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FIELD NOTE

Basic wood properties of Borneo ironwood (*Eusideroxylon zwageri*) planted in Sarawak, Malaysia

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ABSTRACT The aim of this study is to obtain the basic wood properties of planted Borneo ironwood (*Eusideroxylon zwageri*) from a plantation established about 80 years ago. Stem diameter at 1.3 m above the ground, tree height, and stress-wave velocity (SWV) of stem were measured on 36 planted *E. zwageri* trees. Later, core samples were collected from four trees whose measurements represented the average stem diameter of all the measured trees. Using the core samples, the moisture content (MC), basic density (BD), and compressive strength parallel to grain (CS) were measured. Dynamic Young's modulus for longitudinal direction at green condition (*E*) was also calculated from SWV. There was no significant relationship between growth characteristics and SWV. Mean values of MC, BD, CS, and *E* were 37.2 %, 0.86 g/cm^3, 64.3 MPa, and 18.47 GPa, respectively. Significant differences among individual trees were found in MC, BD, and CS. In addition, radial variations were almost constant from bark side to pith side. The results indicate that longitudinal *E* is independent from growth characteristics, and that the *E. zwageri* wood tested in this study has uniform BD and CS in the radial direction.

Key words: Borneo ironwood, compressive strength, basic density, dynamic Young's modulus

INTRODUCTION

Eusideroxylon zwageri Teijsm. & Binnend., known as belian in Malaysia, ulin in Indonesia, and Borneo ironwood in English, is in the Lauraceae family. This evergreen tree species is distributed in Eastern and Southern Sumatra, Bangka, Belitung, Borneo, and the Sulu archipelago and Palawan (Soerianegara and Lemmens 1993). Although *E. zwageri* trees grow very slowly, this species is known as one of the heaviest and most durable timbers in South-East Asia (Soerianegara and Lemmens 1993; United States Department of Agriculture Forest Service 2010). Due to these natures, *E. zwageri* wood is commonly utilized for marine work, boatbuilding, heavy construction, and roofing shingles (Soerianegara and Lemmens 1993; United States Department of Agriculture Forest Service 2010).

For effective wood utilization, the physical and mechanical properties of the wood must be known. Data of physical and mechanical properties can usually be obtained from published literature; however, wood properties generally vary within a tree (in radial and longitudinal directions) and among trees (Panshin and de Zeeuw 1970). In the case of the tropical fast-growing planted species *Acacia* spp., wood fiber length and wood density increase from pith to bark sides (Kim et al. 2011; Nugroho et al. 2012). Makino et al. (2012) pointed out that in *Acacia mangium*, the compressive strength parallel to grain also increased from pith to bark. In *E. zwageri* wood, physical and mechanical properties such as wood density, shrinkage, modulus of elasticity, and modulus of rupture have been listed in literature (Soerianegara and Lemmens 1993; United States Department of Agriculture Forest Service 2010), whereas the radial variations of wood properties in *E. zwageri* are not fully investigated, especially in the case of planted trees.

This study was carried out to obtain the basic information on physical and mechanical properties of wood from planted *E. zwageri* trees in relation to growth characteristics. With collected core samples from bark to pith sides, we also investigated the radial variations of the wood