

**Research Article****A preliminary study of insect pollinators on apple in Seobagh, Kullu district of Himachal Pradesh**

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**Abstract**

In flowering plants, pollination is the process by which pollen grains are transferred from the male anther to the female stigma. Fertilization and the establishment of fruit or seeds depend on pollination. Animal pollination is necessary for plants, and insects, birds, and bats are important pollinators. Many fruits, nuts, and oilseeds are among the crops that depend on or benefit from animal-mediated pollination. One of the most commercially significant crops pollinated by insects is apples. Apples need pollen transfer from another "polliniser" cultivar in order to bear fruit because they are self-incompatible. The present investigation on insect pollinators diversity on apple in Seobagh village of Kullu district of Himachal Pradesh was conducted in the Department of Biosciences, M. L. S. M. College, Sundernagar and Seobagh (Kullu), Himachal Pradesh during March-April, 2025. Handpicking, fluorescent pan trap and sweep net capture methods were used to collect the diversity of insect visiting apple orchards. Insect diversity showed that apple flowers were visited by 34 insect belonging to 27 genera under 13 families and 5 orders. Out of which 12 species belonged to Hymenoptera, 10 from Diptera, 8 from Lepidoptera 3 from Coleoptera and 1 to order Thysanoptera. In addition to Hymenopterans, Dipterans were crucial pollinators of insects. Pollinator-dependent fruit crops often yield more than self-pollinating crops. Agro-ecosystem biodiversity is enhanced by the presence of a variety of pollinator species.

**Key words:** Pollination, apple, insect pollinators, honey bees, Kullu, Himachal Pradesh

## Introduction

According to MacInnis *et al.* [9], pollinators are essential to the agricultural production process since plants depend entirely on vectors to spread their pollen during cross-pollination. An important factor in raising crop productivity and enhancing the quality of fruit and seeds is insect cross-pollination. According to Gupta and Gupta [7], the orders Coleoptera, Lepidoptera, Diptera, Thysanoptera, and Hymenoptera comprise the majority of insect pollinators. The great majority of pollinator species are natural insects, such as bee species, butterflies, moths, wasps, beetles, thrips, and some fly species. With 20,000 species known to exist worldwide, including 5,000 in the Neotropics, bees are the primary pollinators of both wild and cultivated plant species because of their reliance on floral resources like pollen and nectar [12].

The western honey bee (*Apis mellifera*) is the most common pollinator species for crops globally [5] and offers highly valued pollination services for a wide range of agricultural crops [1]. More than 80 per cent of all pollination activities are carried out by insects, and bees account for almost 80 per cent of all insect pollination, making them the best pollinators [13]. Bee-pollinated crops provide over one-third of the human food, and pollination is valued at 143 times the amount of honey produced [11]. Because of their efficiency and accessibility, honey bees are regarded as important pollinators [1]. Honey bees and other wild pollinators also participate in cross-pollination in apples. Considering that practically every apple variety is incompatible with itself [6].

Apples (*Malus domestica*) account for 4.72 million hectares of farmed land worldwide, making them one of the most commercially significant insect-pollinated crops [3]. For apples to bear fruit in marketable quantities, pollen must be transferred from another "polliniser" cultivar

because they are usually self-incompatible [2]. One of the most significant horticultural activities in India is the production of apples, which are mostly grown in the Himalayan states of Uttarakhand, Jammu & Kashmir, and Himachal Pradesh. Due to their moderate environment, these areas are perfect for growing apples, which is vital to the farming community's lives and the states' economic growth.

## Material and Methods:

Study on diversity of various insect visitors to apple crop was made by collecting the flower visitor in Seobagh, Kullu (1278m amsl), Himachal Pradesh (Figure 1a,b). The collection was conducted during March-April, 2025. The diversity of insect visitors on apple was recorded by different sampling method i.e hand picking, fluorescent pan traps and sweep net capture (Figure 2). Pan traps of fluorescent yellow, blue and white colour were used and traps were placed prior to 0900 h in the morning and removed after 1500 h. The collected insect species were preserved in 70 per cent ethanol for their identification as dry specimen. Insect visitors were got identified by morphologically and also by available literature.

