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Popular Article

The Role of Insect Pollinators in Agriculture

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Abstract

A vital stage in the sexual reproduction of flowering plants is the transport of pollen grains to the stigma of the plant gynoecium; this process is known as pollination. Different pollinating agents involved in this process can be wind, water, animals such as birds, insects, bats and even plants. The majority of flowering plants depend on animals to transfer pollen. Out of the total, approximately 75 % of global food crops depend upon pollination. Insect pollinators like bees, butterflies and flies are essential for plant reproduction and ecosystem health. Their diversity enhances ecosystem resilience by supporting plant variety and productivity. A decline in pollinator diversity can lead to lower crop yields and weakened ecosystem resilience. Conservation efforts aim to protect diverse habitats, adopt agroecological practices, and increase public awareness of the importance of pollinators.

Keywords – Pollination, pollinators, insects, diversity, conservation.

Introduction

The process of pollinating flowers involves moving pollen from their male to female sections in order to aid in fertilization and reproduction. Most cultivated and wild plants rely on animal pollinators to transfer pollen, although self-pollination or wind pollination also plays a significant role (Chumacero de Schawe *et al.*, 2018). Pollinators are insects, such as bees, butterflies, flies, beetles, and moths, are essential to the reproduction of plants and the health of ecosystems. Each pollinator species has a unique method of transferring pollen. For example, bees collect pollen on their fuzzy bodies, while butterflies use their long tongues to reach the depths of flowers. Insect pollinators are vital for ecosystems and agriculture, but their populations are declining due to various threats. So, it is essential

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to protect insect pollinators (Maggi *et al.*, 2024).

Diversity of Pollinators

While the majority of plant species (about 90%) rely on animals to transmit pollen, certain species depend on wind or water currents. There are around 200,000 animal species that pollinate plants. Out of them, one thousand are invertebrates, which include moths, bees, flies, beetles, and butterflies, and the remaining 1,000 are vertebrates, such as birds, bats, and tiny mammals (Ollerton *et al.*, 2011). While other pollinator species visit less than 6% of crop variations, bees and flies pollinate nearly 90% of the major plant species in the globe.

- 1. Bees:** *Apis mellifera* and *Apis cerana*, the western and eastern honey bee species, as well as a few solitary bees, bumblebees, and stingless bees, are controlled. Nonetheless, the majority of the 20,077 species of bees that are known to exist today are wild and uncontrolled (Michener, 2007). Bumblebees have the ability to shake themselves to expel pollen from flowers. After that, they use their hairy bodies to comb pollen into tiny baskets on their legs known as corbiculae. Buzz pollination is the name given to this process. Solitary bees gather pollen to feed their young, much like honeybees and bumblebees do, but they don't gather it in pollen baskets. Nonetheless, they collect pollen on a brush-like device called a scopa, which is either on their legs or beneath them.
- 2. Hoverflies:** Over 70% of animal-pollinated wildflowers and at least 72% of the world's food crops are visited by hoverflies, who are an abundant source of pollination. These extremely migratory insects can cover hundreds of kilometers in a single day and transport pollen over open waters over a distance of more than 100 kilometers. Certain plants employ misleading strategies to draw pollinators.
- 3. Wasps:** Given their high energy requirements, wasps are gregarious insects that frequently forage for nectar from flowers. They are nonetheless significant pollinators even though they lack the hair that bees have, which makes pollen less likely to adhere to them.
- 4. Moths:** Most moths are nocturnal, so their movements from flower to flower often go unnoticed in the dark. Some night-flying moths are attracted to pale, tubular, and scented flowers like honeysuckle. As moths reach into these flowers for nectar, pollen can stick to their furry bodies, long tongues, and faces.
- 5. Butterflies:** Due to their lower species diversity, they are less crucial for pollination than other insects. However, they are abundant in florally diverse meadows and chalk downlands.



6. **Beetles:** For millions of years, beetles have been pollinating flowers; their many species eat pollen. They are important to the evolutionary link between insects and plant reproduction since they were among the earliest creatures to pollinate plants. This early pollinator makes up 40% of all known insect species and 25% of all known living species. For some beetles, like pollen beetles, pollen is their primary food source.

