EVALUATION OF PYROXASULFONE BASED RESIDUAL HERBICIDES FOR CONTROL OF ITALIAN RYEGRASS IN KENTUCKY WHEAT

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INTRODUCTION

Italian ryegrass (*lolium perenne* L. spp. *Multiflorum*), also known as annual ryegrass, is the primary weed pest for wheat growers in Kentucky. This particular species is a highly competitive winter annual grass that can reduce yields up to 60% when allowed to occur at high densities. The similarities in growth habit and herbicide tolerances in wheat and ryegrass can make ryegrass especially difficult to control with herbicides.

The increased adoption of no-till wheat in Kentucky has led to an increased reliance on herbicides for weed control for all weed species in wheat. This increased use of herbicides on annual ryegrass in particular has led to numerous resistance events in the state of Kentucky. To date of this report, Italian ryegrass in Kentucky has been confirmed to be resistant to: mesosulfuron-mehtyl and pyroxsulam (ALS-inhibitors, Group2), diclofop-methyl and pinoxaden (ACCase-inhibitors, Group 1), and glyphosate (EPSPS-inhibitors, Group 9). The increasing levels of herbicide resistance, particularly to postemergence herbicides has led to the search for alternative methods of control of ryegrass in wheat.

Pyroxasulfone is a group 15 herbicide that is widely used in corn and soybean for preemergence control of small seeded broadleaves and grasses. The use of these products in wheat is not widely labeled due to crop injury risk, although the need for alternative control methods has led to local needs labels for several products on Kentucky wheat acres. Fierce, Anthem Flex, and Zidua are all products containing pyroxasulfone that have been labeled for use on Kentucky wheat acres.

The timing of application of each of the pyroxasulfone product to wheat varies. Fierce is a mixture of flumioxazin (PPO-inhibitor, Group 14) and pyroxasulfone and is only labeled for application 14 days prior to wheat planting. Anthem Flex is a mixture of carfentrazone (PPO-inhibitor, Group 14) and pyroxasulfone and can be applied preemergence, delayed preemergence, and early postemergence. Lastly Zidua contains only pyroxasulfone and is labeled for application delayed preemergence and early postemergence.

The objective of this research was to evaluate the three pyroxasulfone based herbicide at all allowed application timings as well as sequential applications for the control of Italian ryegrass in wheat in western Kentucky.

MATERIALS AND METHODS

An experiment was established at the University of Kentucky Research and Education Center in Princeton, Kentucky in the fall of 2018. Pioneer 26R10 wheat was planted on October 24th, 2018 into a plot area with an artificially established annual ryegrass population. The ryegrass population was established by broadcast seeding a cover crop ryegrass variety onto the plot area on October 12, 2018.

The experimental design was a randomized complete block with four replications. Treatments consisted of residual applications of Fierce, Anthem Flex, and Zidua at all allowed timings as well as split sequential applications of Anthem Flex and Zidua. All preemergence (PRE), and delay preemergence (DPRE) were tank mixed with Roundup PowerMax (glyphosate) to control any emerged ryegrass, while 2 oz/A metribuzin was mixed with all early postemergence (EPOST) applications to control emerged ryegrass. A complete list of treatments and application timings are included in Table 1.

Evaluations of visual crop injury and ryegrass control were taken, 21, 60, and 90 days after wheat planting. Counts of ryegrass occurring within a 1-ft^2 area within each plot was also taken at spring greenup.

RESULTS

Crop Injury. Despite cold and wet soil conditions following application of pyroxasulfone herbicides, no crop injury was noted at any evaluation timing (Data not shown). It should be note that overall wheat emergence was slow due to the cool and wet soil temperatures and thus any injury due to herbicide application may have been masked and undetectable.

