

PRELIMINARY ANATOMICAL STUDY ON LEAF SURFACES OF BORNEAN ZINGIBERACEAE (TRIBE ALPINIEAE) FROM NORTH EAST SARAWAK

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Accepted 2 October 2018, Published online 30 November 2018

ABSTRACT

Among the family Zingiberaceae, the biggest subfamily in Borneo is Alpinioideae. The highest diversity is recorded for tribe Alpinieae, with nine genera from Borneo. Tribe Alpinieae is, in fact, the most challenging that need further analysis for recircumscription of many of the genera. The study reported in this paper was carried out to investigate if the anatomy of leaf surfaces particularly epidermal cells, stomata, and trichomes are applicable as supportive data in finding the intergeneric variations within the tribe Alpinieae. The leaf surfaces of selected species from six genera of tribe Alpinieae (viz. *Alpinia*, *Amomum*, *Elettaria*, *Etilingera*, *Geocharis*, and *Plagiostachys*) from the north east of Sarawak was preliminarily studied. The epidermal cells of the adaxial surface are hexagonal or more or less polygonal in shapes in all selected species with straight anticlinal walls at both surfaces. The cells of the abaxial epidermis are much more variable and irregular in shapes and sizes. Different sizes of epidermal cells are also shown in all species. In addition, crystals are observed in epidermal cells of *E. longipilosa* only. Meanwhile, the type of stomata observed is of tetracytic form in all species. All species except for *Alpinia aquatica* possessed simple and unicellular trichomes. Study on leaf surface anatomy alone may only provide a baseline data to facilitate in taxonomical classification and a thorough leaf anatomical study on the lamina, leaf margin, midrib and petiole involving more species in each genus would provide more insightful information.

Key words: Alpinieae, Zingiberaceae, leaf anatomy, leaf surface, Borneo

INTRODUCTION

The pantropical Zingiberaceae is one of the important herbaceous plants of tropical forests and the largest family among seven others of order Zingiberales. There are at least 60 genera and 1,500 species in the family of which 1,000 species occur in tropical Asia (Kress, 1990; Larsen *et al.*, 1999). In Borneo, 21 genera with nearly 250 named taxa have been reported of which five genera namely *Haniffia*, *Burbidgea*, *Haplochorema*, *Myxochlamys* and *Tamijia* are endemic to the island (Poulsen, 2006; Lamb *et al.*, 2013; Wong *et al.*, 2014). Many of the Bornean species are only determined to genus level such as *Amomum*, *Hornstedtia*, *Plagiostachys*, *Zingiber* and *Boesenbergia* and many other species remain undescribed and are yet to be documented (Takano *et al.*, 2004; Julius *et al.*, 2010; Lamb *et al.*, 2013).

Tribe Alpinieae is grouped under subfamily Alpinioideae together with Riedelieae. The subfamily is morphologically defined by the plane of distichous leaves perpendicular to rhizome and the reduction or absence of the two lateral staminodes (Smith, 1985; Kress *et al.*, 2002). There are currently nine genera in the tribe Alpinieae that commonly occur in Borneo namely *Alpinia* Roxb., *Amomum* Roxb., *Elettaria* Maton, *Elettariopsis* Bak., *Etilingera* Giseke, *Geocharis* (K. Schum.) Ridl., *Geostachys* (Bak.) Ridl., *Hornstedtia* Retz. and *Plagiostachys* Ridl (Lamb *et al.*, 2013). Tribe Alpinieae is characterised by having fleshy or indehiscent fruit and lacking extrafloral nectaries (Smith, 1985; Kress *et al.*, 2002). Genus *Etilingera* represents the highest species number of Bornean gingers with 42 known species followed by *Amomum* with 36 named taxa (Lamb *et al.*, 2013). Lowland forests up to 600 m altitudes are the richest zone for family Zingiberaceae and species richness drops at higher altitude. However, the species of

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