Smooth scouringrush control with fallow-applied herbicides in a winter wheat/spring wheat/fallow rotation.

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In 2015, we repeated a 2014 field trial evaluating herbicide control of smooth scouringrush in a no-till winter wheat/spring wheat/fallow cropping system. Smooth scouringrush is a deep-rooted native rhizomatous perennial that is becoming more prevalent in no-till/direct-seed cropping systems in eastern Washington. Current herbicide strategies for in-crop and fallow weed management have failed to reduce or control scouringrush, consequently, patches like the one pictured here near Pullman, WA are persisting.

Our study site was located in the intermediate rainfall zone of eastern Washington near Reardan, WA on land owned by the Spokane Hutterian Brethren. Plots were initially established July 24, 2014 in chemical fallow prior to winter wheat seeding. The trial consisted of two identical sets of plots. Plots on the right side of the trial had experimental herbicide applications only in 2014 and received a blanket chemical fallow treatment in 2015 similar to that used by the cooperating grower. Plots of the left side had experimental applications in both 2014 and 2015 (Table 1).

The field site was 300 feet upslope from a grass waterway with a gentle northwest slope. Soil type was an Athena silt loam with pH of 4.9 and 3.3% organic matter in the 0-6 inch depth. Herbicides were applied with a CO_2 backpack sprayer and eight-foot spray boom. All spray solutions were applied at 15 gal/A with 30 psi traveling 3.5 mph. The 2014 treatments were applied on July 25 with 70°F air temperature, 36% relative humidity, and a 6 mph wind out of the SW. In 2015, treatments were applied on August 10 with 84°F air temperature, 30% relative humidity and a 1-3 mph wind out of the N. Whetstone hard red winter wheat was seeded on September 10, 2014 at the rate of 60 lb/acre. The field was fertilized with 85-10-15 lb N-P-S per acre at the time of planting. On April 21, ‘Glee’ hard red spring wheat was seeded at a rate of 80 lb/A and fertilized with 100-40-30-0.8-0.6 lb N-P-S-B-Zn per acre. In both years wheat was seeded with a Bourgault 3710 disc drill on a 10-inch row spacing, and harvested with a Kincaid plot combine.

Winter wheat yield in 2015 averaged 72 bu/A, and spring wheat yield in 2016 averaged 55 bu/A; however, differences were not found between any of the treatments in either year (data not shown). This may have been due to the competitiveness of the winter wheat in 2015, and stand variability of the spring wheat in 2016; however, scouringrush density at this site may not have been sufficient to reduce wheat yield.

Herbicide efficacy was evaluated both visually and by measuring scouringrush stem density in each plot. Visual ratings were approximately 15 days (15 DAT) and 30 days (30 DAT) after herbicide applications and were based on the degree of herbicide injury to scouringrush stems as a percentage of the non-treated check plots. In 2014, ratings were on August 8 and 20; in 2015, plots were rated on August 28 and September 9. Scouringrush stem densities were counted in and between two 1-meter lengths of wheat rows in May and August of 2015 and 2016. Counts in 2015 evaluated the 2014 herbicide applications. Counts in 2016 evaluated the cumulative effect of the 2014 and 2015 applications to the left-side plots and evaluated the right-side plots two years following the 2014 applications.

Visual control ratings were generally higher for treatments that included MCPA ester; however, in 2014 MCPA ester with either clopyralid or chlorsulfuron showed the greatest control at both 15 DAT and 30 DAT (Table 2). Visually, MCPA ester was impressive as it turned the stems black soon after application (personal observation). In 2015, chlorsulfuron + MCPA ester at 30 DAT had the highest control but was not different from glyphosate + glufosinate or MCPA ester alone. Glyphosate + glufosinate was one of chemical fallow treatments used by the cooperating grower at this field site. Glyphosate by itself, a commonly applied chemical fallow herbicide, or with saflufenacil, showed very little control in either year. Furthermore, very little injury was observed from either 2,4-D LV6 or quinclorac (Table 2).

Herbicide efficacy based on scouringrush stem density differed considerably from the level of control observed with the visual ratings. Stem density was reduced substantially by chlorsulfuron + MCPA ester in relation to the non-treated plots following the 2014 application. Densities averaged 4.5 and 0.2 stems per 2 linear meters of row in the right and left sides, respectively (Table 3). In contrast, densities in the non-treated plots averaged 85.2 and 61.1 stems in the right and left sides, respectively. However, on the right-side where chlorsulfuron + MCPA ester was only applied in 2014, scouringrush density increased to 31.6 by August 2016. In contrast, scouringrush density on the left side remained low (1.2 stems/2 linear meters of row) through the August 2016 census. In this trial, no other herbicides consistently reduced stem density. Even after causing substantial visual injury, stem densities following MCPA ester applications were not different from the non-treated check at any census date on either the right or left side (Table 3). By the August 2016 census, only chlorsulfuron + MCPA ester had kept stem densities low.

This study found that herbicide control of smooth scouringrush was only achieved and maintained by application of chlorsulfuron + MCPA ester in both years. Given that MCPA ester by itself had no effect on stand density, it is highly probable that chlorsulfuron alone was effective. Standard chemical fallow treatments, including those with glyphosate, are not effective in controlling smooth scouringrush, even when they cause injury to the stems following application.

Table 1. Herbicides applied to chemical fallow in 2014 and 2015 for control of smooth scouringrush. Experimental treatments were applied to both sides in 2014 and only left-side plots in 2015. In 2015, right-side plots were treated with a blanket chemical fallow treatment.

