Auburn University Southern Forest Nursery Management Cooperative

RESEARCH REPORT 99-3

TOP PRUNING SWEETGUM – AN UPDATE

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 will increase the harvested root weight ratio (root dry weight/tree dry 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 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 dieback 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 seedlings 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.

Top-pruning seedlings is one method of reducing dieback of sweetgum. In theory, top-pruning sweetgum should not only reduce dieback, but it should also increase survival when seedlings are planted on stressful sites.

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 above the ground. 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. Seedlings were measured on November 7, 1996, September 4, 1997 and December 8, 1998. Data were analyzed using an analysis of variance procedure. A 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 reach 100 degrees Farenheit. Irrigation water was applied on May 22 and 23 so that a 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.

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). Although transplant shock was not great enough to result in survival differences among treatments, leaf size was affected by pruning. 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. A transplant stress index (South and Zwolinski 1997) was determined using the initial height and first-year height growth of 88 non-pruned seedlings. The TSI value was –0.1 which indicates unpruned seedlings experienced some transplant stress.

Survival and Growth

First-year survival was excellent with only 18 dead trees. Six control seedlings died and the remaining dead trees were evenly distributed among the pruning treatments (Table 1).

Table 1. Effect of top-pruning after planting on sweetgum during the first year after planting.

Pruning treatment	Leaves by April	Height (cm)	Height growth (cm)	Diameter (cm)	Leaf size (mm)	Survival
None	49% a	86.4 a	5.9 c	10.9 a	55 c	94% a
Terminal	62% a	75.1 b	2.1 c	11.6 a	61 b	96% a
45 cm	52% a	57.5 c	12.5 b	10.7 a	71 a	96% a
30 cm	28% b	49.5 d	19.5 a	10.4 a	71 a	96% a

Means within a column followed by the same letter are not significantly different at the 5% level of probability according to Duncan's New Multiple Range Test.

Height growth was increased by pruning. The unpruned trees grew very little during the year (< 6 cm). In contrast, seedlings pruned back to a height of 30 cm grew 19.5. 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).

Top-pruned seedlings continued to grow more and by the end of the second year, the top-pruned seedlings were about the same height as controls (Table 2). Diameter at groundline was slightly smaller (1.4 cm) than controls. By the third year, there were no differences in average height, diameter, or survival.

Table 2. Effect of top-pruning after planting on sweetgum during the second and third year after planting.

Pruning treatment	97 Height (cm)	97 Height growth (cm)	97 Diameter (cm)	98 Survival	98 Height (cm)	98 Diameter (cm)
None	162 a	61 b	21.4 a	90% a	193 a	26.5 a
Terminal	157 a	65 b	21.1 a	92% a	192 a	26.0 a
45 cm	156 a	92 a	20.9 ab	93% a	189 a	26.2 a
30 cm	159 a	106 a	20.0 b	93% a	187 a	25.1 a

Means within a column followed by the same letter are not significantly different at the 5% level of probability according to Duncan's New Multiple Range Test.

MANAGEMENT IMPLICATIONS

The initial differences due to top-pruning treatments were gone after three years of growth. The shorter top-pruned seedlings grew more than taller non-pruned seedlings. As with other hardwoods, top-pruning sweetgum can lower handling costs and reduce seedling stress.

LITERATURE

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