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HORIZONTAL PLANTING OF GREEN ASH CUTTINGS ON A SHARKEY CLAY SITE

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Abstract

Horizontally planted green ash cuttings made from 1-0 seedlings sprouted and grew well, as did seedlings and vertically planted cuttings. Ten- and 14-inch cuttings planted 1 and 3 inches deep sprouted best. Two-inch-long cuttings and ones planted 6 inches deep performed unsatisfactorily.

Additional Key Words: Fraxinus pennsylvanica . Sprouting . Artificial regeneration . Vegetative reproduction .

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Landowners are seeking ways to regenerate green ash cheaply. The wood finds a ready market, growth rate in plantations is satisfactory, and the trees do well on sites that are seasonally flooded. An earlier paper[2/] described a method of placing cuttings horizontally in furrows. The ease of furrow planting makes the technique commercially attractive, and the study described here reinforces the earlier data in showing that the cuttings sprout and grow well.

METHODS

The plantings were on the Delta Experimental Forest in Stoneville, Mississippi. The soil was Sharkey clay. The study had three concurrent phases.

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2/ Kennedy, H. E., Jr. Horizontal planting of green ash cuttings looks promising. USDA For. Serv. Res. Note SO-147, 3 p. South. For. Exp. Stn., New Orleans, La. 1972.

All cuttings were made from 1-0 nursery seedlings in January, wrapped in damp peat moss and plastic sheeting, and stored in a cooler at 2 to 4°C until planted in late February of 1972. One or two cuttings were taken per seedling. Those less than 0.2 inch in diameter at the small end were discarded.

In Phase I, cuttings 2, 6, 10, and 14 inches long were planted in hoed furrows 1, 3, and 6 inches deep. Half of the cuttings included the seedling rootcollar, and half were from further up the stem. Rows were 20 feet long with 10 cuttings per row. Distance between rows was 10 feet. Weeds were controlled by disking, and those close to the sprouts were hoed by hand.

The experimental design was a randomized complete block with three replications. There were 26 treatment combinations: 4 cutting lengths X 3 planting depths X 2 cutting types (with and without rootcollar); in addition one row was established with 15-inch cuttings planted vertically to a depth of about 13 inches, and one row was planted with 1-0 rooted seedlings. Treatments were randomly assigned to rows within replications. Each row constituted a plot. Variables analyzed were survival (percentage of cuttings that sprouted), average heights, and diameters at groundline. Means were compared with Duncan's new multiple range test (0.05 level of significance). Survival percentages were transformed to arcsin before analysis.

In Phase II, 2-inch cuttings made from three positions on the seedling (lower end, middle, and top) were planted in furrows 1, 3, and 6 inches deep. As in Phase I, there were 10 cuttings per row in rows 10 feet long and 10 feet apart. Sprouts were kept weed-free during the growing season.

Experimental design was a randomized complete block with three replications. There were 9 treatment combinations: 3 seedling positions on the stem X 3 planting depths. Analysis was the same as in Phase I.

In Phase III, three methods of machine planting were tested. In one approach, slits 3 or 6 inches deep were made with a planting machine, 20 cuttings inserted per row, and the slits closed by the packing wheels. In a second method, 20 cuttings were placed in a row on the surface of a disked strip and covered with a second pass of the disk. A third method consisted of laying cuttings on unprepared soil surface and covering them with a levee plow. All cuttings were 10 inches in length.

Rows were 10 feet apart to allow cultivation. The rows, but not the strips, were also hand weeded.

A completely randomized design was chosen, with three replications of each treatment. Analysis was the same as in Phase I.

RESULTS

During May after planting, the cuttings began to sprout and root. Roots developed first at the large end, and then progressed along the entire cutting. By the end of the growing season, each sprouted cutting had a good root system. Most sent up a single sprout. When double sprouts appeared--on about 20 percent of the surviving cuttings--one nearly always became dominant during the first season.

Average survival, diameters, and heights for Phase I are shown in table 1.

In terms of survival, the best treatments were 10- and 14-inch cuttings planted 1 and 3 inches deep, and 6-inch cuttings planted 1 inch deep. Survival here ranged from 63 to 100 percent, and Duncan's multiple-range test indicated no significant differences among these treatments. The vertically planted cuttings with survival of 87 percent, and the seedlings with 93 percent, also performed well. There was no clear preference between cuttings with rootcollars and those without.

Other treatments, as a group, averaged lower survival than those just mentioned. All lengths sprouted poorly at the 6-inch planting depth, survival ranging from 3 to 50 percent. Two-inch cuttings fared poorly at all depths, with survivals of 3 to 43 percent. From a practical standpoint, any treatment giving less than 60 percent survival would probably be unsatisfactory.

