

FUSIFORM RUST RESISTANCE IN AN ATLANTIC COASTAL ELITE LOBLOLLY PINE POPULATION

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Fusiform rust is the most critical disease affecting the health and productivity of loblolly pine (*Pinus taeda* L.), the most commercially important pine in the Southeast. An Atlantic Coastal Elite (ACE) breeding population was developed in the NC State University Cooperative Tree Improvement Program to assess the short-term genetic gain for the Coastal regions of the Southeast. Twenty-four elite Atlantic Coastal parents were mated to produce 76 crosses and were screened at the US Forest Service Resistance Screening Center (RSC) in Asheville, NC. About 9775 progeny of the 76 crosses were challenged with a broad-based inoculum from expected deployment ranges, at a spore density of 50,000 spores per milliliter, and assessed for gall presence or absence after six months. The overall rust incidence was 0.48. Full-sib family means ranged from 0.11 to 0.83. The combined additive and genetic dominance explained 9.9% of the phenotypic variance. The ratio of dominance over the additive genetic variance was 0.13 (± 0.07). The narrow-sense heritability of full-sib family means was 0.93 (± 0.03), suggesting strong genetic differences among families.

Selection for rust resistant progeny was conducted at age six months, after gall assessment. All seedlings with rust galls, as well as some entire full-sib families, were discarded based on the expectation they would also be susceptible in the field. The remaining 2362 seedling progeny of the 51 crosses (~45 per family) were clonally propagated via rooted cuttings. Ramets of the clones were planted across eight test sites using incomplete block row-column designs. A half-sib family that was not tested for rust resistance at the RSC was included in the test design as a checklot, and fusiform rust disease incidence was recorded for these seedlings in the field tests. Survival, height, diameter at breast height, incidence of fusiform rust galls, straightness, forking and ramicorn branching were assessed at ages four and six. At age four, the cloned ACE population had an overall rust incidence of 0.02. The checklot family had 0.19 rust incidence both at ages four and six. At age six, the overall rust incidence was 0.06, indicating screening at the RSC with subsequent field-testing of survivors was effective.

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