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THE COMPOSITION OF BLOOD AND STRESS HORMONE OF RED TILAPIA (Oreochromis sp.) FEED WITH SPIRULINA ENRICHED ARTEMIA

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This project report is submitted in partial fulfillment of the requirement for the Degree of Bachelor of Agriculture (Aquaculture)

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ABSTRACT

Effect of *Spirulina* enriched *Artemia* of the Great Salt Lake strain on the blood composition and cortisol hormone (stress hormone) level of *Oreochromis niloticus* was studied. This experiment was conducted at Institute of Bioscience, University Putra Malaysia for 15 days. The Red tilapia about 14 days old were stocked into different treatment tanks, each tank filled with 11L of dechlorinated aerated tap water and 110 tilapia individuals. There were 4 different treatment tanks, each treatment consisted of 3 replicates. The treatments tested were T1 (unenriched *Artemia*), T2 (*Artemia* enriched with *Spirulina* for 3 hours), T3 (*Artemia* enriched with *Spirulina* for 6 hours) and T4 (*Artemia* enriched with *Spirulina* for 9 hours). The *Artemia* were then frozen before fed to the fish *ad libitum* three times per day. Level of cortisol hormone and blood composition were examined for their initial and final readings. The analyzed water quality parameters were water temperature, dissolved oxygen, pH and ammonia nitrogen rate. The result showed that both unenriched and enriched *Artemia* effected the blood composition and cortisol hormone level. Fish fed with *Artemia* enriched with *Spirulina* for 9 hours gave the highest blood composition reading as well as recording the lowest stress hormone level compared to other treatments.

ABSTRAK

Kesan *Artemia* yang diperkayakan dengan *Spirulina* daripada Tasik Great Salt ke atas komposisi darah dan tahap hormon kortisol (hormone tekanan) pada *Oreochromis niloticus* telah dikaji. Kajian telah dijalankan di Institut Biosains, Universiti Putra Malaysia selama 15 hari. Ikan tilapia merah berumur sekitar 14 hari telah dimasukkan ke dalam tangki rawatan berbeza. Setiap tangki diisi dengan 11 liter air paip yang telah dinyahklorinkan dan 110 ekor ikan tilapia merah. Sebanyak 4 rawatan berbeza telah diuji di mana setiap rawatan mempunyai 3 replikasi. Setiap rawatan telah diuji dengan T1 (*Artemia* yang tidak diperkayakan), T2 (*Artemia* yang diperkayakan dengan spirulina selama 3 jam), T3 (*Artemia* yang diperkayakan dengan spirulina selama 6 jam) dan T4 (*Artemia* yang diperkayakan dengan spirulina selama 9 jam). *Artemia* kemudian dibekukan sebelum diberikan kepada tilapia merah secukupnya sebanyak 3 kali sehari. Tahap hormon kortisol dan komposisi darah telah diperiksa bacaan untuk awal dan akhir eksperimen. Parameter kualiti air yang telah dianalisis adalah suhu air, oksigen terlarut (DO), pH dan kandungan ammonia-nitrogen. Keputusan menunjukkan artemia yang tidak diperkayakan dan artemia yang diperkayakan telah memberi kesan kepada komposisi darah dan tahap hormon kortisol. Pada akhir kajian, ikan yang telah diberi makan dengan rawatan T4 (*Artemia* yang diperkayakan dengan spirulina selama 9 jam) memberikan peningkatan tinggi kepada bacaan komposisi darah begitu juga telah merekodkan hormon tekanan paling rendah jika dibandingkan ikan yang telah diberi makan dengan rawatan T1,T2 dan T3.

