Genetic Linkage Map of Nordmann fir: The First in the Genus *Abies*

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Genetic linkage maps have been constructed for many species of conifers, however none has been previously published for an *Abies* species. A genetic linkage map of Nordmann fir (*Abies nordmanniana* (Steven) Spach) open-pollinated family 9M was constructed using AFLP and RAPD markers developed from megagametophyte DNA. In all, 556 markers were grouped at LOD 5.0, $\theta = 0.30$ into 19 linkage groups which covered 1977 cM (Kosambi). Framework maps were ordered with interval support ≥ 3.0 for each linkage group. Accessory markers were attached to the nearest framework marker based on LOD scores and recombination fractions. Significant linkage distortion (approximately 10% of the 556 markers based on a chi-square test at $p \leq 0.05$) from the expected 1:1 Mendelian segregation ratio was recognized. The genome size was estimated to be 2471 cM and this map provided 80% coverage of the genome. Attempts to map a trait locus (based on disease phenotype in an inoculated mapping population) for disease resistance to *Phytophthora cinnamomi* Rands were unsuccessful. This *Abies* linkage map should be important to the Christmas tree industry for marker-assisted selection of useful traits such as pest resistance, branching characteristics, height, growth rate, and post-harvest needle retention.