

Preemergence and Postemergence Herbicides for Downy Brome Control in Clearfield Winter Wheat

Zuger, R.J., A.L. Hauvermale, & I.C. Burke

Downy brome 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. Our objective was to identify one or more herbicide treatments with different herbicide modes of action for management of downy brome.

The study was established in a Clearfield winter wheat field near Anatone, WA. Whole plot treatments were applied delayed preemergence (delayed-PRE) to 4 to 5-leaf wheat and 2-leaf downy brome on November 16, 2016, detailed in Table 1, Table 2 and Table 4. 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 5, 2017, detailed in Table 1, Table 3, and Table 5. The study was conducted in a randomized complete block with 4 replications.

Downy brome (*Bromus tectorum*) control and crop injury was assessed by visual estimation at 127, 154, 174, and 189 days after treatment (DAT) of application A the delayed-PRE (Table 2, 3, 4, & 5). Downy brome biomass was harvested by collecting two 1/10th meter quadrants from each split-plot on June 15, 2017 (Table 2 & 3). Plots were harvested using a Kincaid plot combine on July 31, 2017.

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 R (R Development Core Team 2008). Significant differences between treatments were analyzed using Fisher's protected LSD in R using the agricolae package.

The combination of both a fall applied delayed-PRE and a spring applied POST herbicide treatment did not impact the efficiency of downy brome control, crop injury, or yield. Downy brome control with Zidua plus TriCor DF and TriCor DF alone was greatest for the duration of the study with 53% and 50% (127 DAT), 76% and 68% (174 DAT), and 60% and 78% control (189 DAT), respectively (Table 2). Zidua alone had lower downy brome control with 28%, 12%, and 15% control at 127, 174, and 189 DAT, respectively, possibly due to the late timing of application with downy brome at the 2-leaf stage present (Table 2). Zidua inhibits long chain fatty acid synthesis (Group 15) preventing root and shoot formation of germinating seedlings and has little to no effect on already germinated weeds. Zidua with TriCor DF and TriCor DF alone both significantly reduced the amount of downy brome biomass compared to the nontreated control. Downy brome biomass in the nontreated control was 2035 lb A⁻¹ compared to 291 lb A⁻¹ downy brome biomass for Zidua with TriCor DF and 725 lb A⁻¹ for TriCor DF.

POST applications of Powerflex and Beyond in the spring had no significant impact on the visual ratings of downy brome control or downy brome biomass compared to non-POST treatments (Table 3). Significant crop injury was present in March, 127 days after the delayed-PRE treatments, for both the Zidua with TriCor DF and TriCor DF alone compared to the nontreated with 78% and 53%, respectively. However, although not significantly different all delayed-PRE treatments caused some visual injury compared to the nontreated control at 127 DAT (Table 4). No crop injury was observed again till 189 DAT of the delayed-PRE. Zidua with TriCor DF (15%) and TriCor DF alone (18%) had greater crop injury compared to the nontreated (0%) at 189 DAT. No crop injury was observed for either POST treatment at 14 DAT (Table 5).

There were no differences in crop yield observed for the delayed-PRE treatments. However, when POST treatments were applied a significant reduction in yield was observed possibly due to the low night time temperature of 45°F. When no POST treatment was applied yield was 74 bu A⁻¹ compared to 63 bu A⁻¹ for Powerflex HL and 67 bu A⁻¹ for Beyond.

Table 1. Treatment application details

Study Application	A	B
Date	November 16, 2016	April 5, 2017
Application Timing	Delayed-PRE	POST
Application volume (GPA)	15	15
Day air temperature (°F)	35	50
Night air temperature (°F)	27	45
Soil temperature (°F)	48	39
Wind velocity (mph, direction)	8, SW	10, S
Next rain occurred on	November 20, 2017	April 7, 2017

Table 2. Downy brome percent control and biomass following preemergence applications. Anatone, WA, 2016-2017. DAT = days after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Application Timing	Rate		Downy Brome Control				Downy Brome Biomass
				3/23/17 127 DAT	4/19/17 154 DAT	5/9/17 174 DAT	5/24/17 189 DAT	6/15/17
				%	%	%	%	LB/A
Nontreated	A	-	-	-	-	-	2035 a	
Zidua	A	1.50 oz/A	0.080	28 acbd	35	12 bc	15 ab	1793 a
Zidua	A	1.50 oz/A	0.080					
Outrider	A	0.66 oz/A	0.031	23 abc	34	26 b	43 bc	1400 ab
NIS	A	0.25 % v/v						
Zidua	A	1.50 oz/A	0.080					
TriCor DF	A	0.5 lb/A	0.375	53 d	63	76 a	60 cd	291 c
NIS	A	0.25 % v.v						
Hoelon	A	2.66 pt/A	1.000	30 abcd	28	14 bc	8 ab	1311 ab
Hoelon	A	2.66 pt/A	1.000					
Outrider	A	0.66 oz/A	0.031	18 ab	30	20 bc	10 ab	1249 ab
NIS	A	0.25 % v/v						
Outrider	A	0.66 oz/A	0.031	28 abcd	28	8 bc	13 ab	1852 a
NIS	A	0.25 % v/v						
Outrider	A	0.66 oz/A	0.031					
Olympus	A	0.60 oz/A	0.026	15 ab	31	0 c	10 ab	1913 a
NIS	A	0.25 % v/v						
TriCor DF	A	0.50 lb/A	0.375	50 cd	58	68 a	78 d	725 bc
NIS	A	0.25 % v/v						
Prowl H2O	A	2.1 pt/A	1.000	10 ab	17	3 c	0 a	1917 a
Valor	A	2 oz/A	0.064	33 bcd	32	0 c	0 a	1359 ab
Outlook	A	16 fl oz/A	0.750	23 abc	26	5 bc	8 ab	1528 ab
Finesse	A	0.40 oz/A	0.016	15 ab	21	0 c	20 ab	1677 a
NIS	A	0.25 % v/v						
			LSD	19	NA	21	25	939

