PELLETING CONIFER SEEDS FOR CONTROL OF DAMPING-OFF

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The control of damping-off is one of the_. troublesome problems confronting the superintendent of a forest-tree nursery. Various methods have been used, depending on local nursery conditions. A fast and inexpensive method of damping-off control is needed, and pelleting of seed with a fungicide may be the solution at some nurseries. Pelleting is intended to coat the seed prior to sowing with a fungicide which will sterilize the soil in the immediate vicinity of the seed when it is planted, to sterilize the soil through which the germinating seed passes, and to protect the seedling after emergence by reason of the small quantity of fungicides which would be released from the seed coat to sterilize the stem until
the seedling passed the critical stage or as long as the seed coat remained attached to the seedling.

Some experimental work with pelleting seed has been done by John G. Berbee, Plant Pathology Department, University of Wisconsin., With some associates, he tested 28 fungicides over a period o13 years and found one which was quite effective for use in this manner. He also found that methyl cellulose was satisfactory for use as the binder needed to hold the fungicide to the seed. 1/

To determine whether pelleting would control damping-off tests were made in the spring of 1955 at the Union Tree Nursery operated by the Illinois Department of Conservation, Division of Forestry. Stratified shortleaf, loblolly, and Scotch pine seed were used. The seeds were pelleted immediately after they were removed from stratification and partially dried.

Two different fungicides--Captan 50W, and tetramethylthiuram disulfide (hereafter indicated as TMTD) which is sold under the trade names of Arasan SF-X, 75% Thiram, and Tuex--were tested. These two fungicides are very different chemically, but both are effective in controlling various fungus diseases. The fungicides were tested separately for comparison.

1 / The Prevention of Damping-off of Coniferous Seedlings. Univ. Wis. For. Res. Notes No, 14:. 2pp October 1954.

To make the fungicides adhere to the seed a solution of one part by measure of methyl cellulose powder in 15 parts by measure of water was used. Since methyl cellulose dissolves slowly, the solution was made several days in advance of its use.

The Dybvig seed cleaner was adapted for pelleting use by reducing the speed of the machine so that seed motion in the cleaner was gently-rolling. A small portion. of seed lying against the vanes of the agitator failed to go through the pelleting process. Most of these seeds did receive some coating of fungicide when the seed was placed on drying screens. This difficulty could be overcome by improving the design of the agitator and hopper. About 10 pounds of seed could be treated in about 5 minutes in this machine, but 7 to 8 pounds seemed to be the most satisfactory amount for best treatment.

The treating process consisted of placing seed in the hopper of the seed cleaner, starting the agitator, adding enough methyl cellulose to thoroughly moisten all the *seed,* and then adding enough powdered fungicide to almost dry up the methyl cellulose. The thickness of the fungicide coating was controlled by the quantity of methyl cellulose solution used; the more methyl cellulose used to wet the seed, the more fungicide used, and the thicker the coating. The motion of the agitator kept most of the seed from forming in a wad unless excessive amounts of cellulose and fungicide were used. As soon as the seeds were coated with the fungicide, the material was removed and placed on a drying screen. Stirring the seed a few times while on the drying screen broke up any small wads that occurred. Under normal conditions the drying of freshly coated seed took about 10 minutes. By volume measure, about 4 parts of fungicide were required to 1 part of methyl cellulose solution. If unstratified dry seed are used, slightly more methyl cellulose would probably be needed. The quantity of cellulose and fungicide to use for various seeds can best be determined through experience.

No injury to seed or seedlings was observed in any of the tests. The pelleting process did not damage the stratified seed; germination test rates were almost identical for treated and untreated seed. Treated and check beds were sown on April 27 and 28. The pelleted seed were sown just before the untreated and within 2 hours after pelleting. The pelleted seeds were larger than the untreated seeds and passed through the seeding machine less freely than the untreated seed. As a result, 13 to 47 percent less seed was sowed in the treated seedbeds than the untreated seedbeds, an important point to remember when considering the final results.

Personnel was not available to make repeated examinations of seedbeds during the critical period to measure the effects of the treatments. How-

ever, they were evident to even the casual observer. Counts of damping-off losses were made 21 days after sowing in the central row of various 8-row, 480 feet beds. The data are as follows:

	Seedlings damped-off[1/] (number)
Shortleaf pine, sand stratified, 50-percent germination:	
Captan 50W	43
TMTD	63
Check	305
Loblolly pine, sand stratified, 48-percent germination:	
Captan 50W	10
TMTD	10
Check	195
Loblolly pine, moss stratified, 69-percent germination:	
Captan 50W	5
TMTD	25
Check	310
Scotch pine, sand stratified, 96-percent germination:	
Captan 50W	110
TMTD	88
Check	370

1/ In contrasting these figures with each other the following facts should be borne in mind.

(1) These figures do not show how much, if any, pre-emergence damping-off occurred.

(2) Additional seedlings damped-off after the others were made, mostly in the untreated beds.

(3) Fewer seeds were planted in the treated beds.

Counts on August 1 showed that despite the reduced rate of sowing for treated seed, the number of live trees per linear foot in the treated beds equaled or exceeded the number in the untreated beds.

During the germinating period no molds grew directly above the drilled rows, which indicates that a narrow band of soil was effectly sterilized. No difference was noted in rate of germination between the treated and untreated beds. Moss stratified seed germinated slightly ahead of sand

stratified seed. There was no difference in the rate of growth of seedlings in the treated and untreated seed areas.

Bird damage in untreated beds was considerably more than in the treated beds. In fact, no bird damage was observed on any of the treated beds, but this might not have been true if the birds had had no untreated seed to feed on.

The possibility of incorporating a soluble fertilizer in the pelleting process had to be abandoned as the addition of soluable fertilizers to the methyl cellulose solution caused it to lose its adhesive quality. The incorporation of insecticides was not attempted but would be a possibility for control of grubs, cut worms, root weeviles, and wire worms.

This method of damping-off control will be used more extensively at Union State Tree Nursery. An attempt will be made to determine whether Captan 50W or TMTD is more effective although observations so far indicate very little difference in effectiveness between these two fungicides. Perhaps tests should be made to determine if a mixture of these two fungicides would increase the effectiveness of this method of control.

Since this method of controlling damping-off is less hazardous to use, less subject to error, and in most cases cheaper than other methods, any nurseryman producing conifer seedlings should give this method a trial.