

Weed Control and Crop Response to Anthem Flex Applied at Different Timings in Winter Wheat

Zuger, R.J. & I.C. Burke

The study objective was to evaluate weed control and crop response to Anthem Flex® (pyroxasulfone + carfentrazone; group 15 & 14) applied to winter wheat at three different timings; preplant, post-plant preemergence, and early postemergence (6 to 7-leaf wheat). Downy brome is a problematic grass weed in low and intermediate rainfall zones in the PNW. Due to increasing downy brome resistances to ALS (group 2) inhibitors, alternative herbicide options are needed.

The study was established at the WSU Wilke Farm near Davenport, WA. Treatments were applied preplant (PREPLANT), post-plant preemergence (PRE), and early postemergence (POST), detailed in Table 2 and Table 3. An comparison treatment of Olympus® + NIS was included. Treatments were applied with a CO₂ powered backpack sprayer and a 5 ft boom with 4 Teejet 11002VS nozzles, calibrated to deliver 15 gallons per acre (GPA). RT3® (glyphosate) with NIS at 0.125% v/v was included with all preplant and post-plant preemergence treatments. The study was conducted in a randomized complete block design with 4 replications. Plots were 10 ft by 30 ft long.

Table 1. Soil characteristics for field site for study ICB0919

Soil Texture	pH	OM %	CEC	Sand %	Silt %	Clay %	NO ₃ -N lb A ⁻¹	NH ₄ -N lb A ⁻¹	Sulfur ppm	P (bic) ppm	K (bic) ppm
Silt Loam	5.3	2.65	15.9	33.8	58.7	7.5	114	21	5	29	407

Pest control of tumble mustard, and common lambsquarters were visually rated 36 weeks after treatment (35 WATB; 8 WATC). Downy brome populations across the study were low. Due to that fact, downy brome was rated based on if it was present (yes = 1) or not present (no = 0) for each plot 36 WATA (35 WATB; 8 WATC). Crop injury was rated at 2 (1 WATB), 4 (3 WATB), and 29 (28 WATB; 1 WATC) WAT, and crop stunting was accessed at 2 (1 WATB), 4 (3 WATB), 29 (28 WATB; 1 WATC), and 36 (35 WATB; 8 WATC) WAT. Heights (cm) of three wheat plants were taken from each plot 41 WATA (40 WATB; 13 WATC). All plots were harvested using a 5 ft wide plot combine on August 22, 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).

Table 2. Treatment application details

Study Application	A	B	C
Date	September 26, 2018	October 3, 2018	April 9, 2019
Application volume (GPA)	15	15	15
Crop Stage	PREPLANT	PRE	Early POST
Air temperature (°F)	69	45	47
Soil temperature (°F)	60	50	43
Wind velocity (mph, direction)	6.5, SW	4.5, SE	7, W
Cloud Cover	5	5	100
Next rain occurred on	October 5, 2018	October 5, 2018	April 12, 2019
Rain accumulation 2 WAT (IN)	0.37	0.37	0.64

Results

Tumble mustard control was similar for all treatments, except Anthem Flex at a rate of 2.75 fl oz A⁻¹ applied preplant (8% control) and Olympus applied POST (18%) 36 WATA (35 WATB; 8 WATC). Anthem Flex (3.5 fl oz A⁻¹) + metribuzin applied POST had the greatest tumble mustard control with 88%

36 WATA (35 WATB; 8 WATC) (Table 3). Common lambsquarters control 36 WATA (35 WATB; 8 WATC) was greatest for Anthem Flex with Finesse applied PRE (84%) control and most other treatments had similar control. Anthem Flex applied preemergence at 2.75 and 3.50 fl oz A⁻¹ lacked control of common lambsquarters with 0 and 10% control, respectively, 36 WATA (35 WATB; 8 WATC) (Table 3). Due to low downy brome populations across the plot, downy brome could only be rated based on if there was downy brome present in the plot (1 = yes) or not (0 = no). Downy brome was present in 50% of the nontreated and Anthem Flex + Finesse (PRE) plots, and 75% of the plots treated with either Anthem Flex + Metribuzin (POST) or Anthem Flex (PRE) with Anthem Flex + Metribuzin (POST) 36 WATA (35 WATB; 8 WATC) (Table 3).

No crop injury was observed at 2, 4, and 29 weeks after PREPLANT treatments (WATA) (Table 4). Data not presented for 2 (1) and 4 WATA (3 WATB) (injury = 0). Crop stunting was similar for all treatments at 29 WATA (28 WATB; 1 WATC). By 36 WATA, Anthem Flex + Finesse applied PRE had significant visual crop stunting of 19% compared to less than 9% stunting for all other treatments (35 WATB; 8 WATC) (Table 4). However, there were no differences in wheat heights 41 WATA (40 WATB; 13 WATC) with an average of 75 cm per plant. No significant differences in yield were observed either (average 36 bu A⁻¹), although when metribuzin was applied yields averaged 61.5 bu A⁻¹ (Table 4).

