Pollination by Insects in *Abelmoschus esculentus*

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Abstract: Flowers are the most beautiful among nature's creation. Flowering plants with medicinal properties are threatened by global warming. Many of threats that endanger plants also place their pollinators at risk. The present study is carried out on pollination by insects in *Abelmoschus esculentus*. It is a perennial, upright annual which was observed for its insect visitors and pollination ecology for a period of 2 months from November to December in 2015. The study was carried out at Ayyampatti near Chinnamanur for ten days. Five different types of insects were observed. *Coccinella magnifica, Papilio machano, Apis florae, Sympetrum striolatum,* and *Monomorium pharaonis. Coccinella magnifica, Papilio machano,* and *Apis florae* was observed to be the significant pollinator and *Sympetrum striolatum, Monomorium pharaonis* consistent foraging on *Abelmoschus esculentus* during November and December respectively.

Key Words: *Abelmoschus esculentus*, Pollination, Diversity, Flower opening and Closing time, Pollinator.

1. INTRODUCTION:

A flowering plant springs from a seed and grows, given flower emerges. Then pollination must occur. As the flower fades a fruit with seed is produced. To produce a seed or fruit, pollen must move from the anther to a respective stigma, this is pollination. When the proper compatible pollen adheres to the stigma, it germinates and a pollen tube grows the stigma and the style to the ovary. Fertilization takes place in the ovary when the nucleus of the ovule of female germ cell now a seed is produced. The pollinators are insects, animals, wind and water. Pollination by insects in agricultural crops improves their quality and quantity (Datni *et al.,* 2005). A large flower competes for attention with small smelling flower, while files are attracted to the rotten meat smell of the carrion flower. Nature designed each flower with a form that attracts the type of pollinators. At present the potential pollinators of *Abelmoschus esculentus* was investigated in Ayyampatti at Chinnamanur in Theni district, Tamilnadu, India.

2. MATERIALS AND METHODS:

The study was carried in Ayyampatti at Chinnamanur during November and December, 2010, ten days in each month. A plot of 1×1 m was chosen and the plants in the area was observed for insect visitors. Plant characteristics such as flowers opening and closing time, flower color, number of petals, sepals, were also recorded. The data collected in the present study was statistically analyzed.

$$\text{Mean} = \frac{\text{Sum of observation}}{\text{Number of observation}}$$

$$\text{Standard Deviation} = \sqrt{\Sigma d2/N}$$

d= Deviation of the data from the mean.

N= Total number of observation.

3. RESULTS AND DISCUSSION:

Foraging behavior of insect visitors and pollination ecology of *Abelmoschus esculentus* was studied for a period of two months of November and December 2015. A group of plants occupying 1 m^2 area comprising of approximately 30 and 40 flowers during the month of November and December respectively were observed for the present study. The floral characteristics were observed. The study was carried out for ten days during November and December 2015. Numbers of visits were given in Figure-1a and Figure-1b at the five days interval.

Five different types of insects via, *Coccinella magnifica, Papilio machano, Apis florae, Sympetrum striolatum,* and *Monomorium pharaonis* were found to visit the flowers during the study period of November and December which are pollinators. Frequency of visit of individual insect species was observed during morning time.

Figures 1a and 1b reveals the daily foraging activity of all the insects during the month of November. In Figures 2a and 2b the average foraging of insects during the study period is depicted. The average foraging activity in insect *Coccinella magnifica* has made 404 visits for ten days during November and 273 visits for ten days during December. *Coccinella magnifica* was the first frequent pollinator and *Monomorium pharaonis* was the least frequent pollinator.

Most flowers secrete nectar, a sugary scented liquid to help to attract insects to the flower. This is usually offered deep within the flower near the base where petals originate from around the ovary. In seeking nectar of gathering pollen the insect accidentally brushes against anthers so that pollen grains are transferred to the stigma, and also insect pollinated plants work by attracting pollinators through sight and smell. Butterflies and bees are attracted to color that attraction varies widely between species. There is a very specific pollination process with orchids which use sexual deception. Orchid flowers will mimic the odor and appearance of female wasps. So pollination is achieved during mating attempts by the male (Galen *et al.,* 1999).

