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## Biological Insect Controls

Virtually all insect species have natural enemies that help keep their populations in check. In many cases, natural enemies are the primary regulating force preventing insect populations from exploding. Natural enemies can be predators, parasites, or diseases. Other factors such as food availability, competition, and environmental conditions also help regulate insect populations. In native plant ecosystems, insect populations are usually kept in balance by these factors. However, when non-native crops are planted or non-native insects are unknowingly introduced, insect populations may increase to the point where extensive crop damage occurs.

A “pest” is an organism which has characteristics that are regarded as injurious or unwanted. The term pest is often used to refer to harmful animals, insects, weeds, mites, fungi and viruses. Use of the word “pest” troubles some people because it implies a negative value on the organism in question regardless of the context. For example, we have native Arizona cockroaches. Are these cockroaches “pests” when they live outdoors, subsist on native foods and are part of a local food web? Regardless, the word “pest” persists in the literature and it is often difficult to avoid its use.

Biological pest control differs from chemical, cultural, and mechanical controls in that it requires maintenance of some level of food supply (e.g., pest) in order for the biocontrol agent to survive and flourish. Therefore, biological control alone will only manage any pest species under the best circumstances. Pest eradication is never the goal of biological control practices.

*Classical* biological control has been used most for introduced or “exotic” pests. The origin of the pest is determined and then a search for natural enemies in its native habitat is conducted. Here, potential biocontrol agents are imported to the new location of the pest and evaluated under controlled conditions. In particular, the biocontrol agent is monitored to ensure that it does not feed on organisms other than the pest species (this is called host specificity). It is also evaluated to see whether it can survive the environmental conditions where it may be introduced.

*Conservation* biocontrol is based on controlling what usually are native pests with the natural enemies or predators that should already be out there doing the work. One reason they're not out there working is that broad-spectrum pesticides applications may have killed them. In the United States, the use of broad-spectrum pesticides appears to be declining. This is good news for growers that place a greater reliance on natural control agents.

In the world of insect biocontrol, predators and parasites that feed on the pest are often present in the area and populations increase in response to increased food (pests). Major types of insects that are predaceous: dragonflies and damselflies, mantids, true bugs, some thrips, lacewings and relatives, beetles, some wasps and ants, and some flies. Spiders and some mites are also important predators of insects. In the world of insect biocontrol, parasites are actually called parasitoids because what they kill are parasitic in their immature stages and free-living as adults. Some examples of these include wasps, flies, some beetles, and mantisflies.

Microbial pathogens can also reduce insect populations and these organisms have become very popular for insect biocontrol. Major pathogens used in biological control of insects are:

- Bacteria— *Bacillus thuringiensis* = Bt (many caterpillar pests, beetles, mosquitoes, others).
- Viruses— Nucleopolyhedrosis viruses (Gypsy moth, European corn borer), granulosis viruses (Codling moth).
- Fungi— *Metarhizium* (cockroach motels), *Beauveria bassiana* (Colorado potato beetle, Corn rootworms).
- Protozoa— *Nosema locustae* (grasshoppers).
- Nematodes— *Steinernema* and *Heterorhabditis* spp. (Soil weevils, Stem-boring caterpillars).

Keep in mind that insect biocontrol never provides complete pest control and minimizing the use of broad spectrum insecticides will enhance the probability that predators and parasitoids will be present in your garden.

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