

Diversity of insect pollinators and foraging behaviour of honey bee, *Apis dorsata* on Rapeseed crop

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ABSTRACT

Eleven species of insect pollinators belonging to five families under three orders viz., Hymenoptera, Diptera and Lepidoptera were visited rapeseed flowers under natural condition and their foraging activity was highest during 0900-1100 hrs. *Apis dorsata*, *A. cerana indica*, *A. florea*, *Xylocopa fenestrata*, *Andrena* sp., *Nomia* sp., *Eristalinus arvorum*, *E. taeniops*, *E. punctulatus*, *Erisyrphus balteatus* and *Pieris napi* were recorded. Out of these, six species of pollinators viz., *X. fenestrata*, *Andrena* sp., *Nomia* sp., *E. taeniops*, *E. punctulatus*, and *P. napi* were recorded for the first time pollinating rapeseed flower in ICR farm, AAU, Jorhat and adding the number of pollinators of rapeseed. Among all the species, *A. dorsata* was found to be dominant forager (34.2%). The maximum number of *A. dorsata* / m² / min. was found 6.67 ± 0.33 during 1000-1100 hrs and minimum was 1.33 ± 0.33 during 1600-1700 hrs. The maximum frequency of flower visit was found to be 14.67 ± 0.88 during 1000-1100 hrs and minimum was 2.67 ± 0.33 during 1600-1700 hrs. Likewise, maximum time spent / flower was recorded 3.97 ± 0.10 seconds during 0900-1000 hrs and minimum was 1.47 ± 0.27 seconds during 1500-1600 hrs of the day.

Key words: *Apis dorsata*, *Brassica campestris*, Dominant forager.

Insect pollination is very important as only 5% of flowers are self-pollinated and 95% are crossed pollinated. Among them, 85% of pollination is brought about by insects and also enhanced crop productivity. It has been established that almost all the agricultural crops depend upon pollinating insects for commercial seed/fruit production. The yield of rapeseed and mustard can be doubled through effective pollination by insects. Rapeseed being a cross pollinated crop attracts a large number of insect pollinators during flowering stage and is grown mainly in the *rabi* season after harvesting of paddy in Assam. To study the diversity of pollinators visiting the rapeseed under open condition, field observations were made in the rapeseed field at Instructional cum Research Farm (ICR), A.A.U., Jorhat, during 2013-2014.

Materials and Methods

Visual observations were made during the day from 0800 to 1700 hrs to record and identify flower visitors of rapeseed. Net sweeping was done for collection of pollinators by using insect collecting net during morning and evening hrs and the captured insects were transferred to killing jar having chloroform for killing. Pinning was done after the insects were killed for identification. The collected insects were identified using keys available and standard manuals and was confirmed from the University of Agricultural Sciences, Dharwad. *Apis dorsata* as a main forager in rapeseed, observations on number of *A. dorsata*, number of flower visits and time spent / flower on randomly selected 10 plants were also recorded from 0800 to 1700 hrs during peak blooming period. The observations on

number of *A. dorsata* / m² / min., frequency of flower visit and time spent / flower were recorded. Ten observations at two days interval were made and means were calculated out.

Results and Discussion

Eleven species of insect pollinators belonging to five families under three orders viz., Hymenoptera, Diptera and Lepidoptera were visited rapeseed flowers under natural condition. *Apis dorsata*, *A. cerana indica*, *A. florea*, *Xylocopa fenestrata*, *Andrena* sp., *Nomia* sp., *Eristalinus arvorum*, *E. taeniops*, *E. punctulatus*, *Erisyrphus balteatus* and *Pieris napi* were recorded (Table 1). Out of these, six species of pollinators viz., *X. fenestrata*, *Andrena* sp., *Nomia* sp., *E. taeniops*, *E. punctulatus*, and *P. napi* were recorded for the first time pollinating rapeseed flower at ICR farm, AAU, Jorhat and adding the number of pollinators of rapeseed. Among all the species, *A. dorsata* and *A. cerana indica* was found to be dominant forager with abundance of 34.2 and 27.4%, respectively (Table 1). The peak activity of the pollinators was during 0900 hrs to 1100 hrs.

