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Research

Floral biology and pollination strategy of seven *Tacca* species (Taccaceae)

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We investigated the floral characteristics, floral biology and floral visitors of the six Bornean *Tacca* species: *T. bibracteata* (only floral characteristics), *T. borneensis*, *T. havilandii*, *T. leontopetaloides*, *T. palmata* and *T. reducta*, and *T. cristata* from Peninsular Malaysia. All species are protogynous with pollen strings extruded post flower opening. Blooming of all species started from dawn except for *T. leontopetaloides* which flowered from dusk. While *T. borneensis*, *T. cristata*, *T. havilandii*, *T. leontopetaloides* and *T. reducta* are facultatively autogamic as the pollen/ovule ratios (P/O ratios) were low, *T. bibracteata* is facultatively xenogamic as its P/O ratio was higher. Four species (*T. borneensis*, *T. cristata*, *T. havilandii* and *T. reducta*) were tested for autonomous self-pollination but all failed to set fruit. Manual self- and cross-pollination treatments of *T. borneensis*, *T. cristata* and *T. havilandii* showed reduced fruit set and seed set. In contrast, *T. reducta* was highly self-compatible. The showy bracts and bracteoles of *T. borneensis* are needed to guarantee pollination success but is not so in the other species investigated. *Tacca* are pollinated by two pollination guilds of female midges: two species of *Forcipomyia* (*Lasiohelea*) and *Culicoides hinnoi*. The floral biology and mating system of *Tacca* species indicate that most fruits and seeds were produced in samples resulting from natural pollination.

Keywords: bat lily, biting midges, black fungus gnats, Ceratopogonidae, pollen/ovule (P/O) ratio, reproductive display

Introduction

Flowering *Tacca* J.R. Forst. & G. Forst. are among the most striking plants of the understory of tropical Asian forests and yet they remain remarkably understudied. *Tacca* (including *Schizocapsa*) is a monophyletic genus of about 20 species (Lim and Raguso 2017) of (irregularly-) seasonally dormant tuberous-stemmed geophytes or rhizomatous evergreen mesophytes of still uncertain relationship within Dioscoreales (Caddick et al. 2002, Wilkin et al. 2005, Merckx et al. 2006, 2009, Merckx and Smets 2014, Hertweck et al. 2015, Trias-Blasi et al. 2015). *Tacca* is particularly speciose in humid tropical and subtropical Asia, with four species (*Tacca lanceolata*, *T. parkeri*,



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