Southern Forest Experiment Station

Research Note SO-220

1976

Survival and Growth of Cottonwood Clones After Angle Planting and Base Angle Treatments

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SUMMARY

Presently, commercial cottonwood plantations in the lower Mississippi Valley are established using vertically planted, unrooted cuttings with a flat (90°) base. Neither survival nor first-year growth of a group of six Stoneville clones was improved by angle planting or cutting base angles diagonally. For one clone, survival was significantly better when base angle was 45°.

Additional keywords: Populus deltoides, artificial regeneration, planting techniques, root development.

Survival and growth of eastern cottonwood (*Populus deltoides* Bartr.) cuttings are influenced by clone and environment (Randall and Mohn 1969, Mohn and others 1970), preplanting preparation, and planting technique (dePhilippis 1963, Peterson and Phipps 1976). Presently commercial cottonwood plantations in the Lower Mississippi Valley are established using vertically planted, unrooted cuttings with a flat base. When stem cuttings are planted vertically, they develop a horizontal root system, many of whose primordia grow at right angles to the stem periphery and are initiated in the wound cambium zone of the callus (Komissarov 1964). Thus, planting cuttings at an angle should encourage roots to grow downward. Warren-Wren (1973) suggests that willow cuttings should have a sloping cut at each end to expose a larger surface for callus development.

Our objective was to determine how planting angle and the angle of base cut affect survival, first-year growth, and root development of six cottonwood clones. Specifically, we compared cuttings planted vertically with flat and diagonal bases to cuttings planted at a 45° angle with flat and diagonal bases.

METHODS

Cuttings were planted in mid-February at Huntington Point, 15 miles north of Greenville, Mississippi. The area was typical of those where cottonwood is commercially planted in the Lower Mississippi Valley. The soil was Commerce silt-loam, classified as excellent for cottonwood growth; site index was 120 feet at age 30.

Cuttings from six cottonwood clones were evaluated. Five of the clones (Stoneville 66, 67, 74, 92, and 109) had been previously released by the Southern Hardwoods Laboratory for commercial use (Mohn and others 1970). The sixth (Stoneville 124) has a low survival rate and only average first-year growth, but its growth after the first year is the best of the six clones. All cuttings were 18 inches long and had a top diameter of ½ inch. Cuttings were planted either vertical@ (standard method) or at an angle of 45 to the soil surface. The base angle on some cuttings was 90° (standard method); the basal angle

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on others was either 45° or 30° measured from the longitudinal axis of the cuttings. The slant faced downward when cuttings with a diagonal base were planted at an angle.

Planting layout was a split-split-plot design with three blocks. Main plots were clones, split plots were planting angle, and split-split plots consisting of 10 cuttings each were angle of basal cut. Spacing between rows of clones was 42 inches, and spacing between cuttings in the rows was 12 inches. Survivai was recorded on June 1, 1975, and height was measured on September 11, 1975. When the plants were dug up on September 22, 1975, position and number of roots were recorded.

Differences in survival and height were tested by analysis of variance (0.05 level of significance).

RESULTS AND DISCUSSION

Neither survival nor first-year growth were improved by deviating from the standard planting procedures (vertical planting, 90° base angle). The treatments did not increase number of roots per cutting but did influence, their distribution. Cuttings planted at a 45 angle grew twice as many roots (3.5) on the bottom and sides as they did on the top (1.8) (fig. 1). Therefore, angle planting might enable roots of freshly planted cuttings to reach subsurface moisture quicker and thus avoid stress under dry conditions. Angle planting may also encourage the development of a more wind-firm tree.

Heights of clones ranged from 7.3 to 8.8 feet. There were no differences in height growth among the five clones released for commercial use, but after the first year all five of them were significantly taller than clone 124, a difference that confirms the known growth patterns. Analysis of individual clones, however, revealed a significant interaction of clone x base angle. For Stoneville 124, best survival was attained

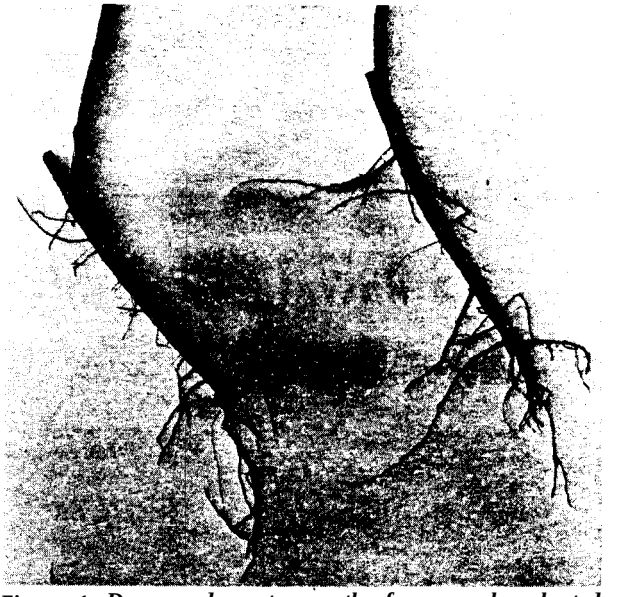

Figure 1.-*Downward root growth from angle planted cottonwood cuttings. Note that more roots occurred on* sides *and bottom than on upper surfaces.*

when base angle of cuttings was 45° (table 1). This interaction suggests that refined planting techniques might be possible for difficult-to-root clones and for unusual planting conditions.

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Table 1. ***--Survival by clone,*** planting angle, and *angle* of base.

Angle of base	Clone number					
	66	67	74	92	109	124
	- - - - ***Percent*** - - - -					
Vertical Planting						
90°	97	90	63	97	77	70
45°						
30°	100 100	8383	7753	9380	9787	'87 60
Mean	99	86	64	90	87	72
Angle Planting						
90°	100	97	80	87	77	60
45°	100	83	77	90	73	'83
30°	100	83	83	93	90	57
Mean	100	88	80	90	80	67

[1] For clone 124, significantly (0.05 level) better survival was attained when base angle was 45°.