Rush skeletonweed control with fall applications in winter wheat stubble

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Rush skeletonweed (*Chondrilla juncea* L.) is a deep tap-rooted perennial invasive plant species that spreads by rhizomes and seeds. Rush skeletonweed is in the Asteraceae (sunflower) family and competes aggressively for soil moisture and nitrogen, particularly during spring and summer months. In eastern Washington, rush skeletonweed became established on thousands of acres of rangeland in Whitman and Lincoln counties, and then spread into adjacent farmland when the land was enrolled in the Conservation Reserve Program (CRP). Recently, CRP contracts have expired and much of the CRP land is now back in wheat production. Consequently, stands of rush skeletonweed on CRP land have persisted into winter wheat production.

Figure 1. Rush skeletonweed in wheat stubble following harvest.

The winter wheat/fallow rotation is predominant in this area with tillage as the primary tool used through the fallow year to control weeds, conserve moisture, and prepare the seedbed for fall planting. Standard weed management strategies do not control or prevent rush skeletonweed from flourishing during the fallow phase of the rotation. Rush skeletonweed resprouts following early-spring aid-to-tillage glyphosate applications and subsequent tillage operations, including rod weeding. Furthermore, tillage can spread the infestation by fragmenting and spreading rhizomes that will resprout and start new plants.

Infestations of rush skeletonweed in fallow reduce wheat yield potential by depleting soil moisture. Germination of wheat seeded into moisture-depleted soil is delayed until fall rains replenish the seed zone, or fails to emerge if fall rains crust the soil surface. Reseeding can fill in areas of poor emergence, but yield potential of late-emerging wheat is low. Effective herbicide control of rush skeletonweed during the fallow phase would increase yields by preserving soil moisture, and would reduce the number of rod weeding operations currently required to keep dense stands from further depleting soil moisture.

A preliminary trial was established October 2016 near LaCrosse, WA to compare herbicides applied following winter wheat harvest for rush skeletonweed control during the following fallow year. The site had been taken out of CRP in fall of 2013 and seeded to winter wheat. The field was fallowed in 2014-15 and in winter wheat 2015-16. A relatively uniform stand of rush skeletonweed was present while in CRP and persisted into wheat production. Winter wheat was

harvested July 2016 and the remaining wheat stubble was left standing through the fall and winter.

Herbicide treatments were applied October 19, 2016 using a CO_2 pressurized 10-ft hand-held spray boom. The spray output was 15 gpa at 24 psi travelling 3 mph. At the time of application, the sky was clear and air temperature was 67 °F with 43% relative humidity. The soil temperature was 48 °F at 3 inches and the surface was moist. Design of the trial was a randomized complete block with four replications per treatment. Individual plots measured 10 by 30 feet.

At the time of herbicide application, the majority of rush skeletonweed plants were bolted with actively growing leaves, likely benefiting from early occurring above average October rains. Bolted plants were up to 29 inches tall and contained buds with flowers or seeds, but a few plants were still in the rosette stage. The density of plants was variable across the trial site and range from 1 to 12 plants/m^2.

The field that contained the study site was originally planned to be in fallow through 2017, but the volume of wheat stubble was too great for fallow tillage operations. Consequently, the stubble was burned in the spring of 2017 and the field was seeded to spring wheat. Rush skeletonweed re-emerged following the burn and was present in the spring wheat crop. Herbicide efficacy was evaluated on June 21, 2017 by counting all plants in a 6- by 28-foot area in the center of each plot. Even though the field contained spring wheat instead of fallow, it was determined these measurements would be useful for evaluating efficacy of the fall-applied herbicides.

Results of June 21 evaluations were straightforward and encouraging. Applications of Milestone®, Stinger®, or Arsenal® reduced the presence of rush skeletonweed (Table). High rates of Stinger and Arsenal completely controlled the population in three out of the four plots (25% presence), while the high rate of Milestone controlled the population in two of the four plots treated (50% presence).

Rush skeletonweed density was reduced to near zero with both rates of Stinger and the high rates of both Milestone and Arsenal (Table). The low rates of Milestone and Arsenal also resulted in good control with densities averaging 0.6 plants/m^2 for each treatment (Table). The high rates of aminocyclopyrachlor or Ally XP® resulted in only intermediate control with densities of 1.3 and 2.1 plants/m^2 but were more effective than their corresponding low rates, which were not different from the non-treated check. The RT 3® + 2,4-D LV6 treatment also resulted in intermediate control with 2.7 plants/m^2 remaining.

Results of this trial suggest that control of rush skeletonweed during the fallow year may be possible with Stinger, Milestone, or Arsenal; however, Milestone and Arsenal are not label for fallow applications in winter wheat production. Both high and low rates of Stinger were equally effective and resulted in good control. For the other herbicides tested, the high rate was more effective than the low rate. The more common application of glyphosate + 2,4-D does not appear to be effective and only slightly better than applying nothing.

Effect of fall-applied herbicides on rush skeletonweed in winter wheat stubble. Rush skeletonweed presence and density were assessed June 2017 of the following year.

Treatment	Rate	Unit	Presence [1]	Density
			(%)	(plants/m^2)
Nontreated	-	-	100	3.7 ab
Milestone (aminopyralid)	0.594	fl oz/a	100	0.6 ef
Milestone (aminopyralid)	1.19	fl oz/a	50	<0.1 g
Stinger (clopyralid)	0.5	pt/a	75	0.2 fg
Stinger (clopyralid)	1	pt/a	25	<0.1 g
Aminocyclopyrachlor	1.71	fl oz/a	100	4.1 ab
Aminocyclopyrachlor	3.43	fl oz/a	100	1.3 de
Arsenal (imazapyr)	1.5	pt/a	75	0.6 f
Arsenal (imazapyr)	3	pt/a	25	<0.1 g
Ally XP (metsulfuron)	0.1	oz/a	100	5.6 a
Ally XP (metsulfuron)	0.2	oz/a	100	2.1 cd
RT 3 (glyphosate) + 2,4-D LV6 (2,4-D ester)	32 + 8.6	fl oz/a	100	2.7 bc

[1] Presence defined as the percentage of plots with the same treatment having at least one rush skeletonweed plant.

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