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ACOUSTIC METHODS TO DETERMINE STRENGTH CLASSES OF ROUND EUCALYPTUS TIMBER.

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Abstract

The structural use of round timber has been considered competitive in terms of both economics and sustainability due to the low energy consumption required for its processing. However, structural uses of wood in round or sawed forms require knowledge of wood properties, which makes the sorting of these properties essential. The objective of the present study was to determine roundwood grading by ultrasound method. For this evaluation, we tested round timber with different diameters. Static bending tests were performed under the equilibrium moisture content to determine strength and stiffness. Round timbers were sorted using Brazilian standard (NBR 15521 2007). An analysis of the results led to the conclusion that the classification of round timber must consider the range of diameters of the pieces. The classes proposed by the Brazilian standard can be used in the classification of round Eucalyptus timber with the application of a speed correction coefficient. The correction coefficient decreases as the diameter of a round wood increases.

Key words:

Modulus of elasticity in bending, wave propagation, logs

Introduction

The timber grading is extreme important to the market, because it facilitates the distinction between pieces with more or fewer defects and greater or lower resistance and/or stiffness.

In Brazil, two standards serve as basis for characterizing (NBR 7190) and grading wood for structural uses (NBR 15521), but these standards had not been developed for round wood pieces. So, this study aimed to the evaluate the feasibility of using NBR 15521 to sort logs.

Results and Discussion

Ultrasound tests were performed on round timber pieces from three species of *Eucalyptus* on saturated and equilibrium (12%) moisture content. To determine resistance and stiffness (E_M), bending tests were performed on logs only in equilibrium moisture content. The results obtained by ultrasound tests (V_{sat} and C_{LL}) were used to sort the pieces according NBR 15521 (2007). To evaluate the suitability of this grading, the result of each piece was classified into 1 of 3 categories – Image 1.

Image 1. Evaluation of the suitability of round pieces according to Brazilian standard NBR 15521 (2007).

Category 1 – The E_M value obtained in bending test is within the expected interval for the grade.

Category 2 – The E_M values obtained in bending test are lower than those expected for the grade.

Category 3 – The E_M values obtained in bending test are higher than those expected for the grade.

In addition to the ultrasound and bending tests, we measured the diameter of the pieces and sort them into visual grades. The diameter showed negative correlation with the acoustic and static parameters, as well as with the visual class. This result indicated the need for a grading system that considers the diameter of the round pieces. Applying correction coefficients to V_{sat} and C_{LL} led to a significant reduction in the number of pieces in Category 2 (against safety) – Chart 1.

Chart 1. Average percentages of framing in the categories of classification for the three species of Eucalyptus by applying the reduction coefficients speed according to the diameter range.

Category	V_{sat}	C_{LL}
1	23%	9%
2	5%	7%
3	72%	84%

* Correction coefficients according to diameters ranges: less than 169 mm – 0.85; 170 and 229 mm – 0.80; more than 230 mm – 0.70

Conclusions

The classes proposed by the Brazilian standard (NBR 15521 2007) can be used in the classification o round Eucalyptus timber by applying reduction coefficient to the velocity.

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