

THE EFFECT OF SHORT-TERM EXPOSURE OF ROOTS
ON SURVIVAL OF 2-0 DOUGLAS-FIR STOCK

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Short periods of exposure to sun and wind are unavoidable when planting stock is handled either in the nursery or in the field. The general practice of holding such periods to a minimum certainly ought to be continued. But as Wakeley (4) has pointed out, misconceptions regarding the duration of exposure required to produce harmful effects may result in unnecessary and costly culling of good stock.

There are indications that seedlings are less sensitive to exposing roots for short periods than is commonly believed. Exposures of less than 20 minutes did not reduce substantially first-year survival of 2-0 eastern white pine (5, 6) and of 1-0 shortleaf pine (1). Similar results were obtained in an experiment (2) involving several species of deciduous trees. On the other hand, a recent paper (3) emphasized that 2 minutes of exposure led to 50 percent mortality of 1-0 Scotch pine in cloudy weather and resulted in loss of 80 percent of the seedlings in hot, clear weather. The present trial was made to determine whether short exposure of roots would have serious consequences for 2-0 seedlings of Douglas-fir.

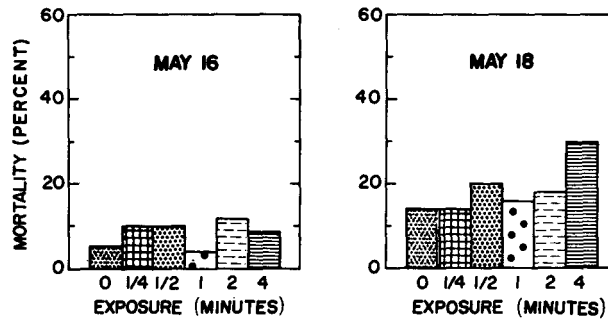
Roots of seedlings were exposed prior to planting for one of the following periods: 15 seconds, 30 seconds, 1 minute, 2 minutes, 4 minutes. Controls were transferred without delay from the planting bag into the ground. The first planting was made on May 16, 1961, of 50 seedlings for each period of exposure. Planting commenced at 9 a.m. and terminated around 3 p.m. Seedlings were planted in groups of six, one for each length of exposure, so that all treatments were represented for the entire period of planting. Following the same procedure and with the same numbers of seedlings, further plantings were made on May 18, 19, and 22. Seedlings planted on May 16 and 18 had their roots well puddled in soupy mud. Roots of seedlings planted on May 19 and 22 were kept moist by wetting the vermiculite in the planting bag.

All stock had been lifted during the last week of April in the Oregon State Forest Nursery at Corvallis. Seedlings had been graded for size and were about 8 inches in height. They were kept in cold storage at 35° F. until planting. When seedlings were planted they were extremely close to bud burst. All were planted by the same person with a Michigan planting bar. Spacing was 3 by 3 feet. The planting site, an old pasture adjacent to the Forest Research Laboratory, was kept free of grass and weeds.

Inspection on August 1, 1961, showed that puddling the roots had a much greater effect on survival than did the periods of exposure in this trial (fig. 1). The difference between mortality for puddled and unpuddled seedlings was highly significant.

Few of the seedlings planted on May 16 died, and a relationship between duration of exposure and mortality was not apparent. However, consistently higher mortality was observed for seedlings exposed 4 minutes when planted on May 18, 19, and 20. Statistical analysis of the data showed that mortality after 4 minutes of exposure was significantly higher than after exposure of one minute, or 30 or 15 seconds. The relatively high mortality of unexposed seedlings planted on May 19 and 22 is difficult to explain. Perhaps some mechanical damage was done to the roots by trying to get the seedlings into the ground as quickly as possible.

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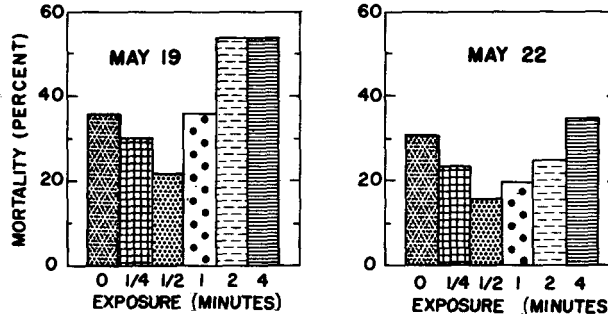


Figure 1.--Relationship of mortality in Douglas-fir seedlings to period roots were exposed before planting; percentages are based on number planted in each group.

Overall mortality of both unpuddled and puddled stock (fig. 1) was higher for the warmer than for the cooler day of planting (fig. 2). But mortality was not significantly different between stock planted in the forenoon and in the afternoon (fig. 2).

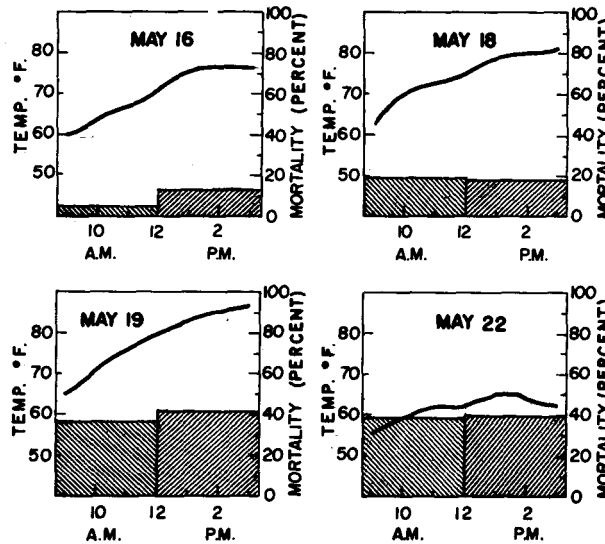


Figure 2.--Temperatures on days of planting and mortality in forenoons and afternoons, percentages are based on number planted each half-day.

The following conclusions were drawn from the results of this trial:

1. Exposing roots for less than 4 minutes cannot be regarded as critical for survival of 2-0 Douglas-fir.
2. Four minutes' exposure appears to mark the point after which survival of seedlings begins to decrease significantly. Further tests with longer periods of exposure will be necessary to fix reliably the beginning of the critical length of exposure.
3. Puddling will decrease significantly mortality of 2-0 Douglas-fir, even for very short durations of exposure.

Literature Cited

- (1) Cummings, W. H. 1942. Exposure of roots of shortleaf pine stock. Jour. Forestry 40: 490-492.
- (2) Briggs, A. H. 1939. Report of planting experiment to determine the effect of root exposure on deciduous planting stock. Jour. Forestry 37: 939-943.
- (3) Daskevitch, M. D. 1960. Ne ostavliat otkrytymi korni sejancev (Don't leave roots of seedlings exposed). Lesnoe Khoziaistvo 12: 79-80.
- (4) Wakeley, P. C. 1954. Planting the Southern Pines. U.S. Dept. Agr., Agr. Monog. 18, pp. 130-131.
- (5) Ziegler, E. A. 1914. Loss due to exposure in the transplanting of white pine seedlings. Forestry Quart. 12: 31-33.
- (6) 1915. Further notes on the effect of exposure on white pine seedlings. Forestry Quart. 13: 163-170.