

ETHYLENE DIBROMIDE CONTROLS A ROOT ROT AT THE

W. W. ASHE NURSERY

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A little-known root disease has taken a persistent though variable toll of seedlings at the W. W. Ashe Nursery near Brooklyn, Mississippi, since the nursery was established in 1936. All pine species produced there (*Pinus palustris*, *P. caribaea*, *P. taeda*, and *P. echinata*) are susceptible. —

The above ground symptoms vary with the species involved and the intensity of the disease. Loblolly and shortleaf may suffer wholesale mortality in the seedling beds during the summer months. They die in an upright position much as if the root had been cut by grubs. Such mortality has seldom occurred with longleaf and never with slash. However, "all species may suffer severe root damage without noticeable top symptoms. Therefore, the most reliable symptoms are those present on the roots when 1-0 stock is lifted. These may range from small, reddish, rough areas on the tap and larger lateral roots, to a blackening and roughening of the entire surface of the tap root with few laterals and these often stubby, and to a rotting away of the lower tap root, often with a profuse development of laterals near the soil surface.

On the average, diseased seedlings are smaller than healthy ones as might be expected to result from the reduced root system. When this stock is graded on the usual size and vigor basis, much of it must be culled because of small size and insufficient roots. Thus in addition to a reduced stand there is the added loss of excessive culls. When the number of plantable seedlings produced per unit area has been calculated, it has not been unusual to find a 40-50% reduction resulting from the root rot.

There is a further loss, particularly with longleaf, in that diseased seedlings, even though meeting the usual standards for "plantable" do not survive in the field as well as clean stock; two years after out planting, 74% of the clean longleaf stock had survived while only 25% of the diseased stock lived. It would thus appear inadvisable to plant longleaf that had the root rot symptoms. Diseased but "plantable" seedlings of slash and loblolly survived about as well as clean stock. Survival of diseased shortleaf has not been determined.

Rather intensive studies aimed at finding a practical control for this disease have been carried out during the past 4 years. The cause of the trouble was not known, and so various fungicides, insecticides, and soil fumigants were tried. The fumigants, normally recommended for nematode control, provided the answer. Chloropicrin, methyl-bromide gas, and ethylene dibromide each effectively controlled the disease. The last-

named material is by far the cheapest and least dangerous to handle, and so it was selected as the logical chemical to use. All the primary experimental trials were carried out with a 20% by volume solution of ethylene dibromide (Dowfume W-40, furnished by the Dow Chemical Company). This material has unfailingly given effective control of the root rot in numerous trials during the past 4 years.

The material is injected to a depth of 6 inches with a 10-inch space between rows, into tilled soil of moderate moisture content. The application is made 2-3 weeks prior to spring sowing of the beds. The beds are made, or "thrown-up", immediately before sowing. The optimum rate of Dowfume W-40 has been about 25 gals. per acre.

For small areas of not more than a few hundred square feet, the material can be applied with a hand applicator such as the Mack Weed Gun (buck Company, Caldwell, Idaho; cost approx. \$21.00) or the Fumi-Gat (Whiting Engineering and Manufacturing Company, Hartsville, S. C.; cost approx. \$17.50). For larger areas, some sort of power equipment is needed. Therefore an outfit was constructed at the Ashe Nursery to fit on a Farmall H tractor (Fig. 1). It is powered by a pump attached to the power takeoff which delivers the chemical under pressure from a 50-gallon drum on a rack back of the driver's seat to a boom attached to the hydraulic lift under the tractor. Two rows of shanks, 4 and 3 per row with a lateral spacing of 10 inches, are also attached to the lift. Down the back of each shank is a metal tube with a nozzle just back of the point of the shank. The chemical is carried by individual hoses from the boom to the tube of each shank. A small cultipacker is attached to the rear of the tractor to seal the furrows left by the shanks. This machine will treat a 70-inch strip at a speed of 4-4.5 miles per hour, or a 400-foot nursery bed in about one minute. The total cost of labor and materials for treating one acre is less than \$50.00, amounting to but a few cents per M seedlings. About 15 acres of the nursery were treated with this fumigator for the 1950 crop. Root rot control was satisfactory; no seedbed mortality or culling of seedlings was attributed to this disease. Approximately 28 acres were treated in February for the 1951 crop.

