Efficacy of Silwet® L77 organosilicone surfactant with RT 3 herbicide for control of smooth scouringrush in no-till fallow.

Mark Thorne, Jacob Fischer, Drew Lyon

Control of smooth scouringrush (*Equisetum laevigatum* A. Braun) in fallow has been a challenge for producers, especially in no-till systems. Standard fallow applications of glyphosate containing herbicides, such as RT 3, have mostly been ineffective. Applications of synthetic auxin herbicides, such as MCPA or 2,4-D, will quickly turn stems black but do not reduce the presence or abundance of smooth scouringrush in following years. Smooth scouringrush is an ancient species dating back about 350 million years. It is unique among land plants in that it has no leaves and its stems contain about 10% silica, which is much greater than most other plants. Smooth scouringrush is also a very deep-rooted plant with extensive vertical rhizomes. Previous research has shown that organosilicone surfactants increase glyphosate uptake, but by mass flow through the stomates as opposed to movement through the epidermis. This trial builds upon research trials put out last year at Omak and Reardan, WA.

Trial locations were at the Palouse Conservation Field Station (PCFS) near Pullman, WA, the Hall farm near Steptoe, WA, and the Camp farm near Edwall, WA (Table 1). Experimental design was a split-plot randomized complete block, with three sub-plot treatments per main plot, and four application times. Sub-plot treatments were RT 3 with no added surfactant, RT 3 with Silwet L77, and no herbicide. Main-plot treatments were timed applications near the first of each month from June to September. Main-plots at Steptoe and Edwall measured 10 by 30 ft with sub-plots measuring 10 by 10 ft. Due to limited area, PCFS main plots were 6.7 by 15 ft with 6.7- by 5-ft sub-plots. Herbicides were applied with a hand-held spray boom with six or four TeeJet® XR11002 nozzles on 20-inch spacing and pressurized with a CO_2 backpack at 3 mph. Spray output was 15 gpa at 25 psi. Treatments were assessed visually beginning approximately 30 days after the first treatment, and each subsequent month until October. Stem discoloration from light green to yellow straw color was the primary symptom observed.
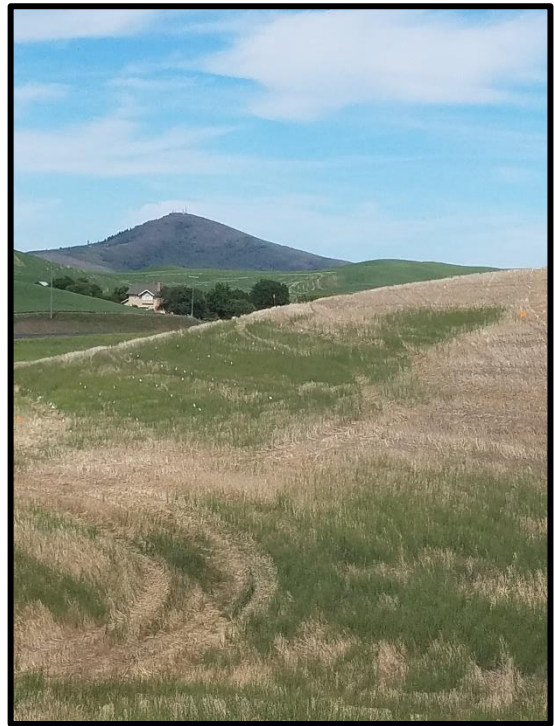

Figure 1. Dense patches of smooth scouringrush near Steptoe, WA.

Smooth scouringrush at each location differed in response to treatment. The greatest response was observed at PCFS at the first two application dates where RT 3 + Silwet L77 resulted in 96

and 94% non-green stem tissue from the June and July applications, respectively (Table 2). At each application time, the addition of Silwet L77 was superior to no added surfactant. At Steptoe, early applications trended better than later applications, but statistical difference did not reach the 95% probability level. Furthermore, Silwet L77 was more effective than no surfactant only at the first two application times. At Edwall, RT 3 + Silwet L77 was less effective at the first application date and only reached 58% injury from the September application, but was superior to no surfactant at each application time.

The variable response to RT 3 + Silwet L77 at each location may been a result of plant vigor and topography. Stem height and diameter appeared considerably greater at both Steptoe and Edwall. In addition, stand density was greater at these two locations (data not shown). The Steptoe site was a north-facing steep slope while the Edwall site was in the bottom of a slight north-facing draw. Both of these locations were likely more moist and cool compared with the slight south-facing PCFS site, which had warmer soil temperatures at each application time (Table 1). The addition of Silwet L77 clearly enhanced the efficacy of RT 3, but local conditions may determine the most effective application time. These trials will be re-evaluated in 2020 to see if any of the treatments effect a change in stem density the following year. In the future, Kinetic®, a similar organosilicone non-ionic surfactant will replace Silwet L77 in this region.

Figure 2. Robust smooth scouringrush stems in no-till winter wheat fallow near Edwall, WA.

Table 1. Application and soil data.

Location	PCFS, Pullman, WA			
Application date	5/28/2019	7/2/2019	7/25/2019	8/29/2019
Air temperature (°F)	72	72	86	67
Relative humidity (%)	42	32	26	43
Wind (mph, direction)	2-4, W	0	0-1, W	2, E
Cloud cover (%)	20	3-5, W	0	100
Soil temperature at 2 inches (F)	75	76	90	64
Soil texture	Caldwell silt loam			
Soil organic matter (%)	3.3			
Soil pH	5.1			
Location	Steptoe, WA			
Application date	6/11/2019	7/2/2019	7/25/2019	8/28/2019
Air temperature (°F)	77	74	82	88
Relative humidity (%)	34	32	28	18
Wind (mph, direction)	1-3, E	3-5, W	2-3, SE	3, W
Cloud cover (%)	1	10	0	0
Soil temperature at 2 inches (F)	72	72	74	62
Soil texture	Palouse-Thatuna silt loam			
Soil organic matter (%)	2.7			
Soil pH	5.0			
Location	Edwall, WA			
Application date	5/23/2019	7/2/2019	7/25/2019	8/29/2019
Air temperature (°F)	73	71	78	75
Relative humidity (%)	22	28	27	33
Wind (mph, direction)	2, E	3-5, SW	1-2, SW	3, SE
Cloud cover (%)	0	2	0	100
Soil temperature at 2 inches (F)	61	72	76	62
Soil texture	Broadax silt loam			
Soil organic matter (%)	2.9			
Soil pH	5.0			

Table 2. Visual assessment of RT 3 activity on smooth scouringrush with and without Silwet L77 surfactant at three locations in eastern Washington.

Location	Time of Application*	Visual rating – October 2019**		Difference***
		Silwet L77	none	
		-------(% injury)-------		
PCFS	June	96 a	7 a	Y
	July	94 a	24 a	Y
	August	80 b	14 a	Y
	September	71 b	6 a	Y
Steptoe	June	71 a	32 a	Y
	July	83 a	24 a	Y
	August	47 a	34 a	N
	September	53 a	21 a	N
Edwall	June	16 b	5 b	Y
	July	41 a	5 b	Y
	August	44 a	18 a	Y
	September	58 a	5 a	Y

*RT 3 was applied at 96 oz/A. Applications were made near the first of each month.
**Numbers for each location in each column followed by the same letter are not different (Pvalue≤0.05).
***Comparison between Silwet L77 and no surfactant. Y=difference; N=no difference.