Genetic Variation In Wood Density And Its Measurement Using The Resistograph

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ABSTRACT

Specific density is one of the most important wood characteristics. It affects many wood properties and products made of wood. Wood specific gravity is usually determined by volumetric and x-ray density measurements, but these methods are time consuming and expensive for use in a large scale. A study was initiated to develop a new, non-destructive, and relatively efficient method to estimate standing tree wood density by using the Resistograph, a tool developed mainly for detecting decays in the trees or structure wood.

For the study, 12 mm increment cores were collected from 14 full-sib families of loblolly pine generated by a diallel mating design. Randomized complete blocks with six replications field design was used in four test sites located in South Carolina. Each full-sib family was represented by six trees in row plots. Wood basic density was determined for 2016 trees applying standard volumetric method. The same trees were drilled with the Resistograph. Individual ring density, ring width, early and late wood were determined scanning the core increments by the x-ray. Relationships between volumetric, x-ray scanning profiles and the Resistograph profiles were detected.

There were marked differences among six parent trees for basic wood density values estimated from a BLUP analysis, which ranged from 0.392 (parent 1634) to 0.451 (parent 1649). The difference between genetic values of full-sib families was considerable and ranged from 0.399 (cross 01626 x 01634) to 0.436 (cross 01649 x 01612).

The preliminary results showed that power consumption by the resistograph reflected the density of a tree. The denser the tree, the greater average amplitude of the resistograph profile (correlation r=0.69). Average amplitude of the resistograph profile and sum of the ring width were the most significant traits to explain wood density (R^2=50%). Family mean genetic values were moderately correlated with family mean resistograph amplitude (r=0.67). The early results showed that the method is promising to estimate gross wood density. The research is continued to relate the x-ray profile with the resistograph profile. If the correlations can be further improved, the method may be more efficient than x-ray and gravimetric density methods.

Keywords: Loblolly pine, basic wood density, x-ray scanning, resistograph