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LIST OF ABBREVIATION

T1, T2, T3, T4	Treatment 1,2,3,4
°C	Degree Celsius
ANOVA	Analysis of variance
SD	Standard deviation
mg	milligram
ppt	part per thousand
kg	kilogram
g	gram
µm	micrometer
mm	millimetre
mg/l	milligram per little
DO	dissolved oxygen
NH^3-N	ammonia nitrogen
pH	measure of acidity or basicity of a solution
Ca^+	Calcium
Na^+	Sodium
Cl^-	Chloride
K^+	Pottasium

CHAPTER 1

INTRODUCTION

Fish is a very beneficial food for human consumption. Due to its high protein content, fish is commonly consumed all over the world. At this age, most food fish have been cultured and commercialized. Culturing of fish and other aquatic organisms in fully or partially controlled environment is called aquaculture. Aquaculture can be carried out in tanks, cages and ponds. Whatever ways the fish is cultured by, the reared fish will sometimes face stressful conditions. Physiological stress is one of the primary contributing factors of fish disease and mortality in aquaculture. Under natural conditions, fish often experience brief periods of stress, bringing about a temporary disturbance of homeostasis (Van Weerd and Komen, 1998). Being under this situation, cultured fish stress hormone could be affected. Hence, there would be fluctuation in stress hormone level in the fish body.

Stress hormone involved is cortisol. According to Pickering and Pottinger (1989), stress in fish is monitored by levels of plasma cortisol, a general indicator of stressful conditions in vertebrates, and its release into the circulation is controlled by the hypothalamus – pituitary – inter – renal axis. Known formally as hydrocortisone, cortisol is a steroid hormone which secreted in response to stress. This hormone comes with several effects. For instance, it can increase blood

pressure. If prolonged, it will lead to poor growth and can also cause retardation of cultured fishes especially at fingerlings stage. Due to that, a good fish fingerlings farmer should take prevention steps in order to overcome stress problem on the fish. Steps involved include the preparation of good water quality for fish. Van Weerd et al. (1998) stated that in most fishes, increased cortisol levels coincide with the highest water temperature, longest photoperiod and lowest concentration of testosterone. However, there is also a need in feeding them with high nutritional value of live feed. Because of its high protein content, live feed is widely used in raising fish fingerlings. Example of live feeds are Moina sp, Dapnia sp and *Artemia* sp. Mainly, *artemia* nauplii is used as the start feed for fish larvae worldwide (Ness et.al, 1995). Although feeding *artemia* provides reasonable growth during the initial feeding stage in marine and freshwater fish species in culture, diets based solely on *artemia* throughout the entire live feed period have resulted in a higher degree of abnormalities such as malpigmentation and incomplete eye migration in cultured species of flatfish (Seikai, 1985; Ness et al., 1995; Ness and Lie, 1998).

Most of the live feed organisms can be enriched before given to fish larvae as food. Several methods can be used to enrich these live feeds. For example, Tonheim S.K et al. (2000) conclude that *artemia* can successfully be enriched with free methionine. Besides, enrichment is also done by using highly unsaturated fatty acid (HUFA), n- 3 polyunsaturated fatty acids (PUFA'S) and others (Lemm et. al., 1991). Enriched live feeds comes with high protein content, essential for fish tissue development of fish being cultured because live feeds

nutritional value is highly reliance on the nutrition that is given or what type of nutrition that we wanted to enrich them with . This method is also known as "bioencapsulation". Such "enriched organism" plays important role in rapid development of most fish including tilapia. Tilapia (*Oreochromis sp)* originate from the country of Africa. This species inhabits fresh and brackish waters of Africa. Middle East, Coastal India, Central and South Africa (Chapman, 2009) and also have been transplanted to many countries outside their native range and is now farmed worldwide. Due to their rapid growth and other beneficial characteristics, they are famous as food fish and become one of the major species produced in aquaculture industries in Malaysia.

For the purpose of preventing stress on tilapia, fish should be fed with high nutritional value of daily feed as their diet. This will surely help in lowering the stress hormone level in fish, indicating that the fish is stress free. It is a fact that higher cost is required in production of live feed compared to commercial feed. However, enriched live feed will bring a lot of benefits, mainly help in resistance of fish to stress (Bhavan et al., 2010).

The general objective of this present work is to study the composition of stress hormone in red tilapia fed with enriched *artemia* and the specific objectives are:

1. To study the compositon of stress hormone of tilapia fed with enriched *Artemia.*
2. To study the blood composition of tilapia fed with enriched *Artemia.*

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