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Genetic parameter estimates for *Eucalyptus dunnii* wood properties assessed by multiple methods

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Eucalyptus dunnii Maiden (Dunn's white gum) is a fast-growing tall tree with favourable wood properties for pulp production. Effective selection and deployment of superior genetic material in plantations require knowledge of the genetic architecture of relevant traits, including genotype-by-environment interactions (G×E). However, as open pollination (OP) is a common mating strategy for deployment in eucalypts, the genetic architecture is complicated due to the mixture of self and inbreeding progeny. Here we report genetic parameters estimated from a multivariate analysis of wood quality traits (basic density, kraft pulp yield, and wood concentration of calcium, phosphorus and lignin) assessed on trials of OP progeny established at two locations (Mt. Gambier —Australia—, and Rio Negro —Uruguay) across multiple ages. In addition, density was assessed as basic density (BD) from 5 mm wood cores, pilodyn penetration (PP), near-infrared (NIR) spectroscopy and resistance drilling (RESI). Kraft pulp yield (KPY), and calcium, phosphorous and lignin content were also predicted from NIR. A factor analytic model was implemented to accommodate the complex data structure. Within trial phenotypic correlations among observations for density assessed by BD, RESI, and PP were moderate (0.47-0.70), although correlations with NIR-predicted density were lower (0.0-0.48). Average estimated individual OP repeatability (Rop) and individual narrow-sense heritability assuming a purely additive model and 30% selfing (h2) were lower for KPY (Rop = 0.12, h2 = 0.29) and higher for RESI assessed density (0.22, 0.55). Genetic correlations between the same trait across the Uruguayan trials were greater than 0.85, but within trait genetic correlations between the Australia and Uruguay trials were lower (0.59 - RESI, 0.82 - NIR density, 0.56 - NIR KPY, 0.66 - NIR Ca, 0.73 - NIR P), suggesting a degree of large-scale G×E. While these estimates may be confounded with NIR sampling methods and models and age-to-age correlations, they provide a solid foundation for developing breeding and deployment strategies across environments.