Pronamide Tolerance in Spring Canola and the Following Winter Wheat Crop

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Introduction

- Italian ryegrass (*Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot) is a troublesome weed in the inland Pacific Northwest that has evolved resistance to the herbicides used for grass control in wheat (*Triticum aestivum* L.) production systems.
- In recent years, many growers have incorporated glyphosate-resistant spring canola (*Brassica napus* L.) into their production systems to control Italian ryegrass, but sole reliance on glyphosate (Group 9, inhibition of enolpyruvyl shikimate phosphate synthase) risks selection for glyphosate-resistant Italian ryegrass biotypes.
- Pronamide (Group 3, inhibition of microtubule assembly) provides effective control of Italian ryegrass in labeled crops, but it is not currently labeled for use in wheat or canola.
- Summer precipitation is limited in the inland Pacific Northwest, which often results in slower microbial degradation of herbicide than is observed elsewhere in the US where summer precipitation is common.
- The objective of this study was to evaluate the crop safety of pronamide in spring canola and the subsequently planted winter wheat in the inland Pacific Northwest.

Materials & Methods

- Pronamide was applied at 0.58 and 1.15 kg ai ha^{-1} in the late fall (November) and late winter (March) prior to spring canola planting in 2021 and 2022.
- Plot size was 3 m by 15 m and each treatment was replicated six times within a randomized complete block design.
- Following canola harvest, winter wheat seed was planted at a rate of 112 kg ha^{-1}. In the fall of 2021, wheat seed was planted on October 4 at a depth of about 1.25 cm into dry soil. In the fall of 2022, wheat seed was planted on October 20 at a depth of about 5 cm into moist soil.
- Winter wheat was harvested with a plot combine and grain samples were cleaned, weighed, and weights adjusted to 12% moisture.
- Data were analyzed using a generalized mixed model analysis (PROC GLIMMIX) in SAS Software and means were separated using pairwise t-tests of LSMEANS at an alpha level of 0.05.

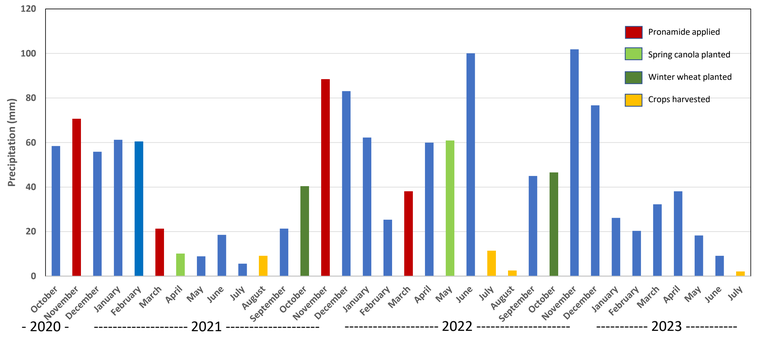

Figure 1. Monthly precipitation near Pullman, WA from October 2020 through July 2023, and timing of pronamide applications, crop planting and harvesting.

Figure 2. Crop injury observed in winter wheat in the fall of 2021 (left) and spring of 2022 (right) following pronamide application prior to the previous spring canola crop near Pullman, WA.

Results

- Precipitation from the late fall applications of pronamide to winter wheat planting the following fall varied greatly between 2020-2021 and 2021-2022, providing examples of both unusually dry and wet seasons, respectively (Figure 1). Annual total precipitation was 430 and 632 mm in 2021 and 2022, respectively. The 30-yr average annual precipitation is 518 mm.
- No crop injury was observed in spring canola (data not shown).
- Severe crop injury, manifested as reduced seedling emergence and crop stand, was observed in the subsequent winter wheat crops in 2022 and 2023 (Figure 2).
- Winter wheat grain yield was reduced in 2022 and 2023 with all pronamide treatments compared to the nontreated check (Table 1).

Conclusions

- Although pronamide appears safe to use in spring canola for Italian ryegrass control, winter wheat should not be planted in the fall following spring canola harvest in the inland Pacific Northwest, even if wheat planting occurs more than the currently labeled 180 days after pronamide application..

Table 1. Winter wheat grain yield following late fall and late winter application of pronamide prior to spring canola planting in the spring of 2021 and 2022 near Pullman, WA.

		Grain yield	
Herbicide rate	Application timing	2022	2023
kg ai ha^{-1}		---------- kg ha^{-1} ----------	
0	---	8130 a	4970 a
0.58	Late fall	2150 b	3830 b
0.58	Late winter	2420 b	2690 c
1.15	Late fall	---	2960 c
1.15	Late winter	---	874 d