Growth response larvae of giant tiger (*Penaeus monodon*) on ethanol extract of Karamunting (*Melastoma malabhatricum*) that mixed in feed

Ahmad Ridwan¹, and Awaludin²

¹School of Life Sciences and Technology, Bandung Institute of Technology, Bandung, Indonesia
²Department of Aquaculture, Faculty of Fisheries and Marine Science, Universitas Borneo Tarakan, Tarakan, Indonesia

E-mail: ridwan@sith.itb.ac.id

Abstract. In fact, Karamunting is known to have a high cholesterol content, more specifically, lanosterol based on GCMS test. Lanosterol is the cholesterol that contained in plants, which assumed as a precursor of growth and reproduction hormone for in *Crustacea*. This experiment consists of several steps: (1) Karamunting extraction, (2) GCMS test for Karamunting, (3) Making the feed by mixing the ethanol extract Karamunting for four weeks with concentration variable 0 (control), Variable 1: 1: 5, Variable 2: 1:2, Variable 3: 1:1, Variable 4: 2:1 dan Variable 5: 5 : 1. (4) The measured parameters are water quality, growth in weight, growth in length, survival rate (5) Data analysis. Statistical analysis result of weight growth measurement indicates that ethanol extract of Karamunting give a significant result to the larvae sample (P˂0.05). Statistical analysis result of length growth measurement at the end of the experiment indicates a significant difference between control and each variable (P˂0.05). Statistical analysis result of the survival rate at the end of the experiment indicates that the ethanol extract of Karamunting gives a significant result to the larvae sample (P˂0.05). Based on these results, it can be concluded that the ethanol extract of Karamunting on feed indicated an increase in the molting process the observation in weight and length indicates that the extract can stimulate molting acceleration rate.

1. Introduction

Indonesia, as a maritime country, really depends on the fisheries and aquaculture sector. Aquaculture becomes one of the Indonesian government’s focus to support the nation’s food supply. Besides that, the aquaculture sector has a related role as a microfinance breakthrough in suburban areas, as well as macro-finance components in the export trade market. An example of a promising organism to sustain an aquaculture system is giant tiger shrimp or Asian shrimp (*Penaeus monodon*).

Indonesia is one of the Asian countries which produce most giant tiger shrimps besides India, Thailand, Vietnam, Philippines, and Malaysia [1]. In 2013, China, Thailand, Indonesia, and Mexico experienced a decline in production due to the Early Mortality Syndrome (EMS) outbreak that originally appeared in China in 2009, but production until 2018 continues to increase [2].

This increment is predicted to increase more in the upcoming years. Giant tiger shrimp has a great market opportunity to support nation foreign exchange in the fisheries export sector. But there are
several factors that cause drastic production drops and production failures in Indonesia, such as; diseases, low-quality feed, and environmental factors. However, feed quality has been improved recently; mass production still stagnant due to the higher price cost of the feed.

Giant tiger shrimp growth can be seen through the molting period, which is a process of detachment of old exoskeleton of the shrimp, replaced with new exoskeleton grown. This molting occurs to other crustaceans and invertebrates besides shrimp as well [3]. [4] reports that the hormone-related in the molting process, molting stimulating hormone (MSH), and molting inhibiting hormone (MIH). These two hormones do not become active in the same period; when the shrimp is in the enlargement process, MSH dominates, whereas, on the swarming period, MIH dominates. The molting stage is first determined by changes in physical criteria, then deposition of collagen fibers, carbohydrates, fats, and calcium salts in histology throughout the molting cycle [3]. The molting cycle consists of molt, postmolt, intermolt, and premolt [5].

Several active substances that originate from natural resources in plants can be utilized to increase shrimp growth. These can be beneficial in terms of low-cost feed supplements when applied environmentally friendly. One example is Karamunting, which is a plant containing numerous secondary metabolites like saponins, tannins, and steroids. Steroid is a growth hormone used in shrimp growth. From GCMS analysis, it is shown that Karamunting extract contains high levels of α-cytosterol in the ethanol phase and β-amyrin in the hexane phase [6].

Molting stimulant of mangrove crab make uses of phytoexdisteroid, a steroid substance in spinach extract, which is proven to increase molting rate in the organism [6]. Spinach extract injection shows to not causing death but stimulate molting significantly than the control sample [6]. As in line with mangrove crab study, the molting period in giant tiger shrimp is expected to be stimulated as well. Current methods to stimulate molting usually achieved through genetic modification, [7] reports that ethanol extracts from Karamunting through dipping method can increase giant tiger shrimp growth. Based on the current progress, more study is needed to further evaluate Karamunting extract role in increasing giant tiger shrimp growth included in feed products.

2. Materials and Methods

2.1. Samples and test materials

Samples used were giant tiger prawn (postlarvae) PL12 from Tarakan and ethanol extract of Karamunting.

2.2. Experiment

There were six variables used in this experiment based on the extract concentration or dosage with five repetitions for each variable. Control; V1: 1:5; V2: 1:2; V3: 1:1; V4: 2:1; and V5: 5:1. The ethanol extract of Karamunting was added by the dipping method for a month. The water for cultivation was filtered before usage using a sand filter with 31 – 32 ppt salinity, 27 – 29°C temperature, DO 6.01, and pH 7.6. The samples were feed with pellets, 5% of their body weight, three times a day.

