



MINNESOTA FORESTRY NOTES

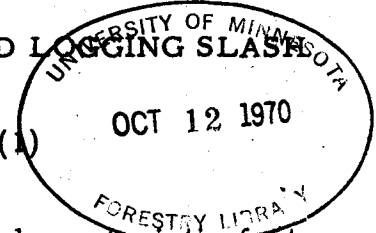
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VIABILITY OF BLACK SPRUCE SEED IN FOUR-YEAR-OLD LOGGING SLASH

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Slow release of seeds from tightly adhering cones is a characteristic feature of black spruce (*Picea mariana*). Previous studies (2) have shown that some seed may remain in cones on standing trees as long as 19 years and that although germination drops off sharply after 5 or 6 years, some seed is still viable after 15 years. After the trees are logged, cones remain attached to the slash for many years. This study (3) had as its objectives to determine: (1) the effects of 4 years of weathering on the viability of seed stored in cones on black spruce slash, and (2) differences in seed viability resulting from such storage at different levels in the slash.

Cones were collected on September 21, 1951, from 4-year-old logging slash in a spruce swamp near International Falls, Minnesota. The 150-year-old stand of black spruce had been logged in the winter of 1946-47. Collections were made at random as follows:

- (1) cones from slash 2 feet or more above ground level
- (2) cones from slash 6 inches to 1 foot above ground level
- (3) cones lying on the ground (moss) surface
- (4) cones buried in the moss.

Weight and Germination Per Cent of Seeds From Black Spruce Cones From Different Levels of Slash.

Seed Lot	Slash level	No. cleaned seeds per pound	Germination per cent*
1	2 ft. + above ground	945,000	3
2	6 in. - 12 in. above ground	987,000	12**
3	On ground surface	1,031,000	8
4	Buried in moss	735,000	1

- * Each per cent is the average from 4 sand flat tests of 400 seeds each except for seed lot 1 which had 200 seeds per sand flat.
- ** This germination is significantly superior at the 1 per cent level when compared with seed lots 1 and 4 and at the 5 per cent level when compared with seed lot 3.

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 (2) Chai, Tsan Sing and Henry L. Hansen. 1952. Characteristics of black spruce seed from cones of different ages. Minnesota Forestry Notes No. 2
 (3) Conducted under the Minnesota and Ontario Paper Company Graduate Research Fellowship in Forestry. Published by the School of Forestry, University of Minnesota, St. Paul 1, Minnesota, cooperating with the Division of Forestry, Minnesota Conservation Department, and Forest Industries of Minnesota

A complete extraction of seed was obtained by drying the cones, shaking them, redrying, shaking a second time, and finally crushing the cones by hand to get out the few remaining seeds. Before sowing, the seeds were cleaned and stratified in wet sand for 2 months at 40°F. Germination tests were made in standard sand flats arranging 4 replications of each of the 4 lots of seed in a Latin square. An additional series of germination tests was made in a Jacobson germinator. Germination percentages obtained in the Jacobson germinators were very similar to those obtained in the sand flat tests. The tests were terminated in 44-50 days -- 3 weeks after the last germination had occurred.

Discussion of results.

(1) Seed weight. Data cited by the U.S. Forest Service (3) indicate that black spruce seed varies from about 300,000 to 500,000 seeds per pound. The seeds in this study were approximately half that heavy and ran almost exactly the same number per pound as reported in the previously cited reference by Chai and Hansen (2). This lighter than average seed is probably a result of: (a) the age of the cones and the likelihood that the larger, heavier seeds drop out first; (b) the extreme care used in the extraction of all seeds from the cones as compared to the partial extraction in commercial processes which leave many small seeds in the cones; and (c) the loss of many small seeds in commercial or large-scale cleaning processes raises the average weight of those remaining.

Seeds from cones stored in the moss were considerably heavier than those collected elsewhere. This could be a result of: (a) failure of the cone scales to separate and release the heavier seeds as they normally do above ground, and (b) a possible difference in the age of these cones as compared to those attached to slash above ground.

(2) Seed germination. Germination of all seeds collected in this study was found to be very poor and to average approximately the same as previously reported (2) using cones of the same range of age from standing trees.

The germination of seed from cones at the 6- to 12-inch level above ground was significantly superior to all others tested.

(3) Practical application. The viability of seed sampled from this 4-year-old slash was too low to advise cone collection from similar or older slash areas for seed purposes.

Data reported by LeBarron (4) indicate that an average crop of new cones contains approximately 180,000 seeds per acre but that less than 2 per cent of the seeds (3600) are present in the cones after the third year. Assuming that cones were retained for about 15 years this would involve a total of 54,000 seeds per acre stored in the 4-year-old slash. Using an average viability of less than 10 per cent as would be indicated by this study, it would mean that not over 5,000 viable seeds were present per acre of slash. This would be a wholly inadequate amount for an exclusive source of seed for natural regeneration on a clear-cut area. However, it might serve to supplement seed obtained from a residual stand or from nearby uncut stands.

(3) U.S. Forest Service. 1948. *Woody plant seed manual*. Misc. Pub. 654. U.S. Govt. Printing Office, Washington, D. C.

(4) LeBarron, R. K. 1948. *Silvicultural management of black spruce in Minnesota*. Circ. 791. U.S.D.A