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Effectiveness of Moringa (*Moringa oleifera*) Leaf Flour in Feed on Growth and Survival of Vaname Shrimp (*Litopenaeus vannamei*)

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Abstract. Vaname shrimp is Indonesia's leading product in national and international markets. Moringa leaves are a source of vegetable protein that is used as an additional ingredient in vaname shrimp feed. This study aims to determine the effectiveness of moringa leaf meal in feed on the growth and survival of vaname shrimp. This study consisted of four treatments with three replicates each, namely: A (control) without moringa leaf meal, B (added moringa leaf meal by 10%), C (added moringa leaf meal by 15%), and D (added moringa leaf meal by 20%). Vaname shrimp weighing 0.008-0.009 g each were reared in aquariums measuring 40×30×30 cm with a stocking density of 10 shrimp/aquarium. Shrimp were kept for 60 days and fed with moringa leaf meal and without moringa leaf meal. The results showed that the addition of moringa flour in vaname shrimp feed by 20% (treatment D) produced the highest absolute growth of 1.34 g with a specific growth rate of 0.022 g%/day.

***Keywords*:** moringa leaf meal; vaname shrimp; growth; feeding; survival rate

I. INTRODUCTION

Vaname shrimp is one of Indonesia's mainstay export products, accounting for 70% of the world's total production. Vaname shrimp has a high economic value both in the local market and in the international market [1]. Market demand and very high public interest in vaname shrimp can be overcome by accelerating shrimp growth [2]. Proper feeding is one way to accelerate the growth and production of vaname shrimp [3, 4].

Feed is one of the important aspects in aquaculture, which is used as a source of energy for activity, growth, and reproduction. Feed quality is determined by the quality of feed ingredients, especially protein, lipids, carbohydrates, minerals, and vitamins, as well as other essential nutrients [5]. Generally, vegetable protein sources that are often used in feed are soybeans [6]. In addition to its high price, its availability is increasingly limited because its use also competes with human food ingredients [7]. Therefore, there is a need for other alternatives to reduce feed production costs but not reducing the nutritional content of the feed.

Moringa leaves are one of the alternative sources of vegetable protein to replace soybeans [8, 9]. The abundant availability of moringa leaves is one of the considerations to be utilized as a mixture in relatively cheap feed. According to Tekle and Sahu [10], the protein content of dried moringa leaves is 28.44%, fat is 2.47%, carbohydrates are 57.01%, and fiber is 12.63%. Moringa leaves added to fish and shrimp feed can also spur growth and increase fish immunity [11, 12]. Moringa leaves meet these criteria and have been widely researched as a promising alternative protein source in fish and shrimp feed [13-15].

II. METHODS

Time and Place

This research was conducted for 2 (two) months starting from July-August 2023 at the UPT Dryland Laboratory, Nusa Cendana University, Kupang.

Research Tools and Materials

The tools used include aquariums, aerators, refractometers, thermometers, digital scales, pH meters,

stationery, and cameras. The materials used include: moringa flour, commercial feed (PSP), vaname shrimp, and seawater.

Maintenance Container Preparation

The containers used in this study were 12 aquariums measuring 40×30×30 cm, which were washed first to avoid pests and diseases, then dried. Then the aquarium was filled with 10 L of water.

Research Design

The experimental design used in this study was a complete randomized design (CRD) consisting of 4 treatments and 3 replications. The doses used in this study are as follows: Treatment A: control (without the addition of moringa leaf flour (*M. olifera*), treatment B: 10% moringa leaf flour (*M. olifera*), treatment C: 15% moringa leaf flour (*M. oleifera*) and treatment D: 20% moringa leaf flour (*M. oleifera*).

Preparation of test animals

The test animals used in this study were vaname shrimp, 0.08-0.09 g/head, and free of pathogens or specific pathogen free (SPF). Maintenance was carried out for 60 days, with the frequency of feeding three times a day, with a feeding frequency of 5% of the shrimp's body weight.

Preparation of Test Feed

Moringa leaves are collected, then washed and aerated until dry. Next, moringa leaves were pulverized with a flouring machine until they became flour, then sieved using a tea sieve to obtain a fine powder and stored in an airtight container. Moringa leaf flour was added according to the dose of each treatment (10%, 15%, 20%) to the commercial feed, which was weighed first and mixed evenly until homogeneous.

Absolute weight

Measurement of absolute weight growth of individual shrimp is measured using the Effendie formula (1979) in (Setiawati et al., 2013) :

W = Wt-W0

Description:

W: absolute weight of test shrimp (g)

Wt: Shrimp weight at the end of the study (g)

W0: Shrimp weight at the beginning of the study (g)

Specific Growth Rate (SGR)

The daily growth rate was calculated using the formula proposed by Hariati (1989), as follows:

$$SGR = (Wt-W0)/t \times 100\%$$

Description:

SGR: daily growth rate (%)

Wt: weight of shrimp at the end of rearing (g)

w0: weight of shrimp at the beginning of rearing (g)

t: length of maintenance time (days)

Vaname Shrimp Survival

The survival rate of vaname shrimp can be calculated using the formula (Effendie, 1979):

$$SR = (Nt)/N0 \times 100\ \%$$

Description:

SR: Survival (%)

Nt: Final shrimp count (tails)

No: Initial number of shrimp (tails)

Data Analysis

The data obtained will be analyzed using ANOVA with a confidence level of 95% (a = 0.05), and if it has a significant effect, it will be continued with the Duncan test. The water quality data obtained during the study were analyzed descriptively by comparing relevant water quality data.

