SOUTHERN FOREST EXPERIMENT STATION

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INFLUENCE OF CUTTING CYCLE AND SPACING ON COPPICE SYCAMORE YIELD

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Cutting cycle significantly affected total aboveground dry-weight yields, which were greater with the 2-, 3-, and 4-year cycles than with the 1-year. For all cutting cycles, significantly higher yields were obtained with 2- by 5-foot spacings than with 4 by 5. Dry-weight yields ranged from 3,229 pounds per acre per year for the 1-year cutting cycle spaced at 4 by 5 feet to 7,210 pounds for the 3-year cycle at 2 by 5 feet. No interaction was detected between spacing and cutting cycle.

Additional keywords: *Platanus occidentalis,* "silage sycamore," short-rotation, juvenile wood.

As the demand for cellulose fiber from natural and planted forests exceeds the supply, the pulpwood industry must find new methods to increase production rapidly. Intensive culture of hardwoods under short rotation cycles may help supplement conventional pulpwood sources. The technique is sometimes referred to as the "silage concept" because the cut wood resembles crops harvested for silage. This note reports the effects of various cutting cycles and spacings on the growth and yield of coppice sycamore planted for pulpwood.

METHODS

In March 1970, unrooted sycamore cuttings were planted in subsoiled trenches at Huntington Point, near Greenville, Mississippi. The soil was Commerce silt loam, a favorable sycamore site.

Plots were eight rows wide by 1 chain (66 feet) long and were divided into two subplots, each four rows wide. Two spacings were randomly assigned on the subplots—2 by 5 and 4 by 5 feet. Early in the growing season, all blanks in the 4-foot spacings and consecutive blanks (two or more) in the 2-foot spacings were replanted with extra 16-inch cuttings

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established when the study was installed. Plots were weeded during the first growing season, and survival was noted.

Four replications of four cutting treatments were randomly installed on the plots. Cutting cycles were 1, 2, 3, or 4 years; thus, the 1-year cycle received four cuttings; the 2-year cycle, two cuttings; and the 3- and 4-year cycles, one cutting each. Cutting was in January for each year except 1974, when floodwaters from the Mississippi River delayed the operation until early March. Resprouting was noted after each cutting.

For each subplot, growth and yield were measured for the central 50 feet of the two center rows; the remainder of the plot formed a border.

When the plants were cut, stems plus branches of all trees within each measurement area were weighed on a platform balance at the study site. Fresh-weight yields per acre were calculated from these data.

Fresh and dry weights of stems and of branches, stump diameter at the point of cut, and stem length were measured for five trees from each subplot. Dry weights were determind after 48 hours of drying in a forced-air oven at 105°C. Total aboveground weights were obtained, and the ratios of total dry to fresh weight and of stems to branches (fresh and dry) were established.

Dry-weight yield per acre per year was calculated for each subplot by multiplying the fresh weight per acre by the ratio of dry weight to fresh weight in the sample. Data were analyzed by analysis of variance and Duncan's multiple range test. Differences significant at the 0.05 level are reported here.

RESULTS AND DISCUSSION

First-year survival was about 95 percent for all treatments. No insect or disease problems were noted during the 4 years of testing. Approximately 90 percent of the stems resprouted after harvesting.

Spacings of 2 feet produced higher fresh and dry weight yields than those of 4 feet (table 1). For all cutting cycles combined, average annual dry weight yield was 6,430 pounds per acre per year for the 2-foot spacing and 5,253 pounds for the 4-foot spacing. However, the greater cost of establishment and harvesting in the denser spacing may offset the advantages of the greater yield.

Table 1.—*Average annual fresh and dry weight, ratio of fresh to dry weight, and dry weight percentages of stems and branches by spacing and cutting cycle*

Spacing (feet) and cutting cycle (years)	Fresh weight	Dry weight	Ratio (dry to fresh)	Dry weight	
				Stem	Branches
	Pounds per acre per year			*-- Percent --*	
2 by 5					
1	9,806	4,349	44	81	19
2	15,528	7,001	45	90	10
3	17,583	7,210	41	92	8
4	15,518	7,161	46	95	5
4 by 5					
1	6,915	3,229	46	85	15
2	12,566	5,167	41	86	14
3	14,484	6,175	43	91	9
4	15,636	6,441	42	95	5

For both spacings the 2-, 3-, and 4-year cutting cycles had higher fresh and dry weight yields than the 1 year cycle but did not differ greatly from each other (table 1). Annual dry-weight yields ranged from 3,229 pounds per acre per year in the 1-year cutting cycle with a 4-foot spacing to 7,210 pounds for the 3-year cycle with a spacing of 2 feet. These results are similar to those of Steinbeck and May (1971) and Kormanik, Tyre, and Belanger (1973). Since growth during the fourth year was not measured for the 3-year cutting cycle, third-year yields were not affected by flooding, which may have lowered average annual yields for the 1-, 2-, and 4-year cycles.

In both spacings of the 1-year cycle, yields were low the first year as the tree established a new root system, increased during the second and third years, but decreased the fourth year after flooding reduced the growing season by 2 months.

Cutting cycle and spacing did not affect the ratio of total dry weight to fresh weight. For both spacings dry weights ranged from 41 to 46 percent of the total weights (table 1), a

finding similar to that of Steinbeck and May (1971), who reported 50 percent.

Cutting cycle apparently influenced the proportion of total fresh and dry weights in the stems. In the 1-year cycle stems comprised 81 percent of the dry weights in the 2-foot spacing and 85 percent in the 4-foot. In the 4-year cycle (both spacings), the stem accounted for about 95 percent of the total—somewhat more than the 70 and 78 percent reported by Steinbeck and May (1971). Thus, although the longer cutting cycles do not seem to increase the ratio of total dry weight to fresh weight, they result in greater yields of stem wood, which may produce a better fiber and a lower proportion of bark than the 1-year cycle.

No interaction was detected between spacing and cutting cycle. Average annual dry weight yields and diameter and height growth are shown by cutting cycle in table 2. Neither diameter nor height growth changed markedly during the first 3 years, but both diminished slightly during the fourth year. Diameters ranged from slightly less than 1 inch for sprouts cut each year to about 2.4 inches in 4-year-old trees. Heights ranged from 9.0 feet at 1 year to 24 feet after 4 years.

Table 2.—*Average annual dry weight yields and diameter and height growth by cutting cycle*

Cutting cycle (years)	Dry weight [1]	Stump diameter	Height
	Pounds per acre per year	*Inches*	*Feet*
1	3,789 a	0.95	9.1
2	6,084 b	.90	8.4
3	6,692 b	.75	7.3
4	6,801 b	.55	5.9

[1] Means followed by the same letter are not significantly different at the 0.05 level.

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