## Result and Discussion

The diversity of insect pollinators visiting apple flower from Seobagh, Kullu, Himachal Pradesh during 2025 were collected by different sampling methods (hand picking, fluorescent pan traps and sweep net capture). A total number of 34 insects belonging to 27 genera under 13 families and 5 order was recorded. Hymenopteran visitor belongs to 5 families namely Apidae (6) Andrenidae (1), Halictidae (1), Vespidae (3), Formicidae (1). *A. cerana*, *A. mellifera*, *A. dorsata*, *C. binghami*, *Xylocopa* sp. and *Bombus* sp. represented the family Apidae. Andrenidae (*Andrena* sp.1),



Figure 1a,b: General view of apple orchard from different location of Seobagh, Kullu, Himachal Pradesh

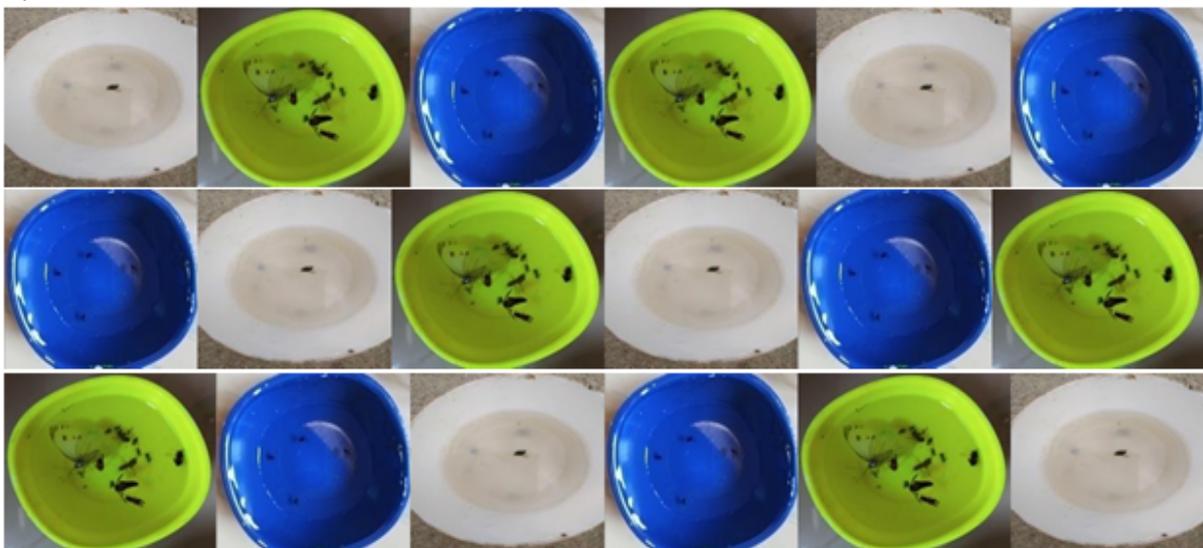


Figure 2: Fluorescent pan trap (white, blue, yellow)

Halictidae (*Halictus* sp.1), Vespidae (*Vespa* sp.1, *Vespa* sp.2 and *Polistes* sp.), Formicidae (*Formica* sp.). Dipteran visitors belongs to 2 families, 9 species were from family Syrphidae (*Episyrphus balteatus*, *Sphaerophoria Indiana*, *Eristalis tenax*, *Eristalis* sp., *Eristalode* sp., *Ischiodon* sp., *Melanostoma* sp., *Eupeodes* sp. and *Syrphis* sp.), Muscidae (*Musca* sp.), coleoptera had 3 specimens belonging to 1 family Coccinellidae (*Coccinella septempunctata*, *Coccinella* sp. and *Hippodamia variegata*). Lepidopterans had 8 specimens belonging to 4 families Pieridae (*Pieris canidia indica*, *Colias electo fieldi*, and *Pieris* sp.), Nymphalidae (*Vanessa cardui*, *V. cashmirensis*, *Junonia orithyia*), Danaidae (*Danaus chrysippus*), Papilionidae (*Papilio machaon*). Thripidae (*Thrips* sp.) belongs to order Thysanoptera. Among the insect sampled by different methods, order Hymenoptera was the most dominant followed by Diptera, Lepidoptera, Coleoptera and Thysanoptera and the result also showed that *A. cerana* was the most abundant species on apple bloom followed by *A. mellifera*, *Bombus* sp., *Ceratina binghami*, *Xylocopa* sp., *Episyrphus balteatus*, *Sphaerophoria Indiana*, *Eristalis tenax*, *Eristalis* sp. *Eristalode* sp. (Table1).

