EVALUATION OF SEED SCARIFICATION FOR THE ESTABLISHMENT OF THREE INTERMOUNTAIN WEST NATIVE LEGUMES

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Introduction

Legumes provide an important role for restored rangelands of the Intermountain West. Reliable commercial seed production is desirable to make seed readily available. Direct seeding of native range plants has been generally problematic, especially for certain species. Rangeland legumes have been extremely difficult to establish.

In established native perennial fields at the Malheur Experiment Station and in rangelands we have observed prolific natural emergence from seed that falls on the soil surface and is covered by thin layers of organic debris. Seed of some legumes has a hard seed coat that slows germination. Scarification of the seed coat might improve water penetration and improve emergence. This trial tested the effect of seed scarification, row cover, and hydroseed mulch on germination of surface planted seed of three legume species that are native to Malheur County and surrounding rangelands (Table 1). Row cover can be a protective barrier against soil desiccation and bird damage. Hydroseeding mulch could be a low cost replacement for row cover.

Materials and Methods

Three species for which stand establishment has been problematic were chosen (Table 1). Seed of each species was scarified by immersion for 5 min in 98 percent sulfuric acid. All seed was treated with a liquid mix of the fungicides Ridomil® MZ58 and Captan (100 g Ridomil, 100 g Captan in 1 liter of water). Seed weights of the scarified and nonscarified seeds were determined after treatment. The seed weights were used to make seed packets containing approximately 300 seeds each. The seed packets were assigned to one of two treatments (Table 2). The trial was planted manually on November 3, 2010. The experimental design was a randomized complete block with six replicates. Plots were one 30-inch-wide by 5-ft-long bed. Two seed rows were planted on each bed.

After planting, some of the beds were covered with row cover. The row cover (N-sulate, DeWitt Co., Inc., Sikeston, MO) covered four rows (two beds) and was applied with a mechanical plastic mulch layer. For the hydroseeding mulch treatments, Hydroseeding mulch (Hydrostraw LLC,

Manteno, IL) was applied dry at 7.5 g/ft of row in a 3-cm band over the seed row. The applied dry mulch was sprayed with water using a backpack sprayer to simulate hydroseeding.

On March 23, 2011, the row cover was removed and emergence counts were made in each plot. Emergence counts were again taken on May 13.

Tetrazolium tests were conducted to determine seed viability of each species. Seed viability was 89 percent for *Dalea ornata*, 84 percent for *D. searlsiae*, and 94 percent for *Astragalus filipes*. The tetrazolium results were used to correct the emergence data to emergence of viable seed.

Data were analyzed using analysis of variance (General Linear Models Procedure, NCSS, Kaysville, UT). Means separation was determined using Fisher's least significant difference test at the 5 percent probability level, LSD (0.05).

Results and Discussion

Emergence for *Dalea ornata* was low for all treatments on both count dates (Tables 2 and 3). Averaged over treatments, nonscarified *D. ornata* seed had higher stands than scarified seed on May 13. On March 23, the highest emergence for *D. searlsiae* resulted from planting nonscarified seed with row cover. On May 13, the highest stands for *D. searlsiae* resulted from planting nonscarified seed. *Dalea* spp. might establish better with scarified seed in a spring planting; this option was not tested. On March 23, the highest emergence for *Astragalus filipes* resulted from planting scarified seed with row cover. On May 13, the highest stands for *A. filipes* resulted from planting scarified seed.

On March 23, for *D. searlsiae* and *A. filipes*, row cover resulted in higher emergence than hydroseed mulch. The trend was the same for *D. ornata*, but differences were not statistically different. By May 13, there was no statistically significant difference in stand between the row cover and hydroseed mulch.

Conclusions

For *Dalea ornata* and *D. searlsiae*, seed scarification reduced emergence.

For *Astragalus filipes*, seed scarification increased emergence.

Table 1. Seed weights for three native legume species submitted to emergence treatments in the fall of 2010. Malheur Experiment Station, Oregon State University, Ontario, OR.

Species and scarification	Seeds/g
Dalea ornata (scarified)	273.2
Dalea ornata (non-scarified)	272.2
Astragalus filipes (scarified)	236.6
Astragalus filipes (non-scarified)	248.3
Dalea searlsiae (scarified)	321.4
Dalea searlsiae (non-scarified)	311.4

Table 2. Emergence of three native legume species on March 23, 2011 in response to seed scarification and two treatments applied at planting in the fall of 2010. Emergence for each species was corrected to the percent emergence of viable seed. Oregon State University, Malheur Experiment Station, Ontario, OR.

	Dalea ornata			*Astragalus filipes*			*Dalea searlsiae*			Average		Avg.
Treatment	Scarified	Non-scarified	Avg.	Scarified	Non-scarified	Avg.	Scarified	Non-scarified	Avg.	Acarified	Non-scarified	
	% emergence											
Row cover	5.1	7.1	6.1	88.3	25.5	56.9	8.4	18.3	13.3	33.9	16.9	25.4
Hydroseed mulch	0.0	0.0	0.0	43.2	13.8	28.5	0.0	1.0	0.5	14.4	4.9	9.7
Average	2.6	3.5	3.0	65.7	19.6	42.7	4.2	9.6	6.9	24.2	10.9	17.5
LSD (0.05)												
Treatment		5.1										
Species		4.8										
Scarification		2.5										
Treatment X Species		6.8										
Species X Scarification		4.4										
Trt X Species X Scarif.		6.2										

Table 3. Stand of three native legume species on May 13, 2011 in response to seed scarification and two treatments applied at planting in the fall of 2010. The stand for each species was corrected to the percent stand of viable seed. Oregon State University, Malheur Experiment Station, Ontario, OR.

	Dalea ornata			*Astragalus filipes*			*Dalea searlsiae*			Average		Avg.
Treatment	Scarified	Non-scarified	Avg.	Scarified	Non-scarified	Avg.	Scarified	Non-scarified	Avg.	Scarified	Non-scarified	
	% stand											
Row cover	0.6	6.4	3.5	55.6	17.2	36.4	0.4	8.3	4.3	18.8	10.6	14.7
Hydroseed mulch	0.5	6.8	3.7	40.0	12.2	26.1	0.5	6.0	3.3	13.7	8.4	11.0
Average	0.6	6.6	3.6	47.8	14.7	31.3	0.4	7.2	3.8	16.3	9.5	12.9
LSD (0.05)												
Treatment		NS										
Species		5.4										
Scarification		3.2										
Treatment X Species		NS										
Species X Scarification		5.5										
Trt X Species X Scarif.		NS										