Table 3. Percent weed control for tumble mustard (SSYAL), common lambsquarters (CHEAL), and downy brome (BROTE) at 36 weeks after treatment. Davenport, WA, 2019. WAT = weeks after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Appl. Code	Field Rate	lb ai/A	June 5, 2019 (36, 35, or 8 WAT)		
				SSYAL Control	CHEAL Control	BROTE Present
				%	%	0 (no) – 1 (yes)
Nontreated	-	-	-	-	-	0.50 ab
Anthem Flex	A	2.75 fl oz/A	0.080			
RT3	A	19 fl oz/A	0.690	8 c	0 b	0 b
NIS	A	0.125% v/v				
Anthem Flex	A	3.5 fl oz/A	0.102			
RT3	A	19 fl oz/A	0.690	59 ab	10 b	0 b
NIS	A	0.125% v/v				
Anthem Flex	A	4.5 fl oz/A	0.131			
RT3	A	19 fl oz/A	0.690	31 abc	23 ab	0 b
NIS	A	0.125% v/v				
Anthem Flex	B	2.75 fl oz/A	0.080			
RT3	B	19 fl oz/A	0.690	64 ab	44 ab	0 b
NIS	B	0.125% v/v				
Anthem Flex	B	3.5 fl oz/A	0.102			
RT3	B	19 fl oz/A	0.690	72 ab	38 ab	0 b
NIS	B	0.125% v/v				
Anthem Flex	B	4.5 fl oz/A	0.131			
RT3	B	19 fl oz/A	0.690	61 ab	39 ab	0 b
NIS	B	0.125% v/v				
Anthem Flex	B	3.5 fl oz/A	0.102			
Finesse	B	0.3 oz/A	0.012			
RT3	B	19 fl oz/A	0.690	80 a	84 a	0.50 ab
NIS	B	0.125% v/v				
Anthem Flex	A	3.5 fl oz/A	0.102			
RT3	A	19 fl oz/A	0.690			
NIS	A	0.125% v/v				
Anthem Flex	C	1 fl oz/A	0.029	80 a	60 ab	0.75 a
Metribuzin	C	2 oz/A	0.094			
NIS	C	0.25% v/v				
Anthem Flex	C	1 fl oz/A	0.029			
Metribuzin	C	2 oz/A	0.094	88 a	63 ab	0.75 b
NIS	C	0.25% v/v				
Anthem Flex	B	1 fl oz/A	0.029			
RT3	B	19 fl oz/A	0.690			
NIS	B	0.125% v/v		60 ab	40 ab	0 b
Olympus	C	0.9 oz/A	0.039			
NIS	C	0.25% v/v				
Olympus	C	0.9 oz/A	0.039	18 bc	18 ab	0 b
NIS	C	0.25% v/v				
			LSD	35.61	41.85	37.00

Table 4. Percent crop injury and stunting, wheat heights, and yield for winter wheat following applications of pyroxasulfone + carfentrazone (Anthem Flex). Davenport, WA, 2019. WAT = weeks after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Appl. Code	Field Rate	lb ai/A	April 16, 2019	June 5, 2019	July 10, 2019	August 22,	
				(29, 28, or 1 WAT)	(36, 35, or 8 WAT)	(41, 40, or 13 WAT)	2019	
				Crop Injury	Crop Stunting	Crop Stunting	Wheat Heights	Yield
				%	%	%	cm	bu A ⁻¹
Nontreated	-	-	-	-	11	4 b	77	29
Anthem Flex	A	2.75 fl oz/A	0.080					
RT3	A	19 fl oz/A	0.690	0	5	3 b	78	33
NIS	A	0.125% v/v						
Anthem Flex	A	3.5 fl oz/A	0.102					
RT3	A	19 fl oz/A	0.690	0	13	5 b	66	25
NIS	A	0.125% v/v						
Anthem Flex	A	4.5 fl oz/A	0.131					
RT3	A	19 fl oz/A	0.690	0	9	6 b	70	20
NIS	A	0.125% v/v						
Anthem Flex	B	2.75 fl oz/A	0.080					
RT3	B	19 fl oz/A	0.690	0	8	3 b	78	39
NIS	B	0.125% v/v						
Anthem Flex	B	3.5 fl oz/A	0.102					
RT3	B	19 fl oz/A	0.690	1	6	1 b	81	33
NIS	B	0.125% v/v						
Anthem Flex	B	4.5 fl oz/A	0.131					
RT3	B	19 fl oz/A	0.690	0	13	6 b	70	28
NIS	B	0.125% v/v						
Anthem Flex	B	3.5 fl oz/A	0.102					
Finesse	B	0.3 oz/A	0.012					
RT3	B	19 fl oz/A	0.690	0	9	19 a	68	25
NIS	B	0.125% v/v						
Anthem Flex	A	3.5 fl oz/A	0.102					
RT3	A	19 fl oz/A	0.690					
NIS	A	0.125% v/v						
Anthem Flex	C	1 fl oz/A	0.029	1	1	1 b	82	62
Metribuzin	C	2 oz/A	0.094					
NIS	C	0.25% v/v						
Anthem Flex	C	1 fl oz/A	0.029					
Metribuzin	C	2 oz/A	0.094	1	8	6 b	75	61
NIS	C	0.25% v/v						
Anthem Flex	B	1 fl oz/A	0.029					
RT3	B	19 fl oz/A	0.690					
NIS	B	0.125% v/v		1	11	9 b	74	33
Olympus	C	0.9 oz/A	0.039					
NIS	C	0.25% v/v						
Olympus	C	0.9 oz/A	0.039	1	3	0 b	85	44
NIS	C	0.25% v/v						
<i>LSD</i>				<i>NS</i>	<i>NS</i>	<i>6.89</i>	<i>NS</i>	<i>NS</i>