Ryegrass Control. Ryegrass control ranged from 84 to 95 percent control amongst plots 90 days after winter wheat planting (Figure 1). There were no statistical differences among pyroxasulfone herbicides or timings of application. Ryegrass densities taken at spring greenup ranged from 1 to 4 ryegrass plants per ft^2 among treatments, and all treatments were significantly lower than the untreated check which had a density of 20 plants per ft^2 (Figure 2). All treatments regardless of product or timings of application resulted in an 80% reduction in ryegrass, which is considered acceptable for a residual herbicide at 120 plus days after application.

CONCLUSIONS

Despite a lack of crop injury in this study, growers are still encouraged to be aware of the risk of crop injury and understand the factors that increase that risk. Poor seed furrow closure, shallow planted wheat, and heavy rainfall after application are leading contributors to wheat injury due to pyroxasulfone, especially in coarse soils.

Results of this research further highlight the utility of pyroxasulfone as a tool for controlling Italian ryegrass on Kentucky winter wheat acres. Regardless of the trade name all products containing this active ingredient resulted in at least an 80% reduction on ryegrass density at spring greenup. In a complete system the remaining ryegrass plants in the field could be controlled with a pinoxaden based herbicide while reducing the selection pressure on that postemergence application.

The ultimate selection of a particular pyroxasulfone product for ryegrass control in wheat will likely depend on the timing in which a farmer would like to apply their residual herbicide. Many no-till wheat farmers prefer to apply their residual with the burndown in which case a product like Fierce would be the best option at 14 days pre plant. The flexibility of Anthem Flex to be applied preemergence, delayed preemergence, or early postemergence makes it a popular option as well. The delayed preemergence timing of Anthem Flex and Zidua, while reducing risk of crop injury, can be particularly difficult to apply simply due to the short window of time in which this stage occurs. While the early postemergence applications of Anthem Flex and Zidua in this research yielded equal weed control as the other timings, this may not always occur with aggressively emerging ryegrass populations that may not be controlled as affectively with this timing.

Similar to our corn and soybean crops, weed management in wheat should be approached as a system that includes residual herbicide. Pyroxasulfone offers an excellent option as a residual herbicide in a weed control system for those dealing with ryegrass as a pest in wheat.

