

EFFECT OF DACTHAL 75 ON THE GROWTH OF NURSERY STOCK

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In the spring of 1964, several sections of the Bascobel State Nursery (Wisconsin) were

treated with 6 pounds per acre of Dacthal 75 herbicide (dimethyl-tetrachloroterephthalate), distributed as wettable powder. Two weeks after treatment, 2-0 seedlings of red pine, white pine, and white spruce were transplanted on the area. At the end of the growing

¹ The author wishes to acknowledge the assistance of John E. Borkenhager, Nursery Superintendent, and Ch. Tamer, Analyst,

season, samples of soils and 2-1 transplants were collected from control and herbicide-treated beds and analyzed according to procedures described by Wilde et al. (1964). The results reported here present a picture seldom obtained from eradicant tests (Iyer 1964).

The soil of the study area is exceptionally suitable for trials of agricultural chemicals; it has a level topography, a matrix of purely siliceous coarse sand (Sparta series), and well-adjusted, uniform fertility.

The results of soil analyses (table 1) indicate that use of the herbicide did not significantly influence the pH value, total nitrogen, and available potassium of the soil. The treatment slightly lowered the content of exchangeable calcium and magnesium by increasing the uptake of these bases by rapidly growing plants on herbicide-treated soils. However, application of the chemical markedly increased the available phosphorus, which

was probably released by decomposing tissues of organisms which failed to withstand the treatment.

Despite the apparent stability of soil fertility factors, the nutrient content of the soil had changed considerably. The results of foliar analyses (table 2) disclose an appreciable drain of nutrients by herbicide-stimulated plants. For example, the additional production of foliage on Dacthal-treated beds, about 4 grams per average 2-1 red pine (1.16 percent N), extracted from the soil some 30 pounds of elemental nitrogen per acre (300,000 transplants), equivalent to 150 pounds of ammonium sulfate.

The loss of available nutrients was compensated by mineralization of the eradicated plant and animal remains. However, this kind of equilibrium could not be maintained when biocidal treatments are repeated at short intervals, so the use of growth-promoting eradicants, particularly hydrocarbons, usually

TABLE 1.--Fertility of control and Dacthal-treated soils (6 pounds/acre) supporting 2-1 transplants of red pine, white pine, and white spruce

Species of 2-1 nursery stock	Condition of soil	Reaction pH	Total N	Avail. P ₂ O ₅	Avail. K ₂ O	Exch. Ca	Exch. mg.
			<i>Percent</i>	<i>Lbs./acre</i>	<i>Lbs./acre</i>	<i>M.e./100 g.</i>	<i>M.e./100 g.</i>
Red pine.....	Biocide-free...	5.6	0.084	50	103	2.24	1.09
Do.....	Dacthal-treated	5.6	.074	101	158	1.63	.71
White pine.....	Biocide-free...	5.8	.067	62	139	2.00	.97
Do.....	Dacthal-treated	5.7	.053	112	132	1.63	.71
White spruce....	Biocide-free...	5.9	.049	73	149	1.80	.94
Do.....	Dacthal-treated	5.9	.053	92	120	1.80	.84

TABLE 2.--Foliar analysis of 2-1 transplants of red pine, white pine, and white spruce raised on biocide-free soils and soils treated with Dacthal at 6 pounds per acre

Species of 2-1 nursery stock	Condition of soil	Organo-solubles	N	P	K	Ca	Mg
		<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Red pine.....	Biocide-free...	23.6	1.30	0.086	0.63	0.80	0.27
Do.....	Dacthal-treated	23.3	1.16	.076	.54	.76	.25
White pine.....	Biocide-free...	24.8	1.68	.104	.31	1.70	.42
Do.....	Dacthal-treated	24.6	1.64	.128	.35	1.30	.40
White spruce....	Biocide-free...	34.8	2.14	.140	.46	1.76	.37
Do.....	Dacthal-treated	27.5	2.22	.136	.44	2.30	.81

must be followed by application of fertilizers. The cost of the necessary extra fertilizers may be as high as \$50 per acre.

