Russian thistle control in chemical fallow with sulfentrazone applied in fall and late winter

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Russian thistle control in chemical fallow is critical to conserve moisture for fall planting in the wheat/fallow producing region of eastern Washington. Herbicide soil activity and application timing can play a role in the effectiveness of soil-applied herbicides. Fall-applied herbicides have the advantage of having fall and winter precipitation to activate the herbicides in the soil, however, late winter-applied herbicides would have less time to degrade in the soil prior to Russian thistle emergence in late spring and summer.

Figure 1. Russian thistle in nontreated check plot (left), and late winter-applied QY998-N001 plot on June 27, 2024.

We tested herbicide containing the active ingredient sulfentrazone for Russian thistle control in chemical fallow at a field site near Washtucna, WA that had produced a spring wheat crop in 2023 (Figure 1). Soil type is a Ritzville silt loam with pH of 6.5 and organic matter of 1.6%. Sulfentrazone is a Group 14 protoporphyrinogen oxidase (PPO) inhibitor herbicide that has soil activity on broadleaf weeds, including Russian thistle. Spartan® 4F (sulfentrazone) and Authority® Supreme (sulfentrazone; pyroxasulfone, Group 15) are currently labeled for preplant applications in certain crops but have a four-month rotational restriction for planting back to wheat. Furthermore, precipitation is important during the four-month rotational period for the herbicide to breakdown and not affect the wheat crop. QY998-N001 is an experimental product containing sulfentrazone being tested for fallow applications. Express® XP (tribenuron, Group 2) was included as a possible tank-mix partner for QY998-N001.

Treatments were applied on November 9, 2023, and on March 18, 2024, with a CO_2-pressurized backpack sprayer and 10-ft hand-held spray boom with six AIXR110015 TeeJet® nozzles. The

spray output was 15 gpa with 40 psi nozzle pressure and 3 mph ground speed. The experimental design at each timing was a randomized complete block with four replicates per treatment and 10- by 30-ft plots. All treatments included WeatherMax® (glyphosate) at 24 oz/A and Downrigger® (acidifier, drift aid, surfactant) at 0.5% v/v to control all emerged vegetation at the time of applications. Express XP treatments included a nonionic surfactant (NIS) at 0.25% v/v. Precipitation from November 9, 2023, through March 18, 2024, totaled 4.7 inches. Precipitation between March 18 and June 27, 2024, totaled 1.1 inch. Treatment efficacy was assessed on June 13 and 27, 2024, with visual control ratings as a percent of the nontreated check. Also, Russian thistle density was assessed in each plot on June 27, 2024.

Differences in efficacy were not found, individually, between the fall- and late winter applications of Spartan 4F, Authority Supreme, and QY998-N001 treatments at either the June 13 or 27 ratings (Table 1). By June 27, all herbicides containing sulfentrazone resulted in 100% Russian thistle control. Russian thistle control with Express XP by itself was only 32% by June 13 and 0% by June 27. Furthermore, Express XP plots averaged 1.5 plants/yd^2, which was 0.5 plants/yd^2 greater than the nontreated check. All other treatments averaged 0 plants/yd^2.

In this trial, treatments with sulfentrazone controlled Russian thistle through June of the fallow year whether the applications were made the previous fall or late winter of the fallow year. Effective chemical fallow weed control with sulfentrazone also includes controlling weeds that are present at the time of application with glyphosate or another effective herbicide. Also, precipitation is needed following sulfentrazone application for activation in the soil.

Table 1. Russian thistle control following fall and late-winter herbicide applications.

			Russian thistle***		
			Visual control ratings		Density
Treatment	Rate*	Timing**	6-13-24	6-27-24	6-27-24
	(oz/A)		(% of nontreated check)		(count/yd^2)
Nontreated check			0	0	1.0 b
Authority Supreme	8	Fall	99 ab	100 a	0 c
Spartan 4F	8	Fall	100 a	100 a	0 c
QY998-R001	5.3	Fall	100 a	100 a	0 c
QY998-R001 + Express XP	2.7 + 0.5	Fall	100 ab	100 a	0 c
Express XP	0.5	Fall	32 c	0 b	1.5 a
Authority Supreme	8	Late winter	85 b	100 a	0 c
Spartan 4F	8	Late winter	100 a	100 a	0 c
QY998-R001	5.3	Late winter	100 ab	100 a	0 c

*Rates are fluid ounces per acre for all herbicides except QY998-R001 and Express XP, which are dry granule formulations.
**Fall treatments applied November 9, 2023; late winter treatments applied March 18, 2024.
***Means in each column followed by the same letter are not different (P≤0.05).

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