Research Article

Increasing Growth Tiger Prawn (*Penaeus monodon*) Using Organic Diet of *Sauropus androgynous*

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ABSTRACT

Sauropus androgynous contain chemical compounds that can increase the growth of tiger prawn. This study aims to determine the growth of tiger prawns after giving *S. androgynous* leaves ethanol extract mixed in feed. The research method uses a completely randomized design (CRD) 4 treatments, three replications. Treatment with a dose of Treatment 1 (T1) Control without giving *S. androgynous* extract, Treatment 2 (T2) 5 gr/kg of feed, Treatment 3 (T3) 50 gr/kg of feed, Treatment 4 (T4) 100 gr/kg of feed. Proximate test results of *S. androgynous* extract crude protein content of 10.83%, crude fiber 1.87%, crude fat 0.85%, ash content 1.94%, dry weight 93.62%, and extract material without nitrogen 78.13%. Based on the results of the study, the weight growth and growth length statistically showed significantly different ($P < 0.05$). The highest growth of tiger prawn at the end of the study was found in P4 by giving *S. androgynous* leaf extract with an average weight growth value (70.18 ± 9.57 g). While the lowest weight growth was observed in T1 with an average weight growth value (32.62 ± 7.54 g). The highest length growth was found in T4 with average length (1.19 ± 0.10 cm), while the lowest length growth was seen in T1 with average length growth (0.62 ± 0.09 cm).

Keywords: Diet, Growth, *Penaeus monodon*, Plant Extracts, *Sauropus androgynous*

Introduction

Fisheries production in Indonesia from 2011 to 2016 has increased, consisting of capture fisheries and aquaculture. Total aquaculture production is 17.22 million tons, while capture fisheries production is 6.04 million tons [1]. Prawn farming exports in Indonesia in 2015-2017 amounted to 393 thousand tons [2]. The increase in prawn production is due to several reasons, including pests and diseases that have been controlled, a huge market demand, and the absence of quotas set by the prawn importing countries so that the export opportunity is still huge. At present, the prawn commodities cultivated in Indonesia are vanamei prawn and tiger prawn. Tiger prawn (*Penaeus monodon*) is a leading export commodity in the fisheries sector. But in its development, the production of tiger prawns in Indonesia

experiences various problems, one of which is the price of high protein feed is very expensive so that production costs also increase. The use of high protein can accelerate growth.

Prawn are arthropod animals that have a shell that performs growth by molting. [3] states that the molting stage changes physical criteria, deposition and collagen, carbohydrates, lipids, and calcium salts. Prawn need energy and hormones for the process of molting; the hormone needed is ecdysteroid. The raw material for ecdysteroid formation is cholesterol [4]. Improved feed quality must be met to meet the nutritional requirements for prawn growth. In addition to cholesterol, prawn growth also requires several other nutrients, lipids, protein, and carbohydrates. [5] A research reported that fats added were affected

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the growth significantly. Prawn cannot produce cholesterol and lipids, so they are needed from a feed. One way to increase cholesterol, lipid, protein, and carbohydrate levels in feed is by using natural ingredients, such as *S. androgynous* leaves.

S. androgynous leaves a vegetable plant for breastfeeding mothers because *S. androgynous* plants contain estrogenic sterols, which have a role in increasing milk production [6]. Other research also mentioned that *S. androgynous* plants contain steroids [7]. *S. androgynous* leaves ethanol extract contains fatty acids and sterols [8, 9]. Cholesterol is one of the chemicals that cannot be synthesized by crustaceans [10] but is highly needed for the maturation of ovarian brood stock and growth of tiger prawn [11]. Red spinach extract containing carbohydrates and fatty acids have the potential to shorten the duration of vannamei prawn molting by the soaking method. Cholesterol supplements for *Litopenaeus vannamei* maintained with a plant-based diet can promote growth [12]. *S. androgynous* contains sterol compounds derived from cholesterol, so this research needs to be done to determine the use of organic diets from *S. androgynous* as feeding raw material for tiger prawn growth.

