



Frequency of Group 14 resistant kochia in western Canada

CATEGORY [weeds](#) | April 22, 2025

Two grower submitted samples were confirmed to have Group 14 PPO inhibitor-resistant kochia from the RM of Newcombe in Saskatchewan and Forty Mile County in Alberta.

Dose response bioassays confirmed high resistance to foliar applied Group 14 active ingredients saflufenacil and carfentrazone in a kochia population from Kindersley in 2021 and two populations from North Dakota in 2022. The Saskatchewan population exhibited up to 87-fold resistance to saflufenacil and 121-fold resistance to carfentrazone.

A screening study was conducted at Agriculture and Agri-Food Canada Lethbridge Research and Development Centre to determine the frequency and distribution of Group 14 PPO inhibitor-resistant kochia in western Canada.

The study included a retroactive baseline survey of 882 kochia populations from three provincial randomized-stratified surveys in Manitoba (2018), Saskatchewan (2019) and Alberta (2021). The field sites were visited in late-September/October and seed was collected from 10 to 20 mature kochia plants. Overall, 315 sites were sampled in Manitoba, 303 in Saskatchewan and 319 in Alberta, with 882 sites that had enough viable seeds for testing.

A second set of kochia weed seed samples were collected from the 2021 to 2023 growing seasons. These samples came from an open call to growers, agronomists, or industry members on the

Prairies for diagnostics of weed samples of suspected novel herbicide resistance. This call was for any weed species and herbicide site-of-action combination for which resistance was not known to occur in the region. Overall, one kochia sample with suspected PPO inhibitor resistance was submitted in 2021, 10 samples in 2022, and three samples in 2023 for a total of 14 samples.

The kochia seed samples were grown in greenhouse flats and were treated with foliar-applied saflufenacil (Heat LQ) when they reached two to three inches in height. The herbicide rate was 50 g ai/ha, which is the high label rate for cereals, and was chosen based on dose-response experiments previously conducted at AAFC Lethbridge. Treated and untreated resistant and susceptible control populations were included for reference. Plant survival and control ratings were conducted 21 days after treatment.

Two populations identified

No kochia populations were found to have Group 14 resistance in the 882 kochia populations in the baseline survey. However, two out of 14 populations from the suspected novel herbicide resistant populations were confirmed to be resistant to saflufenacil.

The first population came from a brown mustard field in the Rural Municipality of Newcombe in Saskatchewan. It had 9% survival rate after application of saflufenacil. The field had been treated with label rates of glyphosate + sulfentrazone + carfentrazone (890 + 75 + 18 g ai/ae/ha) [Roundup WeatherMAX + Authority 480 + Aim EC] pre-emergence followed by glyphosate + carfentrazone + bromoxynil (890 + 9 + 70 g ai/ae/ha) [Roundup WeatherMAX + Conquer] after poor control was observed.

The second population was from Forty Mile County in Alberta and was collected from an alfalfa field in 2023. This population exhibited 63% resistance. The field had been treated with label rates of glyphosate + tiafenacil (1,335 + 50 g ai/ae ha⁻¹) [Roundup WeatherMAX + Insight Liquid SC] before seeding.

The results of the study show that Group 14 kochia resistance was not widespread, as shown by the lack of confirmation of resistance in the 882 kochia populations from the 2018 -2021 surveys. This suggests that the resistance was discovered early with the frequency below detection levels at less than 0.1% of surveyed sites.

However, based on past surveys, kochia resistance can evolve and spread rapidly. For example, Group 9 glyphosate resistant kochia increased from 4% of sites sampled in Alberta in 2012 to 50% in 2017, and 78% in 2021. Similar, rapid increases were observed in Saskatchewan and Manitoba.

Additionally, Group 2 ALS inhibitor-resistant kochia and Group 4 dicamba-resistant kochia has also rapidly increased since 2015, and Group 4 fluroxypyr-resistant kochia is also on the rise.

These past surveys show that resistance to herbicide Groups among kochia populations can rapidly develop across the Prairies within 10 to 20 years after being confirmed.

This study provides a baseline for Group 14 kochia resistance on the Prairies. With the confirmation of Group 14 resistant kochia in two submitted populations, Group 14 resistant-kochia has the potential to spread.

To mitigate the further development of resistant kochia, non-chemical practices will be necessary to limit kochia seed production and return to the seedbank. These include growing competitive crops with early harvest dates, utilizing physical impact mills for harvest weed seed control, mowing kochia patches, and targeted tillage to bury kochia seed at a depth from which it cannot emerge.

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Dr. Charles M. Geddes, Ms. Mattea M Pittman, Dr. Shaun M. Sharpe, and Mrs. Julia Y. Leeson. Baseline survey of protoporphyrinogen oxidase inhibitor-resistant kochia (*Bassia scoparia*) in western Canada. *Canadian Journal of Plant Science*.

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