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Radiata Pine Breeding Co

CELEBRATING 70 YEARS

8 August 2024

Media release: Radiata Pine Breeding Company (RPBC) achieves another milestone in tree breeding genetics by developing a new Radiata Pine SNPchip

RPBC in collaboration with AgResearch and GenomNZ has developed its latest iteration of the Radiata Pine SNPchip for routine operational Genomic Selection. It provides rapid, less expensive, and highly accurate genetic information of tree DNA sampled in the RPBC breeding programme.

A SNPchip is a sliver of glass with very small pits etched into it. These pits each hold a sequence of genetic information called single nucleotide polymorphisms (SNP) or DNA markers. When a tiny amount of DNA is passed through these pits, usually extracted from substances such as plant matter, DNA fingerprints of each individual are recorded. Such DNA fingerprints from SNPchip technology is seen as a 'go to' tool for collating and preserving genetic information in a range of sectors.

"The new SNPchip underwent a robust development and proving phase with close to 1,000 radiata pine seedlings revalidated with the new and old SNPchip," says RPBC's R&D Manager and Geneticist Sai Arojju. "The results were consistent between both the platforms, producing high call rates with low missing DNA markers, a key success indicator."

The number of unique DNA markers on the new SNPchip platform sits at around 8,000, which is more than sufficient to perform routine operational genomic selection. Using the new SNPchip, operational genomic selection of 10,000 seedlings in 2024 has been completed successfully.

"Achieving an operationally efficient and reliable genomics pathway is a significant and important milestone in the 70 years of Radiata Pine tree breeding which we are celebrating this year," says RPBC's General Manager Darrell O'Brien.

"Our collaboration with Crown Research Institutes Scion and AgResearch, who were instrumental in developing the new SNPchip, has assisted us to rapidly move closer to achieving our overall objective of reducing the radiata pine tree breeding cycle from the traditional 17 years to a 9-year breeding cycle, thus increasing the rate of genetic gain over time. Deployment of genetic gain over time has a favourable influence on forest growers' profitability."

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About RPBC

RPBC is New Zealand's only specialist radiata pine breeding company and occupies a central position in the forest industry breeding supply chain.

RPBC breeds elite genetic material, and provides knowledge, support, and tools to continuously improve profitability for Australian and New Zealand radiata pine forest owners.

RPBC has 16 shareholders in Australia and New Zealand representing organisations from across the value chain: vertically integrated forestry companies, forest owners, forest management companies, and seed and planting stock producers. Together, these shareholders account for more than one million hectares of radiata pine plantations in New Zealand and Australia.

For more information go to: www.rpbc.co.nz

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Notes for editors

RPBC's Work

The aim of tree breeding is to improve the genetic quality of trees by improving specific tree characteristics called 'traits'.

These characteristics are an expression of the genetic code, and the environment in which trees are grown. Tree breeding is most successful for traits that are strongly 'heritable', that is, traits that are strongly determined by their genetic code.

RPBC currently implements a breeding objective that includes the traits of tree growth, stem straightness, branch habit, wood density, core wood stiffness. and resistance to Dothistroma needle blight.

Each objective trait has a corresponding economic weight and, along with the genetic and phenotypic relationships between the objective traits and the selection traits (the traits that are measured at selection age, ~6 to 10 years). The selection index is used to identify parent candidates for the next round of crossing and selection.

The economic weights have been derived using a bio-economic model that projects out to sometime in the future, say 40 years. Other uncertainties inherent in the calculation of a selection index for radiata pine are the estimates of correlations between selection age traits and rotation age traits (genetic parameters).

About Genomic Selection

Genomic Selection uses DNA markers to generate a unique DNA fingerprint for an individual, which tells us what blocks of DNA have been inherited from each of its parents.

By studying the patterns of these markers in trees that already have their traits measured (a "training population"), we start to build a picture of how these patterns could be used to make predictions in trees that haven't yet been measured. With a good set of markers and strong prediction models between the resulting fingerprint and the traits, it's possible to screen and select elite trees at the seedling stage, reducing the need for field testing and speeding up the delivery of gain into the next generation of trees.

With DNA fingerprints, we can also confirm the identity of clones, reveal hidden relatedness, and recover (and confirm) the true pedigree of trees. Access to accurate pedigree information further increases the accuracy of prediction model and breeding value estimates and enables a more streamlined approach to the management of inbreeding.