Material and Methods

Sauropus androgynus leaves extraction

Fresh leaves from *S. androgynus* plants were cleaned and dried at 24°C for about seven days. The dried plants were then powdered on size 60 mesh particle material. The powdered plants were extracted using the maceration method with 70% ethanol (Merck, 1 : 3 w/v). The simplicial were blended and soaked with ethanol for 3 – 4 days. The extract was filtered using filter papers Whatman no.1, and the filtrate was concentrated by evaporated using a rotary evaporator (60°C) to separate the extract from the solvent.

Experimental

This study used experimental research using completely randomized design 4 and 3 with the dosage of treatment 1 (control (T1)) without giving *S. androgynous* extract, treatment 2 (T2) 5 g/kg of feed, treatment 3 (T3) 50 g/kg of feed, and treatment 4 (T4) 100 g/kg of feed [9]. Tiger prawns used are postlarva-14 with 50 stock/20 L stocking kept for 30 days. The feed is given in

the form of artificial feed with a dose of 5% of body weight giving frequency three times a day, i.e. (morning, afternoon, and evening). Checking temperature and salinity is done in the morning and evening.

Observation parameters

Proximate analysis

Proximate analysis of *S. androgynous* extract in the science and technology laboratory of the animal husbandry faculty of IPB. 100-gram extract samples were then analyzed dry weight, ash content, crude protein, crude fiber, coarse fat, extract material without nitrogen.

Biological analysis

Diet performance was evaluated by using this formula [13]:

$$\text{Absolute weight growth (g)} = \text{final weight} - \text{initial weight}$$

$$\text{Absolute length growth (cm)} = \text{final length} - \text{initial length}$$

$$\text{Survival rate (\%)} = \frac{\text{number of shrimps alive after treatment}}{\text{number alive in the beginning}} \times 100\%$$

Results and Discussions

Proximate content of *S. androgynous* extract

S. androgynous leaves used in this study were *S. androgynous* extract using ethanol. Proximate tests are performed to determine the nutritional content of the *S. androgynous* extract. The results of the proximate analysis test on *S. androgynous* extract can be seen in Table 1. Others research showed that *S. androgynus* extract has ash content of *S. androgynous* leaf protein obtained (4.8-6.4), crude fat (1.0), crude fiber (1.5), ash content (1.7), and extract content without nitrogen (BETN) scored (26.56) [14, 15].

The primary sources of prawn feed nutrients are protein, carbohydrates, and fat. The protein content of the feed is a critical factor in supporting the success of prawn farming. Protein is a limiting factor for growth and dramatically influences the price of feed [16]. Based on the proximate test results, it suspected that *S. androgynous* extract can be used as raw material for making an organic diet for the growth of tiger prawn.

Growth of tiger prawns by giving *S. androgynous* leaf extract to the feed

The effect of the growth of tiger prawns by giving *S. androgynous* leaf ethanol extract, which was observed, consisted of weight gain and length gain. Growth of tiger prawn (*P. monodon*) using ethanol extract of *S. androgynous* leaves, with different concentrations during 30 days of maintenance, can be seen from Figure 1.

The weight gain of tiger prawns by rearing using feed mixed with *S. androgynous* leaf extract was statistically significant ($P < 0.05$). The highest weight growth was found in T4 by giving *S. androgynous* leaf extract with an average weight growth value (70.18 ± 9.57 g). At the same time, the lowest weight growth was observed in T1 with an average weight growth value (32.62 ± 7.54 g), T2 treatment of average weight growth (56.06 ± 8.89 g) and average weight T3 ($63, 58 \pm 13.88$ g). This is presumably because the addition of protein from *S. androgynous* leaf extract can increase the protein and nutrients of the feed given. Tiger prawn require nutritional elements for its growth. The items are protein, carbohydrates, fats, minerals, and vitamins. Optimal growth of tiger prawn requires protein-containing feed ranging from 35-40%, fat 10-12%, carbohydrate 40%, cholesterol 0.5-1.0% and a few vitamins and minerals with the high nutritional content of feed will increase endurance prawn body so that survival rates are obtained and high crop productivity [17].

