

## Role of Insects in Agriculture and Human life

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*Available online at*

[www.sunshineagriculture.vitalbiotech.org](http://www.sunshineagriculture.vitalbiotech.org)

### Article History

Received: 12. 04.2022

Revised: 20. 04.2022

Accepted: 25. 04.2022

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### INTRODUCTION

Beneficial insects regulating ecosystem services to agriculture such as Pollination and the natural regulation of insect-pests. It aims to enhance insect-derived ecosystem services from a conservation perspective enhancing beneficial insects in agricultural. Human cultures and civilizations have been maintained in countless ways through these beneficial insects, they regulate the pest population of many harmful pest species, produce natural products, and they also dispose the waste and recycle the organic nutrients.

#### Beneficial Insects:

Indeed, pesticide use has been shown to be associated with a large decrease in natural pest control services. Thus, enhancement of agroecosystem appears to be one of the best ways in which we can decrease the use of chemical pesticides for pest and disease control. And it will increase the sustainability of crop production.



## Role of Beneficial Insects in Agriculture

### Pollinators:

Many crops depend on pollination for seed production and fruit set to achieve good yield. Globally, an estimated 35% of crop production is a result of insect pollination. Insects have been recognized for their contributions to pollination. Insect pollinators are flower visiting insects that forage on flowering plants to obtain plant-provided food, nectar, pollen. Flower-visiting insects have the potential to transfer male gametes contained in pollen to the female gametes while foraging, resulting in pollination. Insect mediated pollination is an essential step in reproduction for the majority of the world's flowering plants, including numerous cultivated crop plants species i.e. Sunflower, Cucurbitaceous vegetables, Alfalfa, Coriander, Cardmom, Gingelly, Apple etc.

### Natural Enemies:

Insect predators and parasitoids that attack and feed on other insects, particularly on insect pests of plants are considered natural enemies. Through this type of feeding natural enemies contribute to a type of pest regulation referred to as natural biological control. Natural enemies responsible for nearly 33% of the natural pest control in cultivated systems. Predaceous natural enemies belong to several insect orders and are generally characterized as free-living, mobile, larger than their insect prey, and are able to consume several preys throughout their life cycle. But the parasitoids mainly belong to two orders Hymenoptera and Diptera, and their host ranges are considered to be more specialized than that of predator. Free-living adult parasitoids seek out a host, and depending on the parasitoid species, parasitize different life stages of their host eg. egg, larva, and pupa, adult. In agricultural landscapes, natural enemies have the potential to prevent crop pests from reaching economically damaging levels.

### Natural enemies and use:

#### Predators-

**Ladybirds Beetles:** (Coleoptera) (Family Coccinellidae), Red and Blue beetles (*Dicranolaius bellulus*), Green carab beetles

(*Calosoma schayeri*), Green soldier beetles (*Chauliognathus pulchellus*). These predators attacked Aphids, mites, thrips, mealybugs, moth eggs including *Heliothis spp.* and larvae.

**Bugs:** (Hemiptera) Assassin bugs (Family Reduviidae), Bigeyed bugs (*Geocoris lubra*), brown smudge bugs (*Deraeocoris signatus*), Apple dimple bug (*Campylomma liebknechtii*), Spined predatory shield bug (*Oechalia*), Broken backed bug (*Taylorilygus pallidulus*). Pest attacked Aphids, Diamondback moth, eggs of and larvae of *Heliothis spp.*, cutworms, *Spodoptera litura*.

**Lacewings:** Green (*Mallada signatus*) and brown (*Micromus tasmaniae*) Lacewings pest attacked Aphids, moth larvae and eggs, whitefly, thrips, mites and mealybugs.

#### Parasitoids:

**Aphid Parasitoids** *Aphidius ervi*, *Lysiphlebus testaceipes*, *Aphidius colemani* pest attacked Aphids.

#### Caterpillar's Parasitoids:

**Hymenoptera:** Numerous parasitic wasps including Banded caterpillar parasite (*Ichneumon promissorius*), Two-toned caterpillar parasite (*Heteropelma scaposum*) (Family Ichneumonidae), *Microplitis demolitor*, *Cotesia spp.* (Family Braconidae) pest attacked *Heliothis* and other moth larvae.

#### Caterpillar Parasitoids:

**Sorghum midge:** (*Eupelmus australiensis*, *Aprostocetus diplosidis*, *Tetrastichus spp.*) pest attacked Sorghum midge.

#### Helicoverpa Egg parasitoids:

**Hymenoptera:** *Trichogramma* (Family Trichogrammatidae) and *Telenomus* (Family Scelionidae) egg parasitoids, pest attacked *Helicoverpa* and other Lepidoptera Whitefly Parasitoids.

**Eretmocerus spp:** *Encarsia spp.* including *Encarsia Formosa* pest attacked Whitefly.

#### Some Beneficial Insects:

**Example-** Honey bee, Silk worm, Lac insect, Assassin bug, Hover Aphidius calamani, Syrphid fly, *Zygogramma bicolorata*, Termites, Dragon fly, Praying mantis,

Trichogramma sp., Damselfly, Coccinella sp., Chrysoperla carnea.

### Products from Beneficial Insects

**Honey and Bee Wax:** From thousands of years *Apis mellifera* bees are important for gaining Honey and bee wax. In present, the developing markets are available for the other two products Bee pollen and royal jelly from

honey. The bee pollen collect by pollen trap from ingoing pollen foragers. It is rich protein source. Bee pollen is a "complete" and good supplement in diet. It is available in health food stores. The royal jelly is secreted by gland of nurse bees when the glands are fully active.



### Silk:

**Silk worm:** Natural fiber silk cloth, which usually derives from silkworm, *Bombyx mori*. This domestic silk is famous for its finishing and light colors. The silk can also harvest from the many other species eg. *Antherea spp.* that found in the India, Japan and China forests. The silk provided by wild spp. eg. *Eri, Muga,*

Tussah and Yamamai are heavier and dark in color hence they are less valued than that of *Bombyx mori*. Silk can be dyed, spun, in to thread and woven in to fabric. Cloth of Silk is warm in winters, cool in summers, light in weight, and resistant to wrinkling.





**Lac:**

**Lac**, *laccifer lacca*, is a scale insect that secret a hard encrustation over the body parts as a protective covering. It is of brown color usually and these insects grow on acacia trees in India and Burma. Scale insects present on twigs are heated to

extract the resins and then purify. One gram of Lac is extracted from Up to 200 insects. Lac is still in use as dyes, inks, polishes, sealing waxes, and as stiffening agents in the fabrication of felt hats. It is animal originated and commercial resin.



**Production of Cochineal:**

A scale insect *Dactylopius coccus* found in Mexico and Central America on prickly pear cacti. Cochineal pigment is extracted from these scale insects. For the first time it was used by Aztec Indians as medicines, body paints and as textile dye. The cochineal pigment was important for the intensity and permanency of colors.

**Insects as Food:**

Human ancestors were used to get nutrition from insects. Even today, the insects are being used by people as food in many countries. High in protein and low in fat dried grasshopper are sold in village markets of

Mexico. Wood-boring beetle’s larvae can be boiled or roasted over a fire. And there is long list of nutritive edible insects eg. Ants, bees, termites, caterpillars, flies, crickets, katydids, beetle larvae, and nymphs of dragon fly are among the list. And in Thailand the pupa of silkworm are used as food for human being.

**Insects as Medicines:**

Insects derived products have been widely used in medicines. Maggots and honey showed healing property in chronic and post-surgical wounds and honey is also being used to treat burns and combining with bee wax it found curative for the dermatological disorders.