

NATIVE PERENNIAL FORB TOLERANCE TO RATES AND MIXTURES OF POSTEMERGENCE HERBICIDES

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Introduction

Native forb seed is needed to restore rangelands of the Intermountain West. Commercial seed production is necessary to provide the quantity of seed needed for restoration efforts. A major limitation to economically viable commercial production of native forb seed is weed competition. Weeds are adapted to growing in disturbed soil, and native forbs are not competitive with these weeds. There is a considerable body of knowledge about the relative efficacy of different herbicides to control target weeds, but few trials have tested the tolerance of native forbs to commercial herbicides. The results reported here deal with postemergence herbicide rates and mixtures.

This work seeks to discover product rates and mixtures that could eventually be registered for use for native forb seed production. The information in this report is for the purpose of informing cooperators and colleagues in other agencies, universities, and industry of the research results. Reference to products and companies in this publication is for the specific information only and does not endorse or recommend that product or company to the exclusion of others that may be suitable. Nor should any information and interpretation thereof be considered as a recommendation for the application of any of these herbicides. **Pesticide labels should always be consulted before any pesticide use. Considerable efforts may be required to register these herbicides for use for native forb seed production.**

Materials and Methods

In the fall of 2006 *Eriogonum umbellatum*, *Penstemon acuminatus*, *P. deustus*, and *P. speciosus* were each planted in areas 10 ft wide and 220 ft long (Table 1). The seeds were planted in 4 rows 30 inches apart. The field previously had been disked, ground hogged, and marked in rows 30 inches apart. Planting depths were similar to those used in the irrigation trial (Shock et al. 2007) and appropriate to each species. Prior to planting, one drip tape was inserted 12 inches deep equidistant between pairs of rows to be planted. The drip tape was supplied with irrigation water using filtration and other common drip-irrigation practices (Shock 2006). Drip irrigations were applied every 2

weeks starting on April 10 and ending on May 29 (total of 4 irrigations). Each irrigation applied 1 inch of water.

On March 12, 2008, 13 herbicide treatments (Table 2) were applied to plots 4 rows wide and 5 ft long. The treatments consisted of different rates and combinations of the soil-active herbicides Prowl® and Outlook®. The treatments were arranged within each species in randomized complete block designs with four replicates. Treatments were applied at 30 psi, 2.63 mph, in 20 gal/acre using 8002 nozzles with 6 nozzles spaced 20 inches apart.

Seed of each species was harvested at maturity. Seed was harvested from the middle two rows in each plot of *Eriogonum umbellatum*, *Penstemon acuminatus*, and *P. speciosus*. Plant populations of *P. deustus* prior to herbicide applications were not adequate for data on seed yield to be meaningful. For *P. deustus*, only observations on herbicide damage were made.

General Considerations

The focus of the evaluations was forb tolerance to the herbicides, not weed control. Therefore, weeds were removed as needed.

The effects of herbicides for each species on plant stand and injury were evaluated independently from the effects on other species. Treatment differences were compared using ANOVA and protected least significant differences at the 95 percent confidence LSD (0.05) using NCSS Number Cruncher software (NCSS, Kaysville, UT).

Table 1. Forb species planted at the Malheur Experiment Station, Oregon State University, Ontario, OR and their origins.

Species	Common name	Origin	Year
<i>Eriogonum umbellatum</i>	Sulfur-flower buckwheat	Shoofly Road, Owyhee Co., ID	2004
<i>Penstemon acuminatus</i>	Sharpleaf or sand-dune penstemon	Bliss Dam, Elmore Co., ID	2004
<i>Penstemon deustus</i>	Scabland or hot-rock penstemon	Blacks Cr. Rd., Elmore Co., ID	2003
<i>Penstemon speciosus</i>	Royal or sagebrush penstemon	Leslie Gulch, Malheur Co., OR	2003

Results and Discussion

All observations made on the herbicides tested are strictly preliminary observations. Herbicides that damaged forbs as reported here might be helpful if used at a lower rate or in a different environment. The herbicides were relatively safe for the forbs in these trials but they might be harmful if used at higher rates or in a different environment. Nothing in this report should be construed as a recommendation.

Symptoms of herbicide injury were not observed in any of the plants in 2008. Foliar injury would not be expected since all herbicides tested (except Select[®]) were soil active and were applied early. There were no significant differences in seed yield between the herbicide treatments and the untreated check for *Eriogonum umbellatum*, *Penstemon acuminatus*, and *P. speciosus* (Table 2).

Summary

All four species tested were tolerant to Prowl and Outlook applied as postemergence treatments at the rate, timing, and soils used in these trials. Prowl and Outlook are broad-spectrum, soil-active herbicides that will prevent weed emergence during the season. Select is a foliar-contact, grass herbicide. The use of these three herbicides may provide the basis for an effective weed control program for seed production of these five species. Further tests are warranted to describe the range of safety for these herbicides and whether or not they have any undesirable interactions.

Table 2. Yield of three forbs in response to postemergence herbicides applied on March 12, 2008, Malheur Experiment Station, Oregon State University, Ontario, OR. All herbicides except Select are soil active.

Treatment	Rate (lbs ai/acre)	<i>Penstemon speciosus</i>	<i>Penstemon acuminatus</i>	<i>Eriogonum umbellatum</i>
		----- lb/acre -----		
Weed free, untreated control		820.9	557.9	276.5
Select 2.0 EC ^a	0.094	876.7	491.0	149.1
Prowl	0.95	644.2	403.7	387.2
Prowl	1.19	1,242.0	506.1	533.1
Prowl	1.43	941.0	573.0	250.6
Outlook	0.84	992.5	463.1	319.8
Outlook	0.98	860.4	348.1	143.5
Prowl + Outlook	0.95 + 0.66	653.7	472.3	300.9
Prowl + Outlook	0.95 + 0.84	965.4	483.6	440.0
Prowl + Outlook	0.95 + 0.98	827.3	466.4	330.9
Prowl + Outlook	1.19 + 0.66	917.0	627.8	244.0
Prowl + Outlook	1.19 + 0.84	835.0	434.4	336.7
Prowl + Outlook	1.19 + 0.98	707.4	460.0	285.6
LSD (0.05)		NS	NS	NS

^aapplied with Herbimax adjuvant at 1 percent v/v.

References

Shock, C.C. 2006. Drip irrigation: an introduction. Sustainable Agriculture Techniques, Oregon State University Extension Service. EM8782-E, revised October 2006.

Shock, C.C., E.B.G. Feibert, L.D. Saunders, N. Shaw, and A. DeBolt. 2007. Seed production of native forbs shows little response to irrigation in a wet year. Oregon State University Agricultural Experiment Station Special Report 1075:21-32.