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A review of durian plant-bat pollinator interactions

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ABSTRACT

Durian (*Durio zibethinus*) brings in princely revenue for the fruit economy in Southeast Asia, ushering the current trend of clearing forests for durian plantations. Despite the thorny fruit's popularity and increasing bat-durian papers, not many associate their vital plant-pollinator relationship. This unfamiliarity has led to the persisting negative connotations of bats as agricultural pests and worse, a disease carrier amplified by the Covid-19 pandemic. This review focuses on the bat-durian relationship comprising botanical insights and pollination ecology in relevance to the wider pteropodid-plant interactions. The majority of the studies compiled have concluded that bats are the most effective pollinator for durian than insects. Six fruit bat species (Chiroptera: Pteropodidae) have been recorded pollinating durian flowers, with several other pteropodid species speculated to pollinate durian, including in non-native countries. Lastly, we address the research gaps for the bat-durian relationship, which can also be applied to other chiropterophilous plants.

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1. Introduction

Pollination is a vital process for flowering plants to produce seeds, creating offspring for the next generation. Animals play a major role in pollination as approximately 87.5% of the global flowering plants are pollinated by animals (Ollerton et al. 2011). Insects like bees are generally etched in the media attention and academics as pollinators of flowers, but vertebrates like bats (mammals) and birds also serve the same role but are not extensively perceived (Triplett et al. 2012; Ratto et al. 2018). Nectarivorous bats of the family Pteropodidae in the Paleotropics and Phyllostomidae in the Neotropics pollinate about 528 angiosperm species globally (Fleming et al. 2009). Flowers pollinated by bats usually conform to the chiropterophilous syndrome, which includes drab or white coloration, nocturnal anthesis, unpleasant odor and bell or tuft shape (Marshall 1983; Fleming et al. 2009). These bats not only pollinate ecologically significant plants like *Sonneratia* spp. (Paleotropic) and bromeliad plants (Neotropics) but also contribute to economically important crops such as *Durio zibethinus*, *Parkia* spp., *Musa* spp., *Mangifera indica*, *Stenocereus queretaroensis*, *Hylocereus* spp., *Agave* spp., *Ceiba pentandra* and *Coffea arabica* (Fujita and Tuttle 1991; Mickleburgh et al. 1992; Garibaldi et al. 2011; Raghuram et al. 2011 & Bumrungsri et al. 2013; Göttinger et al. 2019). Despite providing the essential pollination services to commercial plants at night,

bats are often perceived as agricultural pests, while other more destructive animals such as *Ratufa* spp. (Asian giant squirrels), *Macaca nemestrina* (Southern pig-tailed macaque), *Arctitis binturong* (Binturong) and *Sus barbatus* (Bearded pig) receive less attention for such actions (Fujita and Tuttle 1991; Aziz et al. 2017b).

One bat pollinated plant gaining popularity and revenue in Southeast Asia is the durian tree (*Durio zibethinus*), also known as the King of Fruits. The durian is a thorny fruit with a pungent odor juxtaposed for its creamy texture and unique taste (Brown 1997). According to Safari et al. (2018), the exported durian fruits brought in revenue of USD 500 million (Thailand), USD 17 million (Malaysia) and USD 21,000 (Indonesia). Its economic success can also be attributed to about 200 varieties, including Monthong, Kanyou, Chanee, Musang King, and D24. The genus *Durio* has various degrees of self-incompatibility among species, and many require cross-pollination from animals, mainly bats (Brown 1997; Bumrungsri et al. 2013; Ng et al. 2020). Common bat pollinators for durian in the region include *Eonycteris spelaea* (Cave nectar bat), *Pteropus hypomelanus* (Island flying fox), *Pteropus alecto* (Black flying fox), *Pteropus vampyrus* (Large flying fox), *Acerodon celebensis* (Celebes flying fox) and *Macroglossus minimus* (Lesser long-tongued nectar bat) (Brown 1997; Bumrungsri et al. 2013;

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This article has been corrected with minor changes. These changes do not impact the academic content of the article.

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