



**UNIVERSITI PUTRA MALAYSIA**

***EFFECT OF ENRICHED Artemia ON THE GROWTH  
PERFORMANCE AND SURVIVAL OF RED TILAPIA (Oreochromis  
sp.) LARVAE***

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**EFFECT OF ENRICHED *Artemia* ON THE GROWTH PERFORMANCE AND  
SURVIVAL OF RED TILAPIA (*Oreochromis* sp.) LARVAE**

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**This project report is submitted in partial fulfillment of the requirement for the  
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**DEPARTMENT OF AQUACULTURE  
FACULTY OF AGRICULTURE  
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**CERTIFICATION OF APPROVAL**  
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Signature and official stamp of supervisor

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## ABSTRACT

The effects of live feed (*Artemia*) enrichment on the growth performance and survival rate of Red Tilapia (*Oreochromis* sp.) larvae on the tank were studied. This project was conducted at the Institute of Bioscience, University Putra Malaysia for two weeks. *Oreochromis* sp. about 10 day old were stocked into different treatment tanks, each tank way filled with 10L of dechlorinated aerated tap water and 100 larvae. There were 4 different treatment tanks, each treatment consisted of 3 replicates. The tanks were randomly assigned in completely randomized design (CRD). The different treatments tested were T1 (non- *Artemia* enriched), T2 (*Artemia* enriched with *Spirulina* in 3 hours), T3 (*Artemia* enriched with *Spirulina* in 6 hours) and T4 (*Artemia* enriched with *Spirulina* in 9 hours). The *Artemia* were the frozen before fed to the larvae ad libitum three times per day. The growth performance and survival rate were conducted on 0<sup>th</sup>, 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup> and 14<sup>th</sup>. During the experimental period, water quality parameter such as dissolved oxygen, pH, ammonia and temperature were monitored. The growth performances of larvae *Oreochromis* sp. were determined and the data of their total weight, total lengths were collected till the end of experiment. The result showed that unenriched *Artemia* and enriched *Artemia* the significant different ( $P < 0.05$ ). Futhermore, also at the end of the project, larvae fish fed with T4 (*Artemia* enriched with *Spirulina* in 9 hours) gave a better performance of growth and survival compared to fish fed with treatments T1, T2 and T3.

## ABSTRAK

Kesan pengkayaan makanan hidup (*Artemia*) ke atas prestasi pertumbuhan dan kadar hidup larva tilapia di dalam tangki aquarium telah dikaji. Kajian telah dijalankan di Institut Bio Sains UPM selama dua minggu. *Oreochromis* sp. yang berumur lebih kurang 10 hari dimasukkan ke dalam 12 buah tangki, setiap tangki mengandungi 10 liter air tawar bersama 100 ekor larva ikan tilapia merah. Sebanyak 4 rawatan berbeza yang telah diuji, dengan setiap rawatan mempunyai 3 replikasi. Setiap rawatan disusun reka bentuk secara rawak (Completely randomized design, CRD). Rawatan berbeza telah diuji T1 (*Artemia* yang tidak diperkayakan) T2 (*Artemia* yang telah diperkayakan dengan *Spirulina* selama 3 jam) T3 (*Artemia* yang telah diperkayakan dengan *Spirulina* selama 6 jam) dan T4 (*Artemia* yang telah diperkayakan dengan *Spirulina* selama 9 jam). Semua diet yang telah diuji telah dibekukan sebelum diberikan kepada tilapia sebanyak 3 kali sehari. Prestasi pertumbuhan dan kadar hidup telah dikaji pada hari 0, 3, 6, 9 dan 12. Sepanjang tempoh kajian, kualiti parameter air seperti oksigen terlarut, pH, ammonia dan suhu dipantau. Prestasi pertumbuhan larva *Oreochromis* sp. ditentukan dan data mengenai jumlah berat dan jumlah panjang larva ikan diambil sehingga akhir eksperimen. Keputusan menunjukkan terdapat perbezaan antara *Artemia* yang tidak diperkayakan dan *Artemia* yang diperkayakan ( $P < 0.05$ ). Tambahan itu, diakhir projek juga, larva pemakanan ikan pada T4 (*Artemia* yang diperkayakan dengan *Spirulina* selama 9 jam) menunjukkan kadar pertumbuhan dan kadar hidup yang lebih baik berbanding larva pemakanan ikan pada T1, T2 dan T3.

