SOIL TREATMENTS MAY INCREASE STAND OF LOCUST SEEDLINGS1/

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The nurseryman frequently experiences considerable difficulty in getting a satisfactory stand of tree seedlings in the nursery bed, or at least in getting as many plants as he should from the number of seeds that are planted.

here may be many factors contributing to a poor stand of plants, such as heavy rains and flooding at the wrong time, bird and rodent damage, etc., but much of the loss in stand is due to the activity of damping-off and rootrotting fungi, which are almost universally present in the soil. Other contributing factors may be certain insect larvae and nematodes. The latter are not too common in Ohio soils but one or two species of both the root-knot (Meloidogyne) and root-lesion (Pratylenchus) nematodes can be found in nursery beds. Weeds are also a serious production hazard at most nursery sites, where their control is costly and the act of weeding the beds and the growth competition they give often results in further reductions in the stand of tree seedlings. Thus, if a single chemical compound, or a combination of two or more could be found that would control fungi, insects, nematodes and weeds in a single pre-planting application, it would be a long step forward in the production of tree seedlings in the forest nurseries of the state of Ohio, and in the United States.

Combinations Work.

It is unlikely that a single compound capable of doing all of these things will be found soon, but it is possible that certain combinations (formulations) of materials can be prepared that will do most of them with at least a fair degree of effectiveness. For instance, dieldrin is proving itself to be a good soil insecticide, and such materials as Vapam and Mylone are capable of giving a considerable degree of control of various soil fungi and of killing many of the weed seeds present in the soil. D-D and EDB are quite effective against root-knot and root-lesion namatodes. Also, chloropicrin and methyl bromide will kill a considerable portion of all four groups of pests, when properly used. However, most, if not all, of these materials have certain specific handicaps that may prevent their coming into general use in nursery beds, such as high cost, difficulty of application, toxicity to the seedlings themselves, etc.

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In spite of these possible weaknesses of specific materials it was decided to treat several nursery beds that were to be planted to locust (Robinia pseudoacacia) at the Green Springs nursery in the spring of 1956. Dieldrin was chosen as the insecticide to be used, Vapam and Mylone as fungicides and EDB as the nematacide. Also, Vapam and Mylone were known to be rather effective herbicides. The treatments were applied on May 22nd with a rotovator, and the locust seeds were planted about two weeks later. The data showing the results obtained in terms of seedling stands are given in the accompanying table.

The data in the first column of the table indicate the comparative stands of locust seedlings in each 100 feet of row in the differently treated plots on July 16, or about 2 weeks after the plants had come up. The data in the second (or last) column show the average number of one-year old trees harvested from each square foot of bed area on March 12, 1957.

Some Plants Injured

In July of 1956 there were fewer seedlings in the beds treated with dieldrin and with EDB, as well as in those treated with EDB + dieldrin, than in the untreated check areas. This suggests that both of these materials must have been slightly phytotoxic (injurious) to the germinating seeds and young seedlings of locust. On the other hand, the greater number of plants in the beds treated with Vapam and Mylone indicates that these two materials must have given some degree of control of such damping-off organisms as Pythium, Rhizoctonia and Fusarium. Dieldrin used with Vapam and Mylone (Treatments 6 and 7) again showed a tendency to injure the seedlings by causing a slight decrease in stand below that present in beds treated with Vapam and/or Mylone used without that insecticide.

Vapam and Mylone gave a very noticeable decrease in weed populations in the beds where they were used. This effect was more obvious with broadleaved weeds than with grass. ,Notes on the stand of weeds, taken at the time of the first and second weedings of the experimental area, were as follows:

	First Weeding		Second Weeding	
	Broadleaved	Grass	Broadleaved	Grass
Treatment:				
Vapam	None	None	Few	Scarce
Mylone	None	None	Few	Scarce
EDB	Few	Scarce	Medium	Medium
Dieldrin	Few	Scarce	Medium	Medium
No treatment	Few	Some	Medium	Medium

First weeding 15-18 days after locust seedlings emerged.
Second weeding about two weeks later.

Vapam gave slightly better weed control than Mylone and both eliminated more weeds than did EDB. The dieldrin-treated plot had nearly as many weeds as were present in the untreated checks. It was estimated that Vapam and Mylone reduced the cost of weeding by approximately 65 percent below that for the check plots.

A comparison of the relative numbers of plants harvested in the spring of 1957 with those present in the beds in the previous July indicates that the survival rate was not the same with all treatments. There was a considerable amount of grub damage, caused by the larvae of one of the June beetles (Phyllophaga), in the untreated check plots. This was evidenced by a wilting of the affected plants in mid-August, and by the absence of a tap root in some of the small trees as they were dug in the following March (see Figure 1). This type of injury was scarce in all of the treated plots, whether or not they had been treated with dieldrin. This control of grub damage by most or all of the chemicals used probably accounted for the fact that there were more young locust trees per unit of bed area in March in the plot treated with dieldrin than in the check plots, even though the reverse was true in July before the grubs had damaged and/or killed some of the seedlings in the untreated areas. This change in relative populations between the checks and the treated plots occurred with EDB and with Vapam. However, there was comparatively little change with time where Mylone was used.

The Vapam-treated plots showed fewer plants per 100 feet of row than Mylone in July of 1956 but these populations had shifted by the spring of 1957, with more trees per square foot of bed space in the Vapam plots than in those treated with Mylone. The reason for this is not obvious, but it is possible that Vapam gave better protection against a continuing loss of plants from damping-off fungi than did Mylone.

