Italian ryegrass control in spring canola combining multiple modes of action

Mark Thorne, Marija Savic, Henry Wetzel, and Drew Lyon

Italian ryegrass resistance to glyphosate is a concern for canola producers using RR cultivars specifically for control of Italian ryegrass. Resistance has occurred in southern U.S. states and California from repeated use of glyphosate on RR crops or in orchards. To delay or avoid resistance, management that incorporates different control approaches, including multiple herbicide modes of action, is highly recommended (Figure 1). Italian ryegrass is a cool-season annual to short-lived perennial grass weed that has developed a strong foothold in the Palouse region within the last 30 years. In this 30-year period, Italian ryegrass has developed resistance to all Group 1 (ACCase inhibitors) herbicides, e.g., clethodim, Hoelon®, Poast®, Assure®, Axial®, and Group 2 (ALS inhibitors) herbicides, e.g., Osprey®, Outrider®, Amber®, PowerFlex®, or Beyond®.

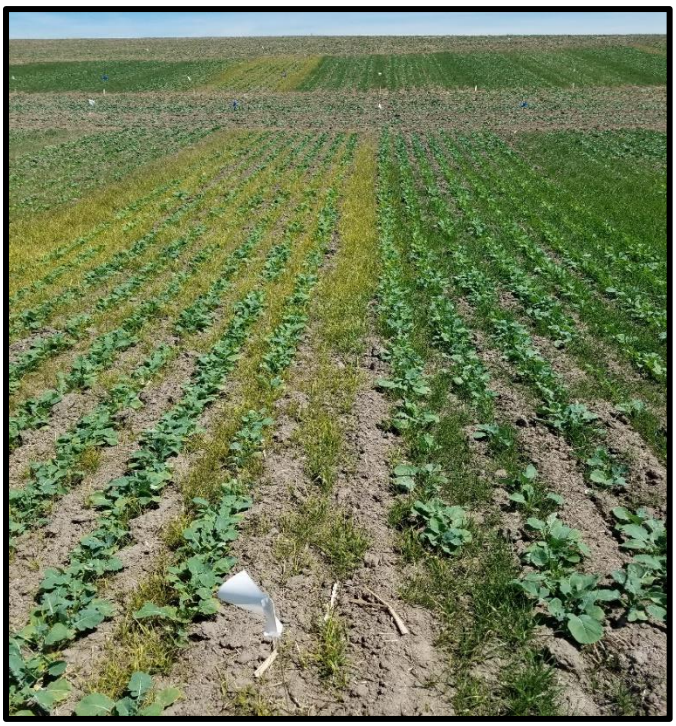

Figure 1. Italian ryegrass sprayed with Liberty on left, nontreated on right.

In this region, Italian ryegrass resistance to glyphosate is not yet present; therefore, RR canola remains an effective tool. For non-Truflex™ RR varieties, a single application cannot exceed 16 oz/A, and total application cannot exceed 22 oz/A up to the 6-leaf stage. Since these rates are lower than recommended for Italian ryegrass control in fallow, there is the chance for incomplete control, especially in dense stands or when applied to larger ryegrass plants. Low rates that result in incomplete control can lead to glyphosate resistance. In contrast, Roundup PowerMAX can be applied to RR Truflex™ canola at 44 oz/A for a single early application when the canola has up to 3 leaves, or at 22 oz/A in two split applications with the last application occurring up to the time of flower initiation. These higher rates are less likely to result in incomplete control of Italian ryegrass.

To reduce dependency on glyphosate for Italian ryegrass control, other strategies need to be incorporated. Potential options include preemergence applications of trifluralin (Treflan® TR-10), which can control Italian ryegrass up to about 70%, but requires rainfall following

application for activation. Pronamide (Kerb®), which is currently not labeled for use in canola, has the same mode of action as trifluralin and needs rain for soil activation. Liberty Link® (LL) canola is resistant to glufosinate (Liberty®), which applied post-emergence can give about 90% control of Italian ryegrass, particularly if the ryegrass is in the 1-2 leaf stage. While Liberty is a non-systemic contact herbicide and can be less effective on grasses than glyphosate, using a LL canola and combining Liberty with a soil active herbicide may be an effective option.

See Table 1 for application dates, rates, and timing. Applications were made in both tilled and non-tilled soil; however, planting method was not statistically different for any of the measurements taken, therefore all data were combined for analysis (Table 1). Results from this year's trial were affected by regional drought conditions; however, several key pieces of information emerged. Overall, glyphosate applications were most effective at controlling Italian ryegrass. Control of Italian ryegrass was 100% for the EPOST (early postemergence) or the EPOST plus LPOST (late postemergence) split applications of Gly Star 5 Extra (glyphosate). The single LPOST applications were slightly less effective and a few Italian ryegrass plants produced seed by harvest. The Liberty applications were less effective than Gly Star 5 Extra; however, Italian ryegrass canopy cover (abundance) was similar to the Gly Star 5 Extra applications that resulted in less than 100% control. Treflan TR-10 PPI followed by EPOST Liberty was visually better than the EPOST Liberty treatment without Treflan TR-10. Also, more Italian ryegrass plants produced seed by harvest following the LPOST Liberty treatment than the EPOST treatments. Furthermore, the dry year was not conducive for the soil active herbicides, Treflan TR-10, Kerb, and Aatrex.

