

Foraging Reward and Foraging Behavior of Insect Visitors on Mango Flowers during Blooming Period

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Received: 10.08.2018 | Revised: 25.09.2018 | Accepted: 3.10.2018

ABSTRACT

Most of the mango cultivars are benefited from cross pollination and required external bio agents to accomplish this process. The production of nectar for the attraction of insects also indicates that the mango is entomophilous. Mango flowers are visited by flies, wasps, bees, butterflies, moths, beetles, ants and various bugs sucking the nectar and some other insects takes pollen for feeding purpose. Among them bees of Apidae family viz., *Apis mellifera*, *Apis dorsata*, *Apis cerana indica*, *Tetragonula laeviceps* and *Xylocopa aestuans* are frequent visitor and foraged mango flowers to take both pollen and nectar simultaneously. However, ants and *Vespula orientalis* visited flowers only for the nectar. Similarly, all the dipteran species visited on mango flowers only for nectar although the greater amount of pollen were adhered on their body during visitation which facilitate the pollination. During the process of nectar and pollen collection *A. mellifera*, *A. dorsata*, *A. c. indica*, *T. laeviceps*, *X. aestuans* and *C. septempunctata* were recorded as a top-worker or side worker. Whereas, some hymenopterans viz. *Ants*, *V. orientalis* and *Polistes sp* were visits as a side worker to take nectar from the flower. On the other hand different species of syrphid flies viz. *E. balteatus*, *S. corollae*, *E. tenax*, *M. orientale*, *Eupeodes sp.* and some other dipterans like House fly (*Musca domestica*) and Blue bottle fly (*Calliphora sp.*) were observed as side worker on the flowers of mango.

Key words: *Apis mellifera*, *Apis dorsata*, *Apis cerana indica*, *Tetragonula laeviceps* and *Xylocopa aestuans* etc.

INTRODUCTION

Mango, *Mangifera indica* L. (family : Anacardiaceae) rightly called the “King of Fruits” is grown all over the country as this is the only fruit that the poor as well as the rich equally enjoy. The fruit of mango is the rich source of vitamin-A, vitamin-B6, vitamin-C, vitamin-E, copper, potassium, carotenoids,

polyphenols and flavonoids like *beta-carotene*, *alpha-carotene*, and *beta-cryptoxanthin*⁸. According to new research study, mango fruit has been found to protect against colon, breast, leukemia and prostate cancers. The mango is native to South Asia from where it was distributed worldwide to become one of the most cultivated fruits in the tropics.

Cite this article: Usha, and Srivastava, P., Foraging Reward and Foraging Behavior of Insect Visitors on Mango Flowers during Blooming Period, *Int. J. Pure App. Biosci. SPI: 6(3): 437-440 (2018).*

This fruit is cultivated in the largest area i.e. 2,312 thousand ha and the production is around 15.03 million tons, contributing 40.48% of the total world production of mango. Mango is the national fruit of India and main producing states are Uttar Pradesh, Uttarakhand, Andhra Pradesh, Karnataka, Bihar, Gujarat and Tamil Nadu².

Most of the mango cultivars are benefited from cross pollination and required external bio agents to accomplish this process. The production of nectar for the attraction of insects also indicates that the mango is entomophilous. Mango flowers are visited by flies, wasps, bees, butterflies, moths, beetles, ants and various bugs sucking the nectar and some transfer the pollen but a certain amount of self pollination also occurs. Observations have shown that among various insect, most important floral visitors are belonging to the order Diptera (Syrphid flies and hover flies), Hymenoptera (Honeybees, stingless bee, bumble bee, solitary bees and other non apis bees), Lepidoptera (Moths and Butterflies) and Coleoptera (Beetles). Du and Swart³ examined the insect foragers for nectar, pollen and bee glue in a 14 hectare mango orchard in S. Africa (Lesitele Valley). Low frequencies of foragers indicated limited quantities of available pollen and nectar. Honey bees however were most frequent pollinator. Panda *et al.*⁷, noticed that three species of *Apis* collected either nectar or pollen in their single trip. A flower visit was scored as successful if the bee made direct contact with the stigma that could allow pollen transfer to occur. The petals of flower plays very important role in foraging behaviour of honeybees as pollinator⁴.

MATERIAL AND METHODS

The Experiments were conducted at Horticulture Research Center, Pattharchatta, Department of Entomology, College of Agriculture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, during the 2013.

This experiment was conducted on 5 randomly selected trees of mango to take observations

for nectar and pollen collecting activity of insect pollinators. Daily observations on insect pollinators were recorded on 10 panicles per tree in all directions at two hours interval.

