

## WITHIN TREE VARIATION OF PHYSICAL AND MECHANICAL PROPERTIES OF BALSA (*Ochroma pyramidale*) GROWN IN LUMAJANG, EAST JAVA

By

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Being known as the faster growing species compares to sengon (*Falcataria* sp.) and jabon (*Anthocephalus cadamba*), balsa offers an opportunity to be utilized to help fulfilling human need on wood. In order to determine its right and optimum usage and realizing that only a few information available about balsa in Indonesia, a study about physical and mechanical properties and variation along axial and radial direction is therefore essential to be conducted.

This research used Completely Randomized Design (CRD) with two factors and three replications which were axial (bottom, middle and top of the tree) and radial direction (nearby pith, middle, and nearby bark). Sample preparation and test were conducted in accordance to British Standard 373 year 1957 and the trees were obtained from plantation forest in Lumajang, East Java where becomes one of the plantation centers of balsa in Indonesia.

The result showed that moisture content in green and air-dried condition were 107.4% and 15.1% respectively. Specific gravity in green, air-dried and oven-dried respectively were 0.14, 0.142 and 0.147. Total shrinkage in direction of tangential, radial, longitudinal were 5.88%; 2.16%; 0.62%; respectively while volume shrinkage in total and T/R ratio were 7.43% and 3.52 respectively. The result of MOE, MOR, hardness, shear strength parallel to grain, compressive strength parallel and perpendicular to grain were 14,89x1000; 107.42; 142.46 ; 18.59; 68 and 15.8 respectively in unit of kg/cm<sup>2</sup>. Interaction didn't show any significant effect to both physical and mechanical properties while radial had significant effect on moisture content, specific gravity, total tangential shrinkage, MOE, MOR, Compressive, strength parallel and perpendicular to grain. Axial direction showed significant effect on a few parameters such as total tangential shrinkage and compressive strength perpendicular to grain.

**Keywords:** Balsa, Radial, Axial, Physical and Mechanical Properties.

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**VARIASI DALAM POHON SIFAT FISIKA DAN MEKANIKA KAYU Balsa  
(*Ochroma pyramidale*) YANG BERASAL DARI LUMAJANG, JAWA TIMUR**

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Sebagai salah satu kayu yang lebih cepat tumbuh jika dibandingkan dengan sengon (*Falcataria* sp.) dan jabon (*Anthocephalus cadamba*), balsa menawarkan kesempatan untuk dimanfaatkan untuk memenuhi kebutuhan manusia akan kayu. Oleh karena itu untuk menentukan penggunaan balsa yang tepat dan optimum serta dikarenakan informasi mengenai kayu balsa masih sedikit tersedia di Indonesia, penelitian mengenai sifat fisika dan mekanika balsa serta variasinya pada arah aksial dan radial penting untuk dilakukan.

Penelitian ini menggunakan metode rancangan acak lengkap dengan dua faktor dan tiga ulangan yaitu arah aksial ( pangkal, tengah dan ujung bagian batang pohon) dan arah radial (bagian dekat hati, tengah dan dekat kulit). Pembuatan dan pengujian sample dilakukan berdasarkan standar British 373 tahun 1957 dan pohon berasal dari hutan tanaman di Lumajang, Jawa Timur yang merupakan salah satu pusat hutan tanaman balsa di Indonesia.

Hasil menunjukan bahwa nilai dari rerata kadar air pada kondisi segar dan kering udara yaitu 107,4% dan 15,1%. Nilai berat jenis pada kondisi segar, kering udara dan kering oven yaitu 0,14; 0,142; dan 0,147. Penyusutan total pada arah tangensial, radial, longitudinal yaitu 5,88%, 2,16%, 0,62%. Nilai penyusutan volume dan rasio T/R adalah 7.43% dan 3,52. Nilai MOE, MOR, kekerasan, kekuatan geser sejajar serat, kuat tekan sejajar dan tegak lurus serat secara berturut-turut yaitu 14,89 x 1000; 107,42; 142,46 ; 18,59; 68 dan 15,8 dalam satuan kg/cm<sup>2</sup>. Interaksi tidak menunjukan pengaruh yang sangat nyata terhadap sifat fisika dan mekanika kayu sedangkan arah radial memiliki pengaruh nyata pada nilai dari kadar air, berat jenis, total penyusutan arah tangensial, MOE, MOR, kekuatan tekan sejajar dan tegak lurus serat. Arah aksial ditemukan hanya berpengaruh nyata pada penyusutan total arah tangensial dan kuat tekan tegak lurus serat.

**Kata kunci : Balsa, Aksial, Radial, Sifat Fisika dan Mekanika**

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