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Glyphosate-resistant annual ryegrass (*Lolium rigidum*) control with 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 can significantly suppress young (early tillering) annual ryegrass.
- This herbicide desiccates weeds and is likely to work more effectively on smaller broadleaf weeds (open growing point) and not as effective on grasses as the growing point is protected by the leaf sheath and stems.

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 and thus five pots per treatment (one plant per pot).
Plant population	One plant per pot (5 cm diameter pots – Figure 1).
Weed growth stages (3)	Annual ryegrass: • 2–4 tillers – sprayed 6 and 14 September 2018 • 5–7 tillers – sprayed 18 and 24 September 2018 • 10 or more tillers – sprayed 24 and 28 September 2018.
Spraying conditions – over the various times of application	Range of temperatures: 21–24 °C; relative humidity: 74–88%.
Assessment date	3 October 2018.

Treatments

Spraying volumes	Spraying was set at 1000 L/ha. This spray volume was both the rate of chemical and total spray volume as the product is a ready-to-go formulation and therefore does not need dilution with water.

Results

Desiccation and plant recovery – ideal time for a second treatment

Non-Tox® herbicide did not control annual ryegrass as effectively as flax-leaf fleabane (findings from previous rate-response experiments). Annual ryegrass plant recovery is common with this herbicide as the growing points are protected by the leaf sheaves and new leaf emergence from this point (Figure 1). Occasional plant death can be seen at the smaller growth stages, however suppression is more common

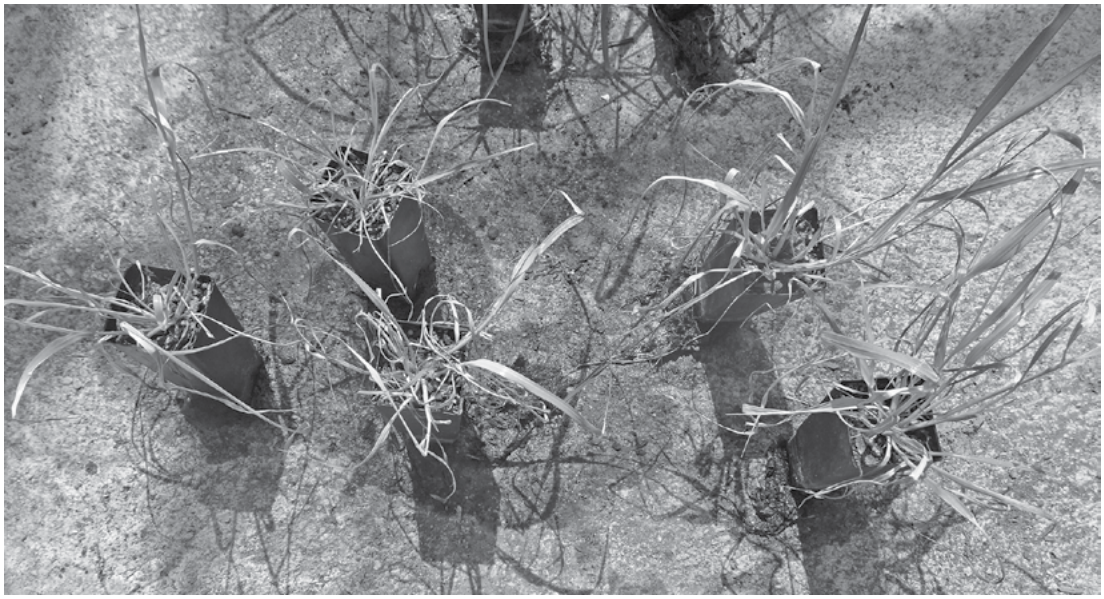

Figure 1 Recovery and emergence of new foliage on annual ryegrass six days after treatment with Non-Tox®. For this example, plants were re-treated to desiccate the new foliage, aiming to significantly suppress weed growth. Lower foliage is necrotic from the previous treatment.

