



Biological Insect Pest Management

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INTRODUCTION

Biological suppression has been the most promising method for insect pest management. It has tremendous potential of managing insect pests in a natural way. It involves the action of parasites, parasitoids, predators and pathogens in maintaining population density of other organisms at a lower level than would occur in their absence. So, the application of living organisms for insect pest management is called biological insect pest management. The success of biological management was first noticed in 1888, when the cottony cushion scale (*Icerya purchasi*) infestation was controlled in California (USA) by introducing a lady bird beetle (*Rodolia cardinalis*). The mass multiplication and release of egg parasite, *Trichogramma* spp. were started in USSR during 1993. After the second world war, the biological management was eclipsed by chemicals, but now it is seriously considered as one of the key components of Integrated Pest Management (IPM).

Types of Bioagents

The organisms used for biological insect pest management are termed as bioagents, natural enemies and crop defenders etc. They can be categorized as follows-

1. Parasites- Parasite are dependent living organisms. They live at the expense of another organism by derive nourishment from the host. Parasites are not necessarily lethal, that since death of host means the death of parasite also. Therefore, a well-adapted parasite should not kill the host but minimize the damage. e.g., Nematodes (*Neoplectana carpocapsae* and *Heterorhabditis bacteriophora*) parasite on white grub (*Holotrichia* spp.)

2. Parasitoids- parasitoids are parasitic insects. Each parasitoid requires only one host, which it kills for its development into a free-living adult.

The free-living adult feeds entirely in a different way than the parasitic larva. They are same size as the hosts, or sometimes even smaller. *e.g.*, Trichogrammatid (*Trichogramma chilonis*)- egg parasitoid and Braconid (*Apanteles subandinus*)- larval parasitoid.

3. Predators- Predators are free living organisms. They consume a number of individual preys during their lives. They are free living and larger in size than their prey. Predators are not necessary to survive on single prey to complete their life cycle. *e.g.*, Lady bird beetle (*Coccinella septempunctata*)- predator on aphid (*Aphis* spp.) and Rove beetle (*Paederus varicornis*)- predator on jassid (*Amrasca* spp.).

4. Pathogens- Pathogens are parasitic microorganisms. They cause outbreaks of disease in the host. They kill their host or debilitate the future generation under certain conditions. They cause disease epizootics in the field. *e.g.*, Bacteria (*Bacillus thuringiensis*)- paralysis of gram pod borer larvae (*Helicoverpa armigera*) and Fungi (*Beauveria bassiana*)- mummification of maize stem borer larvae (*Chilo partellus*).

Application of Biological Management

The biological suppression of insect pests by bioagents are achieved by following methods-

1.Introduction- It involves the search for exotic bioagents to introduction and permanent colonization in native place. This method is also known as the classical biological control method. The Exotic bioagents are mass reared and released in two situations- (i) when, unoccupied niches in the life system of the pest which could be filled by an introduced species, (ii) when, a certain niche is occupied by an organism that is inherently inefficient as a regulator and that might be displaced by a more efficient exotic regulator.

2.Augmentation- It involves the buildup of existing bioagents through field release at the

right time. The existing bioagents are released by two methods- (i) Inoculation- It is the culture of existing bioagents in controlled condition and reintroduction at each season. (ii) Inundation- It is the mass production of bioagents to release at intervals for an intermediate short-term result.

3.Conservation- It involves the maximization of impact of existing natural enemies. It can be adopted by changes in pesticide usage as natural enemies are more susceptible to insecticidal treatment than the pest. Contact with insecticides may be reduced or eliminated by changing time of application, changing application methods and changing to less toxic insecticides.

Approaches of Biological Management

There are following approaches should be adopted for promoting biological insect pest management-

1. Develop mass rearing technique.
2. Evaluate whether the natural enemies released has been effective or not.
3. Conduct survey to know the natural enemies available and their abundance.
4. Gather information regarding identification, origin and biology of the pest and natural enemy complex.
5. Release adequate numbers and avoid releasing during hot, windy and wet weather conditions and also avoid long journey and exposure to heat or cold during transit.

Merits of Biological Management

Biological management is non-polluting, specific to the target insect pest, do not lead to resistance and in some cases works out to be cheap as recurrent input is not required once the insect pests suppression is established.

Demerits of Biological Management

Biological management is not possible with all insect pests and is difficult to implement for insect pest complex. It has high initial cost without guarantee and difficult to get trained people and cooperation from farmers.



Lace wing larva feeding aphids



Chelonus wasp parasitizing host eggs

Source: Modified from MANAGE, 2019.

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