

## Glyphosate application timing and rate affects spring canola yield

Mark Thorne and Drew Lyon

Glyphosate is an effective tool for controlling Italian ryegrass in spring canola that has become resistant to Group 1 ACCase inhibitor herbicides. With the newer Truflex<sup>®</sup> cultivars, glyphosate can be applied to spring canola up to two times from emergence through the first flower stage of development. Application rates can vary but the total amount applied can't exceed the maximum rate of 1.6 lb acid equivalent per acre with no more than half the maximum applied when the canola has six leaves through the first flower. For a product like Roundup PowerMAX<sup>®</sup>, this corresponds to a maximum rate of 44 fl oz/A. With the expanded rates and timing of applications, growers have more flexibility in making applications that corresponds with Italian ryegrass emergence.

Over the past several years, our research has found that glyphosate applications sometimes have had a negative effect on spring canola, either by delaying flowering, delaying maturity, stunting growth, reducing yield, or all or some of the above. Furthermore, it is not clear whether timing or rate of glyphosate application or seeding date is the main contributing factor.



**Figure 1.** Spring canola glyphosate timing and rate trial at the WSU Cook Agronomy Farm, Pullman, WA. Canola on the left seeded April 25; canola in the middle seeded May 5; canola on the right seeded May 15, 2025.

We set up a trial to test the effects of glyphosate rate and application timing on canola seeded at three different dates using the cultivar InVigor<sup>®</sup> LR354PC at the WSU Cook Agronomy Farm near Pullman, WA (Figure 1). Spring canola was seeded on April 25, May 5, and May 15, 2025.

For each seeding date, canola seeding rate was 12 seeds/ft<sup>2</sup> in strips measuring 22.5 by 120 ft. Prior to seeding, liquid fertilizer was applied at 110-20-0-25-0.3-0.3 N-P-K-S-Zn-B lb/A and Treflan HFP was applied for preemergence weed control at 24 fl oz/A and incorporated 2 in deep with a field cultivator. Four glyphosate treatments were applied to the canola at each seeding date. Roundup PowerMAX was applied at 22 and 44 fl oz/A when the canola had three leaves, and 22 fl oz/A when the canola had six leaves. All treatments were replicated three times in each seeding date strip.

Treatments effects were evaluated visually for herbicide injury when the canola was in the flowering stage for each seeding date and recorded as percent of the nontreated check. Injury was seen as stunting of plants and thinning and size of seed pods. Canola yield was measured by harvesting a 5 by 22.5-ft wide swath in each plot with a small plot combine. Canola samples from each plot were bagged and weighed to calculate plot yield. Italian ryegrass at this site was controlled by the preplant Treflan HFP application; therefore, densities were extremely low and did not affect canola yields.

Canola injury and yield responses were similar at each seeding date in relation to glyphosate application timing and rate, therefore, seeding date data were combined (Table 1). The highest yielding treatment was the nontreated check averaging 2310 lb/A indicating that glyphosate negatively affected yield. The least amount of reduction was with Roundup PowerMAX applied at 22 fl oz/A at either the 3-leaf or 6 leaf stage. The lowest yielding treatment was with Roundup PowerMAX applied at 44 fl oz/A, which correlates with the 30% visual injury seen during flowering as a reduction in height as well as smaller size seed pods (Figure 2).

**Table 1.** Spring canola injury and yield in relation to glyphosate (Roundup PowerMAX) application timing and rate.

Herbicide	Rate	Spring canola*		
		Stage	Injury	Yield
	fl oz/A		% of check	lb/A
Nontreated check	0	---	0	2310 a
Roundup PowerMAX	22	3 leaf	20 b	2090 b
Roundup PowerMAX	44	3 leaf	30 a	1950 c
Roundup PowerMAX	22	6 leaf	6 c	2110 b

\*Spring canola InVigor LR354PC Truflex and LibertyLink<sup>®</sup> cultivar resistant to both glyphosate and glufosinate.

Canola yields also differed between seeding dates with the highest yields from the April 25 seeding and lowest from the May 15 seeding (data not shown). However, we are not reporting individual yields by seeding date because of an apparent moisture bias based on slope position of each seeding. The canola seeded April 25 was on the lower part of a slope and likely had greater access to soil moisture compared with the other strips, especially the May 15 seeding which was highest on the slope. Because of this potential slope and moisture effect, it is impossible to separate the effect of slope position from seeding date.

Glyphosate resistance in canola is achieved from two processes, one of which is a gene that codes for a glyphosate-resistant enzyme (EPSP synthase) involved in the synthesis of aromatic amino acids phenylalanine, tyrosine, and tryptophan. These amino acids are critical for protein synthesis and other compounds including chlorophyll. Reports in the literature describes the glyphosate resistant enzyme as having only “reduced affinity,” suggesting that some glyphosate can attach and reduce then enzyme’s function. This may explain in part the injury we have seen in our research trials. Plant stress during flowering from heat or lack of soil moisture, or both, can also reduce canola yield. The impact of glyphosate, especially at the higher rate, may increase plant stress by delaying flowering and exposing the plant to higher temperatures and dryer soil in addition to reduced production of critical aromatic amino acids.



**Figure 2.** Spring canola in the pod fill stage. Left - pods of spring canola treated with 44 fl oz/A Roundup PowerMAX at the 3-leaf stage. Right - spring canola that was not treated with Roundup PowerMAX.