

DIVERSITY OF INSECT POLLINATORS AND THEIR RELATIVE ABUNDANCE ASSOCIATED WITH MORINGA (*MORINGA OLEIFERA*) IN PESHAWAR

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ABSTRACT

The current study was performed at Range Research Garden PFI during 2023 with the objective to analyze the diversity and abundance of insect pollinators visiting the *Moringa oleifera* orchard in different time intervals. Five trees were randomly selected and observed from 9am-6pm at two hours intervals. The insects were collected through aerial handnet, killed in a killing jar and brought to laboratory for identification. Results showed that total 8 insect species were recorded visiting *M. oleifera* from three major orders such as hymenoptera, diptera and lepidoptera in this study. Among all, hymenopteran were the most abundant and species rich order as compared to the others. Five species viz. *Apis mellifera*, *Apis dorsata*, *Apis florea*, *Apis cerana* and *Xylocopa fenestrata* belongs to Hymenoptera, one species from order Diptera (*Eristalis tenax*) and two species from Lepidoptera (*Papilio demoleus* and *Danaus chrysippus*) were recorded. Honey bees were recorded in highest percentage (61.34%) while the lowest values (8.25%) was observed for *Xylocopa fenestrata*. Peak pollinator's activities were recorded in the morning hours (9-10am) as compared to the later part of the day. Overall *Apis mellifera*, *Apis dorsata* and *Eristalis tenax* showed higher abundance.

Keywords: *Moringa oleifera*, Pollinators, Relative abundance, Diversity.

INTRODUCTION

Moringa oleifera Lam commonly known as 'drumstick' or 'horseradish' tree. It belongs to genus *Moringa* consisting of 13 different species. This tree is mainly famous for its versatility. It is a good source of food both for humans and animals, remedy for numerous disorders, water purification as well as a source of biofuel production (Anwar *et al.*, 2007). *M. oleifera* is a tropical deciduous perennial dicotyledonous tree. It is a small, beautiful, deciduous tree with thin leaves belonging to Moringaceae family. It is a highly desirable plant found in many tropical and subtropical areas and is a multifunctional perennial crop (Chowdhury *et al.*, 2020). It is mainly a cross pollinated plant and needs insects for pollination (Sharma, 2019). It provides food source to numerous pollinators and blossoms visitors from various groups of insect as *Moringa* blooms for nearly

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six months each year. Different insect pollinators such as *A. mellifera* and *A. dorsata* (Sharma, 2019), *Apis cerana* (Sowmiya *et al.*, 2018), *Apis florea* (Bhatnagar *et al.*, 2018) *Xylocopa pubescens* and *Xylocopa latipes* (Suneetha and Raju, 2019) were recorded as key pollinators in moringa orchards by several researchers. Krieg *et al.*, 2017 and Sharma, 2019) also reported birds (*Mellisuga* sp. and sunbirds) pollinating the moringa flowers. Keeping in view the importance of moringa plant and its pollinators the present experiment was carried out to study the diversity and relative abundance of insects associated with the moringa tree.

MATERIAL AND METHODS

Study site

To study the diversity and relative abundance of insect pollinators on Moringa flowers the present study was carried out at Range Research Garden PFI during the spring season 2023. Five Moringa plants were randomly selected and observed for different insect species visiting the trees during the study period.

Pollinators Collection

Various insect pollinators were recorded visiting Moringa flowers during the study period. Insects were captured through arial-net and then put into in a killing jar containing ethyl acetate as killing agent. The specimens were then counted and pinned for later species identification.

Identification

All the collected specimens were identified with the help of taxonomist at Entomology Department The University of Agriculture Peshawar. After identification, all the pollinator species were labeled, pinned and deposited in the Insect Museum of Pakistan Forest Institute, Peshawar.

Data collection

Data was recorded on daily basis from 9am to 6pm at two hours interval. Data on mean number of insect visitors was recorded after 20% flower initiation. Insect diversity and their relative abundance were estimated as described by Das and Jha, 2019.

