Stratification Requirements for Sulphurflower and Whorled Buckwheat

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Introduction

Sulphurflower buckwheat (*Eriogonum umbellatum*) and whorled buckwheat (*E. heracleoides*) are low stature perennial forbs native to the Rocky Mountains and Intermountain West. The two species are similar, but whorled buckwheat typically has a ring, or whorl, of leaves mid-way up the otherwise leafless stem. Whorled buckwheat flowers are generally cream-white in color while sulphurflower flowers are a bright yellow. Both species grow in mountain foothill to mountain plant communities including sagebrush, mountain shrub, pygmy conifer, and alpine plant communities on rocky/gravelly soil. Sulphurflower typically occupies sites higher in elevation than whorled buckwheat, ranging from 4,500 to over 12,000 feet. Whorled buckwheat ranges from about 3,500 to 10,000 feet. However their ranges overlap significantly and plants can often be found in close proximity to one another.

Buckwheat species show a high potential for use in revegetation and restoration efforts in the western states. Currently there is a high demand for native forb releases for use by Bureau of Land Management, Forest Service, Fish and Wildlife Service and other federal, state and local government agencies, as well as private landowners. Buckwheat has also been identified as important to the life cycle of sage grouse (*Centrocercus urophasianus*). The flowers of the buckwheat plants attract insects during the spring which are the primary food source for sage grouse chicks. At this time there are only two commercial releases of wild buckwheat, 'Sierra' (*E. umbellatum*) from the Sierra Nevada Mountains of California, and 'Umatilla' (*E. niveum*) from northeastern Oregon. For these reasons, the Aberdeen, ID Plant Materials Center (PMC) is beginning an initial evaluation of Intermountain West buckwheat collections for the development of a selected class release that will be well adapted to the Intermountain West.

Little is known about the propagation and management of native buckwheat species. The PMC successfully propagated sulphurflower buckwheat originating from northern California for small scale seed production in the mid 1990's without any seed treatment. Other studies have shown that buckwheat seeds require a period of cold and moist stratification to induce germination (Meyer and Paulsen, 2000). These studies indicate that populations from higher elevations with longer periods of cold and snow have longer pre-stratification requirements than those from lower, warmer sites. According to Dave Dyer, manager of the NRCS Plant Materials Center in Lockeford, California Seed from 'Sierra' sulphurflower buckwheat begins losing viability after one to three years (2006). More needs to be understood about propagating and seed storage of buckwheat species before commercial plant material production will be feasible.

Materials and Methods

Four accessions of buckwheat were evaluated for germination following one of three stratification treatments, 0, 30, or 60 days cold/moist stratification. CNM 514 is a collection of sulphurflower buckwheat from the Craters of the Moon National Monument in eastern Idaho; ERHE is a collection of whorled buckwheat from the same source. ERUM11 is a sulphurflower buckwheat collection made by Nancy Shaw, USDA-FS, at Slater Creek, ID. The commercial

release, ‘Sierra’ sulphurflower buckwheat was included as a standard for comparison (table 1). All seed was collected in 2005 with the exception of ‘Sierra’ which was produced commercially in 2003.

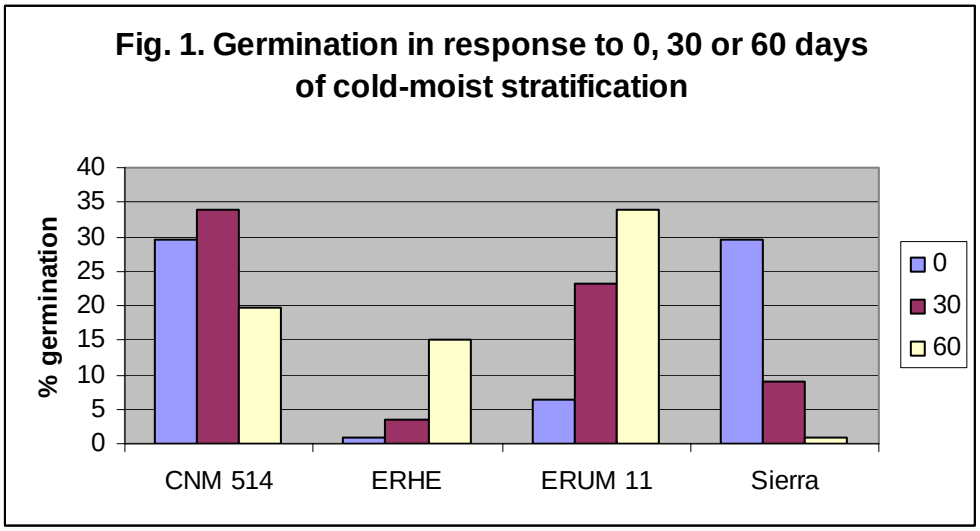
Table 1. Accession and origin

Accession	Species	Location	Approximate Elevation (ft)
CNM 514	*E. umbellatum*	Craters of the Moon NM, ID	5,500
ERHE	*E. heracleoides*	Craters of the Moon NM, ID	5,500
ERUM11	*E. umbellatum*	Slater Creek, ID	unknown
Sierra	*E. umbellatum* ssp. *polyanthum*	South Lake Tahoe, CA	6,500

Seed to be tested was placed in cloth sacks and stapled shut. The sacks were then put in 8 oz plastic ointment jars and situated so the cloth sack was surrounded on all sides by sand mixed with soil moisture at field capacity. Jars were sealed and put in a refrigerator kept at a constant 35º F. After treatment, the seeds were planted in 10 in³ conetainers in the PMC greenhouse. The experimental design contained four replications of seven conetainers; each conetainer was planted with four seeds giving a total of 28 seeds per replication. The cones were evaluated for emergence six weeks after planting. Percent germination was determined as the total number of germinants per replication divided by 28 * 100. Data were analyzed with Statistix 8 analytical software using an Analysis of Variance to determine significance, followed by a Tukey’s test to separate means.

Results

Our results showed trends in response to treatment within populations, but these trends did not hold for all accessions of the species. Two of the four accessions tested (ERHE and ERUM11) showed a definite trend of greater germination resulting from longer durations of stratification (figure 1). However, stratification treatments on CNM 514 did not differ from each other and showed a possible negative affect from the 60 day treatment. Sierra showed a distinct negative trend with the best germination coming from the non-treated seed and significantly poorer germination accompanying longer pre-treatments.



Discussion

These results suggest that there may be great variation between species and even populations of buckwheat with regard to stratification requirements. Some populations seem to have no pre-stratification requirement while others respond favorably to a 60 day or longer stratification. However, age of seed was not considered in this experiment and may prove to be a factor in germination. Some species show higher dormancy levels in fresh seed versus older seed. If this is the case for *Eriogonum* species, it would explain why Sierra, collected in 2003, showed decreasing levels of germination with longer periods of stratification. For greenhouse propagated materials, it may be necessary to test individual accessions to determine the best propagation protocol. However, for seed production and range planting, especially of seed collected from Intermountain West populations, the best practice appears to be dormant seeding in late fall to naturally stratify the seed.

References

Dyer, David. 2006. Personal communication.

Meyer and Paulsen. 2000. Chilling requirements for seed germination of 10 Utah species of perennial wild buckwheat. Native Plants Journal 1(1): 18-24.