

## Pollen foraging activity of *Apis mellifera* during autumn season in Chandigarh

Rajinder Kaur\* and Neelima R Kumar

Department of Zoology, Panjab University, Chandigarh – 160014, India

(e-mail: \*dr.rita85@gmail.com; neelimark6@gmail.com)

### Abstract

Foraging activity of honeybee *Apis mellifera* was studied during autumn season in Chandigarh. The collection of pollen by worker bees was influenced by number of factors including both internal and external. Internal factors like higher area under brood in the colony stimulated the foragers to collect more pollen. External factors such as temperature, light, wind, rain, clouds also influenced the pollen foraging activities. Number of pollen foragers returning with pollen loads at the hive entrance was counted for 5 minutes (September-November, 2011) at intervals of 1 hour each from 10:00 a.m. to 04:00 p.m., twice a week in five honeybee colonies during autumn season. The mean maximum number of pollen foragers was recorded as  $218.38 \pm 33.27$  at 12:00 noon when air temperature ranged from 15°C to 32°C. This pollen collecting activity decreased after 03:00 p.m. Number of trips depended upon various conditions including weather, forage availability, strength of colony etc. The results of findings revealed that 12:00 noon was the hour of peak pollen collecting activity during autumn season and *Cassia siamea* present in large number near the colonies was the main source of collected pollen.

**Keywords:** Honeybees, foraging, pollen, autumn.

### Introduction

Honeybee is one of the most familiar insects in the world. This member of the insect order Hymenoptera plays a key role in human and environmental health. Honeybees are social insects. Each bee belongs to one of the three specialized groups called castes viz., queen, drones and workers.

The development of honeybees largely depends upon the food they are fed. So, the nectar and pollen collection by honeybees plays an important role. Various factors influence the foraging behavior of worker bees such as weather, distance of food source from the hive, food quality, quantity of nectar and pollen. There is usually shortage of floral resources during summer and rainy seasons i.e. from June to August (Mishra and Sharma, 1997). Bees generally forage to a food source within 3

km radius. Foraging also depends upon temperature conditions as follows: no foraging (< 8°C); some activity (8°C-16°C); optimal condition (16°C-32°C); reduction in foraging, increase in water collection (> 32°C). Here we investigate pollen foraging activity of honeybees in autumn season.

### Materials and Methods

The study was carried in a small apiary maintained at the Department of Zoology, Panjab University Campus, Chandigarh. Five colonies of *Apis mellifera* kept in Langstroth hives were taken for the study. To study the foraging activity of the honeybees, the number of pollen collecting foragers returning to the hive entrance was recorded for 5 minutes every one hour from 10:00 a.m. to 04:00 p.m. Observations were recorded twice a week from September-

November, 2011. Foraging efficiency of a colony was measured in terms of number of bees with pollen load entering the hive. The floral sources present near the colonies on which bees reached for pollen collection were observed. These observations were taken by naked eyes.

**Results and Discussion**

**Pollen collection by honeybees:** The bees efficiently collected pollen during the day time in autumn season. Pollen loads varied during the day showing hourly fluctuations. The worker bees had higher tendency to collect pollen in the morning

and reduced their activity in late hours of the day (Table 1 and Fig. 1). It has previously reported that the foraging activity of all insect visitors was affected by environmental conditions such as temperature, light intensity, wind speed, and time of day and season (Kevan and Baker, 1983). Several workers investigated how such factors affected foraging activity and the general opinion was that the activity increased with temperature up to a threshold, above which visitation decreased (Hippa *et al.*, 1981; Willmer, 1983; Arroyo *et al.*, 1985; Boyle-Mackowski and Philogene, 1985; Gilbert, 1985).

**Table 1: Mean number of pollen foragers per 5 minutes in five colonies.**

S. No.	Time of Observations (September–November)	Mean number of pollen foragers per 5 minutes
1.	10:00	64.38 ± 18.67
2.	11:00	168.38 ± 21.31
3.	12:00	218.38 ± 33.27
4.	01:00	159 ± 22.03
5.	02:00	144.25 ± 37.14
6.	03:00	127.38 ± 33.48
7.	04:00	25 ± 9.59

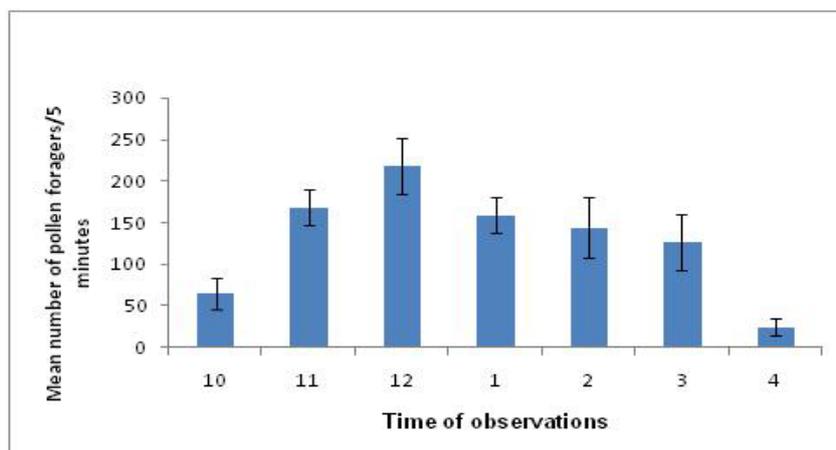
p value is less than 0.0001, which implies results are statistically significant.

Pollen collection took place throughout the day. The rhythm of average number of pollen collecting foragers during day ranged from 218.38 ± 33.27 at 12:00 noon to 25 ± 9.59 at 4:00 p.m. After 03:00 p.m. the graph declined rapidly. This fluctuation was most likely due to fall in temperature. Louveaux (1958) observed that pollen was not collected when air temperature was below 10°C. Neupane and Thapa (2005) recorded that the number of pollen foragers was 62.3/colony during autumn when air temperature ranged from 34°C to 19°C and a relative humidity 85 to 87%. The air temperature played main role in influencing the worker bees to collect

pollen.

**Variety of floral sources present near the colony:** There were many floral sources present near the colonies during autumn season on which honeybees reached for pollen collection. These floral sources were *Hibiscus rosa sinensis* (China rose), *Cassia siamea* (Golden shower), *Callistemon lanceolatus* (Bottle brush), *Eriobotrya japonica* (Loquat) but *Cassia siamea* was most abundant during the season. The pollen foragers collected maximum quantity of pollen from those plants which were more abundant in the area and lesser amount of pollen from those plants which were not very common.

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**Fig. 1: Relationship between time of observation and mean number of pollen foragers per 5 minutes during autumn.**

### Conclusion

Maximum number of pollen collecting foragers was observed at 12:00 noon when air temperature ranged between 15°C to 32°C and *Cassia siamea* was the most abundant flora on which honeybees reached for pollen collection.

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