



## Role of Beneficial Insects on Human Beings and Crops

(\*Ashish Yadav<sup>1</sup>, Jitendra Kumar Yadav<sup>2</sup>, Seema Yadav<sup>3</sup>, Manju Choudhary<sup>3</sup> and Ankit Kumar Yadav<sup>1</sup>)

<sup>1</sup>Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, M.P

<sup>2</sup>Indian Institute of Agriculture Research, New Delhi

<sup>3</sup>Sri Karan Narendra Agriculture University, Jobner, Jaipur, Rajasthan

\*Corresponding Author's email: [yadavashish6888@gmail.com](mailto:yadavashish6888@gmail.com)

### Abstract

There are many insects found on agriculture land that are not imminence to crop production but beneficial to the farmers in different aspects such as natural enemies, pollinators, productive insects, weed killers, and soil builders or decomposers. The motive of the farmers is single-sided to gain only maximum profit, ignoring the impact on the beneficial insects, the environment, and human health. Insecticides can be an important crop production tool to maximize yield but Heavy and indiscriminate use of chemicals also exposes farmers to serious health risks, resulting in negative consequences for the insect that are beneficial to the farmers.

**Keywords:** - Beneficial insect, Pollinator, Honey bee, Silkworm, Lac, Parasites, Predators, Weed killer, etc.

### Introduction

Insects may be beneficial to humans in various ways directly or indirectly. Beneficial insects are insects that play major roles in reducing and controlling populations of both plants and insect pests by acting as both predators and parasites to these detrimental organisms. They pollinate plants, contribute to the decay of organic matter and the cycling of soil nutrients, and attack other insects that are considered to be pests completely preventing or greatly limiting problems.

### Insects are beneficial because insects are

- Pollinators
- Pest Controller
- Provide products for human
- Help to maintain balanced level of insect populations through parasitism and predation
- Attacking on weeds and reducing the plant's ability to spread and to withstand diseases
- Decomposers / Recyclers

### Insects may be beneficial to humans in various ways

#### A. Insects that produce commercially valuable products that are

1. Honey bees
2. Silk worms
3. Lac insects
4. Pela wax scale

**B. Insects of Medicinal value****C. Insects of Scientific research -****Insects are also beneficial to crops in various ways that are following**

1. Insect pollinator
2. Entomophagous insects (Predator & Parasitoids)
3. weed killer
4. Soil builder / Decomposer

**Insects beneficial for Human being****A. Insects that produce commercial valuable products that are:**

**1.Honey bee** – Honey bee is social and hardworking insect which produce many hive products such as honey, bee wax, royal jelly, venom and propolis etc. There are five important species of honey bee that are the giant rock bee (*Apis dorsata*), the little bee (*Apis florea*), the dammer bee (*Meliponairi dipennis*), Indian/Asian honeybee (*Apis cerana indica*) and European or Italian bee (*Apis mellifera*).

Honey – Giant rock bee has produced about 35-40kg honey from a colony in a year. It is impossible to domesticate because of its irritable and ferocious nature. little bee (*Apis florea*) has produced very little amount of honey about 0.5 to 1.0 kg per year from a colony. Indian honeybee (*Apis cerana indica*) produces 8-10Kg honey per colony. Italian bee which is swarms less and has good honey gathering qualities, and produce highest honey among all spp. of honey bee is about 45-101 kg per year.

Composition of Honey is following:

Sr.No.	Constituent	Amount (%)
1	Water	17.2
2	Fructose (Levulose)	38.2 – 41.0
3	Glucose (Dextrose)	31.3 – 35.0
4	Sucrose	1.3
5	Maltose	7.3
6	Minerals	0.17 – 2.00
7	Total Acids	0.57

**Bee wax** - After honey, bee wax is the second most important hive product. It is secreted as a liquid but solidifies when exposed to air. Scales are formed after solidification which is removed by the hive-bees for building the comb. Bee wax is obtained from the combs of wild hives, frame hives. On an average, for every 100 Kg of honey produced, the corresponding wax production may range from 1-2 Kg. Evidently wax is costlier than honey. Although the wax is white in colour, the shade varies depending on the pollen pigments. It is chiefly used in the candle industry, also for making creams, ointments, capsules, deodorants, varnish, leather and wood polish, etc.

**Royal jelly** - It is a secretion from the hypo pharyngeal glands of worker bees normally of 5-15 days of age. It is milky white in colour and contains proteins (12.34%), fats (5.46%), carbohydrates (12.49%), minerals (0.82%) like Iron, Sulphur, copper, silicon. It is rich in vitamin B and C, but lacks Vitamin E. It also contains 10-hydroxydecanoic acid, which exhibits antibiotic activity against bacteria and fungi and keep wounds clean and free from infection.

