BCIL *seeks partners to license…*

Bacillus thuringiensis israelensis (Bti) based Mosquitocidal Biopesticide and Cost Effective Fermentation process for its Preparation thereof

Biotech Consortium India Limited (BCIL) is seeking companies interested in commercializing a technology for production of Bti based mosquitocidal biopesticide using cost effective fermentation process.

BCIL was incorporated as a public limited company in 1990 under the Indian companies Act 1956. It is promoted by the Department of Biotechnology, Government of India and is financed by several all India financial institutions, venture capital funds and the corporate sector. BCIL has been actively involved in technology transfer, project consultancy, fund syndication, information dissemination, and manpower training & placement related to biotechnology over the last decade and half. BCIL has transferred more than 15 technologies in the last 5 years using its expertise in facilitating licensing agreements that allows a healthy and productive cooperation between the inventor and the licensee.

Introduction

Scientists at Vector Control Research Centre, Pondicherry have developed a novel approach to process chicken feather waste for production of microbial toxins with lethal mosquitocidal properties. The present invention explores the utilization of poultry waste (bird feathers) for large scale commercial production of *Bacillus thuringiensis* serovar *israelensis* (*Bti*) based mosquitocidal biopesticide comprising of lethal mosquito attractant and larvicidal toxins.

Technology

1. Product: Water dispersible powder with formulation of *Bacillus thuringiensis* serovar *israelensis* (*Bti*) with mosquitocidal activity based on:
   a) Spores/Crystal endotoxins
   b) Novel mosquitocidal exotoxins- Lethal Mosquito attractant

2. Novel Cost-effective Chicken feather based Fermentation Medium
   a) Around 100 times cost-effective as compared to the conventional media
   b) Extraction of active ingredient requires single step purification.

Spectrum

Effective against a wide range of mosquito species including- *Aedes* (Dengue fever), *Culex* (Filariasis) and *Anopheles* (Malaria).

Mode of Action

Bacterial culture filtrate (Bti based exotoxins) from Chicken feather based fermentation medium acts as oviparous trap for attracting mosquitoes, while the spores/crystal based endotoxins kills the mosquito larvae.

Formulation

Water Dispersible powder

Shelf Life and Storage

The shelf-life of the formulation is one year when kept at room temperature (28-32^{0}C). Prolonged storage possible at -20 ^{0}C.

Cost Effectiveness

Chicken Feather Waste Medium (CFWM) is **100 times cheaper** than conventional Nutrient Yeast Extract Mineral Salt Medium (NYSM).

Data available for the technology

1. Delta endotoxin content
2. Exotoxin content
3. Viable spore count
4. Potency of the product by bioassay method
5. Field trial data for five site
   (Field trials were conducted independently by National Vector Borne Disease Control Program (NVBDC) and Filaria Control Unit, Government of Puducherry)
6. Data on non-target organisms (one season data available)

Toxicity Analysis

Bioassays conducted for *Bti* toxins (crystal toxins) produced in CFWM has shown that the growth and production of toxins was comparable to that of the conventional high cost fermentation medium (Luria Bertani and NYSM) as shown in Table below.

Table: Toxicity of *Bti* spore/crystal toxins from NYSM and CFWM against mosquito species

Mosquito species	LC_{50} (µg/L)	LC_{90} (µg/L)
Culex quinquefasciatus		
A	0.027	0.28
B	0.026	0.16
Anopheles stephensi		
A	0.036	0.24
B	0.034	0.25
Aedes aegypti		
A	0.42	4.10
B	0.44	3.70

B. thuringiensis serovar *israelensis (Bti)* culture media: A-NYSM (*Bti*);
B-CFWM (*Bti*)
LC_{50} (Lethal Concentration-50): Concentration of a chemical which kills 50% of a sample population.
LC_{90} (Lethal Concentration-90): Concentration of a chemical which kills 90% of a sample population.

About the Inventor

Dr. Subbiah Poopathi, Dy. Director, Vector Control Research Centre (ICMR), Pondicherry, has been working on mosquito vector control and management for almost two decades. During this period he has published several papers in peer reviewed Journals of national and international repute and filed three Indian Patent Applications during 2005-08. He is a distinguished fellow of Indian Society for Parasitology (ISP), National Academy of Vector Borne Diseases (NAVD), Electron Microscopy Society of India (EMSI), Association for Advancement of Entomology (AAE) and various other national and international societies. He has received DBT Overseas Associateship of Institute Pasteur, Paris during the year 1999 and INSA fellowship for the year 2001 ï 2002.

Patents Filed

- Microbial fermentation process from bird feather for the production of biopesticides (Indian Patent; Application No. 319/Del/2005).

- Lethal mosquito attractant and the preparation thereof (Indian Patent; Application No. 1210/Del/2006).
- New bacterial culture medium for the production of mosquito pathogenic bacilli using industrial wastes (**S. Poopathi** & S. Abidha) *Indian Patent No. 1106 / Del/ 2008.*

Selected Publications

- Poopathi, S and Abidha, S (2009) Cost-effective medium for the production of bio-pesticides in mosquito control. ***Journal of Economic Entomology*** 102 (4): 1423 ï 1430.
- Poopathi, S and Abidha, S (2008). New bacterial culture medium for production of mosquito pathogenic Bacilli using agro-poultry industrial wastes. ***Biocontrol Science and Technology*** 18 (5): 535 ï 540.
- Poopathi, S and Abidha, S (2008) Biodegradation of poultry waste for the production of mosquitocidal toxins. ***International Biodeterioration and Biodegradation*****.** 62: 479 ï 482.
- Poopathi, S (2008) Oviposition attractancy of bacterial culture filtrates: response to a filariasis vector of *Culex quinquefasciatus* (Diptera: Culicidae). ***Annals of Medical Entomology*****.** 17: 16 ï 24.
- Poopathi, S and Abidha, S (2007). Use of feather-based culture media for the production of mosquitocidal bacteria. ***Biological Control*** (USA). 43: 45 - 55.
- Poopathi, S, and Anup Kumar, K, (2003). Novel fermentation medium for the production of *Bacillus thuringiensis* serovar *israelensis*, in mosquito control. ***Journal of Economic Entomology*** 96 (2): 1039 ï 1044.
- Poopathi, S. and Baskaran. G, (2003). *Bacillus sphaericus* resistance in mosquitoes: An approach for resistance management. ***Proc. Natl. Acad. Sci. (Animal Sci)*** 73, B (I) 29 ï 36.
- Poopathi, S, Anup kumar, K, Arunachalam, N, Tyagi, B.K. and V. Sekar (2003) A small scale mosquito control field trial with the biopesticides *Bacillus sphaericus* and *Bacillus thuringiensis* serovar *iaraelensis* produced from a new culture medium. ***Biocontrol Science and Technology*** 13 (8): 743 ï 748.
- Poopathi, S, and Anup Kumar, K, (2003). Novel fermentation medium for the production of *Bacillus thuringiensis* serovar. *israelensis*, in mosquito control. ***Journal of Economic Entomology*** 96 (2): 1039 ï 1044.
- Poopathi, S. Anup Kumar K, Kabilan, L and Vaithilingam Sekar (2002). Development a low- cost medium for the culture of moquito larvicides, *Bacillus sphaericus* and *Bacillus thuringiensis* serovar *israelensis* ***World Journal of Microbiology and Biotechnology*** 18 (3) 209 ï 216.

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