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## Diversity of insect pollinators on medicinal tree, Baheda (*Terminalia bellirica* Roxb.) in southern Haryana

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### Abstract

Field experiment was conducted at CCS Haryana Agricultural University, Hisar during 2014-15 to investigate the diversity of insect pollinators on (*Terminalia bellirica* Roxb). Dipterans were found to be the most diversified followed by Hymenoptera, Coleoptera. One species belong to orders Hemiptera and Lepidoptera were also reported. Among Dipterans, Syrphidae (*Eristalinus obliquus*, *Eristalis* sp. and *Eristalinus obscuritarsus*) and Calliophoridae (*Chrysomya rufifacies*) visited Baheda flowers. Among hymenopterans *Apis florea* and *Allorhynchium metallicum* were the major visitors of the flowers. Coleopterans family like Coccinellidae (*Coccinella septempunctata* and *Chilomenes sexmaculata*) and one Hemipteran family Scutellaridae (*Chrysocoris stollii* Wolff) and one lepidopteran from Pieridae (*Pieris* sp.) were also documented. Period of study were about two years and almost similar insect visitors were noted during both the years.

**Keywords:** *Terminalia*, pollination, Diptera, Diversity, *Apis florea*

### Introduction

Pollination is one of the most essential and important ecosystem services (Kremen *et al.*, 2007) [7]. Pollinators play key role in increasing the quality and quantity of the yield (Morandin and Winston, 2006) [8]. Almost 80% of wild plant species and 75% of the cultivated plant species depends on insect pollinators for higher fruit set and seed yield (Klein *et al.*, 2007) [6]. Pollinators are found in varied groups of the animal kingdom. Among them, Honey bees are the primary pollinator of most fruit crops and improve not only crop yield, but also crop quality. Several other pollinators including carpenter bees, bumble bees, megachilids, halictids, sphecids, andrenids, and syrphids are known to occur in the country. Effective pollination is a pre requisite for many plants. The structure of the flowers, their degree of self-fertility and their arrangement on the plant determines the extent to which a plant is dependent on insects for pollen transfer (Free, 1993; Williams, 1994; Richards, 2001) [3, 13, 10]. Loss of pollination services may result in improper functioning of ecosystems (Burkle *et al.*, 2013) [2]. Lot of work has been done in India and abroad on commercial fruit crops as bee forage but scanty information is available on underutilized fruit crops. Keeping this in view, we aimed to investigate the diversity of pollinator community of important underutilized medicinal tree i.e., Baheda (*Terminalia bellirica* Roxb). Baheda is also known as beddanut, belliric myrobalan, belongs to the family Combretaceae. It is native of Indo-Malaysian region. It is found throughout India in moist situations and in the peninsular deciduous and mixed forests. Baheda is large and tall tree. Flowers are greenish yellow and have an offensive smell. Male and bisexual flowers are found in un-branched spikes. Petals are absent. Fruit is roundish, obscurely 5-angled, somewhat fleshy brown colored drupes covered with brown velvety fur. Fruit pulp is hard enclosing the stone. Stones contain edible kernels and are split into two valves (Hocking, 1993) [5]. Almost all parts of Baheda possess medicinal properties. The dried fruit used as an integral part of Triphala used in the treatment of common cold, pharyngitis and constipation. The bark is useful in anaemia and leucoderma. Unripe and ripe fruits having the properties of mild laxative and astringent respectively. Seeds are used as aphrodisiac. Oil extract from the seed pulp is used in leucoderma and alopecia (Saroya, 2011) [11].

## Materials and Methods

### Diversity of insect visitors/pollinators of Baheda flowers

Present experiment was conducted in Research farm, Department of Genetics and Plant Breeding located at CCS HAU, Hisar during 2014-2015. Sweeps were made with a hand net throughout the flowering period of the crop at two hourly intervals from the morning to the evening to observe the species diversity of insects. Captured insects were killed by using ethyl alcohol and preserved as dry specimens and were got identified from Insect Taxonomy Division, IARI, New Delhi and a record of the flower visitors was prepared.

