Variation in Rooting Ability Among Selected Clones of Eastern Cottonwood (*Populus deltoides* Bartr. ex Marsh) in Southern Louisiana

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*Rooting of eastern cottonwood (*Populus deltoides *Bartr. ex Marsh) clones selected along the lower Mississippi River was highly variable. Early results indicated that some of these clones rooted as well as or better than some superior check clones obtained from the Texas Forest Service and the USDA Forest Service.*

Eastern cottonwood is a fast-growing, commercially valuable, genetically diverse, and easily propagated poplar species that is planted extensively in the Mississippi River Valley (3,5,6) (fig. 1). Most planters have been using genetically superior clonal stock that was developed through intensive selection and testing procedures by personnel of the USDA Forest Service at the Southern Hardwoods Laboratory at Stoneville, MS (1,4,7,8). Several of these select clones, planted near Baton Rouge, LA, failed to perform satisfactorily and showed even poorer growth than cuttings collected locally from young trees.

A study was initiated at the Louisiana State University Agricultural Center to identify and test selected cottonwood clones that would be adapted for superior growth in the lower Mississippi Valley. Superior native cottonwoods have not been selected in this area, and locally selected material should perform

Figure 1—*Five-year-old eastern cottonwood* (Populus deltoides) *plantation at Stoneville, MS.*

better than clones originating from more northerly latitudes.

Rooting ability can be used as a criterion for the early evaluation of clonal tests (3). Reported here are the results of a rooting study done after the initial selection of parent cottonwood trees along the lower Mississippi River. Rooting of the locally selected clones (LSU clones) was compared to superior check clones obtained from the Texas Forest Service and genetically improved (blue-tag) clones from the Southern Hardwoods Laboratory.

Methods

Forty-nine mature parent trees (ortets) were selected, because of their phenotypes, from along the Mississippi River between Cat Island (near St. Francisville, LA) and New Orleans. The trees were selected in early fall in 1981 for high leaf retention, straightness, and average or above-average height and diameter growth.

Primary ramets (cuttings) were collected from the selected trees from mid-February to early April 1982. Ten to twenty terminal cuttings 12 to 20 millimeters in diameter and 28 to 30 centimeters long were collected from the crowns. The cuttings were soaked in water overnight, and then in 100 parts per million rooting hormone (indole butyric acid) for 24 hours. Each cutting was planted in a 20-centimeter-tall clear polyethylene bag 10 centimeters in diameter that contained 1:1:1 sand/peat/vermiculite rooting medium. The planted bags were placed on heating pads in a greenhouse. Four to six weeks after planting, all rooted cuttings were transplanted to large pots 25 centimeters in diameter by 50 centimeters tall. The selected clones from the Texas Forest Service and the Southern Hardwoods Laboratory were included and treated the same as the LSU clones.

All propagules were watered, fertilized with 20N-20P-20K soluble fertilizer, and sprayed periodically with insecticide. Some were cut back twice during the summer of 1982 to multiply and expand the clonal material. The propagules resprouted each time.

In late February 1983, 10 to 46 secondary cuttings were taken from the primary ramets of each surviving clone. Nineteen LSU clones survived to this stage. Four clones (ST244 from Stoneville and S7C4, 57C20, and KEN8 from Texas) were used as check clones. A total of 798 cuttings 20 centimeters long were taken over a 3-day period. All cuttings were dipped in fungicide (benomyl), soaked in 500 parts per million rooting hormone (indole acetic acid) for 2 hours, and planted in clear polyethylene bags containing a 1:1 perlite/vermiculite rooting medium. The bags were placed on heating pads in a greenhouse, watered daily with deionized water, and sprayed weekly with fungicide (captan). Each cutting was checked for roots every 7 days. An overhead intermittent mist system was turned on after several weeks, when many cuttings had sprouted and leafed out before rooting.

Results and Discussion

Mean clonal rooting for the primary ramets was 47.5 percent and ranged from 0 to 100 percent (table 1). Rooting for twelve LSU clones was 80 percent or higher, and rooting for two clones (LSU-23 and LSU-35) was 100 percent. There were significant differences in rooting among clones (table 1). Rooting for the LSU clones (47.5 percent) was similar to that obtained by Farmer (2) (52.3 percent) for dormant cuttings of mature cottonwood collected in February and March. The check clones all had 100 percent rooting.

Rooting of the primary ramets was probably limited by the age of the cutting material. Maisenhelder (5) pointed out that cuttings taken from mature trees root and survive poorly. However, if the mature cutting material is rejuvenated, or repeatedly propagated over several generations, it will eventually return to a more easily rooted juvenile state. Rooting was lowest for ortets over 25 years old ($r = -0.34$). Maisenhelder (5) and Allen and McComb (1956)

reported that rooting ability usually decreases with increasing ortet age.

Mean rooting for the secondary ramets was 67.4 percent for the 19 surviving clones and ranged from 33.3 to 100 percent (table 2). Clones LSU-32, LSU-39, LSU-50, and LSU-14 all had over 90 percent rooting. Although there were significant differences among clones, a grouping of clones could not be established because of the high variability in the number of cuttings per clone. Mean rooting of the four check clones (81.4 percent) was not significantly different from the mean of the LSU clones (67.4 percent). These results verify that some of the LSU clones rooted as well as or better than the superior check clones (table 2).

