

Bactimos® PT

BIOLOGICAL LARVICIDE

PELLET

Bactimos® PT is a high potency (800 ITU/mg), pellet formulation of *Bacillus thuringiensis* subsp. *israelensis* (Bti, strain AM65-52) designed specifically to control nuisance populations of Chironomid midges (Diptera: Chironomidae). Bactimos PT is designed to sink immediately upon application to assure accurate application of the product to the sites where larval populations develop. The individual pellets typically range from 3 to 10 mm in length with a uniform diameter of ~ 1 mm. Bactimos PT is currently sold in 20 lb cases containing two individual jugs of 10 lbs each. A single application of Bactimos PT can be expected to provide midge control for 3 to 4 weeks.



Midge Life History

Worldwide, chironomids are the most widely distributed and frequently the most abundant aquatic macroinvertebrate in freshwater aquatic environments (Armitage et al. 1995). Some species are also found in brackish and marine water and in terrestrial biotypes. In lentic freshwater eutropic urban environments, the benthic larval stages often occur in huge assemblages and upon emergence, adult midges can be a problem to the general public and industry, even though they do not bite or transmit diseases.

Chironomid midges have four distinct life stages: egg, larva, pupa and adult. The larval stage develops through 4 instars in less than two weeks depending on species and conditions. As with most insects, temperature and food

availability control the length of time required for completion of their life-cycle.

Most nuisance midges are in the sub-families Chironominae, Orthoclaadiinae and Tanytopodinae. These classifications are an important aspect of any prospective suppression program as studies have demonstrated a wide range of susceptibility to Bti for the various sub-families. Typically species associated with the sub-family Chironominae are most susceptible to Bti while those associated with the Tanytopodinae group are the least susceptible (Ali 1996). The filter feeding Chironominae are more likely to ingest Bti than the scrapers, shredders, collector-gatherers or predators (Tanytopodinae, Orthoclaadids).

How can you tell midges apart from mosquitoes?

Typical Mosquito	Chironomid Midge
Uses it's proboscis to bite.	Cannot bite.
Wings are longer than it's body.	Wings are shorter than it's body.
Larvae develop in water.	Larvae develop in mud and detritus on the bottom of lakes and ponds.
May carry disease.	Do not carry diseases.



Why Control Midges?

The emergence and swarming of adult midges from aquatic habitats can create both nuisance and economic problems (Armitage et al 1995):

- Midges congregate in shady cool areas and deposit meconium or release egg-masses which stain surfaces. Adults can deface automobiles, walls, ceilings, curtains and other furnishings.
- They are attracted to light which can cause great discomfort in residential areas.
- Midges can be a problem for paint, paper, pharmaceutical and food processing industries where adults may contaminate final products.
- Economic loss to the hotel and tourism industry can be affected by nuisance swarms that may create stressful conditions for tourists (Anon., 1977).
- Accumulation of dead adults and unattractive spider webs spun around resting adults requires frequent cleaning of properties.
- Large numbers of dead midges can smell like rotting fish that persists in damp weather for several days after removal of adults.
- Midges have been documented to cause allergic reactions including conjunctivitis, dermatitis, rhinitis and asthma.



Midge Control Applications

Midge Habitat	Suggested Rate Range*
Man-made or natural lakes, ponds, lagoons; Sewage oxidation ponds, channels, ditches used for industrial discharges	25-30 kg/ha (22.3-26.8 lbs/ac)

*Use higher rate in deeper water ≥ 0.5 meters (20 inches) of water. Control of midges may be gradual over a period of two weeks. Repeat applications as needed.

Bactimos PT treatments can be made with many types of ground equipment designed for pellet and granule applications. These devices include manually or mechanically driven devices relying on whirling disk (e.g. Cyclone® seeder, Ortho Whirlybird® seeder) and air-blast applicators (Buffalo® turbine, Maruyama® mist/duster or Stihl® power backpacks). When using Bactimos PT pellets, it is important to properly calibrate application equipment. Pellet output at a given setting, swath width, and required speed/travel should be determined prior to application. Actual field applications should be carefully monitored to be assured that operational applications achieve the desired label rate. Consult your VBC technical specialist to determine optimal application methods to meet your program needs.

Bactimos PT should be applied uniformly over the entire surface of the lake or pond. In large habitats where complete surface treatments are not possible, applications concentrated along the

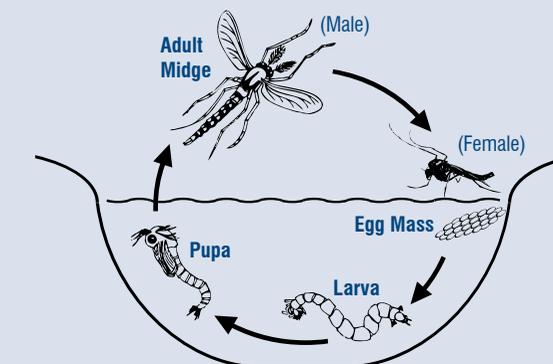
perimeter may be effective in reducing localized midge populations. It is generally agreed that sediment characteristics and water depth are common influences on chironomid assemblages (Lobinske et al. 2002). Larvae of most chironomid spp. of economic importance in the U.S. typically occur in shallower, sand substrates. However, it is suggested that before pursuing perimeter applications, one should confirm larval distribution within the site.