The results of foliar analyses also show that application of Dacthal often increases the concentration of nutrient elements in plant tissues, but does not produce any adverse changes in the normal nutrient ratios. The fact that the herbicide-treated stock preserved its high concentration of organosolubles despite the greatly increased production of dry matter is particularly significant.

Analysis of the morpho-anatomical features of transplants of all three species indicated unusually favorable results (table 3).

Contrary to general experience, the Dacthal, at its critically high rate of application (6 pounds/acre), effected a large, but not necessarily detrimental, increase in the growth of stock--its height, diameter, and dehydrated weight. The values for the two extremely important characteristics--titration value of roots and specific gravity of stems--suggest

an appreciable ameliorating, rather than deteriorating, influence of this chemical. The treatment has produced only minor changes in the height-diameter and top-root ratios (fig. 1).

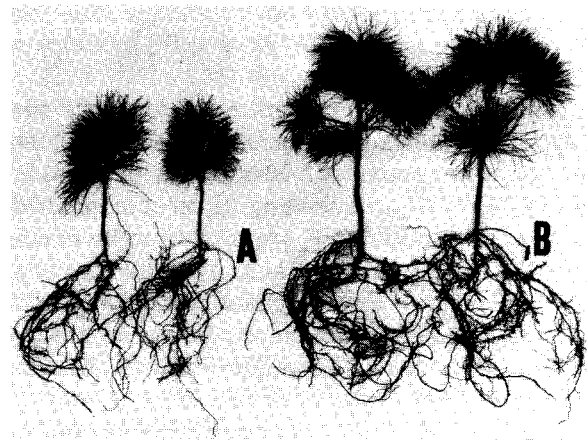


Figure 1.--Effect of Dacthal 75 on the growth of 2-1 white transplants: A, stock raised on control plots; B, stock raised on plots treated with 6 pounds per acre of DCPA (Bascobel State Forest Nursery, Wisconsin).

TABLE 3.--Morphological and anatomical characteristics of average 2-1 transplants of red pine, white pine, and white spruce raised on biocide-free soils and soils treated with Dacthal at 6 pounds per acre (ovendry basis)

Species of 2-1 nursery stock	Condition of soil	Height	Diameter	Height-diameter ratio	Plant weight	Top weight	Root weight	Top-root ratio	Root titration	Specific gravity
Red pine....	Biocide-free....	<i>Cm.</i> 16.2	<i>Mm.</i> 3.3	4.9	<i>Grams</i> 3.01	<i>Grams</i> 2.11	<i>Grams</i> 0.90	2.34	<i>Ml. NaOH</i> 0.40	0.320
Do.....	Dacthal-treated.	24.5	5.6	4.4	9.51	7.21	2.36	3.05	.58	.366
White pine..	Biocide-free....	14.0	3.0	4.6	2.34	1.42	.92	1.40	.45	.346
Do.....	Dacthal-treated.	21.0	4.8	4.4	6.21	3.95	2.26	1.70	.84	.325
White spruce	Biocide-free....	12.0	3.3	3.6	1.59	1.07	.52	2.05	.36	.343
Do.....	Dacthal-treated.	18.1	3.9	4.6	3.11	2.13	.98	2.17	.44	.356

No difference was detected in number or structure of mycorrhizal short roots of the control and herbicide-treated plants.

Also contrary to earlier beliefs, recent observations of Kuntz (1963) suggest that Dacthal is better suited to post-emergence than pre-emergence treatments. An important advantage of this chemical is its very mild toxicity to animals.

While this local and limited experience with Dacthal was encouraging, its unrestricted use is not recommended. The effect of biocides varies greatly, depending upon composition of the soil, nature of organisms to be eradicated, kind of crop raised, rate and manner of application, and weather conditions. The compound is not sufficiently potent to control perennial grasses and weeds with broad leaves, but at higher rates of application it may be detrimental to nursery stock of deciduous trees (Crafts 1961; Audus 1964).

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