



Using crop management to make weeds less comfortable

by John Harapiak*

Integrated crop management vs. 'silver bullet' approach to weed control maximizes crop benefits.

Approaches to managing weeds on western Canadian farms have changed over the last few decades. The development of weed resistance to herbicides was an important wake up call in that it highlighted the fact that a 'silver bullet' approach to weed management, while effective in the short-term, was not necessarily sustainable. Other factors such as the move to reduced tillage and the advent of herbicide tolerant crops (notably canola) have also influenced the extent and nature of weed populations and their management. (From a meeting in January 2007: "Weed management ain't what it used to be." John O'Donovan and Denise Maurice.)

Seek uniform crop establishment

Paying close attention to the seeding can pay dividends in terms of establishing a healthy, uniform and a rapidly growing crop that will more aggressively compete with weeds. In that regard, I am always surprised at how many growers still plant deeper than required to ensure germination and early emergence. In a research trial, seeding barley 1.5 inches deeper than required resulted in a spotty stand that left plenty of room for uninhibited weed growth (see photo). Barley production experts located in Alberta established a 'rule of thumb' stating that every half inch deeper barley was seeded than necessary resulted in a yield penalty of five bushels per acre.

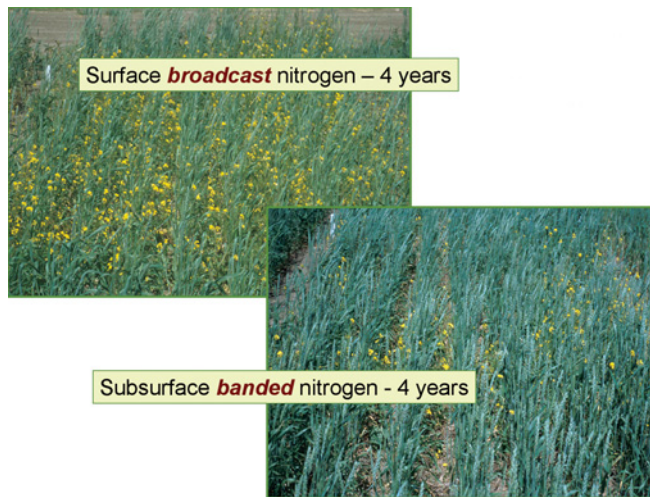
Consider impact of seeding speed

The negative impact of increasing the speed of the seeding operation on crop stand establishment is generally not considered or assessed. As illustrated in the data generated by Bayer CropScience, the success in achieving canola crop emergence was directly related to the speed at which the seeding operation was carried out. By increasing

the speed of the seeding operation from five to seven miles per hour, the number of plants emerging was almost reduced by 40 percent. In addition, the resulting stand was significantly less uniform, thereby providing greater opportunity for unencumbered weed establishment.

Fertilize the crop, not the weeds!

Growers have been learning that many weeds will respond to fertilizer if they have access to it. This is one of the reasons that prairie growers have dramatically reduced broadcast application of N fertilizers. Wild mustard concentration in a crop of wheat was significantly higher where N fertilizer was broadcast rather than subsurface band applied for four consecutive years (see photo). As a direct result of the weeds having greater access to surface applied fertilizer, a greater weed seedbank had accumulated within the soil.



Four successive years of broadcast application of nitrogen fertilizer created a much higher seedbank of wild mustard than if the same amount of nitrogen fertilizer was applied in subsurface bands.

COURTESY OF J. O'DONOVAN, AAFC, LACOMBE.



Illustration of the visual differences in wild oats infestation that existed in the fifth study year between the extremes in management factors (i.e. shorter barley variety, lower seeding rate and five years of continuous barley vs. taller barley variety, higher seeding rate and diverse crop rotation) included in the Lacombe AAFC research study.

COURTESY OF N. HARKER, AAFC, LACOMBE.

Integrating impact of several factors

These three situations illustrate how the management of a single factor can either increase or decrease the ability of a crop to compete with weeds. Of course, there are many management factors that could also play an important role in determining crop competitiveness with weeds. Sorting out how these various factors interact with weed/crop dynamics is a very daunting task. However, Neil Harker and his associates at AAFC Lacombe have undertaken this important task and the initial results have been very encouraging. They have demonstrated that the manipulation of several crop management factors in

concert can have a distinct unsettling impact on the competitiveness of weeds.

Important Lacombe study

Harker and his associates have been conducting a number of different studies on cropping factors that might enhance crop suppression of weed growth. In one study, they assessed the impact of five years of continuous barley production as opposed to a more diverse rotation (i.e. barley-canola-barley-peas-barley). In addition, they compared the influence of tall vs. short barley and low and high seeding rate (i.e. seeding rates of 200 vs. 400 seeds per square metre). For all years, only the quarter rate of wild oats herbicide spray was used in order to ensure that the crop was growing under some degree of weed pressure. After a period of five years, the impact of these treatment variables on wild oats production was surprisingly large.

