

COMPARISON OF GROWTH AND VOLUME PRODUCTION
OF SLASH AND LOBLOLLY PINE TEST PLANTATIONS ON TWO PLANTING SITES

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Abstract.--In progeny test plantings established on two separate test areas in East Texas, adjacent plantations of loblolly and slash pine were compared after 10 years. Loblolly pine produced about 22 percent more volume than comparison slash pine plantations. Survival of loblolly pine was slightly higher than slash pine. Infection and mortality attributed to fusiform rust was also higher in slash pine than in loblolly pine plantations.

Additional keywords: Pinus taeda, Pinus elliottii var. elliottii, productivity, growth and yield, species comparison

The most commonly planted pine species in East Texas are slash pine (Pinus elliottii Engelm. var. elliottii) and loblolly pine (Pinus taeda L.). Loblolly pine is planted throughout the eastern part of the state from Galveston Bay north to the state line and west into the post oak belt on the western edge of the natural range of loblolly pine.

Slash pine is not a native species in Texas but it has been planted in the state for over 50 years. Most slash pine plantings are established in the coastal plain in the southeast corner of the state and inland up to 100-150 miles from the Gulf of Mexico.

Differences in productivity between slash and loblolly pine should be considered in long term forest management planning. However, reports on comparative growth and yield from slash and loblolly pines are somewhat contradictory. Shoulders (1970) indicated that loblolly and slash pines in central Louisiana grew about the same rates from ages 23 to 38 when initial differences in diameter were allowed for. In 1977 Shoulders compared 15-year-old slash in central Louisiana and concluded that loblolly and slash pine appeared to be equally suited for short rotation on coastal plain soils in central and south Louisiana. Cole (1973) reported that loblolly pine was significantly more productive than slash pine in Florida, Georgia, and South Carolina on planting sites in the lower and middle Atlantic coastal plain and Piedmont region. In these test plantings volumes averaged about 49 percent higher for loblolly pine than for slash pine.

MATERIALS AND METHODS

All seedlings, including controls, were grown at Indian Mound Nursery near Alto, Texas. All test material was randomized and replicated in the nursery beds. Nineteen or more families were included in each test planting.

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Progeny test plantations had eight or more replications of randomized four tree row plots. The 1967 plantings had 12 replications, a total of 1200 trees, for both loblolly and slash pine plantations at both locations. The 1968 slash pine plantings used the same design as the 1967 plantings. A slightly different design was used for the loblolly plantings in 1968 because of low seed germination in some families.

Two plantations, one slash pine and one loblolly pine, were established at each planting area during 1967 and 1968. Thus a total of eight plantations at two locations were available for comparison.

The slash pine plantings were from controlled pollinated crosses between seed orchard trees selected for good growth and form. Since slash pine is not native to Texas all slash pine selections were from plantations established in East Texas. Information on provenance was unavailable for some of the parent plantations.

Loblolly pine plantations established during 1967 were from crosses of seed orchard trees selected for good growth and form from native stands throughout East Texas. The 1968 loblolly plantations contained both open-pollinated and controlled pollinated drought resistant selections from the extreme western edge of the natural loblolly range.

Four plantations were established on the Spurger test site in Tyler County - about 75 miles inland from the Gulf of Mexico. The site is level coastal plain with about 55 inches of annual rainfall. The soil has good internal drainage and slow surface drainage. Overall, the site is typical of many areas in the coastal plain where slash pine is being extensively planted.

Comparison plantings were made at Pine Valley in San Jacinto County about 100 miles northwest of the Gulf of Mexico. The site is slightly hilly with good surface drainage and poor internal drainage. Rainfall is about 45 inches annually. Slash pine is also planted widely in this area.

On both planting sites, slash pine and loblolly pine plantations were either planted adjacent to each other or as close as topography and soil variations would permit.

Height and diameter of all trees were measured at five and ten years. Incidence of infection by fusiform rust (Cronartium fusiforme Hedgc. & Hunt) was recorded along with height and diameter measurements. Form evaluations and specific gravity determinations were made at ten years.