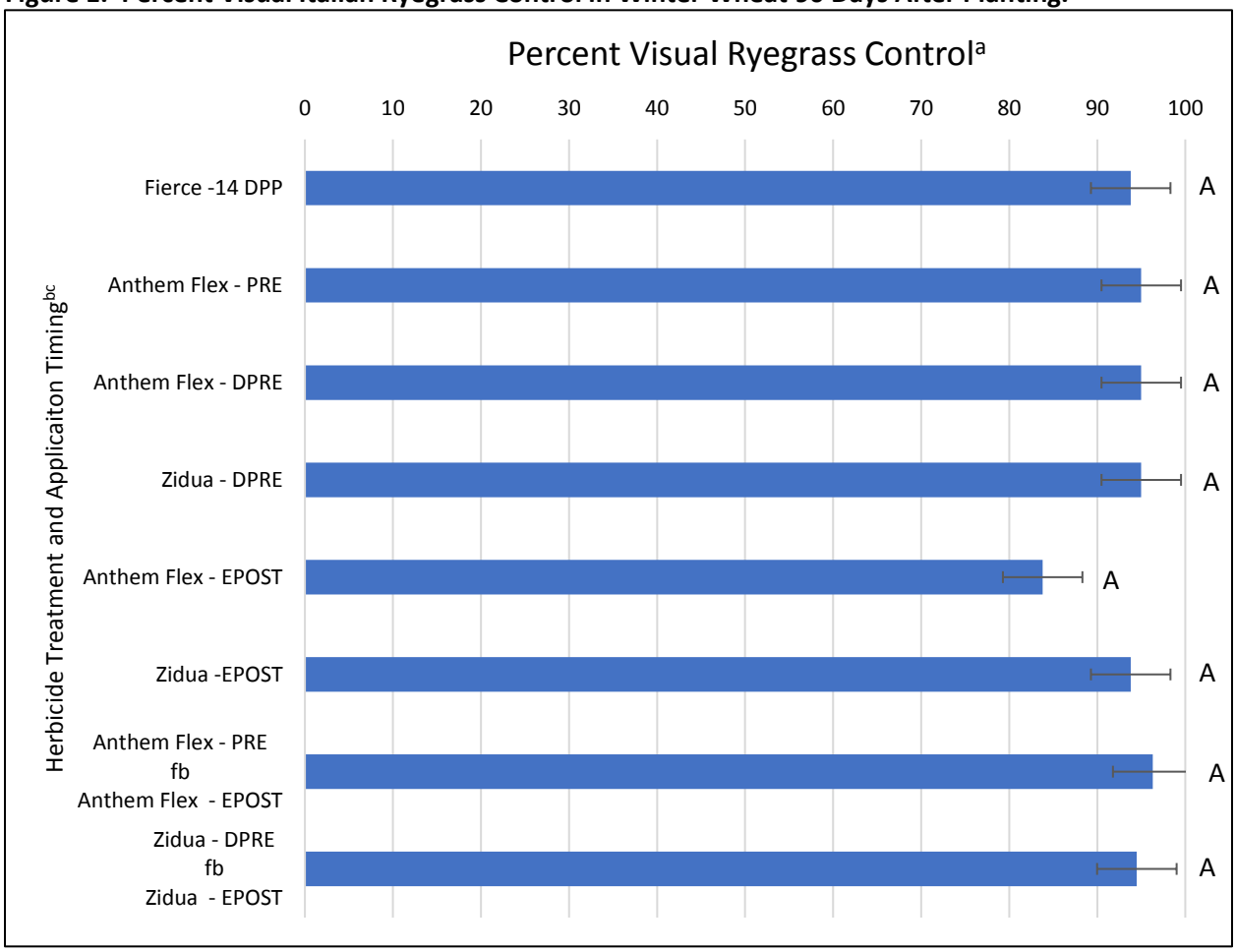
Table 1. Herbicide Treatments Evaluated for Italian Ryegrass Control in Wheat. Including Rates of Trade Name Products as well as Timing of Application.

Herbicide[a]	Rate	Timing[b]
Fierce + Roundup PowerMax	3 oz/A + 32 fl oz/A	14 DPP
Anthem Flex + Roundup PowerMax	3 fl oz/A + 32 fl oz/A	PRE
Anthem Flex + Roundup PowerMax	3 fl oz/A + 32 fl oz/A	DPRE
Zidua SC + Roundup PowerMax	2 fl oz/A + 32 fl oz/A	DPRE
Anthem Flex + Metribuzin 75DF	3 fl oz/A + 2 oz/A	EPOST
Zidua SC + Metribuzin 75DF	3 fl oz/A + 2 oz/A	EPOST
Anthem Flex + Roundup PowerMax *fb* Anthem Flex + Metribuzin 75DF	2 fl oz/A + 32 fl oz/A *fb* 1 fl oz/A + 2 oz/A	PRE *fb* EPOST
Zidua SC + Roundup PowerMax *fb* Zidua SC + Metribuzin 75DF	2 fl oz/A + 32 fl oz/A *fb* 2 fl oz/A + 2 oz/A	PRE *fb* EPOST

[a] *fb*: Followed by

[b] **14DPP:** fourteen days pre plant; **PRE:** preemergence; **DPRE:** delayed preemergence (80% of germinated wheat has ½ long shoot until wheat spiking); **EPOST:** early postemergence (Feekes 1.3)

Figure 1. Percent Visual Italian Ryegrass Control in Winter Wheat 90 Days After Planting.