**Table 1: Diversity of insects pollinators visiting plum flowers from Seobagh, Kullu during March-April, 2025**

Order	Family	Scientific Name
Hymenoptera	Apidae	<i>Apis cerana</i>
		<i>Apis dorsata</i>
		<i>Apis mellifera</i>
		<i>Bombus</i> sp.
		<i>Ceratina binghami</i>
		<i>Xylocopa</i> sp.
	Andrenidae	<i>Andrena</i> sp.
	Halictidae	<i>Halictus</i> sp.
	Vespidae	<i>Vespa</i> sp.1
		<i>Vespa</i> sp.2
<i>Polistes</i> sp.		
Formicidae	<i>Formica</i> sp.	
Diptera	Syrphidae	<i>Episyrphus balteatus</i>
		<i>Sphaerophoria indiana</i>
		<i>Eristalis tenax</i>
		<i>Eristalis</i> sp.
		<i>Eristalode</i> sp.
		<i>Ischiodon</i> sp.
		<i>Melanostoma</i> sp.
		<i>Eupeodes</i> sp.
	<i>Syrphis</i> sp.	
Muscidae	<i>Musca</i> sp.	
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i>
		<i>Coccinella</i> sp.
		<i>Hippodamia variegata</i>
Lepidoptera	Pieridae	<i>Pieris canidia indica</i>
		<i>Pieris</i> sp.

		<i>Colias electo fieldi</i>
	Nymphalidae	<i>Vanessa cardui</i>
		<i>Vanessa cashmirensis</i>
		<i>Junonia orithyia</i>
	Danaidae	<i>Danaus chrysippus</i>
	Papilionidae	<i>Papilio machaon</i>
Thysanoptera	Thripidae	<i>Thrips sp.</i>

In different temperate fruit crops, different researchers have recorded different amounts of pollinators. For example, Seobagh and Larankelo apple trees were pollinated by insects, and Sharma *et al.* [14] identified *A. cerana* as a crucial pollinator in apple orchards. Gardner conducted an investigation of apple orchards in the Finger Lakes region of New York State and found that honey bees are an effective pollinator of apple orchards. They collected 31 species of bees, 14 of which belong to the *Andrena* genus. Garcia and Minarro [4] conducted a related survey in which they looked at the groundcover in a non-cider apple orchard and found that a variety of insects, mostly belonging to the orders Hymenoptera (70 per cent) and Diptera (25 per cent), frequently visited flowering plants. Some researchers used Hungarian apple orchards to study pollinator communities. Pollinators, including hover flies, honey bees, and wild bees, were observed during the apple tree flowering season. According to their findings, wild bees were the most prevalent pollinator. When Mahmood *et al.* [10] studied apple orchards in Murre, Pakistan, they found 18 distinct pollinator species from 16 genera and 7 groups. Using three distinct orchards viz., Seobagh (Kullu), Mashobra (Shimla), and Nauni (Solan), Kaundil and Thakur [8] investigated the range of insects that visit apple plantings. Insects from 11 families and 5 orders totaled 34 species. *A. cerana*, *A. mellifera* and *E. balteatus* were the most common.

### Conclusion

In conclusion, it is evident from the studies that pollinators play a major role in boosting apple fruit yield. It supports ecosystems and biodiversity. Since honey bee populations vary, introducing hive bees to an apple orchard will guarantee a higher harvest of apple fruit.

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