

The Correlation and Relationship Between Diameter Increment and Climatic Elements in a Secondary Forest of Universiti Malaysia Sarawak, Malaysia

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ABSTRACT

Climatic elements play important roles in the growth of plants. The aims of this study were to determine correlation and relationship between plant growth and climatic elements (rainfall, rainy days, temperature, relative humidity, and solar radiation) in a secondary forest of Universiti Malaysia Sarawak (Unimas), Sarawak, Malaysia. The plant growth was indicated by diameter at breast height (DBH) of some selected tree species. The DBH increment of 30 selected trees which consisted of nine species (*Acacia mangium*, *Cratoxylum arborescens*, *Cratoxylum glaucum*, *Endospermum diadenum*, *Euodia glabra*, *Macaranga gigantea*, *Macaranga triloba*, *Vernonia arborea*, and *Vitex pubescens*) was recorded monthly through the use of Series 5 Manual Band Dendrometer for a period of 1 year. The result showed that increments of several selected species were positively and negatively correlated to one or more climatic elements. The relationship between DBH increment of *E. diadenum* and climate elements were significant.

Keywords: Climatic Elements, Diameter Increment, Fast Growing Species, Secondary Forest

1. INTRODUCTION

The growth rate of trees in tropical forests reflects the variation in life history strategies that affect determining species' distributional limits, setting limits to timber harvesting and controlling carbon balance of the stands [1]. The duration to develop a stand and transit it from one stage to another varies among forest communities at different developmental stages [2].

Climate is the strongest driver of spatial variation in tree growth, and that change in climate may, therefore, have large consequences on forest productivity and carbon sequestration [3]. Species-inherent and resource factors as well as considerable variation in stand-level growth of trees resulted from site-climate interactions [4]. Large variances in diameter increment could be associated with high covariance between increment and basal area at the end of the growth period [5]. Seedlings and saplings experience strong growth when increased light is available [6].

The amount of rainfall and average diurnal temperature in a growing season are important to explain variations in tree diameter growth. The variation in diameter growth is mostly by climatic elements [7]. Temperature has a greater influence than rainfall for most of the tree species. In addition, a linear and significant relationship was obtained between precipitation and

height-diameter relationships for seven of the 44 tree species studied [8]. The diameter increments of trees have a negative correlation with temperature and rainfall in certain months [9].

The previous study reported that average DBH increments for nine selected species, namely: *Buch.Ham.*, *Cratoxylum glaucum* Korth, *Endospermum diadenum* (Miq.) Airy Shaw, *Euodia glabra* (Bl.) Bl., *Macaranga gigantea* Mull. Arg., *Macaranga triloba* Mull. Arg., and *Vitex pubescens* Vahl. In the secondary forest were 0.75 cm year⁻¹ [10]. However, there is need to understand the correlation and relationship between DBH increment and climatic elements. The objectives of this study were to determine correlation and relationship between DBH increment of nine selected tree species and climatic elements (rainfall, rain days, temperature, relative humidity, and solar radiation) in a secondary forest.

2. MATERIALS AND METHODS

2.1. Study sites

The study was carried out at secondary forest of Universiti Malaysia Sarawak (UNIMAS) (01°28.111'N 110°26.234'E) in Kota Samarahan, Sarawak, East Malaysia as illustrated in Figure 1. The study plot was