Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(5): 865-872

Received: 19-07-2018
Accepted: 20-08-2018

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Foraging activity of pollinators in guava under organic and conventional farming systems

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Abstract
The activity of bees *viz.*, *Apis dorsata*, *Apis florea*, *Apis cerana*, *Tetragonula iridipennis* and other hymenopteran pollinators was noticed foraging in guava under both the ecosystems. The rock bee activity under organic guava ecosystem attained its peak during VIII week after 10 per cent flowering and was on par with VII, IX and X weeks whereas, during IX and X weeks under conventional farming system. The significantly highest activity of little bees under organic ecosystem was recorded during VIII and IX weeks whereas, during X week under conventional ecosystem. The maximum activity of *A. cerana* in guava was observed during VII, VIII and IX weeks under organic ecosystem whereas, during X week under conventional farming system. The maximum activity of all the pollinators was recorded at 1000 hr except for *T. iridipennis*, which were most active at 1200 hr. In general, the foraging activity of pollinators in guava was higher in organic ecosystem as compared to conventional ecosystem.

Keywords: Foraging activity, pollinators, guava, organic, conventional ecosystem

1. Introduction
Guava (*Psidium guajava* L.) belonging to family Myrtaceae is well known as the "apple of tropics" and is one of the most popular grown in tropical and sub-tropical regions of India. It is grown in India over an area of 262 thousand ha with a production of 3648 thousand MT [1]. Inspite of being capable of self-pollination, cross-pollination by insects is favoured in guava as it results in higher yield [2]. In guava, self-pollination is conspicuous however, the distribution of cross-pollination by insects is about 35.00 per cent [3]. Cross-pollination was considered by some authors to be the most frequent form of pollination in guava [4, 5]. This statement is reinforced by the fact that the morphology of guava flowers indicates a tendency towards melitofilia as they have white flowers which emit sweet odour during the day, flowers without depth and anthers with a lot of pollen [6]. The chief pollinator of guava is honey bee which contributes to cross-pollination ranging from 25.70 to 41.30 per cent [7]. The presence of floral visitors to promote cross-pollination has favoured increase in fruit production in guava [8]. In this context, the role of insect pollinators especially bees in guava production has to be realised and enhanced to attain better yield of fruits.
In the present scenario, there has been a paradigm shift from conventional agricultural methods to organic agriculture. Demand for organic foods has grown dramatically over the last decade. The awareness among humans regarding the health and environmental issues resulting from chemical intensive conventional agricultural practices has increased the dependency on organic farming and further organically produced foods. However, the influence of organic and conventional practices on the pollinator fauna and their foraging activity in different crops needs to be analysed. Though several studies related to pollination and related aspects have been carried out in guava, no attempt has been made to study neither the effect of organic and conventional farming on bee pollination nor the effect of different indigenous bee attractants under Indian conditions. In preview of this context, present investigation was undertaken.

2. Materials and methods
The present investigation was carried out in established guava orchard at Bio-farm, Institute of Organic Farming (IOF) and Saidapur farm at Main Agricultural Research Station (MARS), University of Agricultural Sciences (UAS), Dharwad, Karnataka for organic and conventional farming systems, respectively. The field experiments were undertaken for two consecutive flowering seasons during rainy (May-June) and winter (October-November) seasons, 2017 on guava trees of similar age (10 years old). The variety used for the study was Lucknow-49 with

a spacing of 6 × 6 m. All the crop husbandry practices remained uniform throughout the study in both the seasons and were followed as per the standard package of practices developed by UAS, Dharwad for both organic and conventional farming systems.

The observations on foraging activity of hymenopteran pollinators on guava were initiated during 10.00 per cent flowering under both the farming systems. The foraging activity of different pollinators visiting guava flowers for five minutes at 0800, 1000, 1200, 1400 and 1600 hr were recorded from five randomly selected inflorescences from five trees. Such observations were recorded at weekly intervals till the completion of flowering. The data on foraging activity of different bee pollinators was averaged species wise accordingly at different time intervals. The data was further undergone square root transformation and then subjected to factorial analysis.

3. Results and Discussion

3.1 Foraging activity of *A. dorsata* in guava

The data on foraging activity of *A. dorsata* on guava at different weeks after 10 per cent flowering and different times of day under organic and conventional ecosystems during May-June and October-November flowering are presented in Table 1. The foraging activity of rock bees under organic ecosystem gradually increased from the first week of flowering (0.34 bees/flower/5 min) and attained its peak of 3.16 bees/flower/5 min during VIII week which was on par with VII, IX and X weeks (2.53, 3.14 and 2.65 bees/flower/5 min, respectively). However, under conventional ecosystem, IX and X weeks were on par with each other in recording highest activity of 1.99 and 2.38 bees/flower/5 min, respectively) which showed a declining trend later on. The highest rock bee activity under organic ecosystem was observed at 1000 hr (2.85 bees/flower/5 min) followed by 1200 hr (2.11 bees/flower/5 min). However, under conventional ecosystem, the peak activity of rock bees was observed at 1000 hr (1.58 bees/flower/5 min) which was on par with 0800 and 1200 hr (1.06 and 1.31 bees/flower/5 min, respectively). The interaction effect between different weeks of flowering and times of day in organic ecosystem showed significant difference with maximum rock bee activity noticed during VII, VIII, IX and X weeks (4.02, 4.80, 4.64 and 4.06 bees/flower/5 min, respectively) at 1000 hr whereas, it was observed during IX and X weeks (3.24 and 3.60 bees/flower/5 min, respectively) which were on par with each other at 1000 hr under conventional farming system.

Similar findings were reported that the visitation rate of rock bees was more in the beginning of guava flowering season which gradually declined with the advancement of season [9]. The maximum mean foraging activity of *A. dorsata* (2.07 bees/5 flowers/5 min) was observed in guava compared to other bees with the commencement of activity from 0600 hr which attained its peak at 0900 hr (8.00 bees/5 flowers/5 min) and there after declined gradually [10]. The peak activity of rock bees at 1000 hr can be attributed to the fact that optimum anthesis and anther dehiscence in guava takes place from 0530 to 0930 hr in the morning and reduces steadily from 1030 hr onwards [11]. The higher activity of these bees in the morning might also be due to the behaviour of honey bees which exhibit rhythmic activity of higher foraging during morning and lesser later on till evening.

3.2 Foraging activity of *A. florea* in guava

The foraging activity of *A. florea* in guava exhibited significant variations among different weeks of flowering and different time intervals under both the ecosystems. A gradual increase in the activity was observed along the flowering weeks which attained a peak activity of 3.27 and 3.24 bees/flower/5 min on an average during VIII and IX weeks, respectively under organic ecosystem which were on par with each other. The best foraging time was observed as 1000 hr with 3.27 bees/flower/5 min followed by 1200 hr (1.92 bees/flower/5 min). Under conventional ecosystem, the highest activity of 3.29 bees/flower/5 min was recorded at X week and 1000 hr was observed as the best foraging time (2.36 bees/flower/5 min) which was on par with 1200 hr (1.96 bees/flower/5 min). The interaction studies under organic ecosystem revealed highest activity of 5.80 and 5.82 bees/flower/5 min during VIII and IX weeks, respectively which were statistically on par at 1000 hr. However, under conventional ecosystem, the maximum little bee activity being observed during X week (5.40 bees/flower/5 min) at 1000 hr (Table 2).

