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The diameter increment of selected tree species in a secondary tropical forest in Sarawak, Malaysia

KARYATI[1,♥], ISA B. IPOR[2], ISMAIL JUSOH[2], MOHD. EFFENDI WASLI[2]
[1]Faculty of Forestry, Universitas Mulawarman. Jl. Ki Hajar Dewantara, Samarinda 75119, East Kalimantan, Indonesia. Tel.: +62-541-735089, 749068, Fax.: +62-541-735379, ♥email: karyati.hanapi@yahoo.com
[2]Faculty of Resource Science and Technology, Universiti Malaysia Sarawak. 94300, Kota Samarahan, Sarawak, Malaysia

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Abstract. *Karyati, Ipor IB, Jusoh I, Wasli ME. 2017. The diameter increment of selected tree species in a secondary tropical forest in Sarawak, Malaysia. Biodiversitas 18: 304-311.* The diameter at breast height (DBH) increments of dominant tree species in a secondary forest can determine forest growth in the area. This study was conducted to investigate the DBH increments of the nine dominant tree species in a secondary tropical forest. A total number of 180 trees representing nine species, seven genera, and six families were selected for the assessment of DBH increments during two years of study. Those nine species, namely: *Acacia mangium* Willd. (2.33 cm year^{-1}), *Endospermum diadenum* (Miq.) Airy Shaw (1.05 cm year^{-1}), *Cratoxylum arborescens* Blume. (0.96 cm year^{-1}), *Vernonia arborea* Buch. Ham. (0.96 cm year^{-1}), and *Cratoxylum glaucum* Korth. (0.80 cm year^{-1}) had shown a high growth rate during the assessment, while the other four species such as *Macaranga gigantea* Mull. Arg., *Macaranga triloba* Mull. Arg., *Euodia glabra* (Bl.) Bl., and *Vitex pubescens* Vahl. had 0.53, 0.48, 0.37, and 0.30 cm year^{-1} in DBH increments, respectively. The average DBH increments for the entire selected species was 0.86 cm year^{-1} for periodic measurement and 0.75 cm year^{-1} for monthly measurement. This information is needed in order to understand the succession process in the secondary forests. It is important for the selection of the suitable species in a reforestation and a rehabilitation projects.

Keywords: Diameter increment, fast growing species, secondary forest, selected species

INTRODUCTION

A secondary forest is the type of vegetation resulted after a forest or woodland area have been disturbed or cleared for shifting cultivation prior to abandonment (Johnson and Miyanishi 2007; Keddy 2007). After field abandonment, the secondary forest develops naturally (Van Do et al. 2010). The secondary forests are reflected in their structure and extent of vegetative cover, as well as their composition in terms of dominant and secondary species (Mittelman 2001). Typical swidden fallow secondary forest vegetation includes many forest patches at different stages of succession. The structure of swidden fallow secondary forests changes rapidly at the young stages. The principal structural changes include increased canopy height and tree diameter, a stratification of the tree vegetation and a reduction in the number of stems per a considered area (Perera 2001). The patterns of stand development are based on tree physiology, soils, and micrometeorology. The rates of tree growth in tropical forests reflect the variation in life history strategies that contribute to the determination of species' distributional limits, set limits to timber harvesting and control the carbon balance of the stands (Baker et al. 2003). Uzoh and Oliver (2008) hypothesized that the increment of the trees was influenced by tree size and vigor effects, site effects, competitive effects and regional effect as well as relative competitive status to neighboring trees and the impact of land use management.

In addition, it is quite certain that the plant growth, development and its productivity depend on the internal factors (genetic or hereditary) and external factors (surrounding environmental). The environmental factors affecting the planting site encompass climate (meteorological variables), edaphic (soil), biotic (living or organisms), physiographic (elevation) and anthropogenic effects (Pancel 1993; Gopalaswamy 1994). Abazari and Talebi (2008) described the duration of development of a stand and transition from one stage to another varied among the forest communities. The growth characteristics and dynamic of the stands varied in different development stages. Lynch and Huebschmann (1992) clarified that large variances in diameter increment will tend to be associated with high covariance between increment and basal area at the end of growth period. In addition, the annual diameter increment was also influenced by planting space (Mawazin and Suhaendi (2012) and silvicultural treatments (Venturoli et al. 2015).

Seydack et al. (2011) pointed out that variation in stand-level growth was affected by species-inherent and resource factors as well as site-climate interactions. Rüger et al. (2016) stated the most important trait determining growth characteristics was wood density. In addition, intrinsic growth rates were related strongly to adult stature, while all traits contributed to light response. Hérault et al. (2011) added that the maximum absolute diameter growth rates increased with the increase of adult stature and leaf 13C and decreased with the increase wood density. The effect of growth-mediated ontogenic changes on the localization of water and carbohydrate storage within a tree is a result of sapwood and heartwood dynamics throughout tree ontogeny (Lehnebach et al. 2016).