FUSIFORM RUST RESISTANCE IN AN ELITE POPULATION OF LOBLOLLY PINE POPULATION

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Fusiform rust (caused by the fungus *Cronartium quercuum* f. sp. *fusiforme*) is the most critical disease affecting the health and productivity of loblolly pine (*Pinus taeda* L.), the most commercially important pine in the Southeastern United States. An Atlantic Coastal Elite (ACE) breeding population was developed in the N.C. State University Cooperative Tree Improvement Program to assess 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 U.S. Forest Service Resistance Screening Center (RSC) in Asheville, NC. About 9,775 progeny of the 76 crosses were challenged with a broad-based inoculum from across the expected deployment region. A spore density of 50,000 spores per milliliter was used, and seedlings were assessed for gall presence or absence after 6 months. The overall rust incidence was 0.48, and full-sibling family means ranged from 0.11 to 0.83. The narrow-sense heritability of half-sibling family means was 0.95 (± 0.003), suggesting strong genetic differences among families. Broad-sense heritability of full-sibling family means was 0.93 (± 0.03).

Based on the 6-month results, all seedlings with rust galls as well as some entire full-sibling families were discarded based on the expectation they would also be susceptible in the field. The remaining 2,362 seedling progeny of the 51 crosses (~45 per family) were clonally propagated via rooted cuttings, and ramets of the clones were planted across eight test sites. A half-sibling 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. Incidence of fusiform rust galls, survival, height, diameter at breast height, straightness, forking and ramicorn branching were all assessed at ages four and six. At age 6 years, the overall rust incidence was 0.06. The checklot family had 0.19 rust incidence both at ages four and six. Two sites in Colleton county South Carolina had 56 percent and 71 percent rust incidence in the non-screened checklot compared to 0.11 and 0.15 in the screened rooted cuttings. These results indicate screening at the RSC with subsequent field-testing of survivors was effective.

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