

# DIRECT SURFACE SEEDING STRATEGIES FOR THE ESTABLISHMENT OF TWO NATIVE LEGUMES OF THE INTERMOUNTAIN WEST

---

*Clinton C. Shock, Erik B. G. Feibert, and Lamont D. Saunders, Malheur Experiment Station, Oregon State University, Ontario, OR, 2012*

*Doug Johnson and Shaun Bushman, USDA Agricultural Research Service, Logan, UT*

## 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. Fall planting is important for many native plant species, because their seed requires a period of cold to break dormancy (vernalization). Loss of soil moisture, soil crusting, and bird damage are some detrimental factors hindering emergence of fall planted seed. Row cover can be a protective barrier against soil desiccation and bird damage. Seed treatment can protect the emerging seed from fungal pathogens that might cause seed decomposition or seedling damping off. This trial tested the effect of timing of planting (fall vs. spring), seed scarification, row cover, and seed treatment on germination of surface-planted seed of two legume species, blue mountain prairie clover (*Dalea ornata*) and basalt milkvetch (*Astragalus filipes*) that are native to Malheur County and surrounding rangelands for which stand establishment has been problematic.

## Materials and Methods

Two selected germplasms of blue mountain prairie clover, 'Majestic' and 'Spectrum', and one accession of basalt milkvetch were included in the stand establishment trials. One seed lot of each of these three plant materials was scarified by immersion for 5 min in 98 percent sulfuric acid. After scarification, 12 seed packets of each seed lot were prepared with 120 seeds per packet. Seed of half of the scarified and half of the nonscarified packets was treated briefly with a liquid mix of the fungicides Allegiance (metalaxyl) and captan (100 g Allegiance, 100 g captan in 1 liter of water) then dried. The seed packets were assigned to one of six treatments (Tables 1-3). Seed was planted manually on November 11, 2011 and again on February 28, 2012. Immediately before the spring 2012 planting, a manual clodbuster was run over the surface of the beds to break the crust formed over the winter. The experimental design was a randomized

complete block with four replications. Plots were one 30-inch-wide by 5-ft-long bed. Each plot had 120 seeds planted in 5 ft of 2 rows on the 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.

On March 12, 2012, the row cover was removed and emergence counts were made in each plot. Emergence counts were again taken on March 22, April 2, April 12, April 24, and May 8. The row cover for the fall planted seed was replaced after the March 12 count. The row cover for the spring planted seed was replaced after the March 12 and March 22 counts.

Tetrazolium tests were conducted to determine seed viability of each species. Seed viability was 89 percent for unscarified and 91 percent for scarified *Dalea ornata* (cv. Spectrum, 2010), 88 percent for unscarified and 92 percent for scarified *Dalea ornata* (cv. Majestic, 2009), and 97 percent for unscarified and 95 percent for scarified *Astragalus filipes* (Lot No. NBR-1 2010). 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

The winter of 2011/2012 at the Malheur Experiment Station had no snowfall compared to the 68-year winter (Oct-Mar) average of 18 inches. Snow cover may reduce fluctuations in temperature and moisture and thus may be an important factor in vernalization of surface-planted seed. Precipitation from October 2011 through March 2012 (6.1 inches) was close to the 68-year average of 6.4 inches.

### ***Dalea ornata***

Emergence and stand for both *D. ornata* selected germplasms was very poor for the fall-planted seed for all treatments (Tables 1 and 2). There were no statistically significant differences in stand between treatments for the fall-planted seed. Emergence and stand for the spring-planted seed was significantly better than for the fall-planted seed, but was nevertheless poor. The highest stand for the spring-planted seed was achieved with row cover and scarified seed with no fungicide (24% for Spectrum and 34.7% for Majestic). For the spring-planted seed, row cover resulted in significantly higher stand than uncovered seed for both germplasms. Scarified seed resulted in significantly higher stand than non-scarified seed for both germplasms. Seed treatment resulted in lower stand than untreated seed for both germplasms.

### ***Astragalus filipes***

Fall planting resulted in higher stand than spring-planted seed (Table 3). Emergence and stand for the fall-planted seed was nevertheless poor. The highest stand for the fall planted seed was achieved with row cover and scarified, untreated seed (36.2%). For the fall-planted seed, row cover resulted in significantly higher stand than uncovered seed. Scarified seed resulted in

significantly higher stand than nonscarified seed. Seed treatment resulted in lower stand than untreated seed.

## **Conclusions**

Stand survivability was very poor for both species. By May 8, stand was 10 percent or less for all treatments and both germplasms of *D. ornata* and 12 percent or less for all treatments of *A. filipes*.