2.3. Measured parameters

In this experiment, the parameters that were being measured are the chemical content of Karamunting, the growth of giant tiger prawn larvae in weight, length, and survival rate. The chemical content measurement of Karamunting was done by the GCMS method.

2.4. Data Analysis

Data obtained are analyzed statistically using One-way ANOVA to determine the significance of mean differences between variables with a 95% confidence level. The data analyzed using SPSS 16.0 software.

3. Results and Discussion

3.1. Effect of Karamunting extract in ethanol towards biomass growth
Biomass growth of giant tiger shrimp in this study is conducted to compare shrimp growth between treatments of groups with Karamunting extracts supplemented in feed and control. Based on Figure 1, average shrimp weights at the end of culture period are the following: Control 0.0049±0.0001 g, V1 0.0166±0.0010 g, V2 0.0166±0.0042 g, V3 0.0161±0.0015 g, V4 0.0205±0.0120 g and V5 0.0183±0.0041 g. Statistical analysis shows that Karamunting ethanol extract effect towards giant tiger shrimp growth at the end of the culture period increased significantly compared to control. (p<0.05). This is in line with previous research by [7], which states that ethanol extracts from Karamunting through the dipping method can increase giant tiger shrimp growth. [8] reported that Karamunting ethanol extract contained high α lanosterol and β amyrin. [9] reported that Karamunting plants contained cytosterol α and β amyrin from hexane fraction. Lanosterol is cholesterol in plants, where this compound serves as a raw material for shrimp reproduction.

Figure 1. The average weight of giant tiger prawn’s larvae treatment with ethanol extract of Karamunting

3.2. Effect of Karamunting extract in ethanol towards giant tiger shrimp body length
Body length elongation is one indicator that supports giant tiger shrimp growth. It is also measured in this study to compare shrimp growth between treatments of groups with Karamunting extracts supplemented in feed and control. Based on Figure 2, average shrimp weights at the end of culture period are the following: Control 0.864±0.045 cm, V1 1.472±0.106 cm, V2 1.496±0.099 cm, V3 1.408±0.098 cm, V4 1.488±0.092 cm and V5 1.480±0.112 cm. Statistical analysis shows that Karamunting ethanol extract effect towards giant tiger shrimp growth at the end of the culture period increased significantly compared to control (p<0.05). this is presumed by the presence of cholesterol in Karamunting ethanol extract. [10] state that cholesterol is a typical lipid that is synthesized de novo by crustaceans, cholesterol is assumed to be an essential lipid diet. Cholesterol is a chemical compound needed by crustaceans, but cholesterol cannot be produced naturally in the body of crustaceans but is obtained from the outside, both from food and from the environment. [11] states that cholesterol is needed by crustaceans to fulfill several endocrine functions, namely precursor steroid hormones, growth, gonadogenesis, maturation, and reproduction.
3.3. Effect of Karamunting Extract in Ethanol Towards Giant Tiger Shrimp Survival Rate
Statistical analysis shows that Karamunting ethanol extract effect towards giant tiger shrimp survival rate at the end of the culture period increased significantly compared to control. (p˂0.05). From Figure 3, survival rates of each treatment are as follows; control 37.6±1.7%, V1 73.8±3.2%, V2 71.8±2.6%, V3 64.4±6.1%, V4 47±5.3 % dan V5 48.6±76%.

4. Conclusion
Based on results, Karamunting ethanol extract has a positive effect on biomass growth, elongation, and survival rate.

References
[1] (FAO) F and A O of the U N 2016 Data and Statistics Unit
[2] Anderson B J L, Valderrama D and Jory D E 2020 Global shrimp production review and forecast: Steady growth ahead 5–10
[3] Promwikorn W, Boonyong P and Kirirat P 2005 Histological characterization of cuticular depositions throughout the molting cycle of the black tiger shrimp (Penaeus monodon) Songklanakarin J. Sci. Technol 27 765–72
[4] Huberman A 2000 Shrimp endocrinology. A review *Aquaculture* 191 191–208
[5] Kuballa A and Elizur A 2007 Novel molecular approach to study moulting in crustaceans *Bull. Res. agency japan* 20 53
[6] Fujaya Y and Trijuno D D 2007 Haemolymph ecdysteroid profile of mud crab during molt and reproductive cycles *Torani* 17 415–21
[7] Ridwan A, Awaludin, & Wibowo, I.(2016). Potential Study of Ethanol Extract of Karamuntings (Melastoma malabatrhicum) As Growth Precursor for Larva of Giant Tiger Prawn (Penaeus monodon) By Dipping Method *The 6th Basic Science International Conference*
[8] Ridwan A, Awaludin A and Anggraeni T 2016 Gonadal Maturity Induction using Karamuntings (Melastoma malabatrhicum) Ethanol Extract on White Shrimp Female (Litopenaeus vannamei) *Proceeding International Conference on Global Resource Conservation vol 6*
[9] Nuresti S 2003 Chemical components of Melastoma malabathicum *ACGC Chem Res Commun* 16 28
[10] Kanazawa A, Chim L and Laubier A 1988 Tissue uptake of radioactive cholesterol in the prawn Penaeus japonicus Bate during induced ovarian maturation *Aquat. living Resour.* 1 85–91
[11] Wouters R, Piguave X, Bastidas L, Calderon J and Sorgeloos P 2001 Ovarian maturation and haemolymphatic vitellogenin concentration of Pacific white shrimp Litopenaeus vannamei (Boone) fed increasing levels of total dietary lipids and HUFA *Aquac. Res.* 32 573–82