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FORAGING PATTERN OF INSECT POLLINATORS IN *PENTAS LANCEOLATA* (FORSSK.) DEFLERS AND *CATHARANTHUS ROSEUS* (L.) G. DON IN THRISSUR DISTRICT, KERALA, INDIA

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Abstract: A total of 8 species of insect pollinators (5 species of Lepidoptera and 3 species of Hymenoptera) in *Pentas lanceolata* and 4 species (all Lepidoptera) in *Catharanthus roseus* were recorded in Thrissur District, Kerala, India. The 8 insect pollinators made 1084 visits in *P. lanceolata*, of which *Oecophylla smaragdina* showed maximum affinity (214 visits) followed by *Papilio demoleus* (188), *Tirumala septentrionis* (167) and *Euploea core* (149). In *C. roseus,* 448 pollinator visits were recorded of which *E. core* showed maximum affinity (128 visits) followed by *T. septentrionis* (115). Butterflies were dominant in both *C. roseus* and *P. lanceolata* constituting 77% of total pollinators recorded. Foraging pattern of the pollinators was worked out based on a total of 1532 visits conducted by these insects on *P. lanceolata* and *C. roseus.* The peak activity for majority of pollinators was recorded between 8.30 hours and 12.30 hours with about 72 % activity observed during this period. Most of the insects like *E. core, P. demoleus, T. septentrionis* and *P. polytes* showed two distinct peaks of activity (9.30 hours in the morning and 14.30 hours in the afternoon.) Two species of bees, *Amegilla* sp. and *Megacampsomeris grossa* showed only a single peak and were active only during the morning hours. *Junonia atlites* was found to be active during early morning up to 9.00 hours and then in the evening after 17.00 hours.
Keywords: Insect pollinators, *Pentas lanceolata, Catharanthus roseus,* Kerala, India.

Introduction

Pollination is one of the crucial functions performed by insects. For humans, pollination is by far the most useful activity that insects carry out. A recent review on the importance of pollination in crops shows that 87 out of 124 leading crops are dependent on animal pollination. Furthermore losses due to poor pollination range from 26% to 50% for tropical tree crops (Bawa, 1994).

Various insects act as wonderful pollinators. The pollinating efficiency may vary in different insects but directly or indirectly they functions as pollinators. Greater variation of methods and habits of pollination is found among Diptera, Coleoptera,

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Hymenoptera, Lepidoptera and many minor insect groups. The recognition that pollinators gained came after the identification of a global pollinator crisis that indicated the local extinctions and decrease of natural populations of pollinators consequently resulting in the productivity gaps in the crop yield because of insufficient pollination.

India, as a country and Kerala in particular is widely recognized as a biodiversity hotspot area. Although we have a very rich flora and fauna, our knowledge of insect pollinators of specific plants and their ecology is scanty and fragmentary. In Kerala, only very few attempts have been made for the study of the insect pollinators of specific plants and to understand their ecological requirements. Mathew et al. (1987) studied the insect pollinators of Teak while Binoy and Mathew (2001) studied about the butterflies visiting flower heads of *Terminalia paniculata* in Kerala. Shahabuddin (1997) studied the nectar resource utilization by butterflies in the Palni Hills, Tamil Nadu. The present study is a pioneering attempt to document the insect pollinators and their foraging pattern in two common garden plants *Catharanthus roseus* and *Pentas lanceolata* in Thrissur District, Kerala.

Materials and Methods

The study was conducted at selected home gardens in Thrissur District. The locality has a tropical humid climate with an oppressive hot season and plentiful seasonal rainfall. The hot season was from February to May followed by the southwest monsoon from June to September. The place provides an excellent habitat for the insect fauna, since it has a rich flora of flowering plants, herbs, shrubs, and trees intermingled with coconut palms and banana plantations along with paddy fields.

Insect pollinators were monitored regularly and their visiting pattern was recorded. For capturing strong flying insects like butterflies, dipterans and hymenopterans, an insect net with a diameter of 40 centimeters was used. For killing the collected insects, killing jars were used in which benzene was soaked in cotton. Photographs were taken with the help of Canon 520 digital camera. To detect the presence of pollen on the body of the insect, Magnus stereo zoom binocular microscope was used. The collected insects were kept in entomological boxes for further studies.

Six flower bearing plants of *Catharanthus roseus* and *Pentas lanceolata* were selected for pollination studies. These plants were systematically monitored during the flowering season from September to May. Observations for pollinators visiting the inflorescence were made from dawn to dusk starting from 6.30 am to 6.30 pm. The foraging time, frequency of insect

visit, time spent on the inflorescence and number of individuals of each species visiting the flower was noted. Observations were made regularly in order to confirm the identity and specificity of different species. Samples of pollinating insects were collected using sweep net and observed under the microscope to detect the presence of pollen carried by the insects. The insects collected were later preserved for confirming their identity. The collected insect specimens were identified by referring to literature, comparing with museum specimens and with the help of experts.

