

# A Preliminary Study on Insect Pollinators in Peach Crop in Different Geographical Zones of Himachal Pradesh

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**Abstract:** *Pollination services are critical for food production and act as an integrated system that connects vegetation of earth, wildlife and human welfare. The pollination process primarily includes a number of animal pollinators, of which the insect pollinators performs a major role. Studies on diversity and distribution of insect pollinators on peach flowers was made by collecting the insect visitors from different localities of Himachal Pradesh i.e. Mashobra (2146m), Summer Hill (2100m), Naldehra (1887m), Jatoli (1464m), Kandaghat (1425m), Hamirpur (786m) and Jaladi (508m). Present study showed that Peach flowers were visited by 23 species of insect pollinators which belonged to 4 orders and 9 families. Among all insect pollinators species collected from peach flowers *Apis cerana*, *Episyrphus balteatus* and *Melanostoma orientale* were most frequent visitors.*

**Keywords:** diversity, distribution, insect pollinators, peach, Himachal Pradesh

## 1. Introduction

Pollination is necessary for agriculture, horticulture and other flowering plants for seed production (Pardo and Borges, 2020). Different types of flowering plants have special characteristics such as bright colour, attractive scent and nectar glands to attract a particular pollinator. In terrestrial ecosystem 5% flowering plants are self pollinated, 10% pollinated by wind and 85% of the flowering plants depends on animal pollinators for pollination process (Wilson, 1999). There are different types of insect pollinators like bees, wasps, butterflies, moths and beetles that help in pollination. These belong to orders Hymenoptera, Diptera, Lepidoptera, Coleoptera and Thysanoptera. Among of these, hymenopterans are very active pollinators and responsible for very efficient and effective pollination in many crops ( De Grandi Hoffman and Watkins, 2000). Pollinators act as indicator of environmental change, agriculture activity and air pollution (Nakamura, 2011). But, these days pollinators diversity decrease abruptly due to many human activities, climate change, pollution, use of pesticides and temperature. Pollinators abundance and richness have decreased in many parts of the world because many natural resources have been modified anthropogenically.

## 2. Materials and Methods

Studies on diversity and distribution of various insect pollinators of peach crop was made by collecting the flower visitors from different sites viz., i. e. Mashobra (Shimla), Summer Hill (Shimla), Naldehra (Shimla), Jatoli (Solan), Kandaghat (Solan), Hamirpur and Jaladi (Hamirpur) (Table 1). Different insect pollinators were collected during the flowering season and were killed, stretched and preserved for identification. Pollen grains were identified by comparing them with pollen removed from flowers harvested from the crop. The study was made by selecting trees at random, on basis of their size, flowering stage and number of branches. The observations were started 2 to 3 days after the flowering started and recorded during 0900-1000 hrs, 1200-1300 hrs and 1500-1600 hrs (Southwood, 1978). Insect pollinators were collected using an insect net or forceps. Collected specimens were killed with the help of killing bottles and stretched on stretching boards and thermocol sheets. Identification was done with the help of earlier records of Biodiversity and Entomology Research laboratory, Department of Biosciences, Himachal Pradesh University, Shimla, High Altitude Regional Centre, Zoological Survey of India, Solan, and Zoological Survey of India, Kolkata.

**Table 1:** Physiographic details of different sites selected for the collection of insect pollinators from Peach flowers

S. No.	Locality	District	Altitude (Meter)	Latitude (North)	Longitude (East)
1.	Mashobra	Shimla	2146m	31°-12'96	77°-22'83
2.	Summer Hill	Shimla	2100m	31°-11'46	77°-13'99
3.	Naldehra	Shimla	1887m	31°-18'39	77°-18'69
4.	Jatoli	Solan	1464m	30°-87'96	77°-12'66
5.	Kandaghat	Solan	1425m	30°-97'02	77°-10'54
6.	Jaladi	Hamirpur	508m	31°-77'85	76°-34'44
7.	Hamirpur	Hamirpur	786m	31°-68'62	76°-52'13

