



Molecular and biochemical characterization of the effects of insecticidal toxin from meloidae beetles on *Helicoverpa armigera* (Hub.) (Lepidoptera: Noctuidae)

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Genet. Mol. Res. 12 (4): 4393-4404 (2013)

Received October 17, 2012

Accepted April 27, 2013

Published October 10, 2013

DOI <http://dx.doi.org/10.4238/2013.October.10.5>

ABSTRACT. The molecular and biochemical effects of an insecticidal toxin extracted from Meloidae beetles were investigated on *Helicoverpa armigera*. The toxin was identified as cantharidin, a well-known natural compound produced by beetles of family Meloidae and Oedemeridae. Furthermore, the effect of the toxin on the metabolic enzymes alkaline phosphatase (ALP) and glutathione *S*-transferase (GST), responsible for the metabolism of insecticides, was also investigated. Results of a diet incorporation bioassay performed under laboratory conditions showed that the LC₅₀ value of cantharidin was 0.068 mg/g. The body weight of the insect was also significantly reduced by cantharidin treatment. The LC₁₀ concentration of cantharidin, 0.01 mg/g, was also tested to determine its effect on ALP and GST. Our results showed that cantharidin significantly inhibited ALP activity after 48 h, whereas GST activity was significantly inhibited after 24 h. The decline of ALP

and GST transcript levels was also validated by semiquantitative RT-PCR analysis. It may be concluded from the results that ALPs and GSTs may be targets of the cantharidin intoxication mechanism. Moreover, the inability of ALP and GST to metabolize cantharidin shows that the mechanism of detoxification for cantharidin is different from that for conventional insecticides. On the basis of our investigations, the chemical structure of insecticides may be modified using a model structure of cantharidin, to avoid metabolism by metabolic enzymes.

Key words: Cantharidin; *Helicoverpa armigera*; Alkaline phosphatase; Glutathione *S*-transferase