Results and Discussion

A total of eight species belonging to 2 orders and 5 families were identified as the insect pollinators of *C. roseus* and *P. lanceolata*. Of these, five species belonged to Lepidoptera and the remaining three species to Hymenoptera. Butterflies were dominant on both *C. roseus* and *P. lanceolata* constituting 77 % of total pollinators recorded here. All the eight species visited the flowers of *P. lanceolata* while four species of butterflies visited *C. roseus.* The foraging pattern of the pollinators was worked out based on 1532 visits made by the different pollinators on these flowers.

Catharanthus roseus

A total of 4 species of insect pollinators identified in *C. roseus* are provided in table 1. Hymenopterans, dipterans, and coleopterans were altogether absent in this plant. All the pollinators observed were butterflies belonging to Papilionidae and Nymphalidae.

Table.1. Insect pollinators recorded from *C. roseus*

S.No.	Species	Order / Family
1	*Papilio polytes* Linn.	Lepidoptera / Papilionidae
2	*Junonia atlites* Linn.	Lepidoptera / Nymphalidae
3	*Euploea core* Cramer	Lepidoptera / Nymphalidae
4	*Tirumala septentrionis* Fruh.	Lepidoptera / Nymphalidae

In *C. roseus,* a total of 448 insect visits were carried out by the four insect pollinators. *E. core* showed maximum affinity for the flowers of *C. roseus* (128 visits) followed by *T. septentrionis* (115 visits) and *P. polytes* (113). *J. atlites* (92) showed least affinity towards *C. roseus* (Fig.1).

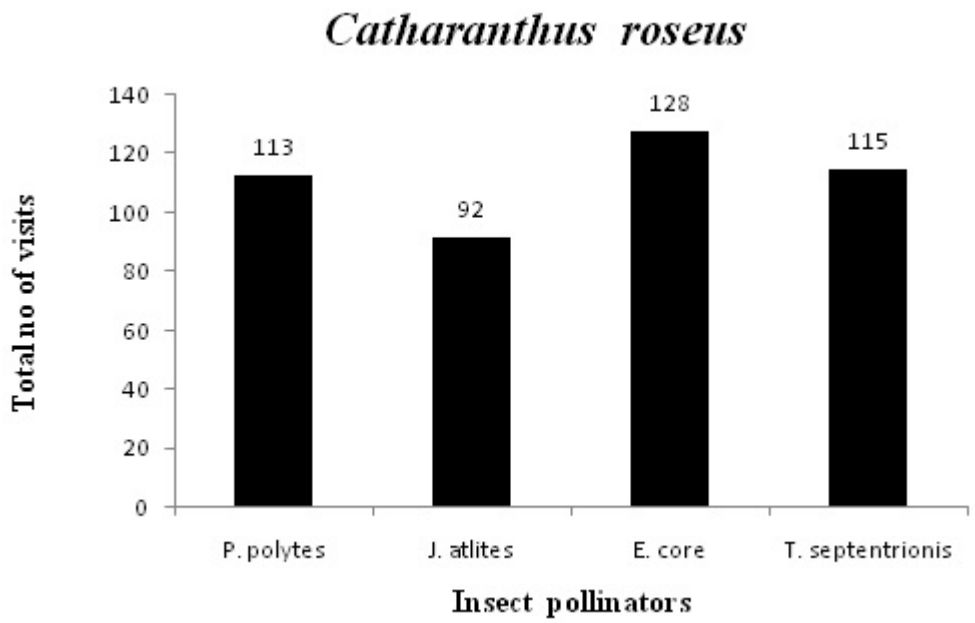

Fig. 1. Insect pollinators and their foraging intensity in *C. roseus*

Pentas lanceolata

A total of 8 species were recorded in *P. lanceolata*. Among these, 3 species belonged to the order Hymenoptera and the remaining 5 species belonged to order Lepidoptera. The list of pollinators of *P.lanceolata* is provided in table 2.

A total of 1084 insect visits were recorded in *P. lanceolata*. Among different insects *O. smaragdina* showed maximum affinity for this flower (214 visits*)* followed by *P. demoleus* (188). Six other pollinators such as *Amegilla* sp. (111), *P. polytes* (123), *J. atlites* (104), *E. core* (149) and *T. septentrionis* (167) were also recorded from *P. lanceolata. M. grossa* showed least affinity (28 visits) for these flowers (Fig.2).