The results derived from the present study are supported by findings that *A. florea* was second abundant pollinators of guava with a total of 7.64 bees/5 flowers/5 min under Dharwad conditions [12]. *A. florea* bees foraged on guava flowers from 0600 to 1100 hr which declined thereafter [13]. The initiation of little bee activity in guava occurred at 0521 hr and ceased at 1054 hr [14]. It was obvious from the results obtained that in general, the peak activity of little bee in guava was observed during weeks of peak flowering. The maximum foraging activity was observed at 1000 hr under organic farming system whereas both at 1000 and 1200 hr in conventional ecosystem which declined thereafter with the advance of time. This difference might be probably due to differential response of cultivars with respect to period of anthesis at different locations under varying agricultural practices.

Table 1: Average foraging activity of *Apis dorsata* in organic v/s conventional guava farming system during first and second flowering seasons - 2017 (May-June to October-November) (Pooled)

Flowering weeks*	Average number of *A. dorsata* visited/ flower/5 min at different hours of the day (hr)											
	Organic farming system					Mean	Conventional farming system					Mean
	0800 hr	1000 hr	1200 hr	1400 hr	1600 hr		0800 hr	1000 hr	1200 hr	1400 hr	1600 hr	
Week I (20-04-2017)	0.16 (0.81)	1.02 (1.23)	0.38 (0.94)	0.12 (0.79)	0.00 (0.71)	0.34 (0.89)^{h}	0.10 (0.77)	0.40 (0.94)	0.20 (0.83)	0.00 (0.71)	0.00 (0.71)	0.14 (0.79)^{g}
Week II (27-04-2017)	0.34 (0.91)	1.52 (1.42)	0.92 (1.19)	0.22 (0.85)	0.10 (0.77)	0.62 (1.03)^{gh}	0.24 (0.86)	0.64 (1.07)	0.42 (0.96)	0.18 (0.82)	0.00 (0.71)	0.30 (0.88)^{g}
Week III (04-05-2017)	0.94 (1.19)	2.12 (1.61)	1.40 (1.38)	0.56 (1.03)	0.40 (0.95)	1.08 (1.23)^{ef}	0.42 (0.95)	0.80 (1.13)	0.60 (1.05)	0.30 (0.89)	0.00 (0.71)	0.42 (0.95)^{fg}
Week IV (11-05-2017)	1.28 (1.32)	2.84 (1.82)	2.16 (1.63)	0.98 (1.22)	0.52 (1.00)	1.56 (1.40)^{de}	0.50 (0.99)	1.06 (1.25)	0.80 (1.14)	0.44 (0.97)	0.00 (0.71)	0.56 (1.01)^{efg}

Week V (18-05-2017)	1.72 (1.47)	3.14 (1.90)	2.66 (1.77)	1.26 (1.32)	0.62 (1.03)	1.88 (1.50)^{cd}	0.90 (1.18)	1.54 (1.43)	1.24 (1.32)	0.50 (1.00)	0.06 (0.75)	0.85 (1.13)^{def}
Week VI (25-05-2017)	2.08 (1.60)	3.50 (2.00)	3.02 (1.87)	1.58 (1.44)	0.92 (1.17)	2.22 (1.62)^{bc}	1.18 (1.30)	1.56 (1.44)	1.44 (1.39)	0.76 (1.12)	0.16 (0.81)	1.02 (1.21)^{cde}
Week VII (01-06-2017)	2.44 (1.71)	4.02 (2.13)	3.32 (1.95)	1.86 (1.54)	1.02 (1.21)	2.53 (1.71)^{ab}	1.78 (1.51)	2.04 (1.59)	1.66 (1.47)	0.86 (1.16)	0.28 (0.87)	1.32 (1.32)^{cd}
Week VIII (08-06-2017)	2.70 (1.78)	4.80 (2.30)	4.22 (2.17)	2.42 (1.71)	1.64 (1.46)	3.16 (1.89)^{a}	2.00 (1.58)	2.60 (1.76)	2.06 (1.60)	1.06 (1.25)	0.40 (0.94)	1.62 (1.43)^{bc}
Week IX (15-06-2017)	2.94 (1.85)	4.64 (2.27)	3.84 (2.08)	2.46 (1.72)	1.84 (1.53)	3.14 (1.89)^{a}	2.10 (1.61)	3.24 (1.93)	2.70 (1.79)	1.38 (1.37)	0.54 (1.00)	1.99 (1.54)^{ab}
Week X (22-06-2017)	2.62 (1.76)	4.06 (2.13)	3.34 (1.96)	2.06 (1.60)	1.16 (1.26)	2.65 (1.74)^{ab}	2.70 (1.79)	3.60 (2.02)	3.06 (1.88)	1.60 (1.44)	0.92 (1.19)	2.38 (1.66)^{a}
Week XI (29-06-2017)	1.52 (1.40)	3.38 (1.96)	2.26 (1.66)	0.90 (1.18)	0.50 (0.99)	1.71 (1.44)^{cd}	1.36 (1.35)	2.06 (1.54)	1.96 (1.57)	1.08 (1.25)	0.28 (0.88)	1.35 (1.32)^{cd}
Week XII (06-07-2017)	0.74 (1.10)	2.32 (1.67)	1.48 (1.39)	0.42 (0.96)	0.12 (0.78)	1.02 (1.18)^{fg}	0.90 (1.17)	1.36 (1.33)	1.14 (1.27)	0.50 (0.99)	0.24 (0.85)	0.83 (1.12)^{def}
Week XIII (13-07-2017)	0.34 (0.91)	1.78 (1.49)	0.50 (1.00)	0.06 (0.75)	0.00 (0.71)	0.54 (0.97)^{hi}	0.48 (0.99)	0.84 (1.13)	0.70 (1.09)	0.00 (0.71)	0.00 (0.71)	0.40 (0.93)^{fg}
Week XIV (20-07-2017)	0.00 (0.71)	1.00 (1.22)	0.52 (1.01)	0.00 (0.71)	0.00 (0.71)	0.15 (0.79)^{i}	0.24 (0.85)	0.34 (0.90)	0.36 (0.92)	0.00 (0.71)	0.00 (0.71)	0.19 (0.82)^{g}
Mean	1.42 (1.32)^{c}	2.85 (1.79)^{a}	2.11 (1.55)^{b}	1.06 (1.20)^{c}	0.63 (1.02)^{d}		1.06 (1.21)^{ab}	1.58 (1.39)^{a}	1.31 (1.30)^{a}	0.62 (1.03)^{b}	0.21 (0.82)^{c}	
	S. Em. ±			C.D. (0.05)			S. Em. ±			C.D. (0.05)		
T (Timing)	0.01			0.04			0.01			0.04		
W (Weeks)	0.02			0.07			0.02			0.07		
T x W (Interaction)	0.06			0.17			0.05			0.15		