The previous study reported that 70% ethanol extract contained sterols [9]. Sterols are cholesterol precursors. Cholesterol is one of the chemicals that cannot be synthesized by crustaceans [10] but is needed for the maturation of ovarian brood stock and growth of tiger prawn. Increased rate of protein synthesis due to stimulation of the molting hormone causes apolysis (physical separation between the epidermis and endocuticles) [18]. So, it is suspected that giving *S. androgynous* extract containing sterols can increase protein synthesis by prawn so that it can increase growth. There are two stages in ecdysteroid biosynthesis, namely the conversion of cholesterol into 5β -diketol and the conversion of 5β -diketol to a secreted product [19]. Ecdysteroid hormones are hormones used in the molting process for the growth of crustaceans. The application to Crustacea animals in accelerating molting

Figure 2. Average length of tiger prawns. T1 (Feed control without the addition of *S. androgynous* leaf extract); T2 (Addition of *S. androgynous* leaf extract 5 gr/kg of feed); T3 (addition of *S. androgynous* leaf extract 50 gr/kg of feed); T4 (addition of *S. androgynous* leaf extract 100 gr/kg of feed). a and b: Significant 135 differences ($p < 0.05$) between means were determined using ANOVA.

like crabs is also widely practiced. The use of natural ingredients extracts from *Nephrolepis biserrata* containing steroids at a dose of 150 mg/L can increase the frequency of molting [20, 21]. Another research reported that steroids in the form of ecdysteroid were able to influence the process of payment, trade and acceleration of crustacean [19].

The increase in the length of tiger prawns by rearing using feed mixed with *S. androgynous* leaf extract was statistically significant ($P < 0.05$) (Figure 2). The highest length growth was found in T4 with average length (1.19 ± 0.10 cm). In comparison, the lowest length growth was observed in T1 with average length growth (0.62 ± 0.09 cm), whereas in growth T2 length with an average length (0.97 ± 0.10 cm), and the average growth at T3 is (1.04 ± 0.09 cm), giving *S. androgynous* leaves ethanol extract to the feed can increase body weight and be accompanied long growth in tiger prawn.

The survival of tiger prawns by giving *S. androgynous* leaf extract to the feed

Survival is a comparison of the number of individuals at the beginning of the maintenance

Figure 3. Average survival rate of tiger prawns. T1 (Feed control without the addition of *S. androgynous* leaf extract); T2 (Addition of *S. androgynous* leaf extract 5 gr/kg of feed); T3 (addition of *S. androgynous* leaf extract 50 gr/kg of feed); T4 (addition of *S. androgynous* leaf extract 100 gr / kg of feed).

period and the number of individuals living at the end of the period with the same population distribution. The survival rate states the percentage of tiger prawn that lived during the maintenance period. The survival rate of using *S. androgynous* leaf extracts mixed in feed for increased growth can be seen in Figure 3.

The survival rate of tiger prawns among treatments was not significantly different ($P > 0.05$). The survival of tiger prawn (*P. monodon*) is cultivated, giving *S. androgynous* leaf extract to feed with a solid 50 individuals/20 L. In the control treatment, the survival rates were T1 (44.66%), T2 (52.66%), T3 (57.33%), and T4 (57.33%). The survival of tiger prawn is highest in T4 and lowest in T1. A study shows that *S. androgynous* plants that contain lanosterol could increase the survival rate of tiger prawns. The number of stable causes low survival value [22].

The ability of shrimps to consume dietary cholesterol and phytosterols such as ergosterol and isitosterol has been demonstrated [23]. Nutritional cholesterol is, therefore, considered essential for high crustacean growth and survival [24]. Cholesterol supplements for *Litopenaeus vannamei* maintained with a plant-based diet do not affect survival but affect growth [12]. *S. androgynous* extract dose used under a dosage of 552.208 mg/L, which is a safe dose for tiger shrimp [9]. The high quality of the water media has been regulated conditions during the experi-

ment. The water temperate ranged from 25.3-30°C; the salinity ranges from 27-30; the pH ranges from 6.14-7.9; and the dissolved oxygen ranged from 5.28-8.43. At the time of the study, the water quality was the optimal condition for the growth of tiger prawns [13].

Conclusion

The giving *S. androgynous* leaf extract as organic diet to tiger prawn can improve the length and weight of tiger prawn. Giving 100 g extract of *S. androgynous* extract per kg feed can improve the weight of prawn until 70.18 ± 9.57 gr and length until 1.19 ± 0.10 cm.

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