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Pollination of Acerola (*Malpighia emarginata*, Malpighiaceae) and Promising Management of Oil-Collecting Bee Pollinators in Brazil

CLEMENS SCHLINDWEIN¹, FERNANDO C.V. ZANELLA², CELSO F. MARTINS³, REISLA OLIVEIRA⁴

¹Federal University of Minas Gerais (UFMG), Botany, Brazil

²Federal University of Latin-American Integration (UNILA), Brazil

³Federal University of Paraíba (UFPB), Dept. of Systematics and Ecology, Brazil

⁴Federal University of Ouro Preto (UFOP), Dept. of Biodiversity, Evolution and Environment, Brazil

Abstract

Acerola (*Malpighia emarginata*, Malpighiaceae), also called Barbados cherry, is a vitamin C rich neotropical fruit crop, widely cultivated in Brazil and consumed in numerous countries. The flowers require specialised native pollinators to set fruit. We evaluated the pollination success in acerola orchards, determined effective pollinators, their environmental demands and pollinator friendly cultivation conditions to maintain strong pollinator populations. Furthermore, we defined pollinator species with potential to be reared for commercial use. The study was conducted in experimental orchards and commercial plantations.

The flowers of acerola produce floral oils, collected by females of oil collecting bees, which harvest these oils with specific brushes on their legs. The oils are used for brood cell impregnation and, mixed with pollen, to feed larvae. Females of numerous species of *Centris* and *Epicharis* (Apidae, Centridini) were determined as effective pollinators of acerola flowers. Surveys of bees and pollen analysis of scopa loads revealed that females of Centridini frequently vibrate flowers with poricidal anthers to collect pollen, especially of *Solanum* (Solanaceae), mixed with pollen of acerola and other Malpighiaceae. Moreover, the *Centris* and *Epicharis* bees depend on additional nectar flowers for adults' energy supply.

While most of the effective pollinator species nested in the soil, females of two species, *Centris analis* and *C. tarsata*, were successfully attracted to use trapnests introduced in the orchards. The cavities were frequently re-used by the daughters in both species. Both *Centris* species, thus, are strong candidates for manageable pollinators in acerola orchards. Pollen analyses of brood cells revealed that females collect almost exclusively pollen from acerola flowers, when reared inside the plantations. To feed one larva, the total pollen amount of about 80 flowers of acerola is necessary, an quantity gathered in about 2900 flower visits.

Our study revealed pollinator limitation at the study sites. Fruit set could be substantially increased, if pollinator populations were stronger. The effective pollinators require a diversified environment in the surroundings of the plantations. Isolated orchards inside an environmental matrix, impoverished in floral resources like that of sugar cane plantations, reduce their productivity and can sustain only small populations of specialised pollinators.

Keywords: Acerola, Brazil, ecosystem services, pollination, pollinator management, tropical fruits