

## Biocontrol

### Getting Started

#### START SMALL

As with any new technology, start small. Learn the system in one greenhouse and expand as you gain confidence and knowledge.

#### NO PESTICIDE RESIDUES

Discontinue using insecticides with long residual activity at least 1 to 2 months prior to introducing biocontrols. Insecticide residues on plants and greenhouse fixtures can be deadly to biocontrol agents. To be certain about the compatibility of a compound that has been applied, consult biocontrol suppliers for current information on specific products. Also check the compatibility chart on page 19.

#### SOFT PESTICIDES

Consider the use of “soft” or “reduced-risk” compounds (e.g., insecticidal soap, ultra-fine horticulture oil, neem compounds) for treating pest outbreaks that occur while managing with biocontrols. For compatibility information, check the compatibility chart or consult your biocontrol supplier before spraying. Some growers prefer having a sprayer designated only for soft pesticides, thus avoiding contamination with more toxic insecticides.

#### ORDERING, PRODUCING, AND DISTRIBUTING BIOCONTROL ORGANISMS

Koppert is currently the international market leader in the field of biological greenhouse crop protection. Large-scale production of natural enemies such as *Encarsia formosa* and *Aphidius colemani* takes place in the main facility located in the Netherlands. Several other large producers include Biobest (Belgium), a leader in bumble bee pollination and biocontrol producer; Syngenta Bioline (England and California); and Applied Bio-Nomics, Ltd. (Canada), largest producer of greenhouse biocontrols. More than twenty producers in the United States specialize in the production of many species of predatory mites, lacewings, *Trichogramma* parasitoids, beneficial nematodes, and filth fly natural enemies.

These biocontrol producers have distributors in the United States and Canada. Many of them have technical support staff including full-time entomologists to answer pest control and pollination questions. A list of some distributors is included in the appendix; also check the Association of Natural Biocontrol Producers (ANBP)

Web site at <http://www.anbp.org/> (accessed 9/27/2004) for a list of distributors. This professional organization’s membership includes researchers and producers, distributors, and users of natural enemies.

Because most greenhouse biocontrols are shipped from Europe or Canada, most distributors require orders to be placed by Thursday for delivery the following Wednesday. So, growers must plan ahead. Products are delivered directly to growers via UPS, Airborne, or FedEx. Insist on guaranteed live delivery and overnight express only.

Most natural enemy producers screen for quality and use packaging or best-used-by dates. Be cautious of suppliers who do not put dates on their materials. When biocontrols arrive, check for viability. Predatory mites can be checked by shaking material onto a white sheet of paper and looking for movement. For biocontrols shipped as pupae, a small portion of each shipment should be set aside in small, sealed containers, such as plastic bags or yogurt cups, and observed for adult emergence.

Parasitoids such as *Aphidius colemani* (shipped in bottles) should be placed in the greenhouse within 24 hours of receipt. Mortality of parasitoids can be determined by checking emergence rate. During warm weather, biocontrols should be shipped with cooling material. Inform employees that you will be receiving biocontrols so that the materials can be stored in a cool area if they cannot be distributed immediately.

Biocontrols are available for all of the major greenhouse pests, including aphids, caterpillars, fungus gnats, mealybugs, scales, shore flies, spider mites, thrips, and whiteflies.

### Types of Biocontrol Organisms

Before starting a biological control program, recognizing the characteristics of predators and parasitoids and how they are used for each unique pest management situation is important. Most biocontrol organisms fall into the following categories and are described further in the section starting on page 73.

#### PREDATORS

A predator kills and consumes many prey individuals as food, and they are usually as large or larger than their prey and quite capable of moving around to search for their prey. Predators can be beetles, mites, mantids, flies, and bugs. In addition to ladybird beetles, many other predators are commercially available for introduction into crops.

## PARASITOIDS

Parasites, by definition, feed on or in a host without killing it directly and therefore are usually not effective in controlling pest populations. Parasitoids, on the other hand, develop within the body of its host, killing it directly. For consistency in this manual, the term parasitoid will be used when referring to biocontrol agents that invade their hosts, eventually killing them.

Parasitoids are usually smaller than their prey. One or more grow and develop in or on a single host. As the parasitoid larvae feed and mature, the host is slowly killed. Adult parasitoids (usually wasps or flies) are highly mobile and parasitize many individuals. Parasitoids attack many different species of pests, such as aphids, whiteflies, caterpillars, leafminers, flies, and scales.

## PARASITES

A group of organisms parasitic on insects are often referred to as entomopathogenic (insect-parasitic) nematodes.

Nematodes are simple roundworms lacking segments or appendages and may be parasitic, free-living, or predaceous. Entomopathogenic nematodes have a symbiotic association with bacteria (*Xenorhabdus* spp.) that is lethal to many soil-dwelling insects but do not affect animals and plants. The two genera of insect-parasitic nematodes used for pest control include *Steinernema* and *Heterorhabditis*. Insect-parasitic nematodes have been used successfully to control soil-dwelling pests in greenhouses, nurseries, strawberries, mushrooms, and turf, replacing traditional synthetic pesticide drenches. Nematodes require moist soil to be effective, and soil temperatures should remain between 60°F and 90°F. Because of the high degree of safety, nematode applications are exempt from reentry intervals and worker protection standards and do not require a mask or other safety equipment. Nematodes can be applied like most conventional pesticides using a pull-behind sprayer, fertigation system, or backpack sprayer.

## PATHOGENS

Entomopathogenic fungi (mycoinsecticides) are pathogens that infect and kill insects. Fungal spores must have direct contact with insects to be effective. As spores attach to the insect cuticle, they germinate and the fungus grows into the body cavity. *Beauveria bassiana* (Balsamo) Vuillemin is an entomopathogenic fungus that may control infestations of whiteflies, some thrips, and certain species of aphids. (BotaniGard™ and Naturalis T&O™ are two commercially available products.) Hyphae—small tubes that grow from the spores—enter the body cavity of the pests and then attack the internal organs. The infected insect stops feeding and dies within a few days.

## Sources for Biocontrol Organisms

See Appendix E for list of sources and contacts for biocontrol organisms.

## REFERENCE

Gill, S. A., et al. 2003. *Integrated Pest Management for School Greenhouse Operations*. Maryland Cooperative Extension, University of Maryland.