

Investigation into the mechanisms of resistance of trifluralin-resistant *Lolium rigidum*

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Summary *Lolium rigidum* Gaud. (annual ryegrass) is the most significant weed of southern Australian cropping systems. Widespread resistance to group A and B selective herbicides, has meant growers have turned to trifluralin (group D herbicide) for chemical control of annual ryegrass. However recent surveys have found that trifluralin resistance in annual ryegrass is increasing rapidly, leaving few options for reliable chemical control.

A study was undertaken to investigate the mechanism of trifluralin resistance in two trifluralin resistant annual ryegrass populations: SLR31, a population with moderate resistance, and SLR74, a population with high resistance. Malathion is a known inhibitor of cytochrome P-450 enzymes and has been shown to overcome resistance to pendimethalin, but not trifluralin both group D herbicides (Tardif and Powles 1999).

Malathion (0 and 12 kg a.i. ha⁻¹) and trifluralin (0, 200, 400, 800 and 1600 g a.i. ha⁻¹) were applied to annual ryegrass seeds on the soil surface using a laboratory sprayer (100 L ha⁻¹) and covered with soil. Plants were grown in a growth cabinet for 29 days, maintained at 20°C/12°C for the day/night cycle.

In the absence of malathion, SLR31 exhibited resistance to trifluralin with LD₅₀ of 361 g a.i. ha⁻¹ and GR₅₀ of 317 g a.i. ha⁻¹. In the presence of malathion LD₅₀ and GR₅₀ were reduced by 59 % and 83 %, respectively (P < 0.0005) (Figure 1). In the absence of malathion, SLR74 was more resistant to trifluralin than SLR31, with LD₅₀ of 604 g ha⁻¹ and GR₅₀ of 480 g a.i. ha⁻¹. In contrast to SLR31, neither LD₅₀ nor GR₅₀ of SLR74 was reduced by the addition of malathion (Figure 2).

These results indicate that the mechanism of resistance to trifluralin is likely to be non-target site, enhanced herbicide metabolism in SLR31, but not in SLR74.

Keywords Annual ryegrass, herbicide resistance, trifluralin, resistance mechanisms.

REFERENCES

Tardif, F.J. and Powles, S.B. (1999). Effect of malathion on resistance to soil-applied herbicides in a population of rigid ryegrass (*Lolium rigidum*). *Weed Science* 47, 258-61.

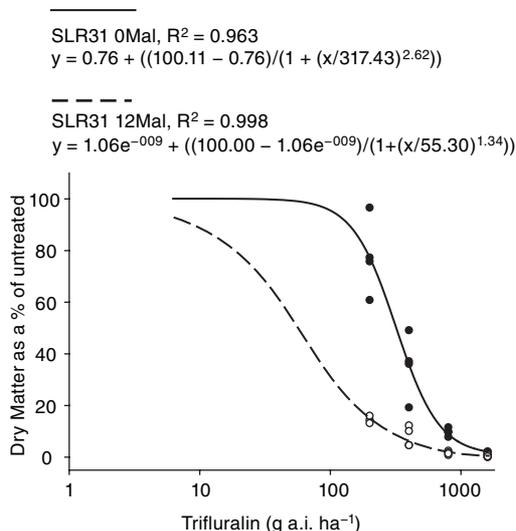


Figure 1. The effect of trifluralin dose on shoot dry matter of SLR31 pre-treated with 0 or 12 kg a.i. ha⁻¹ malathion.

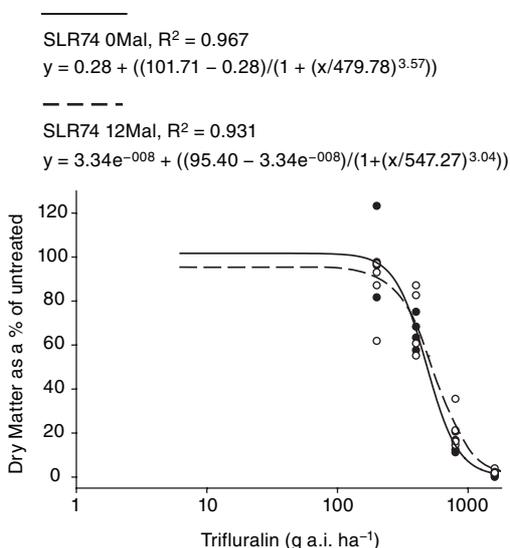


Figure 2. The effect of trifluralin dose on shoot dry matter of SLR74 pre-treated with 0 or 12 kg a.i. ha⁻¹ malathion.