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Assessment of Different Measurement Methods/Techniques in Predicting Modulus of Elasticity of Plantation Eucalyptus nitens Timber for Structural Purposes

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摘要　　　　The mechanical properties of plantation Eucalyptus Nitens timber are currently assessed by applying visual stress grading (VSG) designed for the sawn timber from the mature plantation and do not represent the actual characteristics of the resource. However, the well-known limitation of VSG application for this resource led to the discovery of other methods to grade the timber to its relevant structural grade. There is potential for hardwood plantations in Australia to supply wood to the timber industry and be used in structural applications. However, it is necessary to employ criteria to evaluate the structural properties of this resource before it could be satisfactorily used for structural purposes. This research aimed to assess the use of non-destructive technique (NDT) through acoustic wave velocity (AWV), machine stress grading (MSG), and multiple linear regression (MLR) model to predict the modulus of elasticity (MOE) as a grade-determining factor. The results showed that there was a strong correlation (R2 = 0.88) between the dynamic MOE (MOEdyn) and static MOE (MOEs) of the boards, proving the NDT as a reliable method for the MOE estimations of E. nitens timber. The results from the MLR model also showed that the density and AWV are effective parameters and their combination can be practical to estimate the MOE. There was a high correlation between the MOE obtained from MSG and MOE obtained from four-point bending, demonstrating that the MSG method through the flat-wise bending can be a suitable method for fast grading. The results also indicated that the measured MOE in the edgewise direction correlates with both the flatwise and longitudinal directions. The results also showed that the E. nitens timber resource has the potential to be used in

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