**GROWTH RESPONSE OF CLONAL PINUS TAEDA FOLLOWING FERTILIZATION IN THE VIRGINIA PIEDMONT**

Jeremy P. Stovall, Colleen A. Carlson, Thomas R. Fox, and John R. Seiler
Department of Forestry, Virginia Tech

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**Introduction**

Clonal forestry offers the opportunity to increase yields, enhance uniformity and improve wood characteristics. Intensive silvicultural practices, including fertilization, will be required to capture the growth potential of plantations. However, variation in nutrient use efficiency that exists among clones could affect growth responses of clones, necessitating clone-specific silvicultural prescriptions. Our research objective was to determine the range of growth response to fertilization in clones of *Pinus taeda* and explore stem and foliar variables related to this response.

**Methods**

Our site is located on the upper Piedmont in Patrick County, Virginia, (36°40' N, 80°10' W) on a Hiesee loam (very-fine, kaolinitic, thermic Rhodic Kanhapludults) and a Louisa loam (loamy, sparsely silty, thermic, shallow Rupitic-Ultic Dystrochrepts). A split plot experimental design was used with the whole plots being two levels of fertilization (with or without) and the split plot factor being 25 clones. Whole plot treatments were blocked and replicated four times. Trees were planted in May 2003, with the fertilizer (224 kg ha⁻¹ DAP and 184 kg ha⁻¹ ammonium nitrate) being applied by hand in a banded application in May 2004 and again in May 2006. Stem volume was measured in December 2005, 2006, and 2007, cold damage in 2005, and stem sinusity and forking in 2005 and 2007. In 2005 a representative branch from the north side of the crown near DBH was harvested. All needles were removed, oven dried, and weighed.

**Results**

A repeated measures analysis indicated that the fertilizer by time and clone by time interactions were both highly significant (p < 0.01 for both factors) for height and for tree volume development. Although there were no statistically significant fertilizer by clone interactions in this trial, the response to the fertilizer was highly variable across the 25 clones (FIG 1, upper plot). The improvement in volume due to fertilization when the trees were 5 years old was greater than 20% improvement in 32% of the clones. Another 40% of the clones had responses that ranged from negative to less than a 5% volume improvement. While it is clear that volume response to fertilization is related to leaf area response on average, this is inconsistent across clones (FIG 1, lower plot, inconsistent responses indicated by arrow).

**Conclusions**

Our results suggest that different silvicultural prescriptions (i.e. fertilization) may be appropriate for different clonal plantations. Based on the physiology of the genotype deployed. A rapid screening technique for clonal response to fertilization may be necessary given the wide range of fertilizer responses found between clones in this field trial and the large numbers of clones being developed by forest industry. Physiological mechanisms other than leaf area increase, such as shifts in biomass allocation belowground or increased photosynthetic rates, are likely responsible for fertilizer volume response in some clones.