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RESEARCH NOTES

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RESULTS OF PRELIMINARY TESTS OF PELLETIZED CRESTED WHEATGRASS SEED

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Pelletized seed for use in range reseeding has been given wide publicity and its merits have received much acclaim. During the past three years it has been used on several thousand acres of range land. Reports of results have been conflicting, with some claims of striking success and others of complete failure. Tisdale (1) has found poor germination results with pelletized seed similar to that used in this study. It is not known whether, under a given set of conditions, pelletized seed will produce a grass stand sufficiently superior to other methods to justify the added expense.

To get more definite information, the Pacific Northwest Forest and Range Experiment Station started field plantings and laboratory examinations in the fall of 1947 to investigate some phases of the effect of pelletizing on seed germination and seedling establishment. The crested wheatgrass (*Agropyron cristatum* L.) seed, and pellets (fig. 1) used in this study were obtained from the Bureau of Land Management^{1/} reseeding project conducted north of Gooding, Idaho, in the late fall of 1947. The process used in making the pellets was that developed by Dr. Lytle S. Adams.

^{1/} The author wishes to express his appreciation to the Bureau of Land Management, U. S. Department of Interior, for its cooperation in this study.

Laboratory Tests

To study the effect of pelletizing on seed viability, laboratory examinations and germination tests were made on pelletized and untreated seed. The untreated seed was not screened and contained a large proportion of sterile florets. The purity was found to be 75.3 percent and the viability 73 percent. There were 386 seeds per gram of the untreated seed material as received from the Gooding project.

Germination tests were run on whole pellets kept moist in covered Petri dishes in the germinator. The number of seeds which germinated per pellet was 5.0 ± 1.6 . To determine the number of seeds per pellet, three samples of 100 pellets were placed in gauze bags and carefully washed free of clay. The seed material recovered, including chaff and broken seed, was separated from foreign matter and weighed. An average of 5.17 grams of seed material was recovered per 100 pellets. On the basis of 386 seeds per gram, this would be equivalent to 20 seeds per pellet. Having determined that there were 5 seedlings per pellet and 20 seeds per pellet, the viability of pelletized seed was calculated to be 25 percent as compared to 73 percent in the untreated seed. This means that 66 percent of the viable seed used in compounding the pellets failed to germinate.

The material which remained after washing the pellets included considerably more chaff and broken seed than was present in the original seed (figs. 2, 3) apparently because of breakage by mechanical action in the pelletizing process. Part of the reduction of viability, therefore, may be a result of mechanical injury. Also, some reduction may have been caused by physiological factors such as deterioration in storage, induced secondary dormancy, and harmful effects of the pressure used in forming the pellets. Silen (2) found the effects of pressure in reducing germination and the phenomenon of secondary dormancy to be of primary importance in the germination of pelletized seed.

Field Tests

Field plantings were made to compare the establishment of crested wheatgrass seedlings by broadcasting pelletized seed, broadcasting unpelletized seed, and drilling seed. All seed used in these field trials was of the same lot used in compounding the pellets. Three treatments were employed on both cultivated and uncultivated seedbeds:

- Treatment 1 - Pellets broadcast by hand at 43 pounds per acre, an equivalent of 2 pounds of seed per acre. This corresponds to the rate of application used at Gooding, Idaho.
- Treatment 2 - Crested wheatgrass seed broadcast by hand seeder at 2 pounds per acre.
- Treatment 3 - Crested wheatgrass seed drilled at 2 pounds per acre.

Plantings were made in November 1947 near Baker, Oregon, in a small valley bottom which had been used for farming about 20 years ago. Since that time the area had reverted to big sagebrush (Artemisia tridentata) and cheatgrass brome (Bromus tectorum). In the fall of 1947 the area was burned over to eradicate the sagebrush. The site is favorable to the growth of crested wheatgrass; annual rainfall is about 10 inches and the soil is a deep friable sandy clay loam.

Besides these three treatments a seeding was made using commercial seed drilled at a rate of 7 pounds per acre on both cultivated and uncultivated seedbed. The purpose of this seeding was to serve as a check on weather and soil conditions affecting germination and establishment. A highly satisfactory stand resulted with an average of 4.6 seedlings per square foot.

Behavior of the pellets was observed from time to time in the field. The pellets readily disintegrated under the effects of weather until no trace of the clay remained. On the uncultivated seedbed, the disintegration frequently left the seed lying free and uncovered on the surface of the ground over an area of from one to three inches in diameter. Seed covering was better on the cultivated seedbed since the pellets became partially embedded in the loose surface soil before they were disintegrated.

Seedlings were counted in the summer of 1948 to compare the effectiveness of the three seeding treatments. The average number of seedlings per square foot² for each treatment was:

<u>Treatment</u>	<u>Cultivated</u>	<u>Not Cultivated</u>
Broadcast at 2 lbs. per acre	0.325	0.075
Pellets broadcast	0.100	0.050
Drilled at 2 lbs. per acre	1.025	0.850

No significant difference was found in seedling numbers between cultivated and uncultivated seedbeds for any method of seeding. However, an advantage of the cultivated seedbed became evident as the summer advanced. Competition from cheatgrass brome and mustard on the uncultivated plots took a heavy toll of the young plants, and by late summer only a few crested wheatgrass plants could be found on the uncultivated plots.

With an equivalent amount of seed, drilling gave much better results than broadcasting. The advantage of drilling over broadcasting free seeds and broadcasting pellets was found to be highly significant.

²/ Numerical average of 20 one-square-foot samples taken in each of the two replicated $\frac{1}{4}$ -acre plots.

