COPPER SAFELY CONTROLS ROOTS OF TUBED SEEDLINGS

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Sheets of metallic copper, copper-armored fiber, or copper paint, when used on the inside of the holding trays, will apparently restrict the elongation of seedling roots without detrimental effects on the seedlings. This experiment demonstrated that root growth can be controlled, permitting seedlings to be held in tubes for prolonged periods.

Although copper paint is the cheapest and most convenient form of treatment, further experimentation is required to determine if it is as efficient as the metal or copper-armored fiber.

In 1965, the Ontario Department of Lands and Forests initiated a reforestation program in which coniferous seedlings were reared and then planted in plastic tubes. The preliminary research for this method was described by McLean (1) and Williamson (2), and provisional instructions were issued to field staff by Timber and Research Branches of the Department (3). In this method, seeds are sown individually on suitable soil in plastic tubes, with 200 tubes in a tray 12 in. x 6 in. x 2 in. deep. Following a period of greenhouse culture, seedlings are planted in the field together with the tube and the enclosed soil.

1 Contribution No. 67-12, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario, Canada.

As work progressed it became apparent that with the present technique, tubed seedlings could be kept in trays for only a limited time before roots would extend beyond the tubes and become intermingled with those of other seedlings, making separation without damaging the roots extremely difficult. A period of 4 weeks for pine and 7 weeks for spruce was recommended to produce a plantable seedling. Within this time, extension of roots beyond the tubes is normally not great. However, longer periods would be needed if larger seedlings were required for some planting sites, if the planting schedule was delayed, or if unique hybrid seeds were raised in the greenhouse prior to nursery culture. Therefore, some technique to confine the root systems to the tubes for a prolonged period, without detrimental effects to the seedlings, would greatly increase the flexibility of the method.

So a study was begun in February 1966 to find a suitable means of controlling root elongation in the tubes. Various chemicals were tested in solution and in metallic form, and copper metal showed the most promise. Various applications of copper materials were tested, including the lining of trays with copper sheeting and copper-coated fiber, and the application of copper paint on the trays.

Experimental Procedure

In all tests, seedlings were grown on benches in the greenhouse under conditions of lighting, temperature and fertilization which provided the most vigorous growth possible. Each test included one tray for each of four species: red pine *(Pinus resinosa* Ait.), white pine *(Pinus strobus L.),* white spruce *(Picea glauca* (Moench) Voss), and black spruce *(Picea mariana (Mill) BSP).*

Test 1-Copper Metal. Copper sheeting of 0.02 in. thickness was cut to fit the inside bottom of the trays in which tubed seedlings were grown. At an age of 3 months, tubed seedlings were removed from the trays and the roots examined. In the four species, root development was controlled, and roots more or less confined within the tube (fig. 1) .

Red pine seedlings, being at the time the most vigorous, were transplated with tubes to a greenhouse bench containing an 8 in. depth. of nursery soil. After 6 months, seedlings were lifted and

Figure 1.—A red pine tubed seedling grown 5 months on a copper plate.

roots examined. Root formation and growth rate were good, and the condition of leaves and buds quite normal, suggesting that the copper had no detrimental effect. A random sample of these seedlings was examined at the Forest Pathology Laboratory, Maple, Ontario, to determine whether the copper had been toxic. However, no abnormal condition was noted that could be attributed to the copper.

Test 2.-Copper-Armored Fibrene. In this test, three grades of copper-armored Fibrene, a coppercoated fiber sold by Domtar Construction, Toronto, were used to line the bottoms of the trays. There was no difference due to the grade of paper used, although the heaviest (3 oz.) grade deteriorated least.

Test 3.-Copper Paint. Two types of copper paint were sprayed on the inside bottom of the trays (fig. 2). The most desirable paint was one which had a high content of coarse metallic copper and a mixing vehicle which allowed the particles of cope,

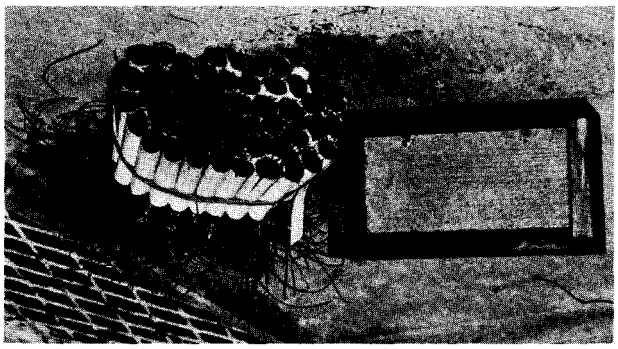

Figure 2.—The copper paint on this wooden tray has retarded root growth and prevented the matting of roots in red pine tubed seedlings 12 months old.

per to float to the surface ensuring a better contact with the seeding roots.

One copper paint, selected because of its high metallic content, was supplied by Canada Paint and Varnish, Toronto. The other paint was specially prepared by the Sheffield Bronze Powder Co., Ltd., Toronto. In the latter paint, an adhering or mixing agent was used that would not react with the styrene plastic trays. This test has not been completed but at the present time results are very promising.

Literature Cited

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