Efficacy of Silwet® L77 organosilicone surfactant with RT® 3 glyphosate applied in no-till fallow for control of smooth scouringrush in the following winter wheat crop.

Mark Thorne and Drew Lyon

Control of smooth scouringrush (*Equisetum laevigatum*) in fallow has been a challenge for producers, especially in no-till systems (Figure 1). 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 the following year. 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 a high concentration of silica compared with most other plants. Smooth scouringrush is also a very deep-rooted plant with extensive vertical rhizomes. Previous research has shown that the organosilicone surfactant Silwet L77 increases glyphosate uptake by mass flow through the stomates as opposed to movement through the stem epidermis. This report follows up on treatments that were applied in fallow in 2019.

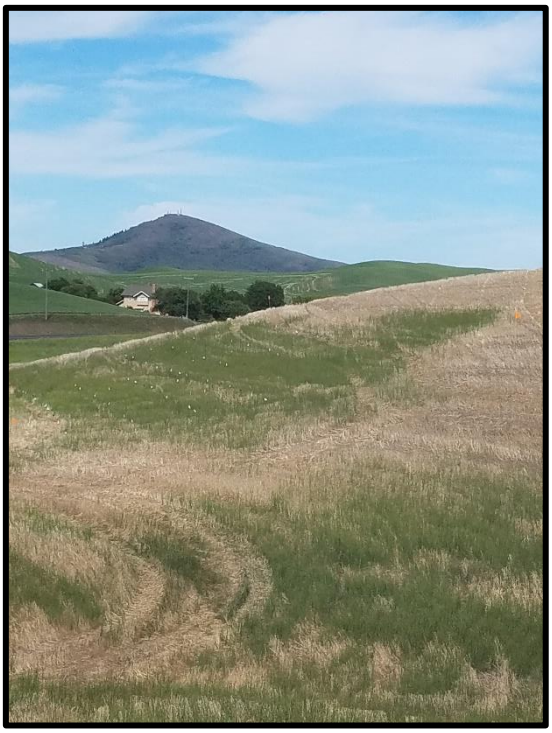

Figure 1. Dense patches of smooth scouringrush in fallow near Steptoe, WA.

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. Soil pH and organic matter was 5.1 and 3.3% at PCFS, 5.0 and 2.7% at Steptoe, and 5.0 and 2.9% at Edwall, respectively. Initial densities in 2019 averaged 67, 125, and 370, stems/yd^2 at Edwall, PCFS, and Steptoe, respectively. All treatments were applied in 2019 near the end of each month from May through August, except for the first application at Steptoe, which was applied June 11, 2019. Experimental design was a split-plot randomized complete block, with three sub-plot treatments per main plot, and four application times. Main plots were the application times and the sub-plot treatments were the herbicide treatments of RT 3 with no added surfactant, RT 3 with Silwet L77, and no herbicide. 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 TeeJet® XR11002 nozzles on 20-inch spacing and pressurized with a CO_2 backpack at 3 mph. At PCFS, two of the six nozzles were blocked to accommodate the narrower plot width. Spray output was 15 gpa at 25 psi. In July 2020, all treatments were assessed in the winter wheat crop, approximately a year after the herbicide

applications, by counting stems in sample quadrats in each sub-plot. Stem density is presented as stems/yd^2 (Table 1).

Smooth scouringrush density at each location differed in response to herbicide treatment and timing of application. Furthermore, each location differed in its topography and aspect. The PCFS location had a south exposure and was located at the bottom of a gentle slope. This location was the warmest of the three and had warmer soil temperatures at each application time. The Edwall site was in a northwest-facing draw with a gentle slope and moist soil much of the year. The Steptoe site was on a steep north-facing slope. These differences likely had an impact on the growth of the plants, and possibly the efficacy of the treatments.

