

Early Performance and Genetic Parameters for Atlantic Coastal and Piedmont Loblolly Pine and Their Hybrids in the Piedmont

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Abstract

Atlantic Coastal (C) and Piedmont (P) loblolly pine (*Pinus taeda* L.) sources and their hybrids were assessed at four years of age for height and survival in 15 test sites across five Piedmont regions (Piedmont, Upper Gulf, Blue Ridge, North East and Cold Area). Two intra-provenance (CxC and PxP) and two inter-provenance (CxP and PxC) populations were generated. Twenty polymix families represented each population. Main objectives of the study were to: (1) determine whether the inter-provenance hybrids can combine the growth of Atlantic Coastal and the cold hardiness of Piedmont sources when planted in Piedmont regions, (2) characterize the genetic architecture among and within populations across and within Piedmont regions, and (3) evaluate the stability of performance of families within populations across different environments.

The performance of inter-provenance hybrids was intermediate to that of the parental populations. When compared to the Piedmont population, which is the commonly planted source in Piedmont regions because of its cold hardiness, CxP inter-provenance hybrids exhibited significantly better height growth, with superiority ranging among 0.16% to 5.81% for height. Survival differences among populations within Piedmont regions were not significant at this age, except in the Cold Area, where significantly higher survival was found for the Piedmont population.

There were large family differences within populations for growth and survival. Genetic control for growth traits varied among populations, with stronger additive genetic control for CxP hybrids. Considerable variation was also detected for family performance for growth and stability across sites. The CxC and CxP populations were more responsive to site quality increase (measured by the test means), with a higher percentage of families having regression slopes larger than 1.0.

This early evaluation showed some promise for using loblolly pine hybrids as planting stock in the Piedmont region. With additional testing for cold hardiness, there is a potential to combine the growth of Atlantic Coastal and the adaptation to cold of Piedmont sources for planting in Piedmont regions. The CxP hybrids may perform well in milder Piedmont environments, while PxC could be more suitable for more inland and north Piedmont regions. Long-term monitoring of population performance and survival is essential, as prolonged exposure to adverse climatic conditions will provide more confidence about the results.

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