			Applications per side	
Num	Treatment	Rate	2014	2015
1	non-treated	none	left and right	left only
2	2,4-D LV6	1.0 lb ae/A	left and right	left only
	non-ionic surfactant (NIS)	0.334 % v/v		
3	MCPA ester	1.0 lb ae/A	left and right	left only
	NIS	0.334 % v/v		
4	clopyralid	0.12 lb ae/A	left and right	left only
	MCPA ester	0.69 lb ae/A		
	NIS	0.334 % v/v		
5	chlorsulfuron	0.0234 lb ai/A	left and right	left only
	MCPA ester	1.0 lb ae/A		
	NIS	0.334 % v/v		
6	halosulfuron	0.0623 lb ai/A	left and right	left only
	MCPA ester	1.0 lb ae/A		
	NIS	0.334 % v/v		
7	glyphosate	1.13 lb ae/A	left and right	left only
	NIS	0.334 % v/v		
	ammonium sulfate (AMS)	3.13 lb/A		
8	glyphosate	1.13 lb ae/A	left and right	left only
	saflufenacil	0.089 lb ai/A		
	crop oil concentrate (COC)	1 % v/v		
	AMS	3.13 lb/A		
9	fluroxypyr	0.245 lb ae/A	left and right	left only
	NIS	0.334 % v/v		
10	quinclorac	0.248 lb ae/A	left and right	left only
	modified vegetable oil (MSO)	32 oz/A		
	AMS	3.13 lb/A		
11	glyphosate	0.75 lb ae/A	left and right	left only
	glufosinate	0.55 lb ai/A		
	NIS	0.334 % v/v		
	AMS	3.13 lb/A		
Blanket	glyphosate	2.0 lb ae/A		right only
	glufosinate	1.3 lb ai/A		
	AMS	1.0 lb/A		

Table 2. Scouringrush visual control following herbicide applications in chemical fallow in 2014 and 2015.

	2014[2]		2015[3]	
Treatment[1]	15 DAT	30 DAT	15 DAT	30 DAT
	-----(injury as % of non-treated check)[4]-----			
non-treated	0 -	0 -	0 -	0 -
2,4-D LV6	35 de	39 ef	27 c	35 cd
MCPA ester	55 bc	55 cd	63 a	66 ab
clopyralid + MCPA ester	75 a	70 ab	42 bc	50 bc
chlorsulfuron + MCPA ester	77 a	79 a	42 bc	87 a
halosulfuron + MCPA ester	65 ab	67 bc	55 ab	60 bc
glyphosate	18 f	17 g	6 d	19 d
glyphosate + saflufenacil	15 f	10 g	7 d	34 cd
fluroxypyr	24 ef	29 f	31 c	32 cd
quinclorac	16 f	18 g	19 c	32 cd
glyphosate + glufosinate	42 cd	46 de	48 a-c	68 ab

[1]See Table 1 for rates and adjuvants.
[2]Treatments applied July 25, 2014.
[3]Treatments applied August 10, 2015.
[4]Means in each column followed by the same letter are not different.

Table 3. Scouringrush stem counts in 2015 and 2016 following each previous year's applications.

Herbicide treatments[1]	Stem counts following ---- 2014 treatments ---- May 2015	Aug 2015	Stem counts following ---- 2015 treatments ---- May 2016	Aug 2016
	--- (stem counts in and between 2 linear meters of row)[2] ---			
Table 2a. Applications to right-side plots in 2014, then a blanket treatment in 2015				
non-treated	85.2 a	73.5 a	52.6 a-d	93.3 a
2,4-D LV6	53.4 a-c	77.7 a	40.8 b-d	64.0 ab
MCPA ester	78.6 a-c	81.2 a	65.1 a-c	95.0 a
clopyralid + MCPA ester	80.5 ab	99.6 a	58.0 a-d	105.6 a
chlorsulfuron + MCPA ester	4.5 e	6.0 b	18.4 e	31.6 c
halosulfuron + MCPA ester	58.0 a-c	57.2 a	55.2 a-d	65.1 ab
glyphosate	43.0 cd	74.4 a	74.0 ab	85.1 ab
glyphosate + saflufenacil	43.9 b-d	70.5 a	32.6 de	64.3 ab
fluroxypyr	43.2 cd	72.3 a	57.0 a-d	65.6 ab
quinclorac	24.1 d	63.9 a	39.2 cd	48.1 bc
glyphosate + glufosinate	85.6 a	95.6 a	86.2 a	103.8 a
Table 2b. Applications to left-side plots in 2014 and repeated in 2015				
non-treated	61.1 a	74.2 a	50.6 a	60.7 a
2,4-D LV6	32.5 a	46.2 a-d	22.8 cd	40.5 ab
MCPA ester	44.7 a	64.2 ab	30.1 a-d	44.1 ab
clopyralid + MCPA ester	38.0 a	65.5 ab	34.3 a-c	41.1 ab
chlorsulfuron + MCPA ester	0.2 c	0.7 e	0.2 e	1.2 c
halosulfuron + MCPA ester	35.1 a	52.5 a-c	28.1 b-d	42.4 ab
glyphosate	12.5 b	34.2 cd	23.5 cd	50.9 ab
glyphosate + saflufenacil	36.3 a	43.0 b-d	31.8 a-c	37.4 b
fluroxypyr	60.5 a	68.7 ab	31.5 a-c	44.8 ab
quinclorac	44.0 a	55.7 a-c	47.9 ab	50.0 ab
glyphosate + glufosinate	31.4 a	28.1 d	17.6 d	42.3 ab

[1]See Table 1 for rates and adjuvants.
[2]Means in each column within each side followed by the same letter are not different.

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.