

Original Research Article

Population Dynamics and Foraging pattern of Different Species of Honeybees on Rai (*Brassica juncea*)

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ABSTRACT

Honey bees are the primary pollinators of rai crop because it is highly attractive to bees and provides both nectar and pollen. The population dynamics (number of bee visits/minute per m²) of *Apis* spp. were recorded on rai, showed that among all *Apis* spp., *A. mellifera* was dominant visitor followed by *A. florea*, *A. dorsata* and *A.C. indica*. Maximum population of *Apis* spp. was observed on 27 November, 2016, as compared to other dates of observation due to high temperature and low relative humidity. The activities of honeybee recorded at different hours of day showed that peak activity of *Apis* spp. at 1330 h (16.50) and 0930 h. The minimum population (4.91) of *Apis* spp. was recorded due to high relative humidity and low temperature on 10 December 2017. Initiation-cessation time and period of activity by *Apis* spp. on rai was among the four species of honeybees. *A. mellifera* started foraging earlier (0936 h) and ceased her foraging late (1615h) followed by *A. dorsata* (0939, 1610h), *A. C. indica* (0960, 1594h) and *A. florea* (0988, 1588h) and maximum period activity (6.35 h) by *A. mellifera* spent time for collecting nectar or pollen in the field followed by *A. dorsata* (6.31), *A.C. indica* (6.25) and *A. flrae* (6.12) in above crop.

Keywords

Foraging,
Population, *Apis*
spp.

Introduction

Brassica juncea is an important rabi oilseed crop of India with a wide range of adaptability to various agro-ecological situations. It requires optimum pollination for proper seed set to get commercial crop through bee pollination. Rai is a highly cross-pollinated crop and its seed production depends on insect pollinators (Chhuneja *et al.*, 2007 and Singh *et al.*, 2008). It attracts many insects, particularly honeybees. It provides or secretes copious nectar and pollen flow. Honeybees have been recognized as important role of pollinators on Rai while foraging for nectar or pollen. Honey bees and flowers seemed to have evolved together. Therefore, it was of

great interest to study the population dynamics and foraging pattern of different species of honeybees on cultivar or rai flowers.

Materials and Methods

The experiment was conducted during 2016-17 at Nalanda College of Horticulture, Noorsarai Nalanda (Bihar) in rabi season to assess the population dynamics and foraging pattern of Different species of honeybees on cultivars of *Brassica juncea*. Rai was sown on 15 October 2016. The crop came into bloom after 35 days of sowing. The population dynamics of *Apis mellifera*, *Apis*

cerana indica, *Apis dorsata* and *Apis florea* were observed on rai blooming flowers. These bees foraged for nectar, pollen or both at different hours of the day were recorded at weakly interval from 20 November to 10 December, 2016. Number of *Apis* spp. were recorded from 0930 to 1530 h at two-hour intervals in one square meter area at three locations marked randomly and the weather parameters of the day was recorded. The observation foraging activity on initiation was recorded in the morning hours at the entrance gate of the beehive to know the starting time of foraging and also observed during evening hours the cessation time of the bees activity.

Results and Discussion

The study was conducted table 1 reveals that all the four species of honey bees visited rai bloom on different dates. Among the *Apis* spp, *A. Mellifera* dominated over all the other species of honey bees on 27 November

2016 as evident its mean population (15.50) followed by *A. florea* (13.08) while the lowest population was recorded for *A.C. indica* (8.25) only on the above date of observation. The population of *Apis* spp showed significant (P=0.05) variations on different hours of the days was highest (16.50) on 27 November at 1330h followed by 20 November (15.66) and the lowest population was (4.91) at 0930h on 10 December. The population of *Apis mellifera* was highest (22.00) on 27 November at other spp. of honeybees the same trend was recorded on the same date and time.

The population dynamics of *Apis* spp. On rai was recorded when maximum temperature was (20.00c) and low humidity (60.75%) and at minimum temperature (15.25⁰C) and high humidity (84.33%). *Apis mellifera* were the dominant visitors among all the *Apis* spp. It might be due to the experiment site was nearer to where at *Apis mellifera* colonies were available.

