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DIGGING INTO RESEARCH

Fall-applied residual herbicides suited for ultra-early seeded wheat

CATEGORY **weeds** | *September 28, 2022*

Fall applications of flumioxazin, pyroxasulfone, and combinations of flumioxazin and pyroxasulfone to manage weeds emerging the following spring is a safe and effective weed management program in ultra-early seeded wheat.

Ultra-early planting of wheat with a soil temperature trigger of 0-2.5 C has been shown to have increased yield and stability compared to seeding at current practices of higher soil temperatures (Collier et al. 2021). However, this early seeding means emerging wheat seedlings are exposed to fall-applied herbicides for a longer period of time in the spring – potentially increasing the risk of crop damage.

The objectives of this study were to compare fall-applied herbicides for their impact on grain yield, growing system stability, spring wheat tolerance, crop safety, and weed control. The research was conducted at Edmonton and Lethbridge, Alberta, and Scott, Saskatchewan in 2017 and 2018, and at Lethbridge in 2019 for a total of 7 site years. An experimental hexaploid spring wheat variety, LQ1299A, developed by intercrossing two previously identified cold tolerant lines derived from a cross between “Norstar” Canada Western Red Winter (CWRW) wheat and “Bergen,” a Dark Northern Spring (DNS) wheat grown in North Dakota.

Fall-applied herbicide treatments included flumioxazin (Valtera herbicide) at low and high label rates, pyroxasulfone at low and high rates, and flumioxazin + pyroxasulfone (Fierce) at low and high label rates. These were applied without an in-crop herbicide application the following spring. A Fierce treatment with a lower application rate plus an in-crop herbicide treatment of Enforcer M herbicide (fluroxypyr + bromoxynil + MCPA ester) was included. The herbicide treatments also included an untreated check, and a weed-free check established in the fall.

The following spring, wheat was planted at sub-optimal seeding rate of 20 viable seeds/ft^2 (200/m^2). This lower seeding rate was used to ensure that a better wheat stand did not mask the herbicide treatments effects. Ultra-early seeding commenced at a soil temperature trigger of 2C, while conventional seeding started at 8C. Seed was treated with a fungicide seed treatment for control of seed and soil-borne diseases.

Fertilizer was applied based on soil test recommendations.

Weed control

Plant establishment and survival was not affected by herbicide treatment at any location. Crop safety was not affected by herbicide treatment with no negative effects on plant density, phytotoxicity or delayed growth. Overall phytotoxicity was very low, at 1-2% at 14 days after wheat emergence, and 0-2% at 21 days after emergence.

Broadleaf weed control was evaluated at 21, 35, 49, and 63 days after the crop emerged. All herbicide treatments had lower broadleaf weed counts at all timings and locations. At Edmonton and Scott, greater weed control was observed at the later planting date, but no differences were observed at Lethbridge.

Generally, the earliest evaluation dates had the best weed control. The exception was the Fierce + Enforcer M in-crop application, which had better weed control at the later evaluation dates at Scott and Edmonton.

In general, treatments with either flumioxazin alone or pyroxasulfone alone performed similar to one another. Flumioxazin + pyroxasulfone and flumioxazin + pyroxasulfone with a post-emergent herbicide application tended to provide more consistent weed control longer into the growing season.

At Lethbridge, there was a trend to more consistent weed control with ultra-early seeded wheat compared to the conventional seeding date.

The researchers concluded that because of lack of injury to any herbicide treatment, pyroxasulfone and flumioxazin are both safe to use in the fall prior to ultra-early seeded wheat. The use of fall-applied herbicides were also found to be an effective replacement for a pre-seed burndown in ultra-early seeded wheat, but including an in-crop herbicide was desirable for later emerging weeds to help reduce weed seed return to the soil seedbank.

Grain yield and stability

At Lethbridge, ultra-early seeded wheat had significantly higher yield at 44 bu/ac (2.97 t/ha) compared to planting at 8C with a yield of 37.5 bu/ac (2.52 t/ha) – an 18% yield increase. This would have resulted in a gross economic benefit of $47/ac ($117.45/ha) given commodity prices in 2021. Yield stability was also better with ultra-early seeded wheat.

Yield did not differ significantly between planting date at Edmonton and Scott, and there was little difference in yield stability. This is different than other research that found a yield and stability benefit to ultra-early seeded wheat. The researchers felt the suboptimal seeding rate was the likely reason for this result.

There was no effect on grain protein between planting dates at any location.

At Lethbridge, the different herbicide applications had no effect on grain yield, grain protein concentration, or kernel weight. At Edmonton and Scott, yield for all herbicide treatments was equal to the yield of the weed free check, and multiple herbicide treatments resulted in a greater grain yield than the untreated check.

The results of this and other research indicates that grain yield, grain yield stability, and integrated weed management can be optimized by combining ultra-early planting, optimal seeding rates, a competitive cultivar and soil-applied residual herbicides. Note that herbicide labels should be followed closely, as durum spring wheat, for example, is very sensitive to pyroxasulfone found in Fierce and Focus herbicides, although other residual preseed options such as flumioxazin (Valtera) exist for durum.

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Collier, G.R.S., Spaner, D.M, Hall, L.M, Graf, R.J., and Beres, B.L. Fall-applied residual herbicides improve broadleaf weed management in ultra-early wheat (Triticum aestivum L.) production systems on the northern Great Plains. *Canadian Journal of Plant Science*. **Just-IN** https://doi.org/10.1139/CJPS-2022-0036

Collier, G.R.S., Spaner, D.M., Graf, R.J., Beres, B.L. Optimal Agronomics Increase Grain Yield and Grain Yield Stability of Ultra-Early Wheat Seeding Systems. Agronomy 2021, 11, 240. OPEN ACCESS: https://doi.org/10.3390/agronomy11020240

Collier G.R.S, Spaner D.M, Graf R.J, and Beres B.L (2020) The Integration of Spring and Winter Wheat Genetics With Agronomy for Ultra-Early Planting Into Cold Soils. Front. Plant Sci. 11:89. OPEN ACCESS: https://doi.org/10.3389/fpls.2020.00089