

**EFFECTS OF THERMAL STRESS ON PHYSIOLOGICAL RESPONSES IN MALE
RED HYBRID TILAPIA *Oreochromis* sp.**

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**Thesis Submitted in Fulfillment of the Requirement for the
Degree of Master of Science in the School of Fisheries and Aquaculture Sciences
Universiti Malaysia Terengganu**

June 2017

DEDICATION

To Allah SWT who gave me the strength throughout this journey. To my parents and siblings who always shower me with continuous support and endless love.

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

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April 2017

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Effect of thermal stress on some physiological activities were examined in male red hybrid tilapia (*Oreochromis* sp.). The 24h loss of equilibrium temperature (LET₅₀) and lethal temperature (LT₅₀) were preliminarily identified using water temperature regime of 28, 30, 32, 34 and 36 °C, and determined at 31.6 and 33.6 °C, respectively. Fish were then subjected to gradual acclimation at 1°C/8 h from 28 to 31 °C, and exposed for a duration of 1, 7 and 14 days. The effect of sublethal thermal stress on the activities of cortisol, HMG-CoA reductase, osmolality, ionic composition and total protein in plasma; citrate synthase activities in brain, liver and kidney tissues, 11-β hydroxylase activity in testis tissue, as well as oxidative stress responses (lipid peroxidation, superoxide dismutase, catalase, glutathione-S-transferase) in muscle, liver and kidney tissues were investigated. Plasma cortisol was gradually increased from day 1 to day 7, but decreased on day 14. Plasma HMG-CoA reductase and 11-β hydroxylase in testis tissue were also significantly increased ($p < 0.05$) on day 14. Citrate synthase activity in the brain, liver and kidney tissues were significantly decreased ($p < 0.05$) with the

increased duration of exposure. Plasma calcium ion (Ca^{2+}) and osmolality were significantly ($p < 0.05$) increased on day 14. Total plasma protein was significantly decreased ($p < 0.05$) from day 1 to day 14. Results of oxidative stress evaluation showed stress responses increased with exposure time in all tested tissues. Lipid peroxidation activities were significantly increased ($p < 0.05$) in the muscle, kidney and liver tissues on day 14. Superoxide dismutase (SOD) activity in the muscle tissue was decreased gradually while the catalase (CAT) and glutathione-S-transferase (GST) activities increased gradually with the increasing duration of exposure. In conclusion, thermal stress at 31 °C for 14 days has induced stress-related responses in physiological activities in male red hybrid tilapia, *Oreochromis* sp., indicating possible negative effect on physiological performance and fitness, which in turn implicates potential threat of increased global temperature to aquaculture production.