

Italian Ryegrass Management with Pyroxasulfone and Sulfosulfuron in Spring Wheat

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The study objective was to evaluate Zidua® (pyroxasulfone; group 15) in combination with Outrider® (sulfosulfuron; group 2) for Italian ryegrass control in spring wheat. Multiple herbicide modes of action applied at the same timing against the target weed, Italian ryegrass for example, could help delay the selection of herbicide resistance. However, the method is not effective if the population already has resistance to one of modes of action being applied. Then control is dependent upon only the mode of action still active.

The study was established at the WSU Cook Farm near Pullman, WA. Treatments were applied preemergence (PRE) at planting and to 2-3 tiller wheat, detailed in Table 2 and Table 3. Treatments were applied with a CO₂ powered backpack sprayer and a 6.67 ft boom with 5 Teejet 11002VS nozzles, calibrated to deliver 15 gallons per acre (gpa). The study was conducted in a randomized complete block design with 4 replications. Plots were 10 ft by 30 ft long. On July 8, 2019 the entire study was treated with Brox-M® (1.5 pt A⁻¹) and NIS (0.25% v/v) for broadleaf weed control.

Table 1. Soil characteristics for field site for study ICB0919

Soil Texture	pH	OM	CEC	Sand	Silt	Clay	NO ₃ -N	NH ₄ -N	Sulfur	P (bic)	K (bic)
		%		%	%	%	lb A ⁻¹	lb A ⁻¹	ppm	ppm	ppm
Silt Loam	5.3	3.70	19.8	22.5	62.5	15.0	29	71	4	3.5	232

Italian ryegrass control was visually rated 5, 8, and 10 weeks after PRE treatments WAT. Common lambsquarters control was also assessed at 5 and 8 WAT. Crop stunting was visually assessed 5 WATA and general crop injury was rated 10 WAT. Plots were harvested using a 5 ft wide plot combine on September 4, 2019. All data was subjected to an analysis of variance using the statistical package built into the Agricultural Research Manager software system (ARM 8.5.0, Gylling Data Management). Percent control data for Italian ryegrass at 5 WAT was arcsin square-root transformed because data was not homogeneous.

Table 2. Treatment application details

Study Application	A	B
Date	May 8, 2019	June 11, 2019
Application volume (GPA)	15	15
Crop Stage	PRE	3-tillers
Air temperature (°F)	68	72
Soil temperature (°F)	55	60
Wind velocity (mph, direction)	2, SE	1, NW
Cloud Cover	30	0
Next rain occurred on	May 14, 2019	June 27, 2019
Rain accumulation 2 WAT (IN)	0.83	0

Results

At 5 WAT, Zidua applied alone PRE had the greatest Italian ryegrass control (48%). Zidua + Outrider (40%) and Zidua + Outrider + RyzUp® Smartgrass (35%) had similar control 5 WATA. Common lambsquarters control at 5 WATA was greatest for treatments of Outrider + RyzUp Smartgrass (90%), Zidua + Outrider (88%), and Zidua + Outrider + RyzUp Smartgrass (90%) (Table 1).

Similar results were observed for Italian ryegrass control 8 WATA, Zidua + Outrider applied PRE had the greatest control of 38% and RzyUp Smartgrass applied alone PRE had 0% control 8 WATA. There was no difference in common lambsquarters control 8 WATA for any treatment.

By 10 WAT, no treatments were effective at controlling the Italian ryegrass with control ranging from 3 to 28% control. Common lambsquarters was not rated at 10 WATA, because Brox-M had been applied to the entire study for broadleaf weed control.

Crop stunting or crop injury was not observed at 5 and 10 WATA, respectively. Yield was highest for Zidua alone and Zidua + Outrider (59 bu A⁻¹) although not significantly difference from any other treatment except Outrider alone (44 bu A⁻¹) and RzyUp Smartgrass alone (39 bu A⁻¹).

Figure 1: Italian ryegrass in spring wheat 10 weeks after treatment A (5 WATB). Left to Right = Nontreated, RT3 + Zidua + Outrider + RzyUp Smartgrass + AMS + NIS applied PRE, and RT3 + Zidua, AMS + NIS applied PRE.



Table 3. Percent Italian ryegrass and common lambsquarters control in spring wheat following applications of pyoxasulfone and sulfosulfuron. Pullman, WA, 2019. Means followed by the same letter are not significantly different ($\alpha=0.05$).

