



Multiple resistant kochia continues to spread in Alberta

CATEGORY [weeds](#) | February 8, 2023

Kochia with resistance to glyphosate was found at 78% of sites sampled, with 44% of sites exhibiting fluroxypyr resistance, and 28% with dicamba resistance. Triple resistance to Group 2 ALS inhibitors, Group 9 glyphosate, and one of the Group 4 synthetic auxins was found at 45% of the sites.

Kochia was found to be the most abundant weed species in the Mixed Grassland ecoregion of Alberta in a weed survey conducted in 2017. An even greater challenge has been the development of not only herbicide resistance, but multiple herbicide resistance in kochia on the Prairies.

In 1989, Group 2 herbicide resistance was confirmed in Alberta, and now all kochia populations are assumed to be resistant to Group 2 ALS inhibitors. Subsequently, glyphosate (Group 9) resistance was initially confirmed in southern Alberta in 2011 in kochia, and a 2012 Alberta survey found 4% of sites sampled had glyphosate-resistant kochia – growing to 50% of sites sampled 5 years later in 2017.

The same 2017 survey found Group 4 dicamba-resistant kochia at 18% of sites and 13% of sites had Group 4 fluroxypyr-resistant kochia. All of these samples were Group 2 resistant, and 16% had multiple resistance to Group 2, glyphosate and at least one of the Group 4 herbicides.

The objectives of this study were to document the frequency and incidence of resistance to glyphosate, fluroxypyr, and dicamba among kochia populations sampled in Alberta in 2021, and to see how herbicide resistance in kochia has changed since 2012.

The survey was conducted after harvest in late-September/early-October of 2021 at 319 randomized-stratified sites in Alberta, of which 314 sites had enough seed for evaluation. Seed was collected, grown in the greenhouse, and treated with either glyphosate, fluroxypyr, or dicamba at typical label rates. Control was assessed 21 days after treatment for glyphosate and 28 days for the Group 4 herbicides, and categorized into susceptible, low, moderate, and high resistance based on the number of plants showing response to the herbicide application.

Glyphosate-resistant kochia was found in all 18 counties sampled, and 78% of sites had glyphosate-resistant kochia. Of these samples with glyphosate resistance, 46% had low resistance, 37% had moderate resistance, and 17% had high resistance.

Fluroxypyr-resistant kochia was found on 44% of sites in 2021, which was an increase from 13% in 2017. Of these samples, low resistance was found in 74% of samples, moderate resistance in 25%, and 1% had high resistance. These levels of resistance were similar to results from the 2017 survey.

The 2021 survey found fluroxypyr-resistant kochia in two new counties of Taber and Kneehill, in addition to the 10 counties where it was found in 2017. These counties are generally south of Calgary, although some sites were also north and east of Calgary.

Dicamba-resistant kochia was found on 28% of sites, which was an increase from 18% in 2017, while none was found in 2012. Most (94%) sites with dicamba-resistant kochia showed low levels of resistance and 6% had moderate resistance. It was found in 16 of 18 counties surveyed, an increase from 9 counties in 2017, again, mostly in southern Alberta.

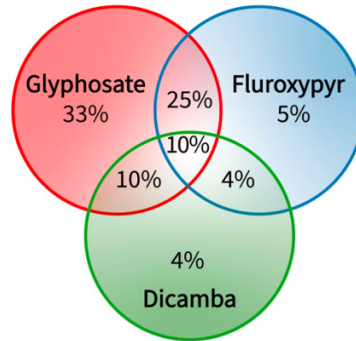
Multiple resistance increasing

The survey confirmed that 45% of sites surveyed in 2021 had multiple resistance to Group 2, glyphosate and at least one of the Group 4 dicamba or fluroxypyr herbicides. This was a jump from 16% in the 2017 survey, when this three-way resistance was first confirmed. Furthermore, 10% of sites had multiple resistance to all four herbicides tested.

However, 30% of the overall sites were resistant to fluroxypyr but not dicamba, 14% were resistant to dicamba but not fluroxypyr, and 14% were resistant to both Group 4 herbicides. This means that in Alberta, Group 4-resistant kochia populations are more likely to be resistant to one of these

herbicides than resistant to both. This suggests that the development of fluroxypyr and dicamba resistance in kochia in Alberta likely have different mechanisms of resistance.

Resistant population frequencies



Source: Geddes et al. 2023

While the frequency of Group 4 resistance is expanding rapidly, the majority still have low levels of resistance. This indicates that Group 4 resistance will continue to grow without alternative methods of control.

The researchers concluded that with increasing resistance to multiple herbicide MOAs, non-chemical approaches such as growing competitive crops, increasing crop seeding rates, and strategic tillage will be necessary to preserve the efficacy of the remaining herbicides available for kochia control.

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Dr. Charles M. Geddes, Ms. Mattea M Pittman, Dr. Linda M Hall, Mr. Keith C. Topinka, Dr. Shaun M. Sharpe, Mrs. Julia Y. Leeson, and Dr. Hugh J Beckie. Increasing frequency of multiple herbicide-resistant kochia (*Brassia scoparia*) in Alberta. *Canadian Journal of Plant Science*. **Open Access:** <https://doi.org/10.1139/CJPS-2022-0224>

Photo by Charles Geddes