

Beneficial Organisms

Of more than 400 species of insects and mites that occur in a typical cornfield during a growing season, only a small fraction are pests. Insect and mite pests are attacked or infected by many species of beneficial organisms (also called natural enemies), including predators, parasitoids, and pathogens. However, practical information about the use of natural enemies in corn pest management is lacking because beneficial arthropods and pathogens have been studied less intensively than the pest species.

A predator may be an insect or other animal that consumes many insect prey during its lifetime. Predators often are large, active, and/or conspicuous in their behavior. Parasitoids of insects are other insects that lay their eggs in or on the host insect. When the parasitoid egg hatches, the larva feeds on the host and kills it. Many parasitoids are specific to the type of host insect they attack, and they are not harmful to humans. Insect pathogens include viruses, bacteria, fungi, and other microorganisms that cause insect disease. Many insect pathogens attack only one species or a limited group of insects and rarely harm nontarget species.

Classical introduction, augmentation, and conservation of natural enemies are the three primary methods for implementing biological control or enhancing natural control in pest management programs. After a pest has been introduced into the United States from a foreign country, natural enemies of that pest in its country of origin also are introduced into the United States. All of the wasp parasitoids of the European corn

borer have been introduced into the United States from Europe and Asia. Although introductions of natural enemies help suppress pest populations, outbreaks of pests still occur. Natural enemies also can be reared and released by humans to augment their natural populations or to inundate a field. *Trichogramma* wasps have been used for this purpose throughout the world, and they show promise for use in some corn production systems in the United States. Conservation of natural enemies encourages their presence. Conservation includes managing cultural practices to allow natural enemies to persist and increase even when the pest is absent.

Some practical uses of natural enemies in corn are discussed in the following sections. Coverage is selective, focusing upon the most geographically widespread, abundant, and easily observed natural enemies of corn pests. The natural enemies of some corn pests remain unknown. Important groups not discussed in this handbook are the Diptera (Cecidomyiidae) that feed on aphids, mites, and other small arthropods; Acari (Phytoseiidae), predatory mites that feed on other mites and some insect eggs; other predatory mites; *Geocoris* spp., Heteroptera (Lygaeidae); paper wasps and hornets that are generalist predators; many parasitoids of aphids; the blister beetle parasites of grasshoppers; and the many families of spiders. The practical significance of most of these natural enemies in corn is poorly understood.

The impact of most species of arthropods in cornfields is not known. Many of these species may be beneficial. Several species of small flies and beetles probably help decompose organic matter by grinding large particles into smaller ones. Some species eat fungal spores, possibly suppressing the incidence of some corn diseases. Ants may recover nutrients from below the rooting zone by bringing soil to the surface as they build their nests. Some minor pests may have a net beneficial effect on corn. Natural enemies may consume minor pests and decomposers and thus survive when key pests are absent. These and many other potentially beneficial organismal interactions in cornfields remain to be characterized.

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