



Biological Control by Natural Enemies

**Arvind Kumar*, Vishnoo
Omar, Pradip Kumar Patel
and Vishal Yadav**

(Researcher Student)
Acharya Narendra Dev
University of Agriculture and
Technology, Kumarganj,
Ayodhya-224229



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*Corresponding Author

Arvind Kumar*

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INTRODUCTION

Biological control is a component of an integrated pest management strategy. It is defined as the reduction of pest populations by natural enemies and typically involves an active human role. Keep in mind that all insect species are also suppressed by naturally occurring organisms and environmental factors with no human input. This is frequently referred to as natural control. This guide emphasizes the biological control of insects, biological control of is also included. Natural enemies of insect pests, also known as biological control agents, include predators, parasitoids, and pathogens. Biological control is the beneficial action of parasites, pathogens, and predators in managing pests and their damage. Use of natural enemies for biological control. Biological control is often harder to recognize, less well understood and more difficult to manage. Conservation, augmentation, and classical biological control.

Conservation

The conservation of natural enemies is probably the most important and readily available biological control practice available to growers. Natural enemies occur in all production systems, from the garden to the commercial field. They are adapted to the local environment and to the target pest and their conservation is generally simple and cost-effective. These natural controls are important and need to be conserved and considered when making pest management.

Classical biological control

Classical biological control refers to the international introduction of an exotic biological biocontrol agents for permanent establishment and long-term pest control to an area where the pest has invaded. The introduced natural enemies have been either those that have coevolved with the pest in its native home in the case of neoclassical biological control.

The latter strategy enables the control of native pests with introduced natural enemies.

Example-

- Egg parasitoid introduced from Europe for biological control of southern green stink bug.
- European weevil imported to attack purple loosestrife

Augmentation

This third type of biological control involves the supplemental release of natural enemies. Relatively few natural enemies may be released at a critical time of the season.

Inoculative release or literally millions may be released.

Inundative release. Additionally, the cropping system may be modified to favor or augment the natural enemies. This latter practice is frequently referred to as habitat manipulation. An example of inoculative release occurs in greenhouse production of several crops. Periodic releases of the

parasitoid, *Encarsia formosa* are used to control greenhouse whitefly and the predaceous mite is used for control of the two-spotted spider mite. Lady beetles, lacewings, or parasitoids such as *Trichogramma* are frequently released in large numbers (inundative release). Recommended release rates for *Trichogramma* in vegetable or field crops range from 5,000 to 200,000 per acre per week depending on level of infestation.

Habitat or environmental manipulation is another form of augmentation. This tactic involves altering the cropping system to augment or enhance the effectiveness of a natural enemy.

Natural Enemies

Parasites, pathogens, and predators are the primary groups used in biological control of insects and mites. Most parasites, pathogens and many predators are highly specialized and attack a limited number of closely related pest species.



1. Parasites

A parasite is an organism that lives and feeds in or on a host. Insect can develop on the inside or outside of the host's body. Often only the immature stage of the parasite feeds on the host. Although the term "parasite" is used here, true parasites (eg. fleas and ticks) do not typically kill their hosts. Species useful in biological control. Their larvae are maggots that feed inside the host.

2. Pathogens

Pathogens are microorganisms including certain bacteria, fungi, nematodes, protozoa, and viruses that can infect and kill the host. Some beneficial pathogens are commercially available as biological. These include *Bcillus thurengensis* (*Bt*) entomopathogenic nematodes, and granulosis viruses.

3. Predators

Predators kill and feed on several to many individual prey during their lifetimes. Many species of amphibians, birds, mammals, and reptiles prey extensively on insects. Predatory beetles, flies, lacewings, true bugs and wasps feed on various pest insects or mites. Most spiders feed entirely on insects. Predatory mites that feed primarily on pest spider mites include *Amblyseius* spp., *Neoseiulus* spp. and *Galendromus occidentalis*.

a. Ladybird beetles

Identification: There are many species of ladybird beetles that vary in size color and pattern. Depending on species, colors are black, red, orange-red to almost yellow. Most species have colored spots or markings on their backs. Usually only one generation per year. Both the larvae and adults feed on pests. Host aphids, whiteflies, scales, mites, mealybugs and other soft-bodied insects. Monitoring Inspect colonies of aphids for adults.

b. Lacewings:

Identification: Common species of lacewings include two green lacewing species, *Chrysoperla carnea* and *Chrysopa oculata*. Lacewing eggs are white and laid singly or in groups on long stalks on the underside of

leaves or branches. The brown and green lacewing larvae are very similar except for small differences in body shape and the brown lacewing's habit of moving its head from side to side while walking. Up to four generations per year depending on temperature. Monitoring Examine aphid- or psylla-infested leaves and shoots for feeding larvae or use limb taps. Insect Pests Attacked Aphids, spider mites, whiteflies thrips, leafhoppers, scales, mealybugs, psyllids, small caterpillars and insect eggs.

c. Syrphid:

Identification: Syrphid fly larvae are flattened, legless maggots with no distinct head and a tapered body. They are variously colored yellow, green to brown. Adults frequent flowers over which they hover before landing to feed on nectar and pollen food source. Eggs laid on aphid infested plant parts. Several generations per year depending on temperature and location. Insect pests attacked Aphids, scales, thrips and other small soft-bodied insects. Monitoring Examine aphid-infested leaves and shoots for maggot-like larvae.

d. Praying mantid:

Identification: Adults are 5-10 cm long and green, brown or yellow in color. Mantids have an elongated thorax and grasping forelegs, which they use to hold their prey while they eat. Life cycle One generation per year. Overwinters as eggs in egg cases, which are glued to wood, bark, or other plant material. Insect pests attacked Many, including aphids, flies, beetles. Feeds on pests as well as beneficials

e. Minute pirate bug:

Identification: Adult anthocorids have a narrow, pointed head, flattened, smooth body with distinctive clear markings on their back. Becomes active early in season. 3 to 4 generations per year. Insect pests attacked aphids, spider mites, thrips, psyllids, whiteflies and small caterpillars. Monitoring limb taps in orchards will detect adults and nymphs.

f. Predatory mites:

Identification: The western predator mite, *Typhlodromus occidentalis*, and *Zetzellia mali* are the two most common species of predaceous mites in biological control. They are distinguished from their prey by their larger size, pear-shaped body, and translucent coloration. Become active in spring and produce several generations per summer depending on temperature. Insect pests attacked Spider mites, thrips, fungus gnat larvae Monitoring Visual inspection of leaves or leaf brushing for microscopic examination.

g. Bigeyed bug:

Identification: Adults and nymphs are oval, somewhat flattened, about 4 mm long, usually brownish or yellowish, and have a wide head with large, bulging eyes. Life cycle 5 nymphal instars. Females lay oblong, pale-colored eggs singly on leaves which develop reddish eyespots shortly after being laid. Common on low-growing plants and crops. Insect pests attacked Flea beetles, mites, insect eggs, small caterpillars, other bugs.