Preemergence and Postemergence Herbicides for Control of Bromus Spp. in Winter Wheat in Ewan, WA

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Downy brome (*Bromus tectorum*) continues to be a problematic and widespread weed in inland PNW wheat-fallow rotations. Acetolactate synthase inhibitor resistance continues to spread, and there are very few herbicide options remaining. Sterile brome (*Bromus sterilis*) is another bromegrass invading wheat fields in intermediate and low rainfall zones. Our objective was to identify one or more herbicide treatments with different herbicide modes of action for management of downy brome and sterile brome.

Fig 1. Wheat and *Bromus spp.* at application.

The study was established in a Clearfield winter wheat field near Ewan, WA. Whole plot treatments were applied early-postemergence (POST) to 1 to 2-tiller wheat, downy brome was present at 2 to 3-leaf stage, on October 9, 2017, detailed in Table 1 and Table 2. The whole plots were 10' by 75' long and then split into 10' by 25' long plots in the spring for postemergence (POST) applications. Split plot treatments were applied in the spring POST on April 18, 2018, detailed in Table 1 and Table 3.

Downy brome (*Bromus tectorum*) control was assessed by visual estimation at 177 and 208 days after treatment (DAT) of application of early-POST treatments (A) (Table 2). Downy brome biomass was harvested by collecting two 1/10th meter quadrants from each split-plot on May 20, 2018 (Table 2 & 3). Plots were harvested using a Kincaid plot combine with a 5 ft header on July 19, 2018.

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) and PROC GLIMMIX in SAS (version 9.2, SAS Institute Inc., Cary, NC) with the fixed effects of delayed-PRE treatments and POST treatments and random effect block. Biomass failed normality and was square root transformed. Significant differences between treatments were analyzed using Fisher's protected LSD in SAS using the %mult macro.

The combination of both a fall applied early-POST and a spring applied POST herbicide treatment did not impact the efficiency of *Bromus spp.* control or yield. All treatments controlled the *Bromus spp.* compared to the nontreated control. Zidua (pyroxasulfone) + metribuzin + diclofop and metribuzin + diclofop had the greatest control of 79 and 81%, respectively (Table 2). Powerflex HL has the worst visual control with only 38% 191 DAT. No differences in *Bromus spp.* biomass resulted from any treatment although the nontreated control had the greatest amount with 1331 lb A^{-1}. Zidua + metribuzin (694 lb A^{-1}), Zidua + metribuzin + diclofop (539 lb A^{-1}), and Axiom (562 lb A^{-1}) had the least amount of *Bromus spp.* biomass.

POST applications of Powerflex and Beyond in the spring had no significant impact on the visual ratings of downy brome control or *Bromus spp.* biomass compared to no-POST treatments (Table 3).

There were no differences in crop yield for the no-POST treatment and the two spring herbicides. The yield loss produced by Beyond (66 bu A^{-1}) is likely attributed to a miss application of Beyond resulting in 2-times the labeled field rate being applied. The spring applied Powerflex HL yielded in 78 bu A^{-1} and the no-POST treatment had 72 bu A^{-1}.

Table 1. *Treatment application details*

Study Application	A	B
Date	10/9/2017	4/18/2018
Application Timing	Early POST	POST
Application volume (GPA)	15	15
Day air temperature (˚F)	64	49
Night air temperature (˚F)	34	38
Soil temperature (˚F)	59	43
Wind velocity (mph, direction)	2.5, SE	2.5, SE
Next rain occurred on	10/12/2017	4/28/2018

Table 2. *Percent control and biomass for Bromus spp. (Bromus tectorum and Bromus sterilis) and yield following fall preemergence applications. Ewan, WA, 2017-2018. DAT = days after treatment of preemergence (A). Means followed by the same letter are not statistically significantly different (α=0.05).*

				Downy Brome Control	***Downy Brome Biomass***	***Yield***
Treatment	**Application Timing**	**Rate**		**4/18/2018 191 DAT**	**5/23/2018**	**7/19/2018**
		field rate	**lb ai/A**	**%**	**LB/A**	**bu/A**
Nontreated	A	-	-	-	1331	69
Zidua	A	1.50 oz/A	0.080	53 abc	1009	69
NIS	A	0.25% v/v				
Zidua	A	1.50 oz/A	0.080	70 ab	694	72
Metribuzin	A	4.00 oz/A	0.188			
NIS	A	0.25 % v/v				
Zidua	A	1.50 oz/A	0.080	74 ab	815	83
Diclofop	A	2.66 pt/A	1.000			
NIS	A	0.25 % v.v				
	A					
Zidua	A	1.50 oz/A	0.080	79 a	539	82
Metribuzin	A	4.00 oz/A	0.188			
Diclofop	A	2.66 pt/A	1.000			
NIS	A	0.25 % v/v				
Metribuzin	A	4.00 oz/A	0.188	55 abc	1080	66
NIS	A	0.25% v/v				
Diclofop	A	2.66 pt/A	1.000	65 abc	780	71
NIS	A	0.25% v/v				
Metribuzin	A	4.00 oz/A	0.188	81 a	1013	69
Diclofop	A	2.66 pt/A	1.000			
NIS	A	0.25% v/v				
Axoim	A	8 oz/A	0.068	63 abc	562	75
NIS	A	0.25% v/v				
Outrider	A	0.66 oz/A	0.031	55 abc	833	64
Metribuzin	A	1.50 oz/A	0.070			
NIS	A	0.25% v/v				
Olympus	A	0.90 oz/A	0.039	48 bc	813	74
NIS	A	0.25% v/v				
Powerflex HL	A	16 fl oz/A	0.016	38 c	956	70
NIS	A	0.25% v/v				
			LSD	*19.20*	*NS*	*NS*

Table 3. *Bromus spp. (Bromus tectorum and Bromus sterilis) biomass and yield following spring postemergence applications. Ewan, WA, 2017-2018. Means followed by the same letter are not statistically significantly different (α=0.05).*

Treatment	**Application Timing**	**Rate**		***Downy Brome Biomass***	***Yield***
		field rate	**lb ai/A**	**LB/A**	**bu/A**
No POST		-	-	909	72 ab
Powerflex HL	B	2.0 oz/A	0.016		
NIS	B	0.25 % v/v		948	78 a
UAN	B	2.5 gal/100 gal			
Beyond*	B	12 fl oz/A	0.094		
NIS	B	0.25 % v/v		719	66 b
UAN	B	2.5 gal/100 gal			
			LSD	*NS*	*6.97*

** 2-times the labeled field rate*

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