



GREEN TIPS

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BENEFICIAL INSECTS AND MITES

Biological control refers to the control of insect pests and mites by their natural enemies. Left undisturbed by human activities, many garden and orchard pests are maintained at low population levels by predatory and parasitic insects.

Such beneficial insects are common in wild habitats, but because of their susceptibility to pesticides, they are often eliminated from cultivated areas. The encouragement of beneficial insects costs the grower little compared with the potential savings and benefits derived from their activities. In a sense, beneficial insects are a form of free pest control just waiting to be utilized.

More subtle benefits can be derived from biological control other than the immediate economic one. The development of resistance of some pests to pesticides is common. Encouraging biological pest control reduces the chances of this happening. Once established, biological pest controls tend to offer a measure of permanent control, compared with other methods. Biological control reduces environmental contamination by minimizing pesticide use.

While many benefits can be derived from biological control programs, there are some limitations to this approach. Predatory and parasitic insects and mites require the presence of a certain number of their hosts (the insect pests) to maintain their own populations. When biological control functions properly, enough pests are present to maintain a breeding population of the biological control agents without injuring the crop being produced. This means that a few pests must be tolerated in the garden or orchard. Thus, biological control is most effective against indirect pests (those which attack the stems, foliage, etc.), such as aphids, leafhoppers

Source: MSU Oakland County Extension Bulletin

and mites. Its effectiveness against direct pests (those which attack the fruit or other edible parts directly), such as apple maggot or spinach leaf miners, is limited.

PREDATORY INSECTS

Predators are usually larger and more powerful than their prey. Both the adults and immature stages of predatory insects feed by devouring their prey or by sucking their body juices. To grow, predaceous insects must consume many pests. They can quickly destroy many pest insects, but they also require high pest populations to support their activities.

Syrphid Fly Larvae

The family Syrphidae includes insects we call bee flies or hover flies. They are medium-sized, brightly colored with yellow and black stripes, and are often mistaken for bees or yellow jackets. They are strong fliers and can hover motionless while flying. The larval stages of many syrphids are predaceous, feeding on aphids, scales and even small caterpillars. One larva can consume up to 400 aphids before completing development.

These insects overwinter as pupae in the soil. In the spring, adult flies emerge, mate and lay eggs singly on leaves or bark, usually among aphid colonies. One female lays several hundred eggs. The larva is cylindrical, but tapers to a point at the head. It has dark-colored breathing tubes on the tail end. The life cycle from egg to adult takes 16 to 38 days, depending on temperatures, and there are 5 to 7 generations per year. Syrphids can effectively maintain aphids at low densities.

Cecidomyiid Larvae

The Cecidomyiidae comprise another fly family having species with predaceous habits. Although most of the species form plant galls, a few are predaceous on aphids, scales, thrips and mites. They also feed on the eggs of soft scales and mealybugs. The adults are small, delicate flies with long legs, mostly nocturnal and not often seen.

These flies overwinter as mature larvae or pupae inside a cocoon. As the weather warms, adults emerge to mate and lay eggs among aphid colonies. The very small orange eggs hatch into brightly colored, orangish larvae. The larvae attack aphids, sucking out their body contents. They are not very mobile, so they are restricted to the aphid colonies where the eggs were placed. There are about six generations per year.

Ladybird Beetles

Source: MSU Oakland County Extension Bulletin

The ladybird beetles, or Coccinellidae, are very efficient predators of aphids, scales, whiteflies and mites. There are about 400 species native to North America. In addition, several species have been introduced into the U.S. for biological control of various pests. The more successful cases involve fairly host-specific beetles, those feeding on only one, or a few, pest life cycles and habits. The high reproductive potential and voracious appetites of both larvae and adults often leads to rapid control of scale, mite and aphid pests.

Adult ladybird beetles are generally hemispherical and brightly colored, although some are completely black. Adults overwinter in sheltered locations, such as tree holes and other natural cavities. In spring they become active and eggs are laid on the underside of leaves, usually near aphid colonies. One female can lay hundreds of eggs, which are yellow, spindle-shaped and stand on end.

The active larvae have well-developed legs and might remind one of tiny alligators. They are generally brightly colored and decorated with various protuberances on the body segments. The larvae develop through 4 instars (molts), then pupate on a leaf or branch by attaching to the surface by their posterior segment. The larval skin splits along the upper surface and is pushed to the bottom of the pupa, which then stands erect on the leaf or branch until adult emergence. There are usually 1 or 2 generations per year.

Lacewings

The lacewing family, Chrysopidae, are well-known because of their distinctive characteristics. The adults have lacy, net-veined wings, metallic copper-colored eyes and a strong defensive odor. The larvae, with their long sickle-shaped mandibles and rounded bodies, are distinctive predators, feeding on aphids, mealybugs, leafhoppers, thrips, scales, mites and eggs of Lepidoptera.

Mature larvae overwinter inside cocoons in bark cracks or on leaves on the ground. In the spring adults emerge to lay oval eggs situated on top of a long stalk, on tree trunks and branches. The stalk protects the eggs by reducing parasitism and predation, and might even reduce cannibalism by newly emerged larvae. When the larvae hatch, they must climb down the stalks to seek prey. Larvae are easily recognized because they "decorate" themselves with the bodies of their prey and other debris from their environment. The trash is placed atop the body, which gets to looking like a walking trash heap. This "decoration" is lost at each molt and a new accumulation is started. There are two generations per year.

