AGRONOMY

Managing the Volunteer Canola Seedbank After Harvest

Timely tillage following canola harvest increases volunteer canola germination prior to winterkill, decreasing seedbank persistence.

LARGE HARVEST LOSSES of canola (5.9% of canola yield) coupled with secondary seed dormancy allows viable volunteer canola seed to exist in the soil for several years as a dominant and abundant weed species. In western Canada, conventional crop rotations often only span two or three years, enabling a continuous re-stocking of volunteer canola in the seedbank.

The soil seedbank is an effective, yet underutilized management target to bring annual weeds under control, especially those with seedbank persistence like canola. However, practical knowledge on preventing seedbank persistence in Canadian cropping systems is lacking.

This field study was designed to assess the timing and type of post-harvest soil disturbance for management of volunteer canola in the seedbank. The first objective was to evaluate soil disturbance timing and tillage implement. The second was to evaluate the effect of establishing a winter-annual cereal following canola harvest on the persistence of the volunteer canola seedbank.

Experiments were established on canola stubble following harvest at Carman, Howden and Melita in 2013, and Carman and Pilot Mound in 2015. Seed losses from the canola crop were supplemented with 7000 seeds/m^2 glyphosate-resistant canola seed, broadcasted evenly. Soil disturbance treatments were conducted either shortly after canola harvest, one month after canola harvest or in early spring prior to seeding. Soil disturbance consisted of two passes of either spring-tooth tine harrow (1 cm depth) or tandem disc (12 cm depth) implements. These treatments were contrasted with an undisturbed zero-tillage control treatment. For two additional treatments, winter wheat was established in early fall using a double disc seeder into lightly-disturbed (tine harrow) or undisturbed (zero-tillage) soil. Canola seedbank density and seedling emergence were quantified before and after treatment implementation.

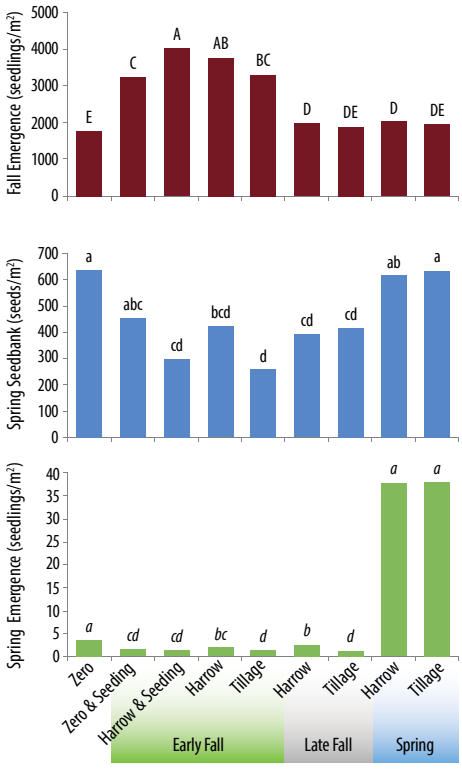
Tillage shortly after canola harvest proved timely in triggering volunteer canola germination and seedling emergence in the fall, thereby decreasing volunteer canola seedbank persistence over winter (Figure 1). Seedlings that germinate in fall should be effectively killed by harsh winter conditions. Encouraging post-harvest emergence in this manner also helped deplete the overall stock of weed seeds in the soil seedbank. Timing of soil disturbance was more important than implement type and degree of disturbance. Even a low disturbance tillage pass (tine harrow) was effective at encouraging fall emergence of volunteer canola.

Although these management practices are effective at reducing volunteer canola seedbank persistence over the first winter, total seed losses at harvest are large enough that 3% population persistence under early fall soil disturbance may still result in large spring seedbank densities. Spring soil disturbance may be used as an additional management tool to stimulate volunteer canola emergence prior to a pre-seed herbicide application.

In early fall, seeding winter wheat into disturbed soil decreased populations of volunteer canola on average by 35% compared with no tillage prior to sowing winter wheat (Figure 1). Soil disturbance during seeding of winter wheat occurred only near the seed row, while tine harrow caused more uniform surface disturbance. This explained the higher fall emergence following early fall tine harrow compared to seeding winter wheat without prior soil disturbance.

Timing of soil disturbance is an effective tool that should be used in addition to other management tactics, as part of a comprehensive integrated program to manage volunteer canola.

Figure 1. Average volunteer canola fall seedling emergence and spring seedbank persistence across five locations established in fall 2013 and 2015.



Different letters above bars indicate statistically significant differences among treatments.

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