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Floral biology and pollination strategy of *Durio* (Malvaceae) in Sarawak, Malaysian Borneo

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Abstract. *Ng WS, Jayasilan MA, Wong SY. 2020. Floral biology and pollination strategy of* Durio *(Malvaceae) in Sarawak, Malaysian Borneo. Biodiversitas 21: 5579-5594.* This study was carried out to investigate on the flowering mechanisms of four *Durio* species in Sarawak. The anthesis started in the afternoon (*D. graveolens* and *D. zibethinus*), evening (*D. kutejensis*) or midnight (*D. griffithii*); and lasted between 11.5 hours (*D. griffithii*) to 20 hours (*D. graveolens*). All four *Durio* species are generalists. Individuals of a fruit bat (*Eonycteris spelaea*, Pteropodidae) are considered as the main pollinator for *D. graveolens, D. kutejensis*, and *D. zibethinus* while spiderhunter (Arachnothera, Nectariniidae) is also proposed as a primary pollinator for *D. kutejensis*. Five invertebrate taxa were observed as secondary or inadvertent pollinators of *Durio* spp.: honeybee, *Apis* sp. (Apidae), stingless bee, *Tetrigona* sp. (Apidae), nocturnal wasp, *Provespa* sp. (Vespidae), pollen beetle (Nitidulidae), and thrip (Thysanoptera). Honey bees and stingless bees pollinated all four *Durio* species. Pollen beetles were found to pollinate *D. griffithii* and *D. graveolens* while nocturnal wasps were found to pollinate *D. kutejensis* and *D. zibethinus*. Thrips were found to pollinate *D. griffithii* only. Floral rewards include nectar, pollen and staminodes. The nectar production of *D. graveolens, D. kutejensis*, and *D. zibethinus* increased from the start of anthesis until just after midnight but decreased from then onwards. *Durio griffithii* produced consistent nectar concentration with inconsistent volume. *Durio graveolens, D. griffithii*, and *D. zibethinus* are partially self-incompatible.

Keywords: Dawn bat, floral visitors, fruit set, spiderhunter

INTRODUCTION

Durio Adans., a genus under the subfamily Helicteroideae Meisn. falls within the family of Malvaceae Juss. (Nyffeler and Baum 2001; Stevens 2020). The genus is separated into two subgenera: *Boschia* and *Durio* (Kostermans 1958; POWO 2019). However, Nyffeler and Baum (2001) supported the resurrection of *Boschia* as a genus based on the molecular evidence and the differences in the anther architecture. *Durio* s. lat. is distributed across tropical Southeastern Asia with Borneo as its center of diversity, 23 species (Kostermans 1958; Salma 2011; POWO 2019). Fifteen species are found in Sarawak: *Durio acutifolius* (Mast.) Kosterm., *Durio affinis* Becc., *Durio carinatus* Mast., *Durio crassipes* Kosterm. and Soegeng, *Durio dulcis* Becc., *Durio excelsus* Bakh., *Durio grandiflorus* (Mast.) Kosterm. and Soegeng, *Durio graveolens* Becc., *Durio griffithii* (Mast.) Bakh., *Durio kutejensis* Becc., *Durio lanceolatus* Mast., *Durio oblongus* Mast., *Durio oxleyanus* Griff., *Durio testudinarius* Becc., and *Durio zibethinus* L. (Kostermans 1958; Salma 2011; POWO 2019).

Durio s. lat. can be distinguished by the surface of the branchlets clothed with small scales and the lower surface of the leaf lamina covered with stellate hairs and topped by a layer of coppery brown scales (not always). The inflorescences are borne on young branchlets, on older branches or on the bole, sometimes at the base of the bole, consisting of few-flowered cymes on reduced and hardly branched or unbranched peduncles. The flowers are small to large, covered by lepidote bracts and each comprises of an epicalyx and calyx. The calyx splits into five free sepals (not always) with the petals in (4-) 5 (-6), and the stamens are numerous, either free or united in five phalanges, or a combination of two with the anthers are unilocular, either opening by a longitudinal slit (subgenus *Durio*) or by an apical pore (subgenus *Boschia*). The fruits are capsular, globular to ellipsoid, often sulcate, usually 5-locular with the valves are either dehiscent or indehiscent with the seeds are usually arillate (Kostermans 1958; Nyffeler and Baum 2001). The commercial value of Durian has gone beyond just direct consumption. Durian rinds, for example, have great potential to be processed as non-wood based raw material for the pulp and paper industry (Masrol et al. 2015). The seeds can be extracted to produce hydrocolloid which can be used as dietary fiber, food thickeners, and packaging films (Amid and Mirhosseini, 2011), a new substrate substitute for the production of angkak, a type of fermented rice used to color and preserve foods and beverages in Southeast Asia (Srianta et al. 2012), and production of vegan mayonnaise by replacing egg yolk during production (Cornelia et al. 2015).

The degree of self-incompatibility varies among several species studied in the genus. Many clones/cultivars/ varieties of *D. zibethinus* were found to be leaning towards self-incompatible spectrum (Lim and Luders 1998; Bumrungsri et al. 2009). However, Jutamanee and Sirisuntornlak (2017) reported no self-incompatible