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Foraging behaviour of nectar collecting insects in banana, *Musa paradisiaca*

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Abstract

The experiment was conducted to observe the foraging behaviour of nectar collecting insects on a banana from October to November. About eight species of insects were recorded which belongs to the order Hymenoptera, Lepidoptera and Diptera. Among Hymenoptera, *Apis cerana* and *Vespa tropica* were the common visitors in banana. The mean foraging activity of *A. cerana* was 4.00 per day and 1.06 per day for *V. tropica* during the first fortnight interval. During the second fortnight interval the mean foraging activity was 5.40 per day for *A. cerana* and 0.33 per day for *V. tropica*. The third fortnight recorded the least foraging activity of both *A. cerana* (3 per day) and *V. tropica* (0.33 per day). The activity of different species of butterflies was least in all time points of observation.

Keywords: insect pollinator, banana, *Apis cerana*, *Vespa tropica*

Introduction

Bananas are the world's fourth most cultivated food crop after rice, wheat, and maize in terms of the gross value of production. As well as providing a cheap and easy source of energy, bananas are also rich in certain minerals and in vitamins. The nature of the wild banana inflorescence is that female flowers are separated in space and time from male flowers. In this case, pollinators are essential for seed production. Since the tepals are not colourful and nectar is abundant, the main pollinators are bats and birds. Banana flowers are visited by numerous species of insects and some animals but these are not involved in pollination (Buddenhagen, 2008) [1]. But in edible bananas, sexual reproduction is rarely successful, with very few if any seeds produced as a consequence of pollination. This failure is multifaceted, due to a greater or lesser extent to a lack of viable pollen, disruption of the pollen pathway through the gynoecium in the female flower and a lack of viable ovules. Instead, the fruit of edible bananas develops through vegetative parthenocarpy, with the pulp developing autonomously from tissues on the ovary wall of the female flower without the need for pollination. Therefore in edible banana insects are attracted to flowers only for getting abundant nectar instead of aid in pollination. Different insect species were frequently visiting banana inflorescence. The honeybee species like *Apis cerana*, *Apis mellifera* and *Apis dorsata* were the dominant visitors (77.5%) followed by a wasp (paper wasp, yellow banded wasp) (15.53%). Bats are also an important and effective pollinator in wild banana (Kaushik *et al.*, 2012) [3].

Nectar is produced uniformly while flowers are open, the nectar quantity and rate of female flowers are significantly higher than that of male flowers. Insects, such as bumblebees (*Bombus eximius* and *B. montivolaris*), honeybees (*Apis cerana* and *A. florea*), and wasps (*Vespa mandarinia*) are the primary floral visitors and show a preference for female flowers in *Musella lasiocarpa* (Liu *et al.*, 2002) [2].

Material and Methods

Insect pollinators and their abundance, foraging activity, number of bee visits in Banana were carried out from October to November 2020 at Aralapura, Ramanagara (Karnataka).

Insect pollinators visiting Banana

One inflorescence of banana was selected randomly to record different species of insect pollinators visiting the flowers at fortnightly intervals from 07.00 to 10.00 hrs at an hourly interval for 15 minutes during forenoon session in three fortnight intervals for one and half months from October 15th to 30th November 2020. Similarly, readings were taken in the

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evening hours from 16.00 to 17.00 hrs at an hourly interval for 15 minutes.

Foraging activity of insect pollinators on Banana

The foraging activity of honey bee species *A. cerena* in banana inflorescence for nectar collection was recorded from October to November. The observations were recorded on randomly selected inflorescence from 07.00 to 10.00 hrs in the morning and 16.00 to 17:00 hrs in the evening at the hourly intervals for 15 minutes and expressed as the mean numbers of foragers per inflorescence.

Results and Discussion

Insect pollinators abundance and their diversity on Banana

About eight species of insect were recorded during the flowering period of banana (October-November). Among them three species were belong to hymenopteran, four species fall under lepidoptera and single species comes under the Dipteran family. Then the Hymenopteran consists of honeybees and wasps, Lepidopteran consists of tiger butterfly, Sulphur butterfly, lycanid and Diptera consists of a fly (Table 1).

