**Plant Protection & Pest Management**

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**Bacillus thuringiensis israelensis (Bti) Fact Sheet**

What is Bti - Bacillus thuringiensis israelensis?

*Bacillus thuringiensis* subsp. *israelensis* (Bti) is a naturally occurring soil bacteria used as a microbial insecticide to control the spread of vector-borne diseases, protect public health, and manage insect pest species. *Bti* was first discovered in a stagnant pond in Israel in 1976 (Margalit and Dean 1985). Initial testing of *Bti* revealed acute toxicity to mosquitoes (Goldberg and Margalit 1977) and black flies (Undeen and Nagel 1978). Further research demonstrated that *Bti* is nontoxic to humans, mammals, birds, beneficial insects, fish, plants, and most aquatic organisms (*EPA 1998 Bti EG2215 Factsheet*). *Bti* is an ideal pesticide with greatly reduced environmental impacts in comparison to man-made chemical insecticides. In addition, *Bti* is species specific, breaks down rapidly, limited non-target impacts (de Barjac and Sutherland 1990). There are 26 *Bti* products in the United States with some of the following trade Names: Vectobac, Teknar, Aquabac, Bactimos, LarvX, etc.

*Bti* application for black fly control

*Bti* is applied by via aerial spraying or boat spraying at a safe rate specified by the United States Environmental Protection Agency in the form of liquid. *Bti* is currently being used in several states to control black flies and mosquitoes. Both Pennsylvania and West Virginia have large black fly suppression programs and use *Bti* as the treatment. *Bti* is also currently being used to suppress mosquito populations throughout Maryland.

How *Bti* impacts black flies

Black flies must actively ingest *Bti* in order for the material to be effective. *Bti* is a spore-forming bacterium that produces protoxins in the form of parasporal protein crystals. *Bti* works best in black flies with alkaline guts because the protoxins become activated into highly toxic delta-endotoxins. The endotoxins cause a rapid breakdown in the lining of the midgut and necrosis of skeletal muscles, resulting in paralysis and mortality of target insect pests. *Bti* is nontoxic to other non-target species due to their acidic digestive system.

Non-target impacts of *Bti*

Research has demonstrated that *Bti* is nontoxic to humans, mammals, birds, fish (trout and bluegill), and most invertebrates when properly applied (*EPA 1998 Reregistration Eligibility Decision*). Data from a large number of studies indicate that *Bti* can be used in a carefully managed treatment program to selectively control insect pest and vector species with minimal adverse environmental impacts (Jackson et al. 2002), (Laird et al. 1990).

Further Reading

- de Barjac H. and D.J. Sutherland (eds.). 1990. Bacterial control of mosquitoes and black flies: Biochemistry, genetics and applications of *Bacillus thuringiensis israelensis* and *Bacillus sphaericus*. Rutgers University Press, New Brunswick, NJ. 349 pp.
- Environmental Protection Agency (EPA). 1998. *EPA Bacillus thuringiensis subspecies israelensis strain EG2215 Factsheet*; available from
- Environmental Protection Agency (EPA). 1998. *EPA Re-registration Eligibility Decision (RED) Bacillus thuringiensis EPA738-R-98-004*

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