



Programme Manager: Marco Lausberg

Issue Number: 13

Date: 2022

Summary

Highlights

- NIR used on *E. nitens* samples showed that shrinkage and several chemical parameters could be predicted and hence selected for in the breeding programme.
- Results from the Cypress trial sites showed large variation in heartwood % between clones which shows good potential to select for this trait. Heartwood is the more valuable timber in cypress logs.
- *E. quadrangulata* trials have had heartwood diameters assessed and the data made available for commercial selection. However, heartwood size was found to be negatively correlated to sapwood width and not correlated with tree diameter, indicating that DBH cannot be used to select for heartwood development.

RESEARCH PROGRESS: Q3 Year 7

Non-durable eucalypts

An existing NIR model, developed as a screening tool for tree breeding, has been assessed as a possible method for identifying *E. nitens* trees that produce timber that is not susceptible to within-ring checking and collapse. Tangential shrinkage values were used to predict the defect ratings of both kiln-dried and air-dried boards. These predictions were very poor at predicting differences in defect ratings between trees and tended to consistently predict very low defect ratings for air dried boards and very high defect ratings for kiln dried boards, even though both drying techniques showed a wide range of defect ratings between different boards and between trees. Because of these poor predictions it was recommended to end this project (predicting the behaviour of individual trees using this NIR model). Despite not being able to predict defect ratings of individual trees, it was observed that the group of trees with the highest average tangential shrinkage also contained a high proportion of the trees with high levels of within-ring checking. This suggests that removing trees with high levels of tangential shrinkage from the breeding population could reduce the overall incidence of within-ring checking, without needing to predict the behaviour of individual trees.

.....

A second study using NIR was undertaken to examine the ability to develop a model for wood shrinkage and lignin/cellulose content as a substitute for expensive destructive phenotyping methods. The evaluation was performed on wood samples retained from an open pollinated field experiment ("Keen's block") specifically to develop NIR based models for

shrinkage based on previous data, and new wet chemistry determinations for lignin and wood sugars.

See image below of blocks being prepared from *E. nitens* disc.



The NIR models developed explained up to 46% of the variation in tangential shrinkage and 26% of radial shrinkage in samples previously measured. They also explained 76% of the variation of Lignin, 32% of Galactose and 28% of Glucose. After applying the NIR models to 800 stored samples, and using the family information associated with the disks, estimated heritabilities for Lignin was 0.46, Galactose 0.29 and Glucose 0.3, which would allow the use of the models in the breeding program.



Having models which allows the prediction of shrinkage and cellulose from wood samples adds another option for screening and selecting the next generation of *E. nitens* in New Zealand, beyond the traditional method based on growth and form traits.

Naturally durable eucalypts

A report was produced on NZDFI's 2011 *E. quadrangulata* breeding populations for heartwood. Analysis indicate that heartwood diameter was not genetically correlated to tree diameter (DBH or core length) but negatively to sapwood diameter. This would suggest that neither DBH nor core length can be used as proxy to select for heartwood quantity. Families from these trials were previously ranked for form, growth and growth strain. Some families recommended for propagation in that report matched families performing well for heartwood traits. The data has been made available to the industry to select appropriate genotypes for commercial production.

Cypresses

Heartwood is a highly desirable attribute for cypress timber, particularly if installed outdoors. The Cypress Breeding Program has developed several hybrid cypress clones but has been waiting for the research trials to be old enough to sample and measure heartwood development.

Results from the Whakarewarewa sites showed large variation between clones (0 to 38% heartwood) with and overall average of 19% and on the Paparoa site heartwood percentage among clones ranged from 10 to 58% with an overall average of 31%. Variation between clones shows good potential to select for this trait.

The Paparoa site showed faster growth and better tree form than Whakarewarewa. A few clones are showing some susceptibility to canker infection which should be monitored over the next few years. All the cores have been air-dried and stored for possible use in future durability/extractive studies.

Reports and other outputs completed

| Report No. | Document Title |
|------------|---|
| SWP-FN136 | Heartwood screening of selected cypress clones and hybrids. |
| SWP-T144 | Assessment of NZDFI's 2011 <i>Eucalyptus quadrangulata</i> breeding populations |
| SWP-T145 | Using NIR to predict sawn timber quality in <i>Eucalyptus nitens</i> |
| SWP-T146 | Using NIR to predict wood shrinkage and cellulose content in <i>Eucalyptus nitens</i> |
| | |
| | |