Canola yield was reduced by at least 50% from the previous year because of the dry spring conditions, and it was observed that some of the Gly Star 5 Extra applications resulted in reduced yield compared with the EPOST Liberty treatments (Table 1). Furthermore, harvest for all canola treated with Gly Star 5 Extra was delayed three weeks compared with the Liberty treated canola. This was especially evident in the no-till plots. Furthermore, yield of the TT and Non-GM canola were low compared with the highest yielding RR/LL plots. Overall, the no-till planted canola was a little slower to emerge because the seed zone soil was about 5° F cooler at planting compared with the tilled soil, and this also delayed flowering by a few days.

Overall, the early or split applications of Gly Star 5 Extra resulted in the best control and were more effective than Gly Star 5 Extra applied only LPOST, or the Liberty applications; however, the canola sprayed with the early Liberty applications yielded higher than Gly Star 5 Extra alone. The TT and Non-GM canola emerged and flowered a little faster than the RR/LL canola but resulted in lower yields and very little Italian ryegrass control. Unfortunately, the soil active herbicides were not effective because of the lack of rainfall following application.

Table 1. Applications to three different canola cultivars for Italian ryegrass control with multiple modes of action.

	Dates for each operation, and canola stage at each date or operation									
	04/23/21	04/21/21	04/23/21	05/26/21	06/01/21	06/08/21	6/23/21	Canola Harvest[7]		
Trt	Canola Planted[1]	PPI[2]	PRE[3]	Canola 3-4 leaves EPOST[4]	Canola 5-6 leaves LPOST[5]	Canola Bolting LPOST[6]	Italian Ryegrass Control	Italian Ryegrass Cover	Italian Ryegrass with Seed	Canola Yield
							(%)	(%)	(%)	(lb/A)
1	RR/LL	-	-	Gly Star (50)	-	-	100 a	0 ef	0 c	1120 bcd
2	RR/LL	-	-	-	-	Gly Star (25)	88 b	6 cd	0.4 c	1160 bc
3	RR/LL	-	-	Gly Star (25)	-	Gly Star (25)	100 a	2 def	0 c	1150 bcd
4	RR/LL	Treflan	-	Gly Star (50)	-	-	100 a	0 f	0 c	1290 ab
5	RR/LL	Treflan	-	-	-	Gly Star (25)	93 b	6 cd	0.4 c	1260 ab
6	RR/LL	-	-	Liberty	clethodim	None	67 c	5 cde	54 b	1490 a
7	RR/LL	Treflan	-	Liberty	-	none	84 b	4 cde	61 b	1480 a
8	RR/LL	Treflan	-	-	-	Liberty	59 c	12 bc	80 a	1300 ab
9	TT	-	Aatrex	clethodim	-	-	8 d	22 ab	84 a	942 d
10	TT	-	Aatrex	clethodim + Wetcit	-	-	10 d	27 a	85 a	1020 cd
11	TT	-	Kerb	Aatrex	-	-	11 d	25 a	85 a	1090 bcd
12	NonGM	Treflan	-	clethodim	-	-	15 d	17 ab	85 a	975 cd
13	NonGM	-	-	-	-	-	0	31 a	85 a	983 cd

[1]RR/LL canola (InVigor LR344 PC) is resistant to both Gly Star 5 Extra (glyphosate) and Liberty (glufosinate) herbicides; TT canola (Rubisco RUBSCT20215) is tolerant of triazine herbicides, e.g., atrazine, simazine, metribuzin; Non-GM (Photosyntech NCC1010s) is a non-GMO canola. All canola varieties were planted at 12 seeds/ft^2 with a no-till drill on 12 in. spacing.

[2]Treflan TR-10 (trifluralin) was applied preplant incorporated (PPI) (2x harrow 180°) at 7.5 lb/A.

[3]Aatrex (atrazine was applied PRE (post-plant preemergence) at 32 oz/A; Kerb was applied at 20 oz/A.

[4]EPOST (early postemergence) Gly Star was applied at 50 and 25 oz/A; Liberty was applied at 22 oz/A; clethodim was applied at 6 oz/A plus crop oil concentrate at 1% v/v; Aatrex was applied at 16 oz/A plus crop oil concentrate at 1% v/v; Wetcit surfactant was applied at 0.78% v/v.

[5]LPOST (late postemergence) clethodim was applied at 6 oz/A.

[6]LPOST Gly Star was applied at 25 oz/A; Liberty was applied at 22 oz/A. Glyphosate and Liberty applied with NH4 SO4 at 17 lb/100 gal.

[7]Italian ryegrass cover is percent of canopy covering the ground; Italian ryegrass with seed is percent of remaining plants that produced seed. Numbers followed by the same letter in each column are not statistically different ($P \leq 0.05$). Canola was harvested on 7/30/21 and 8/19/21.

Disclaimer

Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to $7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.