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PROPER CULTIVATION NEEDED FOR GOOD SURVIVAL AND GROWTH OF PLANTED COTTONWOOD

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SOUTHERN FOREST EXPERIMENT STATION

Survival and growth were significantly better when cuttings were not covered or broken during early cultivation. Survival with good cultivation was 90 percent; with poor cultivation, survival ranged from 20 to 60 percent. Undisturbed cuttings grew 30 to 35 percent better than those covered before sprouting and almost 100 percent better than covered cuttings with broken sprouts.

Additional keywords: *Populus deltoides*, cuttings, sprouting, cultivation techniques.

Cottonwood is highly marketable for a wide range of products including pulp, plywood, and furniture. Because young cottonwood tolerates little competition for light and moisture, weeds must be kept completely away from the trees during the first growing season.

Intensive mechanical cultivation during the first growing season greatly improves survival and can more than double growth expected with

minimal weed control (McKnight 1970). Most commercial planters are plowing with a conventional farm cultivator and a disk. Inexperienced or speeding tractor drivers can severely reduce first-year survival and growth by covering cuttings with soil or breaking off sprouts. This Note compares the survival and growth of well-cultivated cottonwoods to that of trees damaged during cultivation. Since cutworms are present in most soils where cottonwood is planted and may damage soil-covered cuttings, their influence on the survival of poorly cultivated trees is also reported.

METHODS

The study was conducted at Huntington Point, Mississippi, on Commerce silt loam soil. The land was cleared in late fall 1971 (McKnight 1970) and fallowed during the summer of 1972. The original planting during the winter of 1972-73 was destroyed by the Mississippi River flood, and the area was replanted in winter 1973-74.

Cuttings were from select planting stock developed at Stoneville, Mississippi (Mohn *et al.* 1970). Each of the sixteen 40 × 100-foot plots was hand-planted with forty 18-inch cuttings

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spaced at 10 × 10 feet and planted about 15 inches deep. Plants were protected from animals by fencing but were not protected from insects.

Four replications of four cultivation treatments were installed in a completely randomized design. The treatments either represented good cultivation or simulated injuries caused by poor cultivation:

- 1) Cultivate to ensure that cuttings are not covered with soil and that sprouts are not broken: proper cultivation is achieved by adequate site preparation, well-adjusted equipment, and careful driving to avoid covering the cuttings. All 16 plots received good cultivation in March 1974, but four of them received only good cultivation throughout the study.
- 2) Cultivate to cover cuttings before they sprout: immediately after the original cultivation in March, the operator covered the plants on four plots by increasing the tractor speed and driving close enough to cause the disk to throw soil over the plants.
- 3) Cultivate to cover cutting and break 1- to 3-inch sprouts: about 3 weeks after the initial cultivation, the operator repeated the covering procedure on four additional plots. Soil thrown by the disk broke most of the sprouts; the remaining ones were immediately broken by hand.
- 4) Cultivate to cover the cutting and break 10- to 15-inch sprouts: about 6 weeks after the original cultivation, covering and breaking were performed on the remaining four plots.

After treatments, all plots were kept weed-free without covering or damaging the trees. Several weeks after the cuttings were covered, soil was removed from those that had not sprouted to determine why no sprouting had occurred. At the end of the growing season, survival was recorded, and diameters and heights were measured. Differences among treatment means were evaluated by analysis of variance (0.05 level of confidence) and Duncan's multiple range test.

RESULTS AND DISCUSSION

Good cultivation significantly increased survival and growth (table 1). Survival under good

Table 1.—*Survival and growth of cottonwood after good and poor cultivation treatments*

Treatment	Survival	Diameter	Height
	Percent	Inch	Feet
Good cultivation	90a ¹	1.0a	10.1a
Cutting covered before sprouting	62b	0.6b	7.4b
Cutting covered and 1- to 3-inch sprouts broken	13c	0.4c	5.3c
Cutting covered and 10- to 15-inch sprouts broken	20c	0.3c	5.0c

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

cultivation was 90 percent, significantly better than all other treatments. When cuttings were covered before sprouting, survival was only 60 percent but was still significantly better than the two treatments where cuttings were covered and the sprouts broken.

Some of the covered cuttings sprouted below the soil, but the sprouts were consumed by cutworms, which damaged 60 to 70 percent of the cuttings that did not survive. Although these cuttings appeared to have resprouted while their stored energy lasted, the sprouts were cut off below the soil each time, and the cuttings finally died. Cutworms did not damage sprouts that originated above the soil. In both of the treatments where sprouts were broken off, resprouting seldom occurred.

Good cultivation brought about significantly better growth than did all other treatments (table 1). Undisturbed trees grew 30 to 35 percent better than cuttings covered before sprouting and almost 100 percent better than covered cuttings with broken sprouts.

Because covered cuttings sprouted 3 to 4 weeks later than uncovered ones, their shorter growing season may partially account for their poor growth. Delayed sprouting and reduced growth were previously observed in the laboratory when cuttings grown in the dark began shoot and root development 10 to 12 days later than those grown in light (dePhillips 1966).

This study reiterates the need for careful cultivation during the early life of cottonwood plantations. Poor first-year cultivation results in growth losses and may kill the trees. The planting site should be well prepared, and tractor drivers should keep their equipment properly adjusted and avoid disking so close or driving so fast as to cover the cuttings with soil.

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