

SPECIES COMPOSITION OF APOIDEA VISITORS ON *OCIMUM BASILICUM* L. IN EASTERN RAJASTHAN

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KEY WORDS

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Apidae

ABSTRACT This study details the collection and identification of bee species (Apoidea) those are regularly associated with *Ocimum basilicum* L. in Eastern Rajasthan for the first time. It is quite important in Indian cultural rituals. Basil is an open and insect pollinated plant. Traditionally, basil has been used as a medicinal plant in the treatment of headaches, coughs, diarrhea, constipation, warts, worms and kidney malfunction. This study is based upon collection of bees made during Dec. 2015. The investigation revealed that flowers of *O. basilicum* attracted a total of 16 species of Apoidea in Eastern Rajasthan. Which belong to families: Megachilidae (7 Spp.: *Megachile creusa* Bingham, *Megachile bicolor* Fabricius, *Megachile lanata* Fabricius, *Megachile albifrons* Smith, *Megachile penetrata* Smith, *Megachile* Spp., *Coelioxys sexmaculata* Cameron), Halictidae (4 Spp.: *Nomia curvipes* Fabricius, *Nomioides* Spp., *Lasioglossum vagans* Smith., *Halictus* Spp.), Apidae (4 Spp.: *Amegilla zonata* Linnaeus, *Amegilla dizona* Engel, *Ceratina propinqua* Cameron, *Thyreus histrio* Fabricius). *Andrena* (1 Spp.) *O. basilicum* is a perennial. It is in flower from September to October and the seeds ripen in October. The flowers are hermaphrodite and are usually pollinated by bees. *O. basilicum* plant is sensitive to cold and is best grown in hot & dry condition. It survives annually if a little of frost and humidity prevails.

INTRODUCTION

Honey bees are considered as major pollinators of many crops (Bohart 1972); westerkamp 1991; Williams 1996). But in last few years, diseases in honey bees had created big problem to honey bee

population in several countries (Kluser & Peduzzi 2007), and due to this problem "pollination crisis" might threaten our food supply (Holden 2006; kremen & Ricketts 2000; westerkamp & Gottsberger 2000). Several species of solitary bees also pollinate plants

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crops. Gupta and Yadav (2001) recorded a total of 64 species of bees (Apoidea) on four cultivated crops.

This paper presents the bees which visits *Ocimum Basilicum* L. in eastern Rajasthan. *Ocimum basilicum*, commonly called sweet basil, is a native of Africa and Asia. In India, basil was believed to be imbued with a divine essence. *Ocimum basilicum*. Belongs to the family Lamiaceae, has been used for thousands of years as a culinary and medicinal herb. It acts principally on the digestive and nervous systems, easing flatulence, stomach cramps, colic and indigestion. The leaves and flowering tops are antispasmodic, aromatic, carminative, digestive, galactagogue, stomachic and tonic. They are taken internally in the treatment of colds and influenza, poor digestion, nausea, abdominal cramps, gastroenteritis, migraine, insomnia, depression and exhaustion. Externally, they are used to treat acne, loss of smell, insect stings, snake bites and skin infections. The leaves can be harvested throughout the growing season and are used fresh or dried.

It is well-known medicinal herb commonly grown in India. Its aroma and exposed nectar attracts a large number of insects including pollinators. This plant because of its protandrous property requires pollen vectors for its cross pollination (Ichimura, and Noguchi, 2004). However, very little is known about the pollination mode of this important herb.

Ocimum basilicum is a perennial in tropical climate and is planted as an annual in temperate regions. Basil prefers little competition for sun & water. Basil prefers to be grown in full sun. However, will grow in partial shade. The flowers are hermaphrodite and are pollinated by mainly bees.

Basil also has been reported in herbal publications as an insect repellent. Extracts from the plant are bactericidal and are also effective against internal parasites. It is an Indian medicine for earache, rheumatoid arthritis, anorexia, itching, menstrual disorder and malaria.

