EFFECTS OF A TRANSPIRATION RETARDANT AND ROOT COATING ON SURVIVAL OF DOUGLAS-FIR PLANTING STOCK

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Introduction

Experience shows that natural seeding cannot be relied upon to regenerate logged Douglasfir areas in California. Since artificial seeding is still new and uncertain, foresters probably will continue to rely on planting for several years to regenerate logged or burned forest land. Unfortunately, survival of Douglas-fir plantations has not been consistently satisfactory. We need to know how to obtain better results.

Investigators, hoping to increase survival of planted trees, have tested transpiration retardants (2, 3, 4, 5).[1] Results of their experiments have been inconsistent. In some trials transpiration retardants have slightly improved low survival rates, but results were still too poor to be acceptable. In other trials transpiration retardants decreased survival, while still other times field tests showed no differences in survival between treated and untreated trees.

This study tested the effects of two relatively new products on planting stock survival and growth. The first, Rutex Foli-gard (formerly Rutex W-3), a transpiration retardant, was sprayed on seedling foliage; and the second, Rutex 59 (Hygrostat), a water absorbing material, was applied to seedling roots.

The manufacturer [2] describes Foli-gard as a modified type, water-soluble polymer which forms a continuous film upon drying. When sprayed on foliage and stems of plants it forms a clear, flexible film. When Foli-gard is wet it absorbs water and swells, yet the film does not wash off or disintegrate. This film reduces water transpiration considerably, but allows passage of carbon dioxide and oxygen. Foligard treatment protects plants against injury from excessive moisture losses including those caused by harsh winter winds, sudden temperature changes, and freezing.

Rutex 59, a solution of a plasticized acrylictype polymer which has high water absorbing and retaining qualities, is applied to roots of plants by dipping or spraying. It produces a flexible sponge-like film around roots and absorbs and holds water for extended periods. Developed as a substitute for packing materials in bare-root shipping, this material has been used successfully for roses, fruit trees, shade trees, and ornamental evergreen shrubs.

The Study

Douglas-fir 1-0 seedlings grown from seed collected in California Seed Zone XI (Coast Range Douglas-fir) (1) were lifted and treated at the U.S. Forest Service Nursery, Placerville, Calif., on January 24, 1962. The treatments were:

1. Tops sprayed with Foll-gard
2. Roots dipped in Rutex 59
3. Tops sprayed with Foli-gard and roots dipped in Rutex 59
4. Control

Foli-gard was sprayed on seedlings before removing them from the nursery bed. The formulation was one part Foli-gard to four parts water. It was sprayed from a 2-gallon, gardentype pressure sprayer with a nozzle adjusted to produce a fine mist. The foliage was allowed to dry for 2 hours before seedlings were lifted.

Roots treated with Rutex 59 were coated by dipping them in a 1:1 v/v water solution. Two-thirds of a quart treated 200 seedlings. Excess

[1] Italic numbers in parentheses refer to Literature Cited at the end of this article.

[2] Rutex Foli-gard and Rutex 59 were supplied by the UBS Chemical Company Division of the A. E. Staley Manufacturing Company. Mention of trade names and commercial enterprises or products is solely for necessary information. No endorsement by the U.S. Department of Agriculture is implied.

material was allowed to drain before placing this planting stock in polyethylene bags without packing media. The roots of other seedlings were packed, according to current standard practice, in a wet mixture of shingle-tow and coarse vermiculite wrapped in waterproof paper.

Planting stock was placed in cold storage until January 29, when it was shipped to the Lower Trinity Ranger District, Six Rivers National Forest, in northwestern California. Trees were planted on February 13 during a rain which varied from a fine mist to a heavy downpour. At planting time, tree conditions were evaluated subjectively. The roots treated with Rutex 59 were very moist--more so than the moist untreated roots packed in shingle-tow and vermiculite. Appearances of seedling tops did not differ by treatments.

The experimental planting consisted of four randomized blocks with four plots within each block. Each plot, or row, was planted with 25 trees receiving one of the treatments. The planting site selected was within a deer exclosure on Block 12, Hennessy Unit, near Salyer. This block lies at an elevation of 3,000 feet and slopes to the north at rates of 30 to 40 percent. The soil series was classified as Hugo with hard metasedimentary rocks--largely sandstone and phyllite--as parent material.

The planting was examined on June 15, July 24, and August 24. Trees were rated by vigor (vigorous, medium, poor, or dead), and heights were measured at each examination. The vigor classifications were based upon foliage color, needle complement, needle length, and number of buds.

Results

TABLE 1.--First-year survival of 1-0 Douglas-fir seedlings

Treatment	Survival on--					
	June 15		July 24		August 24	
	Mean	Range	Mean	Range	Mean	Range
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Control............	97	92-100	94	80-100	85	72-100
Foli-gard..........	95	88-100	89	72-100	85	68-96
Rutex 59...........	90	80-96	76	72-84	64	56-68
Foli-gard--Rutex 59...............	89	76-100	80	68-92	65	52-80
Total...........	93	76-100	86	68-100	75	52-100

Seedlings packed in shingle-tow and vermiculite for shipping performed b e s t. Their survival was 20 percent higher than that for seedlings treated with Rutex 59 and shipped in polyethylene bags (table 1).

Seedling vigor, as indicated by height growth, differed among treatments (table 2). Mean growth was significantly greater for trees treated with Foli-gard and shipped in shingle-tow and vermiculite. Rutex 59 depressed height growth. The subjective vigor classifications assigned to seedlings in the

TABLE 2.--Height growth of 1-0 Douglas-fir seedlings

Treatment	Height growth	
	Mean	Range
	Inches	*Inches*
Control............	1.74	0.5-6.1
Foli-gard..........	2.04	0.3-4.7
Rutex 59...........	1.48	0.0-3.5
Foli-gard--Rutex 59	1.42	0.0-5.6
All.............	1.70	0.0-6.1

TABLE 3.--Surviving 1-0 Douglas-fir by vigor class at the end of the first growing season

Treatment	Seedlings surviving when vigor classes were--					
	Vigorous		Medium		Poor	
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
Control............	19	22	63	74	3	4
Foli-gard..........	28	33	52	61	5	6
Rutex 59...........	16	25	47	73	1	2
Foli-gard--Rutex 59	7	11	49	75	9	14
Total...........	70	23	211	71	18	6

field also suggest, although somewhat weakly, that the Rutex 59 treatment may reduce vigor (table 3).

Discussion

Results in this small, exploratory test indicate that the shipping methods now used by the U.S. Forest Service nurseries in California are preferable to dipping roots in Rutex 59 and shipping them in polyethylene bags. Shipment in polyethylene bags, however, reduces costs of packing materials, labor, and shipping. Furthermore, survival of trees packed this way compared favorably with survival rates now common for Douglas-fir plantations in California. Additional trials should test this method further.

Treatment with Foli-gard did not seem to affect tree survival, but this transpiration retardant may increase seasonal growth. This possibility also should be tested by more experiments.

Literature Cited

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