## 3. Results and Discussion

A variety of factors, including geographic distribution, climatic conditions, the availability of natural locations for

nesting and hibernation, and the relationships between plant and insect species influence the diversity and dispersion of different insect visitors during the bloom of various horticultural crops. Study showed that Peach flowers were

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visited by 23 species of insect pollinators belonging to 4 orders and 9 families. Among all insect species, 7 species belongs to Hymenoptera, 9 to Diptera, 6 to Lepidoptera and only 1 species reordered from Coleoptera (Table 2). Order Hymenoptera was represented by 2 families i.e. Apidae and Vespidae. Family Apidae represented by 4 species i.e. *Apis cerana*, *Apis dorsata*, *Bombus haemorrhoidalis* and *Xylocopa tenuiscapa*, and family Vespidae includes *Vespa velutina auraria*, *Polistes delhiensis* and *vespula flaviceps* (Table 2).

Among all dipterans insect pollinators, 6 species belongs to family Syrphidae i.e. *Episyrphus balteatus*, *Eristalis tenax*, *Eristalis cerealis*, *Eristalinus paria*, *Eristalis himalayensis* and *Melanostoma orientale*, and each of Calliphoridae, Muscidae and Asilidae represented by only one species i.e. *Calliphora vomitoria*, *Morellia* sp. and *Neoitamus graham*. Six species of lepidopterans were belonged to 2 families i.e. Pieridae and Nymphalidae. Family Pieridae were represented by 3 species i.e. *Vanessa indica*, *Aglais caschmirensis* and *Neptis hylas* whereas *Pieris canidia indica*, *Pieris brassicae* and *Gonepteryx rhamni nepalensis* belongs to family Nymphalidae. Only one species of coleopteran was observed i. e. *Coccinella septempunctata* of family Coccinellidae (Table 2).

Different investigators on different temperate fruit crops have reported different number of pollinators. Hong *et al.* (1989) revealed that pear, peach and apple flowers in Korea were visited by 88 insect pollinators species which were belonged to 5 orders and 40 families. Nyeki *et al.* (2000) studied the nectar production, foraging behavior of bees, fruit set and effect of bee pollination on 16 varieties of peach in the year 1998 and 1999 at Siofok and Szatymaz, Hungary.

Chaudhary and Mehta (2005) made an effort to study the floral biology of peach and concluded that flowering period in peach was very short and lasted for only few days. Dar *et al.* (2016) studied the diversity and richness of insect pollinators on peach and observed highest species richness at Budgam (46) followed by Pulwama (43) and Srinagar (35).

**Table 2:** Systematic list of insect pollinators of Peach from different areas of Himachal Pradesh

Order	Family	Fauna
Hymenoptera	Apidae	<i>Apis cerana</i> Fabricius <i>Apis dorsata</i> Fabricius <i>Bombus haemorrhoidalis</i> Smith <i>Xylocopa tenuiscapa</i> Westwood
	Vespidae	<i>Vespa velutina auraria</i> Smith <i>Polistes delhiensis</i> Das and Gupta <i>Vespula flaviceps</i> Smith
Diptera	Syrphidae	<i>Episyrphus balteatus</i> De Geer <i>Eristalis tenax</i> Linnaeus <i>Eristalis cerealis</i> Fabricius <i>Eristalinus paria</i> Bigot <i>Eristalis himalayensis</i> Brunetti <i>Melanostoma orientale</i> Wiedemann
	Muscidae	<i>Morellia</i> sp.
	Calliphoridae	<i>Calliphora vomitoria</i> Linnaeus
	Asilidae	<i>Neoitamus graham</i> Joseph and Parui
Lepidoptera	Nymphalidae	<i>Vanessa indica</i> Herbst <i>Aglais caschmirensis</i> Kollar <i>Neptis hylas</i> Moore
	Pieridae	<i>Pieris canidia indica</i> Evans <i>Pieris brassicae</i> Linnaeus <i>Gonepteryx rhamni nepalensis</i> Doubleday
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i> Linnaeus

