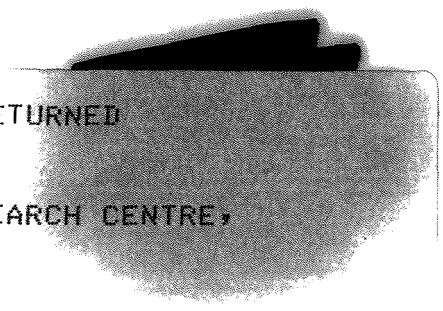
CANADA
Department of Northern Affairs and National Resources
FORESTRY BRANCH

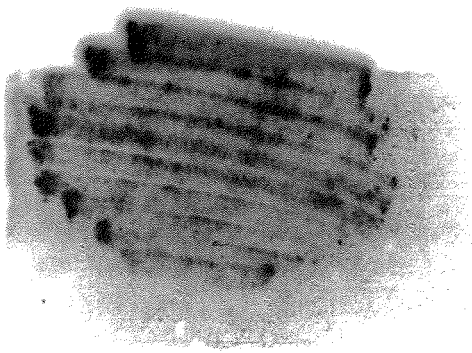
EFFECT OF WATERING, SHADING, SEED-BED MEDIUM, AND DEPTH OF SOWING ON RED PINE GERMINATION

By
J. W. Fraser and J. L. Farrar



Forest Research Division
Technical Note No. 15
1955

Published under the authority of
The Minister of Northern Affairs and National Resources
Ottawa, 1955



EFFECT OF WATERING, SHADING, SEED-BED MEDIUM, AND DEPTH OF SOWING ON RED PINE GERMINATION

Project P-366-1

J. W. Fraser* and J. L. Farrar*

In a recent Leaflet (1) the authors reported on an experiment dealing with the germination of jack pine (*Pinus banksiana* Lamb.) under various conditions of light, moisture, seed-bed medium, and depth of sowing. This Technical Note reports on a parallel experiment with red pine (*Pinus resinosa* Ait.) using the same physical facilities approximately one year later.

As in the first experiment, the object of this was to show how germination of a particular species was affected by manipulating the environment. This was done by arranging for three levels of light intensity, two levels of soil moisture, two seed-bed mediums, and two depths of sowing. A description of these treatments is contained in the Table. It was expected that these changes in environment would affect germination through their action on soil moisture and soil temperature.

The experiment was conducted in 1952 at the Petawawa Forest Experiment Station. As with the jack pine experiment noted above, there were 24 treatment combinations applied to 96 sub-plots. Thirty red pine seeds were sown on each sub-plot; their germination capacity was 85% when tested in moist sand for 18 days.

To lessen the chance of differential germination from possible dormancy, all seeds were cold-soaked in a hydrochloric acid solution with a pH value of 6, at 35°F. to 40°F. for 24 hours immediately prior to seeding.

Seeding was completed on June 4. The first germinates appeared on June 15, and there was no further germination after July 15. During this period one-half the plots received 3·61 inches of precipitation, less that intercepted by their screens (M_1 in Table); the remainder (M_2 in Table) received an additional 4·75 inches of water. Maximum air temperatures 12 inches above the ground varied from 69°F. to 104°F., averaging 87°F. Germination was recorded each morning for a month from June 15. This was necessary because insects often consumed seedlings shortly after they emerged, especially on the unscreened plots. Total germination was used in the analysis.

The data were analysed by the variance method, and the statistical tests of significance showed that the effect of any one factor was influenced by the level of all other factors in the experiment. For this reason it is not valid to discuss the effect of light, for example, without specifying the seed-bed medium, the level of soil moisture, and the depth of sowing. Unfortunately this makes it very difficult to describe the results in simple terms.

*Silviculture and Management Section, Ottawa

The treatment effects are shown in the Table.

TABLE SHOWING MEAN PER CENT GERMINATION BY TREATMENTS

Main Treatment			Sub-Treatment	
Moisture	Seed-bed Medium	Light*	Depth of Seeding	
			Surface	1 cm.
M_1 = natural precipitation	Fine sand	L_1	84	96
		L_2	96	95
		L_3	96	96
	Coarse sand	L_1	0	0
		L_2	27	7
		L_3	52	50
M_2 = natural precipitation + .125″ per day when previous day's rain was less than .25″	Fine sand	L_1	99	99
		L_2	100	96
		L_3	99	98
	Coarse sand	L_1	11	37
		L_2	99	93
		L_3	94	98

*Light treatments, expressed as a percentage of full daylight, were: $L_1 = 100\%$, $L_2 = 33\%$, and $L_3 = 19\%$.

The statistically significant results are mentioned in the following paragraphs.

Germination was excellent on fine sand at all levels of the other main factors; it either equalled or exceeded the tested germinative capacity. On coarse sand it was poor without additional water; with additional water it was still poor in full light, but excellent in partial shade.

Germination on fine sand in full light with only natural precipitation was better from depth-sown seed than from seed sown on the surface; at all other main factor levels it was equally good on fine sand from both depths of sowing. On coarse sand with natural precipitation, germination from surface-sown seed was as good as, or better than, from depth-sown seed; with additional water, germination from depth-sown seed was better than from surface-sown seed, but only in full light.

As was expected, those treatments which favoured a high moisture content in the seed resulted in good germination, as occurred with the jack pine experiment (1). These treatments were: 1) the use of a fine-textured sand, 2) shading, 3) watering, and 4) planting below the surface. No one treatment was sufficient by itself to give maximum germination. The use of fine-textured sand was the most effective treatment; when coarse sand was used, it took the combination of shading, watering, and planting below the surface to give maximum germination. The fact that sowing at 1 cm. resulted in poorer germination than surface sowing on coarse sand with natural precipitation (where it would normally be expected to be most effective) is anomalous and cannot be satisfactorily explained.

A comparison of these results for red pine with those previously reported for jack pine (1) shows that both species reacted similarly to the treatments. However, the advantage of sowing the seed at a depth of 1 centimeter below the surface was not so evident with the experiment on red pine. This difference is probably attributable to the higher precipitation during the red pine experiment rather than to differences between species.

REFERENCE

1. FRASER, J. W., and J. L. FARRAR. 1953. Effect of watering, shading, seed-bed medium, and depth of sowing on jack pine germination. Canada, Dept. Northern Affairs and National Resources. For. Br., Silv. Leaflet No. 90.