

## Expression of heat shock protein genes during development and after temperature stress in the maize weevil, *Sitophilus zeamais* Motschulsky

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DOI: xx.xxxx/xxx.2014.xxx.xxx.xxx

### Abstract

The maize weevil (*Sitophilus zeamais* Motschulsky) is a major pest of rice and post-harvest grain stocks in tropical countries. Heating and cooling are used extensively to control this pest by causing stress on insects. Since heat shock protein (hsp) genes respond to temperature stress, the aim of this study was to determine whether hsps confer thermotolerance in *S. zeamais*. Temperature-response bioassays were therefore carried out at high and low temperatures. The patterns of three hsps, Szhsp70, Szhsc70 and Szhsp90, at various stages of development of *S. zeamais* and time-dependent expression after heat shock were examined by real time-PCR. The transcriptional levels of Szhsp70 and Szhsp90 increased significantly at the pupal stage while the expression levels of Szhsc70 increased at the larval stage. After heat shock, the expression of Szhsp70 and Szhsp90 in adults increased dramatically to the highest level at 45 min. The expression of Szhsc70 was down-regulated when the adults were heated at 40 °C for 15 to 45 min but the gene was up-regulated at 60 min. The expression level of three Szhsps peaked at 40°C prior to the median lethal temperatures (LT<sub>50</sub>) (45°C). Szhsc70 mRNA was relatively high at all developmental stages and increased only several fold by heat shock. In contrast, Szhsp70 transcripts were present at low levels but strongly induced by heat shock at all stages. Szhsp90 had a high level of expression throughout development and was moderately induced by heat shock. Noteworthy, cold shock induced only Szhsc70 in adults.

Keywords: maize weevil, *Sitophilus zeamais* Motschulsky, heat shock proteins, temperature stress, expression profiles