



Pollen and Nectar Load Quantification in *Apis mellifera*.L in Different Eco Habitat

KEYWORDS

Behaviour, Quantify, Pollen, Nectar

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ABSTRACT Honeybees are social insects distributed throughout the world. They are known for the behaviour of collecting pollen and nectar and this act is called foraging. The foraging behaviour is an important aspect of their biology that enables them to adapt themselves to the available vegetational and climatic conditions. Honeybee like any other animal performs wide varieties of functions in order to avail the basic necessities of life and also to procure food and shelter. The foraging efficiency of honeybee largely depends on the availability of bee forage, conditions of the colony and the foraging range of worker bees. Studies on the foraging activity of bees in different seasons of the year gives an indication of the adaptability of the bees in exploiting the bee forage in a locality. Similarly, the extensive knowledge of the pollen sources helps the beekeepers to exploit the sources to the maximum extent so as to develop stronger colonies that are highly desirable from the point of their productivity. The success of beekeeping industry largely depends on the exploitation of the nectar and pollen resource of the flowering plants by the bees. The aim of this paper is to quantify the pollen and nectar load carrying behaviour in *A. mellifera*. This study primarily helped to investigate the size of the foraging population with reference to the bees foraging for pollen or nectar at different hours of the day and then throughout the year in different agroclimatic ecozones of Karnataka. The pollen and nectar collected by the honeybees showed variations not only in the same area but also in different geographic ecotypes. A wide seasonal variation was observed in the foraging activity. The efficient management of these bees in an area solely depends on the detailed knowledge of their behavioural pattern.

INTRODUCTION

Honeybees are most familiar and productive insects known to mankind from prehistoric times. Man has maintained intimate association with honeybees from times immemorial and developed. There is a Social liking for honeybees for their fascinating and spectacular ways of life. Beekeeping has a greater scope in India to develop as a prime agro-horticulture and forest based rural industry ideally suitable to the rural, tribal and weaker sections of the population.

Beekeeping is a multifaceted activity, (Singh, 1997) the value of many aspects like bee pollination, wax production, medicinal properties of honey and others have enabled it to become the most viable industry. Beekeeping is practiced under wide agro climatic conditions in the plains and hills up to 2700m (Melkania et al., 1983). Honeybee like any other animal performs wide varieties of functions in order to avail the basic necessities of life and also to procure food and shelter.

Honeybees are social insects and are distributed throughout the world with which man has established a harmonious co-existence (Mishra, 1995; and Nagaraja and Reddy, 1996). These insects are of great importance because they not only produce honey, but also are also important pollinating agents for many plants (Kapil and Kumar, 1975; Jadhav, 1981; Rao et al., 1981; Swaminathan and Bharadwaj, 1982; Abrol and Bhat, 1985; Deshmukh et al., 1985; Winston, 1987; Rao and Suryanarayana, 1988; Woo et al., 2000).

Foraging is a social enterprise (Seeley, 1985) in which bees collect pollen, nectar, water and propolis from plants. The act of collecting all these is called foraging and the bee is a forager. The foraging behaviour of the honeybee is dependent on its innate capacity and responses to the various environmental stimuli. The foraging behaviour is an important aspect of their biology that enables them to adapt themselves to the available vegetational and climatic conditions. When the bee begins to forage, it will usually make several trips per day when the weather conditions are favourable. A single foraging trip may last up to an hour or more, with the pollen-gath-

ering trip often making more time than a nectar-gathering trip. Bees utilize pollen and nectar as food source and nectar is converted into honey and pollen is used to build combs.

Change in the availability of bee flora seriously affects the beekeeping and as a result migratory beekeeping has become one of the most important practices of modern apiculture in India. Migratory beekeeping was introduced in India which has been into practice since 1939. *A. cerana* enjoys a wide distribution in India. *A. mellifera* was found in America, Africa, Australia, Asia and now available in India. Many of the cultivated crops and commercial plantations provide pollen and nectar that are food for the bees.

The effort in this paper is to quantify the pollen and nectar load in *A. mellifera* in different eco-habitat of Karnataka.

Materials and Methods:

Eight healthy colonies of *A. mellifera* were selected for studying from different apiaries (Table 1) during January 2011 to December 2012. The foragers were evaluated for pollen and nectar load. The returning foragers were captured at the hive entrance to collect the pollen loads (Suryanarayana, 1992). Samples were collected throughout the day at hourly intervals. The incoming pollen foragers were caught by hand by holding the wings. The loads on the two hind legs were gently removed into a clean paper, the two loads were then packed into two separate packets. Each packet was labeled with data, the colony number, bee species, time and date of collection. Similar samples were collected every month and throughout the year.

