

NATURAL ENEMIES OF INSECT PESTS



Soybean Pests

Overview

Biological control is defined as the use of living beneficial organisms, also called natural enemies, for the control of pests.



A common predator, *Orius* spp. (pirate bug) preying on an aphid.

Photo Credit: S. Yoo, Purdue University.

Birds, mammals and reptiles feed on insect pests, but the most important group of natural enemies are insects that feed on other insects. These beneficial insects occur abundantly in cropland and provide a significant amount of control of some crop pests.

It's important to recognize that the intent of biological control is not to eradicate the pest population, but to reduce the population to below the economic threshold necessary for a pesticide application. In fact, because natural enemies require prey or hosts for survival, biological control works best when there is always a small population of pests to sustain the populations of these natural enemies. This is a major difference between biological control (reduction of the pest to below economic levels) and the use of pesticides (elimination of the pest).

Biological control can be easily and effectively supplemented with cultural and carefully-

chosen chemical controls when necessary. This is the basis of the concept of integrated pest management (IPM).

Types of natural enemies of soybean pests

Natural enemies of insect pests fall into three categories: general predatory insects, parasitic insects, and insect pathogens (fungi, bacteria, viruses, or nematodes).

Predatory insects are usually much larger than their prey. They are generally voracious feeders that kill and eat a wide variety of insects as they grow and reproduce. Ground beetles, minute pirate bugs, lacewings, and ladybeetles are examples of predatory insects.

Most predators are fairly mobile and can search for their prey. Many predators are active in both their immature larval or nymph stage as well as adults.



Lacewing larva eating a soybean aphids.

Photo Credit: David Cappaert, Bugwood.org.

Insect parasites, also called parasitoids, are some of the most effective natural enemies, however, they are tiny and easily overlooked. Many of these are non-stinging wasps. Parasitic wasps are free-living in the adult stage. They lay their eggs in the target pest. When the eggs hatch, the parasitic larvae eat their hosts from within, ultimately resulting in the death of the host insect.

When scouting for this type of biological control activity, you will look for signs of the parasitized pest rather than the parasite itself.



Photo Credit: Frank Peairs, Colorado State University, Bugwood.org

Insect pathogens are a third type of natural enemy. Insect pathogens include fungi, bacteria, viruses, and nematodes that infect or attack insect pests, resulting in their death. The most well-known insect pathogen is *Bacillus thuringiensis*, or Bt, which is a bacterium that has been made into commercially available microbial insecticides.

Fungi that attack insect pests are known as entomopathogenic fungi and are fairly common. Under rainy, humid conditions, the fungi produce spores that infect the insect. Death caused by fungal infection can be a major mortality factor for soybean aphids. Under some conditions, entire aphid populations can be wiped out. However, most of the time infection does not occur early enough or often enough to be an important control agent.

Natural Enemies and Insecticides

The use of broad-spectrum insecticides and fungicides are one of the main obstacles to effective biological control since natural enemies are just as susceptible to the pesticides as the targeted pest.

Sometimes, one pest will be under good biological control, just as another one is reaching an economic threshold. This is often what causes a secondary pest outbreak in which the pest that was not causing damage becomes damaging after treatment eliminated its natural

enemies. As an example, spraying an insecticide to control soybean pests such as grasshoppers, green cloverworms or soybean loopers may eliminate the beneficials that help control spider mites, resulting in a flare-up of mites in the field.

A similar situation, called pest resurgence, occurs when the population of the treated pest, especially aphids, rebounds rapidly because of the elimination of its natural enemies.

It is important to protect natural enemies present in a field.

Provide food, water and shelter

- Providing food, water, and shelter for natural enemies will encourage them to stay in the crop area to feed and reproduce.
- Beneficial insects often need an alternate food supply in addition to the pest prey. Many natural enemies, including the adult lacewing and minute pirate bug must have a source of nectar, pollen, or honeydew to feed on in the general vicinity of the pest. This will stimulate egg laying in the crop.

Maintain a diverse landscape

- A more diverse landscape tends to harbor many more natural enemies than a large-area monoculture because it offers more food, water, and shelter to beneficials.
- Consider how you might supply these resources near your fields. Small patches of unmowed grass and flowering plants can provide a food source as well as sheltered, humid spots where beneficial insects can hide during the day without dehydration. A managed boundary around fields is also a good way to control weeds and provide overwintering sites for beneficials.

Practice IPM

- Integrate the use of host-plant resistance, crop rotation, tillage, seed treatments, insecticides and fungicides with the presence of natural enemies to enhance their contribution to biological control.
- Evaluate the potential for interference among control strategies and work towards ways that promote synergism.

Use insecticides carefully

- Most insecticides kill beneficial insects as well as the target pest.
- Reduce the overall use of broad spectrum insecticides when possible and treat only when necessary based on economic injury thresholds of the pest. Use the least disruptive product available, and apply at a time and place that is the least injurious to beneficial insects.

Use fungicides carefully

- Insects, like plants and animals, are attacked by microorganisms that cause disease. In particular, fungal diseases can infect a high percentage of an aphid population very rapidly, resulting in significant levels of control.
- Foliar fungicides applied to soybean are detrimental to this group of natural enemies and unnecessary fungicide applications should be avoided to preserve these beneficial fungi.



An aphid colonized by the pathogenic fungus, *Paecilomyces lilacinus*
Photo Credit: Bill Stoneman



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