ADDITION OF ORGANIC MATTER TO A NURSERY SOIL

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Addition of large quantities (800 cubic yards per acre) of local peat to the sandy soil of the Dryden Nursery has resulted in great improvement in the size of the stock under production.

The forest tree nursery at Dryden, Ontario (about 150 miles northwest of Thunder Bay) is located in a dry sandy esker. After many years of production, the quality of the stock was apparently gradually declining, perhaps due to exhaustion of the organic matter. The normal soil treatment (the addition of 200 cubic yards per acre of peat) as a seedbed preparation procedure, and the normal fertilizer practice (15 pounds of nitrogen (N) at 2-week intervals during the growing season) did not prevent this deterioration. These amounts were recommended by the central laboratory at the Head Office in Toronto, as a result of the soil and plant analyses from samples collected yearly.

Methods

It was decided to test the effects of increasing the recommended quantities of both organic matter and fertilizer. The organic matter is obtained from a nearby bog and consists of peat with a pH of about 5.8. This is collected each winter and stockpiled at the nursery. In the spring, it is spread by manure spreaders at the required rate and roto-tilled into the soil where it is allowed to settle for the summer. The seedbeds are established and sown in the fall. In this test, two levels of treatment have been used on the three species-white spruce (*Picea glauca* (Moench) Voss), black spruce (*P. mariana* (Mill.) B.S.P.), and Jack pine (*Pinus banksiana* Lamb).

Test A. The normal (recommended) treatment of 200 cubic yards of peat per acre in land preparation, and 15 pounds of nitrogen (N) every 2 weeks during growth.

Test B. Peat added at 800 cubic yards per acre and nitrogen (N) at 15 pounds every week.

Results

The relative effects of the two tests have been summarized in table 1, which shows differences in the soil analyses, and in table 2, which shows some of the effects on the trees. Unfortunately no outplanting tests of the stock have been completed. Table 1 clearly shows the increase in total soil organic content, nutrient elements, and cation exchange capacity with the increased peat application. Table 2 shows a similar increase in seedling height, diameter (caliper), and weight (oven-dry).

Discussion

The benefits of the quadrupled application of peat and doubled application of nitrogen on the size of the stock were immediately apparent in the first crop. It was possible to produce 1+0 Jack pine that was the apparent equivalent of the 2+0 formerly produced. Similar reductions in production ages may be possible for other species. There were additional benefits: (1) The western gall rust (*peridermium harknessii*, J. P. Moore) that had accounted for 40 to 60 percent losses in culling Jack pine was not found in the trees that were produced under the procedure of Test B (2). Various snow molds

Table 1.--*Effects of the tests on the organic matter content, nutrient quantities, and cation exchange capacity*

	Test A[1]	Test B	Increase
			(*percent*)
Organic matter	3.2 percent	9.8 percent	206
Phosphorus	21.3 mg/100 g	27.4 mg/100 g	29
Potassium	0.14 mg/100 g	0.35 mg/100 g	150
Magnesium	0.15 mg/100 g	1.33 mg/100 g	786
Cation Exchange Capacity	13.9 meq/100 g	26.6 meq/100 g	91

[1]Test A=200 cubic yards peat per acre, 15 pounds N at 2-week intervals. Test B=800 cubic yards peat per acre, 15 pounds N at weekly intervals.

that had caused losses of up to 40 percent in white spruce had also disappeared.

It was found in practice that the nursery irrigation equipment was inadequate to maintain soil moisture near the desired level, particularly on the areas of Test B. It is expected that we will obtain even greater growth responses when alterations to the irrigation system have been completed, enabling us to maintain soil moisture during the growing season at much higher levels. We hope to reduce the rotation ages of much of our stock in future years.

Table 2 *—Effects of the tests on the size of the trees*

	Test A[1]	Test B	Increase
			(*percent*)
White Spruce, 2+1			
Height	12.5 cm	17.3 cm	38
Diameter	2.5 mm	3.9 mm	56
Oven-dry weight	1.4 g	3.6 g	157
Black Spruce, 2+1			
Height	12.6 cm	22.2 cm	76
Diameter	2.5 mm	3.7 mm	48
Oven-dry weight	1.1 g	4.7 g	327
Jack Pine, 1+0			
Height	5.0 cm	11.0 cm	120
Diameter	0.9 mm	2.9 mm	222
Oven-dry weight	0.2 g	1.1 g	450

[1]Test A=200 cubic yards peat per acre, 15 pounds N at 2-week intervals. Test B=800 cubic yards peat per acre, 15 pounds N at weekly intervals.