MATERIAL AND METHODS

The study was conducted during the time span of years 2015-2016 in eastern Rajasthan. The

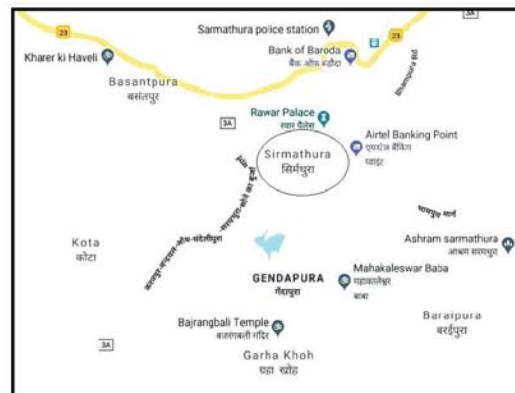
collection of bees was continuously made from 4 selected wild habitats located in the district Dholpur village Sarmathura. Various site of collection were regularly visited during flowering time. The collection of bees was made by sweeping an insect net across the flowers as the collector moved through the field. Collection was made on every day during 15 days of blooming period that normally ranged between August to September or October.

Bees were immediately killed with the help of Benzene fume and were brought to laboratory along with some phenolphthalein powder. They were mounted and properly spread exposing their different parts such as wings, mouth parts and genitalia etc. Bee sample were collected from 8:00 AM up to 6:00 PM on every day of field visit. Most of listed species are present in our wild bee laboratory at Department of Zoology, Jai Narain Vyas University Jodhpur, Rajasthan.

RESULT AND DISCUSSION

A total of 318 bees were collected on *O. basilicum* from various locations in Eastern Rajasthan mainly from Sarmathura town located in Dholpur district. The Sarmathura subdivision is well known for its versatile sandstone.

These were identified belongs to 16 species grouped under 10 genera incoming 04 families of Apoidea (Megachilidae, Halictidae, Apidae and Andrenidae). On a normal sunny and clear day most of bees started their foraging activities in morning around 8:00 - 9:30 A.M. *i.e.* when ample of sunshine



was spread all over the fields. Their population reached its peak at around 12:00 to 2:00 P.M. and most of the bee begun to return to their nest around 3:00 to 5:00 P.M. onwards. Therefore, the plants is noticed as a very useful resource for a rich bee biodiversity in this area as compare to other plant which are also present in this area but maximum number of bee were came to *O. basilicum*.

So far around 650 species of bees have been recorded from India which are identified to 65 Genera grouped under 6 families (Gupta, 2003). Evidently the referred plant has plenty of resources to attract huge number of bees. Following account details the family-wise data with regard to various genera and species found on this crop. Bees of family Colletidae were never found on *O. basilicum*. Only 1 species of family Andrenidae was collected on this crop. They seem to be quite rare in their visits but these were noticed collecting pollens from the flowers.

A total of 7 species of family Megachilidae were collected in a considerable number. They belong to genera *Megachile* Latreille may be referred as top pollinators for this crop. The highest attraction for the nectar and pollens both for *O. basilicum*. Its 10 species have been recorded on this crop during from all over specified area. *Megachile* can be seen staying on flowers of *O. basilicum* for a good time span and slowly returning in reverse pattern loaded with pollens. Member of this family can collect huge amount of pollen grains on their scopa which is prominently located at the ventral surface of the abdomen and bears quite long, dense bristles, more particularly this plant pollinator relationship seem to be more intimate for the species incoming subgenus *Eutricharia* Thomson, *Megachile creusa* and *M. Penetraa* can be ranked at the top with regard to population ratio. Species of *Coelioxys* Latreille (It is well known cleptoparasitic of nest of genus Anthophorinae and *Megachile*) were often seen tracking behind other bees and were rare visitors to the flowers for the nectar. They lack pollen collecting scopa hence are incapable of pollen collection. Circumstantially, *Coelioxys* lay their eggs on the provision deposits of host bees collected for their own off springs.

Four species belonging to four genera of family Halictidae those belonging to genera *halictus* Latreille, *Nomia* Latreille, *Nomioides* Schenck and *Lasioglossum* Curtis constituted the bulk of population on the flowerings. They had enough affection for the nectar and pollen both therefore a good number of these minute bees were seen working on the flowers from sunrise to sunset.