The data reveals that the highest number of *Apis dorsata* / m² / min. was observed (6.67 ± 0.33) during 1000-1100 hrs followed by 6.33 ± 0.33 during 0900-1000 hrs and lowest was observed at 1600-1700 hrs having 1.33 ± 0.33 (Table 2). The highest frequency of flower visit / min. was 14.67 ± 0.88 at 1000-1100 hrs of the day and the lowest at 1600-1700 hrs having 2.67 ± 0.33 visits / min. The maximum time spent / flower was 3.97 ± 0.10 seconds during 0900-1000 hrs and minimum time spent was 1.47 ± 0.27 seconds during 1500-1600 hrs of the day. Similar result was obtained by Sachdeva *et al.* (2003) who reported that *Apis cerana*, *A. dorsata*, *A. mellifera* visited 6-15, 7-11 and 5-8 flowers/min. on sesasum flowers. Honey bee foraging behaviour was mainly governed by the food (flowers), abiotic factors and their habit to visit times taken to collect nectars (Navatha *et al.* 2014). The average time spent by three visitors was also in the same order as observed by Pandey and Tripathi (2003). The frequency of flower visit / min. was found to be maximum between 1000-1100 hrs

Table 1. Diversity of insect pollinators on rapeseed crop.

Common name	Scientific name	Order	Family	Peak period of visit (hrs)	Abundance (%)
Giant honey bee	<i>Apis dorsata</i>	Hymenoptera	Apidae	0900-1100	34.24
Indian honey bee	<i>Apis cerana indica</i>	Hymenoptera	Apidae	0900-1100	27.40
Red dwarf honey bee	<i>Apis florea</i>	Hymenoptera	Apidae	0900-1100	13.70
Carpenter bee	<i>Xylocopa fenestrata</i>	Hymenoptera	Apidae	1000-1100	2.74
Mining bee	<i>Andrena</i> sp.	Hymenoptera	Andrenidae	0900-1100	6.85
Sweat bee	<i>Nomia</i> sp.	Hymenoptera	Halictidae	1000-1100	1.37
Hover fly	<i>Eristalinus arvorum</i>	Diptera	Syrphidae	0900-1100	4.11
Hover fly	<i>Eristalinus taeniops</i>	Diptera	Syrphidae	0900-1100	2.74
Hover fly	<i>Eristalinus punctulatus</i>	Diptera	Syrphidae	0900-1100	1.37
Hover fly	<i>Erisyrphus balteatus</i>	Diptera	Syrphidae	0900-1100	4.11
Green veined white butterfly	<i>Pieris napi</i>	Lepidoptera	Pieridae	0800-0900	1.37

Table 2. Foraging behavior of *A. dorsata* on rapeseed during different period of a day.

Time of observations (in hrs)	No. of <i>A. dorsata</i> / m ² /min.*	Frequency of flower visit/min	Time spent / flower (sec.)
0800-0900	5.33 ± 0.33	11.67 ± 0.88	2.95 ± 0.10
0900-1000	6.33 ± 0.33	10.33 ± 0.88	3.97 ± 0.10
1000-1100	6.67 ± 0.33	14.67 ± 0.88	3.64 ± 0.25
1100-1200	4.33 ± 0.33	10.00 ± 0.58	3.06 ± 0.59
1200-1300	4.33 ± 0.33	12.67 ± 0.33	3.11 ± 0.62
1300-1400	3.67 ± 0.33	11.00 ± 1.15	2.29 ± 0.32
1400-1500	3.33 ± 0.33	9.33 ± 0.88	2.62 ± 0.35
1500-1600	2.33 ± 0.88	6.00 ± 0.33	1.47 ± 0.27
1600-1700	1.33 ± 0.33	2.67 ± 0.33	2.04 ± 0.63
S.E.m±	0.45	0.81	0.43
CD (P=0.05)	1.36	2.44	1.30

*Mean of 10 observations.

and minimum was at 1300-1400 hrs of the day. In pigeon pea, the maximum number of *A. cerana* / m² / min. was found to be 11.28 and maximum frequency of flower visit was found to be 22.37 during 1000-1100 hrs as observed by Rajkhowa and Deka (2013). However, maximum time spent / flower was found to be 3.97 seconds during 0900-1000 hrs of the day (Table 2). Sachdeva *et al.* (2003) also recorded that the flies were active early in the morning and remained in the field for the whole day on sesamum heads. They were most abundant and active towards the end of flowering season when heads started drying. In this case of

study, maximum frequency of flower visit was noticed during 1000-1100 hrs. Bodia *et al.* (2009) reported that in addition to quantity of honey, the insect pollination in general also brought about good crop growth. Singh and Singh (2004) reported similar foraging behaviour of *Apis* spp. on sesamum flowers thus, enhanced the plant growth and higher yield.

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