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Charting the spread of wild oat patches

CATEGORY weeds | *August 29, 2024*

Patch expansion was attributed mainly to natural seed dispersal or seed movement by equipment at time of seeding. Extensive seed shed from plants in patches before harvest or control of herbicide resistant plants by alternative herbicides minimized seed movement by the combine harvester.

Wild oat plants naturally shed their seed in late summer, often before the crop is harvested. But in early harvested crops, some seed may still be present on the plants and are harvested by the combine. Previous research had found that the viable seed bank density of wild oat decreased by about 90% and seedling density by 75% when seed shed was prevented in the previous year.

The objective of this field-scale study was to determine how preventing seed shed from herbicide-resistant wild oat affects patch expansion over a 6-year period. While the research was conducted over 20 years ago, the findings stand the test of time.

A trial was set up on a 158 acre (64 ha) field near Carrot River, Saskatchewan from 1997 through 2002. Group 1 herbicides were applied in cereals in 1997 and 1999, glyphosate (Group 9) in glyphosate-resistant canola in 1998, flamprop (Mataven) in canary seed in 2000 and 2002, and a Group 2 herbicide in imidazolinone-resistant canola in 2001.

Four wild oat patches were identified in the field and georeferenced. At the reproductive stage of wild oat, the perimeter of the patch was marked with flags and mapped using GPS. Panicle density was measure in each patch.

In Patches 1 and 2, the seeds were allowed to shed naturally and were considered non-treated controls. The percentage of shedded seed from 20 plants in each non-treated plant was calculated before swathing to estimate the amount of seed shed at harvest. In Patches 3 and 4, seed shed was prevented by clipping panicles from the wild oat plants and bagging them.

To calculate the viable wild oat seed bank, soil was sampled from the patches after harvest and frozen. The soil samples were subsequently thawed, and placed in a greenhouse. The number of wild oats that emerged were counted at the two- to three-leaf stage. These were sprayed with fenoxaprop-P (i.e. Puma), and the soil was remixed and refrozen for three weeks. This procedure was conducted three times to simulate freeze-thaw cycles.

Wild oats in all four patches were resistant to fenoxaprop-P ranging from 16% in patch 3 to 100% in Patch 1. This meant that in cereal years when fenoxaprop-P was applied, the resistant wild oat biotypes were survived to set seed.

Patches expanded rapidly

Non-treated patches that were allowed to shed their seed naturally expanded by an average annual rate of 31% in Patch 1 and 38% in Patch 2. Over the six-year trial, Patch 1 expanded by 270% from 0.1 acre (440 m^2) to 0.4 acre (1,630 m^2). Patch 2 expanded by 390% from 0.02 acre (100 m^2) to 0.12 acre (490 m^2).

The patch expansion varied from year to year. Relatively high seed production and extensive seed shed before harvest in 1999 and 2000 resulted in significant natural seed dispersal. The rapid expansion of Patch 2 in 2001 of 54% was due to the majority of wild oat seed still on the spikelets at harvest time of the canola crop.

The annual rate of expansion in Patches 1 and 2 was also influenced by the crop grown in each year. The percentage of empty spikelets per wild oat plant immediately before harvest was high in cereals because wild oat plants matured and shed seed prior to the cereals being swathed or combined. Similarly, wild oat seed shed in the canary seed crop was high because of the later harvest. As a result, patch expansion with a combine would have been low.

The percentage of empty spikelets in the canola crop was much lower at 19 to 26% in Patch 1 and 16 to 21% in Patch 2. That means that 75 to 80% of the spikelets had seed that would have gone through the combine. However, patch expansion in canola was low because the high degree of wild oat control with glyphosate meant that there were few wild oat seeds to spread.

The patches tended to spread east-west vs. north-south. This was attributed to combining and seeding in east-west directions.

The expansion rate in Patches 3 and 4 where the seed was not allowed to shed were much lower. Patch 3 expanded at an annual rate of 4% and Patch 4 at an annual rate of 8%. After 6 years, these patches had expanded by 35% compared to 330% in the non-treated patches. The small annual expansion of the Patches 3 and 4 would be attributed to the persistence of wild oat in the seed bank, and their movement in the soil by the knife openers of the seeding equipment.

The research highlights the importance of managing wild oat patches. With wide-spread wild oat herbicide resistance to multiple herbicides, growers should proactively manage these patches with herbicides with alternative modes of action. Limiting seed spread during harvest of early maturing crops like field pea could also be considered by using harvest weed seed control methods such as chaff collection or impact mills.

Hugh J. Beckie, Hall, L. M., & Barclay Schuba. (2005). Patch Management of Herbicide-Resistant Wild Oat (Avena fatua). *Weed Technology*, 19(3), 697–705. http://www.jstor.org/stable/3989494