



Role of Insect Pollinators in crop production

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Article ID: 43

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Pollination Introduction:

Pollination is refers to the transfer of anther to stigma in flowering plants for sexual reproduction. This helps to bring about fertilization of the ovules in the flower by the male gametes from the pollen grains. Approximately, 80 percent of all flowering plants species are pollinated by animals, including vertebrates and mammals. Among these insect are the but the main pollinators are insects. Entomophily is refers to cross pollinated aided by insects.

Insect pollination:

Pollinators are responsible for providing with a wide variety of orchard, agricultural crops, horticultural crops and forage production. More than three quarters of the world's food crops rely at least on some parts on pollination by insects and other animals. In India, about 80 percent or more of the crop plants depend or stand benefited from insect pollination. About 750 to 1000 bee floral plants estimated to be growing in India. Of the 160 million hectares of the cropped area, more than 55 million is under bee dependent crops. Insect pollinators include honey bees, bumble bees, pollen wasps, ants, flies including bee flies, hoverflies and mosquitoes, butterflies and moths and flower beetles. 50 percent of the plant species propagated by seeds are dependent on insect pollination whereas one third of the food supply is either directly or indirectly depend on these insects pollinated plants. Many insect pollinated crops are high yielding, nutritious and of high economic value. Several insect pollinated crops also form an important income source in developing countries like production of coffee and cocoa. Cocoa beans used for the production of chocolate are pollinated by midges. Similarly, mango flowers are pollinated by wide variety of insects such as wasps, ants, flies, butterflies, beetles and bees. Among which flies (*Musca domestica*) is the most important one. According to a research conducted at Universiti Teknologi MARA, Malaysia it was found that contribution to mango fruit set was 53% of total fruit set. Different crops rely on different insect pollinators. Some crops depend on specialist pollinators, for example beans are heavily reliant on bumblebees. Other crops like oilseed rape, apples and strawberries are pollinated by many different insects including solitary bees, honey bees, bumble bees, hover flies and other flies. The insects important for pollinating crops can vary from year to year and from place to place and are affected by the climate, weather and local farm management

Insect group	Pollination type
Butterflies	Psychophily
Small moths	Phaleophily
Hawk moths	Sphingophily
Beetles	Cantharophily
Syrphid and Bombylid moths	Myophily



Carrion flies	Saprophily
Bees	Mellitophily

Crops benefitted by Pollinators

- **Fruits and Nuts:** Almond, apple, apricot, peach, strawberry, citrus, litchi, fig etc.
- **Vegetables:** Cabbage, cauliflower, carrot, coriander, cucumber, melon, onion, pumpkin, radish, turnip etc.
- **Oil seed crops:** Sunflower, rape seed, mustard, safflower, sesame, etc
- **Forage seed crops:** Lucerne, clover, etc.

Percent Increases in yield due to Bee pollination

S.No	Crops	Percent
1.	Mustard	43%
2.	Sunflower	32-48%
3.	Cotton	23-53%
4.	Lucerne	11.2%
5.	Onion	93%
6.	Apple	44%
7.	Cardamom	21-37%

List of Crops and the insects that pollinate them

Insect	Family	Order	Crops pollinated
Honeybees	Apidae	Hymenoptera	Sun flower, cotton, tobacco, alfalfa and clover, coconut
Weevil: <i>Eladeidobius kamerunicus</i>	Curculionidae	Coleoptera	Oilpalm
Hover flies and Syrphid flies	Syrphidae	Diptera	Carrot, bhendi and pulses
Fig wasps: <i>Blastophaga psenes</i>	Agonidae	Hymenoptera	Fig (Both Smyrna and Capri fig)
Carpenter bee	Anthoporidae	Hymenoptera	Ridge gourds, tomato
Digger bee	Anthoporidae	Hymenoptera	Vegetable crops
Mining bee	Andrenidae	Hymenoptera	Water melons, apple, cucumber



Other pollinators: Butterflies (*Deilaphila sp.*)
Moths (*Acherontia sp.*)
Stingless bees (*Tetragonula sp.*)

Among many insect pollinators, bees play a vital role in crops pollination.

Protecting Pollinators

- Good stewardship practices by the crop protection industry, farmers, and beekeepers are necessary for protecting the health of pollinators.
- The crop protection industry is committed to educating farmers on stewardship best practices to limit any risks to pollinators.
- The crop industry relies on our pollinators and wants to keep them safe and healthy.
- Farmers can improve pollinator habitats by planting flower borders around crop areas.
- Beekeepers must be vigilant in monitoring for disease and mite levels in a colony

Management of Bees for Pollination:

- Place hives very near the field (source) - to save bee's energy
- Migrate colonies near field at 10% flowering
- Place colonies at 3/ha - Italian bee; 5/ha - Indian honey bee
- The colonies should have 5-6 frame strength of bees, possess sealed brood, have young mated queen
- Allow sufficient space for pollen and honey storage

Major Threats to Pollinators :

Many pollinators are adversely affected when large, intact tracts of habitat are broken up into smaller, isolated patches by road construction, development, or agriculture. Pesticides often kill directly, but sub-lethal amounts can also be detrimental to bees and other pollinators by impeding their ability to navigate or forage. The use of herbicides that eradicate important forage plants for bees and other pollinators is an additional problem. Systemic insecticides applied to seeds can contaminate the pollen grains that are an essential source of food for bees and their young. Pollinator populations due to colony collapse disorder and mite attack have increased concerns for food security, food quality and farming practices around the world.

Conservation of pollinators:

Increase the available foraging habitat to include a range of plants blooming at different times to provide nectar and pollen throughout the seasons. The wild flower planting function by attracting pollinators from the surrounding landscapes to the farm scape and ideally to “spill over” to provide pollination services. The wildflower plantings have been demonstrated as an effective practice for benefiting pollination by increasing crop production. Provide the alternate hosts. Artificial food supplements. Reduce the risk to bees from the use of insecticides and herbicides, which directly kill pollinators or the plants they rely on. Select less toxic insecticides or utilize alternative strategies to manage pest insects and minimize the use of insecticides.

**Conclusion:**

Conservation of existing population of pollinators potential to help promote the growth and stability to better crop production and low cost and eco friendly safer to the environment. Insect Pollinators play an important role to maintain the ecosystem healthy by their friendly activities to the human beings.

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