Development Varies

One of the interesting features of this experiment was the comparative stem size and root development of the plants in the differently treated plots. The plants in the plots with comparatively thin stands such as the untreated checks and those that received only dieldrin or EDB were considerably larger than those in the plots treated with Vapam and Mylone (see Figures 2 and 3) as one would expect, but the greatest difference was in the extent of the different root systems. As is illustrated in Figures 2 and 3, the roots on the plants in the untreated check plots were much larger and more numerous than on the more crowded plants (four times as many per unit of bed area) in the plots treated with Vapam. Actually this larger size of the check plants makes them little if any more valuable to the purchaser since the small plants are easier to handle and set and may even show a higher percentage of survival than the larger ones.

Specific recommendations concerning materials and rates of application cannot be made on the basis of only one experiment in only one season, but the data presented here do suggest that there is a strong possibility that either Vapam or Mylone, or both, will come into use as soil treatment materials to improve the stand of various tree seedlings such as those of locust, and to give an appreciable reduction in weed populations and thus lower the cost of hand weeding the nursery beds. The rate at which they should be used will depend somewhat on soil type but it is likely that Vapam, formulated to contain 4 pounds of the active ingredient per gallon, should be applied at 40 to 50 gallons per acre. Mylone, at 85 percent active, should be used at 150 to 200 pounds per acre. The interval that should elapse between soil treatment and seedling will be regulated to some extent by soil type, temperature and moisture content, but planting should be delayed for 10 to 14 days to avoid chemical injury.

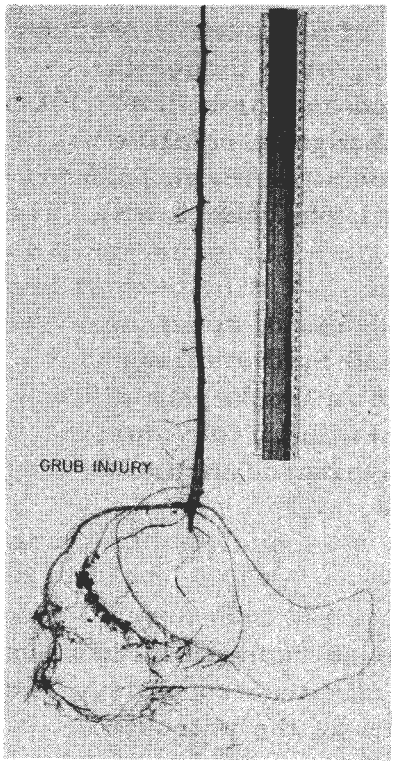

Figure 1. Note absence of tap root which was destroyed by a larva of one of the June beetles, and the strong brace roots developed to replace it. Knots on roots not due to nematode infestation but are the nodules caused by nitrogen fixing bacteria.

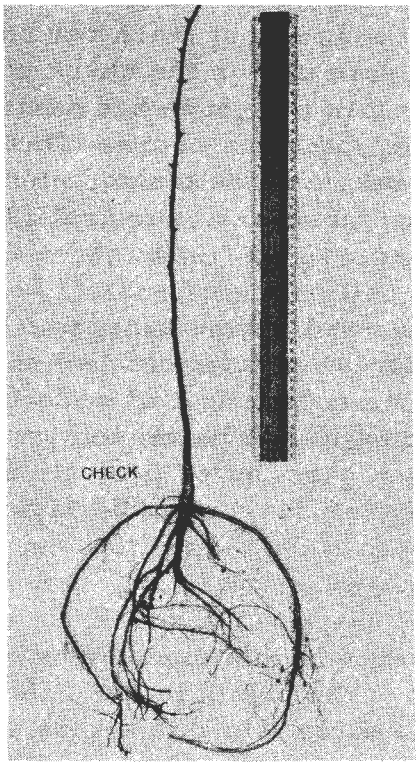

Figure 2. Heavy root development on uncrowded plant in check plot. Some of these plants were almost too large for best use.

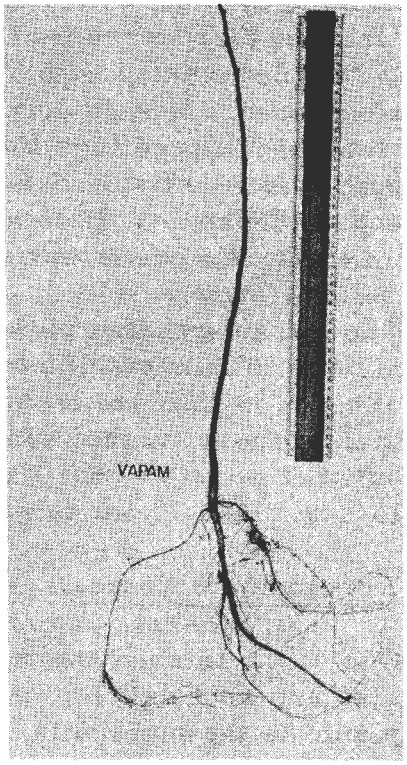

Figure 3. Plant from plot treated with Vapam. Note excellent root system which is less extensive than that on check plant because of some crowding in a quadrupled stand.

Stand of Locust Seedlings in Nursery Beds Treated with Various Compounds at Green Springs in 1956

Treatments	Rate used per acre	Plants per 100 feet of row in July, 1956	Plants per sq. ft. of bed area in March, 1957
1. No treatment	-----	325	4.34
2. Dieldrin	2 gal.	262	6.94
3. Vapam	50 gal.	815	17.51
4. Mylone	150#	1036	14.00
5. EDB (M-731)	12 gal.	202	4.58
6. Vapam dieldrin	50 + 2	732	*
7. Mylone dieldrin	150 + 2	851	*
8. EDB dieldrin	12 + 2	175	*

* Counts not made