The foraging bees returning without the pollen load and swollen abdomen were captured and micro capillary tubes were used to collect nectar. The resultant nectar collected was measured using the method (Galen and Plowright, 1985) on the visual scale which has been calibrated for direct reading in microlitres (μ l).

Table 1: Different Apiary sites identified in Karnataka for the study

Location	Apiary sites	Code
1	Heserghatta Village	HG
2	Jnanabharathi	JB
3	Arkavathy madhuvana	AK
4	Honnavar	HN
5	Bhagamandala	BG
6	Kuntanahalli	KT
7	Shivakote	SK
8	Shivanahalli	SH

RESULTS AND DISCUSSION :

The test colonies were observed throughout the study period for the foraging behaviour .The pollen gathering activity and the nectar gathering activity were recorded on a daily, monthly and then yearly for the period January 2011 to December 2012

The numbers of foragers at different hours in different apiaries were recorded (Table2and 3)

Table – 2: Number of pollen foragers at different hours in different apiaries

Apiary site	0600 hr	0800 hr	1000 hr	1200 hr	1400 hr	1600 hr	1800 hr
1	3.14±0.44	5.31±1.18	7.32±1.48	13.44±1.86	12.61±2.11	12.38±1.15	8.13±1.76
2	2.11±0.63	4.17±1.04	5.38±1.78	16.43±1.76	8.22±1.97	8.36±1.82	8.38±1.26
3	4.76±1.17	6.38±1.28	5.93±1.13	17.74±1.87	13.61±1.18	11.18±2.12	11.84±2.16
4	6.31±1.72	7.11±1.32	9.36±1.87	16.92±2.12	14.37±2.61	12.38±1.76	12.43±1.66
5	5.38±1.97	6.12±2.4	6.72±1.41	14.78±1.58	10.13±2.04	10.32±1.36	10.41±1.47

Table – 3: Number of nectar foragers at different hours in different apiaries

Apiary site	0600 hr	0800 hr	1000 hr	1200 hr	1400 hr	1600 hr	1800 hr
1	2.21±0.47	3.21±0.16	8.12±1.54	12.14±1.28	12.51±1.11	12.25±1.12	9.23±1.39
2	3.11±0.43	4.18±1.74	7.37±1.26	12.56±1.92	11.27±1.35	9.32±1.01	9.36±1.33
3	3.16±0.17	5.24±1.28	5.29±1.24	14.34±0.67	11.41±1.14	12.13±1.12	9.84±1.17
4	5.18±0.72	4.12±1.74	6.16±1.37	13.91±2.02	12.57±1.21	12.33±1.78	11.43±1.34
5	4.59±1.47	5.15±1.4	6.12±1.81	12.62±1.14	11.15±1.04	11.12±1.35	10.11±1.28

Mean pollen load carrying capacity of *A.mellifera* during different hours of the day during 2009-2010 (Fig1) showed the highest pollen collectors during 0900-1300 hr with a peak at 1200 hr.

