7-31-1987

Planting depth of 'Hobble Creek' mountain big sagebrush seed

Tracy L. C. Jacobson  
USDA Forest Service, Intermountain Research Station, Shrub Sciences Laboratory, Provo, Utah

Bruce L. Welch  
USDA Forest Service, Intermountain Research Station, Shrub Sciences Laboratory, Provo, Utah

Follow this and additional works at: https://scholarsarchive.byu.edu/gbn

Recommended Citation
Available at: https://scholarsarchive.byu.edu/gbn/vol47/iss3/13

This Article is brought to you for free and open access by the Western North American Naturalist Publications at BYU ScholarsArchive. It has been accepted for inclusion in Great Basin Naturalist by an authorized editor of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.
PLANTING DEPTH OF 'HOBBLE CREEK' MOUNTAIN BIG SAGEBRUSH SEED

Tracy L. C. Jacobson and Bruce L. Welch

ABSTRACT.—We conducted a greenhouse study in which 'Hobble Creek' mountain big sagebrush (Artemisia tridentata ssp. vaseyana) seeds were planted at various depths in soil to determine the optimal planting depth. Results showed that the optimal planting depth is 5 mm or less.

Big sagebrush (Artemisia tridentata) is an important winter forage for wintering mule deer (Odocoileus hemionus hemionus) in the Rocky Mountains. In some areas big sagebrush is the single most important mule deer winter forage (Smith 1950, Leach 1956, Kufeld et al. 1973). This is due to big sagebrush abundance, availability, and superior winter nutrient content (Welch 1983). Recent reports have shown significant variation among subspecies and accessions within subspecies for production, preference, and winter nutrient content (Scholl et al. 1977, McArthur et al. 1979, Sheehy and Winward 1981, Welch and Pederson 1981, Welch et al. 1986, Personius et al. 1987, Wambolt et al. 1987). Of the accessions tested, an accession of subspecies vaseyana called 'Hobble Creek' was found to be the most preferred accession by wintering mule deer and among the most preferred accessions by wintering domestic sheep (Ovis aries) (Welch et al. 1986). A. Perry Plummer discovered it in 1968 at the mouth of Hobble Creek drainage just east of Springville, Utah. 'Hobble Creek' is a low-elevation mountain big sagebrush whose forage value exceeds most winter forages for crude protein, phosphorus, carotene, and digestibility (Welch et al. 1986) and does not contain substances that lower grass cell wall digestion in ruminant animals (Hobbs et al. 1986). 'Hobble Creek' is needed to increase the nutrient content of winter diets of mule deer and domestic sheep.

'Hobble Creek' can be established by direct seeding, by transplanting bareroot or containerized stock, and by a technique called "mother plant" (Welch et al. 1986). Direct seeding is the most practical method for establishing this superior accession of big sagebrush. Factors that affect germination and establishment include light, temperature, available moisture, seed quality, seedbed preparation, seeding mixture, competition reduction, planting time, and planting depth (Goodwin 1956, Payne 1957, Weldon et al. 1959, Deitschman 1974, McDonough and Harness 1974, Harvey 1981). The last factor, planting depth, is the subject of this study. This study was designed to determine the optimal planting depth for seeding emergence and the effects of stratification on emergence.

MATERIALS AND METHODS

The planting depths evaluated in this study were surface, 2 mm, 5 mm, 10 mm, and 15 mm. The depths were compared by planting unstratified seeds and stratified seeds. Petri dishes were also sown with seeds to check seed viability.

Seeds were collected in November from a breeder plot in Hobble Creek Canyon east of Springville, Utah. Entire inflorescences were clipped, bagged, and air dried at room temperature for two weeks. Large stems were separated from the seed and chaff by hand stripping. After stripping, the seed and chaff were passed through a series of screens that removed the fine stems and larger particles of chaff. The seed was cleaned to 70% purity with an air flow seed cleaner. At the time of use, a dissecting scope and tweezers were used to remove abnormal seeds and remaining chaff. The unstratified seeds were sealed

1USDA Forest Service, Intermountain Research Station. Shrub Sciences Laboratory, 735 North 500 East, Provo, Utah 84601.
in glass vials and stored at room temperature. The seeds to be stratified were treated with a fungicide (1 gram fungicide to 1 liter distilled water), sown in 9-cm sterile petri dishes containing distilled water-saturated no. 4 Whatman filter pads, and then placed in a cooled room (2 C) for 10 days (Deitschman 1974).

The experimental design consisted of 12 treatments (stratified + unstratified and control + 5 planting depths) with 5 replications. Sixty containers were randomly arranged on a greenhouse bench. Ten of the 60 containers were sterile 9-cm petri dishes (controls), and 50 were 6-inch-deep by 2-inch-square pots. The petri dishes contained two layers of no. 4 Whatman filter papers. The square pots contained a sterile sandy loam that had been watered and compacted to the desired depth before the seeds were sown. Soil was placed over the seeds in such a manner to maintain the desired depth and to eliminate compaction. Fifteen ‘Hobble Creek’ big sagebrush seeds were sown in each container. Each of the six treatments was run on stratified and unstratified seeds (control, petri dishes, surface, 2 mm, 5 mm, 10 mm, and 15 mm).

