

Response to IWM practices in zero-till wheat canola rotations

Researchers at Agriculture and Agri-Food Canada have been investigating Integrated Weed Management (IWM) for several years, and have found that an integrated approach to weed control can provide higher yields with less dependency on herbicides.

A field experiment was conducted at Lethbridge, Alberta and Scott, Saskatchewan to determine the combined effects of seed date (late April or late May), seed rate (recommended or 150% of recommended), fertilizer timing (applied in fall or spring), and in-crop herbicides (50% or 100% of recommended) on weed growth and crop yield. The experiment ran for four consecutive years within a spring wheat-canola-spring wheat-canola rotation in a zero-till production system.

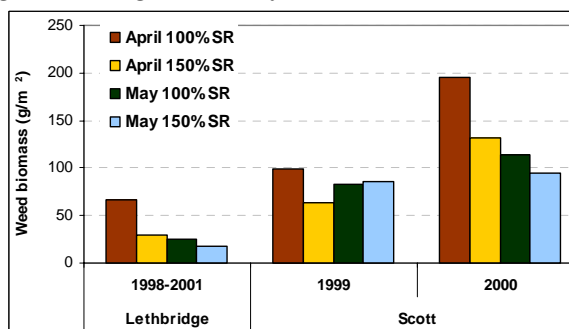
Recommended wheat seeding rate was 80 kg/ha (71 lb/ac) and canola was 6 kg/ha (5.3 lb/ac) with a second treatment of 150% of these rates. Fertilizer was banded 10 cm (4 inches) deep in October, or mid-row banded at seeding. Herbicides applied in wheat were Horizon and Refine Extra. Glyphosate was applied in Roundup Ready® canola. In the first year at Lethbridge and the first two years at Scott, herbicides were applied at 50% of recommended rates, or not at all. However, weed competition was severe in the non-herbicide treatment, and so the no-application treatment was changed to 100% of recommended rate for the remainder of the study

A competitive crop reduces reliance on herbicides

The study found that combining the practices of early seeding, higher seeding rates, and spring-applied fertilizer provided a competitive and productive IWM cropping system. This IWM approach allowed greater flexibility in herbicide use, such as reduced rates or fewer applications. Weed biomass, weed seed-bank, and crop yield in the study were often similar with the 50% and 100% herbicide rate when a competitive, IWM cropping system was established.

The most consistent positive effect on weed management and crop yield in the study came from increasing seeding rates. The positive cumulative effects of higher seed rates over 4 years resulted in a 31% decrease in the weed seedbank at Lethbridge and a 44% decrease at Scott. It is important to note that wheat and canola yields were never lower with higher seeding rates, indicating this is a low-risk agronomic practice that can easily be adopted by farmers.

The treatments with higher seeding rates and either 50% or 100% herbicide treatment resulted in similar weed biomass and crop yield. While earlier seeding often resulted in higher weed biomass, this effect was minimized with higher seeding rates and yield was seldom affected.



Interactive effects of seed date and seed rate on weed biomass at 2 locations.

LEGEND: April = Early seeding; May = Normal (late) seeding; 100% = Recommended seeding rate; 150% = 150% of recommended seeding rate.
Source: Blackshaw, R.E., Beckie, H.J., Molnar, L.J., Entz, T., Moyer, J.R. 2005. Combining agronomic practices and herbicides improves weed management in wheat-canola rotations within zero-tillage production systems. *Weed Sci.*, 53:528-535.

Spring-applied fertilizer was often positive - never negative - in terms of managing weeds and optimizing crop yield. Applying fertilizer in the spring is an important IWM tool. Fertilizer application at spring seeding, compared with a previous fall, reduced weed biomass in 8 of 15 site-years and reduced the weed seedbank after 4 years by more than 20%.

Early seeding of canola resulted in higher yield in 4 of 7 site years, and yield was never lower than late seeded canola, even though more weeds were often present for the earlier seeding dates. Delayed seeding of canola often resulted in lower yields, and would not be advisable on the Canadian prairies for weed management.

However, there might be more flexibility with the seed date of wheat than that of canola. Wheat yield was similar with April and May seeding in 4 of 7 site-years, indicating that there is potential to delay wheat seeding to manage weeds without markedly reducing yield potential. This study demonstrates the combined merits of early seeding (April), higher crop seed rates, and spring-applied fertilizer in conjunction with timely but limited herbicide use to manage weeds and maintain high crop yields in zero-till rotations containing wheat and canola.