The secondary ramets of the LSU clones were not in a fully rejuvenated state, so that the age of the cutting material probably still limited rooting. The secondary ramets generally had higher rooting percentages than did the primary ramets. Rooting for the primary ramets of the check clones was higher than for the secondary ramets. The primary ramets of the check clones were taken from young nursery-grown stock, so that the cutting material was at an optimum rooting age. The secondary ramets were grown in containers, which may have affected rooting success.

Table 1—*Ranking of clones by rooting percent of primary ramets taken from selected eastern cottonwood trees*

Clone	Ortet age* (yr)	Number of cuttings rooted/total	Percent rooted†
LSU-23	20	10/10	100a
LSU-35	20	10/10	100a
LSU-19	20	9/10	90a,b
LSU-27	14	18/20	90a,b
LSU-28	16	9/10	90a,b
LSU-13	13	17/20	85a,b
LSU-46	21	17/20	85a,b
LSU-08	12	8/10	80a,b
LSU-14	16	8/10	80a,b
LSU-15	17	8/10	80a,b
LSU-38	21	16/20	80a,b
LSU-42	16	8/10	80a,b
LSU-32	16	15/20	75a,b
LSU-25	28	7/10	70a,b
LSU-29	22	7/10	70a,b
LSU-01	19	6/10	60b
LSU-09	9	6/10	60b
LSU-37	20	6/10	60b
LSU-39	18	6/10	60b
LSU-40	23	12/20	60b
LSU-47	20	6/10	60b
LSU-06	20	5/10	50b
LSU-20	28	5/10	50b
LSU-31	20	5/10	50b
LSU-33	10	5/10	50b
LSU-36	21	5/10	50b
LSU-41	13	5/10	50b
LSU-43	21	5/10	50b
LSU-49	ND	5/10	50b
LSU-48	21	4/10	40
LSU-30	22	3/10	30
LSU-44	22	3/10	30
LSU-51	ND	3/10	30
LSU-07	16	5/20	25
LSU-24	19	5/20	25
LSU-50	15	5/20	25
LSU-05	18	2/10	20
LSU-34	23	2/10	20

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Table 1—*Continued*

Clone	Ortet age* (yr)	Number of cuttings rooted/total	Percent rooted
LSU-45	21	2/10	20
LSU-03	ND	1/10	10
LSU-10	30	1/10	10
LSU-16	16	1/10	10
LSU-21	21	1/10	10
LSU-26	28	1/10	10
LSU-11	27	0/10	0
LSU-12	21	0/10	0
LSU-17	20	0/10	0
LSU-18	25	0/10	0
LSU-22	17	0/20	0
Mean			47.5
Check clones‡			
ST67		20/20	100
ST74		20/20	100
ST92		20/20	100
ST109		15/15	100
ST244		15/15	100
S07C01		10/10	100
S07C02		4/4	100
S07C04		10/10	100
S07C08		10/10	100
S07C13		10/10	100
S07C15		10/10	100
S07C20		10/10	100
S13C15		10/10	100
S13C20		10/10	100
KEN08		10/10	100
Mean			100

* ND = Age could not be determined.

† Clones with 50-percent rooting or higher followed by the same letter do not differ in rooting from each other. ($P = 0.05$).

‡ Clones with ST preceding the number were obtained from the Southern Hardwoods Laboratory, Stoneville, MS; the other check clones were obtained from the Texas Forest Service.

Conclusions

Rooting ability among the primary ramets and the secondary ramets was highly variable. Rooting of the primary ramets appeared to be limited mainly by the age of the cutting material. Statistically significant differences for rooting were evident among clones for both the primary and secondary ramets, indicating that useful variation for selection was present. Significant differences for rooting means were not evident between the secondary ramets of the LSU clones combined and the four superior check clones, indicating that some LSU clones performed as well as the superior check clones.

Finally, long-term conclusions should not be drawn from this study because the results are based on first-year data. The ranking of the top clones (the top five in terms of rooting percent were LSU-19, LSU-14, LSU-13, LSU-32, and LSU-39) could change with time as different clones having consistently high rooting emerge and perform better in the long run. All clones should therefore be tested and observed for several more years so that more definite trends for rooting and survival of each clone can be established.

Table 2—*Ranking of clones by rooting percent of secondary ramets of eastern cottonwood*

Clone*	Number of cuttings	Percent rooted
LSU-39	11/11	100.0
S07C04	19/19	100.0
KEN08	24/25	96.0
LSU-14	23/25	92.0
LSU-32	33/36	91.7
LSU-50	9/10	90.0
LSU-19	15/17	88.2
LSU-13	28/34	82.4
S07C20	36/46	78.3
LSU-06	12/17	70.6
LSU-29	13/19	68.4
LSU-07	8/12	66.7
LSU-42	14/21	66.7
LSU-27	16/25	64.0
LSU-46	19/30	63.3
LSU-37	7/12	58.3
LSU-41	6/11	54.6
LSU-09	12/23	52.2
ST244	19/37	51.4
LSU-28	8/16	50.0
LSU-25	9/20	45.0
LSU-15	11/25	44.0
LSU-35	5/15	33.3

* Check clone ST244 was obtained from the Southern Hardwoods Laboratory, Stoneville, MS. S07C04, S07C20, and KEN08 were obtained from the Texas Forest Service.

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