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Patterns of Osmophores in *Ipomoea Asarifolia* (*Desr.) Roem. & Schult. (Convolvulaceae)*

Padrões de Osmóforos em *Ipomoea Asarifolia (Desr.) Roem. & Schult.* (*Convolvulaceae*)

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A B S T R A C T

To achieve reproductive fitness, floral attractants are essential for insect-plant interaction. Many entomophilous pollination plants have odoriferous zones, composed of glands that release volatile odors, these odors act as attractants for potential pollinators. For this study were used flowers of *Ipomoea Asarifolia*, one of its main characteristics are the infundibuliform morphology and glabrous leaves, their reproductive structures are located in the center of the flower. In order to better understand the dynamics of release of these odors, flowers of *Ipomoea A*. were collected to perform the test in neutral red 60%, being photographed before, during and after the procedure. These flowers were enveloped and separated by anthesis day, from the first to the third day, on which there was floral death. After the tests, variations in the release of osmophores were observed on the days of anthesis of the flowers, with a gradual effect. In addition to a concentration on their reproductive organs.

R E S U M O

Para obter um fitness reprodutivo, os atrativos florais são essenciais para a interação inseto-planta. Muitas plantas de polinização entomófila possuem zonas odoríferas, compostas glândulas que liberam odores voláteis, esses odores funcionam como atrativos para potenciais polinizadores. Para esse estudo foram usadas flores de *Ipomoea Asarifolia*, uma das suas características principais são a morfologia infundibuliforme e folhas glabras, suas estruturas reprodutivas estão localizadas ao centro da flor. Com o intuito de uma melhor compreensão da dinâmica de liberação desses odores, foram coletadas flores de *Ipomoea A*. para realizar o teste em vermelho neutro 60%, sendo fotografadas antes, durante e depois do procedimento. Estas flores foram envelopadas e separadas por dia de antese, do primeiro ao terceiro dia, em que houve a morte floral. Após os testes foram observadas variações na liberação dos osmóforos nos dias de antese das flores, com efeito gradativo. Além de uma concentração em seus órgãos reprodutivos.

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Introduction

Pollination is an indispensable process for the maintenance of biodiversity and reproduction of many species. Pollen exchange often occurs through insect-plant interaction, in which a floral resource is offered to the pollinator (RECH et al., 2014) and the plant can perform cross-pollination, resulting in reproductive success with better pollen and genetic variability (PANSARIN, 2003). This interaction is described as decoy pollination, discovered by Sprengel (1793).

Reciprocal mutualistic interactions involved involve benefits and harms, which increase the chances of reproductive success for the species (DÁTILLO et al., 2009). For the insect-plant interaction to occur, it´s necessary that the visitor is properly attracted to the flower, for this the plant uses floral attractants that indicate the presence of resource for pollinators, among these attractions is the attraction for odors.

One of the species that use odors are the *Ipomoea asarifolia*, belonging to the family convolvulaceae. Its main characteristics are: Alternate leaves and without stipules, are summits, will almost never be inflorescences of a single flower, of bisexual flowers. The genus *Ipomoea*. Also known for its toxicity to ruminants (MONTEIRO, 2010), being easily recognized for its herbaceous habit and for presenting nectaries as a resource and diurnal anthesis (KIILL; RANGA, 2003). Species of *Ipomoea A*. also exhibit characteristics of invasive plants. Studies have been carried out with the objective of revealing the main aspects of reproduction and pollination biology, being essential for control programs (Blanco, 1978).

The olfactory system in insects is used for various functions such as landing and feeding (CHITTKA & THOMSON, 2004). In this sense, many plants use visual stimuli and odors that induce the visit of pollinators (DUDAREVA & PICHERSKY, 2006). These odors are known as osmophores, which are secretory glands that release volatile compounds (WIEMER et al., 2009). The composition of these odors can be linked to the guild of visitors that the plant receives (RAGUSO, 2008).

The presence of osmophore zones is best known in flowers of the Solanaceae, Araceae, Fabaceae and Lentibulariaceae family (MARINHO et al., 2018; PLACHNO et al., 2016; Sázima et al., 1993; WERYSZKO-CHMIELEWSKA & STPICZYNSKA, 1995). Important works such as that of Vorgel (1963) contributed to the understanding of osmophores, but there is still a lack of studies aimed at analyzing the possible ecological relationships involved. Therefore, the present study aims to observe possible patterns in the release of osmophores and their dynamics.

Materials and methods

The present study was carried out in the county of Santana do Ipanema in the state of Alagoas. On the campus of the State University of Alagoas (*Universidade Estadual de Alagoas* - UNEAL) located at the following geographical coordinates -9.375109, -37.232945 (Figure 1).

Figure 1. *Area where the study was conducted.*

Source: Google Maps (2022).