Only a small percentage of the thousands of pestiferous species of “non-biting midges” have been tested for susceptibility to Bactimos PT. Members of the subfamily Chironomini and Tanytarsini are generally susceptible; members of the subfamily Tanytopodinae are not susceptible at the Bactimos PT labeled-use rate. When initially using Bactimos PT in a midge control program, it is recommended that only a small test area be treated if the species of midge(s) to be controlled has not been identified.



Midge Life Cycle

Stage	Description
Eggs	Eggs are laid in mass on water or on firm, fixed objects along water edge.
Larvae	Hatched larvae develop in bottom organic substrates where they feed upon algae, woody debris, detritus, macrophytes, and invertebrates.
Pupae	Pupae rise to the water surface and emerge as adults.
Adults	Adults will live approximately 1 week depending upon the species and various biotic and abiotic factors. Males form swarms where they capture females for mating.



Susceptibility of midges to Bactimos PT

Boisvert & Boisvert (2000) reported that chironomid larvae are typically 15-75 times less sensitive than some mosquito larvae to Bti; consequently, much higher rates are required to manage chironomids. It is assumed that the near neutral gut pH in many chironomid larvae is the reason for the lower susceptibility of chironomid larvae to Bti toxic proteins than other nematoceran Diptera, specifically mosquitoes. Frouz et al. (2007) showed that in two pestiferous Florida chironomid species, gut pH's of 6.7 – 7.6 were found compared to up to a pH of 11 for mosquitoes. Alkaline pH conditions are usually necessary for activation of spores and the solubilization of Bti toxic protein crystals.



Figure 1. Site A – Year 1 (2006): Effect of single mid-summer application of Bactimos PT at 27 lbs/acre against midge larvae in South Carolina, U.S.A.

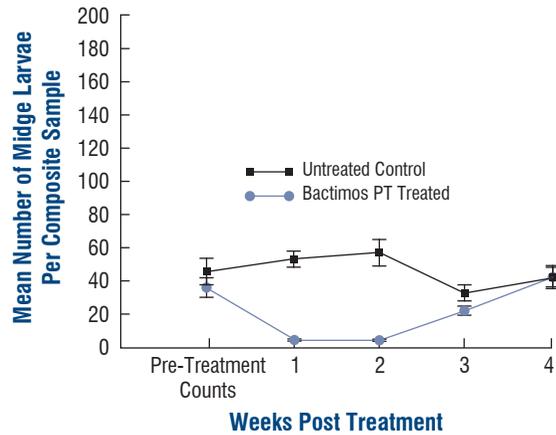


Figure 2. Site A – Year 2 (2007): Effect of single mid-summer application of Bactimos PT at 27 lbs/acre against midge larvae in South Carolina, U.S.A.

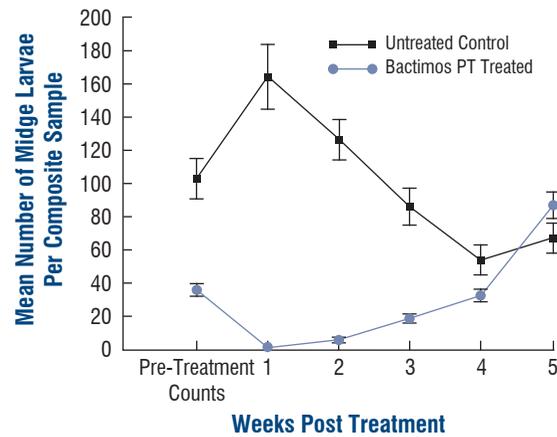
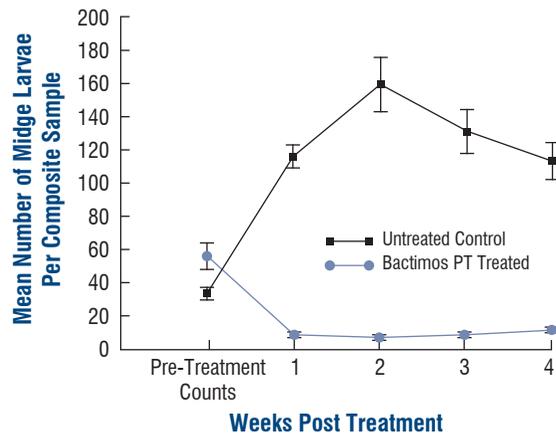


Figure 3. Site B (2007): Effect of single, early fall “band” application of Bactimos PT at 27 lbs/acre against midge larvae in South Carolina, U.S.A.

Note: Treatment targeted a 20 foot band around a portion of the site perimeter



Storage

When stored in a cool, dry place, out of direct sunlight, useful life is expected to be at least two seasons.

Precautions should be taken to provide a long-term storage area that is dry with average temperature below 24° C (75° F) and rodent proof. In northern areas, product can be held in unheated storage facilities. Freezing will not reduce potency.

Container Disposal

Completely empty containers by shaking and tapping sides and bottom to loosen clinging pellets into application equipment. Containers should then be punctured and disposed in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

References

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A Bti formulation designed for midge control

Technical Use Bulletin