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## LIST OF ABBREVIATION

%	Percent
°C	Degree Celsius
ANOVA	Analysis of variance
D	Day
DO	Dissolved oxygen
g	Gram
H	Hour
mg/L	milligram per liter
NH <sub>3</sub> - N	Ammonia nitrogen
pH	Potential Hydrogen
Ppt	Part per thousand
T1,T2,T3,T4	Treatment 1 , 2 , 3 ,4
SGR	Specific growth rate
ADG	Average daily growth
cm	Centimeter
sp.	Species
W	Weight
SPSS	Statistical Package for the Social Sciences

## CHAPTER 1

### INTRODUCTION

Live feeds are the main item in the diet of cultured fish larvae and they are of particular importance when rearing marine fish larvae of artificial type.(Govoni J.J *et al.*,1986). Furthermore, a digestive system is in most cases incapable of processing formulated diets in a manner that allows survival and growth performance of the larvae comparable to those fed live feeds. Live feeds are a convenient and often essential food source for the larvae of some cultured species, especially those without a fully developed digestive system.

According by Lubzens *et al.*,(1989) & Sorgeloos *et al.*,(1991),live feed organisms also provide digestive enzymes that breakdown the food ingested by larvae and can be described as naturally encapsulated bags of nutrients. In the freshwater fish culture, *Artemia* nauplii are used as the live feed. The survival was significantly higher in larvae fed live food than in larvae feed the three formulated diets (Wang *et al.*,2005).Among the example of live feed are zooplankton, microalgae, brine shrimp (*Artemia* spp.) and rotifers (*Brachionus plicatilis*), daphnia, copepods and other. The brine shrimp, rotifers has been used most extensively as a live food for rearing of marine and freshwater fishes (Leger *et al.*,1986 & Bengtson *et al.*,1986).

Example live feed such as the rotifer *Brachionus sp.* and the nauplii of the brine shrimp *Artemia* are satisfy both the dimensional and numerical requirements (Lubzens *et al.*,1989 & Sorgeloos *et al.*,1991).The protein content of live feeds is critical factors for the survival and optimal growth of larval finfish and shellfishes (Howell & Tzoumas, 1991).More specifically, nutrition is considered to be one of the most important issues in production of marine or fish larvae (Koven *et al.*, 2001). Live feeds are important and essential for initial feeding of fish larvae because they lead to increased feeding, stimulate the enzyme secretion and result in continuously good growth and survival (Holt *et al.*, 1993).

What is artemia? *Artemia* also known as the Brine shrimp (*Artemia* spp.) is in the phylum Arthropoda, class Crustacea. There *Artemia* spp have been used for decades as a highly palatable and reliable supply of live feed that is indispensable to good nutrition in the larviculture of many fish and shellfish species (Seale, 1933). The brine shrimp *Artemia* is a relatively primitive form of crustacean of the class Branchiopoda. *Artemia* is still the most preferred and reliable live food in rearing fish and crustacean larvae (Dhont *et al.*,1993).

*Artemia* nauplii is well established due to its many advantages such as year round availability as on the shelf cysts , good nutritional value for some fish, and relatively easy improvement through simple enrichment techniques (Leger *et al.*, 1986). The using of zooplankton such as *Artemia* nauplii as live food for fish improved the quality of fish. The diets contain zooplankton improved



significantly growth performance of different fresh water fish species. Moreover, the feed by zooplankton was more to be enough for fry metabolic and suitable growth more than artificial feed. That the using of zooplankton as live food for fry fish species was significantly increased in growth performance.

According by Rocha *et al.*,(2003) microalgae strains are recognized as an excellent source of proteins, carbohydrates, lipids, and vitamins, to be used as food and feed additives *Nanochloropsis* sp. and *Chlorella* sp. are well known source of EPA, an important polyunsaturated fatty acid (Hanhua &Kunsan, 2003). It is a well-known fact that *Spirulina* sp. is responsible for protein (Babadzhanov *et al.*, 2004).

*Spirulina* is considered as rich source of protein, vitamins, minerals, essential amino acids and fatty acids ( $\gamma$ -linolenic acid (GLA) and antioxidant pigments, carotenoids and perform immune modulator function (Belay *et al.*,1993). *Spirulina* has no cellulosic cell wall, and therefore, the entire cell content can be easily digested and absorbed by the organism. Algae contribute to an increase in protein assimilation and feed utilization (Bhavan *et al.*,2010). Belay *et al.*,(1993) reported that supplementation of *Spirulina* resulted in increased food utilization, protein efficiency ratio, carcass quality and growth of cultured organisms.

Thus this study was established to address the following objectives:

1. To study the effect of enriched *Artemia* on the growth performance of *Oreochromis* sp. for four different feeding treatments.
2. To study the effect of enriched *Artemia* on the survival of *Oreochromis* sp. larvae for four different feeding treatments.



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