Obtaining data

A total of 15 individuals of *Ipomoea asarifolia* were randomly chosen and numbered by identification tags. Soon, the flowers were separated in stage of preserved pre-anthesis buds and without signs of floriivory to be enveloped by voil bags. Being flowers of each day of anthesis (first, second and third days), and following the days of flowering, the flowers were collected stored in pots and taken to the Research Laboratory on Angiosperms of the Caatinga (*Laboratório de Pesquisa em Angiospermas da Caatinga* - LAPAC), located at the State University of Alagoas (*Universidade Estadual de Alagoas* - UNEAL), campus II. Samples were collected around 6:00 a.m.

Neutral red test

For the test of osmophore zones, the flowers were dipped in neutral red 60%, using beakers for immersion, and for analysis of petri dishes and tweezers (figure 1), given the time span of about 15 minutes between photographic records. The average time for total pigmentation was 40 minutes, totaling 75 flowers.

Results and discussion

The results of the osmophore patterns performed in the individuals of *I. asarifolia* are shown in Figure 1, containing areas stained by the neutral red test in the flowers of the first, second and third day of opening, respectively also in cut (Figure 2).

The following is the figure with the results separated on the first day of flowering (1.D, in examples: 1A, 1B and 1C), second day (2D, in examples: 2A, 2B e 2C) and third day (3.D, in examples: 3 A, 3B and 3C). Containing the photographs that most represent the pattern observed in the surveys.

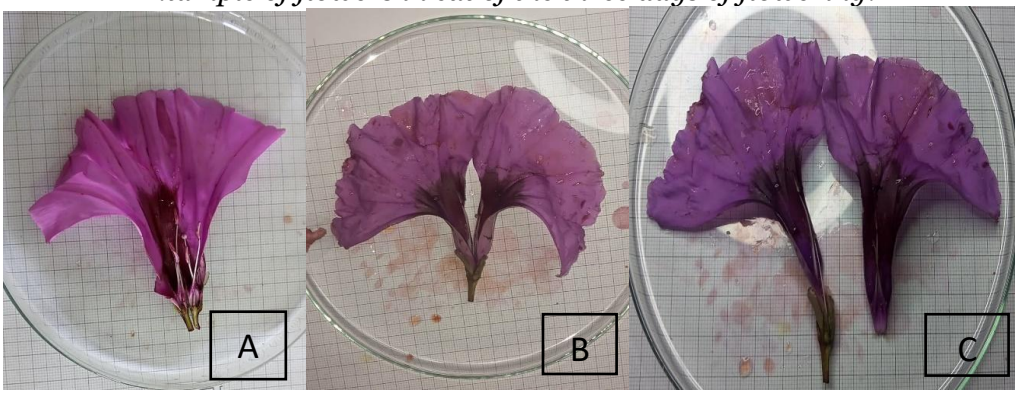
Figure 2.
Result of the separation of the days.

Source: Files of GpTac.

The results show different variations in the days of collection with a gradual effect, as shown in Figure 1. The flowers of the first day of flowering showed little coloration, with a circular pattern between the anthers (1.A, 1.B). Unlike the second day flowers that have a larger coloration, progressing to the center of the flower. Finally, complete coloration is observed in the flower tube on the third day of the table (3, c).

The following figure shows the example of cut flowers from the three days of flowering (first day in A, second day in B and third day in C). With the flowers that most represent the pattern found in the studies.

Figure 3.
Example of flowers in cut of the three days of flowering.



Source: Files of GpTac.

Also, total coloration is observed in the flower tube on the third day table (3, c), and pigmentation in the anthers (figure 3, 3D). The osmophores found are close to the nectaries and anthers, which runs throughout the floral tube, this pattern differs from other works found such as that of Stpiczynka (1993), with the *cymbidium tracyanum* of the family Orchidaceae, where the tests show coloration at the base of the petals and margin of the labella. Considering the morphometry of each species, osmophores tend to relate to other attractants used by the plant, which is no different in *Ipomoea A*. One can understand a direct relationship in their patterns when associated with their nectaries, demonstrating a late way of the flower to promote a more centered and objective attraction. It´s also important to highlight the variation found between the days of flowering, where one hardly sees the presence of coloration in flowers of the first day of flowering. Similar to what Vogel (1993) writes in his work, about there not being a previous accumulation of protoplast secretion in the secretory glands, therefore, osmophores manifest themselves in the post-anthesis period.

Conclusion

The results of the tests performed show a centralization of the presence of osmophores near the reproductive organs and nectaries of the flower. In view of the floral morphology of the species, it´s possible to understand the use of osmophores for the attractiveness of visitors in a specific way, to facilitate the process of pollination of the plant. It´s also notorious to validate the release variation of these volatile resources, as the dynamics and time of odor release can relate directly to the visitor guild it receives, in which such variations can be beneficial. Thus, understanding these patterns becomes very important for understanding the floral attractiveness of the species.

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