TECHNICAL NOTES

PLANTING DEPTH AND SEED SIZE INFLUENCE EMERGENCE OF BEARLESS WHEATGRASS SEEDLINGS

WILLIS G. VOGL
Range Conservationist, U. S. Department of Agriculture, Forest Service, Central States Forest Experiment Station, Columbia, Missouri.

Planting depth is known to influence emergence of many grasses used in range seeding. Recent work has shown that seed size may also influence emergence (Kittock and Patterson, 1962; Rogler, 1954). Influence of both planting depth and seed size was evaluated in a greenhouse study of beardless wheatgrass (Agropyron inerme [Scribn. and Smith] Rydb.). This is a species commonly used for range seeding in the Pacific Northwest and northern Intermountain Regions.

Seed was planted in January 1958 at three different depths and included straight-run seed and two sizes. Planting depths in a sandy-loam potting soil high in organic material were \( \frac{1}{2} \), 1, and 1\( \frac{1}{2} \) inches. Seed was small (6-8 mm. long), large (10-12 mm. long), and straight run (as it came from the bag, 6-12 mm. long). Germinative capacity of straight-run seed was the same as that of either size class, 76 ± five percent.

During the three weeks following planting, emerged seedlings were counted periodically. Planting depth influenced both the rate of emergence and the total amount of emergence. At the end of one week, more than 30 percent of the seeds planted \( \frac{1}{2} \) inch deep had emerged, whereas none planted 1\( \frac{1}{2} \) inches deep had emerged (Figure 1). At the end of three weeks when the final count was made, nearly 70 percent of the seed planted \( \frac{1}{2} \) inch deep had emerged as seedlings. This was more than twice as many seedlings as had emerged from seed planted 1\( \frac{1}{2} \) inches deep. The number of seedlings emerging from seed planted one inch deep was intermediate (Table 1).

At each depth, nearly as many seedlings emerged from large seed as from straight-run seed. But significantly fewer seedlings emerged from small seed (Table 1). Similarity in emergence from large and straight-run seed is probably due to the large percent of the seeds in the straight-run samples that are medium to large in size (over eight mm. long). Thus, the influence of small seed in a straight-run sample is minor and would not justify separation.

This trial indicates that there would be no advantage in sepa-

---

**Table 1. Beardless wheatgrass seedling emergence at 21 days**

<table>
<thead>
<tr>
<th>Planting depth</th>
<th>Large</th>
<th>Small</th>
<th>Straight-run</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{1}{2} ) inch</td>
<td>78</td>
<td>54</td>
<td>74</td>
<td>69</td>
</tr>
<tr>
<td>1 inch</td>
<td>56</td>
<td>40</td>
<td>60</td>
<td>52</td>
</tr>
<tr>
<td>1( \frac{1}{2} ) inch</td>
<td>40</td>
<td>20</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>Average</td>
<td>58</td>
<td>38</td>
<td>36</td>
<td>57</td>
</tr>
</tbody>
</table>

---

**Figure 1. Influence of planting depth on emergence of beardless wheatgrass (straight-run and two different sizes of seed averaged).**
rating beardless wheatgrass seed by size. But planting depth definitely influences emergence of any size of seed.

LITERATURE CITED


AN INEXPENSIVE DRYING OVEN FOR RANGE FORAGE SAMPLES

DON J. NEFF
Research Biologist, Arizona Game and Fish Department, Prescott, Arizona.

Range and game managers and researchers located at small outlying stations may periodically be required to collect and process samples of forage—a job which is greatly facilitated by the use of a drying oven. Such a situation at Prescott led to the development of an inexpensive but dependable homemade drying oven.

In 1958 the writer embarked upon a long-term proper-use experiment involving the clipping of a large number of chaparral shrubs (Arizona Federal Aid Project W-78-R:WP5,J4). The clipping was carried out in October each year and involved the processing of over two hundred samples. Neither storage space for air-drying nor a regular laboratory drying oven was available. After some investigation and experimenting an oven was built (Figure 1).

The case for the oven was a 7.5 cubic-foot refrigerator box bought at a junkyard with motor, condenser, and coils removed. The heat source was a 1000-watt ten-amp. coil of the type designed for house-trailer hot-water heaters. Heat regulation was provided by a Fenwal differential expansion thermoswitch. The coil was placed on the floor of the box and wired in series to the thermoswitch, which was inserted through the wall of the box about half-way up one side. A %-inch steel plate was fitted into the bottom of the box about four inches above the coil to promote even heat distribution. The only ventilation was provided by the cracks around

Table 1. Drying oven efficiency test of 72 hours duration on current annual growth twigs of shrubs.

<table>
<thead>
<tr>
<th></th>
<th>Total Green Weight (Grams)</th>
<th>First 24 Hours</th>
<th>Second 24 Hours</th>
<th>Third 24 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weight Lost (Grams)</td>
<td>Weight Percent Lost of Total</td>
<td>Weight Lost (Grams)</td>
<td>Weight Percent Lost of Total</td>
</tr>
<tr>
<td>Desert Ceanothus (Ceanothus greggii)</td>
<td>335.8</td>
<td>147.6</td>
<td>145.3</td>
<td>98.44</td>
</tr>
<tr>
<td>Cliff-rose (Cowania stansburiana)</td>
<td>170.0</td>
<td>89.4</td>
<td>88.0</td>
<td>98.43</td>
</tr>
<tr>
<td></td>
<td>82.4</td>
<td>45.7</td>
<td>45.1</td>
<td>90.69</td>
</tr>
<tr>
<td></td>
<td>107.5</td>
<td>57.5</td>
<td>56.9</td>
<td>98.96</td>
</tr>
<tr>
<td></td>
<td>127.8</td>
<td>70.3</td>
<td>69.5</td>
<td>98.86</td>
</tr>
</tbody>
</table>
the door and a small hole at the top rear where the coolant tubes entered the box. Entire cost of the completed oven was about $40.

The oven has been in operation for about five weeks each year for the past five years without serious maintenance problems. Placed outside in a carport in October with daily minimum temperatures as low as 26°F, the oven required about six kilowatts of electricity per day.

Results of the first small-scale efficiency test were so complete-ly satisfactory that no further tests were conducted. As shown in Table 1, a 24-hour period of drying at 105°F was sufficient to extract over 98 percent of the moisture content of the twigs. As a result of this test, plans to provide forced-draft ventilation were dropped and the oven was left in its simplest form. Throughout the browse clipping experiments a 48-hour drying period has been employed, insuring removal of over 99 percent of the moisture content of the twig samples.

Many old refrigerator boxes, including the one shown here, are insulated with corrugated cardboard. The normal operating temperature of the oven is well below the charring temperature of cardboard, but a thermoswitch malfunction or wiring short possibly could cause a fire. A box with fiberglass insulation would be safer, but cardboard is acceptable if suitable precautions are taken against fire.

CURRENT LITERATURE
Edited by D. F. Hervey, Meredith Morris and Graduate Student-Faculty Seminar members, Range Management Department, Colorado State University.

PLANT PHYSIOLOGY AND GENETICS


CHEMICAL COMPOSITION OF PLANTS AND ANIMAL NUTRITION


