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Research Article

Diversity of insect pollinators on apple in Nihri village of Mandi district of Himachal Pradesh

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Abstract

Fertilization cannot occur without pollination. Without pollination, fertilization and fruit production are impossible. The movement of pollen grains from the male anther to the female stigma of flowering plants is known as pollination. Animals such as birds, bats, and insects are necessary for pollinating plants, with insects playing a large part. Apples need cross-pollination to bear fruit since they are self-incompatible. The present investigation on "Insect pollinator diversity on apple in Nihri village of Mandi district of Himachal Pradesh" was conducting in the Department of Biosciences, M.L.S.M. College, Sundernagar and Nihri, Mandi, Himachal Pradesh during March-April, 2025. Insect pollinators collected by using hand picking, sweep net capture and fluorescent pan traps during March-April, 2025. The studies revealed 34 species of insects belonging to 5 order and 13 families of class insect. Of these 12 species belonged to Hymenoptera, 10 from Diptera, 8 from Lepidoptera, 3 from Coleoptera and 1 from Thysanoptera. Honey bees were the most prevalent and regular visitors among the insects sampled using various techniques. In addition to Hymenopterans, Dipterans are a significant category of pollinators of insects. For apple trees to successfully reproduce, pollination is essential. In apple orchards, pollination services directly affect the quality and consistency of production. Healthy landscapes, low pollution levels, and excellent habitat connectivity are often reflected in a rich and stable pollinator population.

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

Introduction

Fertilization and fruit/seed set are dependent on pollination. Pollination is necessary for fertilization and fruit production. Approximately 85 per cent of flowering plant species worldwide are thought to depend on animals, mostly insects, for pollination [18]. Birds, bats, insects, and other animals are necessary for pollinating plants, with insects being the primary pollinator [1]. An important factor in raising crop productivity and enhancing the quality of fruit and seeds is insect cross-pollination [10]. Global food security depends heavily on insect pollinators [16]. Insect-pollinated crops make about one-third of our total diet, either directly or indirectly, according to McGregor [15].

One of the most common temperate fruits in Himachal Pradesh, apples are mostly grown in the country's humid temperate regions. The districts of Shimla, Kullu, Chamba, Lahul Spiti and Kinnaur are the main producers of apples in Himachal Pradesh. It has become the most important cash crop in recent years, and it alone makes up 46 per cent of the entire area planted to fruit crops and 76 per cent of the total amount of fruit produced. Insect pollinators are essential to the production of apples [3,5].

For cross-pollination, most apple cultivars are self-incompatible and rely nearly exclusively on insects, particularly bees [15,7]. In addition to pollination from local wild bees, it is customary to provide managed honey bees to orchards because the western honey bee, *A. mellifera*, is the most significant pollinator species for crop pollination overall [8].

According to Bosch and Blas [2], certain wild bee species, including *Osmia*, *Andrena* and *Bombus*, have been seen to visit flowers at lower temperatures and deposit more pollen loads than honey bees. Pollen loads with a high percentage of suitable fruit pollen have also been seen in hover flies (Syrphidae) [13]. Lepidoptera, Hymenoptera and Diptera are the three groups that comprise the majority of pollinating insects [11]. Another possible pollination vector for apples is the buff-tailed bumble bee (*Bombus terrestris*) [9], which visited roughly 40 flowers/minutes in apples.

Material and Methods

Study on diversity of various insect visitors to apple crop was made by collecting the flower visitor in Nihri, Mandi, Himachal Pradesh (Figure 1a,b).

The orchard had many trees belonging to Golden delicious, Royal delicious, Super chief, Gala and Red golden varieties. 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, sweep net capture and fluorescent pan traps (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 (Figure 3).

Insect visitors were got identified by morphologically and also by available literature.

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

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

Figure 3: Traps placed in fields

Result and Discussion

The diversity of insect pollinators visiting apple flower from Nihri, Mandi, Himachal Pradesh during 2025 were collected by different sampling methods (hand picking, sweep net capture and fluorescent pan traps). 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), 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 Coccinelidae (*Coccinella septempunctata, Coccinella* sp. *and Hippodamia variegate*).

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 and Figure 4).

Table 1: Diversity of insects pollinators visiting plum flowers from Nihri, Mandi during March-April, 2025

Order	Family	Scientific Name
Hymenoptera	Apidae	*Apis cerana*
		Apis dorsata
		Apis mellifera
		Bombus sp.
		Ceratina binghami
		Xylocopa sp.
	Andrenidae	*Andrena* sp.
	Halictidae	*Halictus* sp.
	Vespidae	*Vespa* sp.1
		Vespa sp.2
		Polistes sp.
	Formicidae	*Formica* sp.
Diptera	Syrphidae	*Episyruphus balteatus*
		Sphaerophoria indiana
		Eristalis tenax
		Eristalis sp.
		Eristalode sp.
		Ischiodon sp.
		Melanostoma sp.
		Eupeodes sp.
		Syrphis sp.
	Muscidae	*Musca* sp.
Coleoptera	Coccinelidae	*Coccinella septempunctata*
		Coccinella sp.
		Hippodamia variegate
Lepidoptera	Pieridae	*Pieris canidia indica*
		Colias electo fieldi
		Pieris sp.
	Nymphalidae	*Vanessa cardui*
		Vanessa cashmirensis
		Junonia orithyia
	Danaidae	*Danaus chrysippus*
	Papilionidae	*Papilio machaon*
Thysanoptera	Thripidae	*Thrips* sp.

Figure 4: Important Hymenopteran and Dipteran insect visitor of apple flower

Apis cerana

Apis mellifera

***Bombus* Sp.**

Sphaerophoria indiana

***Xylocopa* sp.**

***Eristalis* sp.**

Episyrphus balteatus

Sphaerophoria indiana

***Eristalode* sp.**

Various researchers have reported varying numbers of pollinators on various temperate fruit crops. As an illustration, Sharma *et al*. [17] noted that apple trees in Seobagh and Larankelo were pollinated by insects and He found *A. cerana* a key pollinator in apple orchard. Honey bees are an efficient pollinator of apple orchards, according to Gardner [7] analysis of apple orchards in New York State's Finger Lakes region. Of the 31 bee species they gathered, 14 are members of the *Andrena* genus. In a related survey, Garcia and Minarro [6] examined the groundcover in a non-cider apple orchard and discovered that a wide range of insects, primarily from the orders Hymenopterans (70 per cent) and Diptera (25 per cent), frequent flowering plants. Pollinator communities were investigated in Hungarian apple orchards by Foldesia *et al*. [4]. During the apple trees flowering season, pollinators such as honey bees, wild bees, and hover flies were spotted.

They found that the most common pollinator was wild bees. Similar findings were made by Mahmood *et al*. [14], who recorded 18 different pollinator species from 16 genera and 7 families while studying apple orchards in Murre, Pakistan. Kaundil and Thakur [12] examined the variety of insects that visit apple crops in three different orchards: Seobagh (Kullu), Mashobra (Shimla), and Nauni (Solan).34 species of insects from 11 families and 5 orders were identified. *A. mellifera*, *A. cerana* and *E. balteatus* were the most prevalent.

Conclusion

In conclusion the studies clearly show that the role of pollinators in increasing fruit yield of apple is significant. It support biodiversity and ecosystem. As population of honey bees fluctuates, adding hive bees to apple orchard will ensure increased apple fruit yield.

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Conflicts of interest
The author declares no conflicts of interest.

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