

Contributed Papers

Concurrent Session A1 - Marker Assisted Breeding/Molecular Genetics

Increasing the Efficiency of Breeding Without Breeding Through Phenotypic Preselection in Open Pollinated Progenies

Yousry A. El-Kassaby¹ and Dag Lindgren²

¹Professor and Senior Industry-NSERC Research Chair, Department of Forest Sciences, Faculty of Forestry, University of British Columbia, Vancouver, BC, V6T 1Z4 Canada and

²Professor, Department of Forest Genetics and Plant Physiology, Swedish University of Agricultural Sciences, S-901 83 Umeå, Sweden.

Unlike classical methods used by forest tree breeders that rely on pre-determined mating designs to construct pedigreed materials for testing and selection, the concept of Breeding Without Breeding (BWB: El-Kassaby et al., 2007) was introduced to allow the assemblage of full-sib (FS) and half-sib (HS) families from seed orchards' wind-pollinated offspring without conducting any crosses. The method relies on using highly informative molecular markers (e.g., SSRs) and pedigree reconstruction methods to unravel the genetic relationship among individual's offspring. Fingerprinted large wind-pollinated families are required to allow the assemblage of FS and HS families with reasonable size for field testing. To maximize the method's efficiency while minimizing methodological efforts, we propose the inclusion of phenotypic pre-selection from existing open-pollinated family tests to substantially reduce the number of fingerprinted individuals. The proposed application (merging mass selection with BWB) capitalizes on the efficiency of mass-selection in identifying groups of superior individuals and the use of pedigree reconstruction to delineate the paternal parents of the phenotypically selected individuals, hence complete pedigree tracking. Methods for expanding the BWB utility through either slight modification of the production populations' structure or the introduction of desired genotypes through pollen management techniques are presented. The most breath-taking possibility offered by BWB is offering opportunities to abandon not only clonal archives and crosses but also field testing. If both maternal and paternal pedigrees could be reconstructed in commercial plantations originating from a seed orchard, the same type of mass selection could be performed for the orchard's clones and long term breeding could be practiced in commercial plantations rather than of investing efforts and resources on specialized progeny test trials.