Table 2. Insect pollinators recorded from *P. lanceolata*

S.No	Species	Order / Family
1	*Amegilla* sp.	Hymenoptera/Apidae
2	*Oecophylla smaragdina* Fab.	Hymenoptera/ Formicidae
3	*Megacampsomeris grossa (Fab.)*	Hymenoptera/Scolidae
4	*Papilio polytes* Linn.	Lepidoptera/Papilionidae
5	*Junonia atlites* Linn.	Lepidoptera/Nymphalidae
6	*Papilio demoleus* Linn.	Lepidoptera/Papilionidae
7	*Euploea core* Cramer	Lepidoptera/Nymphalidae
8	*Tirumala septentrionis* Fruh.	Lepidoptera/Nymphalidae

Foraging pattern of insect pollinators

Based on 1532 visits conducted on the flowers of *C. roseus* and *P. lanceolata,* the foraging pattern of 8 insect pollinators was recorded. For most pollinators the most active time for foraging was found to be during the morning hours with about 72 % of activity observed during this period.

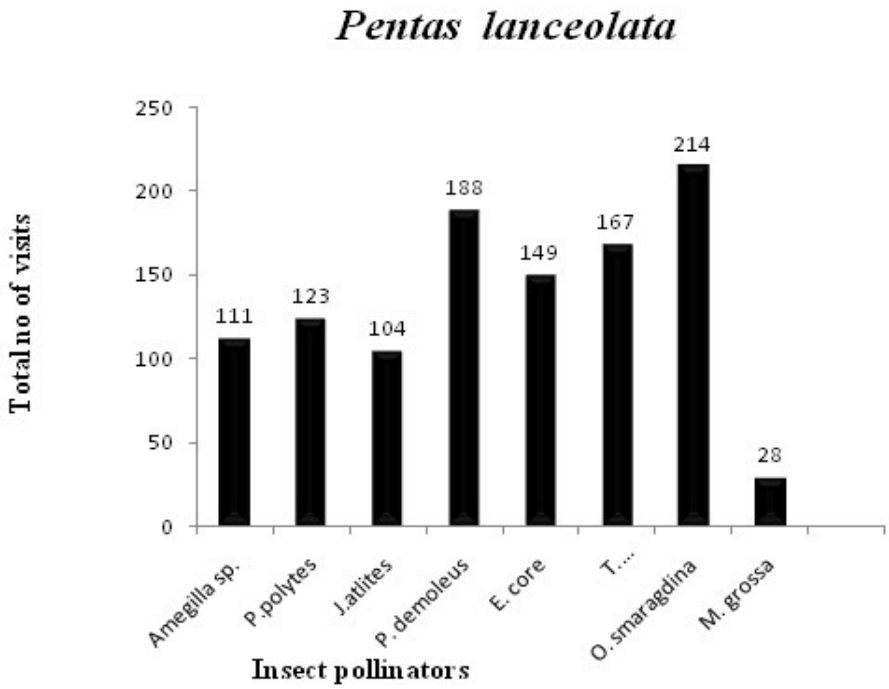

Fig. 2. Insect pollinators and their foraging intensity in *P. lanceolata*

Foraging pattern of insect pollinators in *C. roseus*

E. core showed maximum affinity for the flowers of *C. roseus* (128visits) and was most active around 10.30 hours (28 visits) and showed another peak of activity during 14.30 hours. *T. septentrionis* was the second most active pollinator of *C.roseus* (115) with two peaks of activity around 10.30 hours and 12.30 hours (21 visits). *J. atlites* showed two distinct active periods; one during early morning and the other during 17.30 hours. Similarly, *P. polytes* was active from 8.30 hours to 15.30 hours with peak activity during morning. In general, for most pollinators the most active time for flower visitation was found to be during the morning hours (75.5 %) (Fig.3).

Foraging pattern of insect pollinators in *P. lanceolata*

Foraging pattern of 8 insect pollinators of *P. lanceolata* was recorded (Fig.4). As in *C. roseus,* the most active time for foraging was during the morning hours (71 %). *O. smaragdina* showed maximum affinity for this flower (214) and the peak activity was recorded at 9.30 hours (60 visits). During afternoon hours they were less active. *P. demoleus*

was the second most abundant pollinator of *P.lanceolata* and showed two distinct peaks of activity at 9.30 hours (33) and 14.30 hours (29). Similarly most other species like *E. core, T. septentrionis* and *P. polytes* showed two peaks of activity. *Amegilla* sp. was observed up to 13.30 hours with peak activity before noon while, *M. grossa* showed only a single peak and they were active only during the morning hours (8.30 to 10.30 hours). As in *C. roseus*, *J. atlites* showed two distinct active periods; one during early morning and the other during evening. Three species of Hymenopterans together constituted about 32.6% of the total insect foraging in this plant.