Table 1. Stand of *Dalea ornata* (Majestic selected germplasm) in response to timing of planting and three treatments. Oregon State University, Malheur Experiment Station, Ontario, OR. Stand counts were based on live plants as a percent of live seed planted.

Timing	Row cover	Scarification	Seed treatment	12 Mar	22 Mar	2 Apr	12 Apr	24 Apr	8 May
				----- % stand -----					
Fall 2011	no	no	no	0.00	0.24	0.24	0.00	0.00	0.00
	no	no	yes	0.00	0.00	0.00	0.00	0.00	0.00
	no	avg		0.00	0.12	0.12	0.00	0.00	0.00
	no	yes	no	0.00	0.00	0.00	0.23	0.00	0.00
	no	yes	yes	0.00	0.00	0.23	0.45	0.00	0.00
	no	avg		0.00	0.00	0.11	0.34	0.00	0.00
	avg			0.00	0.06	0.12	0.17	0.00	0.00
	yes	no	no	3.31	0.00	0.95	0.71	0.00	0.47
	yes	no	yes	2.37	0.24	0.47	1.89	0.00	0.24
	yes	avg		2.84	0.12	0.71	1.30	0.00	0.36
	yes	yes	no	1.81	0.91	0.91	0.91	0.00	0.00
	yes	yes	yes	4.08	1.59	1.59	0.68	0.23	0.23
	yes	avg		2.94	1.25	1.25	0.79	0.11	0.11
	avg			2.89	0.68	0.98	1.05	0.06	0.23
avg			1.45	0.37	0.55	0.61	0.03	0.12	
Spring 2012	no	no	no	0.00	0.00	0.71	0.24	0.47	0.00
	no	no	yes	0.00	0.00	0.00	0.47	1.18	0.00
	no	avg		0.00	0.00	0.36	0.36	0.83	0.00
	no	yes	no	0.00	1.59	8.38	12.23	3.85	3.17
	no	yes	yes	0.00	0.00	1.13	6.57	3.17	2.72
	no	avg		0.00	0.79	4.76	9.40	3.51	2.94
	avg			0.00	0.40	2.56	4.88	2.17	1.47
	yes	no	no	0.00	2.60	3.08	3.79	2.84	0.24
	yes	no	yes	0.00	0.24	0.24	0.24	0.00	0.24
	yes	avg		0.00	1.42	1.66	2.01	1.42	0.24
	yes	yes	no	0.00	33.97	34.65	22.87	17.66	5.89
	yes	yes	yes	0.00	2.94	7.02	14.49	0.45	0.23
	yes	avg		0.00	18.46	20.83	18.68	9.06	3.06
	avg			0.00	9.94	11.25	10.35	5.24	1.65
avg			0.00	5.17	6.90	7.61	3.70	1.56	
LSD (0.05)									
Species X timing				2.92	2.55	2.48	2.02	2.21	1.27
Species X timing X row cover				4.13	3.60	3.51	2.86	3.13	NS
Species X timing X row cover X scarification				1.49	3.85	4.19	NS	2.81	NS
Species X timing X row cover X scarif. X seed treatment				4.71	7.98	5.41	NS	2.38	NS

Table 2. Stand of *Dalea ornata* (Spectrum selected germplasm) in response to timing of planting and three treatments. Oregon State University, Malheur Experiment Station, Ontario, OR. Stand counts were based on live plants as a percent of live seed planted.