*Weeks after 10% flowering, Figures in the parentheses are $\sqrt{(X + 0.5)}$ transformed values, Means followed by same letter in a column do not differ significantly by DMRT (P= 0.05)

3.3 Foraging activity of *A. cerana* in guava

The pooled data on foraging activity of *A. cerana* on organic and conventional guava ecosystems revealed that VII, VIII and IX weeks with 3.00, 3.39 and 3.20 bees/flower/5 min, respectively were statistically on par in recording significantly highest activity on an average which further declined gradually under organic ecosystem. However, the peak activity of 3.02 bees/flower/5 min was recorded during X week and the least activity at I and XIV weeks (0.22 and 0.16 bees/flower/5 min, respectively) under conventional ecosystem. Irrespective of the ecosystems, the best foraging time of Indian bees on guava was noted as 1000 hr (3.40 and 2.48 bees/flower/5 min, respectively in organic and conventional ecosystems) followed by 1200 hr (2.26 and 1.86 bees/flower/5 min, respectively in organic and conventional ecosystems). Further, the interaction between different weeks of flowering and different time intervals in day showed significant difference under organic farming system with maximum activity recorded at 1000 hr during VIII and IX weeks (5.68 and 5.64 bees/flower/5 min, respectively) which were on par with each other. In contrast to this, maximum Indian bee activity under conventional ecosystem was recorded during IX and X weeks (3.98 and 4.42 bees/flower/5 min, respectively) which were statistically on par with each other at 1000 hr (Table 3). The present results are in line with [9] who reported an increased activity of Indian bees at the beginning of flowering season in guava which declined further with the advance in the flowering season. The maximum activity of Indian bees with an average of 8.70 ± 1.05 was recorded during 0900 to 1000 hr and the lowest (1.90 ± 0.35) at 1300 to 1400 hr [15]. The two peak visitation times of pollinators in guava are 0700 and 1000 hr [16].

3.4 Foraging activity of *T. iridipennis* in guava

The pooled data indicated significant variations in the dammer bee activity during different weeks of flowering and at different times of day. Under organic ecosystem, the activity increased gradually along flowering period and recorded the highest activity of 2.04 bees/flower/5 min on an average during VIII week and was on par with VII and IX weeks with 1.78 and 1.86 bees/flower/5 min, respectively. The most active foraging was noticed at 1200 hr (1.97 bees/flower/5 min) followed by 1000 hr (1.36 bees/flower/5 min). However, under conventional ecosystem, the dammer bees were found significantly more active during X week of flowering. The best foraging time was recorded as 1200 and 1000 hr (1.08 and 0.69 bees/flower/5 min, respectively). Further, the interaction effect between the different weeks of flowering and times of day exhibited significant variations under organic ecosystem with maximum activity of 2.96, 3.38 and 3.34 bees/flower/5 min during VII, VIII and IX weeks, respectively which were statistically on par with each other at 1200 hr. In contrast to this, the maximum dammer bee activity under conventional ecosystem was recorded during X week (2.16 bees/flower/5 min) at 1200 hr (Table 4).

The present study is however, in contrast to that of [12] who reported the maximum activity of *T. iridipennis* in guava flowers at 1000 hr (2.33 bees/5 flowers/5 min). The best foraging time of dammer bees in guava is around 0600 to 1100 hr [17]. The foraging activity was noted maximum at around 1000 and 1200 hr under both ecosystems. This might be due to the weather characteristics that play an important role in determining the frequency of insect visits where as high visitation rate is associated with warm condition and high light level.

Table 2: Average foraging activity of *Apis florea* in organic v/s conventional guava farming system during first and second flowering seasons - 2017 (May-June to October-November) (Pooled)

