

Comparison of RT[®] 3 and surfactants for control of smooth scouringrush during a drought year – 2021

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Control of smooth scouringrush (*Equisetum laevigatum*) in chemical fallow with glyphosate has been difficult, especially at the rates used for general weed control in no-till fallow management (Figure 1). However, drought and high temperatures can reduce efficacy of glyphosate in many weed species, and smooth scouringrush is no exception. We have found that the addition of Silwet[®] L77 organosilicone surfactant with RT 3 applied at 96 oz/A in fallow can substantially reduce smooth scouringrush density in the following winter wheat crop. The mechanism of action for organosilicone surfactants is reduced spray droplet surface tension on leaves, which facilitates movement of the spray solution across the leaf/stem surface and into open stomates where the herbicide can be more easily absorbed. Reduction of spray droplet surface tension also leaves the herbicide solution susceptible to quicker evaporation. In either situation, if the stomate is closed and/or the spray solution evaporates before it can be taken up the plant, control is lost.



Figure 1. A sea of smooth scouringrush in no-till fallow.

In general, plants open their stomates during the day to obtain CO₂ from the surrounding air, but close stomates at night. To test the hypothesis that organosilicone surfactants facilitate herbicide uptake through open smooth scouringrush stomates, we applied RT 3 during the day and at night to smooth scouringrush in three different trial sites in eastern Washington. Locations were near Rock Lake, WA on the Seagle farm and Reardan, WA on the Carstens farm. All sites were in no-till fallow at the time of application and were planted to winter wheat in October 2021. The Rock Lake site was a slight northwest facing slope on a Uhlig silt loam soil with pH of 5.5 and 3.75% organic matter in the top 6 inches. The Reardan site was on a northwest facing slope on an Athena silt loam soil with pH of 4.9 and 2.4% organic matter in the top 6 inches. Plots measured 10 by 30 ft and were arranged in a randomized complete block design with four replications per treatment. Herbicide treatments were applied at 9:30am

on July 12, 2021, at Rock Lake and at 12:15pm at one Reardan site (Reardan A). At a second Reardan site (Reardan B), night treatments were applied August 9, 2021, while day treatments were applied at 10:40am the following day. Nighttime applications were initiated in the evenings after all surrounding WSU Ag WeatherNet stations reported 0 watts/meter² solar radiation. All applications were made with a hand-held spray boom with six TeeJet[®] XR11002 nozzles on 20-inch spacing and pressurized with a CO₂ backpack at 3 mph. Spray output was 15 gpa at 25 psi. All RT 3 applications were applied at 96 oz/A. Organosilicone surfactants compared were Silwet L77 and Kinetic[®] applied at 0.5% v/v, and Sil-Coat[®] applied at 0.375% v/v. Wetcit[®], a non-organosilicone surfactant, was applied at 0.78% v/v. Finesse was applied at 0.5 oz/A as a positive control because it has been shown to be very effective for smooth scouringrush control. Initial smooth scouringrush density at Rock Lake averaged 271 stems/yard². Initial density at the two Reardan sites averaged 213 stems/yard².

Visual ratings of treatment efficacy 45 days after treatment (DAT) differed at all three trials. At Rock Lake, the day application of RT 3 plus Sil-Coat averaged 44% control and was statistically higher than the night applications that averaged only 15% control; however, there was no difference between day and night for the other two organosilicone surfactants, Silwet L77 and Kinetic (Table 1). Finesse resulted in the best control at 46%. The Reardan A applications were made 3 hours after the Rock Lake applications, after air temperature had risen from 80° to the low 90's F and relative humidity dropped from 30% to less than 20%. At Reardan A, there were no differences between day and night applications for any surfactant, and percent control was low for all treatments, including Finesse. This would suggest that the smooth scouringrush plants had shut down under heat and potentially drought stress. A month later at the Reardan B trial, the night applications of Silwet L77 and Sil-Coat resulted in better control than their corresponding day applications. The night application of RT 3 plus Silwet L77 average 82% control and was substantially better than the day application at 14% control. Likewise for Sil-Coat, the night and day applications averaged 63 and 31% control, respectively, and were statistically different (Table 1). These results suggest that either smooth scouringrush was opening stomates at night after plant water status and temperature had improved, or the night applications did not experience spray droplet evaporation. However, day application of RT 3 alone was greater than the night application, suggesting that faster evaporation with Silwet L77 and Sil-Coat might have had an impact.

Overall, these results indicate that weather and plant water/temperature status are important considerations for herbicide control of smooth scouringrush. It is important to note that other applications we made in 2021, prior to the July high temperatures, of 96 oz/A of RT 3 plus Silwet L77 or Kinetic yielded excellent control between 80 and 100% burn down after 30 days. More work needs to be done with smooth scouringrush control in relation to soil and air temperature and moisture.

Table 1. Smooth scouringrush control rated visually 45 days after treatments (DAT) were applied in no-till fallow.

Herbicide	Surfactant	Timing	Smooth scouringrush control – 45 DAT		
			Rock Lake	Reardan A	Reardan B
			----- % -----		
Nontreated check	---	---	---	---	---
RT 3	none	day	27 bcd	10 c	33 d
RT 3	none	night	13 b	15 bc	15 e
RT 3	Silwet L77	day	35 abc	17 bc	14 f
RT 3	Silwet L77	night	24 cd	23 ab	82 a
RT 3	Kinetic	day	26 cd	26 ab	33 d
RT 3	Kinetic	night	16 d	34 a	33 d
RT 3	Sil-Coat	day	44 ab	25 ab	31 de
RT 3	Sil-Coat	night	15 d	16 bc	63 b
RT 3	Wetcit	day	27 bcd	24 ab	40 cd
RT 3	Wetcit	night	24 cd	23 ab	53 bc
Finesse	Silwet L77	day	46 a	8 c	35 d

*Means are based on four replicates per treatment. Means within each column 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.