

# Polistes Herbreaus are best Pollinators of Zizyphus Maurtiana

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**Abstract:** *The present study deals with the pollination of insect on selected trees, Khair (Acacia catechu), Ber (Zizyphus mauritiana) Siris (Albizia lebbek), Amla (Emblca officinalis), Kachnar (Bauhinia verigata), Shisham (Dalbergia sissoo). Diversity of insect pollinators visiting the tree, Relative abundance of the pollinators, Foraging behavior in term of Foraging rate, Foraging duration and loose pollen grains adhered to the body. On the basis of the data, performance score and pollinating index (PI) of each Polistes herbreaus and Rhynchium flavolineatum was the most efficient pollinator of Ber (Zizyphus mauritiana). No other species viz: Apis cerana Apis dorsata Apis mellifera are found on the Ber.*

**Keywords:** Pollination, Foraging rate, Ber, Abundance

## 1. Introduction

*Zizyphus mauritiana* Lam. blooms twice a year, once during September–January (first season) and again during March–June (second season). The flowers are compatible to geiton and xeno pollen. They are strongly protandrous and pass through distinct developmental stages. While the first 2 flowers of umbel are invariably complete, the succeeding ones either develop up to the male stage or continue through the female. The flowers in the 2 stages are more numerous in the first season than in the second. They decrease as the seasons progress. Two plant types occur. In one, the flowers and these at 0600 h (early) and in the other at 1000 h (late). The stigmas of the late type receive pollen in the latter half of their receptive period, first from the early and then from the both. Those of the early type receive pollen of the late type in the beginning of receptive period, and in the last quarter first from the early and then of the both. About 180 million acres were devoted to the wind pollinated or self pollinated crops, primarily barley, corn, oats, rice, rye, sorghums and wheat, grass hay crops, sugar beets, sugar cane, potatoes, sweet potatoes, and tobacco. About 60 million acres were devoted to crops that may receive some benefit from insect pollination but are largely self-pollinating (beans, cotton, flax, peanuts, peas, and soybeans). About 40 million acres were devoted to hay crops produced from bee-pollinated seeds (alfalfa, clovers, lespedezas). About 6 million acres were devoted to producing fruits, vegetables, and nuts-most of which are dependent upon insect pollination. These plants provide about 15 percent of our diet. The animal products we consume contribute about an equal amount to our diet. These include beef, pork, poultry, lamb, and dairy products--derived one way or another from insect-pollinated legumes such as alfalfa, clover, lespedeza, and trefoil. More than half of the world's diet of fats and oils comes from oilseeds--coconuts, cotton, oil palm, olives, peanuts, rape, soybeans, and sunflower (Guidry 1964). Many of these plants are dependent upon or benefited by insect pollination. When these sources, the animal and plant products, are considered, it appears that perhaps one-third of our total diet is dependent, directly or indirectly, upon insect-pollinated plants.

The conservation status of the various insect pollinators is not well known mainly due to their small size and inconspicuous nature. The decline in insect species can go unnoticed until they approach local extinction. The pollinators that visit agricultural crops are often known but there is a vast vacuum in our knowledge of insect pollinators which visit or bring out pollination in our native plants. It is in this perspective that the present studies are proposed with the following objectives; To assess the species diversity of insect pollinators of selected forest plants, To study the foraging behaviour of the dominant and efficient pollinators on particular plants, to determine the influence of exotic pollinators on diversity and behaviour of native pollinators.

## 2. Study Area

The Kandi tract of Gurdaspur forest division has come under the umbrella of the management plan under Section 4 of Land Preservation Act, 1900. The forest vegetation of the tract varies in composition, quality and density depending upon locality, geological formations, elevation and other aspects.

## 3. Material and Methods

Standard technique with area/crop specific modifications where required will be employed to study insect pollinator diversity efficiency and behaviour. Six plants are selected Khair (*Acacia catechu*), Ber (*Zizyphus mauritiana*) Siris (*Albizia lebbek*), Amla (*Emblca officinalis*), Kachnar (*Bauhinia verigata*), Shisham (*Dalbergia sissoo*), for The parameters to be used and the technique for its determination will be as follows:-

- Pollinator Diversity** – The variety of pollinators visiting the trees to be studied will be caught with the help of butterfly net and immediately killed by fumigation with ethyl acetate in a wide mouthed killing bottle. It will be stretched in the stretching box and pinned properly for preservation. The pollinators will be identified by following various taxonomic keys.
- Abundance/Visitation Frequency** – Population abundance will be recorded by selecting five equal sized branches of forest trees. The number of insect visitors per five minutes in the selected areas will be recorded.

Observations will be taken three times in a day and twice in a week during the full blooming period of the crop.

