Canadian Agronomist

DIGGING INTO RESEARCH

Fluroxypyr-resistant kochia confirmed in Alberta

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In a 2017 Alberta survey, 13% of the kochia populations sampled were fluroxypyr-resistant. Only 4% of the populations were both fluroxypyr- and dicamba-resistant, indicating that different mechanisms may confer resistance to these herbicides. When combined with estimates of dicamba resistance, about 28% of kochia populations sampled in Alberta in 2017 were resistant to at least one synthetic auxin herbicide.

In western Canada, Group 2 (acetolactate synthase (ALS) inhibitor-resistant) kochia was confirmed first in Saskatchewan and Manitoba in 1988, and subsequently in Alberta in 1989. Currently, nearly all kochia populations in western Canada are considered to be resistant to Group 2 herbicides.

Glyphosate-resistant (Group 9) kochia was found in Warner County, Alberta in 2011, and a 2012 Alberta survey identified glyphosate resistance in 4% of the kochia populations sampled. Further surveys found that Group 9 resistance occurred in 50% of the populations sampled in Alberta in 2017. The 2017 survey of Alberta also reported dicamba (Group 4) resistance in 18% of the kochia

populations, while 10% were triple herbicide-resistant to ALS inhibitors, glyphosate, and dicamba. Group 4 resistant kochia was confirmed first in Saskatchewan from a wheat field in 2015. Results from the 2019 Saskatchewan kochia survey are not yet available.

There was a need to understand whether Group 4 (auxinic) herbicide-resistant kochia populations in Alberta were resistant to dicamba only, or to other synthetic auxins as well. This understanding would help in the development of management options for kochia control.

A study of the 2017 randomized-stratified survey of 305 sites in Alberta was conducted to determine the status of fluroxypyr-resistant (Group 4) kochia. The samples were the same as those screened for resistance to tribenuron/thifensulfuron, glyphosate, and dicamba in earlier research.

Of the 305 sites sampled, kochia populations from 294 sites contained enough viable seed for resistance diagnostics. Overall, 13% of the kochia populations were fluroxypyr-resistant, and were found in 10 of the 17 counties sampled. The greatest confirmation frequency of fluroxypyr-resistant kochia was along the Highway 2 corridor between Lethbridge and Calgary. Fluroxypyr-resistant kochia was found at the greatest frequency in small-grain cereal crops (23% of populations were resistant), followed by canola (15%), non-cropped areas (7%), chemical fallow (6%), and pulse crops (3%).

The majority of fluroxypyr-resistant populations, consisting of 9% of total populations, had low resistance (incidence of 1-20%). Low resistance within these populations is indicative of the early stages of resistance evolution. These populations often remain undetected by farmers or agronomists, but are segregating for resistance, indicating that problems with inadequate control are imminent.

Moderate resistance (incidence of 21-60%) was present in 3% and high resistance (61-100%) was present in 1% of the populations tested. Fluroxypyr-resistant kochia populations with moderate and high resistance would likely cause herbicide failures if fluroxypyr-based herbicides were used for control. Fluroxypyr is often mixed with other active ingredients, however, suggesting that the level of control will vary based on tank mix partners. Many of these partners do not provide adequate control of kochia when used alone.

Of the 294 kochia populations tested, 13% were fluroxypyr-resistant, 19% were dicamba-resistant, and 53% were glyphosate resistant. The exclusion of 11 populations with limited seed supply caused the slight discrepancy between these dicamba and glyphosate resistance frequencies and those reported in the earlier study.

Four per cent of the kochia populations tested were resistant to both fluroxypyr and dicamba, and 28% were resistant to at least one of dicamba or fluroxypyr in 2017. This suggests that separate mechanisms may confer resistance to dicamba and fluroxypyr.

Even more challenging for growers is that 16% were triple herbicide-resistant to ALS inhibitors, glyphosate and a synthetic auxin.

Limited herbicide options left

With the development of triple-resistant kochia populations, limited herbicide options exist. Other research has been conducted looking at control of these resistant populations on chemfallow and in spring wheat. These options typically utilize alternative herbicide Groups such as Group 14 applied pre-emergent, or a post-emergent Group 6 or 27 herbicide – depending on the cropping system.

However, reliance on these herbicides will place further selection pressure on herbicide resistance, and the development of further kochia populations resistant to these Groups.

To reduce selection pressure, farmers are also advised to implement alternative non-chemical weed control practices. Management of herbicide-resistant kochia should exploit its short-lived seedbank persistence by preventing seed production and return to the soil seedbank. In addition, the researchers suggest that a community-based approach will be required to reduce the spread of herbicide-resistant kochia from field to field.

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