Synergistic effect of *Bacillus thuringiensis* crystalline toxins against *Cydia pomonella* (Linneaus) (Tortricidae: Lepidoptera)

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With 1 line equation and 1 table

**Abstract:** The purpose of this study was to evaluate potential usefulness of *Bacillus thuringiensis* crystalline toxin mixtures against crop pest representing the insect order Lepidoptera. Crystals of two *B. thuringiensis* strains, MPU B9 and MPU B63, were isolated using a gradient of sucrose density. Mixtures of crystals MPU B9/MPU B63 were prepared and their toxicity against the codling moth *Cydia pomonella* (Lepidoptera) was estimated. In parallel, the toxicity of separate crystal suspension of MPU B9 and MPU B63 was determined. The activities of the mixtures were compared with the toxicities of commercial biopesticides based on *B. thuringiensis*, recommended against lepidopteran pests. The LC$_{50}$ of crystal mixtures against the insects were lower than the LC$_{50}$ of suspensions of crystals of separate bacterial strains. Crystalline proteins of two *B. thuringiensis* isolates are synergistic in toxicity to *C. pomonella*. The activities of mixtures were higher in comparison with the toxicities of commercial bioinsecticide, which indicates a potential usefulness of mixtures in crop protection. This research participates in a search of a new virulent factor enriching a set of *B. thuringiensis* toxins already applied in the bioinsecticide production.

**Keywords:** *Bacillus thuringiensis*, Berliner, 1911 – *Cydia pomonella*, Linneaus, 1758 – insecticidal activity – interaction of toxins – plant protection

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