## PLANTS & POLIINATION SYNDROMES Wenheng Zhang, Jingbo Zhang, Ghadeer Bukhari, and Farahnoz Khojayori



Stereotyped floral morphology of the ~1,300 species of New World Malpighiaceae showing the prominent dorsal banner petal that is highly differentiated from the other four petals (A). All petals are conspicuously clawed at the base (A), which allows their primary oil-bee pollinators access to the large paired, multicellular abaxial oil glands, borne on four or all five of the sepals (B) (15, 25). A female oil bee orients toward the banner petal (C) and lands at the center of the flower and grasps the thickened claw of that petal with her mandibles (D). She then reaches between the claws of the lateral petals and scrapes the oil from the glands with her modified front and mid legs. She then transfers the oil and pollen to her hairy hind legs and takes the mixture to her nest, where it serves in nest construction and as food for her larvae. A and B are of Mezia angelica W. R. Anderson, courtesy of C. Gracie (New York Botanical Garden). C and D are of a Centridini oil bee visiting Malpighia emarginata DC, courtesy of G. Gerlach (Munich Botanical Garden, Munich).



Worldwide, over 500 species classified in 28 orders, 67 families of angiosperms rely on bats as their pollinators. The classic characteristics of bat pollinated flowers, as described by Faegri and van der Pijl (1979) and modified by Howe and Westley (1988), include nocturnal anthesis, drab coloration (i.e. white or green), musty smell, flowers often located on branches or tree trunks (cauliflory) or suspended on long stalks (flagelliflory), and tubular or radially symmetrical flowers, often of the 'shaving brush' type, that produce relatively large amounts of hexose-rich nectar. Two of the 18 currently recognized families of bats (Simmons, 2005) contain pollinator species, as thirty-six species of American leaf-nosed bats (Phyllostomidae) and twelve species of Old World flying foxes (Pteropodidae). For Solanaceae family, the genera as following are considered with bat pollination species, Markea, Datura, Merinthopodium, Solandra, Dyssochroma, Schultesianthus, and Nicotiana. (A) Glossophaga soricina about to visit a newly opened flower. Note the downward orientation of Dyssochroma viridiflorum flowers with both stamens and style exerted beyond the corolla opening, and whitish pollen from previous visits on the bat belly. (B)The same bat species clinging to an already visited first-day flower. Note the bat left wing claw grasping the flower, the claw marks on the corolla, and the anthers touching the bat hind-body. (C) Carollia perspicillata biting off a piece of a ripe fruit. Note the bat feet grasping the fruit. (D)Sturnira lilium about to bite off a piece of an already chewed fruit. Note yellowish white pulp and brownish, small seeds.

## Malpighiaceae and the **Oil-Bee Pollination Syndrome**

Galphimia clade Acmanthera clade Bvrsonima clade Acridocarpus clade Mcvauahia clade Barnebva clade 🔟 🛛 Ptilochaeta clado 🕺 Bunchosia clade Hiraea dade 98 Heteropterys clad **Z5** Carolus clade E Christianella clade Tetrapterys sens. str. clade 100 Tetraptervs sens. lat. cla 91 Niedenzuella clade Stigmaphyllon clade Ectopopterys clade Amorimia clade 100 Malpiahia clade

**Pollination Syndrome** 

Phylogeny

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Distribution







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