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Glyphosate-resistant flaxleaf fleabane (*Conzya bonariensis*) control with alternative non-conventional herbicides: Using repeated applications to control large weed sizes – Tamworth (glasshouse) 2018

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Key findings

- Repeated applications of Non-Tox® herbicide are not required for small rosette fleabane control.
- Repeated applications of Non-Tox® herbicide are required when treating fleabane at the stem elongating development stage.
- This experiment has shown that Non-Tox® herbicide has greater efficacy on smaller broadleaf weeds compared with grasses (alternative experiment).

Introduction

Herbicide resistance is becoming more widespread in the northern grains region. Furthermore, no new herbicides with novel modes-of-action have been developed since the 1980s. This reducing number of effective conventional herbicides has necessitated investigation into alternative herbicides.

This experiment aimed to measure the success of repeated applications (twice) of Non-Tox® herbicide. Repeated applications of conventional desiccant herbicides are known to improve weed control across a broader range of growth stages, this experiment is trying to prove this scenario with Non-Tox®.

Site details

Location	Tamworth – Tamworth Agricultural Institute
Soil type and nutrition	Potting mix for containerised plants. Scotts® Osmocote Premium Potting Mix.
Irrigation	Plants watered regularly, soil was near field capacity for the duration of the experiment.
Experiment design	Randomised complete block design with weed growth stage as the only treatment factor; five replications. A total of five pots per treatment.
Plant population	One plant per pot (5 cm diameter pots – Figure 1).
Weed growth stages (4)	Flax-leaf fleabane: • 5 cm diameter – sprayed 17 September 2018, no need for another spray as 100% control achieved with the first spray. • 10 cm diameter – sprayed 28 September 2018, no need for another spray as 100% control achieved with the first spray. • Very early stem elongation – sprayed 16 October 2018, no need for another spray as 100% control achieved with the first spray. • Mid stem elongation – sprayed 26 and 30 October 2018.

	Spraying conditions – over the various times of application	Temperature range: 22–26 ºC, relative humidity: 71–88%.
	Assessment date	5 November 2018.
Treatments	Spraying volumes	Spraying was set at 1000 L/ha. Since the product is formulated as a ready-to-go (no dilution required), the spraying volume is the same as the product rate.

Results

Desiccation and plant recovery – ideal time for a second treatment

Non-Tox® herbicide is a more effective control for fleabane than annual ryegrass (findings from previous rate-response experiments). The first three growth stages did not require a repeat application. However, the mid stem elongating fleabane required two applications, which resulted in significant ($P<0.05$) suppression in biomass, but did not kill the plant. The upper canopy leaves protect the lateral growing points on the stem, which results in new leaves emerging from these points (Figure 1).

Figure 1 Recovery and emergence of new foliage on fleabane five days after Non-Tox® treatment. In this example, the plants had been treated twice. Lower foliage is necrotic from the previous treatment and upper growing points are dead, however, protected lateral buds on the stem are the source of new growth.

Repeat application and weed growth stage interaction

Fleabane was completely controlled with one application of Non-Tox® at 1000 L/ha (5 cm to very early stem elongation). Once plants attained a protected semi-woody stem, i.e. the mid stem elongating stage, sequential treatments only achieved suppression (Table 1). This interaction is strongly related to the protection of secondary growing points at this stage. (Table 1 and Figure 1 and Figure 2). The first three growth stages were fully controlled with one application of Non-Tox® with a second application not required. Survival is strongly related to fleabane stem and lateral bud development

Table 1 Effect on flaxleaf fleabane growth stage from Non-Tox® herbicide (applied twice only for mid stem elongating plants), Tamworth (2018). Assessed 5 November 2018.

Weed growth stage	Percent dead plants per pot (0–100)	Estimated reduction in weed biomass (0–100%)
5 cm diameter	100	100
10 cm diameter	100	100
Very early stem elongation	100	100
Mid stem elongation	0	83
Untreated control	0	0
l.s.d. ($P = 0.05$)	20	11

Figure 2 Effects from Non-Tox® on various flaxleaf fleabane growth stages after treating with sequential applications. Increasing growth stages from left to right.

Conclusions

Non-Tox® herbicide is a salt-based non-selective herbicide that has lethal effects against flaxleaf fleabane, including glyphosate-resistant strains, at the smaller growth stages before stem development.

Non-Tox® herbicide is best suited as a spot treatment of very light patchy weeds due to the large volume of solution required. It has not been researched as a potential treatment using camera detector sprayers or robotic devices, however, it has much potential with these technologies. It might have a fit in broadacre agricultural systems in fallow paddocks or potential in non-agricultural areas. The product's desiccating properties could be used for glyphosate resistance management.

Annual ryegrass will also be investigated in a similar experiment. Ryegrass was selected because it is another widespread glyphosate-resistant weed that is problematic in fallows and in non-cropped areas.

In summary, the findings from this research show that Non-Tox® could be used to control flaxleaf fleabane if the size of the weed is in the rosette stage (10 cm diameter or smaller). Non-Tox® needs to be applied twice for good suppression (greater than 80% biomass reduction) for weeds that have a stem. The second application must be made when the new foliage is soft and expanding, usually about 4–8 days after the first treatment.

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