

WINTER INJURY BY ICE AND SNOW TO RED PINE NURSERY STOCK

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During the spring of 1966, severe mortality occurred in several nurseries in Michigan, Wisconsin, and Minnesota. Beds of many red pine seedlings were almost totally destroyed. Dead and injured trees exhibited both terminal bud dieback and stem lesions. This situation was unprecedented and totally unexpected. Efforts made by the North Central Forest Experiment Station to determine the cause were only partially successful. Scleroderris canker was suspected as the cause of this mortality, but, despite numerous isolation attempts, Scleroderris was isolated from only a few trees in one nursery. As the summer of 1966 progressed, many of the trees that had appeared dead in the spring developed new shoots at the base of the seedlings. By late fall these trees, although smaller than normal, appeared in good health. It seemed that the agent responsible for the losses was not active during the warm summer months.

One possible cause for this mortality was physiological damage due to severe weather changes. The late winter and early spring of 1966 were unusual in several aspects. A warm period with rain in February was followed by a cold period. Spring was unusually late and was characterized by warm periods followed by severe temperature reductions. Nursery stock was not lifted until the last week in April.

Numerous workers have commented on the deleterious effect of this type of weather on young nursery stock. Bjorkman (1963) in Sweden believed that a February thaw followed by freezing weather in 1958 caused a compact ice layer that contributed to the death of several million nursery seedlings. Eiche (1966) states that Scotch pine in Sweden is frequently injured by the rupturing force of an ice crust formed by melting snow and temporary freezing of melt water. But these theories have not been substantiated by experiments. The purpose of this study was to find out how much nursery seedling mortality is caused by adverse weather conditions.

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Materials and Methods

The study was established in the fall of 1966 in 2-0 red pine beds at the Tourney Nursery, Watersmeet, Mich.

Five treatments were established as follows: (1) no snow. A plywood box was placed over the nursery bed plots to prevent snow cover developing.

(2) Deep snow. The snow depth was maintained at a minimum of 12 inches. (3) Winter rain. During the first warm period in January, 1 inch of water was added to the plots to create an ice slush, and a metal border was erected around each rain plot to retain the moisture. (4) Compacted snow. The snow was kept packed over the beds to reduce its insulation value. (5) Untreated plots.

Each plot was 2 by 4 feet with a 3-foot isolation strip between plots. Each treatment was assigned at random to three plots.

In June 1967, 100 trees were selected at random from each of the 15 plots. These trees were sliced open on two sides from the root crown to the terminal bud. The cambium zone on each tree was rated on the number of basal cankers and lesions. The terminal buds were also examined for dieback symptoms.

Results

No evidence was found that any of the treatments caused either terminal dieback or stem lesions (table 1). The winter rain treatment was expected

TABLE I.-Condition of cambium zone and terminal buds of 20 red pine following winter weather treatments

Treatment	Condition of stem cambium area	
	Healthy <i>Number</i>	With lesions <i>Number</i>
None	299	1
Deep snow	294	6
Winter rain	299	1
No snow	298	2
Packed snow	294	6

to produce numerous stem lesions where the ice crust formed, but no such injury was found. The plots were observed for one additional growing season, but no subsequent damage appeared.

Severe winter weather may occasionally damage pine nursery stock, however, under the conditions of this test no evidence of damage was found. What then was the cause of the damage to red pine stock in the spring of 1966? Recent work by plant pathologists at the North Central Station indicates that certain needlecast fungi probably were the cause of

this injury. Work is still in progress on this phase of the study and will be reported later.

Literature Cited

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