The difference between the results from broadcasting free seed and broadcasting pellets was not significant. However, it is of interest that this difference on the cultivated seedbed is of the same proportion found in laboratory tests on viability of treated and untreated seed.

Conclusions

The results of this study at the present time can be stated only in terms of initial stands, but enough is known about reseeding in cheatgrass to say that the success is closely related to the number of seedlings established during the first growing season. The conclusions reached in this study are:

1. Pelletizing resulted in a reduction of 66 percent in the viability of seed used.
2. Drilling of free seed at the same rate was far superior to broadcasting of either pelletized or free seed in producing an initial stand.
3. The establishment of seedlings by use of pelletized seed was not improved over that of broadcast free seed.

LITERATURE CITED

- (1) Tisdale, E. W.
1948. A study of range improvement by reseeding and fertilizing with seed pellets or other non-cultural methods. University of Idaho Bulletin 43(6): 39-42, illus.
- (2) Silen, R. R.
1948. A walking stick planter for pelleted Douglas-fir seed. A thesis. Yale School of Forestry, pp. 44-82.

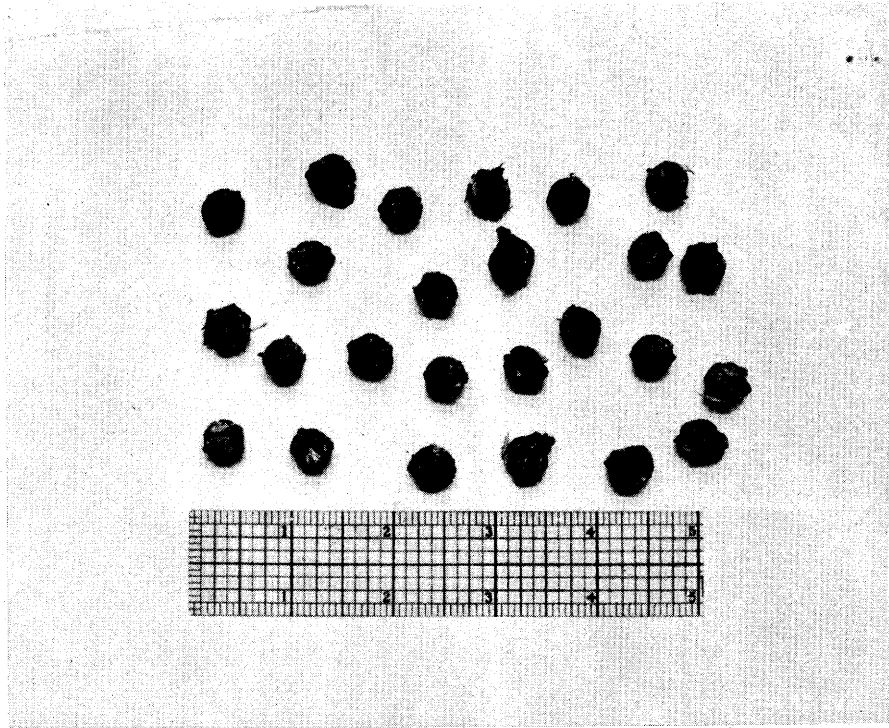


Figure 1. - Twenty-five compressed clay pellets of the type studied showing size and configuration.



Figure 2. - Crested wheatgrass seed of the lot
used in preparing the pellets.

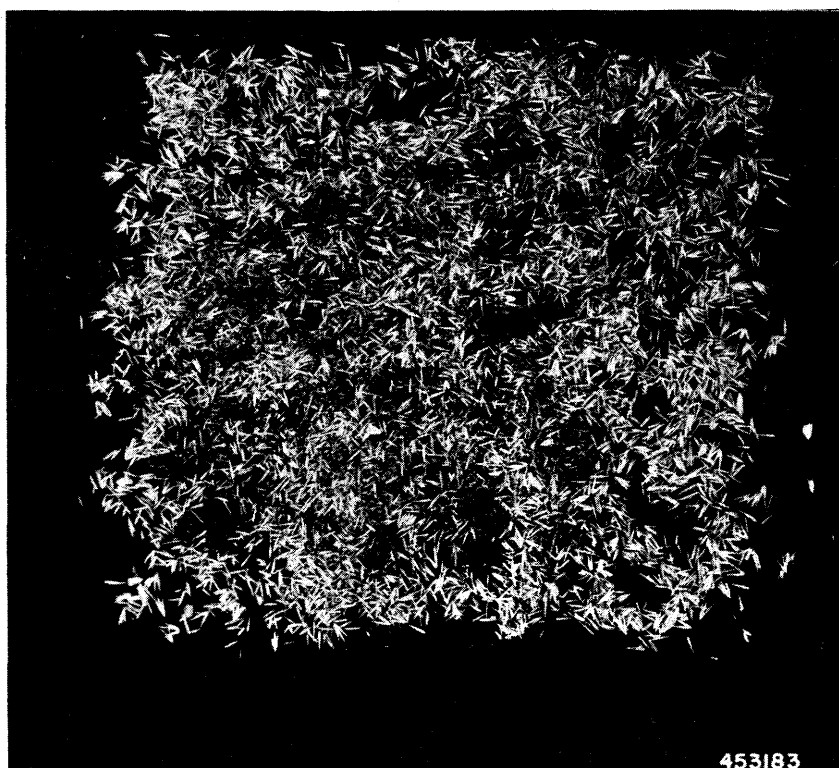


Figure 3. - Crested wheatgrass seed recovered from 150 pellets by washing. Note the large amount of chaff and broken seed as compared with untreated seed.