

Fact Sheet

Biopesticides

What Are Biopesticides?

Biopesticides—also known as biological pesticides—are pesticides derived from natural materials such as animals, plants, bacteria, and certain minerals. Biopesticides target specific pests and generally pose little or no risk to humans or the environment. Traditional pesticides, by contrast, are generally synthetic materials that not only affect the targeted pest, but also unintended organisms, such as beneficial insects, surrounding vegetation, and wildlife. Biopesticides fall into three major classes:

Microbial Pesticides

A microorganism (e.g., a bacterium, fungus, virus, or protozoan) serves as the active ingredient to control pests. Microbial pesticides can control many different kinds of pests, although each separate active ingredient is relatively specific to its target pest(s). For example, there are fungi that control certain weeds, and other fungi that kill specific insects.

The most widely used microbial pesticides are subspecies and strains of *Bacillus thuringiensis*, or *Bt*. Each strain of this bacterium produces a different mix of proteins, and specifically kills one or a few related species of insect larvae. While some *Bt*'s control moth larvae found on plants, other *Bt*'s are specific for larvae of flies and mosquitoes. The target insect species are determined by whether the particular *Bt* produces a protein that can bind to a larval gut receptor, thereby causing the insect larvae to starve.

Plant-Incorporated Protectants (PIPs)

PIPs are pesticidal substances that plants produce from genetic material that has been added to the plant. For example, scientists can introduce the gene for the *Bt* pesticidal protein into the plant's own genetic material. Then the plant, instead of the *Bt* bacterium, manufactures the substance that destroys the pest. The protein and its genetic material, but not the plant itself, are regulated by EPA.

Biochemical Pesticides

Biochemical pesticides are naturally-occurring substances that control pests by non-toxic mechanisms. Traditional pesticides, by contrast, are generally synthetic materials that directly kill or inactivate the pest. Biochemical pesticides include substances—such as insect sex pheromones, that interfere with mating—as well as various scented plant extracts that attract insect pests to traps. Because it is sometimes difficult to determine whether a substance meets the criteria for classification as a biochemical pesticide, EPA has established a special committee to make such decisions.

Who Can Use Biopesticides?

Anyone seeking to reduce the risks associated with pesticide use can use biopesticides—commercial growers, specialty crop growers, schools, landscaping professionals, and backyard gardeners.

Benefits of Using Biopesticides

Biopesticides can be used to significantly reduce reliance on traditional pesticides. With few exceptions, biopesticides are not intended to function as “stand-alone” pest control products that can substitute other pesticides one-for-one. Instead, biopesticides are most effective when used as a component of an Integrated Pest Management (IPM) program.

- **Decrease risk without affecting yield.** Biopesticides—when used as a component of an IPM program—can greatly decrease the use of pesticides, without affecting crop yield.
- **Target specific pests.** Biopesticides are frequently pest-specific in their targets; that is they generally affect only the target pest and closely related organisms. In contrast, broad spectrum, pesticides may affect organisms other than the targeted pest, such as plants, birds, insects, and mammals.
- **Are effective.** Biopesticides are often effective in very small quantities and decompose quickly. This can result in lower exposures and avoid pesticide pollution problems.
- **Avoid resistance problems.** Biopesticides have broad modes of action on pests. A mode of action refers to how the pesticide works to kill or deter the target. When used in rotation with other pesticides, optimal pest management can be obtained while avoiding resistance problems.
- **Have no restricted entry interval.** Many biopesticides do not have a restricted entry interval. Restricted entry intervals are requirements that limit the time that one can return to a field once it has been treated. Restricted entry intervals can delay or obstruct pruning, irrigation, or other cultural practices. Biopesticides can also offer peace of mind to homeowners who have difficulty keeping children and pets off recently treated lawns or gardens.
- **Are often less toxic.** Generally, biopesticides are less toxic than other pesticides.
- **Have fewer harvest restrictions.** Many biopesticides do not have harvest restrictions. A harvest restriction is a waiting period between when a pesticide is applied and when a crop can be harvested, often for a period of a few days. Biopesticides without harvest restrictions give a grower much greater flexibility during harvest, and peace of mind.
- **Have wide applications.** Biopesticides are generally broadly labeled (i.e., they may be registered for use on a wide range of crops). For very minor crops or obscure pest problems, a biopesticide may be available when no other pesticide is available.
- **Have improved residue management.** Buyers and consumers are becoming increasingly selective in their purchasing habits. Illegal pesticide residues left on produce can result in loss of markets, fines, and other consumer avoidance. Biopesticides often contain natural products that are normally consumed and do not have residue concerns.



For more information about biopesticides, visit www.epa.gov/opp0001/biopesticides

