POT CULTURE TRIALS AS GUIDEPOSTS TO AMELIORATION OF NURSERY SOILS[1]

Pot trials showed that injury to nursery stock was caused by a chemical and not a biotic agent.

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The results reported in this note illustrate the value of soil and foliar analyses and simple pot culture trials in the determination of amendments required for improvement of nursery soils, especially soils impaired in their productive capacity by potent eradicants. At times, analyses supplemented by pot cultures provide a solution of the very difficult problem, namely whether the injury to the planting stock was inflicted by a biotic or a chemical agent, that is, by a primary parasite or a toxicant that permitted a subsequent invasion of either a facultative parasite or a saprophyte.

Subject of investigation

The nursery stock in question, 2-year-old Norway spruce, Picea abies, and white cedar, Thuja occidentalis, suffered about 40 percent mortality and the surviving seedlings exhibited a greatly reduced size (figure 1). The reddish-brown or bronzed color of foliage of both tree species and a near absence of mycorrhizal short roots suggested the effect of inadequately detoxified Mylone (DMTT, 50 D) applied before, seeding at a rate of 400 lbs/a (*2*). On the other hand, many roots of seedlings contained abundant spores of Fusarium fungi, a genus that includes'parasitic as well as saprophytic species.

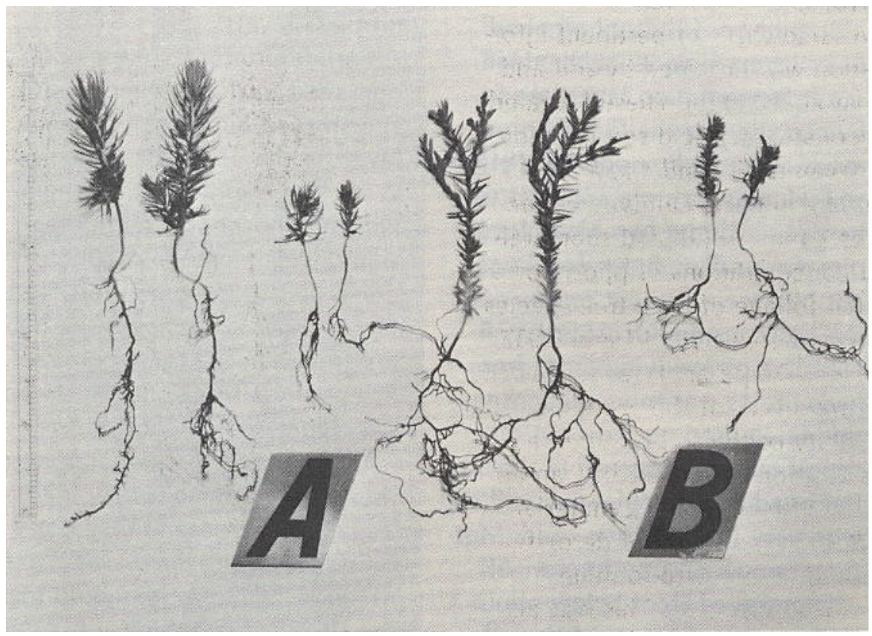

Figure 1.—*Representative samples of surviving 2-year-old seedlings inhibited in their development by an unknown factor: A—partly recovered, and nearly dead Norway spruce; B—partly recovered and nearly dead , white cedar.*

Table 1.—*Effect of addition of lime, noncalcareous papermill sludge, and nutrient-enriched suspension of hardwood-hemlock leafmold on the growth of 8-week-old rye, soil reaction, and soil catalytic capacity (treatment on a 1,000 square feet basis)*

Soil treatments	Oven-dry weight of ave. plant (g)	Reaction (pH)	Catalytic capacity (mm Hg)
Control	0.59	4.5	7
100 lbs lime and 20 ftg sludge	0.78	6.4	53
Ditto plus 30 gal of humate suspension	1.85	6.2	122

[1]Research supported by the College of Agricultural and Life Sciences, University of Wisconsin, Madison, and the Wisconsin Department of Natural Resources.

Methods and Results

A large share of pertinent information was provided by soil and foliar analyses (*4*). These revealed a very strongly acid soil reaction between pH 4.3 and 4.5, an extremely low soil catalytic capacity of 7 mm Hg (*5*), and submarginal concentrations of phosphorus in the foliage of both. tree species varying between 0.057 and 0.037 percent. These analyses suggested that recovery of the productive capacity of the soil required a moderation of soil acidity, an addition of biodegrading material, and an introduction of detoxifying and mycorrhiza-forming microorganisms (*1*). This was accomplished by the following amendments, reported per 1,000 square feet of nursery beds: 100 pounds of dolomitic limestone, 20 cubic feet of non-calcareous papermill sludge, and 3 cubic feet of hardwood-hemlock leafmold dispersed in 20 gallons of solution containing 2 pounds of mono-ammonium phosphate and 4 pounds of potassium nitrate (*3*).

The treated and untreated soils were sown to rye and to Monterey pine, *Pinus radiata*, a fast growing tree particularly vulnerable to fungus diseases. The results given in table 1 illustrate the effect of ameliorating treatments on reaction and catalytic capacity of the soil and the growth of 8-week-old rye. Figure 2 includes representative seedlings of Monterey pine raised in ameliorated and control soils. The growth of the seedlings leaves no doubt that the injury to the original stock was caused by toxicity of the applied eradicant coupled with strong soil acidity and not by the saprophytic species' of Fusarium fungi.

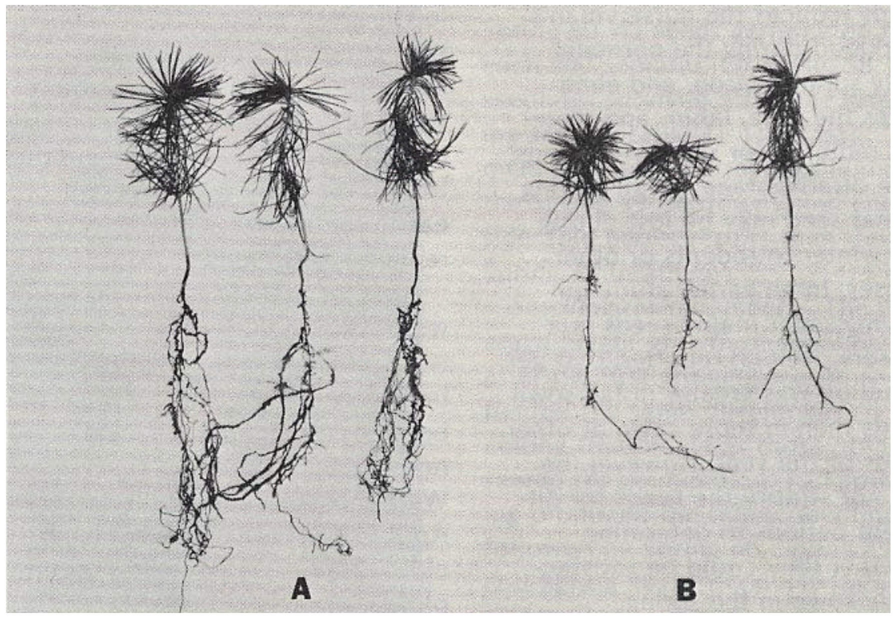

Figure 2.—*The growth of 3-month-old Monterey pine in the investigated nursery soil: A—seedlings raised in a soil ameliorated by application of lime, non-calcareous papermill sludge, and nutrient-enriched suspension of leafmold; oven-dry weight of average plant—0.48 g. B—representative seedlings raised in the unameliorated soil; oven-dry weight of average plant—0.15 g.*

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