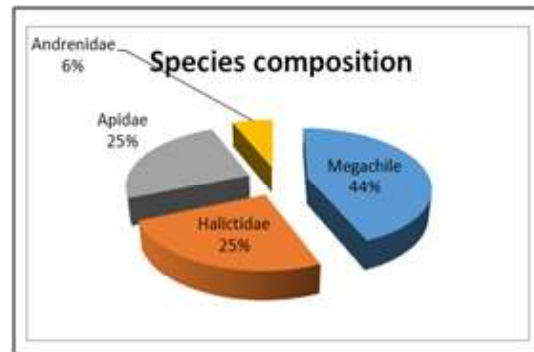


Figure 2. Different Apoidean bee Species observed on *Ocimum basilicum* L. in Eastern Rajasthan during 2015-16

A total of 4 species of family Apidae were collected from this crop. They belong to genera *Ceratina* Latreille, *Amegilla* Friese, seem to have good affection for *O. basilicum*. Genus *Thyreus* Panzer includes cleptoparasitic bees just like species of genus *Coelioxys* Latreille of Megachilidae, they also lack pollen collecting apparatus therefore, and they are incapable of collecting pollen grains. These were often seen tracking the *Amegilla* female (Batra, 1977).

Honey bees have been credited with pollination services that are actually performed by other species (Parker *et al.* 1987). Since the taxonomic revision of family Apidae (Michener, 2000 & 2007), number of genera in this family have been considerably increased. Although the two native species of genus *Apis* were observed hanging on flowers on every sunny day as whole time visitors but they were interested in drinking nectar only.

We can conclude from the above table - 1 that which of the species may be consider quite effective pollinator on *O. basilicum* further studies are required

Table 1: Apoidean Species on *Ocimum basilicum* L. in Eastern Rajasthan during 2015-16

S. No.	Family	Species	Activity Periodicity	Population Density	Attracting Resource	
					Nectar	Pollen
	Halictidae					
1		<i>Nomia curvipes</i> Fabricius, 1793	8:00AM-3PM	+++	N	P
2		<i>Lasioglossum vagans</i> Smith, 1857	8:00AM-3PM	++	N	P
3		<i>Halictus sp.</i>	8:00AM-3PM	+	N	P
4	Megachilidae	<i>Nomioides sp.</i>	8:00AM-3PM	+++	N	P
5		<i>Megachile bicolor</i> Fabricius, 1781	8:00AM-3PM	++	N	P
6		<i>Megachile lanata</i> Fabricius, 1775	8:00AM-3PM	+++	N	P
7		<i>Megachile creusa</i> Bingham, 1898	8:00AM-3PM	++	N	P
8		<i>Megachile albifrons</i> Smith, 1853	8:00AM-3PM	+	N	P
9		<i>Megachile penetrata</i> Smith, 1879	8:00AM-3PM	+	N	P
10		<i>Megachile sp.</i>	8:00AM-3PM	+	N	P
11		<i>Coelioxys sexmaculata</i> Cameron, 1897	8:00AM-3PM	++	N	-
	Apidae					
12		<i>Thyreus histrio</i> Fabricius, 1775	8:00AM-3PM	++	N	-
13		<i>Ceratina propinqua</i> Cameron, 1897	8:00AM-3PM	+++	N	P
14		<i>Amegilla jonata</i> Linnaeus, 1758	8:00AM-3PM	+	N	P
15		<i>Amegilla dizona</i> Engel, 2009	8:00AM-3PM	++	N	P
	Andrenidae					
16		<i>Andrena sp.</i>	8:00AM-3PM	+	N	P

to make comparison in efficiencies for the referred act in between non-Apis and Apis species as well as among themselves. Several studies were made where majority of the estimates on crop yield were derived primarily for honey bee pollination crops (Robinson,

1989, 1992) on the other hand very few estimated are available on the value of non-Apis pollination (Cevin, 1983; Currie et al. 1990). Authors suggest that identical studies should be made by pollination and bee biologists to explore further possibilities of

pollinator bees towards intensive and more effective pollination on wild and cultivated crop. Hence, if *O. basilicum* is planted near the traditional Rajasthan agricultural fields, it can attract pollinating bees for enhancing crop productivity.

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