Genetic Variation in MFA, MOE and Wood Density Among Clones of *Pinus taeda* L.

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Breeding and selection for desirable wood properties will be a key factor in determining the global competitiveness of forest industry in the United States. Microfibril angle (MFA), modulus of elasticity (MOE) and wood density are the most important wood characteristic that affect solid wood properties. Forty-five clones from nine full-sib families of loblolly pine were sampled in this study to study genetic variation in these traits. The experimental design was split-plots with seedlings and rooted cuttings of the same full-sib families in whole plots. In rooted cutting plots, 5 to 9 clonal sub-plots were established per family, with each sub-plot consisting of two ramets. The field trials were established in two locations with six complete blocks within each site. Increment cores (12 mm thick) were sampled from breast height of the stems. Wood properties were measured by SilviScan® 2, an instrument that combines x-ray densitometry, diffractometry and image analysis to measure a variety of wood properties.

Based on core average values, considerable variation was detected among clones for MFA, MOE and density. Clonal differences explained 26% of the variation in MFA and MOE. Percent of the total variation explained by clones in density (43%) was much higher. Within family clone-mean heritabilities were 0.62 for MFA and MOE. MFA had negative phenotypic and genetic correlations with height suggesting that fast growing loblolly pine clones tend to have acute MFA angles. However, correlations between MFA and diameter at breast height were weak. MFA had also weak correlations with wood density, suggesting that selection for volume or density will not affect MFA in the population studied.

Parents differed significantly for MFA, MOE and density values obtained from the seedlings based materials. Male parents explained greater percentage (9%) of variance for MFA than females (4%). Full-sib families were not different for any of the traits. The results suggested that MFA, MOE and density are repeatable at the family level. Additive genetic effects were the main source of genetic variation. Dominance genetic effects were negligible. MFA had negative but weak phenotypic and genetic correlations with the growth traits. Correlation between MFA and density values was. Selection of parents of loblolly pine for MFA and MOE for deployment in the pine plantations seems promising. Considerable improvement could be realized for fiber properties from traditional selection. The results suggested that emphasis should be given clonal selection for greater improvement of traits.

Radial variations in MFA and MOE and differences among clones and families were examined. MFA decreases from the pith to the bark, whereas MOE increases. The highest MFAs occurred close to the pith for all clones and families. However, large genetic differences (at family and clones levels) were detected in the rate of change over time for MOA and MOE, which should provide opportunities for selection and breeding for these properties in a tree improvement program.

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