

Rush skeletonweed control in no-till fallow

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Rush skeletonweed (*Chondrilla juncea*) on land enrolled in the Conservation Reserve Program (CRP) is difficult to control after farming resumes. In the wheat/fallow cropping areas of eastern Washington, rush skeletonweed flourishes during the fallow phase of the rotation in the absence of winter wheat competition, and herbicide applications for weed control in the fallow phase have not been effective (Figure 1). Rush skeletonweed is a deep-rooted perennial that spreads by seed and rhizomes. Furthermore, few new herbicide chemistries for rush skeletonweed control in fallow or crop have been labeled in the past 40 years. Therefore, effective control must rely on older herbicides and strategic management practices.



Figure 1. Rush skeletonweed persisting in no-till fallow near Hay, WA following standard herbicide applications for no-till fallow weed control.

Trials were initiated on October 8, 2018 at sites near Hay and LaCrosse, WA. Both sites had standing winter wheat stubble from the 2018 harvest. Soil at the Hay site was a Walla Walla silt loam, 7-25% slope, with a pH of 6.0 and 3.1% organic matter, and was near 1800 ft in elevation.

Soil at the LaCrosse site was a Bengé Complex silt loam, 0-15% slope, with a pH of 6.6 and 2.3% organic matter, and was 1480 ft in elevation. Initial rush skeletonweed density at the Hay site averaged 1.6 plants/yard² while the LaCrosse site averaged 3.2 plants/yard². Herbicides were applied at three different times, which included autumn following harvest when plants were near the end of flowering, early spring when plants were only in the rosette stage, and early summer when plants had started to bolt. Autumn applications were applied on October 8, 2018 at both sites. The LaCrosse site had experienced a hard freeze of 22° F on October 3, five days before the autumn applications, and bolted stems were beginning to senesce at the time of application. At the Hay site, temperatures had stayed above freezing and plants were still green and flowering. Spring treatments were applied April 18, 2019 to rosettes. Furthermore, at the spring application timing, all plots except for the 64 oz/A RT[®] 3 (glyphosate) treatment, were sprayed with 24 oz/A of RT 3 to control volunteer crop and winter annual weeds. Temperatures remained above freezing at both sites for at least five days after application. Summer applications were applied June 5, 2019 when plants were bolting.

Overall, the autumn applications of Tordon[®] 22K (picloram) and the spring applications of Stinger[®] (clopyralid) and Milestone[®] (aminopyralid) were most effective in reducing rush skeletonweed density (Table 1). At Hay, however, the only treatment statistically different from the 1.3 plants/yard² density of the RT 3 check was the spring application of Milestone, which averaged 0.4 plants/yard². At LaCrosse, the spring applications of Stinger and Milestone resulted in the lowest densities of 0.2 and 0.4 plants/yard², respectively (Table 1). However, at LaCrosse, the autumn applications of Stinger or Milestone, each followed by the summer application of 2,4-D LV6 were not statistically different from the Tordon 22K application. It was not evident that the summer applications of 2,4-D LV6 at bolting were effective. The least effective treatments, overall, were the autumn application of RT 3/2,4-D LV6 fb 2,4-D LV6 treatment and the spring application of 64 oz/A of RT 3 fb 2,4-D LV6. Autumn applications of Curtail[®] (clopyralid + 2,4-D) or Curtail/Finesse[®] (chlorsulfuron + metsulfuron) were also not effective. Furthermore, autumn applications, except for RT 3/2,4-D LV6, were less effective at the Hay site than at LaCrosse. This is likely a result of the Hay site not getting a frost just prior to application. The elevation and topography at the Hay site did not facilitate the accumulation of cold air from cold-air drainage that caused the hard freeze at the LaCrosse site. Other researchers have shown that frosts in autumn change the structure of storage carbohydrates going into roots of plants in the Asteraceae family, like rush skeletonweed, which results in better herbicide movement of certain herbicides into the roots. It is likely that Tordon 22K at Hay would have been more effective had there been a frost ahead of the autumn applications. Although the hard freeze at LaCrosse likely caused the plants to alter their carbohydrate structure going into the roots, the damage from the extreme cold likely reduced the amount of movement into the roots. In contrast, spring frosts at, or shortly after, application can reduce herbicide efficacy. Both sites had above freezing temperatures for at least a week following applications, which was reflected by good control through the fallow phase from the spring applications of Stinger and Milestone.

