Time of Weed Control

Controlling Weeds in Canola:
The Ideal Timing

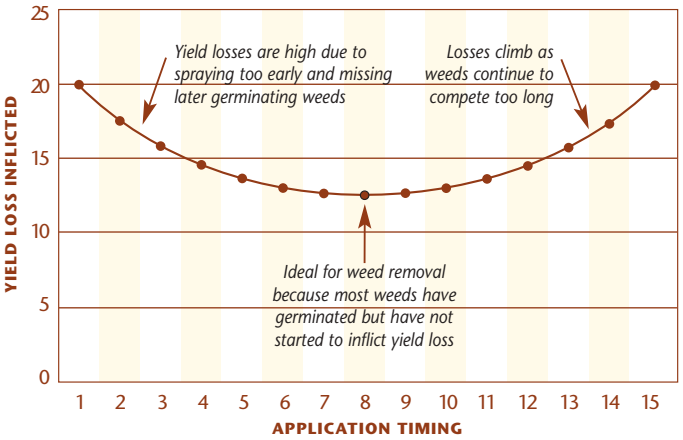
Weeds can be the most limiting factor in canola production and deciding when to control weeds is a complex decision. Growers often question: "Should I get rid of weeds early or wait until more weeds emerge to minimize passes? How far along does canola have to be so that any late emerging weeds are too far behind to inflict yield loss?"

Time of weed control is a critical question for growing canola because of the competitive nature of the crop. In earlier leaf stages, there is a high cost to leaving weeds. Young canola is very non-competitive and weeds will win the competition for nutrients and soil moisture. But in later stages, the crop is more competitive, letting less than 9% of full sunlight down to the soil surface where late-emerging weeds are in near darkness. Knowing when to remove weeds is critical to profitability.

When to Control Weeds

Researchers at Iowa State University developed a graph that depicts the goal in timing weed control operations (Figure 1). The graph shows that herbicide applications made too early can miss weeds that emerge later, causing yield losses. At the other end of the graph, yield losses are also high because late applications generally leave weeds within the crop too long. With even a few extra days, weeds can use enough moisture and nutrients to leave the crop short of these resources later in the season.

FIGURE 1 **Time of Weed Removal Model**



Theoretically, there should be an ideal application timing that is late enough to allow weeds to germinate, but not so late as to allow weeds to cause serious yield losses.

This ideal timing is depicted in the graph at the bottom of the curve, where losses are minimal.

The ideal timing will likely shift to the left (earlier) or right (later) depending on weed populations, types of weeds, weather and whether crop nutrients are limiting.

The question is how early does this ideal point occur in canola?

The middle of the curve is the lowest point and produces optimum weed control. The herbicide application is late enough that the majority of key weeds have emerged. But the emerging weeds have not been left so long that they have depleted the water and nutrient resources.

Canola Production Centre Trials

Trials at Canola Production Centres show the impact of early weed removal in western Canadian canola. While there are site-to-site and year-to-year differences, the ideal herbicide application timing on canola is consistently at about the same time.

Canola Council Agronomists sprayed canola in large plots in farm fields. Applications were timed at the 1-2 leaf stage of the crop (early), the 3-5 leaf stage (mid) and at the 6-plus leaf stage (late). In some years, the mid-timing was missed or not included in the trials. And in some years, two broader timings were used as opposed to three narrower timings.

The results (Table 1) show a consistent trend toward better yields when application is aimed at the earliest timings. In an overwhelming 24 seeding date/locations out of 27, the earliest timing gave the best yield. The early applications showed a 16% yield advantage compared to the latest timing.

The mid-timings (3-5 leaf stage) did not have better yields compared to the early timings. Waiting a few extra days means that more late germinating weeds may be up and controllable. But this did not translate into yield. The mid-timings only were best in three cases out of the eight trials where three timings were included.

The most profitable timing for weed control was early and holds true for early-seeded or late-seeded crops.