Recently a similar fumigation outfit also fitting on a Farmall H tractor has been placed on the market by Fabricated Metals, 900 Thirty-Third Avenue, Oakland 1, California. It is called the "SprayRite" soil injection kit.

To date, no effects other than root rot control have been attributed to the use of ethylene dibromide. It appears to give no additional benefits, nor does it appear to have any deleterious effects on seedling production or field survival when properly handled.

There has been some carry-over of control into the second consecutive crop of seedlings, but not enough to warrant recommending that nurserymen depend on it. Furthermore, since the accepted practice is to rotate pine with cover crops, it appears that fumigation will be required before each spring-sown pine crop.

The cause of the root rot at the Ashe Nursery has not been proved according to rigid scientific standards, though the inference is that the inciting agency is probably nematodes. At least 10 genera of nematodes occur in the Ashe soil and some of them are recognized as plant pathogens.

A more complete account on soil fumigation at the Ashe Nursery, together with the results of extensive studies on fertilization and soil amendments, has been published as Southern Forest Experiment Station Occasional Paper 119*

Ethylene dibramide and other chemicals are now being tested against a somewhat similar root rat of white pine at the Chittenden Nursery, Wellston, Michigan. The tests have not progressed far enough for conclusions to be drawn.

For those who may be interested further in some of the aspects of soil fumigation, reference is made to: Christie, Jesse B. Soil fumigation for control of nematodes and other soil-inhabiting organisms. 21 pp., mimeographed. U. S. Dept. of Agr., Bur. Pl. Ind., Soils and Agr. Eng., Div. Nematology, Beltsville, Md., April 1, 1948.

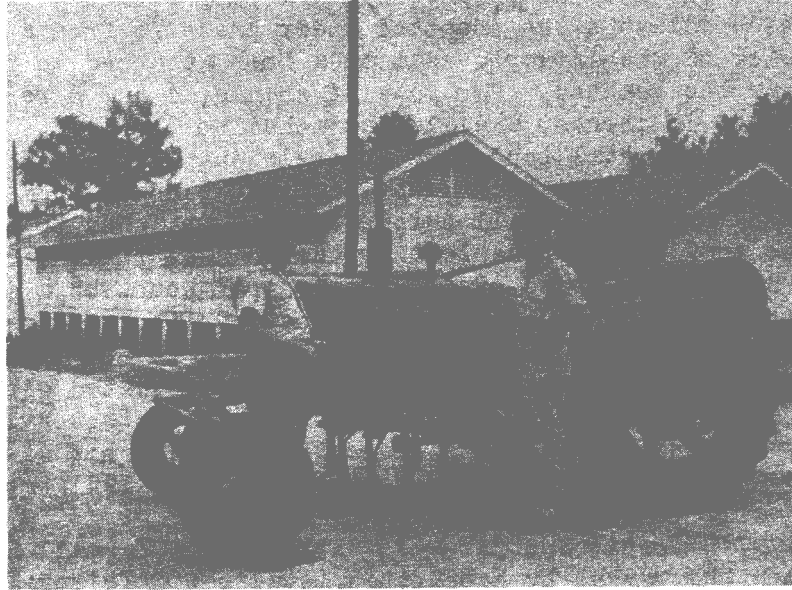


Fig. 1. The "Ashe Fumigator" and the two men most responsible for its construction. Left, Clarenoe Walley U.S.F.S., Brooklyn, Miss.; right, Hoyt A. Nation, Dar Chemical Co., Auburn, AL.