CHARACTERIZATION OF YIELDS FOR PINUS TAEDA GENOTYPES AT THE HALF-SIB, FULL-SIB, AND VARIETAL LEVELS OF GENETIC IMPROVEMENT AT TWO PLANTING DENSITIES AT AGE 5 IN THE UPPER COASTALPLAIN OF GEORGIA

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Seedling deployment options for the establishment of operational *Pinus taeda* plantations in the Southeastern U.S. now include half-sib families, full-sib crosses, and varietals. In 2005, a study to evaluate the effects of genotype and density on yield and quality was established on a moderately well-drained upland site in the Upper Coastal Plain in Marion County, GA. Establishment culture intensity was operational and included chemical and mechanical site preparation and herbaceous weed control. The genotypes used in the trial included four varietal entries (C32 and C93 referred to as "high yielding" below, and C36 and C40 referred to a "low-yielding"), three full-sib genotypes (M2, M15, M16), and one well-known and widely-planted half-sib family (OP3). The density treatment included a 388 tree per acre planting level and a 518 tree per acre planting level. The trial design is a split-block, randomized complete block. Tree measurements were completed at the end of the 5th growing season. Genotype and density treatment mean differences were evaluated for statistical significance for traits including survival, DBH (diameter at 4.5 ft), height, and mean tree volume, at the alpha level of 0.01. These means and their relative significance are summarized in Table 1.

Survival was not significantly different for either the density or genotype treatments. Differences between means for all other measured traits were statistically significant for both treatments. There was not a significant genotype by density interaction for any of these traits.

Mean DBH of the low density plots was significantly greater than that of the higher density plots (Table 1). Mean DBH of the high yielding clones C93 and C32, the full-sib crosses M2, M15, and M16, and the open-pollinated entry OP3 were not significantly different at age 5. Mean DBH of these genotypes was significantly greater than those of the low-yielding varieties C36 and C40. At low density, M15 and C93 had the greatest mean DBH at 4.5 inches and 4.4 inches respectively. In the high-density plots, M15 and M16 had the greatest diameters at 4.1 inches and 4.3 inches respectively.

Mean height was one foot greater on the low density than the high density plots. The mean height of Variety C93 at 24.41 feet was significantly greater than all other genotypes (Table 1, Figure 1).

Mean tree volume was greater on low density than high density plots. M16 had the greatest volume but was not significantly different than that of C93, M2, or M15. Variety C93 and cross M16 were significantly different than the elite half-sib family OP3. Varieties C36 and C40 were significantly lower than OP3.

Results suggest that the individual genotype is more important that the level of genetic improvement when considering mean yield characteristics, i.e. some open pollinated seedlings may have higher yield characteristics than some varieties. However, in general, for the genetic entries compared at the Marion County, GA location, varieties C93 and C32

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and mass-control-pollinated crosses M2, M15, and M16 performed very well and showed a statistically significant improvement in yield through 5 years of growth as compared to historically elite and widely planted half-sib family OP3.

The statistical difference in mean height by density at age 5 is worth highlighting. The difference observed suggests that even at this moderate density contrast (388 versus 518) but at a high operational level of culture, differences in height may have occurred prior to age 5. The low density treatments demonstrating greater heights at this young age may be attributed to the existence of larger crowns with more potential for light interception and resource storage in fast growing trees.

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Table 1—Loblolly pine mean DBH, height, tree volume and proportion of surviving trees by density and genotype treatment at age 5 in the Upper Coastal Plain of Georgia. DBH in inches, total height in feet, and mean tree volume in cubic feet; For a particular treatment and attribute, means followed by the same letter are not significant at alpha = 0.01

	Density Treatment		Genotype Treatment							
			Variety				Mass-control pollinated			OP
Factor	Low	High	C93	C32	C40	C36	M2	M16	M15	OP3
DBH	4.09a	3.72b	4.14a	3.99a	3.48b	2.82c	4.16a	4.37a	4.27a	4.01a
Height	21.52a	20.51b	24.41a	22.26bc	18.48d	15.80e	21.97bc	22.64b	21.74bc	20.82c
Volume	1.16a	0.94b	1.26ab	1.10bc	0.76d	0.46e	1.19abc	1.34a	1.23abc	1.07c
Survival	0.94a	0.94a	0.96a	0.95a	0.89a	0.94a	0.95a	0.94a	0.91a	0.94a

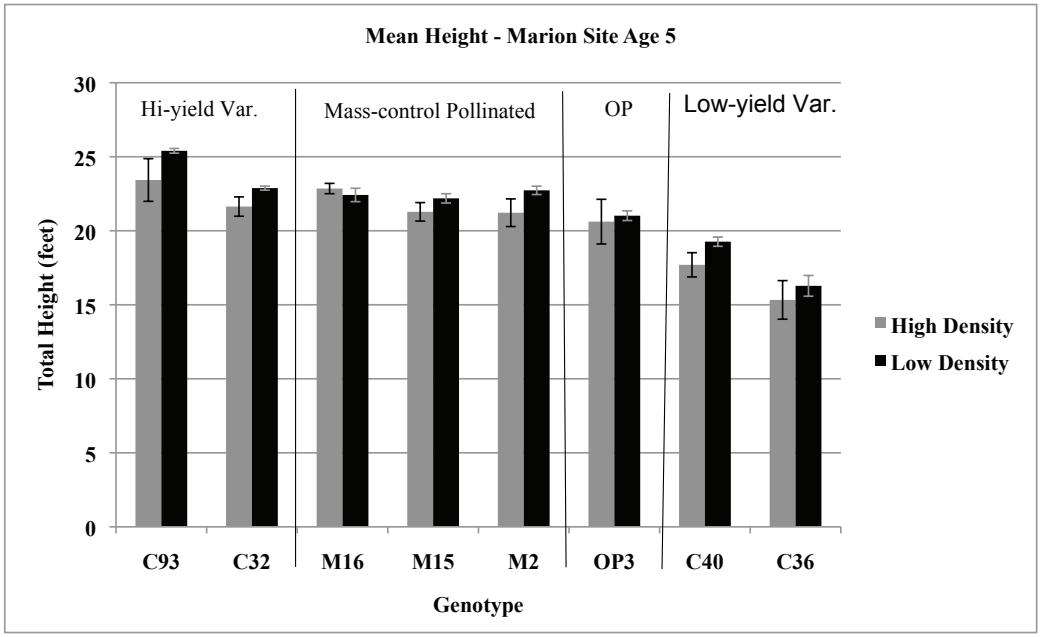

Figure 1—Loblolly pine mean height at age 5 by genotype and planting density in the Upper Coastal Plain of Georgia. Error bars are provided to represent the standard error for each mean.