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EFFECT OF TWO COMMERCIAL PREPARATIONS ON ROOT INITIATION OF DOUGLAS FIR NURSERY STOCK

Verne R. Osburn 1/

California's usual summer drought, and consequent lack of soil moisture replenishment during this period, is thought to be one of the factors responsible for the planting failures which have occurred in the State. In an attempt to overcome this difficulty, two readily available and relatively inexpensive commercial preparations: "GRO-FAST" and "TRANSPLANTONE," were initially tested on Douglas fir (Pseudotsuga menziesii) and ponderosa pine (Pinus ponderosa) nursery stock. It was hoped that the preparations investigated would stimulate the early initiation and growth of roots. This might enable the root system of seedlings to penetrate the soil fast enough to keep ahead of receding soil moisture during the summer months.

The Gro-fast preparation tested contained 100 p.p.m. giberellins (gibberellic acid). The claim of the manufacturer was that it would produce more rapid and erect stem growth. Even though no statement was made regarding the effect of the compound on root growth, it was hoped that stimulation of the crown might be accompanied by an accelerated root growth. The Transplantone material contained naphylacetamide and vitamin B-1. It was claimed to invigorate roots and reduce losses in transplanting.

Method

Ninety 2-0 Douglas fir seedlings, root pruned to a uniform length of eight inches, and thirty 1-0 ponderosa pine seedlings were used in the experiment. The ponderosa pine suffered initial losses in both treated and untreated stock after transplanting. While these losses could not be correlated with the treatments, depletion of the stock made it impossible to continue work with the pines. The Douglas fir stock was lifted on March 25, 1958, and held in cold storage at 34 degrees F. for thirty days prior to treatment and planting. Due to unavoidable limitations in the stock available for this test, the seedlings were relatively small and in poor condition. The groups were graded insofar as possible to achieve equal size and vigor for each type of treatment.

1/ Forest Technician, Service Forester, California Division of Forestry, Redding, California.

Gro-fast was applied by spraying each individual seedling with the spray applicator provided with the retail product. Sufficient solution was applied so that small droplets of the solution formed on the treated portions. This was in accordance with the manufacturer's specifications. Transplantone was applied to the seedlings by preparing a standard solution and immersing the roots of the seedlings to be treated for a two-hour period immediately prior to planting. This was not in accordance with the manufacturer's recommendations which would have required an exorbitant amount of solution per seedling. The method used could be easily duplicated in a field or nursery transplanting operation. The Gro-fast cost about five cents per seedling for treatment. The Transplantone solution was not used completely during the test. It was estimated one gallon of solution would treat about 550 seedlings at a cost of .04 cents per seedling. The treatments used and the number of seedlings treated were:

Test 1.	Control - no treatment	20 seedlings
Test 2.	Gro-fast on tops	15 seedlings
Test 3.	Gro-fast on roots	10 seedlings
Test 4.	Gro-fast on roots and tops	10 seedlings
Test 5.	Transplantone on roots	20 seedlings
Test 6.	Gro-fast on tops and Transplantone on roots	15 seedlings

After treatment each seedling was individually planted in a tar paper pot. The pots were constructed so that they could be broken apart easily for examination of root development. Sixty pots four inches in diameter and thirty-six inches deep, and thirty 4 by 18 inch pots were used. After planting in the tar paper pots the seedlings were watered once every two weeks during the summer months.

At intervals of two, six, fourteen, twenty, and seventy-five weeks after transplanting, two or four seedlings from each treatment were selected as having as closely comparable tops as possible, and the pots were broken down for measurement of the seedlings. The number of new rootlets and shoots were counted, and the length of root and top shoots measured. The total density of the root system was described subjectively.

Results

Treatment with the giberellic acid compound, Gro-fast in Tests 2, 3, and 4, did not significantly increase either top or root growth. While the recommended treatment was followed, additional doses or other rates of application may be necessary to stimulate crown development of Douglas fir. It is possible that the dormancy of the stock upon removal from cold storage had an inhibiting effect since the stock was treated almost immediately after being removed; however, if this were true it could be assumed that the Transplantone treated stock would have behaved in a similar manner.

Seedlings treated with Transplantone generally showed accelerated root initiation and development. (Table 1 shows the data from Test 5. Test 6 gave comparable results to Test 5.)

Only very tentative conclusions can be drawn from the measurements. Due to

the small size of the test and limitations in the available number of seedlings, it was difficult to find comparable or representative examples of equal crown size for all comparisons. This difficulty became worse as the test progressed and the remaining samples became more limited. For this reason inherent

Table 1. Root and crown development of Douglas fir seedlings treated with Transplantone compared with untreated control seedlings. (Test 5).