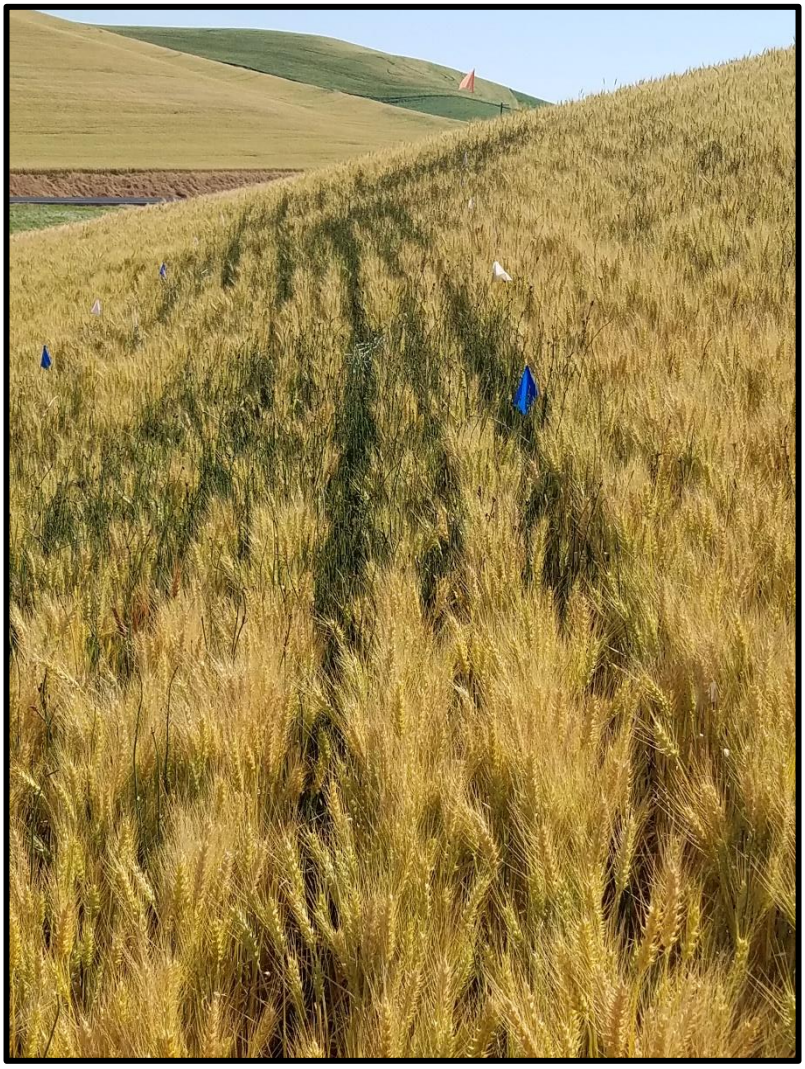

Figure 2. Effect of RT 3 + Silwet L77 (foreground) vs. RT 3 alone and no herbicide one year after treatment.

Applications of RT 3 + Silwet L77 resulted in fewer stems than RT 3 alone (Figure 2) at all locations and application times, except for the May application at PCFS (Table 1). The May PCFS applications of RT 3 alone and RT 3 + Silwet L77 resulted in 8 and 2 stems/yd^2, respectively, compared with 63 stems/yd^2 for the nontreated check. Furthermore, the RT 3 alone application statistically reduced stem density in only three other instances compared with the nontreated check, the July applications at Edwall and Steptoe, and the August application at Steptoe (Table 1). In addition, the effect of RT 3 alone was much less consistent and resulted in a high amount of variability (data not shown). This variability is the reason why the RT 3 alone treatment is not statistically different than the nontreated check, even though the means appear very different. In contrast, the response from RT 3 + Silwet L77 was much more consistent and less variable. The poor response of RT 3 alone is consistent with previous research and grower reports and is likely due to the inability of smooth scouringrush to uptake enough of the herbicide to make a difference the following year. This barrier is

diminished by adding Silwet L77. The application of RT 3 + Silwet L77 could be a good alternative to using long residual herbicides such as Glean (chlorsulfuron) and Finesse (chlorsulfuron + metsulfuron), which are known to control smooth scouringrush, but cannot be applied for at least 36 months prior to planting susceptible crops such as pulses or non-sulfonylurea resistant canola (see labels for plantback restrictions).

Table 1. Smooth scouringrush density in 2020 winter wheat crops following herbicide applications the previous fallow year at three locations in eastern Washington.

			Smooth scouringrush density*		
Time	Treatments	Rates	Edwall	PCFS	Steptoe
		oz/A + % v/v	----------stems per square yard----------		
May	None	-	339 a	63 a	280 a
May	RT 3 alone	96	209 a	8 b	143 a
May	RT 3 + Silwet L77	96 + 0.25	79 b	2 b	12 b
June	None	-	276 a	54 a	241 a
June	RT 3 alone	96	189 a	13 a	91 a
June	RT 3 + Silwet L77	96 + 0.25	38 b	0 b	16 b
July	None	-	184 a	146 a	260 a
July	RT 3 alone	96	89 b	67 a	165 b
July	RT 3 + Silwet L77	96 + 0.25	40 c	2 b	67 c
August	None	-	134 a	133 a	263 a
August	RT 3 alone	96	73 a	99 a	158 b
August	RT 3 + Silwet L77	96 + 0.25	29 b	8 b	38 c

*Means are based on four replicates per treatment. Means within a column for each application time followed by the same letter are not significantly different at the 95% probability level, which means that we are not confident that the difference is the result of treatment rather than experimental error or random variation associated with the experiment.