Treatment	Appl. Code	Field Rate	lb ai/A	June 11, 2019 (5 WATA)		July 3, 2019 (8 WATA; 3 WATB)		July 18, 2019 (10 WATA; 5 WATB)
				Italian ryegrass Control	Common Lambsquarters Control	Italian ryegrass Control	Common Lambsquarters Control	Italian ryegrass Control
				%	%	%	%	%
Nontreated	-	-	-	-	-	-	-	-
RT3	A	28.4 fl oz/A	1.000					
AMS	A	2.5 lb/A		12 ab	0 b	13 ab	0	10
NIS	A	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
Zidua	A	1.51 oz/A	0.080	48 a	23 b	31 ab	19	28
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
Zidua	A	1.51 oz/A	0.080					
Outrider	A	1.01 oz/A	0.047	40 ab	88 a	38 a	28	11
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
Zidua	A	1.51 oz/A	0.080					
Outrider	A	1.01 oz/A	0.047					
RyzUp Smartgrass	A	0.43 oz/A	0.011	35 ab	90 a	26 ab	10	24
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
Everest 3.0	A	4.7 fl oz/A	0.028	15 ab	18 b	10 ab	14	5
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v		0 b	15 b	15 ab	13	11
Zidua	B	1.51 oz/A	0.080					
Outrider	B	1.01 oz/A	0.047					
NIS	B	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v		5 ab	18 b	23 ab	19	19
Powerflex HL	B	2 oz/A	0.016					
NIS	B	0.25% v/v						
RT3	A	28.4 fl oz/A	1.000					
Zidua	A	1.51 oz/A	0.080					
RyzUp Smartgrass	A	0.43 oz/A	0.011	10 ab	33 ab	18 ab	0	14
AMS	A	2.5 lb/A						
NIS	A	0.25% v/v						
RyzUp Smartgrass	A	0.43 oz/A	0.011	0 b	33 ab	0 b	0	3
Outrider	B	1.01 oz/A	0.047					
NIS	B	0.25% v/v		10 ab	40 ab	10 ab	8	3
RT3	A	28.4 fl oz/A	1.000					
Outrider	A	1.01 oz/A	0.047					
AMS	A	2.5 lb/A		0 b	90 a	14 ab	28	18
NIS	A	0.25% v/v						
RyzUp Smartgrass	A	0.43 oz/A	0.011					
<i>LSD</i>				<i>24.35t</i>	<i>41.19</i>	<i>19.79</i>	<i>NS</i>	<i>NS</i>

Table 4. Percent crop stunting, injury, and yield for spring wheat following applications of pyroxasulfone and sulfosulfuron. Pullman, WA, 2019. Means followed by the same letter are not significantly different ($\alpha=0.05$).

Treatment	Appl. Code	Field Rate per Acre	lb ai/A	June 11, 2019	July 18, 2019	September 4, 2019
				(5 WATA)	(10 WATA; 5 WATB)	
				Crop Stunting	Crop Injury	Yield
				%	%	bu A ⁻¹
Nontreated	-	-	-	-	-	47 abc
RT3	A	28.4 fl oz/A	1.000			
AMS	A	2.5 lb/A		0	0	47 abc
NIS	A	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
Zidua	A	1.51 oz/A	0.080	3	0	59 a
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
Zidua	A	1.51 oz/A	0.080			
Outrider	A	1.01 oz/A	0.047	6	0	59 a
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
Zidua	A	1.51 oz/A	0.080			
Outrider	A	1.01 oz/A	0.047	3	0	58 ab
RyzUp Smartgrass	A	0.43 oz/A	0.011			
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
Everest 3.0	A	4.7 fl oz/A	0.028	0	0	52 abc
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v		0	0	47 abc
Zidua	B	1.51 oz/A	0.080			
Outrider	B	1.01 oz/A	0.047			
NIS	B	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v		1	0	48 abc
Powerflex HL	B	2 oz/A	0.016			
NIS	B	0.25% v/v				
RT3	A	28.4 fl oz/A	1.000			
Zidua	A	1.51 oz/A	0.080			
RyzUp Smartgrass	A	0.43 oz/A	0.011	5	0	49 abc
AMS	A	2.5 lb/A				
NIS	A	0.25% v/v				
RyzUp Smartgrass	A	0.43 oz/A	0.011	0	0	39 c
Outrider	B	1.01 oz/A	0.047			
NIS	B	0.25% v/v		5	0	44 bc
RT3	A	28.4 fl oz/A	1.000			
Outrider	A	1.01 oz/A	0.047			
AMS	A	2.5 lb/A		3	0	53 ab
NIS	A	0.25% v/v				
RyzUp Smartgrass	A	0.43 oz/A	0.011			
				LSD	NS	NS
						8.42