

# VANAME SHRIMP (*Litopenaeus vannamei*) JUVENILE GROWTH AT REDUCING FEEDING LEVEL IN THE BIOFLOCK CULTURE SYSTEM IN KARAWANG REGENCY, WEST JAVA, INDONESIA

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## Abstract

The aim of the research was to observe vaname shrimp (*Litopenaeus vannamei*) growth at reduced feeding level in the biofloc culture system. Feed residues and metabolites from shrimp farms contain toxic ammonia that can affect water quality and organism growth. However, the existing organisms involved in the biofloc system can change ammonia into a non-toxic nitrite. Biofloc can also be used as vaname shrimp feed. The research was carried out at the Brackish and Sea Water Aquaculture Center hatchery from April to July 2013. The research employed the Completely Randomized Design (CRD) design of experiment, which involved five different feeding level reduction treatments, each of which having a different amount of feed but the same amount of biofloc. The research administered the following treatments: (A) 10% feeding level reduction, (B) 15% feeding level reduction, (C) 20% feeding level reduction, (D) 25% feeding level reduction, and (E) normal feeding level (positive control). Each treatment was repeated three times. The parameter observed was Average Daily Gain (gram/day). Treatments A through E yielded the following results respectively: 0.13; 0.14; 0.19; 0.17 and 0.11. Statistically, the results indicated no significant difference. In other words, reduction of feeding level for vaname shrimp had no effect on Average Daily Gain, and a 20% reduction even yielded the highest result. The water quality parameters observed, namely temperature, pH level, and dissolved oxygen (DO), indicated optimum figures for vaname shrimp rearing.

**Key words:** vaname shrimp, biofloc, reduced feed, ADG, water quality

## INTRODUCTION

The increase in density and amount of feed used to enhance the farming production may result in the accumulation of organic substances around the farming. The accumulation has impact in the form of decrease in the quality of water because of the high content of inorganic nitrogen from metabolism waster (excretion), left-over feed, feces, dead algae, and other organic materials[20]; all of which are excreted to the water in the form of inorganic nitrogen.

The accumulation of in the farming becoming heterotrophic bacterial biomass depends on the ratio of the carbon: nitrogen

or C/N ratio, and the manipulation of the carbon ratio may be conducted by increasing the carbon sources to the farming medium [1] with the ratio 20:1 and C organic in the form of molasses or tapioca flour [7].

The heterotrophic system has the potential to use ammoniac waste in fish farming [6]. The accumulated bacterial community inside the heterotrophic aquaculture system would form flock which can perform as a feed source [4]; bioflock contains high protein level useful as feed source for fish or shrimps [2],[14]. It may also be an immostimulant for fish or shrimps because the heterotrophic bacteria forming a bioflock produce catalase enzyme and dismutase superoxide enzyme [15],[18].

Bioflock is an aggregate composed of flock forming bacteria, filament bacteria, phytoplankton, protozoa, detritus (dead body

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cell), and organic fiber particles rich in cellulose and inorganic particles in the form of hydrate carbonate calcium salt crystals, biopolymer, and polyhydroxyalkanoates (PHA) [2].

The bioflock technology is a farming system based on the principle of inorganic nitrogen assimilation by heterotrophic microbe community in the farming medium which then can be used by the farming organisms as a natural source of food [17]. The conversion of inorganic nitrogen accumulation in the farming to be heterotrophic bacterial biomass depends on the carbon ratio: nitrogen or C/N ratio.

Bioflock can be used as natural feed for shrimps by replacing the synthetic feed for 67% [10]. The vaname shrimps kept in bioflock medium may feed on the flock. Vaname shrimps with the average weight of  $0.18 \pm 0.02$  grams preserved for 75 days with the population of 4 shrimps/liter in a controlled container and fed for 25% less than usual have the highest growth rate for  $0.0526 \pm 0.069$  gram/day [19]. Vaname shrimps PL-13 kept in a bioflock medium and fed 25% less have the highest growth rate for  $0.0149 \pm 0.0003$  gram/day [13]. A 25% reduction yielded the highest vaname shrimp's growth rate [16].

## MATERIAL AND METHOD

This study is conducted at Hatchery of Brackish and sea water Culture Center (Balai Pengembangan Budidaya Air Payau dan Laut/BPBAPL), Karawang District, West Java Province, Indonesia, from April 2013 to July 2013.

