

Early Selection of Radiata Pine I. Trends over Time in Additive and Dominance Genetic Variances and Covariances of Growth Traits

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Abstract

Additive genetic, dominance genetic and phenotypic variances and corresponding correlations were estimated for growth data collected from disconnected half-diallel progeny trials involving 25 *Pinus radiata* D. DON parents and replicated across two sites in central North Island, New Zealand. Sectional area of stem was measured at three, seven, 10 and 13 years after planting at both sites, and height at three and 10 years at one site. Sectional area at three years exhibited similar levels of estimated additive (σ_A^2) and dominance (σ_D^2) genetic variance. However, levels of σ_D^2 remained approximately constant between three and 13 years while σ_A^2 increased substantially. Thus, sectional-area growth changed from being under equal additive and dominance genetic control at three years to almost complete additive genetic control from seven to 13 years. The greater increase in additive variance relative to phenotypic variance led to increases in individual heritability from 0.16 to 0.28 to 0.35 for sectional-area increments between 3–7, 7–10 and 10–13 years, respectively. Height growth exhibited negligible levels of σ_D^2 for the three- and 10-year measurements. The early sectional-area increment between 3–7 years showed an estimated additive genetic correlation of 0.87 with “mature” sectional area at 13 years. Subsequent sectional-area increments between 7–10 and 10–13 years showed estimates of additive genetic correlations of 0.99 with sectional area at 13 years. Dominance genetic correlations were much lower in magnitude, reflecting inconsistent dominance effects over time.

Key words: *Pinus radiata*, additive variation, dominance variation, juvenile-mature correlation, heritability.