Comparisons between slash and loblolly pine plantation growth and volume production was analyzed as unpaired observations (Steele and Torri 1960). Percentage data used in analysis was converted by arcsine $\sqrt{\text{percent}}$ transformation.

RESULTS AND DISCUSSION

Volume

In all comparison plantings loblolly pine produced more volume than slash pine. Overall, loblolly pine produced an average of over 22 percent more cubic volume than slash pine after 10 years. In three of the four pairs of plantations loblolly pine produced significantly more volume than slash pine. In the fourth pair of plantations loblolly pine produced more volume than slash pine but the difference was not statistically significant.

Survival

At ten years loblolly pine averaged about 87 percent survival over all plantations while slash pine averaged about 80 percent survival. There was no significant difference in survival when all plantations were grouped together for analysis. When comparisons were made between pairs of plantations, two had significantly higher loblolly pine survival, while one pair had significantly greater slash survival and the fourth pair had no significant difference in survival.

Differences in survival between loblolly and slash pine resulted in part from losses of slash pine to fusiform rust. The amount of infection by fusiform rust appeared to be greater on slash pine than on loblolly pine and to have caused more mortality of slash pine than loblolly pine.

Basal Area

Basal area of the loblolly pine plantation averaged about 18 square feet per acre more than slash plantations. Survival would be expected to influence basal area but it was not the only factor which caused differences. For example, in adjacent plantings where slash pine had a survival rate of over five percent more than loblolly pine the latter had about 21 square feet per acre more basal area than the former. In all comparisons of pairs of plantations loblolly pine had significantly more basal area than slash pine.

Height

In the four comparison plantings slash pine had significantly greater height than loblolly pine in two, was not significantly taller in the third, and was shorter in the fourth. When all plantations are compared there was no significant difference in height growth. The differences in height ranged from .2 percent up to about 10 percent. The average difference between all comparison plantings was about three percent in favor of slash pine.

Diameter

Loblolly pine had a greater diameter than slash by an average of about six percent for all plantations. In two of the four comparison plantings loblolly pine had significantly greater diameter than slash pine. In the other two plantings the difference was not significant.

In the 1978 plantings at Pine Valley competition from wild pine seedlings and hardwood sprouts influenced the growth rates of both slash and loblolly pine in test plantations. Differences in growth potential were obscured by this competition. In the other six plantations competition with non-planted trees was light to moderate. (Volume, survival, basal area, height, and diameter data are summarized in table 1).

Table 1.--Loblolly pine and slash pine plantation means at 10 years.

	<u>Location and Year</u>			
	<u>Pine Valley</u>		<u>Spurger</u>	
	1967	1968	1967	1968
Volume (M ³ ha yr)				
Loblolly	5.50 a ^{1/}	4.07 a	10.49 a	8.89 a
Slash	4.66 b	4.06 a	8.53 b	6.34 b
Height (M)				
Loblolly	8.70 a	7.59 a	11.26 a	10.12 a
Slash	8.72 a	8.37 b	11.08 b	10.64 b
Diameter (CM)				
Loblolly	11.44 a	9.46 a	13.44 a	12.27 a
Slash	11.01 b	9.55 b	12.00 b	11.42 b
Basal Area (Sq.ft.)				
Loblolly	82.6 a	70.1 a	121.8 a	114.8 a
Slash	72.8 b	63.4 b	100.7 b	78.0 b
Survival (Percent) ^{2/}				
Loblolly	61.54 a	76.31 a	64.90 a	75.70 a
Slash	60.19 a	66.58 b	68.95 b	58.66 b

^{1/} Pairs of plantations with different letters differ at the .05 level of significance.

^{2/} Survival data converted by arcsine $\sqrt{\text{percent}}$ transformation.

CONCLUSION

The differences in growth between loblolly and slash pine in these plantations indicates that planting slash pine on these sites would offer no particular advantage over loblolly pine but would result in significantly less volume production.

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