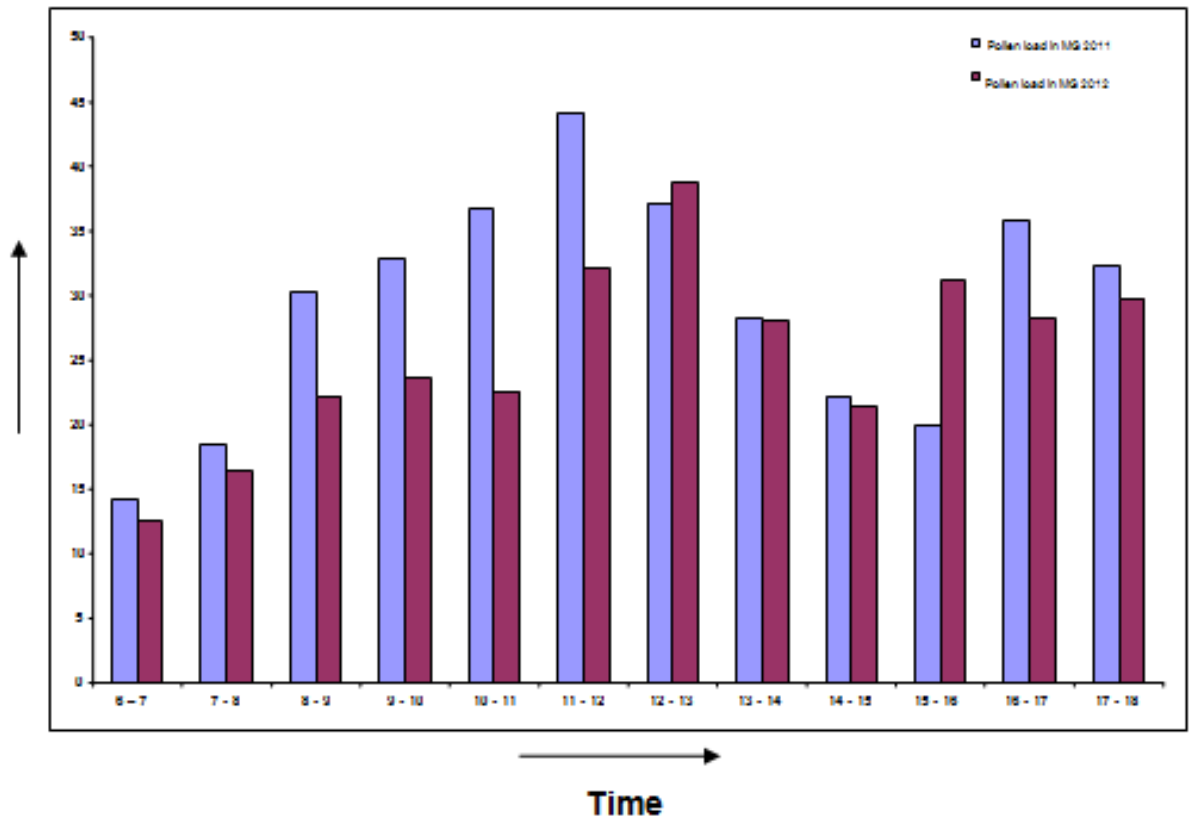


Fig 1 Mean pollen load carrying capacity of Apis mellifera during different hours of the day during 2011 and 2012

Mean pollen load carrying capacity of *A.mellifera* during different months show the pollen collection was constant through out the year except in the month of July and August (Fig 2). The pollen collection was highest in September and October then declined in December as it was the brood rearing period and increased again with the onset of spring season during January. There was increase in pollen load during April, May and June.

