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DIGGING INTO RESEARCH

Reducing herbicide inputs in winter wheat

CATEGORY **agronomy** | ***June* 19, 2024**

In winter wheat cropping systems, pre-plant weed management combined with two in-crop fungicide applications optimized grain yield. An in-crop herbicide application proved to be unnecessary, however multiple applications of fungicides were needed to optimize grain yield and grain protein concentration.

Winter wheat can offer substantial economic advantages through higher yields and the potential for reduced reliance on crop protection products. However, information on effective management of crop inputs such as herbicides and fungicides is still limited. Because winter wheat is a highly competitive crop, questions around how the crop responds to reduced pesticide applications and whether early-stage fungicide applications impact grain yield and quality have been raised.

The objective of the project was to assess how reduced pesticide applications affect plant health, grain yield and quality parameters in an integrated system. A multi-site, integrated weed and disease management study was conducted across the Prairies from 2018 to 2022 to quantify winter wheat responses under full and reduced pesticide usage. The study was conducted at four locations including Lethbridge and Lacombe, AB, Saskatoon, SK, and Brandon, MB. The cultivar ‘AAC Wildfire’, a hard red winter wheat known for its short stature, strength, good winter hardiness, and high grain yield was selected for the study.

In the study, the experimental treatments for weed management included:

a) pre-plant glyphosate
b) pre-plant glyphosate mixed with pyroxasulfone + carfentrazone-ethyl (Focus herbicide)
c) no in-crop herbicide
d) fall-applied 2,4-D at ZGS13-14 (mid-October)
e) fall-applied 2,4-D + spring-applied site-year-specific herbicides.

At each location, the spring in-crop application was based on the weed species present to ensure maximum weed control.

In-crop fungicide experimental treatments compared no in-crop fungicide, one prothioconazole + tebuconazole (Prosaro XTR) application at ZGS60 (beginning of anthesis), or two prothioconazole + tebuconazole applications at ZGS32 (second node detectable) and ZGS60.

Prior to planting, all seeds were treated with a combination of fungicide and insecticide Raxil Pro + Stress Shield to protect against seed- and soil-borne diseases as well as harmful insects.

In-crop herbicides unnecessary

The results from crop responses to weed management emphasized the effectiveness of a pre-plant herbicide application. Both pre-plant glyphosate alone or in a tank mix with pyroxasulfone + carfentrazone-ethyl, yielding around 81 bu/ac (5.4 t/ha), resulted in statistically similar grain yield, quality, and agronomic characteristics. However, growers are advised to consider a tank mix of glyphosate and pyroxasulfone + carfentrazone-ethyl as a strategy for mitigating and managing herbicide resistance.

In-crop herbicide applications proved to be unnecessary, regardless of location, active ingredient(s) employed, or weed species present. Because of the high competitiveness of winter wheat against weeds, in-crop herbicide control did not show an impact on grain yield, quality, agronomics or weed densities/biomass. The no in-crop herbicide treatment had statistically similar yield as the fall and fall + in-crop herbicide applications, at around 80 to 82 bu/ac (5.38 to 5.52 t/ha).

By eliminating an in-crop herbicide application, winter wheat growers can save an estimated $15/ac ($37/ha) herbicide cost and $10/ac ($25/ha) application cost for a total savings of $25/ac ($62/ha).

Fungicides improved yield and protein content

The research confirmed multiple fungicide applications were needed to optimize grain yield. Both single and double fungicide applications increased grain yield while maintaining grain protein concentration levels despite having higher yield. No in-crop fungicide had the statistically lowest yield at 78 bu/ac (5.25 t/ha). One fungicide application yielded 81 bu/ac (5.45 t/ha) while two fungicide applications resulted in a yield of 83 bu/ac (5.58 t/ha).

In conducting a stability analysis, the researchers concluded a stable system for optimal winter wheat grain yield is accomplished with pre-plant glyphosate combined with fall in-crop 2,4-D and two in-crop fungicide applications.

This project was funded through AAFC's Canada Agricultural Partnership, leveraged by the Canadian National Wheat Cluster, which included funds provided by Alberta Grains, Saskatchewan Winter Cereals Development Commission, Saskatchewan Wheat Commission and the Western Grains Research Foundation.

Zhijie Wang, Maya Subedi, Ramona M. Mohr, Charles M. Geddes, Reem Aboukhaddour, Christian Willenborg, Breanne D. Tidemann, Kelly T. Turkington, Hiroshi Kubota and Brian L. Beres. (2024). Effects of reduced pesticide use on winter wheat production in the Canadian Prairies. Canadian Journal of Plant Science.

Open Access: https://doi.org/10.1139/cjps-2024-0043