### Apparatuses and Materials

Water gallon, fibre basin, blower, heater, aeration hose and stone, pH meter, DO meter, thermometer, scale, fish net, plastic containers, measuring cylinders, plankton net, plankton identification instruments such as microscopes, counting chambers, cover glass, hand counter, pipette, plankton identification classification, Vaname shrimp juvenile stock PL 10 (2000 pieces), MAI commercial probiotic, commercial fish feed, fish trashes, and molasses.

## Research Method

The research method used is experimental with completely randomized design consisting of six treatments and three repetitions.

Treatment A : feed given at default level (control).

Treatment B : feed reduced by 5% of default level.

Treatment C : feed reduced by 10% of default level.

Treatment D : feed reduced by 15% of default level.

Treatment E : feed reduced by 20% of default level.

Treatment F : feed reduced by 25% of default level.

The parameters observed are Average Daily Gain and Feed Conversion Ratio [5].

## RESULTS AND DISCUSSIONS

### Average Daily Gain

The Average Daily Growth (ADG) number of vaname shrimps is one of the indicators of the success of a farming process; the higher the ADG number, the bigger the daily growth in gram/day unit. The results of the research are shown in the following Table 1. Statistically, the ADG number is the same among treatments (0.15% – 0.31%); however, it tends to be higher in the treatment of decreasing feed for 20% which results in 0.31%. The high ADG number is expected to result in high profits. In such business, the faster the growth of the shrimps, the bigger the profits as the production cost becomes lower. To gain the most optimal profit however, it is important to consider the size of the medium, the density of the feeding spread, the farming age, environmental support, and the price of the production.

Naturally, the vaname shrimps have been gone through directed breeding process, and its ADG genetic potential has raised to 0.4-0.5 gram/day. However, in reality, the number is hard to realize because the environment surrounding the medium is not supportive. In 2008, the ADG number was only 0.115 gram/day and in 2012 it was 0.2 gram/day, meaning that the acceleration was

0.01 gram per year. This is because the shrimps' performance is varied depending on the feed, the water quality, density, and the farming management.

The water quality is one of the crucial external factors influencing the growth of the vaname shrimps. Observation on the physical parameters of water quality during the research includes temperature, salinity, pH, and dissolved oxygen (DO), while the

chemistry parameters include ammonia, nitrite, and nitrate. Based on the data table of water quality during the farming (Table 2), it is shown that the average temperature, pH, and DO during the research reach above the optimal condition. This causes faster metabolism process resulting in increasing appetite and growth. Meanwhile, the natural condition in Karawang waters causes less optimal condition of salinity.

Table 1 Average Daily Growth (ADG) of Vaname Shrimp

Treatment (feed reduced)	week (grams)							average
	1	2	3	4	5	6	7	
10%	0.01	0.04	0.14	0.15	0.18	0.23	0.21	0.13
15%	0.01	0.04	0.11	0.19	0.25	0.15	0.26	0.14
20%	0.00	0.05	0.13	0.23	0.20	0.20	0.31	0.19
25%	0.00	0.04	0.10	0.19	0.28	0.13	0.15	0.17
Control	0.01	0.07	0.12	0.11	0.13	0.12	0.22	0.11

Table 2 Water Quality Parameters

Perlakuan Pengurangan	Parameter Fisik			
	Suhu (°C)	Salinitas (ppt)	pH	DO (ppm)
10 %	26 - 29	5 - 10	7 - 8	7
15 %	26 - 29	5 - 10	7 - 8	7
20 %	26 - 29	5 - 10	7 - 8	7
25 %	26 - 29	5 - 10	7 - 8	7
Control	26 - 29	5 - 10	7 - 8	7
Kisaran Optimal	26 - 32*	10 - 35*	7,5 - 8,5*	4 - 8**

notes : <sup>(\*)</sup> Haliman dan Adijaya (2007), <sup>(\*\*)</sup> Purbaya (2011)

## CONCLUSIONS

Content Bioflock consists of the organisms forming the medium, such as *Bacillus .sp*, protozoa, rotifers, and worms which help to maintain the water quality and provide natural food source for the shrimps. This eventually results in the ADG number of 0.31% for the vaname shrimps fed 20% less than usual.

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