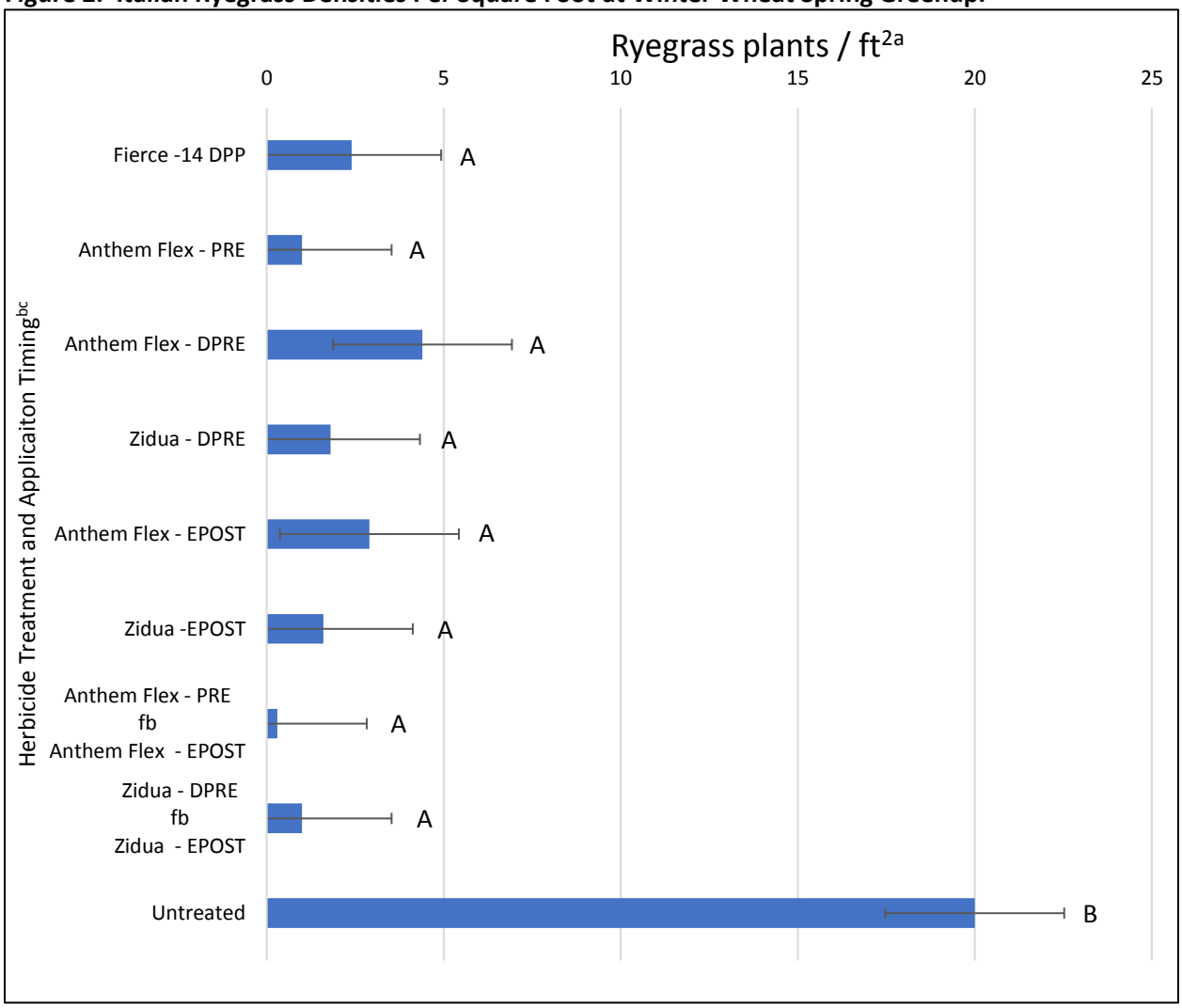


[a] Treatments with the same letter are not statistically different. Tukey HSD. α=0.05

[b] **14DPP:** 14 days pre plant; **PRE:** preemergence; **DPRE:** delayed preemergence; **EPOST:** early postemergence.

[c] All 14DPP, PRE, and DPRE treatments included 32 fl oz/A Roundup PowerMax. EPOST treatments included 2 oz/A metribuzin 75DF.

Figure 2. Italian Ryegrass Densities Per Square Foot at Winter Wheat Spring Greenup.



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