Biological Pesticides Chemical Fact Sheet

Formulations

Two bacteria are commonly used as biological controls for mosquitoes: *Bacillus thuringiensis* (Bt) and *Bacillus sphaericus* serotype H5a5b, strain 2362 (Bsp). The Bt used around ponds is the subspecies *Bacillus thuringiensis israelensis* (Bti). Bti was registered with the EPA in 1983 for control of black flies, mosquitoes and midges and Bsp was registered for mosquitoes in 1991. Bti is sold as Aquabac®, VectoBac®, Mosquito Dunks® and Teknar®. Bsp is the active ingredient in Spheratax SPH (50G) and VectoLex®. Some products are powdered, some are liquid, and some are pellets. Users should check the labels to make sure the product chosen is labeled for use in their water body type.

Aquatic Use and Considerations

Both Bti and Bsp are soil-dwelling bacteria. Bti has been used as a non-chemical control for various insects since the 1960s. The bacteria contain a protein crystal that, once eaten by an insect larva, converts into toxins in the stomach, which then causes the insect to stop eating. The insect either starves or dies from infection. They will not affect larvae that do not eat it or adult mosquitoes or flies.

Different strains of Bt target different types of insects. The crystal varies slightly between strains, and will only dissolve into toxins in a certain pH range. Furthermore, not all insects have the receptors for the toxin. So, a given Bt strain will only affect insects that have the right level of alkalinity in their stomach to convert the crystal to a toxin *and* that have the receptors for the toxin.

Bti targets mosquitoes, black flies and some midges (gnats). Bsp targets only mosquitoes, and varies in effectiveness against different types of mosquito.

Post-Treatment Water Use Restrictions

There are no restrictions on swimming, eating fish from treated water bodies, pet/livestock drinking water or irrigation. It is not intended for use in drinking water reservoirs.

Effectiveness may be lowered in water bodies with matted algae or fast-moving water.

Herbicide Degradation, Persistence and Trace Contaminants

Bacterial biocontrol products usually remain active in the water for up to four weeks, but can stay active for five months in cold water. When the bacteria contact soil particles, either in the water column or on the bottom, they adsorb and are no longer toxic. This can happen quite rapidly. The bacteria may become toxic again when the sediment is disturbed sufficiently to re-suspend the spores. Spores can persist for at least 22 days in soil where it is immobile. Bti degrades rapidly in sunlight. It has a haf-life of 3.8 hours (the time it takes for half the product to degrde) when exposed to sunlight. Within 48 hours, Bti is below levels that are lethal to insect larvae.

Leaching through soil into groundwater is not expected with Bti or Bsp due to its immobility in soil.

Beta-exotoxin is produced by some *Bacillus* species and may contaminate products under certain manufacturing processes. EPA requires that *Bacillus* products are monitored for contamination, and that manufacturing processes are tested and certified. Other pathogenic bacteria such as *Escherichia coli* are tested for as well. Fecal bacteria contamination has been reported (*Streptococcus faecalis* and *S. faecum*).

Impacts on Fish and Other Aquatic Organisms

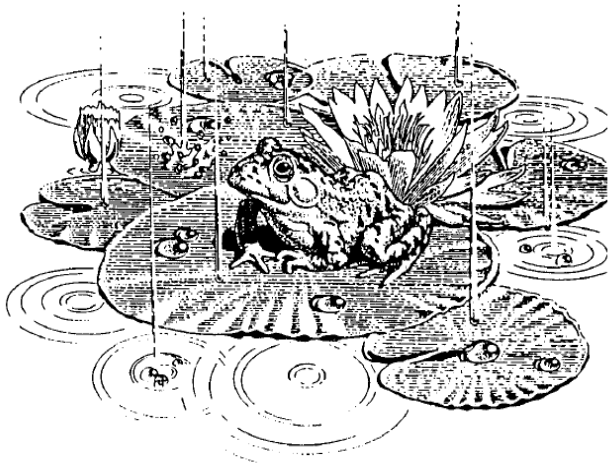
Removing fly, mosquito, and midge larvae from a water body may reduce a food source for many organisms, aquatic and terrestrial. Larvae are important prey items for fish and they are abundant invertebrates in ponds and lakes. Waterfowl feed on aquatic insect larvae, as well. This can be significant if large portions of the prey species are susceptible to the toxins. Proper application design coupled with monitoring, will help prevent effects to non-target species and toxicity to other non-target insects.

Until recently, previous solutions of Bti showed acute toxicity to fathead minnows. The toxicity was not due Bti but an inert additive, which has been discontinued, thus increasing the specificity of Bti solutions.

Human Health

Most concerns about adverse health effects revolve around applicator exposure. Applicators must wear dust/mist filtering respirator. Repeated exposure of high concentrations of microbial proteins can cause some allergic sensations.

Bt should not be added to finished drinking water reservoirs or drinking water receptacles.



For Additional Information

Environmental Protection Agency
Office of Pesticide Programs
www.epa.gov/pesticides

Wisconsin Department of Agriculture, Trade, and Consumer Protection
http://datcp.wi.gov/Plants/Pesticides/

Wisconsin Department of Natural Resources
608-266-2621
http://dnr.wi.gov/lakes/plants/

Wisconsin Department of Health Services
http://www.dhs.wisconsin.gov/

National Pesticide Information Center
1-800-858-7378
http://npic.orst.edu/