Seedlings were grown for five weeks. Day length was extended to 12 hours with the use of fluorescent lighting. Temperature was maintained between 15 and 10 C both day and night. Pots were checked daily for germinated seeds, and twice a day pots were watered with distilled water, using a squeeze bottle to avoid disturbing the soil surface. Germination or emergence was classified as complete with the appearance of green-colored cotyledons. T-tests were used to detect significant differences between stratified and unstratified seed for the various planting depths. Analysis of variance was used to determine significant differences among the planting depths (Ryan et al. 1976).

RESULTS AND DISCUSSION

Results of this study are given in Tables 1 and 2. Stratification treatment stimulated significantly (5% level) the rate and number of seeds emerged (Table 1). Stratified seeds started emerging three days after planting, while unstratified seeds did not emerge until seven days after planting. Stratified seeds had a significantly higher number of seeds emerging for surface, 2-mm, and 5-mm depth than unstratified seed. Stratification had no significant effect on the number of seed emerging for control (petri dishes) and at the 15-mm depth. Unstratified seed had significantly more seeds emerge at the 10-mm depth than stratified seed. This last observation could be an artifact of the experiment. Because big sagebrush seeds are released in the late fall or early winter period, these seeds lay on or near the soil surface. During this period and into the spring, the seeds are usually in a moist-cold environment. We believe that the stratified seeds of this study are behaving more like those in nature than the unstratified seeds.

Because of the significant effects of stratification, the data collected from stratified and unstratified seeds were not pooled for the analysis of variance. Analysis of variance did detect significant difference for numbers of seeds emerging at the various depths (Table 2). Controls (petri dishes), both stratified and unstratified, produced significantly (P < .05) more seedlings than all five depths. Surface, 2-mm, and 5-mm depths of both stratified and unstratified seeds produced significantly more seedlings than 10-mm or 15-mm depths.

The probable higher temperatures and relative humidity in the petri dishes may be the reasons that more seedlings were produced in the dishes, compared with the number produced on the surface. We therefore conclude that ‘Hobble Creek’ mountain big sagebrush

---

Table 1. Comparisons between stratified and unstratified seeds of 'Hobble Creek' mountain big sagebrush (Artemisia tridentata ssp. vaseyana) planted at various depths. Comparisons were made with unpaired t-test. Data are expressed as numbers of seeds germinating out of a possible 75 seeds.

<table>
<thead>
<tr>
<th>Seed treatment</th>
<th>Depth</th>
<th>Stratified</th>
<th>Unstratified</th>
<th>T-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petri dishes (control)</td>
<td>63</td>
<td>69</td>
<td>1.897</td>
<td></td>
</tr>
<tr>
<td>Surface</td>
<td>48</td>
<td>35</td>
<td>2.982*</td>
<td></td>
</tr>
<tr>
<td>2 mm</td>
<td>49</td>
<td>27</td>
<td>2.678*</td>
<td></td>
</tr>
<tr>
<td>5 mm</td>
<td>45</td>
<td>33</td>
<td>3.539*</td>
<td></td>
</tr>
<tr>
<td>10 mm</td>
<td>0</td>
<td>9</td>
<td>3.087*</td>
<td></td>
</tr>
<tr>
<td>15 mm</td>
<td>0</td>
<td>2</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

*Significantly different at t = 0.05. df = 2.015.
### Table 2. Optimal planting depth of 'Hobble Creek' mountain big sagebrush (Artemisia tridentata ssp. vaseyana) stratified and unstratified seeds. Data are expressed as a mean and standard deviation per depth for five pots containing 15 seeds per pot.

<table>
<thead>
<tr>
<th>Petri dishes (control)</th>
<th>Stratified Seeds germinated</th>
<th>Unstratified Seeds germinated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>9.6 ± 1.50</td>
<td>7.0 ± 0.80</td>
</tr>
<tr>
<td>2 mm</td>
<td>9.8 ± 0.81</td>
<td>5.4 ± 3.01</td>
</tr>
<tr>
<td>5 mm</td>
<td>9.0 ± 0.89</td>
<td>6.6 ± 1.10</td>
</tr>
<tr>
<td>10 mm</td>
<td>0.0 ± 0.00</td>
<td>1.8 ± 1.17</td>
</tr>
<tr>
<td>15 mm</td>
<td>0.0 ± 0.00</td>
<td>0.4 ± 0.50</td>
</tr>
</tbody>
</table>

1 Means sharing the same superscript within a seed treatment are not significantly different at the 5% level.

should not be planted any deeper than 5 mm and that surface sowing onto disturbed soil is a practical seeding procedure for establishment of this accession (Kelsey 1986, Young and Evans 1986).

### Literature Cited