## Results

### Diversity of insect visitors/ pollinators on Baheda

Baheda flowers attracted wide varieties of insects belonging to 5 orders, 7 families, 9 genera and 10 species. Out of them

four belongs to order Diptera, two from Hymenoptera, two from Coleoptera, one from Lepidoptera and one from Hemiptera (Table 1). Present studies revealed that, Dipterans were the major floral visitors comprising from two families viz., Syrphidae (*Eristalinus obliquus*, *Eristalis* sp. and *Eristalinus obscuritarsus*) and Calliophoridae (*Chrysomya rufifacies*). They were followed in order of diversity by hymenopterans from two families viz., Apidae (*Apis florea*) and Vespidae (*Allorhynchium metallicum*), Coleopterans from one family viz., Coccinellidae (*Coccinella septempunctata* and *Cheilomenes sexmaculata*) and one Hemipteran to Scutellaridae (*Chrysocoris stollii* Wolff) and one species from one family of Lepidoptera viz., Pieridae (*Pieris* sp.). Out of 10 insects all were top foragers except *Pieris* sp. which was a side forager also.

**Table 1:** Diversity of insect visitors/pollinators of Baheda

Order	Family	Insect Species	IP/IV	Working Behaviour
Hymenoptera	Apidae	<i>Apis florea</i> Fabricius	IP	T
	Vespidae	<i>Allorhynchium metallicum</i> (Saussure)	IP	T
Diptera	Calliophoridae	<i>Chrysomya rufifacies</i> (Macquart)	IP	T
	Syrphidae	<i>Eristalinus obliquus</i> Wiedemann	IP	T
		<i>Eristalis</i> sp.	IP	T
		<i>Eristalinus obscuritarsus</i> (de Meijre)	IP	T
Lepidoptera	Pieridae	<i>Pieris</i> sp.	IV	T and S
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i> Linnaeus	IV	T
		<i>Cheilomenes sexmaculata</i> Fabricius	IV	T
Hemiptera	Scutellaridae	<i>Chrysocoris stollii</i> Wolff	IV	T

\*IP – Insect Pollinator and IV – Insect Visitor

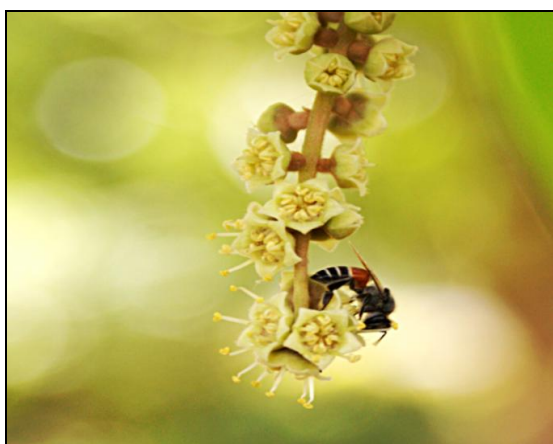
\*T – Top and S- Side



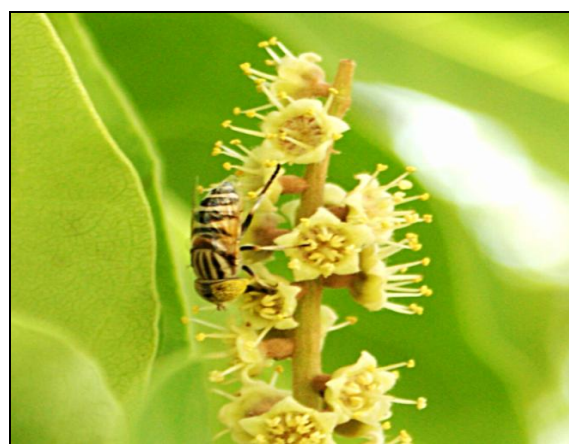
**Fig 1:** Flowers of *Terminalia bellirica*



