Better And Cheaper Method Of Establishing High-Density Stand Sought

Horizontal Planting of Sycamore Cuttings

Robert G. McAlpine, Donal D. Hook, and Paul P. Kormanik [1]

Sycamore can be regenerated by laying cuttings horizontally in furrows and covering them with soil-similar to planting sugar cane. Our interest in the possible use of this planting method was stimulated by the search for a better and cheaper way to establish the high-density stands proposed for the production of "silage sycamore." This method of fiber production calls for an initial stocking of almost 11,000 trees per acre at a spacing of 1 by 4 feet. At this density, the cost of planting stock alone would almost preclude the use ofseedlings.

For some time sycamore has been successfully regenerated from 20-inch cuttings planted vertically to a depth of about 18 inches. As with seedlings, however, this planting method represents a sizeable investment in planting stock. We got the idea of planting cuttings horizontally by observing shoots growing from bundles of leftover cuttings buried in a sawdust bed. Shoots arose from lateral buds along the buried stems, and roots appeared at the basal callus, along the lower portion of the stems, and from the underground portion of the newly formed shoots. It occurred to us that we might bury an entire sprout in a furrow and, through bud sprouting along the stem, obtain ample shoots at a uniform spacing. An added advantage was the possibility that the whole procedure could be easily mechanized.

The first experiment with horizontal cuttings was done with several 1-year-old sprouts cut 5 feet long and planted in a nursery bed at depths of 3 and 6 inches. These sprouted satisfactorily and grew well for 3 years. The degree of care that may be exercised in a nursery is, of course, considerably different from that possible under field conditions. So in 1968 we began a field test designed to give us information on rooting, sprouting, sprout spacing, survival, and subsequent growth.

Test Methods

A creek bottom which had been cleared of forest vegetation some years before was disked and drag-harrowed. Furrows, 4 feet apart, were prepared to depths of 3 and 6 inches. Fourfoot-long cuttings from 1-yearold sprouts were laid end to end in the furrows (fig. 1). The ends of the cuttings were marked by wire pins and the furrows were closed. Half of each planting was hand-cultivated to control competing vegetation. The other half was not treated. The study consisted of three replications of cuttings planted at two depths with and without weed and grass control.

[1] McAlpine and Kormanik are, respectively, principal silviculturist and research forester, Southeastern Forest Experiment Station, USDA Forest Service, at Athens, Ga. Hook is associate professor, Dept. of Forestry, School of Agriculture, University of Kentucky, Lexington, and was formerly principal plant physiologist, Southeastern Forest Experiment Station.

Figure 1.—Sycamore cuttings, 4 feet long, planted horizontally with consistent base-to-top orientation.

We were concerned with: 1) The time when shoots began to break through the soil surface, 2) the point of origin along the cutting, and 3) the number of shoots produced. To achieve our goal of establishing a stand at a density of approximately 11,000 trees per acre at a spacing of 1 by 4 feet, we would need to know the success in stocking each linear foot of row.

Beginning in late April, we observed shoot emergence and growth at weekly intervals until shoot formation ceased. Final measurements of survival, height, and location were made in late November after seasonal growth was completed.

Results

The average number of sprouts per cutting and the average height of the sprouts on June 9 and November 26 are presented in table 1. Survival at the end of the growing season is expressed as a percentage of those sprouts alive on June 9. The effect of cultivation as an aid to both growth and survival is apparent.

Our success in obtaining stocking of each linear foot by one or more sprouts was less than expected. The best stocking was obtained in the cultivated treatments but was only 46 percent for 3-inch depths and 39 percent for 6-inch depths. The stocking of un

treated plots was about half that of the cultivated plots. The picture is brighter if we look at the pattern of sprout formation and if we are willing to accept a wider spacing than 1 foot (table 2). About 90 percent of all cuttings in the treated plots had at least one sprout, i.e., one sprout

for each 4 feet. Only about half of the cuttings in the noncultivated plots had at least one sprout.

TABLE 1.—*Average number and heights of sycamore sprouts during and after the growing season and their final survival*

Treatment	Planting depth	Average height		Average number per cutting		Survival (Nov.)
		June	Nov.	June	Nov.	
	Inches	*Feet*		*Number*		*Percent*
Cultivated	3	0.6	2.7	4.1	3.1	76
	6	.5	2.9	3.8	2.9	71
Not cultivated	3	.7	1.2	3.4	1.3	38
	6	.5	1.2	4.5	1.2	27

These results indicate that cultivation or some other method of competition control is necessary (fig. 2). It is also apparent that some form of bud

inhibition or apical control of bud activity is present. Sprouts were more numerous in the top foot of each cutting and decreased in number toward the base. Partitioning of the cutting into shorter lengths might assure better distribution of sprouts. Perhaps we can plant cuttings as short as 4 to 6 inches with reasonable assurance of success. This will be the object of future research.

TABLE 2.—*Average stocking of the 1-foot segments and of the entire cuttings by cultural treatment and depth of planting*

Segment	Cultivated		Not cultivated	
	3-inch-depth	6-inch-depth	3-inch-depth	6-inch-depth
	Percent	*Percent*	*Percent*	*Percent*
Base - 1 ft.	24	19	15	4
1 ft. - 2 ft.	41	30	26	11
2 ft. - 3 ft.	46	35	20	30
3 ft. - top	74	74	37	39
Base to top[1]	89	91	56	50

[1]At least one sprout along the entire cutting.

Figure 2.—Sprouts from horizontally planted sycamore cuttings respond well to cultivation, (*right*) but are buried beneath vegetation, (*left*) when competition is not controlled.