#### Foraging Rate

This is determined by recording the number of flowers visited per minute by each type of insect. Observations will be recorded five times during a day, repeated twice in a week during the full blooming period of crops.

#### Foraging Duration

The time spent by each insect on one flower (in seconds) will be measured with the help of stopwatch. Observations will be recorded on five inflorescences at one time and three times in a day. This process will be repeated twice a week during the full blooming period of crops and fruit trees.

#### Foraging Behaviour

Proportion of top worker and side worker bees was determined as follows; worker bees alighting upright on stamens to collect pollen or nectar were considered as top workers and those alighting on petals and collecting nectar were considered as side workers (Verma and Rana, 1994), Fig.1 and 2.

#### Pollen Counting

Three individuals of each species will be captured on the flowers and immediately killed individually in 70% alcohol. The pollen will be washed from their body and a constant volume of the rinsate will be prepared. For this procedure, the hind legs of the Apis visitors will be amputated before killing them and then the rinsate will be made.

The number of loose pollen grains adhered to the body of the pollinators will be counted with the help of Haemocytometer as suggested by Kumar et al. (1985). For different pollination attributes, viz. population abundance of flower visitors, their foraging rates, foraging duration, pollen counting i.e. loose pollen grains attached to their body and performance scores will be derived for each species. From various performance scores for different attributes of a species, the Pollination Index (PI) will be derived by multiplying all the PSs of that species. On the basis of the pollinating index (PI) of each species the pollinating efficiency of species will be determined with the formula given by Sihag and Rathi (1994) and conclusion will be drawn as to which of the insect species is better pollinator contributing highest degree to pollination.

### 4. Results and Discussion

The result obtained during the investigations carried out on insect pollinators and their pollinating attributes on are presented in this paper these have been dealt tree-wise under different parameters.

#### Relative abundance

During Present investigation the average number of insects per species visiting per m<sup>2</sup> on tree per five minutes were observed: *Polistes hebraeus* 0.6±0.89 and *Rhynchium* 0.6±1.34 on *Ziziphus maurtiana*, Relative abundance was greater during 1200-1400h on *Ziziphus maurtiana* (Reddi and Reddi, 1983, Bhalla et al. 1983).

#### Foraging behaviour

**Foraging rate:** Data pertaining to the number of flower visited per insect per min. for the various insect visitors were: *Polistes hebraeus* 5.6±1.06 and *Rhynchium* 3.93±0.46 on *Ziziphus maurtiana*, Forging behaviour was greater during followed by 0900-11h on *Ziziphus maurtiana*, Bhalla et al. 1983 reported that honey bees started foraging after 0900 h and were most active from 1100 h to 1600 h. Abrol and Bhat (1987) observed that foraging activity of *A. cerana* was positively and significantly correlated with temperature and non-significant with relative humidity.

**Foraging duration:** The data on average time (in seconds) spent for foraging duration per insect per flower by different insect visitors on different trees were: *Polistes hebraeus* 7.40±1.39 and *Rhynchium* 7.06±4.81 on *Ziziphus maurtiana*,

#### Pollen counting

Average no. of pollen grain per insect has been observed on the basis of performance score and pollinating index (PI) of each species the pollinating efficiency ranking was done. The average pollen grain per insect per flower by different insect visitors on different trees has been *Polistes hebraeus* 6666.66 and *Rhynchium* 3333.33 on *Ziziphus maurtiana*.

#### Pollinating Index:

On the basis of different parameters like relative abundance, foraging behaviour, foraging duration and pollen counting pollinating index were calculated : *Polistes hebraeus* 79.021, *Rhynchium* 11.932 on *Ziziphus maurtiana*.

### 5. Conclusion

On the basis of present Investigation, performance score and pollinating index (PI) of each species the pollinating efficiency ranking was done and it is observed that. *Polistes hebraeus* is the most efficient pollinator of Ber (*Ziziphus maurtiana*).

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**Table 1:** Pollination efficiency ranking of insect pollinators of on Ber (*Ziziphus mauritiana*) tree are the basis of different pollinating attributes (all mean values)

S.No.	Name of insect	Abundance	Foraging Rate	Foraging Duration	Pollen Counting	Pollinating Index (PI)	Pollinating efficiency ranking
1.	<i>Polistes herbreaus</i>	1.46 (2.073)	5.60 (0.659)	7.40 (116.621)	56666.66 (0.746)	79.021	1
2	<i>Rhynchium flavolineatum</i>	0.60 (0.852)	3.93 (0.462)	7.06 (122.237)	3333.33 (0.248)	11.932	2



**Figure 1**



**Figure 2**

**Figure 1 and 2:** *Polistes herbreaus* are showing foraging behaviour on *Ziziphus mauritiana*