Flowering weeks*	Average number of *A. florea* visited/flower/5 min at different hours of the day (hr)											
	Organic farming system					**Mean**	**Conventional farming system**					**Mean**
	0800 hr	**1000 hr**	**1200 hr**	**1400 hr**	**1600 hr**		**0800 hr**	**1000 hr**	**1200 hr**	**1400 hr**	**1600 hr**	
Week I (20-04-2017 & 26-09-2017)	0.28 (0.88)	0.52 (1.01)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.16 (0.80)^{h}	0.22 (0.84)	0.90 (1.18)	0.40 (0.95)	0.00 (0.71)	0.00 (0.71)	0.30 (0.88)^{gh}
Week II (27-04-2017 & 03-10-2017)	0.46 (0.98)	1.28 (1.33)	0.44 (0.97)	0.00 (0.71)	0.00 (0.71)	0.44 (0.94)^{g}	0.40 (0.93)	1.24 (1.32)	0.92 (1.19)	0.30 (0.89)	0.00 (0.71)	0.57 (1.01)^{fg}
Week III (04-05-2017 & 10-10-2017)	0.74 (1.11)	1.68 (1.47)	0.90 (1.18)	0.56 (1.02)	0.00 (0.71)	0.78 (1.10)^{f}	0.52 (1.01)	1.50 (1.41)	1.28 (1.33)	0.70 (1.08)	0.00 (0.71)	0.80 (1.11)^{ef}
Week IV (11-05-2017 & 17-10-2017)	0.92 (1.19)	2.56 (1.74)	1.34 (1.35)	0.84 (1.15)	0.28 (0.88)	1.19 (1.26)^{e}	0.90 (1.18)	1.92 (1.55)	1.76 (1.50)	0.90 (1.18)	0.26 (0.87)	1.15 (1.25)^{de}
Week V (18-05-2017 & 24-10-2017)	1.30 (1.34)	3.52 (2.00)	2.12 (1.62)	1.14 (1.27)	0.56 (1.03)	1.73 (1.45)^{d}	1.02 (1.23)	2.34 (1.68)	2.18 (1.63)	1.28 (1.33)	0.56 (1.01)	1.48 (1.38)^{cd}
Week VI (25-05-2017 & 31-10-2017)	1.50 (1.40)	4.38 (2.21)	3.00 (1.87)	1.52 (1.41)	0.82 (1.14)	2.24 (1.61)^{bc}	1.44 (1.37)	2.76 (1.80)	2.64 (1.77)	1.14 (1.28)	0.70 (1.08)	1.74 (1.46)^{c}
Week VII (01-06-2017 & 07-11-2017)	1.86 (1.53)	4.98 (2.34)	3.32 (1.95)	1.76 (1.50)	1.22 (1.31)	2.63 (1.73)^{b}	1.78 (1.50)	3.58 (2.02)	3.10 (1.90)	1.64 (1.46)	1.04 (1.23)	2.23 (1.62)^{b}
Week VIII (08-06-2017 & 14-11-2017)	2.54 (1.74)	5.80 (2.51)	4.10 (2.14)	2.22 (1.65)	1.68 (1.47)	3.27 (1.90)^{a}	1.90 (1.54)	3.90 (2.10)	3.28 (1.94)	1.82 (1.51)	1.14 (1.28)	2.41 (1.67)^{b}
Week IX (15-06-2017 & 21-11-2017)	2.68 (1.78)	5.82 (2.51)	4.02 (2.12)	2.16 (1.63)	1.52 (1.41)	3.24 (1.89)^{a}	2.10 (1.61)	4.22 (2.17)	3.84 (2.08)	2.08 (1.61)	1.34 (1.35)	2.72 (1.76)^{b}
Week X (22-06-2017 & 28-11-2017)	2.18 (1.64)	5.04 (2.35)	3.06 (1.89)	1.66 (1.47)	1.16 (1.29)	2.62 (1.73)^{b}	2.50 (1.73)	5.40 (2.43)	4.44 (2.22)	2.48 (1.72)	1.62 (1.45)	3.29 (1.91)^{a}
Week XI (29-06-2017 & 05-12-2017)	1.66 (1.47)	4.40 (2.21)	2.44 (1.71)	1.28 (1.33)	0.94 (1.2)	2.14 (1.58)^{c}	1.50 (1.41)	2.82 (1.82)	1.62 (1.45)	1.04 (1.24)	0.64 (1.06)	1.52 (1.39)^{cd}
Week XII (06-07-2017 & 12-12-2017)	1.26 (1.32)	3.28 (1.94)	1.60 (1.44)	0.86 (1.17)	0.28 (0.88)	1.46 (1.35)^{de}	0.98 (1.21)	1.54 (1.43)	1.32 (1.35)	0.38 (0.94)	0.24 (0.85)	0.89 (1.15)^{ef}
Week XIII(13-07-2017 & 19-12-2017)	0.74 (1.11)	1.94 (1.56)	0.60 (1.05)	0.30 (0.89)	0.22 (0.85)	0.76 (1.09)^{f}	0.62 (1.06)	0.72 (1.10)	0.62 (1.05)	0.12 (0.79)	0.00 (0.71)	0.42 (0.94)^{g}
Week XIV (20-07-2017 & 26-12-2017)	0.00 (0.71)	0.60 (1.04)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.12 (0.77)^{h}	0.16 (0.81)	0.20 (0.83)	0.10 (0.77)	0.00 (0.71)	0.00 (0.71)	0.09 (0.76)^{h}
Mean	1.29 (1.30)^{c}	3.27 (1.87)^{a}	1.92 (1.48)^{b}	1.02 (1.19)^{c}	0.62 (1.02)^{d}		1.15 (1.24)^{b}	2.36 (1.63)^{a}	1.96 (1.51)^{a}	0.99 (1.17)^{b}	0.54 (0.98)^{c}	
	S. Em. ±			C.D. (0.05)			S. Em. ±			C.D. (0.05)		
T (Timing)	0.01			0.03			0.01			0.03		
W (Weeks)	0.01			0.05			0.02			0.06		
T x W (Interaction)	0.04			0.11			0.05			0.13		

*Weeks after 10% flowering, Figures in the parentheses are $\sqrt{(X + 0.5)}$ transformed values, Means followed by same letter in a column do not differ significantly by DMRT (P= 0.05)

3.5 Foraging activity of other hymenopterans in guava

A significant difference was noticed in foraging activity of other hymenopteran pollinators among different weeks of flowering and different times of the day, irrespective of the ecosystems. The activity increased gradually with advance in flowering period and attained peak during VIII and IX weeks of flowering (2.61 and 2.44 other hymenopterans/flower/5 min, respectively) which were on par with each other whereas, 1000 hr recorded the maximum activity (2.54 other hymenopterans/flower/5 min) followed by 1200 hr (1.75 other hymenopterans/flower/5 min) under organic ecosystem. However, in conventional ecosystem, the peak foraging activity was noticed during X week of flowering (1.72 other hymenopterans/flower/5 min) which was on par with IX week (1.49 other hymenopterans/flower/5 min) and the peak activity being observed at 1000 and 1200 hr (1.63 and 1.31 other hymenopterans/flower/5 min, respectively). Further, the interaction between different weeks of flowering and different time intervals in day showed significant difference under organic ecosystem with VIII week recording the maximum activity of other hymenopterans (4.50 other hymenopterans/flower/5 min) which was on par with IX week (4.14 other hymenopterans/flower/5 min) at 1000 hr. Under conventional ecosystem, the maximum activity was observed during X week (2.92 other hymenopterans/flower/5 min) which was on par with IX week (2.66 other hymenopterans/flower/5 min) at 1000 hr (Table 5).

Table 3: Average foraging activity of *Apis cerana* in organic v/s conventional guava farming system during first and second flowering seasons - 2017 (May-June to October-November) (Pooled)

