NECTAR SECRETION PATTERN IN PALIAVANA TENUIFLORA AND THE RELATIONSHIPS WITH POLLINATORS IN MUCUGÊ, BAHIA, BRASIL. PRELIMINARIES APPROACHES

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INTRODUCTION

The Gesneriaceae Family includes 3,000 species that are distributed predominantly in the tropics, in Brazil they are about 200 species and 23 genera (Araújo et al. 2005). The Sinningieae tribe, in Gesneriaceae Family, is composed by the genera Sinningia, Vanhouttea and Paliavana. These flowers generally are bisexuals, with tubular corolla, and bees and hummingbirds pollinate almost 93% of these species (Araújo et al. 2005). Sinningia and Vanhouttea genera present ornithophilous pollination syndrome and Paliavana genera are mainly pollinated by large bees and bats (Perret et al. 2001; Sanmartin-Gajardo & Sazima 2005). The ornithophilous syndrome seems to be the original character in the evolution of Sinningieae Tribe, and the chiropterophilous characters associated with Paliavana genera could be derived characters (Perret et al. 2001; Sanmartin-Gajardo & Sazima 2005). In this framework Paliavana tenuiflora presents floral traits relative to chiropterophilous syndromes (Sanmartin-Gajardo & Sazima 2005). This species occurs mainly in rocky outcrops (Rupestrian fields) and humid forests in Pernambuco, Bahia and Minas Gerais (Araújo et al. 2005). Therefore this study attempts to identify the nectar secretion pattern in Paliavana tenuiflora and to analyze their relationships with floral visitors, in areas of rocky outcrops (Rupestrian fields), Mucugê, Bahia, Brazil.

MATERIAL AND METHODS

Study area

This study was conduced between April and May 2007, in "Sandália Bordada" trail in the Municipal Park of Mucugê, located four kilometers from the City of Mucugê in Bahia, Brazil. The main vegetation present in the park is rocky outcrop (rupestrian fields), humid forests, savannas and caatinga, at an elevation more than 800 meters and is habitat for a high numbers of endemic species. The climate is mesothermic with dry winters and rainy summers (Harley 1995).

PROCESSING OF THE COLLECTED MATERIAL

Floral traits related to pollination, production and concentration of nectar of P. tenuiflora were registered and analyzed. Nectar production was measured by removing nectar with a 10µl gradated microtubes every hour from bagged flowers (N = 33 flowers) one hour at time in 24 hours, during 4 days from April 23rd to 27th. Bagged flowers were removed from the plants, one for each hour. All the nectar was removed and analyzed of different ages from the beginning of the anthesis to flower senescence. Sugar concentration was quantified using a hand-held refractometer. Nectar accumulation was measured every 2 h from 07h00 to 16h00 in 9 bagged flowers on three replicates (different plants), without replacing the nectar. Energy supply (quantity of sugar in µg) was calculated by percentage and nectar volume in µL (Dafni, 1992).

To reveal the patterns of nectar production (volume, concentration and energy supply) and the relationships of these data with time of the day and age of flowers, we performed linear regression tests.

RESULTS AND DISCUSSION

Paliavana tenuiflora produces a nectar volume average of 14.98µL (+/- 16.30) and sugar concentration average of 22 (+/- 10.74). This species secretes nectar during the whole flower lifetime. In addition, when nectar is removed the flower reassumes nectar production. Nectar replacement is higher during the afternoon than during the morning. This pattern would be in accordance with a relationship with pollinators in the afternoon and at night. The most common visitors of P. tenuiflora

were bees in the morning, hummingbirds during the afternoon and possible bats in the night. We can characterize the nectar secretion pattern of this species with an initial period of high nectar production in the first hours after the anthesis, which last from 12 to 24 hours, followed by a period of little nectar production at the end of the flower lifetime (6-12 h). Different nectar secretion patterns but related to the main pollinator of some species of unrelated families have been reported elsewhere (e.g., Solanaceae, Galetto et al. 1993; Combretaceae, Bernardello et al. 1994; Loranthaceae, Rivera et al. 1996).

The Linear Regression test shows that nectar volume is related with nectar sugar concentration ($r^2 = 0.3498$, $P = 0.0003$, $F = 16.678$). Contrary to our expectations, these two variables did not reflect any relationship with the time (hour) of the day (time x nectar volume: $r^2 = 0.01682$, $P = 0.4719$, $F = 0.5304$ and time x nectar sugar concentration: $r^2 = 0.02654$, $P = 0.3650$ and $F = 0.8452$). But these data show a relationship with the age of the flower (age of flower x nectar volume: $r^2 = 0.2020$, $P = 0.0112$, $F = 7.342$ and age of flower x sugar concentration: $r^2 = 0.1462$, $P = 0.0338$ and $F = 4.966$). These results can be explained if we take into account some characteristics of this species. Nectar traits are not related with the variations of environmental variables (i.e., temperature, humidity) throughout the day because the long tube of the corolla that could be protecting nectar from this atmospheric variations. On the other hand, the observed relationships between the age of the flower and nectar traits can be explained by the asynchronic flower opening observed in this plant.

In hummingbird and bee flowers, which represent 95% of the species in Sinningieae, nectar was sucrose-dominant. Sugar ratios below one were only found in the nectar of three species with moth and bat syndromes. Sugar concentration averaged 23.9 +/- 10.6% in hummingbird flowers and 28.7 +/- 10.6% in bee flowers, whereas diluted nectar (7.1 +/- 3.4%) was restricted to bat flowers (Perret et al. 2001). Paliavana tenuiflora in agreement with this data could offer flowers reward for hummingbird, bees and bats. The flower produces an intermediary amount of nectar. Similarities in the nectar of hummingbird and bee flowers contrast with the presence of specific morphological traits associated with these two syndromes, indicating that plant-pollinator relationships rely on flower traits or floral display rather than on nectar characteristics (Perret et al. 2001).

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