Table.1 Population dynamic of honeybee (No. of bees visit/minute per m²) on toria var RAUTS-17

Date of observation	Honeybees	Mean * population at different hours of the day (h)				Mean	Mean temperature (C)	Mean relative humidity (%)
		0930	1130	1330	1530			
20 Nov 2016	<i>A. mellifera</i>	9.00	15.33	21.33	13.00	14.67	19.90	62.23
	<i>A. C. Indica</i>	4.00	8.33	10.66	7.00	7.50		
	<i>A. dorsata</i>	7.66	10.33	14.33	11.33	10.91		
	<i>A. florea</i>	8.00	13.00	16.33	12.00	12.33		
	Mean	7.17	11.75	15.66	10.83	11.53		
27 Nov. 2016	<i>A. mellifera</i>	9.33	16.66	22.00	14.00	15.50	20.00	60.75
	<i>A. C. indica</i>	5.00	8.66	11.66	7.66	8.25		
	<i>A. dorsata</i>	8.33	11.66	15.00	11.66	11.66		
	<i>A florea</i>	8.34	14.00	17.33	12.66	13.08		
	Mean	7.75	12.75	16.50	11.50	12.12		
3 Dec 2016	<i>A mellifera</i>	7.66	12.00	20.00	11.33	12.75	17.40	76.25
	<i>A C. indica</i>	3.00	7.66	7.66	5.33	5.91		
	<i>A dorsata</i>	6.66	9.00	12.33	9.00	9.25		
	<i>A florea</i>	7.33	11.33	15.66	10.00	10.08		
	Mean	6.16	10.00	13.91	8.92	9.50		
10 Dec 2016	<i>A. mellifera</i>	6.66	10.33	12.33	8.00	9.33	15.25	84.33
	<i>A. C. indica</i>	2.33	6.66	7.00	4.33	5.08		
	<i>A. dorsata</i>	5.00	8.33	9.00	5.33	6.92		
	<i>A. florea</i>	5.66	9.66	9.66	6.00	7.75		
	Mean	4.91	8.74	9.49	5.92	7.27		

*Mean of three replications.

Factors	SE (±)	CD (P=0.05)
A	0.21	0.57
B	0.21	0.57
C	0.21	0.57
AB	0.41	1.13
AC	0.41	1.13
BC	0.41	1.13
ABC	0.82	2.25
CV (%)		13.87

A = Date of observation B= Hours of day; C= Insect visitors

Table.2 Foraging pattern of different honey bees

Date of observation	<i>Apis mellifera</i>			<i>Apis Cerana indica</i>			<i>Apis dorsata</i>			<i>Apis floreae</i>			Mean			Mean temperature (C)	Mean relative humidity (%)
	I	C	P	I	C	P	I	C	P	I	C	P	I	C	P		
23 Nov 16	0931	1622	6.41	0940	1611	6.31	0930	1617	6.47	0947	1602	6.15	0937	1613	6.36	20.90	65.25
30 Nov 16	0930	1618	6.48	0945	1612	6.24	0935	1615	6.40	0955	1608	6.13	0941	1613	6.32	18.66	75.00
7 Dec 16	0941	1610	6.29	0950	1604	6.14	0944	1608	6.24	0939	1550	6.11	0943	1593	6.50	17.50	82.22
15 Dec 16	0944	1607	6.23	0939	1551	6.45	0948	1605	6.12	0935	1545	6.10	0941	1577	6.36	16.10	85.26
Mean	0936	1615	6.35	0943	1594	6.28	0939	1611	6.31	0944	1588	6.12				18.20	76.93

I= Initiation time (h), C= Cessation time (h), P= Foraging period of activity (h)

The population of remaining spp. was low due to prevalence of natural population only. The observation recorded on different hours of the day, indicated that the two clear peak of honeybees activity i.e. 1330 and 1130h. The maximum peak of activities were (16.50 and 15.66) at 1330h on 27 November 20 November 2016, respectively followed by (12.75 and 11.75) during the same period and same date. The lowest activities were recorded at 0930h (4.91 and 6.16) on 10 and 03 December, 2016, respectively and followed by 1530h (5.92 and 9.50). Significant variations (P=0.05) were observed among all the factors studied. Similar results were obtained by Sinha and Atwal, 1996.

Table 2 reveals that the foraging activity of honeybees observed on rai blooms *A. Mellifera* started foraging earlier (0936 h) on all the dates followed by *A dorsata* (0939 h), *A.C. Indica* (0943 h) and late initiation by *A. floreae* (0944 h) while foraging ceased earlier by *A. floreae* (1588 h) followed by *A. C. indica* (1594 h) *A. dorsata* (1611 h) and latter ceased by *A. mellifera* (1615 h), the maximum foraging period was found by *A. mellifera* (6.35 h) followed by *A. dorsata*

(6.31h) and *A.C. indica* (6.28 h), while *A. floreae* had minimum foraging period (6.12 h), Initiation-ceasstion of *Apis* spp depends upon temperature and relative humidity. The correlation coefficient revealed that there was positive correlation between population of *Apis* spp. and temperature but negative correlation with relative humidity.

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