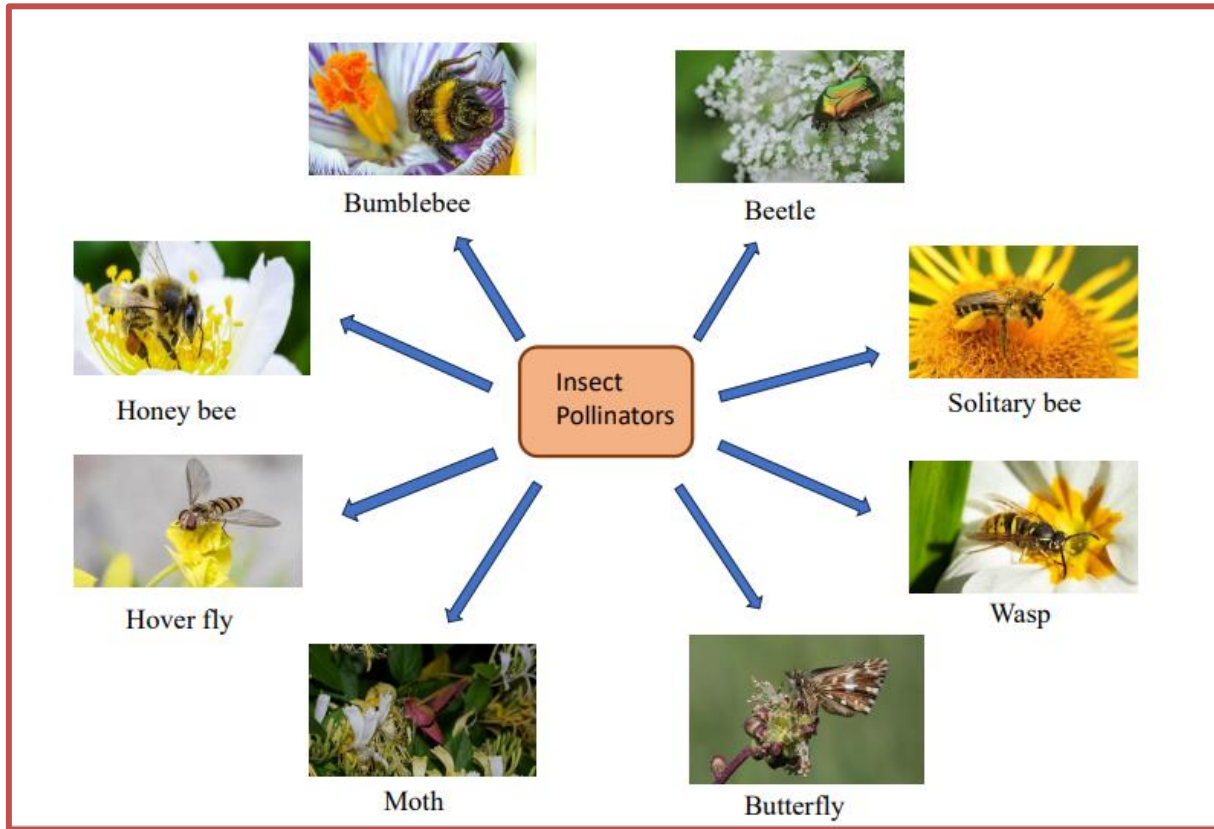


Fig. 1 Different types of Insect Pollinators (Source: Authors)

Threats to pollinators

Numerous threats affect the survival and well-being of pollinator populations. Numerous people are at risk due to factors such as pesticide poisoning, foreign pollinator introduction, fragmentation of habitat, and habitat degradation. Pollution, pests, pathogens, changes in land use and climate change are also linked to the decline and displacement of pollinator populations, especially insect pollinators (Bond, 1994).

Conservation measures

A variety of conservation efforts are being implemented globally to mitigate these challenges and support pollinator health. Habitat restoration, pesticide regulation, public awareness, and education are some key points in conservation practices. Various conservation strategies in intensively farmed areas can support biodiversity by preserving the resources required by pollinators. These



measures protect the dominant crop pollinators in agroecosystems and maintain the ecosystem's biodiversity, including the less agriculturally important pollinators (Klein *et al.*,2007).

Conclusion

Insect pollinators play an essential role in agricultural systems worldwide. Their contribution is economically valuable and ensures food security, supports livelihoods, promotes agricultural diversification, and preserves natural ecosystems. Recognizing the importance of pollinator diversity and implementing effective conservation measures are essential for preserving pollinator communities.

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