Assessing the effects of elevated temperature on the expression of *hsp70, hsp90, igf1, igf2, gh* and *ghrelin* in Nile tilapia (*Oreochromis niloticus*)

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Roll No: 0123/01

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A thesis submitted in the partial fulfillment of the requirements for the degree of Master of Science in Fish Biology and Biotechnology

Department of Fish Biology and Biotechnology

Faculty of Fisheries

Chattogram Veterinary and Animal Sciences University

Chattogram-4225, Bangladesh

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June 2024

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ABSTRACT

Global climate change significantly influences environmental temperature, affecting fish growth, feeding patterns, and overall health. Understanding how fish respond to thermal changes is crucial, particularly for stress response, metabolism and growth in aquaculture. This study examines the effects of different acclimation temperatures on stress response and growth-related gene expression in Nile tilapia (*Oreochromis niloticus*). The research focused on the expression of heat shock proteins (*hsp70* and *hsp90*), insulin-like growth factors (*igf1* and *igf2*), growth hormone (*gh*) and *ghrelin* in juvenile Nile tilapia (*O. niloticus)* acclimated to 31°C (control), 34°C, and 37°C over 14 days. The results revealed that expression of *hsp70* and *hsp90* were significantly upregulated at 37°C in both male and female fish, indicating a pronounced stress response. In contrast, the expression of *igf1*, *igf2* and *gh* was highest at 34°C, stimulating metabolic processes and promoting somatic growth. In comparison, significantly lower levels were observed at 37°C, suggesting an inhibitory effect of higher temperatures on growth-related processes. Expression of *ghrelin* followed a similar pattern to that of IGF and GH with higher levels at 34°C correlating with increased appetite and growth, but a decreased expression at 37°C, indicating reduced feeding activity due to thermal stress. These findings underscore the critical role of maintaining optimal temperatures in aquaculture settings and provide valuable insights into the physiological mechanisms underlying thermal adaptation in Nile tilapia, with implications for improving aquaculture practices and ensuring the health and productivity of farmed fish under varying environmental conditions.

Keywords: Heat shock proteins (HSPs), Insulin-like growth factors (IGFs), growth hormone, Nile tilapia, thermal stress