Pollination of *Philodendron acutatum* Schott (Araceae) in Pernambuco

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Introduction

Cantharophily, pollination performed by beetles, is observed in well known Tropical and Subtropical families, especially Araceae and Annonaceae (Gottsberger 1990). Frequent adaptations of this syndrome involve the emission of odors resembling fruits or decaying flesh, robust flowers or inflorescences, nutritious starch-rich tissues and abundant pollen for the flower visitors to feed on (Vogel 1954). Quite often, flower thermogenesis is observed in these cantharophilous species. It consists of a metabolical mechanism probably evolved to facilitate volatization of the attractive compounds and offer a warm shelter or mating site for the visitors, in a strategy to keep them inside for effective pollination (Gottsberger. 1990). The genus *Philodendron* is exclusively Neotropical and comprises over 500 species (Sakuragi 2001; Mayo *et al*. 1997), many known to be cantharophilous. Most of the pollination biology studies with this large genus have been done in the French Guiana (Gibernau *et al* 1999; Gibernau & Barabé 2000; Gibernau & Barabé 2002). In Brazil, only Cerrado native species have been approached previously (Gottsberger & Amaral Jr. 1984; Gottsberger 1990). There is very scarce knowledge of beetle pollinated Araceae native to the Tropical Atlantic Forest.

Objectives

The study aimed the identification and isolation of the pollinator of *Philodendron acutatum* Schott in a native population in the state of Pernambuco, NE Brazil.

Methods

P. acutatum is a widespread hemi-epiphyte found from north South America to southeastern Brazil (Sakuragi 2001). It has sagittate dark-green leaves with long petioles and funnel-shaped inflorescences, composed of an 18-19 cm long white spadix and an 18-20 cm spathe, which is externally green and internally white above the constriction and red and with vertical dark red striations below. The spadix is composed of male flowers (upper 12-13 cm), female flowers (lower 6-7 cm) and a short transition zone between the two (0,4 - 0,6 cm), comprised by sterile male flowers (Gibernau & Barabé 2000). The research was carried out from February 26 through April 26 of 2005. The studied population was composed of around 100 isolated climbing individuals of *P. acutatum*, established in an old sapodilla (*Manilkara zapota* L.) orchard in Goiana - PE. The area is surrounded by a 20 ha native Atlantic Forest fragment, in which *P. acutatum* is also found. Inflorescences were monitored throughout the female and male phases in three distinct occasions, for time determination of the major events of anthesis, as well as of the behavior of the pollinators. Reproductive success was evaluated on a control group and on bagged immature inflorescences (20 each). A portable logging thermocouple thermometer (Hanna Instruments Inc., USA) was used to record inflorescence and ambient air temperatures from 1530h of the first day of anthesis through 1030h of the third day, as to determine the main thermogenic variations of *P. acutatum*. One of the thermometer's probes was inserted ca. 1 cm into the middle of the sterile male zone and the other was kept under shade ca. 20 cm of the inflorescence. Beetles found inside inflorescences were identified and counted. Samples of all species were collected for analysis of pollen adhered to the cuticle. Plant material was identified by Drs. Simon Mayo (Royal Botanical Gardens, Kew) and Cassia Sakuragi (Universidade Estadual de Maringá, UEM). Identification of the beetles was done using Arnett (1963) and Lawrence *et al.* (1999).

Results

Inflorescences of *P. acutatum* were visited by *Trigona* spp. bees and small staphylinid beetles, none judged capable of carrying out pollination. This assumption was made due to the lack of pollen adhered to their bodies upon field observation and to the fact that no bees ever ventured to the female flowers at the bottom of the floral chambers, and that the small staphylinids usually never left the inflorescences, even after total enclosement of the spathe. Beetles from the species *Cyclocephala* sp. (Scarabaeidae, Dynastinae, Cyclocephalini) were found on all inflorescences investigated during anthesis (12 in total), in numbers which ranged from one to nine individuals per inflorescence. All collected specimens (20 in total) had only pollen of *P. acutatum* adhered to the cuticle. The arrival of *Cyclocephala* sp. to the inflorescences followed closely the thermogenic peak and highest odor emission of the female phase of *P. acutatum* anthesis, which occurred

at 1900h with a temperature differential of 11,6°C. The spadix remained at a minimum 2,0°C above air temperature for about five hours. Once inside, *Cyclocephala* sp. agglomerated at the bottom of the inflorescence where they fed on the starch-rich tissue of the sterile male zone. In the early afternoon of the second day of anthesis, around 1400 - 1500h, most of the inner spathe and both fertile and sterile male zones of the spadix began producing a viscous, sticky orange exudate. By night, around 2000h, pollen was abundantly released from the upper part of the spadix and the spathe begun to close in. The beetles, now sticky with the orange exudate clung to the spadix for their way out of the inflorescences, covering themselves with pollen on the exit. All but one inflorescences in the control group developed into infructescences (95,0%), whereas none of the bagged inflorescences did. All non-pollinated inflorescences dried out within 2-5 days following anthesis.

Conclusions

Cyclocephala is often cited in literature as the main pollinator of *Philodendron* species (Gottsberger & Amaral Jr. 1984; Gottsberger 1990; Gibernau *et al* 1999; Gibernau & Barabé 2000; Gibernau & Barabé 2002). It was observed that the studied population of *P. acutatum* was exclusively pollinated by a single *Cyclocephala* species. Pollen analysis also showed a specific relation of this species to *P. acutatum*, thus characterizing a highly specialized insect-plant interaction during the study period.

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