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Abstract
Maruca vitrata (F.) (syn. M. testulalis) (Lepidoptera: Pyralidae), is one of the most serious pests of vegetable legumes crops such as cowpea, yard-long bean, and mungbean. The larvae attack flower buds, flowers, and young pods, and up to 80% yield losses have been reported. Insect pathogenic viruses have been recognized as potential alternatives to chemical insecticides. The specificity of the baculoviruses like Nucleopolyhedrovirus (NPV) to attack arthropods has made them most appropriate pest control candidates. In spring 2004, diseased Maruca vitrata larvae were found in Sesbnia cannabina, a leguminous green manure crop grown all over Taiwan in summer season. The infected larvae became sluggish, pinkish, ceased feeding, body became fragile and ruptured; dead larvae were hanging on the top of plant with prolegs attached to the host plant, that is a typical symptom of nudeopolyherosis.
The object or aim of this research was to identify the agent which cause the death of Maruca vitrata larvae and to evaluate the potential of this agent to be developed to biopesticides. The results of this studies showed that Maruca vitrata multiple Nucleopolyhedrovirus (MaviMNPV). MaviMNPV was purified from the diseased Maruca vitrata larvae by sucrose gradients centrifugation. The ultrastructures of the MaviMNPV occlusion bodies (OBs) showed several occluder virions (up to 19) with multiple nucleocapsids (up to 6) in an OB. The diameter of OBs was 0.9 to 1.3 U+B5m with a mean of 1.152+0.116 U+B5m. The DNA sequences of the coding region in polyhedrin gene was completely sequenced and subjected to phylogenetic analysis. A neighbour-joining tree indicated that the phylogenetic relationship between MaviMNPV and Anagrapha falcifera NPV or Bombyx mori NPV were most closely related. Restriction analysis of the genomic DNA of MaviMNPV with HindIII, EcoRI, BglII and PstI resulted in distinct profiles viz., 11 HindIII fragments, 13 EcoRI fragments, 14 BalII fragments and 12 PstI fragments. The restriction fragment sizes were estimated relative to the marker fragments. The genome size of MaviMNPV was estimated to be 110 kb from the sum of the fragment sizes.
This virus showed a highly killing efficiency to the larvae of Maruca vitrata. Feeding larvae with Sesbnia cannabina leaves contaminated with 1X106 OBs/ml of MaviMNPV, the accumulave mortality at 3 days postinfection was up to 70~80%. A MV cell line established from pupal tissues of Maruca vitrata has highly compatibile with MaviMNPV. The MaviMNPV could propagate in MV cell line and produced OBs in this cell line. The virulence of OBs produced from the cell line was demonstrated non-significant different from that isolated from the MaviMNPV-infected larvae (wild type virus). These evidences suggested that the MaviMNPV possessed the potential as an environmentally acceptable alternative to chemical insecticides for controlling Maruca vitrata.
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