Timing	Row cover	Scarification	Seed treatment	12 Mar	22 Mar	2 Apr	12 Apr	24 Apr	8 May
				----- % stand -----					
Fall 2011	no	no	no	0.00	0.00	0.00	0.23	0.23	0.00
	no	no	yes	0.00	0.00	0.00	0.47	0.00	0.00
	no	avg		0.00	0.00	0.00	0.35	0.12	0.00
	no	yes	no	0.00	0.23	0.00	0.23	0.00	0.00
	no	yes	yes	0.00	0.00	0.00	0.23	0.00	0.00
	no	avg		0.00	0.11	0.00	0.23	0.00	0.00
	avg			0.00	0.06	0.00	0.29	0.06	0.00
	yes	no	no	3.75	0.23	2.81	1.87	0.23	0.70
	yes	no	yes	3.51	0.70	2.57	4.45	2.11	2.34
	yes	avg		3.63	0.47	2.69	3.16	1.17	1.52
	yes	yes	no	3.21	0.69	1.14	1.37	0.23	0.23
	yes	yes	yes	4.35	0.23	1.14	1.37	0.00	0.00
	yes	avg		3.78	0.46	1.14	1.37	0.11	0.11
	avg			3.70	0.46	1.92	2.27	0.64	0.82
avg			1.85	0.26	0.96	1.28	0.35	0.41	
Spring 2012	no	no	no	0.00	0.00	0.47	2.57	1.17	0.23
	no	no	yes	0.00	0.00	0.00	0.47	0.70	0.23
	no	avg		0.00	0.00	0.23	1.52	0.94	0.23
	no	yes	no	0.00	0.00	2.98	6.87	5.95	2.29
	no	yes	yes	0.00	0.00	0.00	0.23	0.00	0.69
	no	avg		0.00	0.00	1.49	3.55	2.98	1.49
	avg			0.00	0.00	0.86	2.54	1.96	0.86
	yes	no	no	0.00	2.11	0.94	2.11	1.87	0.47
	yes	no	yes	0.00	0.00	1.40	3.51	0.94	0.47
	yes	avg		0.00	1.05	1.17	2.81	1.40	0.47
	yes	yes	no	0.00	16.48	24.04	16.94	11.68	3.89
	yes	yes	yes	0.00	0.00	2.75	4.35	1.60	1.14
	yes	avg		0.00	8.24	13.39	10.65	6.64	2.52
	avg			0.00	4.65	7.28	6.73	4.02	1.49
avg			0.00	2.32	4.07	4.63	2.99	1.18	
LSD (0.05)									
Species X timing				2.92	2.55	2.48	2.02	2.21	1.27
Species X timing X row cover				4.13	3.60	3.51	2.86	3.13	NS
Species X timing X row cover X scarification				1.49	3.85	4.19	NS	2.81	NS
Species X timing X row cover X scarif. X seed treatment				4.71	7.98	5.41	NS	2.38	NS

Table 3. Stand of *Astragalus filipes* in response to timing of planting and three treatments. Oregon State University, Malheur Experiment Station, Ontario, OR. Stand counts were based on live plants as a percent of live seed planted.

Timing	Row cover	Scarification	Seed treatment	12 Mar	22 Mar	2 Apr	12 Apr	24 Apr	8 May
				----- % stand -----					
Fall 2011	no	no	no	0.00	0.43	0.00	0.64	0.64	0.64
	no	no	yes	0.00	0.21	0.21	0.43	0.00	0.21
	no	avg		0.00	0.32	0.11	0.54	0.32	0.43
	no	yes	no	0.00	4.17	1.10	2.41	3.07	2.41
	no	yes	yes	0.44	3.51	0.22	2.41	2.19	0.66
	no	avg		0.22	3.84	0.66	2.41	2.63	1.54
	avg			0.11	2.08	0.38	1.47	1.48	0.98
	yes	no	no	13.75	12.03	9.24	8.81	4.30	4.08
	yes	no	yes	5.58	8.38	2.36	4.08	2.36	0.43
	yes	avg		9.66	10.20	5.80	6.44	3.33	2.26
	yes	yes	no	29.82	36.18	28.29	24.78	17.54	11.40
	yes	yes	yes	14.91	14.91	8.99	8.99	5.04	5.04
	yes	avg		22.37	25.55	18.64	16.89	11.29	8.22
	avg			16.02	17.88	12.22	11.66	7.31	5.24
avg			8.06	9.98	6.30	6.57	4.39	3.11	
Spring 2012	no	no	no	0.00	0.00	0.00	0.43	0.64	0.00
	no	no	yes	0.00	0.00	0.00	0.00	0.00	0.00
	no	avg		0.00	0.00	0.00	0.21	0.32	0.00
	no	yes	no	0.00	0.00	0.00	0.44	0.22	1.10
	no	yes	yes	0.00	0.00	0.00	0.44	0.88	0.88
	no	avg		0.00	0.00	0.00	0.44	0.55	0.99
	avg			0.00	0.00	0.00	0.33	0.44	0.49
	yes	no	no	0.00	0.00	0.21	2.58	1.72	1.07
	yes	no	yes	0.00	0.21	0.00	0.86	0.21	0.21
	yes	avg		0.00	0.11	0.11	1.72	0.97	0.64
	yes	yes	no	0.00	1.32	4.82	14.25	3.07	2.85
	yes	yes	yes	0.00	0.22	1.32	3.29	0.44	0.66
	yes	avg		0.00	0.77	3.07	8.77	1.75	1.75
	avg			0.00	0.44	1.59	5.25	1.36	1.20
avg			0.00	0.22	0.79	2.79	0.90	0.85	
LSD (0.05)									
Species X timing				2.92	2.55	2.48	2.02	2.21	1.27
Species X timing X row cover				4.13	3.60	3.51	2.86	3.13	NS
Species X timing X row cover X scarification				1.49	3.85	4.19	NS	2.81	NS
Species X timing X row cover X scarif. X seed treatment				4.71	7.98	5.41	NS	2.38	NS