**Fig 3:** *Cheilomenes sexmaculata*



**Fig 2:** *Apis florea*



**Fig 4:** *Eristalinus obliquus*



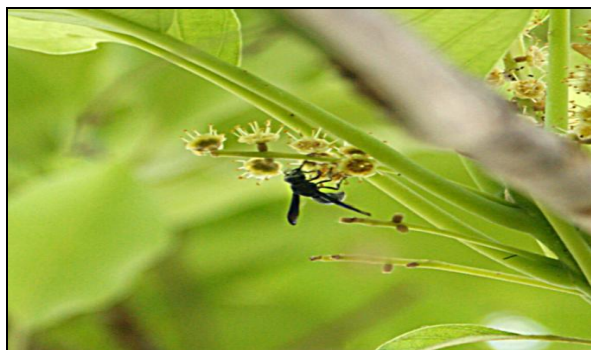


Fig 5: *Allorhynchium metallicum*

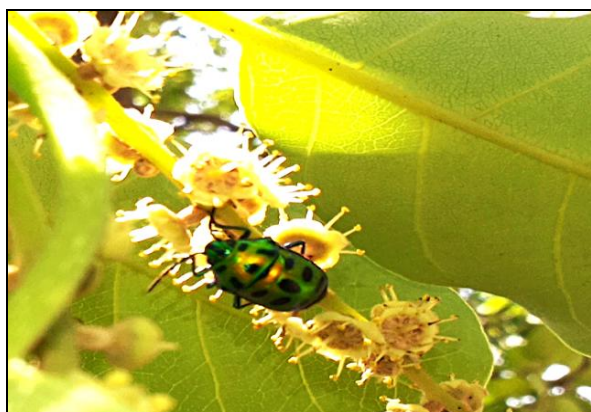


Fig 6: *Chrysocoris stollii*



Fig 7: *Chrysomya rufifacies*

### Discussion

Pollination is a well known social service provided by insects for free to humans but take reward from flowers in the form of nectar and pollen for food and feed. Pollination can't be depending only one on insect species or one type of insect species. This phenomena is pollinator diversity that reduces the risk of lack of pollination in absence of one insect species during critical period of crop flowering. These pollination attributes can be helpful in determining the efficient pollinators which aid in the characterization of best and supplementary pollinators of a crop. Diversity of insect visitors/pollinators on Baheda during April 2014 and 2015 revealed that total of 10 insect species belonging to 7 families of 5 orders were recorded. Among them, Dipterans were the major floral visitor followed by Hymenoptera, Coleoptera, Hemiptera and Lepdoptera. Present findings are in agreement with those of Srivastava, 1993<sup>[12]</sup>, who studied the pollination mechanism of four species of genus *Terminalia* (*T. arjuna*, *T. chebula*, *T. tomentosa* and *T. paniculata*) and revealed that pollination is entomophilous. Also recorded 22 insect

pollinators belong to Lepidoptera, Diptera and Hymenoptera. Similarly, Raju *et al.*, (2012)<sup>[9]</sup> observed that *Terminalia pallida* flowers were foraged during day time by 33 species of insects representing bees, wasps, bugs, flies, butterflies and beetles. Gargi and Sinha, 2017<sup>[4]</sup>, also reported entomophily in both *Terminalia belerica* and *T. chebula* and stated that major flower visitors were *Apis indica*, *Chilomenes sexmaculata*, *Drosophila melanogaster*, *Solenopsis geminata* and *Carpophilus hemipterus*. Findings of their study clearly indicate that honey bee (*Apis indica*) is the chief pollinator. Literature on pollination of Baheda is not available, whatever the literature available related to pollination with similar flowers or tree type is correlated /discussed with the present findings.

### Conclusion

Knowledge of diversity of insect pollinators for a plant is important so that pollination could be made possible in the absence of a particular insect species. Present study provides a vast diversity of pollinators on Baheda (*T. bellirica*) tree flowers belonging to 5 orders, 7 families and 9 genera. Dipterans were observed as major pollinators due to small size of the flowers followed by hymenopterans.

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