Table 1: Different species of insect pollinators

Order	family	Common name	Scientific name	Forage source
Hymenoptera	Apidae	Honey bee	<i>Apis cerena</i>	Nectar
	Vespidae	Yellow banded wasp	<i>Vespa tropica</i>	Nectar
	Vespidae	Paper wasp	<i>Polities Carolina</i>	Nectar
Lepidoptera	Pieridae	Sulphur butterfly	<i>Phoebe's sennae</i>	Nectar
	Lycaenidae	Lycaenid	<i>Lycaenid sp</i>	Nectar
	Nymphalidae	Tiger butterfly	<i>Danacus genuta</i>	Nectar
	Hespiradae	Banana skipper	<i>Erionota thrax</i>	Nectar
Diptera	-	Fly	Unidentified	Nectar

Foraging activity of honeybee and other insect pollinators during different days after flowering

The foraging activity of honeybee species and other pollinators for the collection of nectar showed a significant fluctuation at different hours of the day during the study period. During first fortnight intervals the foraging activity of *A. cerena* was maximum (4 per day) compared to *V. tropica* (1.06) and butterfly visitation was negligible. During the 17.00-17.15 hrs period the maximum activity of *A. cerena* (15), *V. tropica* (7) and butterfly (3) visitation were observed followed by 09:00 to 09:15 hrs and 08:00 to 08:15 hrs time points recorded

maximum activity nectar collecting insects were noted. The time points like 07.00-07.15 hrs, 10.00-10.15 hrs and 16.00-16.15 hrs recorded the least activity of nectar collecting insects (Table 2).

During the second fortnight interval the foraging activity of *A. cerana* was maximum during 17:00 to 17:15 hrs (29) and 8.00 to 8.15 hrs (16) as compared to other time points of observation. The mean foraging activity *A. cerana* was 5.6 per day. But the foraging activity of *V. tropica* was very low for all the time points of observation (Table 2).

Table 2: Foraging activity of insect pollinators at different time interval

First fortnight interval								
Species	Time (Hrs)						Mean (Per day)	Total
	07.00-07.15	08.00 -08.15	09.00-09.15	10.00-10.15	16.00- 16.15	17.00 – 17.15		
<i>Apies cerena</i>	8	12	13	7	6	15	4	61
<i>Vespa tropica</i>	1	4	2	2	-	7	1.06	16
Butterfly	1	5	2	-	-	3	0.6	10
Second fortnight interval								
Species	Time (Hrs)						Mean (Per day)	Total
	07.00-07.15	08.00 -08.15	09.00-09.15	10.00-10.15	16.00- 16.15	17.00 – 17.15		
<i>Apies cerena</i>	8	16	10	6	13	29	5.4	82
<i>Vespa tropica</i>	1	-	1	-	2	1	0.33	5
Butterfly	-	-	-	2	2	1	0.33	5
Third fortnight interval								
Species	Time (Hrs)						Mean (Per day)	Total
	07.00-07.15	08.00 -08.15	09.00-09.15	10.00-10.15	16.00- 16.15	17.00 – 17.15		
<i>Apies cerena</i>	4	12	-	5	9	15	3	45
<i>Vespa tropica</i>	-	2	-	-	2	1	0.33	5
Butterfly	-	2	-	-	1	3	0.40	5

During the third fortnight interval the activity of nectar collectors (*A. cerena* (3), *V. tropica* (0.33) and butterfly (0.40)) was less compared to first and second fortnight interval (3 per day). During 17:00 to 17:15 pm the maximum foraging activity has been observed (*A. cerena* (15), *V. tropica* (1) and butterfly (3)) compared to other time period (Table 2). When compared to first fortnight interval, second fortnight interval recorded the maximum honeybee activity, but third fortnight interval recorded the least. When compared with the different nectar collectors, honey bees were more in

numbers as compared wasps and butterflies. Insect pollinators on banana conducted by Kaushik *et al.* (2012) [3] who concluded that honey bee was the dominant visitors (77.51%), followed by wasp with 15.53%.the remaining visitors comprised of hymenoptera including stingless bees and bats. The present work is in line with the previous results that are honeybee was the dominant insect visitors comprising 80 per cent followed by the wasp with 11.06 per cent and hymenopteran insect with 8.9 per cent.

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