

CONTROLLING DAMPING-OFF OF RED PINE IN QUEBEC NURSERY

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In Quebec nurseries, mortality by damping-off ranges annually between 20 and 65 percent of all the coniferous seedlings emerged (Pomerleau and Nadeau, 1959). To lower these losses, seed pelleting with Captan 50W has been used with satisfactory but variable results for the last few years.

We wanted to compare a soil fumigant, Trizone, with two fungicides, Thiram SF-75 and Zyneb 50W. Trizone and Zyneb 50W gave good results on red pine.

Procedure

The experimental design included the following four treatments, located in a random pattern and replicated 4 times: (1) Trizone-treated soil; (2) untreated soil containing seed pelleted with Thiram SF-75 at the rate of 8 ounces per pound of seed; (3) untreated soil containing seed pelleted with Zyneb

OW at the rate of 8 ounces per pound of seed;

(4) untreated soil. All the seeds used were pelleted with anthraquinone. The sticking material was a 2-percent methyl cellulose solution.

Plots (4 X 25 ft.) were subdivided in two subplots: one to be sown in the fall of 1965 and the other in the spring of 1966. Two counting areas

(0.5 X 4 ft.) were established in each subplot. Seedling emergence and mortality were recorded from the beginning of germination until the end of July 1966. A final count of survival was done on Sept. 2. The seeds used were red pine (*Pinus resinosa* Ait.) and white spruce (*Picea glauca* (Moench) Voss).

Trizone was applied at 180 pounds per acre with an injector similar to the one used by Wright (1964).

In the fall of 1966, 15 seedlings were removed at random from each subplot and examined for growth differences. Measurements were made of height, stem diameter, and dry weight of tops and roots. The abundance of mycorrhizae, and the colour of needles using Munsell colour charts (1952) and values proposed by Wilde (1958),

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TABLE 1.—Percentage of survival and mortality after one growing season and result of Duncan's Test

Treatments	Fall			Spring		
	Survival	Duncan's test ¹	Mortality	Survival	Duncan's test ¹	Mortality
Thiram-----	17	}	21	20	}	25
Check-----	24		13	43		32
Zyneb-----	26		8	46		21
Trizone-----	36		7	59		11

¹ Treatments within the same bracket are not significantly different.

were also noted. The data on seedling survival at the end of the first growing season were subjected to the analysis of variance, and Duncan's new multiple-range test was used to compare means. ²

Results

The results discussed hereafter concern red pine only. Several factors occurred during the germination of white spruce so that no analysis of this species has been possible.

The analysis of variance for the survival data shows significant differences (at 1-percent level) between the two sowing seasons and between the treatments (table 1). Moreover there is no difference between the three treatments, taken as a group and the check. This is due to the Thiram mean being inferior to that of the check, thus bringing back the treatment mean relatively equal to the check.

For both seasons, seeds sown in Trizone-treated soil emerged and survived in greater number than with other treatments. Trizone gave also the lowest

² The authors wish to acknowledge Dr. Aurele Richard, Professor of Statistics, Faculty of Forestry and Geodesy, Laval University, for his help and comments in the analysis of the data in this experiment.

TABLE 2.—Mean weight and sizes of red pine seedlings after one growing season

Measurements (Mean of 60 seedlings)	Thiram		Check		Zyneb		Trizone	
	F	S	F	S	F	S	F	S
Height (cm)-----	3.75	2.83	2.90	2.51	3.05	2.93	2.70	2.46
Diameter (mm)-----	1.41	1.12	1.17	1.00	1.17	1.07	0.96	0.87
Tops weight (g)-----	3.6	2.1	2.2	1.8	2.1	2.0	1.6	1.4
Roots weight (g)-----	2.2	1.8	1.7	1.5	2.1	2.0	1.3	1.2

mortality. Similar results are reported by Smith and Bega (1966) and by Wright (1964).

Red pine seeds sown in fall germinated promptly in spring (May 15-20), but those sown in spring emerged in greater number. In both cases, dampingoff losses extended over about one month during which seedlings became lignified. Losses were over about the end of June.

Thiram gave no satisfactory results under our conditions of soil and climate. The same observation was made in a previous work (Campagna and Lamontagne, 1966). However, Cockerill (1955, 1961) and Shea (1959) have obtained good results in using this fungicide.

In the same report (Campagna and Lamontagne, 1966) it was stated that Zyneb 50W was very promising in controlling damping off. The present test confirms this statement. Moreover, Zyneb 50W gave an acceptable seedling stand.

The colour of needles indicates a phosphorus deficiency of seedlings grown on Trizone-treated seedbeds. This element being needed for the development of rootfibers (Naudet, 1966; Wilde, 1958), the lack of it should explain in part why the dry weight of these roots is lesser than those of the other treatments (table 2).

Trizone hindered the development of mycorrhizae during the first growing season. This could have blocked the assimilation of certain nutritive elements. The chemical analysis of tissues should confirm this statement.

Conclusion

This experiment shows that it is possible to control damping-off by using Trizone or Zyneb 50W, leaving more viable seedlings per square foot.

Under the conditions of the experiment, Trizone did not give seedlings as healthy as those obtained by Anderson, 1963; Haasis and Sasser, 1962, and Wright, 1964. This could be imputed in part to the phosphorus deficiency. So it will be interesting to know, by further tests, if appropriate fertilization could not reduce or prevent this deficiency in order to obtain well-balanced seedlings after one growing season.

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