing seasons and a soil seedbank. This may be why this species is so successful and so difficult to control. Seed germination events in one season may involve a multiple of strategies (under ideal growing conditions, in autumn [March] through to late spring [November]). During drought conditions seed may not germinate or drought affected seedlings may grow to a few centimetres high but are still capable of producing seed. The soil seedbank appears to remain viable for several years—so that (because of intermittent germination events), the cost

and time of travelling to remote sites and of using conventional non-selective post-emergent herbicides have limitations.

The use of karrikinolide is known to stimulate seed to germinate (Long *et al.* 2011) and could be employed to promote germination *en masse* and consequently reduce herbicide applications. Glasshouse and field trials using a pre-emergent herbicide, Isoxaben (Gallery™) and a post-emergent herbicide, metosulam (Eclipse™) were conducted to test the efficacy and suitable application rates for controlling wards weed. The trials would also test their effect over gazetted rare and endangered *Eremophila resinosa* seedlings. The outcome of the project was to find a practical yet safe solution for controlling wards weed on *Eremophila resinosa* translocation sites (sites where rare species are translocated to new locations).

### MATERIALS AND METHODS

**Glasshouse seed sowing trials** Two different seed sowing mixes were used for each trial: Kings Park standard potting mix; and sterilised site soil about 2 cm thick, over potting mix to aid drainage. The latter was to indicate if the herbicide may respond differently when on-site. Seeds were sown into punnets using 6 replicates per trial, including controls, covered with a light topping of crushed rock. These were treated using a calibrated 500 mL hand sprayer applying the equivalent rate of 400 L mixture per hectare. Punnets were lightly watered, placed in a polythene bag to stop moisture loss and placed in a cool room at 15°C constant, with cool white fluorescent light until germination took place. Seedlings were then transferred to a glasshouse to grow-on. Post-emergent treatments are described below.

Seed of wards weed, no pre-treatment, was sown and treated with the following rates of Gallery™: 300, 500, 700 and 1000 g ha<sup>-1</sup>. The *Eremophila resinosa* seed, pre-treated by soaking in smoke water sm (1 part sm to 10 parts scheme water) overnight to stimulate germination, was quickly dried off then sown as described above, and treated with one of the following rates of Gallery™ 300, 500, 700 and 1000 g ha<sup>-1</sup>. Two trials were initiated: one to test the efficacy as a pre-emergent and the other to indicate any potential off-target damage to seedlings, the latter being sprayed

at the cotyledon stage. Another trial used metosulam 100 g L<sup>-1</sup> Eclipse™ sprayed over small *Eremophila* seedlings at the following rates 5, 7 and 10 g ha<sup>-1</sup> in 400 L water plus Agral™ at a rate of 2 ml L<sup>-1</sup>.

**Field trials** Three replicates, 1m x 3m were established at 2 sites using the following rates of Gallery™ 500 and 1000 g ha<sup>-1</sup> in 400 L water plus glyphosate 360 g L<sup>-1</sup> at 6 L ha<sup>-1</sup> and Agral™ at a rate of 2 ml L<sup>-1</sup> to control seedlings which had already germinated in the quadrats, application was with a 7 L calibrated backpack sprayer using the equivalent of 400 L mixture per hectare.

## RESULTS

**Glasshouse trials** Wards weed was effectively controlled—there was no emergence in any of the trials, indicating the lowest rate of Gallery™ is suitable and most cost effective for controlling this weed in the short term. When used as a pre-emergent over *Eremophila* seed, all rates of Gallery™ controlled this species in the Kings Park potting mix; however a few germinants appeared in the site soil and looked very yellow for several weeks but managed to survive, turned green and grew-on as normal seedlings. When used as a post-emergent there was no damage to seedlings at any rate over both seed sowing mixes.

Eclipse™ sprayed over *Eremophila* seedlings killed every seedling, all rates and seed mixes, within four days of application.

**Field trials** Both rates of Gallery™ fully controlled the germination of wards weed for a long period of time, up to 2 years.

## DISCUSSION

The use of Gallery™ has a significant impact on the control of wards weed and though expensive, at the recommended rate of 500 g ha<sup>-1</sup>, is ideal for treating small sites which require long term weed control. Stimulating the soil seedbank with the application of karrikinolide may also be a useful tool to assist rapid depletion of the soil seedbank. The use of Eclipse™, whilst effective on wards weed, should not be used directly over *Eremophila* plants but could be used as a spot spray as it would be less damaging to other native species on-site than total weed killers such as glyphosate.

## ACKNOWLEDGMENTS

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## REFERENCES

- Long, R.L., Stevens J.C., Griffiths, E.M. and Adamek, M. (2011). Seeds of Brassicaceae weeds have an inherent or inducible response to the germination stimulant karrikinolide. *Annals of Botany* 108 (5), 933-944.