Mass Production of Loblolly and Slash Pine Cuttings

Hare's Technique is Modified to Produce More Than 2,000 Rooted Cuttings More Economically

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A technique to root cuttings developed by Hare (2) has been modified to mass produce loblolly (*Pinus tacda L.)* and slash pine *(P. elliottii* var. *elliottii)* cuttings more economically and to increase production.

The modified technique has consistently resulted in rooting percentages near 50 percent throughout the year. Well over 2,000 rooted cuttings have been produced so far.

Hare tried to provide the cuttings with a nearly optimum environment. His cuttings were placed in an airconditioned growth chamber in which the maximum light intensity was achieved with high-intensity fluorescent lights and tinfoil covered walls. In addition, the atmosphere was enriched with carbon dioxide using a Coleman lantern. The humidity in the growth chamber was kept as near 100 percent as possible with a mist system and an evaporative cooler. The cuttings were sprayed daily with a nutrient solution to counteract the effect of leaching caused by the mist system.

The rooting method developed by the Texas Forest Service is an adaptation of Hare's procedure. First, the growth chamber was replaced with a plastic mist chamber constructed in a nonair-conditioned greenhouse. Secondly, the 16-hour daylength was obtained by using incandescent lights to augment natural daylight, rather than using highintensity fluorescent lights. These two modifications saved about $1500 per greenhouse bench in construction costs.

The Rooting Chambers

The rooting chambers were constructed on concrete greenhouse benches using a frame made from 2 X 2 lumber and covered by clear polyvinyl plastic. Cooling is provided by a 12-inch fan at one end of the chamber (fig. 1) and an inlet at the opposite end of the chamber covered with a flap of plastic which closes under its own weight when the fan stops. The fan is controlled by a thermostat, set for 80°F during cooler months. During the summer months the temperature is adjusted upwards as the maximum temperature in the greenhouse increases, to avoid having the fans run continuously during the daytime. A temperature of about 90°F is satisfactory (luring the summer months.

The mist system consists of five nozzles mounted in two lines, 22 inches apart, and on 12-inch centers within each line. The lines are suspended about 12 inches above the rooting medium. The nozzles are activated in two ways: 11) when the thermostat turns the fan on, it activates the nozzles which are regulated by a time clock to spray 24 seconds out of every 6 minutes; (2) since the cuttings eventually get too dry on cool days when the fan will not come on, a time clock activates the sprays periodically. The interval depends on the time of the year, with a maximum of about 4 hours during the period when the fans do not cycle.

The daylength is extended to 16 hours by two rows of incandescent lights suspended above the mist chamber. Carbon dioxide enrichment is provided from a cylinder operated by a solenoid valve and a time clock. The carbon dioxide is re-

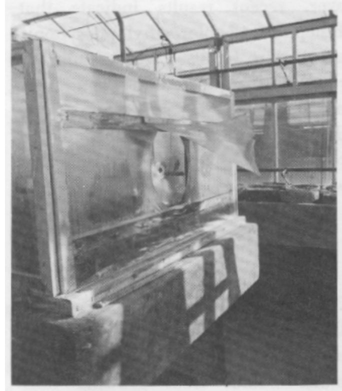

Figure 1.—Cooling fan at the end of a mist chamber.

leased into the chambers through plastic tubes. The time clock is adjusted to maintain a level of approximately 2000 ppm carbon dioxide during the daytime. When the fans are on, the carbon dioxide level, of course, drops rapidly. No carbon dioxide is provided during the night.

The Rooting Medium

The benches contain about 1 inch of gravel (to improve drainage) covered with a mixture of 50 percent

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perlite and 50 percent vermiculite as recommended by Hare (2). Threeby 3-inch peat pots are embedded in the medium. This allows transplanting of the rooted cuttings without severe disturbance of the root systems (fig. 2). After use, the medium can be sterilized with portable steam pipes by raising the temperature to 80°C and maintaining it at that level for 2 hours. After 1 year of use the medium is replaced.

Collection and Treatment Of Cuttings

The preferred length of cuttings is 6 inches, although occasionally cuttings as short as 4 inches are used. Since Grigsby (1) showed better rooting of cuttings which had been kept upright throughout all handling, this technique has been adopted. The cuttings are then treated with hormones. For details see van Buijtenen, *et al.* (3).

The cuttings are lifted after 3 months. Although the percentage of cuttings rooted in a given batch could be increased somewhat by maintaining the cuttings in the mist chamber for a longer period of time. lifting after 3 months gives the highest production of rooted cuttings per mist chamber over a year's period.

When the cuttings are lifted they are potted in 8-inch pots, kept in the greenhouse for 2 additional weeks and then transferred to a lathhouse for further hardening off. After 4 to 6 weeks in the lathhouse they are field planted. No field planting is done during July and August because of the hot and dry weather.

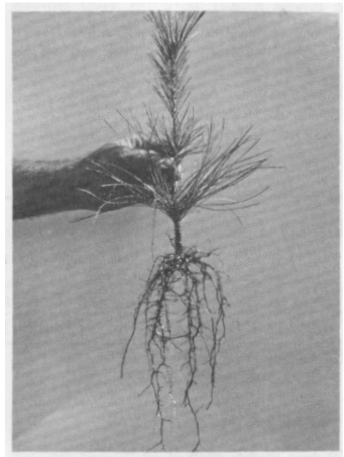

Figure 2.-Lifted cutting after careful removal from peat pot and washing shows the development of the *root* systems.

Results

Using this technique, rooting percentages ranging from 40 to 70 percent have been obtained consistently. The average is slightly less than 50 percent. The rooted cuttings are at present being used to establish hedges for the production of more cuttings and the buildup of clones. The first goal is to obtain sufficient material to screen for its suitability as understock for grafting. Once this goal is reached, additional cuttings will be field tested to determine the genetic gains that can be obtained by this method and to identify outstanding genotypes.

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