Natural Control

“Balance of Nature.” Virtually all pest populations are affected by natural enemies to some extent. In many cases, natural enemies are the primary regulating force of the pest populations. Natural controls include effects of natural enemies (predators, parasites, pathogens), other biotic (living) factors such as food availability and competition, and abiotic (non-living) factors such as weather and soil.

Biological Control

“Any activity of one species that reduces the adverse effect of another.” In pest management, biological control usually refers to the action of parasites, predators or pathogens on a pest population which reduces its numbers below a level causing economic injury. Herbivorous insects and pathogens that attack pest weeds are also considered biocontrol agents.

Biological control is a part of natural control and can apply to any type of organism, pest or not, and regardless of whether the biocontrol agent occurs naturally, is introduced by humans, or manipulated in any way.

Biological 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 is not a means by which to obtain pest eradication (Fig 1).

Biocontrol Agent “Chasing” Its Food Source (Pest)

Fig. 1. Representation of the cyclic relationship between a biocontrol agent and its host or prey (pest).

General Concepts of Biological Control

Diane G. Alston, Entomologist

DEFINITIONS

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GENERAL METHODS

Biological control agents can be purchased from commercial suppliers and released for supplementary control of pests. However, most biological control occurs without assistance from people. Many predators, parasites and pathogens occur naturally and are continually working to help keep nature in balance. The importance of natural enemies is often not appreciated until a broad spectrum pesticide, which kills many beneficiais as well as the targeted pest, is applied and a new pest – suddenly released from biological control – becomes a serious problem. Conservation and enhancement of natural enemies already present in the system can be a very effective method of biological control.

1. Introduction = Importation

This is the “classical method” of using biological control. It has been used most for introduced or “exotic” pests. The origin of the pest is determined and then a search
2. Predators

**Predator** – “Free-living animal that feeds on other animals (prey); it may attack prey in both its immature and adult stages; usually more than one prey individual is required for the predator to complete its life cycle.”

Major types of animals that are predators: birds, fish, amphibians, reptiles, mammals, arthropods, and some plants (e.g., Venus fly trap). 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 arthropods.

3. Pathogens

Use of microbial pathogens has become a very popular method of pest management. Major pathogens used in biological control of insects:

- **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).

4. Herbivorous Insects and Microbial Pathogens of Weed Pests

Numerous species of plant-feeding insects have been evaluated for control of pest weeds. The greatest successes have been in rangelands, forests, and other natural habitats where other weed control approaches (e.g., herbicides, cultivation) are impractical or uneconomical. Some pathogens have also been looked at as weed biocontrol agents (e.g., plant rusts). The goal when using a weed biocontrol agent is generally one of weed population reduction and not eradication. Importation of a biocontrol agent from the region of origin of the weed has been the most common approach. It is generally a long-term process which requires sustained efforts, but which can reap long-term benefits.

Some classic examples:
- Importation of a moth to control prickly pear in Australia; the larvae bore into the stalk of the cactus allowing entry of secondary disease organisms.
- Introduction of a leaf-feeding beetle to control Klamath weed in the western U.S.