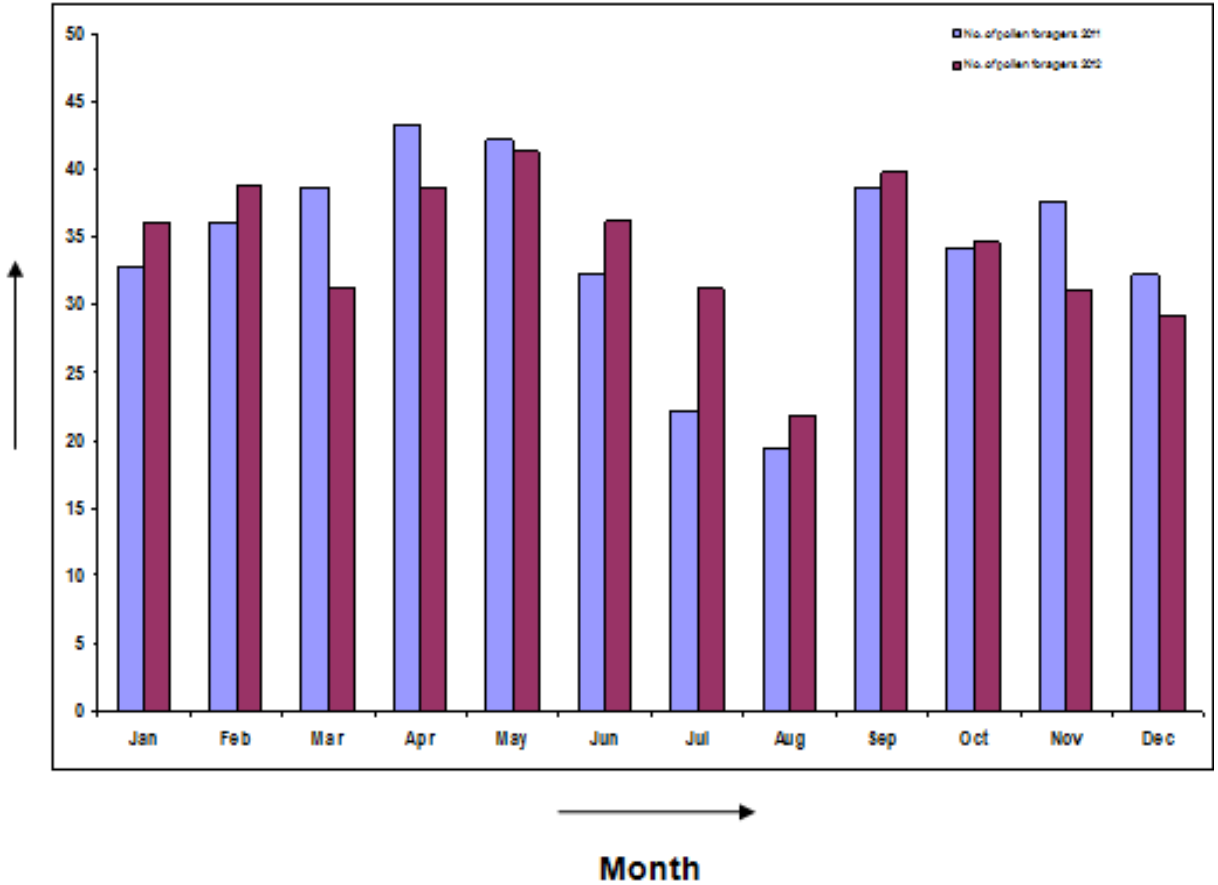


Fig 2 Mean pollen load carrying capacity of *Apis mellifera* during different months of the year 2011 and 2012

In *A.mellifera* the mean nectar load carrying capacity during different hours of the day (Fig. 3) show that the foragers initiated the activity of foraging very late. There was very little activity till 0800 hr and thereafter the activity seemed to commence, however maintained a high rate at 1100 to 1200 hr and continued to forage for nectar till evening to reach a second peak at 1600 to 1700 hr and continued to collect nectar till they ceased their activity.

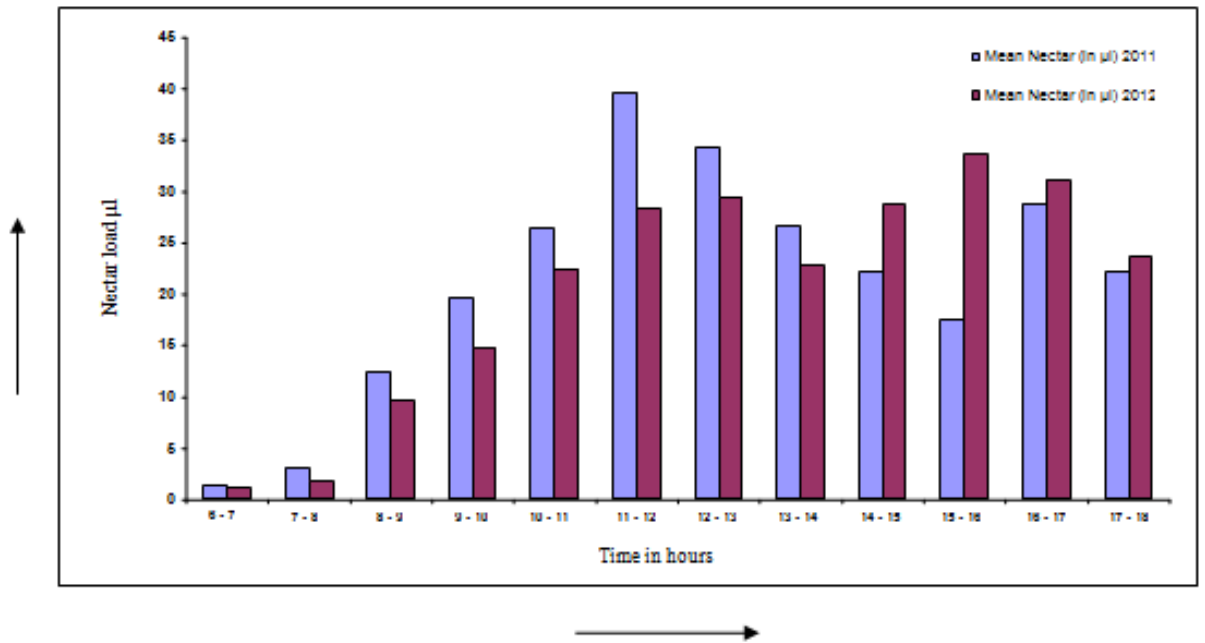


Fig. 3 Mean nectar load carrying of *Apis mellifera* during different hours 2011 and 2012