**Venom** - It is an important secretion used by the worker bees as defence mechanism. It contains active chemicals like histamine, hydrochloric acid, formic acid, calcium, sulphur, apamin, etc. Commercially it is obtained through electric shock (12 – 15 Volt). Bee venom

contains several active molecules such as peptides and enzymes that have advantageous potential in treating inflammation and central nervous system diseases.

**Propolis** - It is the resin-like exudate collected by honey bees from the resins and gums of plants and trees. Propolis is of vital importance for the survival of the honey bees in the beehive. Not only does it protect them against diseases, it also helps fight against climatic changes, such as wind and cold. It contains resin (55%), scent and ethereal oil (10%), wax (30%), pollen (5%). It is used by bees for sealing the cracks and crevices.

It's had numerous applications in treating various diseases due to its antiseptic, anti-inflammatory, antioxidant, antibacterial, antifungal, anticancer properties. It also has both healing property and used for preparing ointments that treat cuts, wounds, etc.

**2. Silk worm** - The art of silk production is called sericulture. The mulberry fruits are rich in minerals and vitamins and from the roots, barks and leaves several ayurvedic medicines are prepared. At present China is the leading producers of silk with about 78% of the world total followed by India and Japan. Nearly 95% of commercial insect silk comes from the mulberry silk worm (*Bombyx morri*). There are various Spp. Of silkworm that are reared on different host plants that are following as -

Sr.No.	Silkworm Spp.	Host / Reared on
1	Mullberry Silkworm ( <i>Bombyx moori</i> )	Mulberry
2	Eri Silkworm ( <i>Philosamia ricini</i> )	Castor
3	Moonga Silkworm ( <i>Antheraea assama</i> )	Som
4	Tasar Silkworm ( <i>Antheraea mylitta</i> )	Arjuna, Asan

The silk is used as raw material in textile industries, surgery for internal suturing and genetic experiments in biotechnology.

**3. Lac insect** - The word lac is derived from the Sanskrit word *lākshā*, which represents the number 100,000. It was used for both the lac insect (because of their enormous number) and the scarlet resinous secretion it produces. It is of brown colour usually these insects grow on Acacia trees in India and Burma. The approximate percentage of different constituents Resin (68 – 90%), Wax (5 -6%), Mineral matter (3 – 7%), Albuminous matter (5 – 10%), Water (2 – 3%). Lac is used as dyes, inks, polishes, sealing waxes and for making toys, bracelets or bangles etc. It is also used in the grinding stones, manufacturing varnishes and paints, silvering the back of mirror and dying purposes. By-products of lac are nail polish, lithographic ink, shoe polish etc.

**4. Pela wax scale**- The pela wax scale (*Ericerus pela*) has been used in China for commercial production of Chinese wax. It is the second instar males that produce economically valuable wax. Most of this wax is used in the manufacture of candles. However, with the discovery of other waxes (particularly paraffin wax), interest in China was declined. It is used for variety of horticultural, industrial and pharmaceutical purposes, viz; grafting agent for fruit trees, insulation of electric cables and equipments, manufacture of molds for precision instruments, production of high-gloss, wax paper and coating candles etc.

#### **B. Insects of medicinal value:**

**1. Blister beetle** - The chemical substance Cantharidin is found in the blister beetle, which is useful internally treating certain urinary diseases.

**2. Honey bee** - The stings of honey bee have remedial value by which a Homeopathic medicine **Apis** is extracted from the honey bees by digesting the excited bees in alcohol which is used against urinary irritations etc.

**3. Cockroach** - Dr. William Boric, a homeopath, make drug **Meteria medica**, that are prepared from cockroach, which is used against asthma.

4. In traditional Chinese Medicine includes the use of herbal medicine along with insects as an integrated part. Ex. Dry grinded Centipeds is applied to the afflicted area to cure snake bite etc.

5. Allantoin is a substance isolated from the secretions of fly maggots which is used to clean and promote healing, it is called maggot therapy.

### C. Insects of Scientific research:

Sr. No.	Insects	Benefits
1.	Fruit fly ( <i>Drosophila melanogaster</i> )	Used as test insect in genetic research
2.	Bugs and Flies	Used in Forensic Entomology
3.	Butterfly	Used as indicator of climate change and pollution of water bodies

### Insects beneficial for Crops

There are many insects found on agriculture land those are not threat to crop production but beneficial to farmer in different aspects i.e., pollinator, decomposer, predator etc.

Beneficial insects play a major role in the crops by reducing and controlling of pest population by acting as predator and parasites.

**1. Insects as Pollinator** – Insect pollinators are flower visiting Insects that forage on flowering plants to obtain food (nectar, pollen). Pollinators are attracted to plants by color, odors, and flower shape and pattern. Globally, an estimated 35% of crop production is a result of insect pollination. In cross pollinated crops, insects play a major role in pollination. Almost 85% pollination is done by insects. The important pollinators are the honey bees, wasps, flies butterflies etc.

