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Wild oat panicle removal investigated as a weed control method

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Early crop topping treatment with a systemic herbicide targeted at panicle emergence had the largest impact on wild oat density, dockage, seedbank, and crop yield in the following year. An early, or a combination of early and late crop topping (at initiation of seed shed), tended to reduce wild oat populations the most during the following season. Panicle removal by clipping was not effective in reducing wild oat dockage or seedbank populations.

On the Canadian Prairies, recent weed surveys have found that 69% of wild oat populations collected from fields prior to harvest are herbicide resistant. These include resistance to Groups 1, 2, and 8, and multiple combinations of Groups 1+2, 1+8, 2+8, 1+2+8, 1+2+8+25, and 1+2+8+14+15. These resistant wild oat biotypes are severely limiting herbicide control options.

This has led researchers to look for alternative control methods that focus on managing the soil seedbank. The objective of this study was to investigate opportunities to target the life-cycle stages between panicle emergence and seed shed for wild oat management.

Two field studies were conducted in Lacombe, Alberta, and Saskatoon, Saskatchewan from 2015 to 2017. In the first study, panicle removal methods were compared including hand clipping, clipping with a hedge trimmer, and a selective herbicide crop topping application of Axial (pinoxaden) at twice the label rate. In addition to these removal methods a weedy check and Axial herbicide applied in-crop at label application timing and rate were compared.

Wheat was seeded in each of 2015 and 2016. Canola was seeded in each of the years following wheat. These treatments were tested at early panicle emergence, late timing at initiation of seed shed, or in combination at Lacombe over 3 years. No additional treatments were applied in each year following wheat; rather, the second year was used to measure the impacts of first-year treatments on wild oat populations and canola yield in Year 2.

Clipping by hand or with the hedge trimmer was carried out immediately above the top of the wheat head to capture as much of the panicle as possible. Panicles were dropped to the ground and were not collected so as to allow any viable seeds at the time of clipping, or that would later mature to viability, to potentially grow the following year.

Wild oat densities were measured in canola, and wild oat biomass was determined when canola was at 50% flowering. Canola yield and wild oat dockage were also measured. Wild oat seedbank was calculated from a 2 inch (5 cm) soil core.

Early crop topping shows promise

In 2015 and 2016, wild oat dockage was significantly lower in the in-crop herbicide, early crop topping and combination early plus late crop topping treatments. In both years, timing of treatment application did not have a significant effect on wild oat viability, but herbicide application to the panicle reduced wild oat viability by 10% to 30% compared to hand clipping or cutter bar treatments.

Similar to the results in wheat, the early or early plus late crop topping resulted in significantly lower wild oat density and dockage in the following canola year. In both years, the industry standard in-crop application, the early crop topping, and the early plus late combination crop topping treatment resulted in higher canola yields than either the weedy check or the clipping treatments.

The wild oat seedbank was also significantly lower in the early and early plus late crop topping in both years compared to all treatments in 2015. In 2016, the in-crop standard herbicide treatment had the lowest wild oat seedbank, followed by the early and early plus late crop topping.

The researchers found the results interesting in that with only a single year of application, crop topping impacts were immediately observable, but clipping treatments did not have an impact.

Panicle removal timing was inconclusive

In the second study, optimal panicle removal timing was investigated by using a hedge trimmer with weekly removals in comparison to a weedy check in wheat and lentil. Canola was grown the year following wheat or lentil. This study was conducted at Lacombe and Saskatoon over 3 years.

Clipping was initiated when the majority of wild oat panicles were visible above the respective crop canopies and continued weekly until it was terminated once seed shed began. Wild oat density, grain yield, and dockage (Lacombe) were measured. In the canola year, wild oat densities, wild oat biomass, canola yield, wild oat dockage, and wild oat seedbank density were measured.

There were no significant differences in wild oat dockage between clipping timings in either crop in 2015 or wheat in 2016. In lentil in 2016, wild oat dockage in wheat was reduced by clipping in Weeks 3, 4, and 5. Panicle removal timing did not have an impact on wild oat densities, wild oat biomass, canola yield, and wild oat seedbank density.

Overall, clipping timing had limited effects with no optimal clipping time identified. As a result of this second study, the researchers suggest that the lack of response to clipping in the first study was likely due to the lack of efficacy of the clipping treatments, not the clipping timing.

Together, the two studies suggest the need for additional research on managing the wild oat seedbank at the panicle emergence stage. Crop topping was clearly the most effective strategy, but the herbicide used is not registered for that application. This highlights the need to develop other products or other chemicals for crop topping since selective, systemic products were effective in reducing the wild oat seed bank. There is potential to develop additional management strategies for wild oat based on reducing viable seed set. These strategies would be combined with already effective strategies such as pre-herbicides, in-crop herbicides and crop rotation to assist in management of wild oat populations.

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Tidemann, B., Harker, K., Shirtliffe, S., Willenborg, C., Johnson, E., Sroka, E., Zuidhof, J., and Duddu, H. (2021). Evaluation of panicle removal methods and crop topping applications as supplemental

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