



Research Article

ISSN: 2395 -5775

COLONY STRENGTH AND ITS PERFORMANCE INDEX IN DIFFERENT APIARIES OF APIS CERANA INDICA, IN KARNATAKA,INDIA

Nagarathna A¹ and Reddy, M.S²

Abstract

The colony performance of *Apis cerana indica* determines its foraging efficiency. The economy of the colony depends on the performance of the colony. The productivity and efficiency of Indian honeybee *A.cerana* depends on various factors which are both external and internal. Effort has been made to study the colony performance index in *A.cerana indica* in different apiaries during different seasons in Karnataka, India.

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. Continuous flow of food substances throughout the year is essential for the successful beekeeping. The availability of nectar and pollen to foraging bee fluctuates from time to time of the year and also flowering of different plant species at different seasons It has been estimated that the influence of apiculture (beekeeping) on agricultural production is 10 or 15 times more important than the direct action by man. This is because about 80% of cultivated crops are entomophilies with bees being the most active insects during pollination (about 60% of pollination is done by bees).

Information pertaining to pollen and nectar loads in different species of honeybees, load carrying capacity of honeybee and the colony performance, the time of visitation to various crops and time of availability is very meager hence it was proposed to carry out the present studies During the present study,it was found that in Karnataka, South India, in the test apiary site maximum and minimum variation of pollen foragers were recorded during the study period. This is due to the prevailing floral diversity and its density in the study sites.

Key Words: Efficiency, productivity, colony *Apis cerana*

INTRODUCTION

Beekeeping is an integral part of mixed farming system, in many parts of the country. It is practiced as a cottage industry especially in rural areas.

Flying activities in the flowering period is governed by pollen or nectar collections (Zaitoun and Vorwohl, 2003). The honeybee is valued for its honey because of its medicinal properties (Batra, 1977).

Flower constancy of individual honeybee during a single foraging trip,

M.S.Ramaiah Degree College and PG Centre, Bangalore, India
Centre for Apiculture Studies, Department of Zoology, Bangalore University, Bangalore, India
Correspondence and Reprint Requests: Nagarathna A

Received: November 20, 2015 | Accepted: December 12, 2015 | Published Online: January 28, 2015

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (creativecommons.org/licenses/by/3.0)

Conflict of interest: None declared | Source of funding: Nil

successive foraging trips and days have been known for a long time (Free,1970).A colony of honeybee adjusts its selectivity in relation to its nutritional status and shifts its effort in response to changes in the foraging opportunities.

Pollination efficiency of an insect can be calculated by studying several factors like its abundance foraging behaviour, foraging rate and duration of the activity. Different bee flora exists in varied agro climatic conditions during different seasons and this has led to adapt the process of migratory beekeeping by beekeepers. The natural food is available for the bees for most part of the period of the year and by migratory bee colonies.

MATERIALS AND METHODS

To study the colony performance index, five colonies of A.cerana were selected for study one each from five different locations during January– December 2014.The numbers of workers entering the colony with or without pollen were counted for five minutes at regular intervals, throughout the experimental period between 0600 to 1800 hr in different seasons. The data collected were used to work out the CPI by using the formula given by Punchihewa et al. (1990).

RESULTS AND DISCUSSION

Colony performance index of the foraging population

Colony performance index (CPI) was calculated during different seasons in

different apiaries. The number of workers entering colony with or without pollen were counted for five minutes at regular intervals through out the experimental period between 0800 to 1800 hr in different seasons. The CPI was worked out in different apiary sites. Spring and summer seasons showed greater foraging activity and better efficiency and more was the size of the foraging population and hence the colony performance was much better than rainy or winter seasons. However, the CPI is also dependent on the available bee flora within the given location.

The data pertaining to the colony performance was observed during different hours of the day from 0800 to 1800 hr during different seasons showed the foragers were active throughout the day. As per the data the CPI of individual colony during different seasons revealed that the colonies performed well in spring and summer. The CPI recorded during the winter season showed the stronger colonies throughout the experimental period except during the rainy season where the CPI was lower than the other period. CPI less than 1.25 shows the colonies are weaker and the bees are to be fed with artificial sugars.