Repeat application and weed growth stage interaction

Annual ryegrass was substantially controlled (98% reduction in biomass) following sequential treatment to plants between the two and seven tiller stage (Table 1). However, the repeated application of Non-Tox® for the next larger growth stage (≥10 tillers) resulted in significantly lower control (P<0.05) (Table 1 and Figure 2). Although biomass reduction was considered excellent for the two smallest growth categories, four out of the five treated plants survived and were capable of recovery and producing seed. Occasional plant death can be seen at the smaller growth stages, however suppression is more common

Table 1 Effect on annual ryegrass growth stage on efficacy of Non-Tox® herbicide (applied twice), Tamworth (2018). Assessed 3 October 2018.

Weed growth stage	Percentage of dead plants per pot (0–100%)	Estimated reduction in weed biomass (0–100%)
2–4 tillers	20	98
5–7 tillers	20	98
10 or more tillers	0	72
Untreated control	0	0
l.s.d. ($P = 0.05$)	10	14

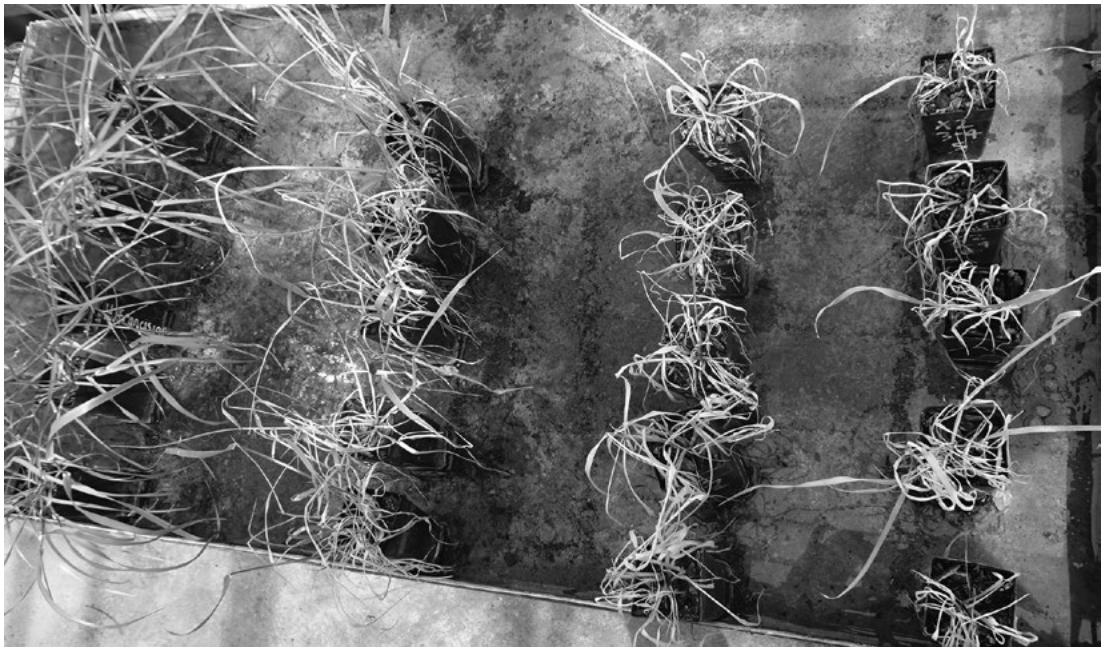

Figure 2 Effects on various annual ryegrass growth stages from Non-Tox® efficacy after treating with sequential applications. Increasing growth stages from right to left.

Conclusions

Non-Tox® herbicide is a salt-based non-selective herbicide that has mainly suppressive and occasionally lethal effects against annual ryegrass, including glyphosate-resistant strains, at the smaller growth stages (2–7 tillers).

Non-Tox® treatment is best suited as a spot treatment on 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.

Flaxleaf fleabane will be investigated in a similar experiment. It 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 as a suppression treatment for annual ryegrass if the weed's size is in the early to mid tillering phase (2–7 tillers); however, it needs to be applied twice for good suppression. Currently it is not registered for this use pattern. The second application must be made when the new foliage is soft and expanding, usually about 4–8 days after the first treatment.

Acknowledgements

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