**2. Insects as Decomposer-** As decomposers, insects help in create top soil, the nutrient-rich layer of soil that helps plants grow. Soil is enriched by the addition of insect saliva and decomposition of exuviae and dead bodies of the insects. Insects play an important role in the degradation and ultimate consumption of plant material falling into soil. Burrowing bugs, ants, cricket etc. dig tunnels in soil that provide channel for water and aeration.

Nutrient cycling - Scarabidae consume great amounts of dung, up to 10 or 12 times their own weight per day which help in the nutrient recycling.

**3. Insects in Weed control** – Insects feed on weed plants that are undesirable from our point of view. Biological weed control is a selective, environment-friendly process, utilizing host-specific control agents towards targeted weeds that prevent damage to nontarget crops or native plants. Weed control has been the use of insects in controlling aquatic weed that clog streams in ponds, and lakes. For example –

Sr.No.	Insect Name	Host / Feed on
1.	<i>Cactoblastis cactorum</i>	Opuntia Spp.
2.	<i>Telenomia srupulosa</i>	Lantana camara
3.	<i>Zyogramma bicolorata</i>	Parthenium Spp.
4.	<i>Cryptobagus singularis</i>	Water fern

**4. Insects as Predator** – Insects helps to keep the population size and density of other insects within reasonable limits. A predator is usually larger than its prey(host), kills its host and requires more than one host to complete its development. Predators are generally active in seeking out their prey and they usually consume many individuals during their life time. The insect predators are spread over a wide range of orders including Coleoptera, Odonata, Diptera, Hemiptera, Hymenoptera etc.



For example:

Sr. No.	Insect Spp.	Host / Prey on
1.	Lady bird beetle	Aphid and soft bodied insects
2.	Vadalia beetle	Cottony cushion scale
3.	Ground beetle	Coconut headed caterpillar
4.	Larva of Lacewing	Aphid, jassid and psyllid
5.	Naiad of Dragon fly	Aquatic insects
6.	Sting bug	Larvae of Red hairy caterpillar
7.	Assassin bug	Red cotton bug

**5. Insects as Parasitoids** – A parasite is an organism which is usually much smaller than its host and single individual usually does not kill the host. A parasitoid is a special kind of parasite which is often about the same size as its host, kills its host and requires only one host for development into a free-living. The parasitic insects attached to the body of a single host. An extreme form of parasitism common in many insects, where the parasitizing insects is attached to or within the body of host and grows along with the host to a certain point, eventually killing the host.

For example: -

Sr.No.	Insect Spp.	Host / Feeds on
1.	<i>Isotomia javensis</i>	Sugarcane top shoot borer
2.	<i>Oenoclytus pyrillae</i>	Eggs of sugarcane pyrilla
3.	<i>Trichogramma chilonis</i>	Lepidopteran pests
4.	<i>Poulomi setosa</i>	Caster semi-looper
5.	<i>Trichospilus pupivora</i>	Pupae of coconut black headed caterpillar

## Conclusion

Above description shows the economic importance and use of beneficial insects that are great indicator in determining the human health and crops and directly or indirectly beneficial are left to human by providing commercial valuable products. Lack of awareness among the farmers about these insects and their benefits they use different management practices to kill them along with the insect -pests.

## References

1. Dr. A. Venkat Reddy, Dr. Ch. Anusha, Dr. B. Ramprasad, Dr. R. Shravan Kumar a D D. Veeranna Importance of Beneficial Insects in Agriculture. (2022)
2. Getanjaly, Vijay Laxmi Rai, Preeti Sharma, Ranjit Kushwaha. Beneficial Insects and their Value to Agriculture. Res. J Agriculture and Forestry. 2015; 3(5):25-30.
3. Ediriweera ERHSS, Premarathna NYS. Medicinal and cosmetic uses of Bee's Honey-A review. AYU. 2012; 33(2):178-182.
4. David V Alford Beneficial Insects, CRC Press, 2019.
5. Cock, M.J.W., Murphy, S.T., Kairo, M.T.K., Thompson, E., Murphy, R.J. and Francis, A.W. (2016) Trends in the Classical Biological Control of Insect Pests by Insects: An Update of the BIOCAT Database. BioControl, 61, 349-363.
6. <https://krishijagran.com/agripedia/role-and-importance-of-beneficial-insects-in-agriculture/?amp=1>
7. <https://www.slideshare.net/AmalGhazaliNasron/beneficial-insects>
8. <https://www.slideshare.net/srinivasnaik52643/ento-332lec-no1importance-of-beneficial-insectspptx>