

## Book Review

Caballero, P., Ferre, J. (eds.). 2001. *Bioinsecticidas: Fundamentos y Aplicaciones de Bacillus thuringiensis en el Control Integrado de Plagas* [Bioinsecticides: Fundamentals and Applications of *Bacillus thuringiensis* in Integrated Pest Control]. Universidad Publica de Navarra, PHYTOMA-España, Valencia, 318 pp. ISBN 84-932056-1-3. Price: \$24.40

This is most recent and comprehensive treatise on entomopathogenic bacterium *Bacillus thuringiensis* addressed especially to Spanish speaking readers but also will be of interest and value to all specialists working in insect pathology and microbial control.

The book contains the following thirteen chapters:

Chap. 1 "Biology and ecology of *Bacillus thuringiensis*" (p. 15–44) by J. Iriarte and P. Caballero provides information on morphology, taxonomy, systematic and biology of BT. Especially broadly is characterized host spectrum and toxic protein classes Cry I, Cry II, Cry III, Cry IV, Cry V.

Chap. 2 "Genetic diversification of *Bacillus thuringiensis*" (p. 45–69) by M. Porcar and P. Caballero discusses structure of Cry genes, their expression, posttranscriptional mechanisms and genetic transformation of BT.

Chap. 3 "Insecticidal proteins of *Bacillus thuringiensis*" (p. 71–86) by A. Bravo discusses classification of delta endotoxins produced by BT. Phylogenetic relationships of BT delta-endotoxin family of proteins and their functional domains proposed by A. Bravo are presented.

Chap. 4 "Mode of action of insecticidal proteins of *Bacillus thuringiensis*" (p. 87–108) by B. Escriche and J. Ferre presents the most recent information on mode of action of Cyt and Cry proteins on peritrophic membrane and midgut epithelium of sensitive insects.

Chap. 5 "Production of *Bacillus thuringiensis*" (p. 109–132) by A. Gonzales et al. reviews media used in industrial production of BT and provides information on technology of fermentation and quality control of commercial products.

Chap. 6 "Quantitative toxicology of *Bacillus thuringiensis*" (p. 133–152) by J. E. Ibarra and C. R. Castro provides information on theory of bioassays and quantitative evaluation of BT toxins what is very important for the standardization of commercial products of BT.

Chap. 7 "Commercial products based on natural and recombinant strains of *Bacillus thuringiensis*" (p. 153–168) by J. A. Ceron reviews three generations of BT bioinsecticides. As the first generation products are considered those based on BT strains isolated from natural environments e.g. Dipel. As the second generation products are considered those based on BT strains changed by transconjugation e.g. Condor. As the third generation bioinsecticides are considered those products in which BT toxin is encapsulated in *Pseudomonas* bacteria cells e.g. M-Trak.

Chap. 8 "Transgenic plants transformed with *Bacillus thuringiensis*" (p. 169–187) by J. Gonzalez-Cabrera describes the methods of plant transformation as well as the limitations of expression of BT toxins in plants. An extensive list of transformed plants is given indicating BT gene used, level of toxin expression and method of transformation.

Chap. 9 "Examples of use of *Bacillus thuringiensis* in agricultural crops" (p. 189–215) by C. Santiago-Alvarez and E. Quesada-Moraga presents information on use of BT for insect control in agriculture (maize, rice, tobacco, cotton), horticulture (tomato, potato, cabbage), orchards (apple, citrus, olives).

Chap. 10 "Pest control in vinyards with *Bacillus thuringiensis*" (p. 217–232) by R. Coscolla and V. Badia provides information on BT use in Spain, France, Switzerland, Italy and other countries to protect vinyards against *Lobesia botrana* (Lepidoptera).

Chap. 11 "*Bacillus thuringiensis* in forest protection against noxious lepidopteran" (p. 233–269) by C. Rausell et al. provides a large list of BT products used in forest, the target insects, and techniques of application. In addition, ecological implications of broad use of BT in forest ecosystems are discussed.

Chap. 12 "Aspects of resistance to *Bacillus thuringiensis* and strategy of use of transgenic plants" (p. 271–296) by J. Ferre et al. discusses strategies of preventing development of resistances in populations of insects controlled using transgenic plants. An important element of such strategy is using BT products containing various toxins and creating refuges for insect populations to maintain their susceptibility to BT toxins.

Chap. 13 "Basic techniques of working with *Bacillus thuringiensis*" (p. 297–318) by B. Escriche et al. provides useful information on following techniques: 1. Isolation of new strains. 2. Growth and

sporulation in liquid medium. 3. Determination of presence of beta-exotoxin type I using HPLC technique. 4. Serological identification of strains. 5. Purification of crystalline protein. 6. Separation of proteins by electrophoresis. 7. Solubilization and activation of crystalline proteins. 8. Obtaining of plasmid profiles of BT strains by electrophoresis. 9. Detection of Cry genes by PCR technique. 10. Transformation of *B. thuringiensis* by electroporation. 11. Bioassay methods: determination of insect susceptibility to insecticidal preparations: 11.1. Impregnation of plant discs with toxin, 11.2. Artificial diet with toxin, 11.3. Method of drop with Fluorella blue.

Without any doubt this book must be considered as a very comprehensive treatise presenting the current "state of the art" on *Bacillus thuringiensis* being the most successful biological control agent of noxious insects. Each chapter contains good illustrations and drawings as well as voluminous references concerning the presented topic. This allows to consider that book as a very important position in the field of microbial control. Nevertheless, it is a pity that this book does not contain subject neither author indexes as they would greatly facilitate finding of pages with necessary information.

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