

A Seedbed Comparison of Two Seed Sources of White Spruce (*Picea glauca* (Moench.) Voss) at the Maine State Forest Nursery

Kathy J. Nitschke

Tree improvement specialist, Maine State Forest Nursery, Passadumkeag

White spruce seedlings (Picea glauca (Moench.) Voss) grown from superior seed, collected in the Ottawa Valley, had significantly greater shoot heights and root lengths than seedlings grown from commercial seed from Michigan. Stem diameters and shoot to root ratios were not significantly different. Tree Planters' Notes 37(2):2728; 1986

White spruce (*Picea glauca*, (Moench.) Voss) at the Maine State Forest Nursery, Greenbush, is grown as 3-0 stock, with 8 inches of shoot height designated as the minimum size for shipping. If an flinch plantable seedling could be produced in 2 years instead of 3, production costs would decrease considerably and fields could be put into a cover crop rotation more easily. This study was conducted to determine if the use of an improved source of seed could reduce production time for white spruce seedlings.

Materials and Methods

Ottawa Valley white spruce seed has been determined through a series of provenance tests in Canada and the United States to be a consistently superior performer under most circumstances. Teich, Morgenstern, and Skeates (5) compared Canadian sources of seed on planting sites in Ontario and found a "consistency in the origin of productive provenances." This area was the Cobourg-Beachburg corri-

dor in the lower Ottawa River valley. In a more widely ranging Canadian study, Teich (4) determined again that the lower Ottawa Valley sources were generally about 20 percent taller than plantation averages. Nienstaedt (2) studied seed sources from a wider range and found that the Ontario sources were among the top ten best sources in each of the 14 outplantings used.

In the spring of 1980, 500 grams of Ottawa Valley white spruce seed (collected in Algonquin Provincial Park) were seeded by hand in a production bed at the Maine State Forest Nursery, Greenbush. The bed was given the same cultural treatments as the regular production beds, which had been mechanically seeded with a commercially collected seedlot from Michigan. Density in the beds was approximately the same, 34 trees per square foot. After three growing seasons, the trees were lifted, and 20 trees from each source were selected randomly and measured for shoot height, root length, and stem caliper at the root

collar. Shoot to root ratios were calculated from these measurements.

Results and Discussion

By use of an unpaired t-test, it was determined that both shoot height and root length were significantly different for the two seed sources, whereas root collar diameter was not (table 1). Due to the non-normality of the distribution of the shoot to root ratio generated here, the Mann-Whitney nonparametric test was used to compare shoot to root ratios for the two sources. This comparison also showed no significant difference. This was not unexpected, as production of a well-balanced seedling should be evident at any stage of development.

Seedlings from the Ottawa Valley source were significantly taller than those from the Michigan source by 20.2 percent (2.16 inches), according to the results obtained from the t-test. They were taller than the flinch minimum height by 60.5 percent (4.84 inches). The smallest individual from the Ottawa Valley

Table 1—Growth characteristics of white spruce seed from two sources (N = 20)

Source	Shoot height (in)	Root length (in)	Root collar diameter (in)
Ottawa Valley	12.84**	14.80*	0.23 NS
Michigan	10.68**	11.30*	0.21 NS

*Significantly different at the 5-percent level (unpaired t-test).

**Significantly different at the 1-percent level (unpaired t-test).

NS = Not significantly different (unpaired t-test).

source was 1.5 inches taller than the minimum, whereas the smallest individual from the Michigan source was 0.25 inches shorter than the minimum.

Mullin and Bowdery (1) suggest that a sturdier, more plantable seedling may be produced by a reduction in seedbed density, perhaps a drastic reduction, to 10 seedlings per square foot. Reese and Sadreika (3) describe acceptable bareroot planting stock of 3=0 white spruce as being between 22 and 28 centimeters (8.7 to 11.0 inches) in height and acceptable 2-0 planting stock as being between 10 and 16 centimeters (3.9 to 6.3 inches) in height.

Results indicate that with a reduction in seedbed density to less

than 20 trees per square foot and the use of superior white spruce seed, such as the Ottawa Valley source, the Maine State Forest Nursery may be able to produce a plantable white spruce seedling in 2 years, meeting and probably exceeding the Ontario standard for 2-0 stock and meeting the present Maine standard for 3-0 stock. A reduction in seedbed density might also reduce the number of cull trees, further decreasing production costs. These possibilities need further investigation.

Literature Cited

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