

Exploring herbicide alternatives to delay glyphosate resistance developing in common sowthistle (*Sonchus oleraceus*) in the northern grain region

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Summary Common sowthistle (*Sonchus oleraceus* L.) is a challenging and difficult to control weed which hinders crop production in the grain growing districts of Queensland and northern New South Wales. In this region common sowthistle has the ability to germinate most of the year and produce thousands of seed per plant (Widderick *et al.* 2004). The weed originally came to prominence with the wide spread adoption of zero till farming and with recent cases of glyphosate resistance identified in northern New South Wales, effective glyphosate alternatives are required.

To identify glyphosate alternatives, field experiments were established over two seasons. These trials included single and double knock treatments at two weed sizes with herbicide rates increasing with increasing weed size. The two weed sizes were 5–10 cm rosettes and large rosettes (>10 cm) to stem elongation.

The first knock treatments were of both residual and knock down products and included saflufenacil (Group G), 2,4-D, picloram + 2,4-D, fluroxypyr, picloram + MCPA or fluroxypyr + aminopyralid + MCPA LVE (Group I), paraquat + diquat or paraquat (Group L), amitrole + paraquat (Group L + Q), glyphosate (Group M) and amitrole + ammonium thiocyanate (Group Q). The treatments were either applied alone or in a tank mix with glyphosate. The second knock treatments included paraquat + diquat + atrazine or paraquat + diquat + diuron (Group C + L) or paraquat + diquat or paraquat (Group L). All products were applied at recommended label rates. There was a seven day interval between first and second knocks.

Excellent sowthistle control (95–100%) was achieved with double knock treatments of Group I products 2,4-D, picloram + 2,4-D and fluroxypyr, the Group M product glyphosate and the Group G product saflufenacil, followed by a second knock of the Group L product paraquat + diquat. However without the double knock, control was variable between seasons for single knock treatments containing glyphosate. For example, control achieved with 2,4-D + glyphosate

differed from 43% of plants killed to 99% of plants killed for small rosettes for 2013 and 2011 respectively. Glyphosate alone gave excellent control (93% of plants killed to 100% of plants killed for small rosettes for 2013 and 2011 respectively) in the only experiment it was included for both weed sizes.

Although glyphosate alone was effective on this population of common sowthistle, continued use and over reliance on glyphosate has led to resistance in some populations of this species. With single knock treatments less effective than double knock, growers with glyphosate susceptible populations should be using a double knock tactic to run down the seed bank and delay the development of glyphosate resistance in common sowthistle.

These trials showed that Group I products were effective when used with a Group L double knock. However overreliance on Group I products is likely to lead to resistance to these herbicides. Alternative first knock research using herbicides with different modes of action is currently underway. The use of herbicides for common sowthistle control is only part of the answer and research has shown growers should use an integrated weed management approach on a whole of farm basis to achieve effective and sustainable control of this weed.

Keywords Sowthistle, herbicide, glyphosate, resistance.

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