Table 1 Colony performance index in A.cerana during spring at different apiary sites during 2014

Location/Time in hr	L1HG	L3AK	L4HN	L5BG	L7SK
0800-0900	4.88	7.32	4.78	6.37	5.19
0900-1000	7.76	9.23	7.98	6.28	11.87
1000-1100	8.78	7.73	6.14	9.17	11.85
1100-1200	6.67	7.62	6.67	9.27	9.64
1200-1300	5.21	6.28	5.08	8.57	6.41
1300-1400	4.54	5.0	5.21	5.80	5.10
1400-1500	13.7	5.44	5.92	5.33	5.45
1500-1600	4.54	4.48	5.67	5.93	8.57
1600-1700	6.14	5.08	6.28	6.85	10.4
1700-1800	5.86	6.57	7.62	7.73	8.78

n = 20 bees

Table 2 Colony performance index in *A.cerana* during summer at different apiary sites during 2014

Location/Time in hr	L1HG	L3AK	L4HN	L5 BG	L7SK
0800-0900	4.28	3.52	4.53	7.76	6.80
0900-1000	3.52	4.28	3.75	5.08	4.61
1000-1100	5.10	6.67	7.62	6.67	5.87
1100-1200	8.57	8.78	7.5	4.41	5.21
1200-1300	3.14	3.16	4.80	3.53	3.92
1300-1400	3.33	3.89	3.83	3.63	2.59
1400-1500	2.05	2.60	2.78	2.98	2.14
1500-1600	2.42	4.0	3.13	2.98	2.42
1600-1700	4.28	4.61	8.78	9.17	6.41
1700-1800	5.10	4.28	7.62	8.78	7.73

n = 20bees

Table 3 Colony performance index in *A.cerana* during rainy at different apiary sites during 2014

Location/Time in hr	L1HG	L3AK	L4HN	L5 BG	L7SK
0800-0900	1.16	1.11	2.14	2.96	2.01
0900-1000	1.36	1.19	1.70	2.4	2.22
1000-1100	1.87	2.26	3.46	3.65	3.40
1100-1200	1.66	2.42	2.96	2.36	2.98
1200-1300	0.95	1.36	3.34	4.63	3.66
1300-1400	0.74	2.60	3.66	3.34	3.71
1400-1500	1.5	3.55	3.89	3.16	3.11
1500-1600	1.84	3.65	3.40	4.61	3.75
1600-1700	2.19	4.25	4.30	4.63	4.11
1700-1800	2.86	3.71	3.33	4.28	2.49

n = 20 bees

Table 4 Colony performance index in *A.cerana* during winter at different apiary sites during 2014

Location/Time in hr	L1HG	L3AK	L4HN	L5 BG	L7SK
0800-0900	1.15	3.57	3.10	3.16	3.20
0900-1000	1.48	4.63	3.67	2.14	3.14
1000-1100	1.02	4.18	4.54	1.90	3.42
1100-1200	1.5	4.28	2.60	2.12	3.96
1200-1300	1.18	3.75	2.86	2.05	3.33
1300-1400	0.95	2.42	4.14	1.48	2.96
1400-1500	1.15	2.86	3.40	1.66	2.60
1500-1600	1.28	3.15	4.30	2.14	2.17
1600-1700	1.17	3.43	4.17	2.25	2.04
1700-1800	1.38	3.07	4.44	2.98	2.72

n = 20 bees

Colony performance index in *A.cerana* during spring (Table 1) showed that performance in all the five locations throughout the day was good, it shows the availability of food source was in abundance. Table 2 shows the performance index of *A.cerana* during summer season. The summer season has flowers blooming all around and hence the collection of pollen and nectar is more hence the performance better.

Colony performance index during rainy season (Table 3) however is moderate; the CPI is low at the apiary site L1HG

during noon. Table 4 shows the colony performance during winter which is less however, possibly because of less availability of bee flora.