Flowering weeks*	Average number of *A. cerana* visited/flower/5 min at different hours of the day (hr)											
	Organic farming system					Mean	Conventional farming system					Mean
	0800 hr	1000 hr	1200 hr	1400 hr	1600 hr		0800 hr	1000 hr	1200 hr	1400 hr	1600 hr	
Week I (20-04-2017 & 26-09-2017)	0.50 (1.00)	1.96 (1.57)	0.98 (1.20)	0.36 (0.93)	0.00 (0.71)	0.76 (1.08)^{gh}	0.00 (0.71)	0.64 (1.07)	0.46 (0.97)	0.00 (0.71)	0.00 (0.71)	0.22 (0.83)^{h}
Week II (27-04-2017 & 03-10-2017)	0.68 (1.08)	2.46 (1.72)	1.22 (1.31)	0.60 (1.04)	0.06 (0.75)	1.00 (1.18)^{efg}	0.54 (1.01)	1.32 (1.35)	0.68 (1.09)	0.12 (0.78)	0.00 (0.71)	0.53 (0.99)^{g}
Week III (04-05-2017 & 10-10-2017)	1.04 (1.24)	2.96 (1.86)	1.58 (1.44)	0.66 (1.08)	0.18 (0.82)	1.28 (1.29)^{e}	0.68 (1.08)	1.68 (1.48)	0.94 (1.20)	0.32 (0.90)	0.14 (0.80)	0.75 (1.09)^{fg}
Week IV (11-05-2017 & 17-10-2017)	1.62 (1.46)	3.50 (1.99)	2.16 (1.63)	0.96 (1.20)	0.36 (0.92)	1.72 (1.44)^{d}	1.08 (1.25)	1.96 (1.57)	1.20 (1.30)	0.48 (0.98)	0.32 (0.90)	1.01 (1.20)^{f}
Week V (18-05-2017 & 24-10-2017)	1.96 (1.57)	3.92 (2.10)	2.64 (1.77)	1.60 (1.45)	0.66 (1.07)	2.16 (1.59)^{c}	1.32 (1.34)	2.46 (1.72)	1.50 (1.41)	0.78 (1.13)	0.58 (1.04)	1.33 (1.33)^{e}
Week VI (25-05-2017 & 31-10-2017)	2.32 (1.68)	4.60 (2.26)	3.34 (1.96)	1.84 (1.53)	0.94 (1.20)	2.61 (1.72)^{bc}	1.76 (1.50)	2.84 (1.82)	1.92 (1.55)	0.86 (1.16)	0.70 (1.09)	1.62 (1.43)^{de}
Week VII (01-06-2017 & 07-11-2017)	2.76 (1.80)	4.94 (2.33)	3.94 (2.11)	2.16 (1.63)	1.20 (1.30)	3.00 (1.83)^{ab}	2.15 (1.62)	3.18 (1.92)	2.44 (1.71)	1.14 (1.28)	0.82 (1.15)	1.95 (1.54)^{cd}
Week VIII (08-06-2017 & 14-11-2017)	3.20 (1.92)	5.68 (2.49)	4.28 (2.19)	2.40 (1.70)	1.40 (1.38)	3.39 (1.93)^{a}	2.38 (1.69)	3.70 (2.05)	2.98 (1.86)	1.48 (1.41)	0.96 (1.21)	2.30 (1.64)^{bc}
Week IX (15-06-2017 & 21-11-2017)	2.92 (1.85)	5.64 (2.48)	4.10 (2.14)	2.14 (1.62)	1.22 (1.31)	3.20 (1.88)^{a}	2.64 (1.77)	3.98 (2.12)	3.36 (1.96)	1.74 (1.50)	1.22 (1.30)	2.59 (1.73)^{b}
Week X (22-06-2017 & 28-11-2017)	2.46 (1.71)	4.28 (2.19)	2.96 (1.86)	1.60 (1.45)	0.74 (1.11)	2.41 (1.66)^{c}	3.18 (1.92)	4.42 (2.22)	3.92 (2.10)	2.10 (1.61)	1.48 (1.39)	3.02 (1.85)^{a}
Week XI (29-06-2017 & 05-12-2017)	1.86 (1.54)	3.00 (1.87)	1.86 (1.54)	1.24 (1.31)	0.42 (0.95)	1.68 (1.44)^{d}	1.70 (1.48)	3.76 (2.06)	3.06 (1.89)	1.58 (1.44)	1.00 (1.22)	2.22 (1.62)^{bc}
Week XII (06-07-2017 & 12-12-2017)	1.46 (1.39)	1.96 (1.56)	1.24 (1.32)	0.80 (1.13)	0.24 (0.84)	1.14 (1.25)^{ef}	0.86 (1.17)	2.82 (1.82)	2.16 (1.63)	1.00 (1.22)	0.62 (1.05)	1.49 (1.38)^{e}
Week XIII(13-07-2017 & 19-12-2017)	1.04 (1.24)	1.70 (1.48)	0.92 (1.18)	0.60 (1.04)	0.12 (0.78)	0.88 (1.14)^{fg}	0.54 (1.02)	1.66 (1.47)	1.18 (1.30)	0.34 (0.91)	0.44 (0.96)	0.83 (1.13)^{f}
Week XIV (20-07-2017 & 26-12-2017)	0.60 (1.05)	1.04 (1.23)	0.42 (0.95)	0.42 (0.94)	0.00 (0.71)	0.50 (0.98)^{h}	0.16 (0.81)	0.36 (0.93)	0.26 (0.87)	0.00 (0.71)	0.00 (0.71)	0.16 (0.80)^{h}
Mean	1.74 (1.47)^{c}	3.40 (1.94)^{a}	2.26 (1.61)^{b}	1.24 (1.29)^{d}	0.54 (0.99)^{e}		1.36 (1.31)^{c}	2.48 (1.68)^{a}	1.86 (1.49)^{b}	0.85 (1.12)^{d}	0.59 (1.02)^{d}	
	S. Em. ±			C.D. (0.05)			S. Em. ±			C.D. (0.05)		
T (Timing)	0.01			0.03			0.01			0.03		
W (Weeks)	0.02			0.06			0.01			0.05		
T x W (Interaction)	0.04			0.13			0.04			0.11		

*Weeks after 10% flowering, Figures in the parentheses are $\sqrt{(X + 0.5)}$ transformed values, Means followed by same letter in a column do not differ significantly by DMRT (P= 0.05)

Table 4: Average foraging activity of *Tetragonula iridipennis* in organic v/s conventional guava farming system during first and second flowering seasons - 2017 (May-June to October-November) (Pooled)

Flowering weeks*	Average number of *T. iridipennis* visited/flower/5 min at different hours of the day (hr)											
	Organic farming system					Mean	Conventional farming system					Mean
	0800 hr	1000 hr	1200 hr	1400 hr	1600 hr		0800 hr	1000 hr	1200 hr	1400 hr	1600 hr	
Week I (20-04-2017 & 26-09-2017)	0.42 (0.96)	0.52 (1.01)	0.74 (1.11)	0.00 (0.71)	0.00 (0.71)	0.34 (0.90)^{ijk}	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)^{h}
Week II (27-04-2017 & 03-10-2017)	0.50 (1.00)	0.94 (1.20)	1.06 (1.25)	0.00 (0.71)	0.00 (0.71)	0.50 (0.97)^{hij}	0.00 (0.71)	0.28 (0.88)	0.20 (0.83)	0.00 (0.71)	0.00 (0.71)	0.10 (0.77)^{gh}
Week III (04-05-2017 & 10-10-2017)	0.58 (1.04)	1.20 (1.30)	1.34 (1.35)	0.26 (0.87)	0.14 (0.80)	0.70 (1.07)^{gh}	0.06 (0.75)	0.41 (0.94)	0.38 (0.93)	0.00 (0.71)	0.00 (0.71)	0.17 (0.81)^{fgh}
Week IV (11-05-2017 & 17-10-2017)	0.84 (1.16)	1.34 (1.35)	1.70 (1.48)	0.46 (0.98)	0.16 (0.81)	0.90 (1.16)^{fg}	0.16 (0.81)	0.58 (1.04)	0.48 (0.98)	0.00 (0.71)	0.00 (0.71)	0.24 (0.85)^{fg}
Week V (18-05-2017 & 24-10-2017)	1.10 (1.26)	1.66 (1.46)	2.36 (1.69)	0.62 (1.06)	0.36 (0.92)	1.22 (1.28)^{de}	0.20 (0.83)	0.84 (1.15)	0.70 (1.10)	0.08 (0.76)	0.00 (0.71)	0.36 (0.91)^{ef}
Week VI (25-05-2017 & 31-10-2017)	1.40 (1.37)	2.06 (1.60)	2.60 (1.76)	0.96 (1.21)	0.54 (1.01)	1.51 (1.39)^{bc}	0.36 (0.93)	1.02 (1.23)	0.94 (1.19)	0.18 (0.82)	0.00 (0.71)	0.50 (0.97)^{de}
Week VII (01-06-2017 & 07-11-2017)	1.80 (1.51)	2.30 (1.67)	2.96 (1.86)	1.20 (1.30)	0.64 (1.06)	1.78 (1.48)^{ab}	0.58 (1.04)	1.14 (1.28)	1.08 (1.26)	0.28 (0.88)	0.00 (0.71)	0.62 (1.03)^{cd}
Week VIII (08-06-2017 & 14-11-2017)	2.18 (1.63)	2.60 (1.76)	3.38 (1.97)	1.34 (1.35)	0.72 (1.1)	2.04 (1.56)^{a}	0.68 (1.08)	1.38 (1.37)	1.32 (1.34)	0.42 (0.95)	0.06 (0.75)	0.77 (1.10)^{bc}
Week IX (15-06-2017 & 21-11-2017)	1.76 (1.50)	2.28 (1.67)	3.34 (1.96)	1.28 (1.33)	0.66 (1.08)	1.86 (1.51)^{a}	0.94 (1.20)	1.54 (1.43)	1.66 (1.47)	0.52 (1.00)	0.00 (0.71)	0.93 (1.16)^{b}
Week X (22-06-	1.20	1.62	2.48	0.98	0.48	1.35	1.18	1.84	2.16	0.74	0.14	1.21

