SOUTHERN FOREST EXPERIMENT STATION

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HORIZONTAL PLANTING OF GREEN ASH CUTTINGS LOOKS PROMISING

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Green ash cuttings made from 1-0 seedlings sprouted and grew exceptionally well when planted horizontally at depths of 1 and 3 inches. Sprouts from 10- and 14-inch cuttings grew better than those from 6-inch cuttings.

Landowners are seeking ways to regenerate green ash cheaply because of its desirable wood, satisfactory growth in plantations, and good performance on periodically flooded areas. The cost of placing cuttings horizontally in furrows might be sufficiently low to make commercial planting practical, and results reported here indicate that this technique can be successful.

METHODS

This study was done in the experimental nursery at the Southern Hardwoods Laboratory. Soil is moderately-well-drained silt loam.

Cuttings were taken from 1-0 green ash seedlings obtained from the Mississippi Forestry Commission. One cutting was made from each seedling; root collars were included. Cuttings were made in January, wrapped in damp peat moss and plastic, and stored in a cooler at 2 to 4° C. until planting.

On April 7, 1971, cuttings 6, 10, and 14 inches long were planted end to end in hoed furrows 1, 3, and 6 inches deep. Approximately 60 inches of cuttings were planted in each row; four 14-inch, six 10-inch, or ten 6-inch lengths. Extra cuttings planted in the same manner at the test site were excavated periodically to study root development.

The experimental design was a randomized complete block with a factorial arrangement of treatments. There were three replications of each of the nine treatment combinations (3 cutting lengths $\times$ 3 planting depths). Treatments were randomly assigned to rows within blocks. Each row constituted a plot. Variables analyzed were number of sprouts, percentage of cuttings that sprouted, average heights, and diameters at groundline. Means were com-

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pared with Duncan's new multiple range test. Survival percentages were transformed to arcsin before analysis. Sprouting data were transformed to the square root of the number of sprouts plus 0.5, a method described by Steel and Torrie.[2]

RESULTS AND DISCUSSION

About 1 month after planting, the cuttings began to sprout and form roots. Roots developed first at the root collar end of the cutting, but during the growing season they were formed at points along the entire cutting. By the end of the growing season, each cutting had a large, well-developed root system (fig. 1).

Five combinations of planting depth and cutting length sprouted particularly well: 1-inch depth and 6-inch cutting (1×6), 1×10, 1×14, 3×10, and 3×14 (table 1). Duncan's multiple range test showed that 3×14 and 1×10 were significantly better than all combinations except 1×6 and 1×14. All lengths sprouted poorly at the 6-inch depth. Six-inch cuttings sprouted poorly at the 3-inch depth. All cuttings performed well at the 1-inch depth (table 1).

There were no significant differences in root-collar diameters by treatment when all sprouts were considered, but treatments significantly affected diameter of the five largest sprouts per row (table 1). The 3×14 treatment had the largest average diameter, but it was not significantly larger than that for 1×10, 1×14, 3×10, 6×6, or 6×10. It is apparent from table 1 that there was not a large difference among treatments with respect to diameter growth.

Height growth in all treatments was good. Many individual sprouts were more than 5 feet tall after one growing season, and some exceeded 6 feet.

Average heights of all sprouts differed significantly among treatments with heights ranging from 2.10 feet in the 1×6 treatment to

[2] Steel, R. G. D., and Torrie, J. H. Principles and procedures of statistics. 481 p. McGraw-Hill Book Co., Inc. 1960.

Figure 1.—*Typical sprouts and root systems at end of one growing season. All cuttings were planted at 1 inch depth; 6-inch length (left), 10-inch (center), and 14-inch (right).*

Table 1.—*Performance of horizontally planted green ash cuttings after one growing season*

Planting depth and cutting length	Proportion sprouting	Sprouts per row [1]	Diameter, all sprouts	Diameter, 5 largest sprouts	Height, all sprouts	Height, 5 largest sprouts
	Percent	*Number*	*Inch*	*Inch*	*Feet*	*Feet*
1×6	86.7 a,b [2]	13 a	0.45 b	0.56 b	2.10 c	2.90 b
1×10	100.0 a	12 a,b	.55 a,b	.65 a,b	2.46 b,c	3.11 b
1×14	83.3 a,b	8 a,b,c	.54 a,b	.63 a,b	2.49 b,c	3.07 b
3×6	50.0 c,d	7 b,c	.53 a,b	.58 b	2.50 b,c	2.83 b
3×10	77.7 b,c	8 a,b,c	.55 a,b	.63 a,b	2.82 a,b	3.23 b
3×14	100.0 a	9 a,b	.60 a	.71 a	3.11 a,b	3.87 a
6×6	23.3 d	2 d	.62 a	.62 a,b	3.08 a,b	3.08 b
6×10	55.7 b,c,d	4 c,d	.60 a	.62 a,b	3.21 a	3.35 a,b
6×14	41.7 c,d	2 d	.56 a	.56 b	2.73 a,b,c	2.73 b

[1] A row is approximately 60 inches of cuttings in a hoed furrow. All data based on average of three replications.

[2] Within columns, means followed by the same letter do not differ significantly at the 0.05 level.

3.21 feet in the 6×10 treatment (table 1). Heights of the five largest sprouts per row ranged from 2.73 feet in the 6×14 treatment to 3.87 in the 3×14 treatment (table 1). The deeper planting depths did not affect growth, but resulted in fewer sprouts.

The 1- and 3-inch planting depths with longer cuttings gave best overall sprouting and growth, with the 3×14 treatment the best.

In plantings such as this, the question of advantages and disadvantages of multiple sprouting arises. Most treatments had multiple sprouting, which probably would be an advantage in close-spacing, short-rotation plantings such as advocated for sycamore. For plantations at more normal spacings, multiple sprouts may be a liability because of reduced growth of one desirable sprout at each planting spot. From this study there would be no way to choose one treatment over another on the basis of multiple sprouting.

Horizontal planting of green ash cuttings looks promising. When the method is perfected, it may be applicable to a wide variety of sites. It should permit highly mechanized planting. Green ash is tolerant, and it probably could be underplanted, eliminating expensive site preparation and cultural treatments. Since the species can be reproduced vegetatively from cuttings, a tree improvement program similar to the one for cottonwood may be feasible.