

AMMONIUM NITRATE APPLICATION TO STIMULATE CONE
AND SEED PRODUCTION IN BLACK SPRUCE AND RED PINE

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In order to test whether fertilizer can increase the amount of cone and seed production, plots in a precommercially thinned black spruce stand and in a red pine seed production area were fertilized in May, 1984, with ammonium nitrate. Application rates were 0, 250 and 500 pounds per acre of elemental nitrogen in the black spruce stand, and 0, 134, 214 and 267 pounds per acre in the red pine stand. Red pine and black spruce cones were collected from 20 dominant trees in each of the plots in the fall of 1985. While not statistically significant, the rates of 250 pounds per acre in the black spruce stand, and 267 pounds per acre in the red pine seed production area, produced the most cones and the greatest amount of seed on a per-acre basis.

Additional keywords: Picea mariana, Pinus resinosa

With the increased interest in black spruce (Picea mariana (Mill.) B.S.P.) and red pine (Pinus resinosa Ait.) for planting, the need for large and reliable quantities of seed becomes increasingly important. Although red pine seed is readily available from seed production areas, black spruce is often difficult to obtain due to the small size of the cones and the four years between good seed years (Schopmeyer 1974). Following a presentation by Ron Smith of the Maritimes Forest Research Centre in Fredriktion, New Brunswick, in March of 1984, concerning cone and seed stimulation by various treatments, Scott Paper Company established two trials.

METHODS

One trial was in an area of predominately black spruce which had been precommercially thinned in August, 1983. Three plots were established, each 0.37 acres in size. One plot had no fertilizer applied; one plot had five, 55.1 pound bags of prilled ammonium nitrate at 33% elemental nitrogen or 250 pounds of elemental nitrogen applied per acre. Another plot had ten, 55.1 bags of ammonium nitrate or 500 pounds of elemental nitrogen applied per acre. The fertilizer was applied to the ground by hand on May 10, 1984, and was spread as evenly as possible.

Four plots were established in a thirty-year old red pine seed production area which had been thinned by hand in 1978 to 217 stems per acre. Each plot was 0.7 acres. Again, the fertilizer was applied by hand and spread evenly on May 18, 1984. It was applied at rates of 0, 134, 214 and 267 pounds per acre of elemental nitrogen.

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In order to determine whether there was a stimulation of cone and seed production, cones were collected in the fall of 1985 from 20 trees in each treatment except the plot treated with 214 pounds in the red pine stand. The effect of the fertilizer on black spruce should have been evident that fall with increased cone production. Any effect on red pine should become evident in the fall of 1986. However, red pine cones were collected to obtain a basis of understanding. The cones were kept separate by treatment. Red pine seeds were extracted at Kingsclear Seed Extraction Facility in New Brunswick. The black spruce seeds were extracted by heating the cones for 24 hours and shaking the cones. This was done three times for each treatment. The seed was cleaned using a small wind seed cleaner.

RESULTS AND DISCUSSION

The mean number of cones produced by individual trees in each treatment were analyzed for differences between treatments. While they were not statistically different, the results are enticing and generally agree with studies elsewhere. In the black spruce stand the most cones and seeds were collected in the block treated with 250 pounds of elemental nitrogen per acre (Table 1, Column 4). The seed yield in this treatment is more than four times the control. (The per-acre seed yields are calculated from the yields on the 20 trees in each treatment and expanded to the average number of trees per acre in the stand as a whole.) Small samples of the black spruce seed were x-rayed for soundness. 2/ The results of this test are also presented. A cut test was performed on the red pine seed. The low percent of sound seed in the 250-pound treatment in black spruce reduces the seed yield to just under twice the control and less than the sound seed yield of the 500-pound treatment. There is no clear reason why this would happen.

TABLE 1: SEED YIELDS AT VARIOUS RATES OF AMMONIUM NITRATE APPLICATION

Pounds of Ammonium Nitrate/AC	Trees With Cones Out of 20 Sampled	Total Number of Cones	Seeds/Acre	Percent Sound Seed	Sound Seeds Per Acre
<u>Black Spruce</u>					
0	4	32	34,000	51	17,400
250	5	184	143,500	22	31,600
500	6	7	72,500	67	48,600
<u>Red Pine</u>					
0	20	1,669	150,800	99	149,300
134	20	1,216	113,700	99	112,600
267	20	2,284	413,200	100	413,200

2/ Acknowledgement and appreciation is given to Lee Eavy, Graduate Student, University of Maine, Orono, for performing the x-ray tests.

Personal communication with Ron Smith of the Maritimes Research Centre in Fredricton, New Brunswick, indicates that greatest seed yield should be expected between 200 and 300 pounds of elemental nitrogen per acre for black spruce. These similar results are encouraging.

LITERATURE CITED

Schopmeyer, C. S. 1974. (Technical Coordinator). Seeds of woody Plants in the United States. USDA Forest Service, Agricultural Handbook Number 450, Washington, D. C.