

## Biological Control or Biocontrol Agents

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### **Introduction:**

Biological control or biocontrol is a method of controlling pests that include insects, mites, weeds and plant diseases using other organisms. It relies on predation, parasitism, herbivory or other natural mechanisms but typically also involves an active human management role.

The father of modern biological control is Professor Harry Scott Smith, an eminent entomologist from University of California, Riverside (UCR) has defined it as the use of natural enemies whether introduced or otherwise manipulated to control insect pests. There are three primary methods of using biological control in the field that include:

1. Conservation of existing natural enemies
2. Introducing new natural enemies and establishing a permanent population and is also called "classical biological control"
3. Mass rearing and periodic release, either on a seasonal basis or inundatively

Often the natural enemies are found in the home range of the invasive pest. Some notable examples of classical biological control include the use of decapitating flies which include several *Pseudacteon* species against red imported fire ants and a group of flea beetles, thrips and stem borers used against alligator weed. Biological control uses living organisms to control pests. A natural enemy such as a parasite, predator or disease organism is introduced into the environment of a pest or if already present is encouraged to multiply and become more effective in reducing the number of pest organisms.

There are three general approaches to biological control which are importation, augmentation and conservation of natural enemies. Each of these techniques can be used either alone or in combination in a biological control program. The control of these pests is attempted through exclusion or quarantine, repulsion, physical removal or chemical means.



In addition to antagonism, biological control can also be achieved by using avirulent strains of pathogen species. A classic example of within-pathogen-species competition is from the release of avirulent *Aspergillus flavus* link genotypes which reduces aflatoxin contamination in cotton, groundnut and other crops.

**Types of Biocontrol:** Biological control is broadly divided into two categories:

- **Classical biocontrol:** The organic method of pest control is known as classical biocontrol which uses natural predators of the invasive plant. The introduced species if not picked carefully, can become significant pests.
- **Inductive biocontrol:** Under this type, a large number of natural enemies are released into the soil to kill the target weed. The most suitable and effective inundation agent is nematodes.
- **Other biocontrol:** Other types of controls include microbes like bacteria, fungi, viruses and other microorganisms or their metabolites or cell fragments that can kill pests or outcompete and prevent diseases. The semiochemicals that are message-bearing compounds are produced by animals or plants used to change and disrupt a pest's normal behaviour.

**Advantages of biocontrol:**

Biological controls can have advantages over pesticides which are usually broad spectrum and can kill a wide range of invertebrates. It causes no damage to plants and does not leave any residues. It is part of natural farming and is particularly desirable because the procedure is environmentally safe, energy self-sufficient, cost-effective, sustainable and can be readily incorporated into integrated pest management (IPM) programs.

They are eco-friendly, prevent soil pollution, do not harm humans and other useful organisms in the soil. They are easy to use, available in all seasons, cheaper than agrochemical pesticides and insecticides. They reduce the impact of chemicals and pesticides on the human body. The biocontrol agents protect plants from their natural enemies like parasites from predation, *etc.* They help in controlling the infestation of plant pests such as weeds, nematodes, insects, and mites. These methods are also comparatively cheaper than other agrochemicals like pesticides and insecticides. They should provide protection to biodiversity in managed ecosystems and be persistent to be able to kill throughout the season or life of the crop



This farming is based on measuring the microbial life in the soil and then applying the microbes, nutrients, compost tea, that the soil needs to regain its balance. An important part of this is an understanding of the soil succession cycle. Some common predatory arthropods include ladybird beetles, carabid (ground) beetles, staphylinid (rove) beetles, syrphid (hover) flies, lacewings, minute pirate bugs, nabid bugs, big-eyed bugs and spiders.

#### **Parasitoids:**

The parasitoids can be used as biocontrol agents as they are an efficient tool of biological control since they lay eggs within the bodies of their hosts, which ultimately results in the hosts' death. Utilizing the deceased host as a source of food for the developing larvae is a biological control method that is used by them.

**Characteristics of effective biocontrol agents:** Biocontrol agents must meet several requirements and some of them are mentioned below.

- It should be able to colonise and multiply itself.
- It has the capacity to outlast competitors and endure longer in soil and host tissue
- It must not be pathogenic to the surroundings specially to the host plants.
- A long shelf life after production and must be present in biomass.
- A full expression of the agent must be allowed during delivery and application.
- It should possess a strong ability to search with high rates of predation or parasitism
- Shortest possible handling time capacity to endure at low prey densities
- Adaptability to a variety of environmental situations
- It must not be pathogenic to both plants and animals and be a strong competitor.
- Be able to prevent or remove multiple pathogens
- They should have a high likelihood of survival in soil or host tissues

#### **Disadvantages of biocontrol:**

There are a few disadvantages to using biological control agents. First, they can be less effective than chemical pesticides in controlling pests as all the pests will become uncontrollable in the end. Second, they can take longer to become effective than chemical pesticides. They are designed to control a single problem and there is always the chance that the predators will switch to a different prey. Finally, they can be more expensive than chemical pesticides.