RESULTS AND DISCUSSION

Results regarding the insect species visiting the Moringa flowers are presented in Table 1. It is evident from the results that eight insect species foraging moringa in the current trial. In this study higher number of pollinators belongs to the order Hymenoptera followed by diptera while lower number of pollinator's were recorded from order lepidoptera. Hymenoptera was represented by five species (*Apis mellifera*, *Apis dorsata*, *Apis florea*, *Apis cerana* and *Xylocopa fenestrata*), one species (*Eristalis tenax*) belongs to diptera while two lepidopteran species such as *Papilio demoleus* and *Danaus chrysippus* were observed foraging the flowers. Pollination is an essential process for plants survival and insects play an important role in pollination. The results of this study are in agreement with findings of Usman *et al.* (2018) who performed similar studies on insect pollinators associated with the coriander. Four species (*Apis mellifera*, *A. dorsata*, *A. florea*, *A. cerana*) belonging to Apidae family, one species (*Xylocopa fenestrata*) from family xylocopidae, one species (*Eristalis tenax*) of family syrphidae while one species each (*Papilio demoleus*) and (*Danaus chrysippus*) from papilionidae and Nymphalidae family respectively.

Table 1. List of Insect pollinators visiting Moringa flowers during 2023

S. No.	Insect species	Family	Order
1	<i>Apis mellifera</i>	Apidae	Hymenoptera
2	<i>Apis dorsata</i>	Apidae	Hymenoptera
3	<i>Apis florea</i>	Apidae	Hymenoptera
4	<i>Apis cerana</i>	Apidae	Hymenoptera
5	<i>Xylocopa fenestrata</i>	Apidae	Hymenoptera
6	<i>Papilio demoleus</i>	Papilionidae	Lepidoptera
7	<i>Danaus chrysippus</i>	Nymphalidae	Lepidoptera
8	<i>Eristalis tenax</i>	Syrphidae	Diptera

Diversity of Pollinators Visiting Moringa Inflorescences at different time intervals

Bees were the most dominant and abundant species found during the study as compared to other groups. *Apis mellifera* (3.99/m²/5min) followed by *Apis dorsata* (2.91/m²/5min) visited the orchard frequently and were top collectors of nectar and pollen which were followed by *Apis florea* (2.62 /m²/5min), *Apis cerana* (1.08/m²/5min), *Xylocopa fenestrata* (1.17/m²/5min). However, both *A. cerana* and *X. fenestrata* were recorded in less number among all the Hymenopterans. *Apis florea*, *Apis mellifera*, *Apis dorsata* and *Xylocopa fenestrata* were found more active during the morning hours. This might be due to the availability of more nectar in flowers at morning as compared to rest of the

day. *Eristalis tenax* was only dipteran species recorded in this study ($2.41/m^2/5min$) which is higher in number than *Papilio demoleus* ($1.56/m^2/5min$) and *Danaus chrysippus* ($1.07/m^2/5min$) which were the most abundant species among the lepidopterans. Among the Syrphidae family (Diptera) the contribution of hoverfly pollination of *Moringa* is probably poor. The low capacity of the Syrphids for transporting pollen is due to the scarcity of their hair and the simple morphology of their bristles Usman et al. (2018). The diversity and relative abundance of different pollinators on the flowers of *M. oleifera* were not reported earlier. According to Jyoth et al. (1990) moringa flowers produced both nectar and pollen with bees as important pollinators.

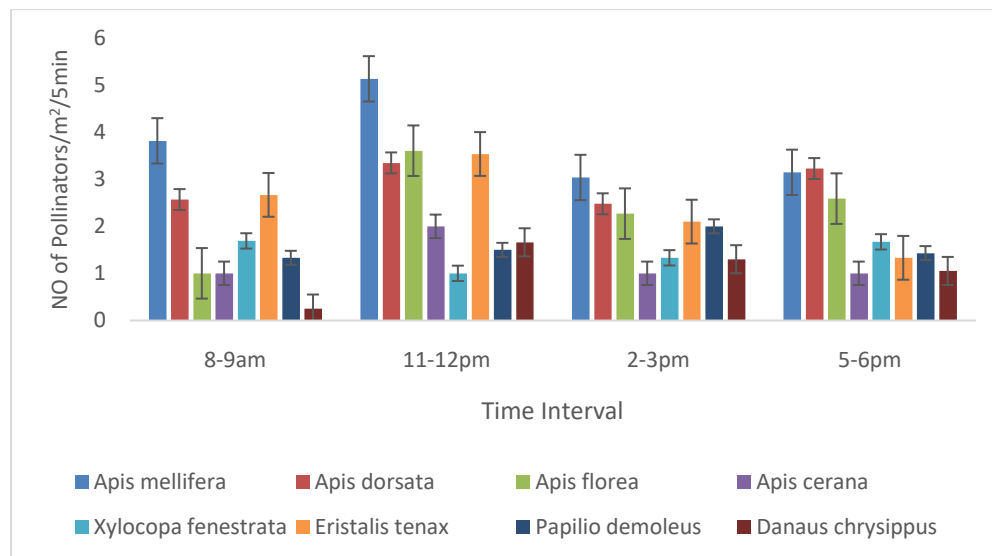


Fig. 1. Diversity of Pollinators Visiting *Moringa* Inflorescences at different time intervals