Item	Time After Transplanting (date)									
	2 weeks (5-8-58)		6 weeks (6-5-58)		14 weeks (8-1-58)		21 weeks (9-19-58)		75 weeks (10-7-59)	
	1/ TPT	C	TPT	C	TPT	C	TPT	C	TPT	C
Number of Samples	2	2	2	2	2	2	4	4	2	2
Root Development:										
Total number new rootlets	8	0	30	12	55	21	-	-	-	-
Average length new rootlets (in.)	0.1	0	1.8	1.0	4.2	2.8	-	-	-	-
Length of longest root (in.)	0.2	-	3.2	1.9	8.0	5.1	14.5	4.2	-	-
Total length root system (in.)	-	-	-	-	16	13	22	12	34	22
Density of root system 2/	L	VL	L-M	VL	H	M-H	M-H	L-M	H	L
Crown Development:										
Total number new shoots	2	0	8	3	12	10	14	9	-	-
Average length (inches)	.15	0	1.3	0.8	1.6	1.4	1.9	1.1	-	-
Length of longest shoot (in.)	.20	0	1.8	1.0	3.2	1.9	2.6	1.5	-	-
Crown height (inches)	-	-	-	-	-	-	-	-	11	5

1/ TPT is Transplantone treatment; treatment C is control or untreated
2/ VL-very light; L-light; M-medium; H-heavy

differences between seedlings may be reflected to some extent in the data for specific dates. By the same token the small size of the pots and the watering schedule probably affected lateral root growth and total root length in the later stages of growth. However, since the primary purpose was to test for root initiation and all stock was treated similarly, this was not considered to be a serious limitation.

The stock treated with Transplantone showed visible signs of root development two weeks after transplanting while the control and Gro-fast treated stock did not. This initial advantage continued and at six and fourteen weeks after transplanting, about twice as many rootlets were apparent on the Transplantone treated stock. These rootlets were also nearly twice as long as the roots that had then initiated on the control stock. The initial advantage of the Transplantone treatment continued into the second growing season. However, this increased growth probably reflects the relative vigor of the seedlings following the first year rather than any carry-over effect from the chemical treatment. Figure 1 shows the difference between the best of the remaining Transplantone treated and control seedlings which were allowed to grow 75 weeks from transplanting.

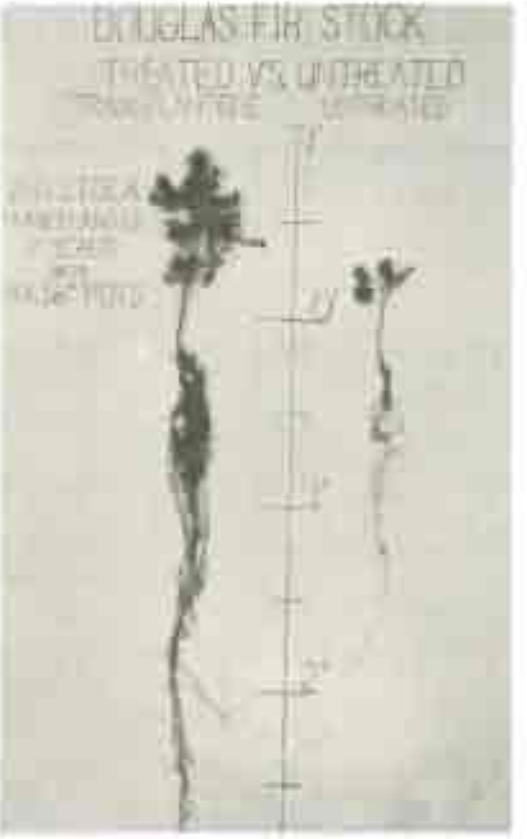

Fig. 1. Comparison of best remaining Transplantone-treated and control Douglas fir seedlings after 75 weeks.

Summary

It was not expected that it would be possible to derive definite conclusions from such a small and relatively uncontrolled study. However, the following observations are noted as a record and a basis for possible further investigation.

1. No mortality due to treatment with either Transplantone or Gro-fast was experienced with Douglas fir stock, even though the seedlings were small and in poor condition. The reason for mortality in ponderosa pine stock could not be determined.

2. No distinct effect of the Gro-fast giberellic acid treatment could be determined from comparison with the control plants. In addition the treatment with Gro-fast was expensive and time consuming.

3. Douglas fir seedlings treated with the commercial preparation Transplantone seemed to show a definite and early stimulation of root growth. The improved length and density of the root systems of the treated seedlings were maintained through the second growing season. The method of treatment was simple, inexpensive and adaptable to nursery or field conditions.

It should be noted that since the conclusion of this investigation in 1959, Transplantone has been used to treat seedlings for a large field planting by a timber company in northern California and on an initial experimental planting under the direction of the forester in charge of the California Division of Forestry Nursery at Magalia. Preliminary results seem to indicate a higher survival rate for the Transplantone treated material when compared with untreated stock. The small size of the control area on the private company planting, however, precludes a sound survival comparison.

While the results of this preliminary investigation are not conclusive, they indicate that further and more closely controlled investigation of the use of Transplantone to reduce losses in field planting is warranted and desirable.

From
CALIFORNIA DIVISION OF FORESTRY
301 State Office Building No. 1
Sacramento 14, California

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