**Table 3:** Diversity and distribution of different insect pollinators visiting Peach flowers at different areas of Himachal Pradesh

S.No.	Insect Species	Mashobra	Summer Hill	Naldehra	Jatoli	Kandaghat	Jaladi	Hamirpur
<b>Order: Hymenoptera</b>								
1.	<i>Apis cerana</i>	+	+	+	+	+	+	+
2.	<i>Apis dorsata</i>	+	+	+	+	+	+	+
3.	<i>Bombus haemorrhoidalis</i>	+	+	+	+	+	+	+
4.	<i>Xylocopa tenuiscapa</i>	+	+	+	+	+	+	+
5.	<i>Vespa velutina auraria</i>	+	-	+	+	+	-	-
6.	<i>Polistes delhiensis</i>	+	+	+	+	+	+	+
7.	<i>Vespula flaviceps</i>	-	-	+	-	-	-	-
<b>Order: Diptera</b>								
8.	<i>Episyrphus balteatus</i>	+	+	+	+	+	+	+
9.	<i>Eristalis tenax</i>	+	+	+	+	+	+	+
10.	<i>Eristalis cerealis</i>	+	+	+	+	+	+	+
11.	<i>Eristalinus paria</i>	+	+	+	+	+	+	+
12.	<i>Eristalis himalayensis</i>	+	+	+	+	+	+	+
13.	<i>Melanostoma orientale</i>	+	+	+	+	+	+	+
14.	<i>Morellia</i> sp.	+	+	+	+	-	+	-
15.	<i>Calliphora vomitoria</i>	+	+	+	+	+	-	-
16.	<i>Neoitamus graham</i>	+	+	+	+	+	-	-
<b>Order: Lepidoptera</b>								
17.	<i>Vanessa indica</i>	+	+	+	+	+	-	-
18.	<i>Aglais caschmirensis</i>	+	+	+	+	+	+	+
19.	<i>Neptis hylas</i>	+	-	+	-	+	-	-
20.	<i>Pieris canidia indica</i>	+	+	+	+	+	+	+
21.	<i>Pieris brassicae</i>	+	+	+	+	+	+	-
22.	<i>Gonepteryx rhamni nepalensis</i>	+	+	+	+	+	+	-
<b>Order: Coleoptera</b>								
23.	<i>Coccinella septempunctata</i>	+	+	+	+	+	+	+



*Eristalis tenax**Aglais caschmirensis**Apis dorsata**Apis cerana**Pieris brassicae*

Present findings are accordance with Randhawa *et al.* (1963) who found honeybees were the most abundant pollinator of peaches. Ko *et al.* (1977) analyzed the diversity of insect pollinators visiting peach, apple and pear and collected 26 species of insect pollinators under three orders. These results also showed similarity with the previous studies of various researchers who studied the role of insect pollinators on different fruit crops from various regions of the country. Chang *et al.* (2001) found *Apis cerana* and *Apis mellifera* were most frequent visitors on plum. Similarly, Williams (2002) reported that many fruit crops were pollinated by wild bee species such as solitary bees, *Bombus* bees and many flies. Rasheed *et al.* (2015) showed that honeybees were most abundant pollinators on sunflowers. Besides hymenopterans, Peach was pollinated by many dipterans species which were accordance to the findings of Ricciardelli and Quaranta (1992), they stated that dipterans species played important role in many stone fruit pollination. Present investigation revealed that among all dipterans, *Episyrphus balteatus* was most abundant pollinator of *Prunus persica*. These findings are in close agreement with the earlier studies of Rai *et al.* (2017) who reported *Episyrphus balteatus* as important pollinator of Litchi flowers. One coleopteran species i.e. *Coccinella septempunctata* belonging to family Coccinellidae was also reported on *Prunus persica*. In a similar way, Sharma (2000) observed that *Coccinella* species played important role in pollination of cherry and plum in Shimla hills.

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**Conflict of Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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