% Abundance of insect pollinators recorded on *Moringa* flowers

It is evident from Fig 2 that honeybees were the dominant and abundant pollinators among all the insects' species visiting *Moringa* trees. Overall the mean population of *Apis dorsata* and *Apis florea* was lower than *Apis mellifera* however higher than *Apis cerana* with lowest average population among all the hymenopterans at all time intervals. As shown in Figure 1, *Apis mellifera* had highest share of 23.13% followed by *Apis dorsata* (16.86%) and *Apis florea* (15.18%) however *Apis cerana* was recorded in lowest number (6.25%) in this study at all the intervals. Syrphid flies (*Eristalis tenax*) were collected in highest number (13.98%) as compared to *Xylocopa fenestrata* (8.25%), *Papilio demoleus*

(9.08%) and *Danaus chrysippus* (7.27%). Furthermore it was also observed that the best time for honeybees foraging is morning (08- 09 am) which might be due the availability of both nectar and pollen in morning as compared to afternoon and evening. Our findings are in accordance with the results of (Sajjad *et al.*, 2008) who also reported *Apis mellifera* and *Episyrphus balteatus* as most abundant pollinators while Ali and Ali (1989) reported *Apis florea* as least prevalent species which is in contrast to the current findings. *X. fenestrata* spent more time on flowers, behaved aggressively while collecting nectar and pollen from flowers. The findings are endorsed by Ahmad *et al.* (2007).

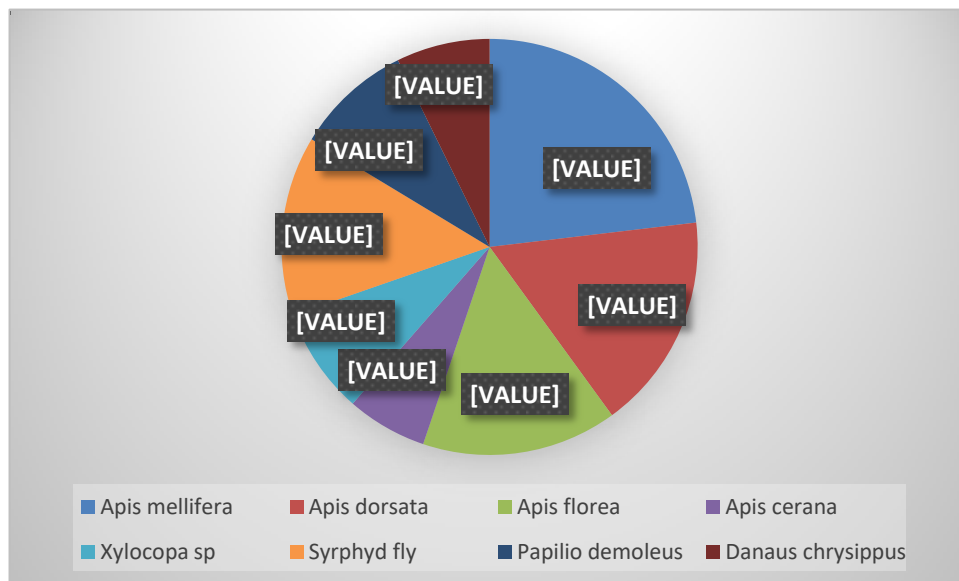


Fig. 2. Abundance of insect pollinators on *Moringa oleifera* flowers

CONCLUSION AND RECOMMENDATION

It was concluded that Hymenopterans were the dominant and abundant group of insect foraging moringa inflorescences as compared to dipterans and lepidopteran. The insect foraging Moringa with maximum number in morning time than evening. Moringa also serve as a better source of nectar thus attracting diverse groups of insects. Hence, managed pollination by the commercial beekeepers may undergo the same in moringa ecosystems to improve the crop yield as well as to obtain increased honey yield from the respective bee colonies.

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