Nectar collection by *A.mellifera* during different months of the year during 2011-2012 (Fig.4) showed the highest nectar collection in the month of May which gradually started decreasing and was at the least in the month of August. The activities of

the foragers were least as the bee flora was scanty and slowly started increasing from September onwards. There was a greater fluctuation in the nectar gathering activity during 2009 and 2010. Nectar collection was not constant through out the year and showed fluctuations.

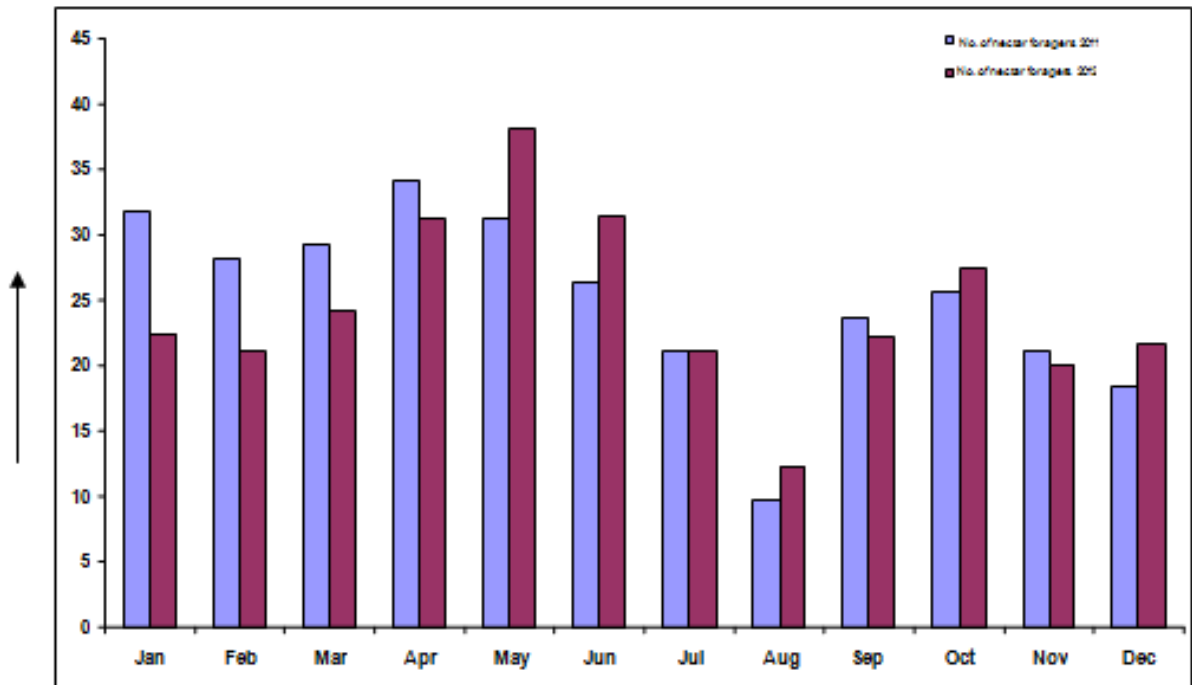


Fig. 4 Mean nectar load carrying of *Apis mellifera* during different Months of the year 2011 and 2012

DISCUSSION :

Honeybees are of great value to farmers for their pollination of crops and honey and other bee products. Honey and pollen sources were greater in summer and autumn than in other seasons of the year (Verma et al.1988a). Similar results were reported by Mattu and Verma (1985) in *A.cerana*. Nectar gatherers dominate pollen gatherers at different time intervals and this might be attributed to the performance of bee species for nectar of niger (Panda, et al.1995).

Observations of the flight activity showed that foraging occurs daily between 0600 to 1600 hr without stopping also confirming the observation of Erickson et al. 1975 made on *A.mellifera*. Foraging pattern shows there is an inverse relationship between pollen and nectar gathering activity. The results are in conformity with the observations of Erickson et al.1973. Reddy (1977) also reported similar relationship in *A.mellifera*.

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