Predaceous Bugs

Source: MSU Oakland County Extension Bulletin

Many true bugs are plant feeders, and many, such as the tarnished plant bug, are serious pests of many crops. However, some true bugs have adopted predaceous habits. The predatory forms generally possess several adaptations, including: modified front legs, which can grab and hold prey; a short, stout beak, which can be maneuvered to feed on the prey; and salivary glands, which produce poisonous or paralyzing secretions for subduing their prey.

The two families of predaceous bugs commonly found in Michigan are the assassin bugs and the damsel bugs. The assassin bugs, or Reduviidae, are fairly large, usually brown to black bugs. Adults and nymphs have similar habits, preying on aphids, leafhoppers and caterpillars. The damsel bugs, or Nabidae, are also predators of aphids, leafhoppers, scales and lepidopterous eggs and larvae. Both assassin and damsel bugs are likely to feed on other predators, such as ladybird beetle larvae. They are among the least effective of the beneficial insects for biological control, but their feeding activities are not harmful and they should not be mistaken for plant-feeding forms.

Predaceous Mites

Three predaceous mites are common in Michigan apple orchards, but a small pear-shaped mite, *Amblyseius fallacis*, is the most important. The females overwinter at tree bases and in litter on the ground. In spring, they feed on the two-spotted and other plant feeding mites on grass and other plant feeding mites on grass and other ground level vegetation. Around mid-June and continuing through July, *Amblyseius* moves up into trees to feed on plant feeding mites. Initially, they feed on the lower, inner-most branches, but if prey is available, they rapidly disperse throughout the tree. Females lay 1 to 5 eggs per day, and it takes only 7 to 9 days to complete one generation. Thus, large predator populations can develop quickly if food resources are adequate.

Amblyseius is effective in commercial orchards because it is resistant to several organo-phosphate insecticides which are often used in orchards. The higher the predator/prey ratio, the better the chance for biological control to succeed. Proper insecticide selection is necessary. In addition, mite predators do better if there is a small reservoir of vegetation around the base of the tree to support spring prey populations.

PARASITIC INSECTS

The most prevalent parasitic insects are wasps or flies, which are generally smaller and weaker than the insects they attack. The adult parasite attacks its host, placing an egg in or on it. Usually, only one egg is placed in each host, although a few parasitic larva feed on the juices or internal organs of the host. When the parasite reaches maturity, the host usually dies. The death of the host sets these parasitic insects apart from other parasites, such as tapeworms, whose survival depends on the survival of the host.

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Tachinidae Flies

The Tachinidae is one of the largest groups of flies, with over 1300 species, in the U.S. They are valuable because nearly all species are parasites. In addition, they have a high potential for rapidly increasing their population and thus can be effective in biological control. Typical hosts for many of these flies are caterpillars and the larvae and adults of beetles. Adults are medium to large flies, with dull coloring and prominent bristles. They are active fliers, but often can be seen resting on foliage.

There is considerable variation among Tachinids in their overwintering habits. One example would be those which overwinter as pupae in the soil or in leaf litter. The pupa is the last larval skin, reddish brown and elliptical like a large grain of wheat. Adults emerge in the spring and feed on insect honeydew and flower nectar. After mating, the female begins searching for hosts on which to begin the next generation.

Most Tachinids do not lay eggs. Rather, they deposit fully developed first instar larvae on, into, or near their hosts. Those larvae which are not placed on or in the host are ingested by host feeding. Those Tachinids which do lay eggs deposit them externally on the host. After hatch, the larvae feeds its way into the host. They feed extensively, often consuming all but the skin of the host. When the larva completes feeding, it bores its way out of the host to pupate and complete the generation. The life cycle of some Tachinids closely corresponds with that of a specific host. Others may switch to different species of hosts during their second and any subsequent generations.

Ichneumon Wasps

The Ichneumonidae is a very large family of slender-bodied wasps with long antennae and a permanently extruded ovipositor, which may be as long as or many times longer than the body. The habits of this large group are varied; however, some generalizations can be made. Most are primary parasites, therefore, the group as a whole is very beneficial. The larvae may be external or internal parasites, mostly feeding on caterpillars, beetle larvae and sawflies.

Ichneumons overwinter as mature larvae in cocoons. Adults live 6 to 8 weeks and attack many hosts. Sometimes the females will attack unrelated hosts on the same plant rather than related hosts on different plants. Thus, the host plant may play a role in determining adult behavior.

The female oviposits onto or into a host's body. Internal parasites are usually synchronized with the host's physiological condition. Thus, an early stage parasitic larva may remain dormant until it is stimulated to develop, waiting for the development of the host to reach a certain stage.

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Braconid Wasps

Like the Ichneumons, the Braconid wasps are parasitic, non-stinging, and, therefore, very beneficial. They are generally smaller than Ichneumons, though similar in appearance. Host types differ among various groups within the family, though most are parasites of caterpillars. beetle, both larvae and adults, fly larvae, sawflies and aphids are also attacked.

Egg Parasites

Eggs of various insects are attacked by several groups of tiny, non-stinging wasps, including the Trichogrammatidae. They attack eggs of Lepidoptera and bugs and can parasitize 90% or more of their host eggs. They are most effective against eggs which are laid in masses, and least effective against those eggs with protective coverings.

These parasites spend the winter as larvae within the host egg. They suffer heavy population declines each year because of insufficient host eggs for overwintering. In spring the larvae that successfully overwinter in eggs undergo pupation and adults emerge. They mate the same day and start laying eggs within hours. Females lay from 40 to 60 eggs and only about 7 to 10 days are required per generation. Thus, although only a few overwinter successfully, their populations build very rapidly in the spring and they are fairly effective biological control agents.

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