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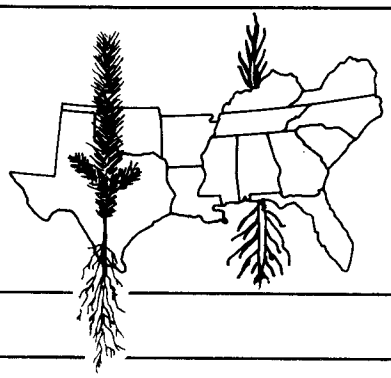

RESEARCH NOTE 97- 5

TOP PRUNING SWEETGUM AFTER PLANTING

by

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INTRODUCTION

For most hardwood species, the taller the seedling in the nursery, the more difficult it is to get enough roots lifted to provide minimal transplant shock. Top-pruning increases the harvested root weight ratio (root dry weight/tree weight) and this, in turn, is expected to increase the probability of survival after outplanting. For some species, top-pruning to a height of 20 cm above the root-collar is a recommended nursery practice (Johnson et al. 1986; Ladrach 1992).

In general, top-pruning studies have been conducted on relatively short seedlings. Several studies on hardwoods have been conducted with seedlings that were less than 50 cm tall. In some cases, top-pruning was practiced on seedlings were less than 30 cm tall (Meadows and Toliver 1987). It would seem that differences in survival would be greater if tall seedlings were top-pruned. However, only a few top-pruning studies have been conducted with seedlings that are taller than 70 cm. Although top-pruning studies have been conducted on a number of hardwood species, there are no reports in the literature for sweetgum (*Liquidambar styraciflua*).

Tall sweetgum often die back when planted on sandy soils. In one study, the percent dieback in June was related to root-collar diameter (RCD) and the number of lateral roots (Kormanik 1986). Large diameter seedlings 13-14 mm RCD with more than 6 lateral roots have greater survival and less dieback than small diameter seedlings (7-8 mm RCD) with <4 lateral roots. However, for a given RCD, taller seedlings tend to die back more (and have less survival) than shorter seedlings. When outplanting 14 mm RCD sweetgum that were 1.1 m, the average length of dieback ranged from 40 to 55 cm. At the end of the 1st growing season, heights were less than at time of planting.

One potential method to reducing dieback of sweetgum on is to top-prune seedlings before outplanting. In theory, top-pruning sweetgum should not only reduce dieback, but when planted on stressful sites, survival should increase.

The objective of this study was to test the effects of three levels of top-pruning on survival and growth of bare-root sweetgum. The null hypothesis is stated as follows: initial seedling survival and growth are not affected by top-pruning.

METHODOLOGY

Seedlings were grown at the Westvaco Nursery in South Carolina. They were lifted and transported to Auburn in January of 1996. Seedlings were planted in 100% sand at the School of Forestry's "trophotron." There were 8 replications (48 trees per replication). After planting, three-fourths of the seedlings were top-pruned. One-fourth had 7.5 cm of the terminal removed. Another one-fourth were pruned to a height of 30 cm. The remaining seedlings were top-pruned to a height of 15 cm. Top-pruning treatments were assigned to trees at random.

The plots were evaluated for leaf emergence on the 10th of April, 1996. Seedling heights were measured on June 3 and November 7th. In November, the seedlings were also measured for groundline diameter. Data were analyzed using an analysis of variance procedure. A Transplant Stress Index - or "TSI" value (South and Zwolinski 1997), was determined for control seedlings by regressing height growth over initial height for 88 seedlings.

Less than normal rainfall occurred for April (40 mm) and May (69 mm). Less than 2 mm of rainfall occurred in the first three weeks of May. On May 24 and 25, temperatures reached 100 degrees Farenheit. Irrigation water was applied on May 22 and 23 so that the waterfront would reach a 15 cm soil depth.

RESULTS

Initial Height and Diameter

The heights of seedlings after planting averaged 81.6 cm and average groundline diameter was 7.9 cm. There was a 3.5 cm difference between mean heights for seedlings assigned to the terminal removal treatment (80.4 cm) and seedlings assigned to the 45 cm pruning (83.8 cm). After pruning, heights were 80.9 cm for nonpruned seedlings, 73.2 cm for the terminal-pruning treatment, and 45 cm and 30 cm for the top-pruning treatments.

Table 1. Effect of top-pruning after planting sweetgum.

Pruning treatment	Leaves by April	Height cm	Height growth	Diameter cm November	Leaf size mm November	Survival November
None	49% a	86.4 a	5.9 c	10.9 a	55 c	94%
Terminal	62% a	75.1 b	2.1 c	11.6 a	61 b	96%
45 cm	62% a	57.5 c	12.5 b	10.7 a	71 a	96%
30 cm	285 b	49.5 d	19.5 a	10.4 a	71 a	96%

Delay in Leaf Out

Leaves began to emerge in late May. By April 10th, about 52% of the seedlings still had no leaves, 38% had some signs of leaves, and 10% had leaves. There was a treatment effect since leaf-out was delayed on seedlings pruned to a height of 30 cm (Table 1).

November

Seedling survival was excellent with only 18 dead trees. Six of the control seedlings died and the remaining dead trees were evenly distributed among the pruning treatments. Overall, survival was 95% (Table 1). Although transplant shock was not great enough to result in survival differences among treatments, leaf size was affected by pruning. The taller seedlings generally produced smaller leaves than seedlings pruned to 30 or 45 cm. Some believe leave size is related to the degree of planting stress. The TSI value for seedlings in the control plot was -0.1 which indicates unpruned seedlings experienced some transplant stress.

Height growth was increased by the degree of pruning. The unpruned trees grew very little during the year (<6 cm). In contrast, seedlings pruned back to 30 cm grew 19.5 cm during the year. As a result, height increased 65% in 9 months. This increase in growth rate due to top-pruning is a common response with many hardwoods. After two or three years growth, heights of top-pruned hardwoods are often the same as controls (South 1996). These seedlings will be remeasured at the end of the 1997 growing season to determine if differences in total height have disappeared.

MANAGEMENT IMPLICATIONS

In one respect, this study is a failure since stresses after planting were not great enough to result in survival differences among treatments. The main reason for planting is sand was to induce moisture stress sufficient to cause mortality. Mortality was expected due to the lack of rainfall and high air temperatures. However, the greater leaf size and the greater height growth of seedlings pruned to 30 cm or 45 cm suggests planting stress was not as great for top-pruned seedlings.

LITERATURE

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