The treatment details are given below:

Details of Treatments:

H1 = 08.00 AM

H2 = 10.00 AM

H3 = 12.00 Noon

H4 = 02.00 PM

H5 = 04.00 PM

RESULTS AND DISCUSSION

The foraging reward of insect visitors on mango flowers during the blooming period of the year 2013 is presented in the table 1. It was observed that bees of Apidae family viz., *A. mellifera*, *A. dorsata*, *A. c. indica*, *Tetragonula laeviceps* and *Xylocopa aestuans* visited on mango flowers and take both pollen and nectar simultaneously. However, ants and *Vespa orientalis* visited only for the nectar. Ahmad¹ reported that when an individual honeybee finds a source of nectar or pollen it continues to collect from one source until it is exhausted or recruited to another source. This behaviour is advantageous to the plants as it facilitates cross-pollination. The syrphid flies, viz. *E. balteatus*, *S. corollae*, *E. tenax*, *M. orientale*, *Eupeodes sp.* and *Musca domestica L.*, *Musca sp.*, *Calliphora sp.* visited on mango flowers only for nectar but the greater amount of pollen were adhered on their body during visitation. Syrphid flies (*E. balteatus*, *S. corollae*, *E. tenax*, *M. orientale*, *Eupeodes sp.*), *M. domestica*, *Musca sp.* and *Calliphora sp.* were take nectar from the mango flower. But the pollen were attached on their body. As stated by Jiron and Hedstrom⁵ who observed that the most common visitors on the mango flowers were Dipterans (Syrphidae, Calliphoridae and Sciaridae) 51.6 per cent of all visitors; Lepidopterans (Nymphalidae and Lycaenidae) 33 per cent, Coleopterans (Cantharidae) 11.6 per cent, and Hymenopteran (Apidae) 13.6 per cent. Some of these insects fed on pollen or nectar, while other preyed on other visitors. Syrphid flies, Calliphorid flies and Tachinid flies had greater

amounts of pollen attached to their bodies rather than other visitors. Some Hemipterans, Love bugs: *Plecia nearctica*, Lepidopterans, Monarch Butterfly: *Danaus plexippus* and *Pieris rapae* and Coleopterans: *Coccinella*

septumpunctata were also found visiting on mango flower for nectar only. Of these *Coccinella septumpunctata* take nectar and pollen both.

Table 1: Foraging reward for insect visitors of mango flowers during the year 2013

| Sl. No. | Common name | Scientific Name | Pollen Collector (P) | Nectar Collector (N) | Pollen+Nectar Collector (P+N) |
|---------|--------------------|--|----------------------|----------------------|-------------------------------|
| 1 | European honey bee | <i>Apis mellifera</i> L. | - | - | P+N |
| 2 | Giant honey bee | <i>Apis dorsata</i> Fab. | - | - | P+N |
| 3 | Indian honey bee | <i>Apis cerana indica</i> Fab. | - | - | P+N |
| 4 | Stingless bee | <i>Tetragonula laeviceps</i> Smith | - | - | P+N |
| 5 | Carpenter bee | <i>Xylocopa aestuans</i> L. | - | - | P+N |
| 6 | Ant (Unidentified) | - | - | N | - |
| 7 | Wasp | <i>Vespula orientalis</i> | - | N | - |
| 8 | Wasps | <i>Polistes</i> sp | - | N | - |
| 9 | Syrphid fly | <i>Episyrphus balteatus</i> DeGeer | - | N | - |
| 10 | Syrphid fly | <i>Syrphus corollae</i> Fab. | - | N | - |
| 11 | Syrphid fly | <i>Eristalis tenax</i> L. | - | N | - |
| 12 | Syrphid fly | <i>Melanostoma orientale</i> L. | - | N | - |
| 13 | Syrphid fly | <i>Eupeodes</i> sp. | - | N | - |
| 14 | Housefly | <i>Musca domestica</i> L., <i>M. sp.</i> | - | N | - |
| 15 | Blue Bottle fly | <i>Calliphora</i> sp. | - | N | - |
| 16 | Love Bugs | <i>Plecia nearctica</i> | - | N | - |
| 17 | Monarch Butterfly | <i>Danaus plexippus</i> | - | N | - |
| 18 | Cabbage Butterfly | <i>Pieris rapae</i> | - | N | - |
| 19 | Humming moth | <i>Macroglossum stellatarum</i> | - | N | - |
| 20 | Lady bird beetle | <i>Coccinella septumpunctata</i> | - | - | P+N |

