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Bt PRODUCTS

Bt products are biological insecticides developed from a naturally occurring bacterial pathogen of insects called *Bacillus thuringienses*. These Bt bacteria produce spores and toxins which, when eaten in sufficient quantity, can kill insects that have the specific physiology required to break down and then bind the toxin to the gut membrane. The gut lining ruptures, feeding stops, and death usually occurs within 2 to 5 days. Since Bt is very selective, it is considered non-toxic to humans, other animals, plants and most beneficial insects. It does not pose a pollution problem, as do many chemical insecticides. Bt is registered to use on food crops up until harvest.

There are many subspecies (varieties) of Bt and each is effective against certain insects. Listed below are some of the varieties available, the insect pests they affect, and products that contain that variety of Bt or its toxins:

Bt var. aizawa (Bta) - larvae of wax moths (in honeycombs), beet armyworm, and other moth species, especially the diamondback moth caterpillar which has developed resistance to Btk	Bta products - Agree, Ketch. and Xentari
Bt var berliner (Btb) - young caterpillars of cabbageworms, loopers, tomato hornworm, and grape leaf folder	Btb products - Wilbur - Ellis's Bt 320 Sulfur 25 dust
Bt var. israelensis (Bti) - larvae of mosquitoes, black flies, and fungus gnats. Warning: Bti applied at rates used for mosquito control may affect some types of midges that serve as food for wildlife.	Bti products - Aquabac, Bactimos, Gnatrol, Mosquito Bits and M. Dunks, Teknar, Vetobac, etc.
Bt var. kurstaki (Btk) - many types of young caterpillars of butterflies and moths such as cabbage worms, loopers, inchworm, tomato hornworm, webworm, snailcase bagworms, leafrollers, redhumped caterpillar, tent caterpillar, webworm, redhumped caterpillar, gypsy moth, tussock moth, spruce budworm, pine butterfly, alfalfa caterpillar, corn earworm	Btk products - Biobit, Condor,.Crymax, Dipel, Foray, Green Light, Javelin, Lepinox, Safer's Caterpillar Killer, Thuricide, etc.
Bt var. san diego /tenebrionsis (Bts & Btt) - larvae of Colorado potato beetle, elm leaf beetle, and cottonwood leaf beetle, and adult elm leaf beetle	Bts or Btt products - Novodor, Raven (Btt + Btk)

Application

Young larvae are usually the most susceptible. Also this is when they are the hungriest. Check to see if they are actively feeding if the weather turns cold. For leaf rollers the daytime temperatures must be at least 65°F in the day(s) following application or they will not be feeding. Since a pest must ingest Bt to be killed it is important to have thorough coverage of all plant surfaces, including the undersides of leaves. Use a spreader/sticker if spraying. In bright sunlight Bt has a half-life of 3.8 hours, so it is best to apply late in the day or on an overcast day (but not rainy). More than one application may be necessary for pest control.

Bt products should never be used unless necessary. There is risk for the development of insect resistance to the Bt toxin. The use of these products should be part of an integrated pest management plan that chooses a combination of tactics to keep pest populations at an acceptable level. Building up a healthy soil; growing plants that attract beneficial organisms; and using row covers, plant collars and water sprays are some of the tactics that can be employed first. For mosquito control, eliminating sites that serve as a source of standing water (tires, empty containers) and controlling weeds around stagnant ponds is more effective than applying Bt.

Certified organic gardeners should be aware that not all Bt products are accredited for use. Some contain inert ingredients that are prohibited and others contain a prohibited type of genetic engineering in their manufacturing. Check with your state agency.

BT comes in spray, dust, granular, pellet, and time-release ring formulations. Most of these products contain living organisms so it is important to follow the storage directions given on the label. Shelf life is greatest when the storage temperature is just above the minimum required. Liquid formulations are more perishable than those that are dry. Avoid high pH water when mixing sprays since it can reduce the effectiveness of Bt. Use caution when applying the pesticide. If rubbed into the skin it may cause an allergic reaction. Read and follow label directions carefully.