By the end of the first growing season, sprout diameters in the better treatments ranged from 0.6 to 0.8 inch, while heights varied from 2.1 to 3.4 feet. These treatments did not vary significantly by Duncan's test. The same treatments excelled after the second year, by which time diameters were 0.9 to 1.3 inches and heights 4.8 to 6.7 feet.

In Phase II, the 2-inch cuttings all performed unsatisfactorily, regardless of whether they came from the lower, middle, or upper portion of the seedling. Survival was less than 30 percent in eight of nine treatments. In the other, where cuttings were made from the lower end of the seedlings and planted 1 inch deep, survival averaged 57 percent. Probably 2-inch cuttings are simply too short for good results.

In Phase III, cuttings on the disked strips failed to sprout. Indications were that they dried out for lack of enough soil cover. For machine planting in rows, survival was 65 percent for the 3-inch depth and 48 percent for the 6-inch (table 2). Of cuttings covered by the levee plow, 52 percent survived. Heights and diameters were comparable to those in the better treatments of Phase I.

Table 1.--Average survival, diameters, stand heights, Phase I

Treatment (planting depth X cutting length)	First year			Second year	
	Survival	Diameter	Height	Diameter	Height
	Percent	Inches	Feet	Inches	Feet
1X2	37 (17)[1/]	0.5 (0.4)	2.1 (1.5)	0.9 (0.8)	4.7 (3.9)
1X6	67 (60)	.7 (.7)	2.9 (2.9)	1.1 (1.3)	5.6 (6.2)
1X10	100 (63)	.7 (.6)	2.9 (2.1)	1.2 (.9)	6.6 (4.8)
1X14	80 (83)	.7 (.8)	3.1 (3.4)	1.2 (1.4)	6.1 (6.7)
3X2	43 (3)	.6 (.2)	2.4 (1.0)	1.1 (.5)	6.1 (2.8)
3X6	47 (23)	.6 (.6)	2.4 (2.3)	1.2 (1.3)	6.0 (4.0)
3X10	50 (83)	.7 (.6)	2.8 (2.4)	1.2 (1.1)	6.2 (5.5)
3X14	70 (67)	.6 (.6)	2.5 (2.8)	1.1 (1.2)	5.7 (6.1)
6X2	20 (3)	.3 (.1)	1.5 (.2)	1.1 (--)[2/]	4.2 (--)
6X6	33 (7)	.5 (.4)	1.7 (1.2)	.8 (1.0)	3.8 (4.2)
6X10	50 (10)	.6 (.4)	2.3 (1.4)	1.3 (0.8)	6.1 (3.3)
6X14	47 (27)	.4 (.6)	1.7 (2.2)	.7 (1.0)	3.8 (5.1)
Seedlings	93	.9	3.9	1.3	6.3
Vertical cuttings	87	.7	3.0	1.2	5.8

1/ First number of each entry is for cuttings with rootcollar, number in parenthesis is for cuttings without rootcollar.

2/ All sprouts were dead at the end of the second year.

Table 2.--Average survival, diameters at rootcollar, and heights, machine planting in Phase III

Treatment	First year			Second year	
	Survival	Diameter	Height	Diameter	Height
	Percent	Inches	Feet	Inches	Feet
Planter, 3 inches deep	65	0.6	2.1	1.3	5.6
Planter, 6 inches deep	48	.6	1.9	1.0	5.4
Disked strip	0	--	--	--	--
Levee plow	52	.7	2.7	1.3	5.9

DISCUSSION

Whether done by hand or machine, horizontal planting of cuttings from 1-0 seedlings appears to be a good method of regenerating green ash. Here as in the previous study on a better soil, results were best when 10- and 14-inch cuttings were planted at depths of 1 or 3 inches. Six-inch depths, short cuttings, and disked strips appear unsuitable.

Seedlings or cuttings set vertically also do well. It is likely, though, that cuttings can be shorter for horizontal than for vertical planting; equipment may be lighter also, since slits are shallower. And cuttings are easier to handle than seedlings.

Horizontal planting should permit mechanized operations on a wide variety of sites. Green ash is tolerant and probably could be underplanted, thereby avoiding expensive site preparation and cultural treatments. On sites likely to be flooded in winter or early spring, planting should be deferred until the waters recede. Survival may be poor if the cuttings are inundated before they have completed their first season's growth. Another word of caution also: preliminary evidence indicates that cuttings should be taken only from 1-0 seedlings.

Since it is easy to reproduce the species vegetatively from cuttings, a tree improvement program similar to the one for cottonwood may be feasible.