Time of Weed Removal

TABLE 1 **Summary of Canola Production Centre Trials on Time of Weed Removal**

YEAR	LOCATION	SEEDING DATE	YIELD AT STAGE REMOVED					BEST* TIMING	EARLY YIELD ADVANTAGE #(%)
			1 TO 2 LEAF	1 to 3 LEAF	3 TO 5 LEAF	4 to 6 LEAF	6 TO 7 LEAF		
1998	RUSSELL	May-13	25.4				18.7	EARLY	35.8%
1998	WHITEWOOD	Apr-23	33.8				31.7	EARLY	6.6%
1998	WHITEWOOD	May-08	28.2				25.6	EARLY	10.2%
1998	NAICAM	May-04	36.4				36.2	EARLY	0.6%
1998	NAICAM	May-21	32.9				32.5	EARLY	1.2%
1998	LETHBRIDGE D	Apr-21	28.1				28	EARLY	0.4%
1998	LETHBRIDGE D	May-01	25.4				26.4	LATE	
1998	ANDREW	Apr-28	33.8				33.3	EARLY	1.5%
1998	ANDREW	May-08	34.7				34.3	EARLY	1.2%
1999	CARMAN	Jun-07	35.8		31.2		28.1	EARLY	27.4%
1999	NAICAM	May-09	40.6		38.5		36.8	EARLY	10.3%
1999	RUSSELL	Apr-30		43		34.7		EARLY	23.9%
1999	RUSSELL	May-27		40		39.2		EARLY	2.0%
1999	NAICAM	May-08		38.4		36		EARLY	6.7%
1999	NAICAM	May-21		35.3		34.2		EARLY	3.2%
1999	DELMAS	May-20	37.7		35.6		35.7	EARLY	5.6%
1999	RUSSELL	NR	33.3		27.4		21.2	EARLY	57.1%
1999	VEGREVILLE	May-23	37.6		38.9		37.7	MID	
1999	VEGREVILLE	May-06		46.1		45.4		EARLY	1.5%
1999	VEGREVILLE	May-22		50.3		48.1		EARLY	4.6%
1999	LETHBRIDGE D	Apr-22		27.9		27.7		EARLY	0.7%
1999	LETHBRIDGE D	May-04		46.6		45.9		EARLY	1.5%
1999	WANHAM	May-06	38.2		37.2		29.2	EARLY	30.8%
1999	ROLLA	May-17	32.4				20.8	EARLY	55.8%
2000	SELKIRK	May-07	33.4				17.8	EARLY	87.6%
2000	NAICAM	May-05	40.4		38.1		37	EARLY	9.2%
2000	VEGREVILLE	May-12	40		40.8		29.8	MID	

** Compared to latest timing; D = dryland*

University of Manitoba Weed Control Studies

The benefits of early weed removal timing are supported by work done at the University of Manitoba (Table 2). In trials conducted at multiple locations over two years, weeds that emerged after the 4-6 leaf stage seldom impacted actual canola yields to a 10% yield loss level (Steve Martin and Dr. Rene Van Acker). Few weeds emerged after the 4-leaf stage of the crop and the few that did were spindly and weak.

In most instances, growers can concentrate on early emerging weeds and worry less about the later emerging weeds that come up after the crop has hit the 4-6 leaf stage.

The length of time weeds could be tolerated until they had caused a 5% or 10% yield loss varied greatly from site to site. A 10% yield loss does not happen until the weeds are allowed to remain in the field to the 4-leaf stage.

In two out of the six fields, weed control was not needed at all to avoid a 10% yield loss. This finding supports the belief that growers can make the maximum amount of money by knowing whether to spray as well as when to spray.

TABLE 2 Time Canola can Tolerate Weeds before a 5 or 10% Yield Loss

		LENGTH OF TIME THAT THE WEED INFESTATION COULD BE TOLERATED FOR THE SPECIFIED YIELD LOSS			
		5 PERCENT YIELD LOSS		10 PERCENT YIELD LOSS	
Location	Year	Days weeds could be tolerated	Crop stage	Days weeds could be tolerated	Crop stage
CARMAN	98	43	8 to 10 leaf	Whole season	Harvest
WINNIPEG	98	32	6 leaf	34	6 leaf
CARMAN (EARLY)	99	38	4 leaf	38	4 leaf
CARMAN (LATE)	99	17	4 leaf	19	4 leaf
WINNIPEG	99	34	8 to 10 leaf	Whole season	Harvest
HOMEWOOD	99	22	6 leaf	33	8 to 10 leaf

Source: Martin S,G, R.C. Van Acker and L.F. Friesen. 2000. Critical period of weed control in spring canola (Brassica napus L.). Weed Sci. 49:326-333.

