PROTECTING MACHINE TRANSPLANTED TREES FROM WHITE GRUBS [1]

R. D. Shenefelt, H. R. Liebig and R. C. Dosen[2]/

The ravages of white grubs in forest tree nurseries can be readily controlled by applications of any one of several chlorinated hydrocarbon insecticides such as aldrin, chlordane, or heptachlor. These treatments are preventative and should be applied before the damage has started, the treatment being designed to kill the grubs shortly after they hatch (Shenefelt and Simkover 1950, 1951).

White grubs often destroy large numbers of trees set in the field (Stoeckeler and Limstrom 1942, Rudolph 1950), but methods for their control in the planting area are not yet established. Protection of field transplants from attack by grubs presents several unique problems. Some of the differences between field and nursery problems are:

1. In the field the grub population is already established, and the object is to provide the trees with immediate protection against root destruction by voracious second and early third instar grubs. Since the trees may be subjected to immediate attack, the insecticide must be toxic enough to produce a quick kill of large grubs, or it must possess such a high degree of repellency that the grubs will leave the immediate area.

2. In the nursery the high value of the crop and the methods of cultivation allow a broadcast treatment with subsequent working of the insecticide into the soil. Such treatment is not practical in the field where the problem is to obtain a spot distribution of the insecticide in the soil immediately around the root system of the tree as it is set.

1 / Published with the approval of the Director of the Wisconsin Agricultural Experiment Station. Results of a cooperative project involving the Wisconsin Agricultural Experiment Station, the Nekoosa-Edwards Paper Company, and the Wisconsin Conservation Department.

2/ R. D. Shenefelt: Assoc. Prof., Univ. of Wis., Madison; H. R. Liebig: Woodlands master mechanic, and R. C. Dosen: forester, Nekoosa-Edwards Paper Co., Wisconsin Rapids, Wis.

Various methods of treating the grubs in the field have been attempted and include dipping the roots and broadcast treatments. Dipping provides very little carryover of insecticide unless concentrations are high. Furthermore it places the insecticide on the roots only, and thus does not protect the young rootlets that grow out into the soil. In addition, it is difficult to dip the stock in the field, since it requires carrying a bucket for dipping just before planting. If the roots are dipped before the trees are placed on the planter, most of the liquid drains away. Dipping has been quite successful, however, in certain experiments. Broadcast treatments treat much more area than is actually necessary and do not place the insecticide around the root system where it is needed.

Dusts cannot be used satisfactorily in conjunction with a machine planter because of the position in which the planter must sit to do his work. Dust puffs released around the tree as it is being set would swirl up into his face. A properly directed spray, however, does not have this disadvantage.

A simple device, designed to produce a spot distribution of insecticide on the roots of field transplants and in the soil immediately around the roots, is illustrated in the photograph and diagram (Figures 1 & 2).

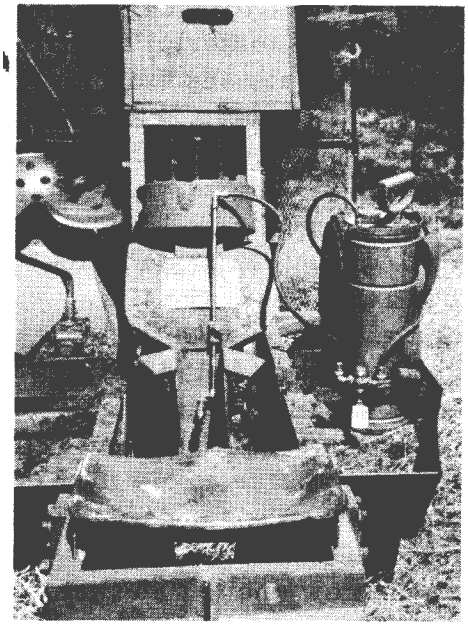

Figure 1. Sprayer ready for operation.