2017 & 28-11-2017)	(1.30)	(1.45)	(1.73)	(1.21)	(0.99)	(1.34)^{cd}	(1.29)	(1.53)	(1.63)	(1.11)	(0.79)	(1.27)^{a}
Week XI (29-06-2017 & 05-12-2017)	0.84 (1.15)	1.06 (1.25)	1.88 (1.54)	0.68 (1.08)	0.32 (0.90)	0.96 (1.19)^{ef}	0.70 (1.09)	1.32 (1.35)	1.28 (1.33)	0.46 (0.97)	0.08 (0.76)	0.77 (1.10)^{bc}
Week XII (06-07-2017 & 12-12-2017)	0.60 (1.04)	0.68 (1.08)	1.64 (1.46)	0.34 (0.91)	0.10 (0.77)	0.67 (1.05)^{hi}	0.38 (0.94)	1.00 (1.22)	1.02 (1.23)	0.28 (0.88)	0.00 (0.71)	0.54 (1.00)^{cde}
Week XIII(13-07-2017 & 19-12-2017)	0.30 (0.89)	0.50 (1.00)	1.30 (1.34)	0.16 (0.81)	0.00 (0.71)	0.45 (0.95)^{ijk}	0.20 (0.83)	0.78 (1.13)	0.62 (1.06)	0.16 (0.81)	0.00 (0.71)	0.35 (0.91)^{ef}
Week XIV (20-07-2017 & 26-12-2017)	0.18 (0.82)	0.32 (0.90)	0.80 (1.13)	0.00 (0.71)	0.00 (0.71)	0.26 (0.85)^{k}	0.12 (0.78)	0.5 (1.00)	0.38 (0.94)	0.12 (0.78)	0.00 (0.71)	0.22 (0.84)^{fg}
Mean	0.98 (1.19)^{c}	1.36 (1.34)^{b}	1.97 (1.54)^{a}	0.59 (1.02)^{d}	0.29 (0.88)^{e}		0.40 (0.93)^{b}	0.69 (1.07)^{a}	1.08 (1.23)^{a}	0.23 (0.84)^{b}	0.02 (0.72)^{c}	
	S. Em. ±			C.D. (0.05)			S. Em. ±			C.D. (0.05)		
T (Timing)	0.01			0.02			0.01			0.02		
W (Weeks)	0.01			0.04			0.01			0.04		
T x W (Interaction)	0.03			0.10			0.03			0.09		

*Weeks after 10% flowering, Figures in the parentheses are $\sqrt{(X + 0.5)}$ transformed values, Means followed by same letter in a column do not differ significantly by DMRT (P= 0.05)

Table 5: Average foraging activity of other hymenopterans in organic v/s conventional guava farming system during first and second flowering seasons - 2017 (May-June to October-November) (Pooled)