The foraging profile shows that there was a definite ratio among the pollen and nectar gatherers. Many factors like the pollen collection frequency, frequency of the trip, foraging time, and length of foraging life and size of foraging loads were also determined in different agro ecosystems. The growth and development of beekeeping in India is very slow as compared to other developed countries, despite the availability of unlimited potentials of bee pollination requirement of many agriculture and horticultural crops.

There is a need to expand, modify and diversify the modern beekeeping practices and also increase the employment opportunities in the areas of bee research. The ever increasing demand of crops needs to be pollinated by bees, the pollination potentials of bees need to be exploited.

A good population of industrious worker bees is vital for high yields of honey, wax, and better pollination services and also offers protection against pests and diseases. Thus the economy of the colony depends on the performance of the colony. There is also a direct relationship between pollen flow and brood rearing activity. (Gatoria et al., 2001, Gowda and Reddy, 2003). Honeybees exhibit different types of foraging behaviour depending on the floral structure and the location of floral rewards (Raju, 1990).

Foraging profile in honeybees is an index of the pollinating efficiency (Reddy, 1983). Daily and seasonal activity of a longer duration is necessary for determination of foraging index who observed maximum foraging activity in sunflower from 0600 to 1000 hr. Verma (1983) found peak period of pollen collection in *A.cerana* between 0800 to 1100 hr. during February, March and then between July and September, while nectar collection was maximum between 1200 to 1400 hr.

Maximum production of honey in an area depends upon the vegetation within flight range, weather conditions and other ecological factors. *A.florea* was found to be most important pollinator for onion. The average visit by *A.florea* to a single inflorescence was 30.02 percent and *A.dorsata* that showed 5 to 22 percent (Jadhav, 1981). It was observed that *A.florea* was more active between 1100 to 1200 hr (Singh and Dharampal, 1970). Pollen colour varies and the colour helps to trace its floral origin. Hamakawa and Morimoto (1967) compared the foraging activity *A.cerana* and *A.mellifera* from April to November. Foraging behaviour was similar in both the species; however *A.cerana* foraged more frequently in spring season.

REFERENCES

1. Batra, S.W.T. 1977 Bees of India (Apoidea), their behaviour, management and a key to The genera. *oriental Insects*. 11:289-324
2. Gatoria, G. S., Pradeep K. Chhuneja, Aulakh R. K. and Singh J. 2001 Migratory beekeeping in India: Its prospects and problem. *Indian Bee J.* 63 : 23-24
3. Gatoria, G. S., Pradeep K. Chhuneja, Aulakh R. K. and Singh J. 2001 Migratory beekeeping in India: Its prospects and problem. *Indian Bee J.* 63 : 23-24
4. Hamakawa, M and Morimoto, H. 1967 Foraging behaviour of honeybee from April to November. *Japanese Journal of Tech. science* 124
5. Jadhav, L.D. 1981 Role of insects in the pollination of onion in Maharashtra. *Indian Bee J.* 43 : 61-64
6. Raju A.J.S. 1990 Studies on pollination ecology in India. A review. *Proc. Indian Nat. Sci. Acad.* 56 : 375-388
7. Reddy, C.C 1983 Foraging index of Indian honeybee *Apis cerana*, F. *Proc. 2nd Int. Conf. in Trop. clim.* New Delhi. *J. Apic. Res.* : 595-599
8. Singh J. P. and Dharampal S. S. 1970 The role of honeybee in setting on onion in Pant Nagar. *Indian Bee J.* 32: 23-27
9. Verma S. K. 1983 Studies on the foraging behaviour of *Apis cerana indica* F. in Jeolikote, Nainital, India. *Indian Bee J.* 45 (1) : 5-9
10. Zaitoun Shahera Talat and Vorwohl Guenther 2003 Major pollen plant Spp. in relation to honeybees' activity in the Jordanian Desert area. *Int. Jour. Agri. Biol* 5 : (4) 411-415