Flowers are used in signaling between plant and the pollinator insect. Because of the energy demands of pollinators, their preferences should result in directional selection for floral signal associated with predictable rewards (Heinrich and Raven, 1972). Paulette Bierzychudek, 1981 reported Asclepiads and Lantana are thought to be mullein mimics whose resemblance allows them to attract more pollinator visits. Flowering plants depend on their pollinators. Many birds, insects, bats interaction covers an important theme in evolutionary ecology with for reaching applications in conservation and agriculture (Delaplaine, 1994).

Among these plants cross pollination is needed for maximization of fruit and seed set and these latter are their main reproductive mechanisms (Barrows, 1976; Gholson and Derwent, 2004). Pollinators as organisms that provide an essential ecosystem service are important in agricultural lands, cultivated, pastoral and natural areas. Hence, the diversity and abundance of pollinators must be conserved for their effective service. (Inoue, 1993).

Table 1.Number of Visits and Insects in *Abelmoschus esculentus*:

Insect Names	November		December	
	No. of Insects Visited	No. of Visits	No. of Insects Visited	No. of Visits
Papilio machaon	286	326	195	213
Apis florae	241	327	178	187
Coccinella magnifica	388	404	200	273
Sympetrum striolatum	226	230	213	227
Monomorium pharaonis	156	169	106	124

Figure 1a: Daily Foraging Behavior of Insects for the First Five days in November:

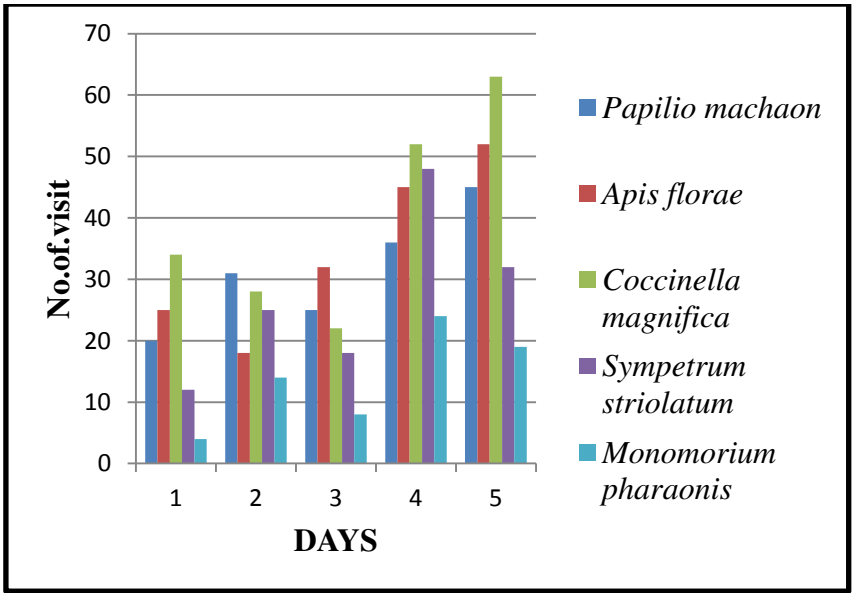


Figure 1b: Daily Foraging Behavior of Insects for the Second Five days in November:

