

EFFECTIVE STRATIFICATION OF SPRUCE PINE SEED

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Spruce pine (*Pinus glabra* Walt.) seeds are dormant and require stratification for fast, complete germination. For up to 28 days, both total germination and speed of germination increased as the stratification period lengthened; extending the period to 56 days improved speed only.

Interest in this species is increasing among land-owners because of its rapid growth and value for pulpwood or sawtimber. Little has been known about the germination characteristics and stratification needs of the seeds. This article reports effective stratification times.

Procedure

Seeds were collected in southeastern Louisiana bottom lands, where the species occurs extensively. Lots 1-4 (table 1) were collected from single trees in 1964; lots 5-8 were collected from many trees between 1960 and 1964. Seeds were extracted in a kiln heated to approximately 100°F. After empties had been removed by flotation in 95 percent ethyl alcohol, the seeds were dried to less than 10 percent moisture content and stored at -5° C. until the study began in July 1965. As seen in table 1, germination was not impaired by these procedures.

Seeds were stratified at 2°C. for 7, 14, 28, and 56 days in covered germination dishes containing a 1:2 mixture of moist sand and peat moss. Stratification was initiated at different times so that all seeds could be placed in the germination temperature of 22.5°C. on the same day. Photoperiods of 16 hours were used during germination testing.

For each length of stratification, 200 seeds were tested from each lot. Germination counts were made every 2 or 3 days. Both speed and completeness of germination were considered in determining the effects of stratification on dormancy, following a formula (1) which expresses these factors in germination values. Germination value is mean daily germination multiplied by peak value. Peak

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TABLE 1.—Germination of spruce pine seed after stratification for five different periods

| Lot No. | Control | Days of stratification | | | |
|-----------------------|-------------|------------------------|-------------|-------------|-------------|
| | 0 | 7 | 14 | 28 | 56 |
| | <i>Pct.</i> | <i>Pct.</i> | <i>Pct.</i> | <i>Pct.</i> | <i>Pct.</i> |
| 1----- | 18 | 79 | 68 | 88 | 96 |
| 2----- | 74 | 98 | 94 | 99 | 99 |
| 3----- | 14 | 97 | 99 | 99 | 99 |
| 4----- | 18 | 69 | 95 | 98 | 99 |
| 5----- | 42 | 88 | 90 | 92 | 94 |
| 6----- | 44 | 76 | 90 | 90 | 98 |
| 7----- | 53 | 90 | 94 | 91 | 98 |
| 8----- | 30 | 76 | 82 | 90 | 97 |
| Mean ¹ --- | 37 | <u>84</u> | <u>89</u> | <u>93</u> | <u>98</u> |

¹ Means underscored by the same line do not differ significantly at the 0.05 level (2). Arcsin $\sqrt{\text{germination percent}}$ transformations were used in the analysis.

value is the highest number obtained by dividing cumulative germination by days of test.

Results

For most lots, germination increased consistently as stratification lengthened. Unstratified seed averaged 37 percent germinability. Lots stratified for 7 days averaged 84 percent. Extending the stratification to 28 days produced further increases, but after 56 days results were not significantly better than after 28 days.

Germination percentages for unstratified seed were highly variable. For example, germination of seed from two lots of single-tree collections were 74 and 14 percent, indicating great differences of seed dormancy between trees. Stratification for even 7 days, however, caused seeds from both of these lots to germinate almost completely.

The greatest benefit derived from the longer treatments was an increase in speed of germination. The mean germination value for unstratified seed

was 1.81; for 56 days of stratification it was 33.95, significantly higher than for any other period. The difference between 14 and 28 days was not significant, but the differences between them and 7 days were significant.

Peak germination occurred earlier with progressive lengthening of stratification time:

| <i>Days of stratification</i> | <i>Average peak day</i> |
|-------------------------------|-------------------------|
| 0 | 30 |
| 7 | 14 |
| 14 | 12 |
| 28 | 11 |
| 56 | 8 |

The peak for unstratified seed had not been reached when testing ceased at 30 days.

The drop from 14 to 8 days is important: prompt complete germination is often essential in direct seeding operations. Stratification for 14 to 28 days may be adequate when seeds are sown in nurseries, where optimum germinating conditions can be maintained for 30 days or longer.

Literature Cited

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