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DNA science aims at growing superior radiata pine trees

COVER STORY P5

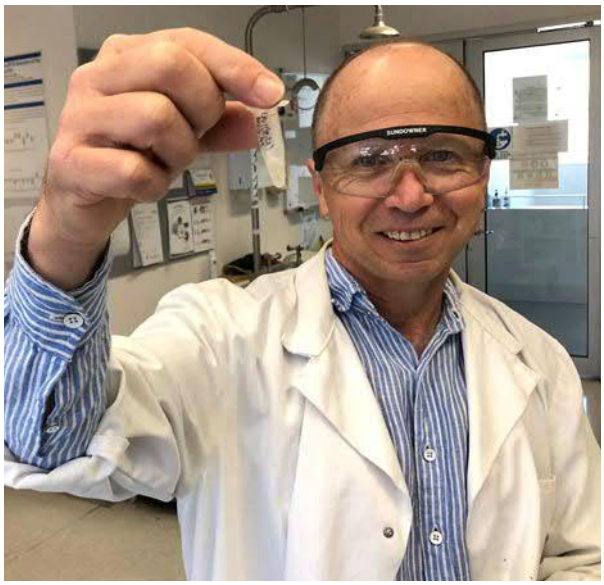
Growing the right tree in the right place at the right time

A superior radiata using DNA science

FINDING the formula to grow taller, straighter and stronger radiata pine trees is about to take a major advance for Australian growers thanks to the development of a sophisticated new genetic analysis program.

Tree Breeding Australia's research geneticist Dr Richard Kerr is developing new digital tools with the capability of pinpointing tree genes and measurement data to assist growers to select parents with optimal breeding values for specific locations, supporting operational and economic gains.

Dr Kerr first partnered with the Mount Gambier-based organisation more than 20 years ago to create TREEPLAN, a world-recognised system that can handle the peculiarities of tree data to assist breeding decision making, which is also utilised by growers in Sweden, France and China. This digital evaluation system transformed industry decision making, ranking trees on their genetic merit, linking performance data and pedigree information to build robust genetic values for plantation regions.



Dr Richard Kerr... a formula to grow taller, straighter and stronger radiata pine trees.

This system is similar to data analysis tools used by the beef sector to produce higher yield. This latest research will further sophisticate the TREEPLAN software, incorporating for the first-time genomic data for the whole species of radiata pine in Australia.

> "NEW SYSTEM COULD DOUBLE THE RATE OF GENETIC GAIN

TBA general manager Dr Tony McRae said it was hoped the new system would double the rate of genetic gain, providing industry with the tools to interpret DNA data for accurate and efficient decision making.

"This is world class research that is providing industry with the tools to sophisticate its breeding program," he said.

"Richard is building the interface to link data from multiple sources to better interpret the trees DNA to create true genetic predictions."

Dr Kerr has sourced needles from 1000 key radiata breeding trees to extract DNA and generate gene variant data, sourcing information from 30,000 informative points on the genome. He explained the DNA assay was undertaken in an American laboratory which has some of the world's best technicians and tools. Meanwhile, the sequencing of important ancestors of the current breeding parents is being completed in Australian laboratories to further strengthen this assay.

"A spot in the genome might have variants in terms of the genes that spot is coding for," Dr Kerr said.

"A tree carrying one variant may have a slight advantage in economic terms, such

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New genetic analysis... producing superior radiata pine trees.

From P 5

as extra height or diameter, compared to another tree carrying a different variant," he said. "When you sum up the effects of the variation at all the individual spots, they could add up to a significant advantage for a tree. We are isolating the best tree by looking at the variance in the genome."

> "SUPPORTING 'PRECISION FORESTRY' FOR THE FIRST TIME

"This program is a world 'first' in forestry, incorporating DNA and traditional breeding information into a BLUP (Best Linear Unbiased Prediction) analysis to generate an integrated analysis system to enable single step genomic selection.

Green Triangle Forest Industries Hub chair Ian McDonnell praised the research, stating that for the first time all data would be consolidated to support "precision forestry".

"The value creation from this new technology will be enormous," he said. "For the first time industry will have the tools to grow the right tree, in the right place and at the right time tailoring decision making to the economic and environmental objective.

This project is one of many funded through the National Institute for Forest Products Innovation which is putting the Green Triangle on the map as a centre of excellence in forestry innovation. In the long term it will assist industry to generate more valuable fibre from its existing land.

NIFPI, jointly funded by the commonwealth and South Australian government, is promoting and encouraging innovation across the country's forest and wood products sector.

NIFPI Mount Gambier chair Tammy Auld emphasised how such collaborative research would enable the sector to grow.

"As chair of the NIFPI Mount Gambier Centre and a local forest manager I am excited about this research which demonstrates the skills we have in our region," she said.

"This research will ensure that South Australia can continue to grow and produce Australia's premium structural grade pine and ensures this renewable resource is available to meet increasing future construction demand."

On the cover: Tree Breeding Australia's research geneticist Dr Richard Kerr is developing new digital tools to pinpoint tree genes and measurement data to assist growers to select parents with optimal breeding values.