Flowering weeks*	**Average number of other hymenopterans visited/flower/5 min at different hours of the day (hr)**											
	Organic farming system					**Mean**	**Conventional farming system**					**Mean**
	0800 hr	**1000 hr**	**1200 hr**	**1400 hr**	**1600 hr**		**0800 hr**	**1000 hr**	**1200 hr**	**1400 hr**	**1600 hr**	
Week I (20-04-2017 & 26-09-2017)	0.48 (0.99)	1.30 (1.34)	0.64 (1.07)	0.00 (0.71)	0.00 (0.71)	0.48 (0.96)^{h}	0.00 (0.71)	0.72 (1.10)	0.52 (1.00)	0.00 (0.71)	0.00 (0.71)	0.25 (0.85)^{hi}
Week II (27-04-2017 & 03-10-2017)	0.80 (1.14)	1.42 (1.38)	1.22 (1.31)	0.10 (0.77)	0.06 (0.75)	0.72 (1.07)^{g}	0.00 (0.71)	1.02 (1.22)	0.68 (1.08)	0.00 (0.71)	0.00 (0.71)	0.34 (0.88)^{ghi}
Week III (04-05-2017 & 10-10-2017)	1.02 (1.23)	1.94 (1.56)	1.38 (1.37)	0.36 (0.92)	0.18 (0.82)	0.98 (1.18)^{f}	0.10 (0.77)	1.28 (1.33)	0.92 (1.19)	0.00 (0.71)	0.00 (0.71)	0.46 (0.94)^{gh}
Week IV (11-05-2017 & 17-10-2017)	1.28 (1.33)	2.40 (1.70)	1.58 (1.44)	0.60 (1.05)	0.34 (0.92)	1.24 (1.29)^{e}	0.26 (0.86)	1.54 (1.43)	1.04 (1.23)	0.12 (0.78)	0.00 (0.71)	0.59 (1.00)^{fg}
Week V (18-05-2017 & 24-10-2017)	1.58 (1.44)	3.10 (1.90)	1.80 (1.52)	0.96 (1.21)	0.50 (0.99)	1.59 (1.41)^{cd}	0.44 (0.96)	1.64 (1.46)	1.28 (1.33)	0.22 (0.85)	0.00 (0.71)	0.72 (1.06)^{ef}
Week VI (25-05-2017 & 31-10-2017)	1.90 (1.55)	3.52 (2.00)	2.06 (1.60)	1.12 (1.27)	0.52 (1.01)	1.82 (1.49)^{c}	0.63 (1.06)	1.76 (1.50)	1.44 (1.39)	0.36 (0.93)	0.12 (0.78)	0.86 (1.13)^{de}
Week VII (01-06-2017 & 07-11-2017)	2.22 (1.65)	3.98 (2.12)	2.64 (1.77)	1.50 (1.41)	0.66 (1.08)	2.20 (1.60)^{b}	0.8 (1.14)	2.02 (1.58)	1.52 (1.42)	0.48 (0.99)	0.18 (0.82)	1.00 (1.19)^{cd}
Week VIII (08-06-2017 & 14-11-2017)	2.46 (1.72)	4.50 (2.23)	3.16 (1.91)	1.82 (1.52)	1.10 (1.26)	2.61 (1.73)^{a}	1.02 (1.23)	2.28 (1.67)	1.84 (1.53)	0.72 (1.10)	0.26 (0.87)	1.22 (1.28)^{bc}
Week IX (15-06-2017 & 21-11-2017)	2.32 (1.68)	4.14 (2.15)	3.06 (1.88)	1.62 (1.46)	1.06 (1.24)	2.44 (1.68)^{ab}	1.34 (1.35)	2.66 (1.78)	2.18 (1.63)	0.98 (1.20)	0.28 (0.88)	1.49 (1.37)^{ab}
Week X (22-06-2017 & 28-11-2017)	1.94 (1.56)	3.48 (1.99)	2.24 (1.65)	0.90 (1.18)	0.80 (1.14)	1.87 (1.50)^{c}	1.64 (1.46)	2.92 (1.85)	2.46 (1.72)	1.24 (1.32)	0.36 (0.93)	1.72 (1.45)^{a}
Week XI (29-06-2017 & 05-12-2017)	1.56 (1.43)	2.26 (1.66)	1.88 (1.54)	0.72 (1.10)	0.48 (0.99)	1.38 (1.35)^{de}	1.02 (1.23)	2.16 (1.63)	1.84 (1.53)	0.74 (1.11)	0.22 (0.85)	1.20 (1.27)^{bc}
Week XII (06-07-2017 & 12-12-2017)	1.14 (1.28)	1.64 (1.46)	1.30 (1.34)	0.34 (0.91)	0.22 (0.84)	0.93 (1.17)^{f}	0.52 (1.01)	1.42 (1.39)	1.32 (1.35)	0.50 (0.99)	0.16 (0.81)	0.78 (1.11)^{def}
Week XIII(13-07-2017 & 19-12-2017)	0.68 (1.08)	1.08 (1.26)	0.84 (1.15)	0.12 (0.78)	0.10 (0.77)	0.56 (1.01)^{gh}	0.00 (0.71)	0.85 (1.16)	0.84 (1.15)	0.26 (0.87)	0.10 (0.77)	0.41 (0.93)^{ghi}
Week XIV (20-07-2017 & 26-12-2017)	0.48 (0.99)	0.80 (1.14)	0.70 (1.09)	0.00 (0.71)	0.00 (0.71)	0.40 (0.93)^{h}	0.00 (0.71)	0.50 (1.00)	0.40 (0.95)	0.00 (0.71)	0.00 (0.71)	0.18 (0.81)^{i}
Mean	1.42 (1.36)^{c}	2.54 (1.71)^{a}	1.75 (1.48)^{b}	0.73 (1.07)^{d}	0.43 (0.94)^{e}		0.56 (0.99)^{b}	1.63 (1.43)^{a}	1.31 (1.32)^{a}	0.40 (0.93)^{b}	0.12 (0.78)^{c}	
	S. Em. ±			C.D. (0.05)			S. Em. ±			C.D. (0.05)		
T (Timing)	0.01			0.02			0.01			0.02		
W (Weeks)	0.01			0.04			0.01			0.04		
T x W (Interaction)	0.03			0.09			0.03			0.10		

*Weeks after 10% flowering, Figures in the parentheses are $\sqrt{(X + 0.5)}$ transformed values, Means followed by same letter in a column do not differ significantly by DMRT (P= 0.05)

Table 6: Comparative foraging activity of different pollinators in guava under organic v/s conventional farming system

