and 250 ppm., the greatest amount of roots was developed on cuttings treated top and basally (.21g). Following in descending order were basal only (.15g), top only (.12g.) and least with untreated controls (.09g.).

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Undercutting depth may affect root-regeneration of lodgepole pine seedlings

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Toppling and taproot malformation of transplanted lodgepole pine has been observed in research and production plantations in British Columbia. Tree toppling is a term used to define instability in young stands; trees are not completely windthrown but lean at carious angles and continue to grow. lodgepole pine may form a basal sweep or sabre form which is apparently interrelated with toppling and windfall. Racal sweep and toppling tray he caused by the lack of development and growth of a dominant taproot after the primary taproot has been severed, such as in root pruning, undercuttings and lifting. The study discussed in this article may help determine the extent of pseudo taproot regeneration and show- the growth and development of the root system in relation to the common nursery practice of undercutting.

The objective of this study was to determine the distribution of dry matter in relation to depth of undercutting.

Methods

The lodgepole pine was grown from seeds planted in 4-inch diameter perforated, polyethylene tubes. The potting mixture was a 4:2:1 parts by volume ratio of loam, Kind, and peat respectively. The tubes were 2 feet long and supported by a wooden framework. The undercutting treatment was made 6 weeks after germination while the trees were making active shoot growth. Cutting depths were at 3, 6, and 12 inches below the root collar. The seedlings were then allowed to grow for 2 months. At harvest, the length of taproot was measured. The root system was then cut into 3-in eh sections starting at the root collar, aril the oven dry weight of the sections was determined.

Results and Discussion

At harvest there were no significant differences in total root weight, shoot weight, or shoot-root ratio among undercutting depths. However, there were significant differences after undercutting in taproot growth (figs. 1 and *2)* and the 3-inch depth grew most in length and dry weight subsequent to

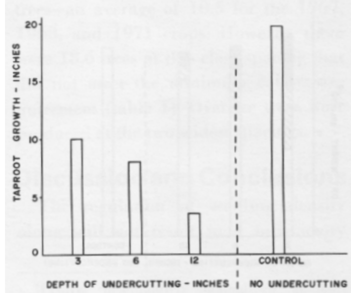


Figure 1.—Taproot length growth of lodgepole pine seedlings in relation to depth of undercutting.

treatment (figs. 1 and 2). This supports the work of Aldhouse, (1) and Van Dorsser and Rock (2). These workers found that undercutting at a depth of 3 or 4 inches produced a seedling with a greater root-regenerating potential than ones undercut at a greater depth. In this study, the seedlings undercut at the 3-inch depth also produced the greatest total root dry weight when the dry weight removed by undercutting is included as shown in figure 2. The dry weight of 3-inch root sections was significantly different below the 9-inch level (fig. 3). Root weight of the control was the greatest in all 3-inch sections below 9 inches subsequent to undercutting.

At present, more work is being done in British Columbia on food relations and dry matter distribution in relation to undercutting depth, frequency of undercutting, and seedbed stocking density. This may provide a better understanding of how to condition nursery stock by undercutting.

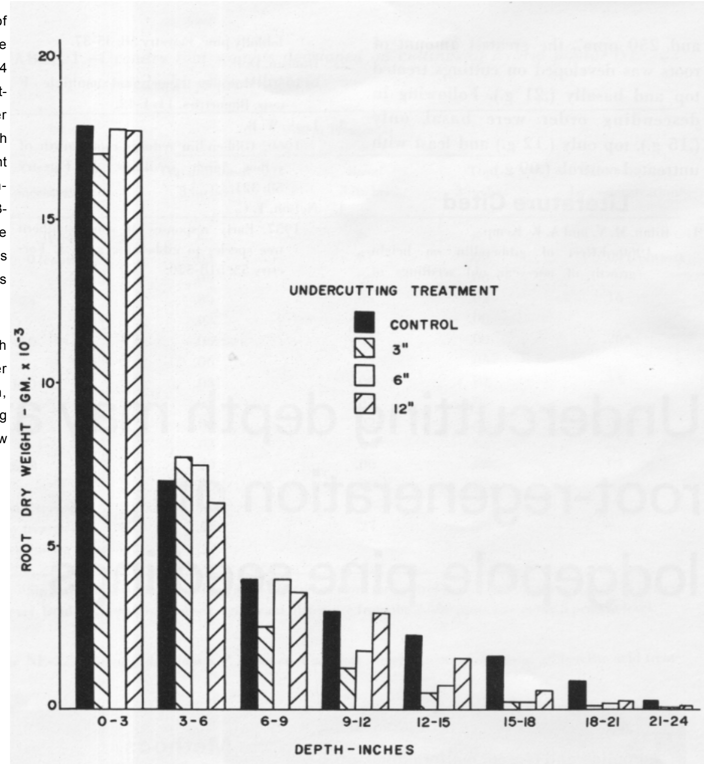
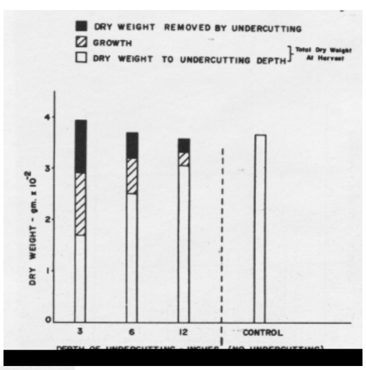


Figure 2-Dry weight distribution of dry matter of lodgepole pine seedlings roots in relation to depth of undercutting



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