

Managing herbicide resistance in wide row lupin (*Lupinus angustifolius*) in Western Australia

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Summary Use of glyphosate to control inter-row weeds in wide row lupins increases risks of further resistance while 62 annual ryegrass populations including five in Western Australia (WA) have already developed resistance to glyphosate in Australia (Preston 2007). In 2003, five experiments evaluated alternative weed control options in lupins (*Lupinus angustifolius* L.) sown in 50–80 cm wide rows in WA.

Experiment 1 was conducted on a non-wetting yellow sand plain soil at Northampton (28°20'S, 114°38'E). Experiment 2 and 3 were conducted on a Tamma sand plain field at WA No-till Farmers Association (WANTFA) site, Meckering (31°38'S, 117°03'E). Experiment 4 was conducted on a red sandy loam soil at York (31°52'S, 116°45'E) using farmer's commercial sowing machine. Experiment 5 was conducted at the farm scale using farmer's commercial machinery at the same site as Experiment 1. Inter-row herbicides were sprayed using sprayshields (Row Rocket or Red Ball). In Experiment 3, simazine and propyzamide were applied in a 15 cm band on lupin rows behind the seeder. The main weed species were blue lupin (*Lupinus consetinii* Guss) and wild radish (*Raphanus raphanistrum* L.) at Northampton and annual ryegrass (*Lolium rigidum* Gaud.) at Meckering and York.

In Experiment 1, paraquat + diquat at 500 g a.i. ha⁻¹ controlled 93% of the blue lupin and 88% of the wild radish plants, giving 58% greater lupin yield than the untreated control.

In Experiment 2, paraquat + diquat at 250 or 500 g a.i. ha⁻¹ controlled 95–100% annual ryegrass on the inter-rows and increased lupin yield by 11–43%.

In Experiment 1 and 2, mowing followed by knockdown herbicide (glyphosate or paraquat + diquat) was equally effective on weeds but the effect of mowing time with regard to crop growth stage was not clear.

In Experiment 3, propyzamide 1 kg a.i. ha⁻¹ or

simazine 1 kg a.i. ha⁻¹ banded on lupin rows at sowing time reduced annual ryegrass density on lupin rows by 55–69%.

In Experiment 4, alternative non-selective herbicide molecules from Groups C, F, G, and N, as tank mixes with glyphosate or paraquat + diquat provided optimum control of inter-row annual ryegrass in wide row lupins.

In Experiment 5 conducted at the farm scale, blue lupin control by glyphosate (94%) and paraquat + diquat (95%) was statistically similar to the boom spray treatment (farmer practice). The trend in the grain yield of lupin was similar to that of weed control.

Results clearly showed that inter-row weed control with paraquat + diquat provided optimum inter-row weed control and increased grain yields in wide row lupins. So, in the wake of the rapid increase in glyphosate resistance in annual ryegrass, WA farmers should use paraquat + diquat as an alternative to glyphosate for inter-row weed control in wide row lupins to delay further development of glyphosate resistance in weeds.

Keywords Wide row lupins, inter-row spraying, glyphosate, paraquat + diquat, annual ryegrass.

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