

THE OPTIMAL SOLUTION TO KILL MOSQUITOES

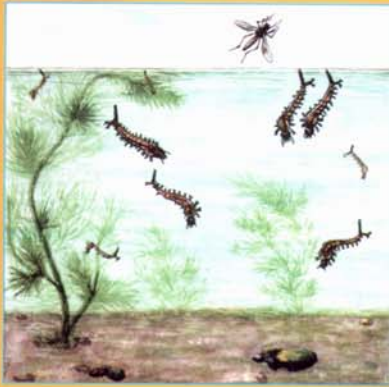


BIOSAN
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PESTICIDE-FREE, ENVIRONMENT-FRIENDLY ALTERNATIVES FOR BIOLOGICAL CONTROL OF MOSQUITOES

Bio San Ltd. develops transgenic microorganisms that produce toxins naturally found in *Bacillus thuringiensis* subsp. *israelensis* (Bti), serve as food sources for mosquito larvae, and multiply in the same habitat.

Further developments of **Bio San's** products, as well as laboratory and field tests, are being conducted by the company's scientists, at the premises of Ben-Gurion University of the Negev, Israel, and abroad.



1 Mosquito larvae swimming in the water body



2 Transgenic *Anabaena* expressing mosquito larvicidal toxins

TRANSGENIC CYANOBACTERIA

EXPRESSING COMBINATIONS OF δ -ENDOTOXIN GENES

Chemical insecticides used to control mosquitoes damage World's ecology and enhance resistance development of the pests. Current formulations of the best biocontrol agent, Bti, have short half-lives hence low efficacies in nature.

Bio San has developed a series of living mosquito-control agents that produce combinations of Bti's δ -endotoxins in transgenic *Anabaena* PCC 7120: a filamentous, photosynthetic and nitrogen-fixing cyanobacterium. *Anabaena* is ubiquitous, serves as a

food source for mosquito larvae and proliferates in their breeding habitats. This series of mosquito larvicides is based on the high specificity of naturally occurring Bti toxins that operate in different modes hence synergistically and reduce the chances for resistance development in the target. The combination of these features alleviates the problems associated with chemical pesticides and results in an excellent environmentally safe way to combat mosquitoes worldwide.

The transgenic *Anabaena* strains of **Bio San Ltd.** will become long lasting alternatives to Bti for field delivery with high mosquito larvicidal activities. Being of a laboratory origin, they will eventually disappear from the natural water bodies due to competition with indigenous cyanobacteria, thus

furnish temporal refugia between applications. **Bio San's** products are cheaply mass-produced and proliferate in nature. Their activities are protected from sunlight irradiation and retained under high intensity hence they are anticipated to be highly cost-effective.



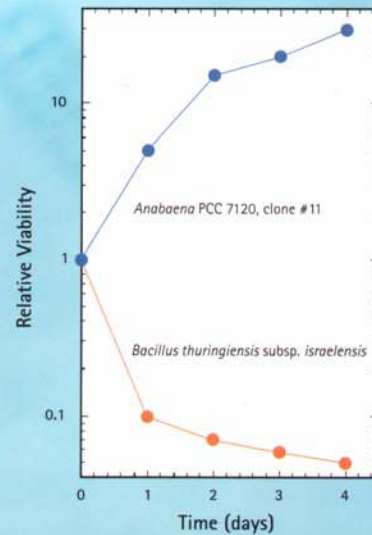
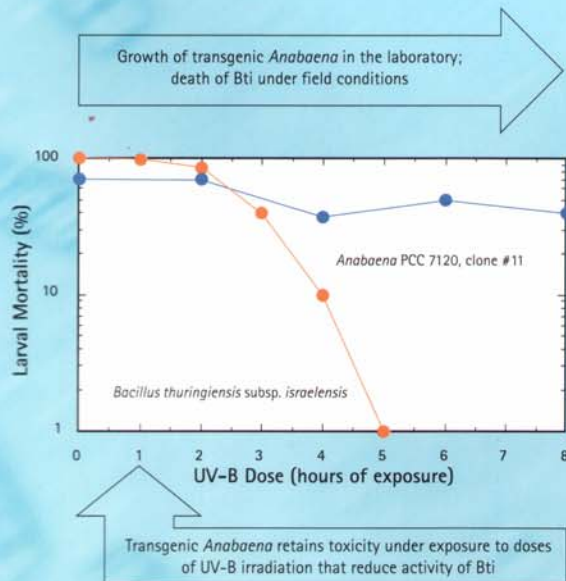
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Mosquito larvae ingest transgenic *Anabaena*



4

Mosquito larvae die and sink to the bottom. Transgenic *Anabaena* keeps on proliferating



Scientists at **Bio San** Ltd. are carrying out the following:

- **Further develop the patented** products to raise their high cost-effectiveness;**
- **Establish a small plant for mass production;**
- **Perform field tests to evaluate cost-effectiveness of the product.**

Completion of these steps will transform **Bio San** Ltd. from an R&D project into a profitable business.

** US Patent (March, 1997) approved (August, 2002), # in preparation;

Israeli Patent Application (1997) # 120,441

SUCCESS FACTORS

The following features of BioSan's products are advantageous for both the customers and producer:

- Low cost of production
- Low frequency of field applications
- Long products' lifetime in nature
- Sunlight-resistance
- Environment-friendly



More details about **Bio San**'s scientists can be found in:

<http://www.bgu.ac.il/life/zaritsky.html> (Professor Arie Zaritsky, Ph.D.)

<http://www.bgu.ac.il/BIDR/research/biotech/algae/sammy.htm> (Professor Sammy Boussiba, Ph.D.)

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