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Use of an Insecticidal-Iridovirus Kinase towards the Development of Aphid-Resistant Plants

Authors : Saranya Ganapathy, Megha N. Parajulee, Michael San Francisco, Hong Zhang

Abstract : Insect pests are a serious threat to agricultural productivity. Use of chemical pesticides, the predominant control method thus far, has resulted in environmental damage, pest resurgence, and negative effects on non-target species. Genetically modified (GM) crops offer a promising alternative, and Bacillus thuringiensis endotoxin genes have played a major role in this respect. However, to overcome insect tolerance issues and to broaden the target range, it is critical to identify alternative-insecticidal toxins working through novel mechanisms. Our research group has identified a kinase from Chilo iridescent virus (CIV; Family Iridoviridae) that has insecticidal activity and designated it as ISTK (Iridovirus Serine/Threonine Kinase). A 35 kDa truncated form of ISTK, designated iridoptin, was obtained during expression and purification of ISTK in the yeast system. This yeast-expressed CIV toxin induced 50% mortality in cotton aphids and 100% mortality in green peach aphids (GPA). Optimized viral genes (o-ISTK and o-IRI) were stably transformed into the model plant, Arabidopsis. PCR analysis of genomic DNA confirmed the presence of the gene insert (oISTK/oIRI) in selected transgenic lines. The further screening was performed to identify the PCR positive lines that showed expression of respective toxins at the polypeptide level using Western blot analysis. The stable lines expressing either of these two toxins induced moderate to very high mortality in GPAs and significantly affected GPA development and fecundity. The aphicidal potential of these transgenic Arabidopsis lines will be presented.

Keywords : Chilo iridescent virus, insecticidal toxin, iridoviruses, plant-incorporated protectants, serine/threonine kinase
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