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TREATMENTS FOR DAMPING-OFF IN STINCHFIELD NURSERY SOIL

by

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Introduction

Wherever coniferous stock is raised one of the greatest difficulties to overcome is damping-off which is caused by one of the fungi, Pythium, Fusarium, Rhizoctonia, or Corticium. Many methods have been used to prevent loss from these fungi but the proper one must be worked out by experiment for every nursery site.

Steam treatment has been used very effectively in some nurseries and would be more likely to meet the requirements for different soils than many of the chemical treatments. This is an expensive method and cannot be used in small nurseries such as the University of Michigan has. Chemicals have been used with great success in many nurseries but the proper chemical and concentration must be determined for each nursery.

In the spring of 1934 the first seed beds were put in the new nursery site on the Bell eighty of Stinchfield woods. There was a heavy loss from damping-off and this experiment has been run to try to determine the best chemical and concentration to use in treating the soil.

The Nursery Site

The Bell eighty of Stinchfield woods is located near Little Portage lake, Michigan and belongs to the School of Forestry and Conservation, University of Michigan.- The soil is a light sandy loam and goes to a depth of more than four feet. It is easily worked, holds moisture fairly well and does not form a crust or cake when dry. The nursery is in a depression between two low hills and is fairly well drained. The only trees around of any size are a few Juniperuss virginianna along the north side.

Methods and Treatments Used in Experiment

Bavarian Scotch pine, Pinus sylvestris, 1933 seed, was used in this experiment since it is very succeptable to damping-off and is to be used in the nursery. The seed was planted in small flower pots about five inches in diameter, fifty seeds per pot.

The chemicals used were formaldehyde, sulphuric acid, and mercuric chloride. The applications were all made on a square foot basis and are as follows; formaldehyde, 2/5 ounce per pint of water, 1/5 ounce per pint, and 1/8 ounce per pint. Sulphuric acid 1/16, 1/8, and 1/32 ounce per pint of water. Mercuric chloride, .05, .1, and .2 grams per pint of water. Three pots were used for each treatment except with sulphuric acid where four were used, making 36 pots with three for germination and three for controls which were untreated. The seeds in one or two pots of each

set of treatments were soaked in a solution of Semesan (1 gm. to 400 cc. water)for a half hour before planting.

The formaldehyde was applied seven days before planting and the other chemicals applied at the time of planting. The pots were given about 25 cc. of water per day and this was varied enough up or down to keep the soil moist all the time.

RESULTS

Formaldehyde treatments

Of the three concentrations used the least damping-off was in the pots treated with 1/8 ounce. The other two treatments showed about the same results but the germination was higher in these two than in thoes treated with 1/8 onnce. No better results were shown in the pots where the seed had been treated with Semesan before planting. The damping-off was about 20% less than in the control .

Sulphuric acid treatments

The treatment of 1/8 ounce per square foot showed the best results with 32.1 per cent damping-off. The germination energy was better in all the sulphuric acid treatments than in any of the other pots, being over 80 per cent in these and only 64.7 per cent in the check pots. This treatment showed the best results of any used and the germination was a little better in the pots where the seed were treated before planting.

Mercuric chloride treatments

This treatment showed no very satisfactory results but .2 of a gram seems to be best of the concentrations used.

Chemical Treatments and Results

Treatment	Pot number	Total germination	Damping-off %	Damping-off av.%	Germination energy (15 days after ger. started) %	Germination energy av.%
Formaldehyde 2/5 oz./sq. ft.	1	33	30		62	
	2	33	48	52.7	56	60.7
	3*	34	79		64	
1/5 ounce per sq. ft.	4	29	62		52	
	5	36	47	52.0	66	66.6
	6*	45	47		82	
1/8 ounce per sq. ft.	7	35	51		33	
	8[1]	--	--	39.1	--	58.0
	9*	26	27		25	
H_2SO_4 1/8 ounce per sq. ft.	20	40	50		76	
	21	44	25		80	
	22*	45	17	32.1	86	81.5
	23*	45	35		84	
1/16 ounce per sq. ft.	16	43	74		84	
	17[1]	--	--		--	
	18*	45	51	57.2	86	86.0
	19*	48	46		88	
1/32 ounce per sq. ft.	24[1]	--	--		--	
	25	39	49		76	
	26*	47	45	46.4	88	84.0
	27*	48	46		88	
Check no treatment	13	33	54		60	
	14	29	69	60.9	54	55.3
	15	27	59		52	
Germination check	10	38			68	
	11	28			54	64.7
	12	42			72	

* Seed treated with Semesan before planting.

1. Failed to germinate and were discarded.

Chemical Treatments and Results (continued)

Treatment	Pot number	Total germination	Damping-off %	Damping-off av.%	Germination energy (15 days after ger.started) %	Germination energy (15 days after ger.started) av. %
Mercuric chloride .05 grams per sq. ft.	28	38	66		74	
	29	40	50	66.6	72	72.7
	30	38	84		72	
.1 gram per sq. ft.	31	45	69		88	
	32	34	59	75.9	62	60.0
	33	15	100		30	
.2 gram per sq. ft.	34	19	58		36	
	35	44	40	49.8	86	61.3
	36	33	51		62	

They all showed over 50 per cent damping-off and no great increase in germination energy.

General dicussion and recommendations

The seedlings in the pots treated with sulphuric acid seemed to be making the best growth but the experiment was not run long enough to draw any definite conclusions about growth without more accurate measurements. The seed started to germinate March first and the experiment was ended May fourth.

Pots 8, 17, and 24 held water much better than the others for some unknown reason, and remained so wet that practically no germination took place and so were discarded as noted in the table.

The above experiment shows that there will be about 60

per cent damping-off in the Stinchfield nursery soil unless some treatment is used to prevent it. On the basis of this experiment I would recommend the use of sulphuric acid, 1/8 of an ounce per square foot, or 6 ounces of commercial acid to a 4 X 12 foot seed bed. I would also recommend that experiments be run in the nursery with different concentrations of formalin and sulphuric acid since the weather seems to play a great part in the damage caused by damping-off and this cannot be controled in the labratory.

A point of interest in the experiment is the fact that the germination was much better in all the pots treated with sulfuric acid than in any of the others. Treating the seed with semesan did not improve the germination materially or prevent damping-off so I would not recommend its use in this way.

One of the disadvantages of the sulfuric acid treatment is the fact that it does not keep down weeds while formalin will to some extent. Weeds had started in the pots treated with sulfuric acid but had not in any of the other pots at the time the experiment was closed.