

Using multiple herbicide mode of actions in Roundup Ready spring canola for avoiding glyphosate resistance in Italian ryegrass

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Accomplishments: We have demonstrated the benefits of using a preemergence herbicide such as Treflan for the management of Italian ryegrass in Roundup Ready spring canola. Although the sole use of glyphosate for the control of Italian ryegrass provided excellent control of Italian ryegrass in this study, the use of Treflan greatly reduced the number of Italian ryegrass plants that emerged and were subsequently treated with glyphosate. By treating fewer plants with glyphosate, the risk for selecting Italian ryegrass biotypes resistant to glyphosate is reduced. We also observed a yield drag associated with the application of glyphosate in both years of this study. In 2022, the yield drag was only observed in treatments receiving a late postemergence application of PowerMax (glyphosate); However, in 2023, a year with a much lower density of Italian ryegrass, we saw a reduction in canola yield in all treatments containing PowerMax. We don't know if the observed yield drag is only associated with the variety we used in our study, or if it is a concern for other Roundup Ready spring canola varieties grown in the PNW.

Results: Herbicide treatments varied slightly between the two years of the study, so the data are presented separately for each year. The major treatment difference between the two years is that we dropped Kerb herbicide from the treatment list in 2023. It provided poor Italian ryegrass control in 2022, and in an associated study, it resulted in significant injury to the subsequently grown winter wheat. Instead of Kerb, we added a few treatments containing Liberty herbicide.

Other major differences between the two years include: 1) differences in growing season precipitation, which affected yield potential, and 2) differences in Italian ryegrass density. Total precipitation received during the spring canola growing season (April through August) was 9.25 and 3.35 inches in 2022 and 2023, respectively. Italian ryegrass density in the nontreated check plots at the time that early postemergence (EPOST) treatments were applied averaged 102 and 10.3 in 2022 and 2023, respectively.

In 2022, the greatest Italian ryegrass control resulted from applications of PowerMax, which provided nearly 100% control at harvest (Table 1). Applications of PowerMax were so effective in controlling Italian ryegrass that it was difficult to see added control from Treflan. The early PowerMax application of 44 oz/A resulted in the highest canola yield of 2590 lb/A. All late postemergence PowerMax applications delayed flowering and reduced yield.

In 2023, a year with a low density of Italian ryegrass (the result of a delayed replanting), all treatments except Liberty applied alone early postemergence provided excellent control of Italian ryegrass (Table 2). Without the competition provided by a high density of Italian ryegrass, we were able to observe a reduction in canola yield with all treatments containing PowerMax. It did not matter if the PowerMax was applied early or late postemergence or at a rate of 22 or 44 oz/a. We are unsure if this is a problem unique to the TruFlex spring canola varieties we used (Invigor LR344PC and Invigor LR345PC) or if it should be a concern for all Roundup Ready spring

canola varieties. Further research is needed to better understand the yield drag associated with the use of glyphosate in Roundup Ready spring canola.

Table 1. 2022 Italian ryegrass control in spring canola.

Herbicides ¹	Canola yield lb/a ²	Italian ryegrass
		% control ² at harvest
PowerMax 44 oz/A EPOST	2590 a	100 a
Treflan 24 oz/A PPI + PowerMax 44 oz/A EPOST	2160 ab	97 a
Treflan 24 oz/A PPI	2020 abc	83 b
PowerMax 22 oz/A LPOST	1540 cd	100 a
Treflan 24 oz/A PPI + PowerMax 22 oz/A LPOST	1400 d	100 a
PowerMax 22 oz/A EPOST + LPOST	1730 bcd	100 a
Treflan oz/A PPI + PowerMax 22 oz/A EPOST + LPOST	1910 bcd	100 a
Liberty 22 oz/A EPOST + LPOST	1930 bcd	73 bc
Kerb 20 oz/A PRE + Liberty 22 oz/A EPOST	1870 bcd	49 cd
Treflan 24 oz/A PPI + Liberty 22 oz/A EPOST	1810 bcd	79 b
Kerb 22 oz/A Pre	1960 bc	24 d
Nontreated check	1500 cd	--

¹EPOST=early postemergence; LPOST=late post; PPI =preplant incorporated; PRE=preemergence

²Numbers followed by the same letter are not statistically different from each other with 95% confidence.

Table 2. 2023 Italian ryegrass control in spring canola.

Herbicides ¹	Canola yield lb/a ²	Italian ryegrass
		% control ² at harvest
PowerMax 44 oz/A EPOST	1370 cde	100 a
Treflan 24 oz/A PPI + PowerMax 44 oz/A EPOST	1510 bcd	100 a
Treflan 24 oz/A PPI	1590 abc	99 a
PowerMax 22 oz/A LPOST	1330 de	99 a
Treflan 24 oz/A PPI + PowerMax 22 oz/A LPOST	1370 cde	100 a
PowerMax 22 oz/A EPOST + LPOST	1290 de	100 a
Treflan 24 oz/A PPI + PowerMax 22 oz/A EPOST + LPOST	1210 e	100 a
Liberty 29 oz/A EPOST	1790 a	80 b
Treflan 24 oz/A PPI + Liberty 29 oz/A EPOST	1770 a	100 a
PowerMax 22 oz/A EPOST + Liberty 29 oz/A LPOST	1350 de	100 a
Treflan 24 oz/A PPI + Liberty 29 oz/A EPOST + LPOST	1730 ab	100 a
Nontreated check	1790 a	--

¹EPOST=early postemergence; LPOST=late post; PPI =preplant incorporated.

²Numbers followed by the same letter are not statistically different from each other with 95% confidence.

Publications:

Thorne, M. E., & Lyon, D. J. (2023) Herbicide Options for Italian Ryegrass Control in Glyphosate-Tolerant Spring Canola [Abstract]. ASA, CSSA, SSSA International Annual Meeting, St. Louis, MO. <https://scisoc.confex.com/scisoc/2023am/meetingapp.cgi/Paper/151075>.