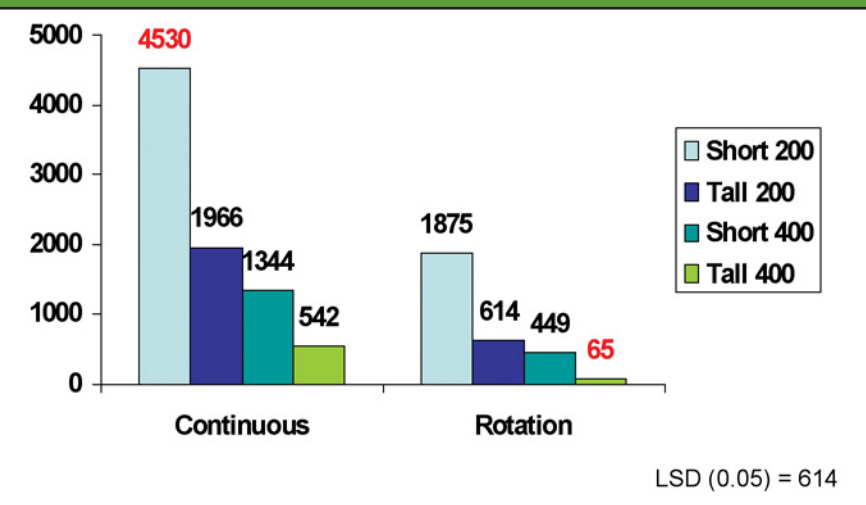
Combination impact is significant

For example, utilizing a taller, more competitive barley variety and a higher seeding rate resulted in a two-fold and three-fold reduction in wild oats biomass respectively. The impact of these two factors in combination had an eight-fold impact. However, when the impact of these two variables plus influence of crop rotation was taken into consideration, there was a 70-fold reduction in wild oats biomass production. It is obvious there is a synergistic interaction that exists between maximizing the level of

Figure 1. Impact of three management factors on wild oats biomass. The individual and cumulative impact of crop rotation, seeding rate and plant height (i.e. variety) on the production of wild oats biomass in a crop of barley. The individual impact of all three crop management factors on their own was significantly less important than the cumulative impact of all three factors being modified.

200 to 400 plants/m² = 3x reduction
 Short to tall barley = 2x reduction
 Both factors = 8x reduction
 Both factors and rotation = 70x reduction

Courtesy of N. Harker, AAFC, Lacombe.



management exerted on all factors involved in suppressing weed growth that growers simply cannot afford to ignore. The range of the impact due to management strategies on density of wild oats plants was visually quite striking (see photos).

Broader view of weed control required

Harker suggests, "When growers are confronted with herbicide performance

problems they usually start thinking about herbicide application factors such as water carrier volume, spray nozzles, temperature, adjuvants, water quality, for instance, since these factors are traditionally thought to be the major factors influencing herbicide performance. However, we have found that combining optimal factors such as rotational diversity, competitive cultivars and higher than normal seeding rates can influence herbicide performance as much or more than herbicide application techniques and conditions."

Adopt diverse systems approach

The importance of using systems-based approaches to weed management and weed control cannot be over-emphasized. To be effective, this approach will require careful scouting of fields in order to assess weed species present, as well as their size and density. In addition, it will require the adoption of agronomic practices that will enhance crop competitiveness with weeds, judicious herbicide application and implementing appropriate crop rotations that can reduce the impact of weeds over the long-term. Researchers and crop

Treatment	June 11, 2004	
	Plants/m ²	% of 5.0 MPH
4.0 mph	82	109%
4.5 mph	80	107%
5.0 mph	75	100%
5.5 mph	58	77%
6.0 mph	50	67%
7.0 mph	47	63%

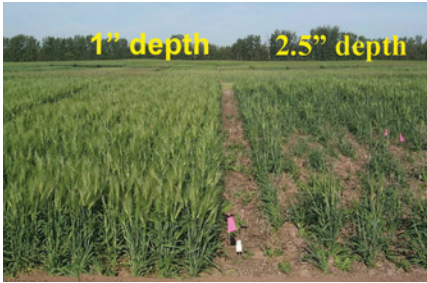


The successful emergence of canola seedlings out of the ground is significantly impacted by the speed at which the seeding operation is carried out.

COURTESY OF BAYER CROPSCIENCE.

AGRONOMY

consultants have become more diligent in determining the root causes of shifts in weed populations and in developing strategies for combating them.



An excessive seeding depth can result in delayed and uneven crop emergence, thereby creating a more favourable environment for weed establishment and reduced crop competitiveness.

COURTESY OF J. O'DONOVAN, AAFC, LACOMBE.

Create an adverse habitat for weed seeds

Weed scientists stress that weeds are suppressed by adding diversity to cropping rotations. Harker also points out that weed seedlings are relatively small and are generally poorly adapted to early competition in undisturbed soils, whereas disturbance (i.e. tillage) creates a much more favourable environment for the survival of the weed seedlings. Harker further points out that the adoption of no-till/reduced tillage systems can create an adverse soil surface habitat that encourages much greater mortality for weed seeds. ■



**John Harapiak has more than 40 years of western Canadian based fertilizer related experience. He will continue to contribute stories to Top Crop Manager. He can be contacted by e-mail: jharapiak@shaw.ca, telephone: (403) 281-3132.*