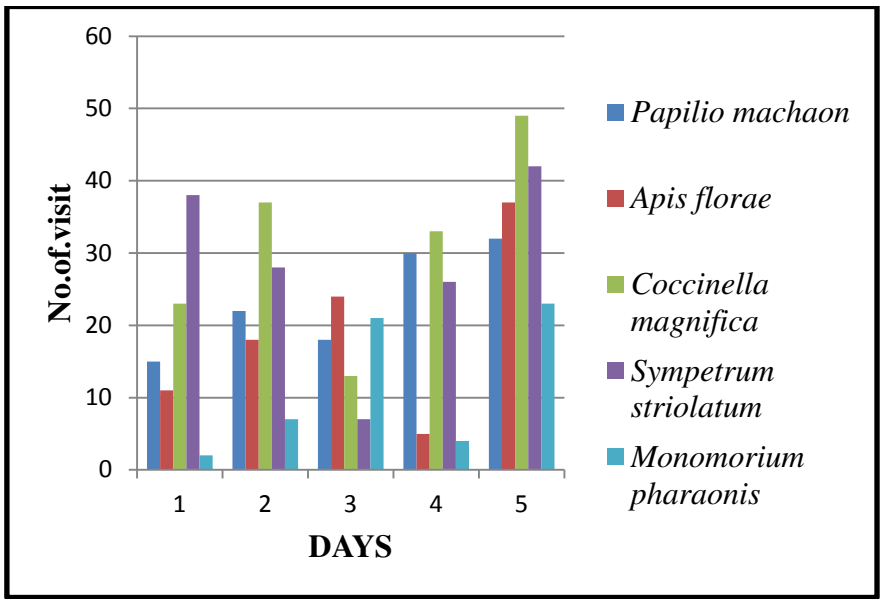


Figure 2a: Daily Foraging Behavior of Insects for the First Five days in December:

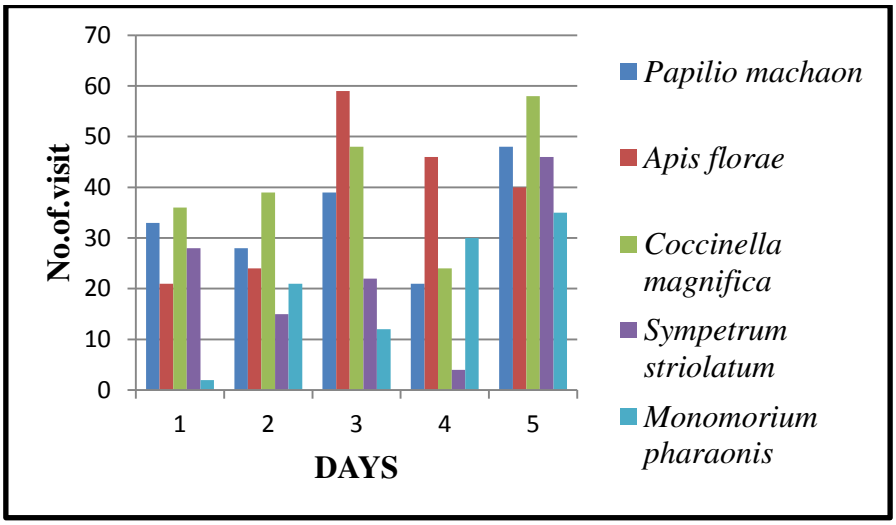
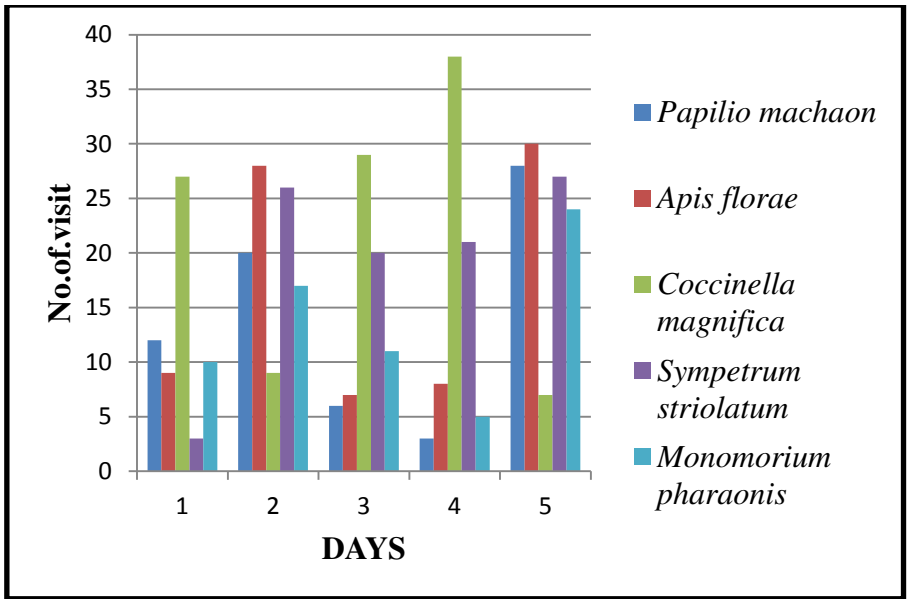


Figure 2b: Daily Foraging Behavior of Insects for the Second Five days in December:



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