Alberta Weed Control Research

Research funded by "Farming for the Future" in Alberta found the same trend: early spraying means higher yields. Waiting for weeds to germinate to the last one did not pay (Figure 2). Results showed a 3 bu/acre yield increase by spraying at the 1-leaf versus the 5-leaf stage. These trials were located on actual farm fields in Fort Vermilion, Manning, Falher, Spirit River, Dawson Creek, Westlock, and Oyen. They were conducted by Smokey Applied Research and Demonstration Association (Project Leader: Tara Lee), North Peace Applied Research Association, Central Peace Conservation Society, Peace River Soil Conservation Association, Chinook Applied Research Association, Gateway Research Organization.

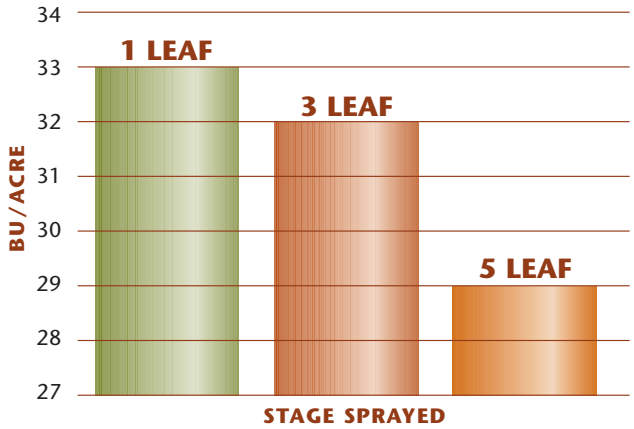
Further work conducted in Alberta by Dr. George Clayton, Dr. Neil Harker and Dr. John O'Donovan looked at nine site years of spray timings in canola. Trials were conducted with glyphosate-tolerant canola in Lacombe, Beaverlodge and at a site near Edmonton. Glyphosate was applied at the 1-2 leaf stage, the 3-4 leaf stage and the 5-6 leaf stage of the crop. A summary of their results is found in Table 3.

TABLE 3 Crop Staging that Gave the Best Yields in Nine Site-Years of Weed Control Trials in Small Plots in Alberta

Year	Lacombe	Edmonton	Beaverlodge
1997	Best yield when crop was sprayed at 1-2 leaf	Best yield when crop was sprayed at 1-2 leaf	Best yield when crop was sprayed at 1-2 leaf
1998	Best yield when crop was sprayed at 3-4 leaf	Best yield when crop was sprayed at 3-4 leaf	Best yield when crop was sprayed at 1-2 leaf
1999	Best yield when crop was sprayed at 5-6 leaf	Best yield when crop was sprayed at 3-4 leaf. The latest (5-6 leaf stage) application actually yielded better than the earliest	Best yield when crop was sprayed at 1-2 leaf

Source: Clayton, George W.; Harker, Neil; O'Donovan, John T.; Baig, Mizra N.; Kidnie, Mark J.; Glyphosate Timing and Tillage System Effects on Glyphosate-Resistant Canola *(Brassica Napus)*, In Press. Funded by the Alberta Canola Producers Commission.

FIGURE 2 Yield of Canola in Alberta Fields



In seven out of the nine cases, early timings (1-4 leaf stage) resulted in the highest canola yields of all treatments. In one case, the latest timing actually yielded the best.

This supports the conclusion that early timings provide the best returns because the early emerging weeds do relatively more damage to yield potential than later emerging weeds.

At Lacombe and at Edmonton in 1999, the latest applications actually yielded better than the earliest application. The researchers believed that this was due to a significant number of weeds that emerged after the glyphosate application. They pointed out that a second application of glyphosate would have been a good strategy two times out of nine.

The study points to the wisdom of planning field walks early so that a spray/no spray assessment can be made at a time in the crop's life when the potential returns are the highest.

A Summary

Although there are differences between trials in methodology, timing and details, there is a clear trend:

1. Time of Weed Control in Canola:

Weed control at the 1-4 leaf stage of the crop maximized profitability. The early half of this application was better.

2. And:

When weed populations were heavy, weed control prior to the 4-leaf stage of the crop was most profitable.

Carefully consider: weed pressure, time of weed emergence, crop competition and weather conditions when planning weed control.

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