Flowering weeks*	Average number visited/flower/5 min									
	A. dorsata		*A. florea*		*A. cerana*		*T. iridipennis*		Other hymenopterans	
	Organic	Conventional	Organic	Conventional	Organic	Conventional	Organic	Conventional	Organic	Conventional
Week I (03-12-2016 & 26-12-2017)	0.34 (0.89)^{h}	0.14 (0.79)^{g}	0.16 (0.80)^{h}	0.30 (0.88)^{gh}	0.76 (1.08)^{gh}	0.22 (0.83)^{h}	0.34 (0.90)^{ijk}	0.00 (0.71)^{h}	0.48 (0.96)^{h}	0.25 (0.85)^{hi}
Week II (10-12-2016 & 02-01-2018)	0.62 (1.03)^{gh}	0.30 (0.88)^{g}	0.44 (0.94)^{g}	0.57 (1.01)^{fg}	1.00 (1.18)^{efg}	0.53 (0.99)^{g}	0.50 (0.97)^{hij}	0.10 (0.77)^{gh}	0.72 (1.07)^{g}	0.34 (0.88)^{ghi}
Week III (17-12-2016 &09-01-2018)	1.08 (1.23)^{ef}	0.42 (0.95)^{fg}	0.78 (1.10)^{f}	0.80 (1.11)^{ef}	1.28 (1.29)^{e}	0.75 (1.09)^{fg}	0.70 (1.07)^{gh}	0.17 (0.81)^{fgh}	0.98 (1.18)^{f}	0.46 (0.94)^{gh}
Week IV (24-12-2016 & 16-01-2018)	1.56 (1.40)^{de}	0.56 (1.01)^{efg}	1.19 (1.26)^{e}	1.15 (1.25)^{de}	1.72 (1.44)^{d}	1.01 (1.20)^{f}	0.90 (1.16)^{fg}	0.24 (0.85)^{fg}	1.24 (1.29)^{e}	0.59 (1.00)^{fg}
Week V (31-12-2016 & 23-01-2018)	1.88 (1.50)^{cd}	0.85 (1.13)^{def}	1.73 (1.45)^{d}	1.48 (1.38)^{cd}	2.16 (1.59)^{c}	1.33 (1.33)^{e}	1.22 (1.28)^{de}	0.36 (0.91)^{ef}	1.59 (1.41)^{cd}	0.72 (1.06)^{ef}
Week VI (07-01-2017 & 30-01-2018)	2.22 (1.62)^{bc}	1.02 (1.21)^{cde}	2.24 (1.61)^{bc}	1.74 (1.46)^{c}	2.61 (1.72)^{bc}	1.62 (1.43)^{de}	1.51 (1.39)^{bc}	0.50 (0.97)^{de}	1.82 (1.49)^{c}	0.86 (1.13)^{de}
Week VII (14-01-2017 & 06-02-2018)	2.53 (1.71)^{ab}	1.32 (1.32)^{cd}	2.63 (1.73)^{b}	2.23 (1.62)^{b}	3.00 (1.83)^{ab}	1.95 (1.54)^{cd}	1.78 (1.48)^{ab}	0.62 (1.03)^{cd}	2.20 (1.60)^{b}	1.00 (1.19)^{cd}
Week VIII (21-01-2017 &13-02-2018)	3.16 (1.89)^{a}	1.62 (1.43)^{bc}	3.27 (1.90)^{a}	2.41 (1.67)^{b}	3.39 (1.93)^{a}	2.30 (1.64)^{bc}	2.04 (1.56)^{a}	0.77 (1.10)^{bc}	2.61 (1.73)^{a}	1.22 (1.28)^{bc}
Week IX (28-01-2017 &20-02-2018)	3.14 (1.89)^{a}	1.99 (1.54)^{ab}	3.24 (1.89)^{a}	2.72 (1.76)^{b}	3.20 (1.88)^{a}	2.59 (1.73)^{b}	1.86 (1.51)^{a}	0.93 (1.16)^{b}	2.44 (1.68)^{ab}	1.49 (1.37)^{ab}
Week X (04-02-2017 & 27-02-2018)	2.65 (1.74)^{ab}	2.38 (1.66)^{a}	2.62 (1.73)^{b}	3.29 (1.91)^{a}	2.41 (1.66)^{c}	3.02 (1.85)^{a}	1.35 (1.34)^{cd}	1.21 (1.27)^{a}	1.87 (1.50)^{c}	1.72 (1.45)^{a}
Week XI (11-02-2017 & 06-03-2018)	1.71 (1.44)^{cd}	1.35 (1.32)^{cd}	2.14 (1.58)^{c}	1.52 (1.39)^{cd}	1.68 (1.44)^{d}	2.22 (1.62)^{bc}	0.96 (1.19)^{ef}	0.77 (1.10)^{bc}	1.38 (1.35)^{de}	1.20 (1.27)^{bc}
Week XII(18-02-2017 & 13-03-2018)	1.02 (1.18)^{fg}	0.83 (1.12)^{def}	1.46 (1.35)^{de}	0.89 (1.15)^{ef}	1.14 (1.25)^{ef}	1.49 (1.38)^{e}	0.67 (1.05)^{hi}	0.54 (1.00)^{cde}	0.93 (1.17)^{f}	0.78 (1.11)^{def}
Week XIII(13-07-2017 & 19-12-2017)	0.54 (0.97)^{hi}	0.40 (0.93)^{fg}	0.76 (1.09)^{f}	0.42 (0.94)^{g}	0.88 (1.14)^{fg}	0.83 (1.13)^{f}	0.45 (0.95)^{ijk}	0.35 (0.91)^{ef}	0.56 (1.01)^{gh}	0.41 (0.93)^{ghi}
Week XIV (20-07-2017 & 26-12-2017)	0.15 (0.79)^{i}	0.19 (0.82)^{g}	0.12 (0.77)^{h}	0.09 (0.76)^{h}	0.50 (0.98)^{h}	0.16 (0.80)^{h}	0.26 (0.85)^{k}	0.22 (0.84)^{fg}	0.40 (0.93)^{h}	0.18 (0.81)^{i}
S.Em. ±	0.03	0.04	0.05	0.03	0.03	0.03	0.02	0.04	0.02	0.03
C.D. (P = 0.05)	0.08	0.11	0.14	0.10	0.09	0.10	0.08	0.11	0.07	0.08

*Weeks after 10% flowering, Figures in the parentheses are $\sqrt{(X + 0.5)}$ transformed values, Means followed by same letter in a column do not differ significantly by DMRT (P= 0.05)

The higher activity of pollinators at mid-morning hours can be correlated to the abundance in availability of pollen and nectar during these hours [18]. The above results are in line with the findings of [17] that the maximum foraging activity of pollinator bees of the family Andrenidae, Halictidae and Apidae in guava were observed to be from 0600 to 1000 hr with 84 per cent of individuals seen foraging during this period.

3.6 Comparative foraging activity of different pollinators in guava under organic and conventional farming systems

The activity of bees *viz*., *A. dorsata*, *A. florea*, *A. cerana*, *T. iridipennis* and other hymenopteran pollinators was noticed in guava under both the ecosystems (Table 6). The rock bee activity attained its peak during VIII week (3.16 bees/flower/5 min) and was on par with VII, IX and X weeks (2.53, 3.14 and 2.65 bees/flower/5 min, respectively) which declined further. Under conventional ecosystem however, X week recorded the significantly highest activity with 2.38 bees/flower/5 min which was on par with IX week (1.99 bees/flower/5 min). The activity of little bees in guava was found to progress gradually along different weeks of flowering which recorded significantly highest activity during VIII and IX weeks with 3.27 and 3.24 bees/flower/5 min, respectively which were on par with each other. However, in conventional ecosystem, the peak activity of these bees was noticed during X week with 3.29 bees/flower/5 min which further declined gradually as the weeks of flowering progressed. With respect to *A. cerana*, the maximum activity was observed during VII, VIII and IX weeks under organic ecosystem which were significantly superior and on par with each other by recording 3.00, 3.39 and 3.20 bees/flower/5 min, respectively. However, under conventional ecosystem, X week recorded the significantly highest foraging activity with 3.02 bees/flower/5 min.

The foraging activity of dammer bees progressed gradually along the weeks of flowering under organic ecosystem which attained its peak during VIII week (2.04 bees/flower/5 min) and was on par with VII and IX weeks (1.78 and 1.86 bees/flower/5 min, respectively). In conventional farming system, the maximum activity of dammer bees was noticed during X week which recorded 1.21 bees/flower/5 min, respectively. In case of other hymenopteran pollinators, the activity which increased gradually recorded significantly higher visitation during VIII and IX weeks in organic ecosystem with 2.61 and 2.44 other hymenopterans/flower/5 min, respectively. However, under conventional farming system, IX and X weeks recorded the significantly higher visitation of other hymenopterans with 1.49 and 1.72 bees/flower/5 min, respectively which declined further (Table 5). The results are in confirmation with the reports of [10] that the mean foraging activity of *A. dorsata* in gyuava was maximum (2.07 bees/5 flowers/5 min) compared to *A. cerana* and *A. florea* (1.65 and 1.59 bees/5 flowers/5 min, respectively).

4. Conclusion

The results of the present investigation strengthen the fact that organic farming system supports higher number of pollinator visitation when compared to conventional ecosystem. In general, VIII and IX weeks recorded maximum pollinators under organic ecosystem whereas, IX and X weeks recorded higher visitation of pollinators under conventional ecosystem.

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