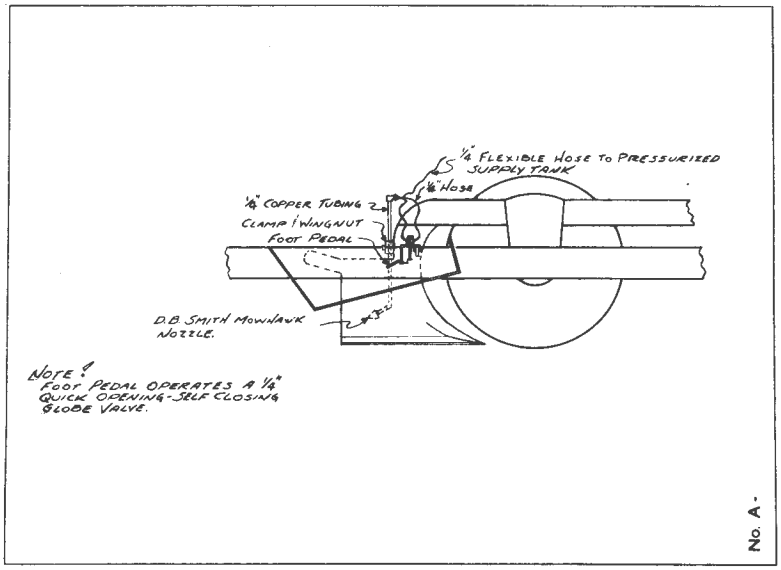

Figure 2. Diagram showing relationship of sprayer and planter parts, drawn from right side. (Courtesy Nekoosa-Edwards Paper Co.)

A 3-gallon pressure type knapsack sprayer was set in the front of the foot box of the planter where it fitted snugly between the brace and the end. (The tank might well be placed above the shoe just back of the planting box in a frame.) The hose of the sprayer was replaced with a flexible, 1/4-inch, oil-resistant hose about 3 feet in length leading to a foot-operated valve. To this valve a tight U-shaped piece was attached with the open end pointing downward so that it might be slipped over the brace to hold the foot pedal in proper position. From the foot valve another hose about 2 feet long was connected to the sprayer rod. This length was sufficient to allow for changes which occurred when the shoe was lifted or lowered. The spray rod was held to the front part of the shoe by two small pieces of metal with a V-shaped groove in each. The first of these was brazed off center to the upper part of the shoe on the front face and had a bolt in it. The second piece had a hole through which the bolt passed. By placing the spray rod in the grooves and tightening a wing nut, the rod was held readily at the desired height and with the nozzle pointing in the correct direction. The nozzle was placed on an offset attached to the lower end of the rod. ,This offset brought the nozzle to about the middle of the shoe and also enabled the vertical angle of the spray to be controlled.

An Indian fire pump nozzle was used since it had the required large output and the width of the spray cone could be adjusted. Nozzles with small bores were found to pass an insufficient amount of material in the time interval required and to have a lag or drool, i.e., the time required for reduction of pressure was too great and a dribble resulted. The nozzle should deliver about 8. 5 m. at a discharge if 2-1 /2 gallons of spray material is to be used per 1, 000 trees.

In practice the sprayer was tested by four men. All four experienced a little difficulty at first in coordinating the foot action with the time of planting and all held the "throttle" down too long at first with the result that only about 400 trees were treated with the first 2-1/2 gallons of spray material. However, it soon became almost automatic to press the foot pedal at the correct time to spray the tree roots and the ground around the space into which the tree was to be set, and the men quickly learned that only a slight, quick pressure was needed.

The nozzle was adjusted to deliver a cone spray narrow enough so that it did not touch the shoe but covered the roots and ground a little in front of the packing wheels. By directing the nozzle downward at the proper angle it was not difficult to avoid getting the spray on the hands. However, rubber gloves were worn as a precaution. It was necessary to repump the tank once during the expenditure of each tank of spray.

The apparatus described is. simple, inexpensive, requires practically no modification of the planter, can be used on any shoe type planter, and can easily be installed or taken off the planter.

The insecticide used in this work was an aldrin emulsion at a concentration of 1/2 of 1 percent.

It is the opinion of the senior author that this spraying device should be used whenever the grub population is one or more per two square feet. "'At two grubs per square foot, the resultant damage has been so great and survival so poor that it was recommended that planting of such areas be delayed (Rudolph 1950). In areas where May bettles are present, which have a life cycle of 2 years or less, it may be advisable to treat the trees even though no grubs are present, since wide spread damage may occur the same year as the flight of such species.

The sprayer described might also be used for other purposes, such as applying fertilizer as the trees are transplanted.

Literature Cited

(1) Rudolf, P. 0.
1950. Forest plantations in the Lake States. U. S. Dept. Agr. Tech. Bul. 1010:#1-171.

(2) Shenefelt, R. D. and Simkover, H. G.
1950. White grubs in Wisconsin forest tree nurseries. Jour. Forestry 48:#429-34.

(3) Shenefelt, R. D. and Simkover, H. G.
1951. White grubs and their control in forest tree nurseries. Tree Planters' Notes 7:#5-9.

(4) Stoeckeler, J. H. and Limstrom, G. A.
1942. Ecological factors influencing reforestation in northern Wisconsin. Ecological Monographs 12:#191-212.