Eradicants and mycorrhizae

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The current literature includes a considerable number of papers reporting adverse effects of eradicants on the development of symbiotic, mycorrhiza-forming fungi with subsequent reduced growth of nursery stock (1, 2, 3, 4, 5). It is safe to state that nearly all eradicants, even when used at the generally accepted rates of application, depress *for a brief period* the activity of these beneficial, in fact, essential microorganisms. However, according to our observations, a harmful, i.e., *long lasting immobilization* of mycorrhizal fungi takes place in nursery soils in some instances, at irregular intervals, and usually in a mosaic-like pattern. The causes of this occasional demycorrhization of the soil are not clear, but an experience with the 1973 fall seeding in the Griffith state nursery of Wisconsin provided a striking illustration of some factors responsible for the deterioration of mycorrhizae.

Method

Tic nursery beds were treated with Mylone 50 D at a rate of 400 pounds per acre (200 lbs/a of active ingredient). As a rule, this eradicant is applied 60 (lays prior to seeding. In this particular case, however, the chemical ¯was applied in early September, and the seeding of red and white pines was done in the middle of October. Thus, the detoxification time was reduced to about 40 days of the relatively cold fall period.

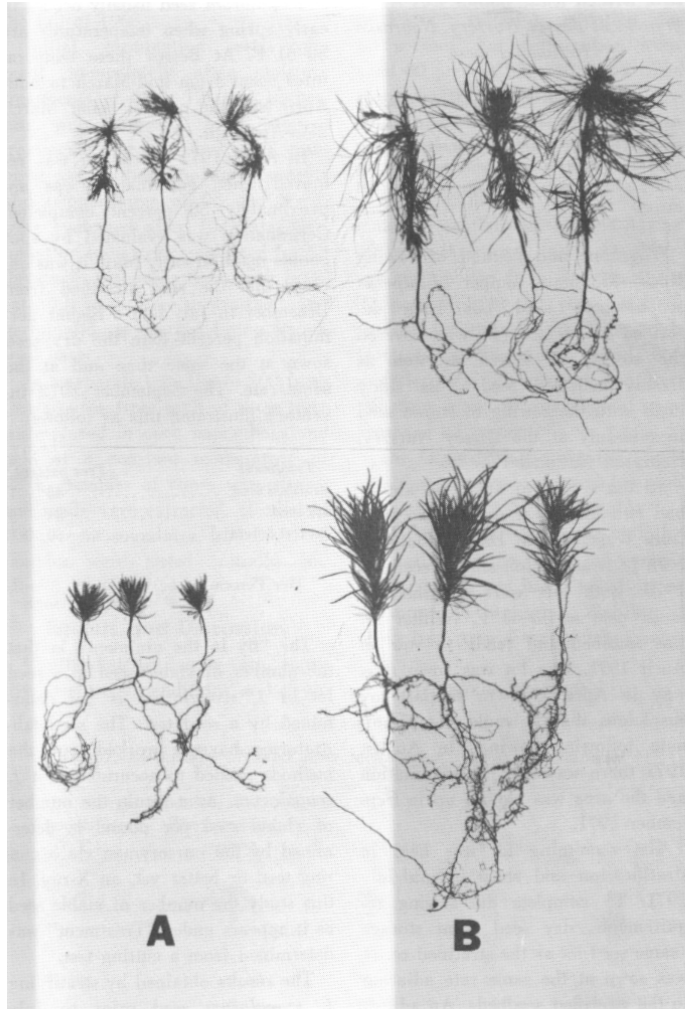

Figure 1.-Two-year-old white pine (top) and r rd pine (bottom) seedlings raised in the same nursery beds: (A) mycorrhiza-free seedlings in depressions with highly concentrated, partly detoxified Mylonc herbicide: (B)-Normally developed seedlings on elevated parts of nursery beds, exhibiting the initial development of mycorrhizal short root-. Griffith State forest nursery of Wisconsin.

Observations

In the fall of 1974 the entire stock of both tree species showed an inferior development; particularly stunted trees were confined to the lower areas of nursery beds accumulating the eradicant-laden runoff water. In June of 1975 the stock was treated with NPK liquid fertilizer, but near the end of the growing season about 20 percent of either white or red pine seedlings remained far below the plantable size. Figure 1 illustrates the morphology of seedlings from the elevated and the depressed parts of nursery beds; the former attained fair dimensions and exhibit some development of mycorrhizal short roots, induced by the fungus *Cenococcum graniforme;* the latter are of grossly retarded growth and are lacking mycorrhizae.

Discussion

A partial or a delayed and a prolonged, nearly complete immobilization of the mycorrhiza formers was inflicted by a combination of two adverse conditions: a too brief detoxification period and an accumulation of the eradicant in a near-lethal concentration by runoff water. It is probable that the process of the detoxification was retarded by the low temperature of the pre-seeding period.

The pesticide label usually pro. vides reasonably reliable information on the periods which should elapse between the application of various eradicants and the seeding or transplanting. However, these estimates do not take into account several unpredictable conditions, such as an accumulation of the toxic chemicals by the lateral movement of water in concentrations greatly exceeding the prescribed rates of application, the supply of soil organic matter and the soil's biodegrading potential, and the state of climatic factors during the detoxification period. Under Wisconsin conditions, a nursery soil with a plowed-under green manure has a far greater rate of detoxification during 30 days of August than has a fallowed soil during 60 (lays of September and October.

It should be mentioned that during the past ten years a critical deterioration of mycorrhiza-forming fungi in Wisconsin was observed predominantly in nursery soils with a low supply of organic matter (less than 1.5 percent in the 6-inch surface layer).

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than from tree 1 or 2 after 6 and 9 years of storage.

Although sand pine seeds stored well under a wide range of conditions, subfreezing temperatures and moisture contents of 10 percent or less are suggested for long-terns storage. These conditions will allow a margin of safety for seed lots weaker than those tested. Serotinous cones provide a suitable environment for maintenance of viability for several years (2, 3) but longterm cone storage is definitely inferior to extracting and storing seeds.

Table 2.—Germination of Ocala sand pine seeds initially and after cone storage for 3, 6, and 9 years at 72°F.

Tree number	Germination when tested after—			
	0 years	3 years	6 years	9 years
	Percent			
1	93	87	48	16
2	94	92	42	12
3	92	91	73	49
Average	93	90	54	26

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