Table 3. Percent downy brome control and downy brome biomass following postemergence applications. Anatone, WA, 2016-2017. DAT = days after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Application Timing	Rate		Downy Brome Control				Downy Brome Biomass
				3/23/17 127 DAT	4/19/17 154 DAT	5/9/17 174 DAT	5/24/17 189 DAT	6/15/17
				%	%	%	%	LB/A
No POST		-	-	-	27	21	-	1416
Powerflex HL	B	2 oz/A	0.016					
NIS	B	0.25 % v/v		-	33	17	-	1554
UAN	B	2.5 gal/100 gal						
Beyond	B	6 fl oz/A	0.094					
NIS	B	0.25 % v/v		-	41	21	-	1425
UAN	B	2.5 gal/100 gal						
			LSD	-	NS	NS	-	NS

Table 4. Percent crop injury and yield following delayed preemergence applications. Anatone, WA, 2016-2017. DAT = days after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Application Timing	Rate		Crop Injury				Yield
				3/23/17	4/19/17	5/9/17	5/24/17	7/31/2017
				127 DAT	154 DAT	174 DAT	189 DAT	bu/A
Nontreated	A	-	-	0 a	-	-	-	65
Zidua	A	1.50 oz/A	0.080	43 abc	8	0	0 a	71
Zidua	A	1.50 oz/A	0.080					
Outrider	A	0.66 oz/A	0.031	38 ab	21	0	15 b	73
NIS	A	0.25 % v/v						
Zidua	A	1.50 oz/A	0.080					
TriCor DF	A	0.5 lb/A	0.375	78 c	38	10	8 a	73
NIS	A	0.25 % v.v						
Hoelon	A	2.66 pt/A	1.000	43 abc	24	0	0 a	67
Hoelon	A	2.66 pt/A	1.000					
Outrider	A	0.66 oz/A	0.031	33 ab	28	0	3 a	68
NIS	A	0.25 % v/v						
Outrider	A	0.66 oz/A	0.031	25 ab	19	0	0 a	66
NIS	A	0.25 % v/v						
Outrider	A	0.66 oz/A	0.031					
Olympus	A	0.60 oz/A	0.026	18 ab	21	0	0 a	66
NIS	A	0.25 % v/v						
TriCor DF	A	0.50 lb/A	0.375	53 bc	36	10	18 b	74
NIS	A	0.25 % v/v						
Prowl H2O	A	2.1 pt/A	1.000	13 ab	19	0	0 a	61
Valor	A	2 oz/A	0.064	35 ab	23	8	0 a	67
Outlook	A	16 fl oz/A	0.750	30 ab	26	0	3 a	66
Finesse	A	0.40 oz/A	0.016	13 ab	23	20	3 a	66
NIS	A	0.25 % v/v						
			LSD	28	NS	NS	7	NS

Table 5. Percent crop injury and yield following postemergence applications. Anatone, WA, 2016-2017. DAT = days after treatment. Means followed by the same letter are not statistically significantly different ($\alpha=0.05$).

Treatment	Application Timing	Rate		Crop Injury				Yield
				3/23/17	4/19/17	5/9/17	5/24/17	7/31/2017
				127 DAT	154 DAT	174 DAT	189 DAT	bu/A
No POST		-	-	-	21	-	-	74 a
Powerflex HL	B	2 oz/A	0.016					
NIS	B	0.25 % v/v		-	25	-	-	63 b
UAN	B	2.5 gal/100 gal						
Beyond	B	6 fl oz/A	0.094					
NIS	B	0.25 % v/v		-	26	-	-	67 b
UAN	B	2.5 gal/100 gal						
			LSD	-	NS	-	-	5

Thank you to the grower and their family for the use of their land.

Disclaimer

Some of the pesticides discussed in this presentation were tested under an experimental use permit granted by WSDA. Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties up to \$7,500. In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action by WSDA and/or the U.S. Food and Drug Administration. It is your responsibility to check the label before using the product to ensure lawful use and obtain all necessary permits in advance.