



University of Zabol
Graduate School
Faculty of Sciences
Department of Biology

The Thesis Submitted for the Degree of M.Sc
(in the field of Genetic)

Title

The effect of temperature changes on *HSP90* gene expression in *Spirulina platensis* microalgae

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Abstract:

Today, microalgae with various applications, including medicinal, food and cosmetic applications, have been the focus of researchers around the world. Among commercial microalgae, *Spirulina platensis* has priority because of its high cell growth rate, the ability to grow in alkaline environments and environments with high salt concentration. *Spirulina* contains distinct orange, green, and blue natural pigments, respectively carotenoid, chlorophyll, and phycocyanin, which are used in food, cosmetics, and pharmaceutical fields. Cultivation for mass production of spirulina is usually done outdoors, which are often exposed to environmental stresses including temperature changes. One of the most characteristic cellular responses to stress is the production of heat shock proteins (HSP). Among them, *HSP90* is a highly conserved member that is regulated in biological processes as well as environmental stresses. In this study, the level of *HSP90* gene expression as well as the amount of pigment in spirulina under temperature treatments of 30°C (control), 20 and 40°C at time intervals of 0, 3 and 6 hours after the cultivation period were investigated. To check gene expression, Real Time PCR technique and *SDHA* reference gene were used for data normalization. Data analysis was done using SAS software and analysis of variance and average comparison (by Duncan's method) was done using EXCEL and SAS 9.1 software. The results showed that the expression of *HSP90* gene at 40°C after 3 hours had a significant increase compared to the control sample. Also, the highest amount of chlorophyll a (2.65 µg/mL), carotenoid (1.32 µg/mL) and phycocyanin (33.1 µg/mL) was observed at 30°C, and the lowest amount of chlorophyll a (1/73 µg/mL), phycocyanin (10.44 µg/mL) at 40°C and carotenoid (0.94 µg/mL) at 20°C after 6 hours. According to the results of this research, temperature changes applied in time intervals increase the expression of *HSP90* gene and decrease the production of pigments in *Spirulina platensis*.

Keywords: *Spirulina platensis*, *HSP90* gene, temperature, Real Time PCR