NITROGEN FERTILIZATION AND REPEATED UNDERCUTTING AFFECT MORPHOLOGY OF BARE-ROOT LOBLOLLY PINE SEEDLINGS

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Abstract.--A study was conducted at the W. W. Ashe Nursery to examine effects of rate of nitrogen (N) application and repeated undercutting on loblolly pine seedlings. The experiment was laid out across four nursery beds in a split-plot, randomized block design. The beds were blocks. There were three undercutting treatments imposed on 24-m long *(79 ft)* whole plots: (A) control with no undercutting, and repeated undercutting at two-week intervals starting when (B) seedlings averaged 15 cm *(6 in)* tall, and (C) when they averaged 20 cm *(8 in)* tall. Starting five weeks after sowing, ammonium nitrate (34% N) was applied every two weeks to 6-m long *(20 ft)* subplots. Four equal applications were made to supply a season total N of: (A) 0 kg N/ha, (B) 40 kg N/ha *(36 1b/ac),* (C) 80 kg N/ha *(71 1b/ac),* and (D) 160 kg N/ha (143 *1b/ac).* There were a total of 48 sub--or fertilizer--plots (4 blocks x 3 undercut treatments x 4 N levels). Seedbed density ranged from 208 to 460 seedlings per m^2 *(20 to 42/ft^2)* on the subplots. Considering the amount of N applied and density, individual seedlings received from 0 to 80 mg of N. At lifting, a number of morphological attributes were measured on a 25-seedling sample from each subplot. Height, diameter, and root area index (i.e., projected root system surface area) of each seedlings was measured. The total ovendry weight of the shoots and roots was obtained for each subplot sample.

Mean N content of shoots was approximately 30 mg, but roots averaged only about 0.004 mg of N. The amount of N in shoots increased from a mean of about 20 mg per seedling with no N fertilization to about 42 mg for seedlings that received 80 mg of N from the fertilizer. Therefore, seedlings took up 25% to 30% of the N in the ammonium nitrate.

Mean height, diameter, and root area index all increased linearly with greater N. Mean height was reduced 10% to 15% compared to controls if undercutting began when seedlings were 15 cm tall. However, if undercutting was postponed until they reached 20 cm, mean height at lifting was not different from that of the control seedlings. With up to about 40 mg N per seedling, undercutting when seedlings were 15 cm tall reduced mean diameter about 12%, but with greater N that reduction became negligible. Undercutting increased root area index by up to 15%.

The height-to-diameter ratio (H/D) is a measure of seedling sturdiness; a relatively low H/D represents a stockier seedling than does a relatively high H/D. In this study, H/D was also affected by both N level and undercutting. The ratio increased, then decreased with greater N per seedling. Repeated undercutting reduced H/D compared to controls, and undercutting began when seedlings were 15 cm tall had a greater effect than waiting until seedlings were 20 cm tall.

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