Wheat yields were above historical averages at both locations (Figure 2). The RT 3 check treatments averaged 98 and 78 bu/A at LaCrosse and Hay, respectively (Table 1). At LaCrosse, the only treatments statistically different from the RT 3 check was the autumn application of

Milestone fb 2,4-D LV6, which yielded 87 bu/A, and the spring application of Milestone/RT 3, which yielded 86 bu/A, which were lower in yield than the RT 3 check. At Hay, the only treatment statistically different from the RT 3 check was Tordon 22K, which yield 86 bu/A, and was statistically greater than the RT 3 check. At either site, Tordon 22K did not cause visible crop injury symptoms or reduced yields. Tordon 22K has long been known as an effective herbicide for rush skeletonweed control; however, in the past it has been applied at high rates for field bindweed (a.k.a. morningglory) control and its long soil residual activity caused crop damage.

Rush skeletonweed control in wheat/fallow cropping systems will require long-term and careful planning. An autumn application of Tordon 22K or spring applications of Stinger may be one part of the overall strategy, however, timing of these applications with relation to frosts or freezes is critical. Milestone is not currently labeled for use in fallow or crop, but at the rate applied, appears to be as effective as Stinger. In contrast, applications of RT 3 specifically for rush skeletonweed control appear to be ineffective.

Control, or good suppression, in the fallow phase is one component of an overall management plan. Following up with a vigorous, competitive stand of winter wheat and effective herbicide treatments in the crop phase is also important, and it may take several rotation cycles to substantially reduce or eradicate rush skeletonweed in the infested wheat/fallow cropping areas.



Figure 2. Rush skeletonweed trial in a 90-100 bu/A winter wheat crop near LaCrosse, WA.

See next page for Table 1.

Table 1. Effect of fallow treatments on rush skeletonweed density and wheat yield at LaCrosse and Hay, WA.

#	Treatment*	Rate	Time**	Rush skeletonweed density***		Wheat yield****	
				LaCrosse	Hay	LaCrosse	Hay
		oz/A		----plants/yd ² ----		-----bu/A-----	
1	Stinger	10.7	Au	0.9 bc	1.8 ab	89	79
2	Milestone	1.2	Au	1.3 ab	0.9 bcde	91	82
3	Stinger	10.7	Au	0.6 cd	2.4 a	96	80
	fb 2,4-D LV6	fb 43	fb Su				
4	Milestone	1.2	Au	0.6 cd	2.2 a	87 [§]	81
	fb 2,4-D LV6	fb 43	fb Su				
5	Curtail	64	Au	1.3 ab	2.2 a	94	82
6	Curtail/Finesse	32/0.4	Au	0.9 bc	2.0 a	100	78
7	Tordon 22K	16	Au	0.3 de	0.8 cde	90	86 [§]
8	RT3/2,4-D LV6	64/43	Au	2.0 a	1.6 abc	98	75
	fb 2,4-D LV6	fb 43	fb Su				
9	Stinger/RT 3	10.7/24	Sp	0.2 e	0.5 de	96	72
10	Milestone/RT 3	1.2/24	Sp	0.4 de	0.4 e	86 [§]	77
11	RT 3	64	Sp	1.4 ab	1.8 abc	96	83
	fb 2,4-D LV6	fb 43	fb Su				
12	RT 3 check	24	Sp	1.5 a	1.3 abcd	98	78

* Applications of Milestone and Finesse included non-ionic surfactant at 0.25% v/v.

All RT 3 applications included ammonium sulfate at 18 lb/100 gal.

**fb”=first treatment followed by a second treatment.

** Au=Autumn 2018, Sp=Spring 2019, Su=Summer2019.

** Density was measured in May 2020 in the winter wheat crop. Means are based on four replicates per treatment. Plant density means within a column for each location 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.

**** Yield means followed by a [§] symbol are statistically different, either lower or higher, from the RT 3 check at the 95% probability level.

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