BREEDING WITHOUT BREEDING: SCIENTIFIC JOURNEY TO REAL-LIFE APPLICATIONS

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Breeding without Breeding (BwB), broadly defined, is the use of molecular marker technology to make selections and genetic gain in tree breeding programs with a greatly reduced effort in control crossing and progeny testing. In this presentation, we cover the development of BwB strategies and highlight some key features, including phenotypic preselection and pedigree reconstruction. Next, we discuss the latest development on the extension of the BwB system to uncover genetic information directly from commercial forest plantations. This approach could be particularly useful at the initiation of a tree improvement program to save the time and expense of traditional progeny trials. The details of a suggested approach will be described, which include the use of both a random and phenotypically selected population (to minimize genotyping costs), pedigree reconstruction, and the use of standard REML-BLUP methodology to predict breeding values and make selections. Quantitative genetic theory and computer simulation were used to determine expected genetic gains, and estimate optimum population sizes for pre-screening and genotyping. In summary, we think BwB is a competitive cost-efficient approach that has potential value to tree improvement programs worldwide.

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