Foraging behaviour for insect visitors of mango flowers The perusal of the data on foraging behaviour of insect visitors showed in Table 2 indicate that *A. mellifera*, *A. dorsata*, *A. c. indica*, *T. laeviceps*, *X. aestuans*, *Calliphora* sp. and *C. septumpunctata* were recorded as a top-worker or side worker during the process of the collection of nectar and pollen. Whereas, some hymenopterans viz. Ants, *V. orientalis* and *Polistes* sp. visited as a side worker to take nectar from the flower. On the other hand different species of syrphid flies

viz. *E. balteatus*, *S. corollae*, *E. tenax*, *M. orientale*, *Eupeodes* sp. and some other dipterans like House fly (*Musca domestica*) and Blue bottle fly (*Calliphora* sp.) were observed as side worker on the flowers of mango. The low population of *P. nearctica*, *D. plexippus*, *P. rapae* and *M. stellatarum* rarely observed on mango on the side branches. The above results also supported by Mattu⁶ who reported that *A. mellifera* and *A. c. indica* were found as top as well as side workers.

Table 2: Foraging behaviour of Insect-Pollinators visiting on Mango flowers during the year 2013

| Sl. No. | Common name | Scientific Name | Top worker (T) | Side worker (S) | Top +Side Worker (T+S) |
|---------|--------------------|------------------------------------|----------------|-----------------|------------------------|
| 1 | European honey bee | <i>Apis mellifera</i> L. | - | - | T+S |
| 2 | Giant honey bee | <i>Apis dorsata</i> Fab. | - | - | T+S |
| 3 | Indian honey bee | <i>Apis cerana indica</i> Fab. | - | - | T+S |
| 4 | Stingless bee | <i>Tetragonula laeviceps</i> Smith | - | - | T+S |
| 5 | Carpenter bee | <i>Xylocopa aestuans</i> L. | - | - | T+S |
| 6 | Ant (Unidentified) | - | - | S | - |
| 7 | Wasp | <i>Vespula orientalis</i> | - | S | - |
| 8 | Wasps | <i>Polistes</i> sp | - | S | - |

| | | | | | |
|----|-------------------|--|---|---|-----|
| 9 | Syrphid fly | <i>Episyrphus balteatus</i> DeGeer | - | S | - |
| 10 | Syrphid fly | <i>Syrphus corollae</i> Fab. | - | S | - |
| 11 | Syrphid fly | <i>Eristalis tenax</i> L. | - | S | - |
| 12 | Syrphid fly | <i>Melanostoma orientale</i> L. | - | S | - |
| 13 | Syrphid fly | <i>Eupeodes</i> sp. | - | S | - |
| 14 | Housefly | <i>Musca domestica</i> L., <i>M. sp.</i> | - | S | - |
| 15 | Blue Bottle fly | <i>Calliphora</i> sp. | - | - | T+S |
| 16 | Love Bugs | <i>Plecia nearctica</i> | - | S | - |
| 17 | Monarch Butterfly | <i>Danaus plexippus</i> | - | S | - |
| 18 | Cabbage Butterfly | <i>Pieris rapae</i> | - | S | - |
| 19 | Humming moth | <i>Macroglossum stellatarum</i> | - | S | - |
| 20 | Lady bird beetle | <i>Coccinella septempunctata</i> | - | - | T+S |

CONCLUSION

The bees of Apidae family viz., *A. mellifera*, *A. dorsata*, *A. c. indica*, *Tetragonula laeviceps* and *Xylocopa aestuans* foraged mango flowers for taking both pollen and nectar simultaneously. However, ants and *Vespula orientalis* visited flowers only for the nectar. Similarly, all the dipteran species visited on mango flowers only for nectar although the greater amount of pollen were adhered on their body during visitation which facilitate the pollination. During the process of nectar and pollen collection *A. mellifera*, *A. dorsata*, *A. c. indica*, *T. laeviceps*, *X. aestuans* and *C. septempunctata* were recorded as a top-worker or side worker. Whereas, some hymenopterans viz. Ants, *V. orientalis* and *Polistes* sp were visits as a side worker to take nectar from the flower. On the other hand different species of syrphid flies viz. *E. balteatus*, *S. corollae*, *E. tenax*, *M. orientale*, *Eupeodes* sp. and some other dipterans like House fly (*Musca domestica*) and Blue bottle fly (*Calliphora* sp.) were observed as side worker on the flowers of mango.

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