

**THERMAL STRESS INFLUENCE ON HSP70 GENE  
EXPRESSION AND FEMALE BROODSTOCK  
REPRODUCTIVE PERFORMANCE OF THE GIANT  
FRESHWATER PRAWN *Macrobrachium rosenbergii***

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**MASTER OF SCIENCE**

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## ABSTRACT

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### **THERMAL STRESS INFLUENCE ON HSP70 GENE EXPRESSION AND FEMALE BROODSTOCK REPRODUCTIVE PERFORMANCE OF THE GIANT FRESHWATER PRAWN, *Macrobrachium rosenbergii* (DE MAN, 1879)**

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**February 2017**

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The giant freshwater prawn, *Macrobrachium rosenbergii* is one of the important freshwater cultured species in the world especially in Asian countries due to its high market value. Temperature was found to significantly affect ovarian development, spawning performance, embryonic development and hatching success in crustaceans. Under thermal stress, stress proteins such as Hsp70 are induced and released into the extracellular environment. Hsp70 aids proper folding or refolding and by inhibiting possible damaging interactions or protein aggregations and assist in disassembling already formed protein aggregates thus protecting cells by maintaining the cellular homeostasis. This study was designed to determine the thermal stress influence on Hsp70 gene expression and female reproductive performance of *M. rosenbergii*. Using Hsp70 as biomarker, thermal stress impinges on reproductive organs, the ovary and hepatopancreas were analyzed by determining the expression of Hsp70 mRNA inside the organs. Reproductive performance parameters; reproductive molt duration and frequency, embryonic development and morphometry, incubation period and hatching success of the eggs were determined after the adult inter-molt females were subjected to thermal treatment at 35, 30 and 28 °C (Control). The results demonstrated that the expression of Hsp70 mRNA under thermal treatment of 35 °C after 2 hr recovery in

ovary were significantly high at all time-points (2, 4, 6, 12, 24 hr and 30 days;  $P<0.05$ ) compared to control whereas in hepatopancreas at similar treatment, the expression of Hsp70 mRNA were significantly high starting at 6 hr and continued at 24 hr and 30 days ( $P<0.05$ ). Frequency of reproductive molt at 35 °C showed that the ovary of females failed to develop and only entered common molt along with three consecutive molt cycles. For 30 °C thermal treatment, the expression of Hsp70 mRNA was low at all time-points in both ovary and hepatopancreas except at 2 hr and 6 hr respectively where the expression of Hsp70 mRNA was significantly high after 2 hr recovery ( $P<0.05$ ) but returned to normal afterwards until 30 days' thermal treatment. In this treatment, the embryo underwent rapid development and had significantly higher hatching success compared to control ( $76.03\pm 1.03\%$ ;  $P<0.05$ ). Maternal heat shock for 2 hr at 35 °C were found to give significantly low frequency of reproductive molt ( $53.0\pm 17.0\%$ ;  $P<0.05$ ) and longer duration of ovarian development ( $33.6\pm 1.8$  days;  $P<0.05$ ) and incubation period ( $20.4\pm 1.9$  days;  $P<0.05$ ) whereas maternal heat shock for 2 hr at 30 °C gave low frequency of reproductive molt ( $44.0\pm 7.0\%$ ;  $P<0.05$ ), slow development of embryo (from 0 to 168 hr) and low hatching success ( $40.2\pm 1.9\%$ ;  $P<0.05$ ). This study suggests that short and long term thermal stress at 30 and 35 °C were found to affect the induction of Hsp70 mRNA in the reproductive organs of *M. rosenbergii* and influenced their reproductive performance.