PLANTING TRIALS WITH TRANSPIRATION RETARDANTS IN CALIFORNIA

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For at least 20 years foresters have been experimenting with methods designed to reduce transpiration from planted conifers. The object is to decrease the water requirement of the plants until the root systems become adjusted to their new environments and are able to supply enough water for the trees to survive. Despite the fact that relatively few clearcut instances of success have been published, considerable enthusiasm for use of transpiration retardants exists. For example, TREE PLANTERS' NOTES presented an article on the subject a few years ago.2/

This report describes the results of five experiments with three commercially manufactured transpiration inhibitors--an emulsified wax, a vinyl latex, and lanolin--at the California Forest and Range Experiment Station. Since the results were largely negative or inconclusive, our purpose is to report that we question whether the transpiration retardants as ordinarily applied to lifted trees are consistently beneficial in California.

Experimental Trial

The first four experiments were purposely conducted under difficult conditions--either on difficult planting sites or with stock of low vitality. The last test planting was with good stock on a good planting site. We reasoned that only under rather difficult conditions could beneficial effects of the treatments be demonstrated. On favorable planting sites with good stock we ordinarily expect that 80 or 90 percent of the trees will survive the first year, and hence comparatively little

1/ Maintained by the Forest Service, U. S. Department of Agriculture, in cooperation with the University of California, Berkeley, California.

2/ Maguire, W. P. Some observations on the use of the transpiration inhibitor "Plantcote" on lifted tree seedlings. Tree Planters' Notes No. 12, pages 15-17. November 1952.

further improvement would be expected. The five experiments were as follows:

1. In the spring of 1949, 1-1 ponderosa pine stock was top dipped in mixtures of 1 part emulsified wax to 2 parts water and 1 part emulsified wax to 4 of water. Each treatment and the control contained 500 trees. They were field planted in 10 randomized blocks on a dry south slope in the Plumas National Forest.

2. The next spring 1-1 Jeffrey pine stock, of rather poor quality, , was treated with emulsified wax and with vinyl latex in water at concentrations of 1 to 2 and 1 to 4. There were 125 trees in each of the concentration levels of the 2 compounds and in the control. They were planted in five randomized blocks on a good site on the Stanislaus Experimental Forest.

3. In the fall of 1950 and spring of 1951, 1-1 sugar pine stock was top dipped with emulsified wax and with vinyl latex in concentrations of 1 to 2, 1 to 4, and 1 to 6. This stock had very poor root systems, resulting from damage by white grub and from attempts to control the insects. Each treatment method and the control was represented by 125 trees in the fall and in the spring. The stock was out-planted in a randomized block design on the Stanislaus Experimental Forest.

4. In the fall of 1953, 1-1 ponderosa pine stock was immersed in water containing 4 percent lanolin and 1 percent soap. The soap was used as an emulsifier. The planting test contained 2, 400 trees—half of them were dipped in the lanolin solution and the other half used as controls. The trees were stored over-winter in a refrigerator at 34°F. and field planted the following spring on a difficult site in the Modoc National Forest.

5. The last test, conducted during the fall of 1953 and spring of 1954, was a comparison between 1-1 ponderosa pine stock stored overwinter and spring-lifted stock field planted on a good site on the Trinity-Shasta National Forest. Shortly after lifting, half of the stored stock and half of the spring-lifted stock were immersed in a lanolin solution of the same concentration as in the above experiment. The test planting contained 2, 000 trees in 10 randomized blocks.

Experimental Results

None of the treatments with transpiration retardants were very effective in increasing survival. In the first test, survival of untreated ponderosa pine stock at the end of the first year. was 21 percent; of stock dipped in a 1-2 mixture of emulsified wax, 16 percent; and of stock dipped in a 1 to 4 mixture, 21 percent.

In the second trial the survival of poor quality Jeffrey pine stock appeared to be increased by treatment with each transpiration retardant, as shown in the tabulation below:

Treatment	First-year survival (percent)
Untreated	10
Vinyl latex 1:2	20
Vinyl latex 1:4	28
Emulsified wax 1:2	16
Emulsified wax 1:4	28

However, owing to the great variability within individual treatments, differences as great as these could have resulted from chance alone.

The third trial, with sugar pine stock, showed no consistent responses to the transpiration retardants. The following tabulation suggests that same treatments assisted in increasing survival, but again the differences were not significant.

In the fourth test, with stored ponderosa pine stock, an examination made about 3

Treatment	Survival Fall-planted (percent)	Survival Spring-planted (percent)
Control	14	25
Vinyl latex 1:2	20	27
Vinyl latex 1:4	28	13
Vinyl latex 1:6	16	24
Emulsified wax 1:2	11	23
Emulsified wax 1:4	15	22
Emulsified wax 1:6	16	36

months after planting indicated a substantial benefit from the lanolin treatment--80 percent survival for lanolin-dipped stock compared to only 37 percent for the untreated. However, by the end of the first growing season, even though the lanolin treated trees still showed better survival--13 percent compared to 2 percent, the difference in survival was of no practical importance.

In the last test planting, with stored and fresh-lifted ponderosa pine stock, untreated fresh-lifted stock had the highest survival (75 percent) and stored stock which had been dipped in lanolin had the lowest survival (46 percent),. Survival of lanolin treated fresh-lifted stock was 68 percent--77 percent lower than the untreated control. Survival of the untreated stored stock was 52 percent--23 percent lower than the control.

Negative results such as those reported here, of course, do not prove that transpiration retardants cannot be beneficial if the right materials, methods, or conditions are discovered. The results do indicate, however, that further investigation is needed before general application is warranted.