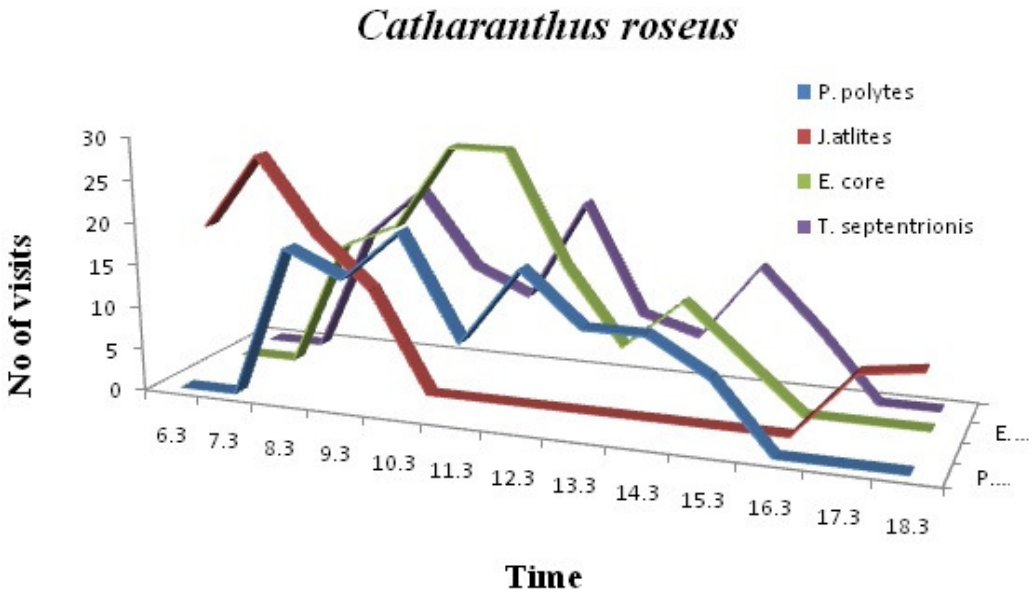

Fig.3. Foraging pattern of insect pollinators in *C. roseus*

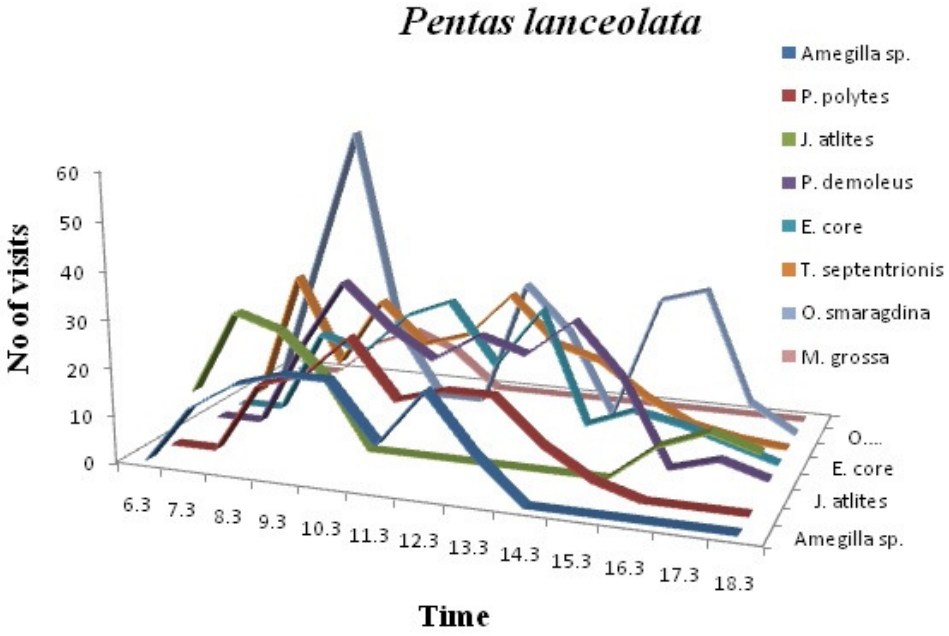

Fig.4. Foraging pattern of insect pollinators in *P. lanceolata*

The pollinators are known to partition the resource both spatially and temporally to avoid competition (Kephart, 1983). The foraging pattern observed here might be an effective mechanism of resource partitioning among the pollinators of *C. roseus* and *P. lanceolata.* Among the various pollinators recorded here, most of the butterflies were common species while the Hymenopterans were present in comparatively low numbers (23%). This might be because the flowers of *C. roseus* and *P. lanceolata* may be more adaptable to butterflies than to bees. Availability of food resources, floral pattern and floral chemistry are the factors determining the distribution and survival of various pollinators in a particular plant (Campbell, 1991). The findings of the study are a contribution with regard to the nectar and pollen utilization by eight species of insect pollinators on *C. roseus* and *P. lanceolata*. However more detailed studies are required to find out the resource utilization, host range and ecological requirements of these pollinators and other pollinators in general on view of the global pollinator crisis. As most species of angiosperms depend exclusively on pollinators for their survival the pollinator community deserves more protection and their conservation should be given prime importance.

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