

GENETIC MAPPING OF QUANTITATIVE TRAIT LOCI FOR WOOD
BASIC DENSITY IN *Pinus radiata* USING RAPD MARKERS

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Abstract: Quantitative trait mapping in *Pinus radiata* was carried out in a controlled-cross half-sib family forming part of an operational tree-breeding program. This family structure required the identification of RAPD markers fitting the pseudo-testcross configuration between the common parent and other contributing parents. The half-sib family structure was successfully used to identify three loci influencing a high heritability trait: wood basic density. These three loci were found to be clustered within a single linkage group, but separated by at least 48cM. All three loci for wood density showed a consistent direction of allelic substitution effect in the background of the half-sib family studied. Determination of the phenotypic variance explained by each locus was not satisfactorily resolved; most probably a consequence of restricted population size. Indications for full-sib family specific effects within the half-sib family, and for genotype x environment interaction at specific loci eroded the resolving power of half-sib family QTL analyses, and the usefulness of this family structure for marker based predictions on the performance of individuals with particular genotype configurations. These results indicate that average loci effects determined through half-sib families of moderate size may be useful for marker assisted breeding. However, potentially the most valuable application of genetic markers in forestry will involve selection of superior genotypes as embryos, young seedlings or juvenile trees for vegetative multiplication and clonal deployment. This application will require QTL analyses to be based on large full-sib families within each site of interest. RAPD marker technology should enable marker/QTL associations to be established in the most important families of interest to an operational plantation program, overcoming the problem of linkage equilibrium.

Keywords: Genetic mapping, QTL mapping, RAPD, half-sib, wood basic density, tree breeding, *Pinus radiata*.