III. RESULTS AND DISCUSSION

Absolute Growth of Vaname Shrimp

Based on the results of the study, the average absolute growth of vaname shrimp (*L. vannamei*) was obtained as shown in Figure 1.

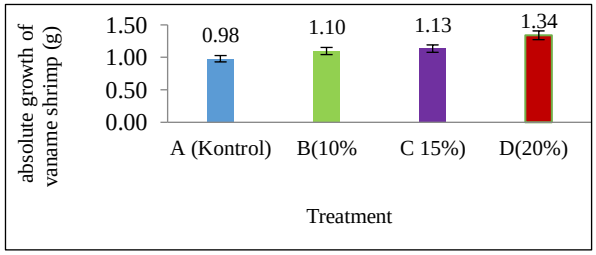

Figure 1. Absolute growth of shrimp (*L. vannamei*)

The absolute growth of vaname shrimp weight was highest in treatment D (20% Moringa leaf meal) at 1.34 g and lowest in treatment A (Control) at 0.98g, with treatment D significantly different from the other treatments. The high absolute growth in treatment D (20%) is thought to be due to the addition of moringa flour in the feed affecting the growth of vaname shrimp. The nutritional content of moringa leaves in the form of protein, calcium, and amino acids is a nutritious supplement for increasing shrimp growth. Puycha et al. (2017) stated that moringa leaves, as a source of plant protein, can be used as a supplement in supporting growth without adversely affecting the digestion of catfish. In addition, the high amino acid content of 44% can improve growth performance (Gopalkrishanan et al., 2016). High calcium content also affects growth (Mahmood et al., 2011).

Specific Growth Rate of Vaname Shrimp

Based on the results of the study, the average specific growth of vaname shrimp is presented in Figure 2.

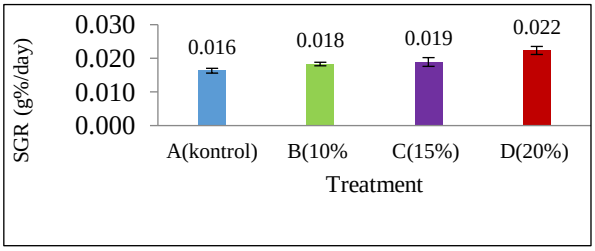

Figure 2. Specific growth rate of vaname shrimp (*L. vannamei*)

In Figure 2, it can be seen that the highest specific growth rate of vaname shrimp is found in the treatment of moringa flour addition of 20% (D) with an average daily growth of 0.022g%/day, while the lowest is in treatment A (control) at 0.016 g%/day. the addition of moringa flour in vaname shrimp feed has a significant effect on treatment D, in contrast to other treatments.

The specific rate value in each treatment does not have a much different value, ranging from 0.016-0.022% / day. This shows that vaname shrimp can utilize the feed well. This is following Erfanto et al. (2013), which states that the growth rate can be accelerated if the feed provided has good nutritional value. Protein is the most influential nutrient to spur the growth of vaname shrimp. Moringa leaf powder per 100 grams contains 27.1 grams of protein (Krisnadi, 2015). In addition to protein, nutrients needed by shrimp are protein, fat, carbohydrates, vitamins, and minerals (Handajani and Widodo, 2010).

Survival of Vaname Shrimp (L. vannamei)

Based on the results of the study obtained the average survival of vaname shrimp is shown in Figure 3.

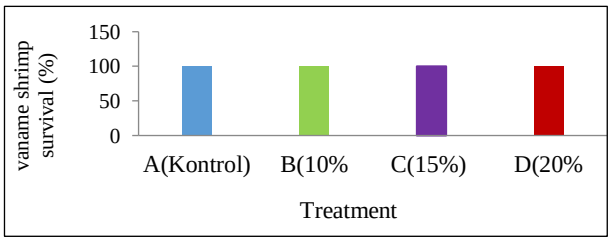

Figure 3. Survival of vaname shrimp (*L. vannamei*).

Based on the results of the study, the survival rate of vaname shrimp was 100% and was included in a very high category. This shows that the research activities were declared successful because of their high survival rate. This is supported by the statement of Renitasari et al. (2021) that the survival value that reaches 80% is included in the high growth category, while the good survival value until the end of cultivation is more than 70%. The survival rate did not show a significant difference between the treatment and without moringa flour treatment. This indicates that the treatment has the same quality as without treatment on the survival of vaname shrimp. In general, feeds with additional moringa flour as much as 10%, 15%, and 20% have the same potential as commercial feed on the survival of vaname shrimp.

In addition, the survival rate was also influenced by the water quality during the study. This is supported by a statement from Tahe and Suwoyo (2011) and Mustafa et al. (2018) that the survival rate is thought to be related to water quality as a maintenance medium, feed, and biota density during maintenance, so that there is no competition for food. The high value of survival in aquaculture activities can be interpreted as a success in these activities (Pamungkas, 2011).

Water Quality

Based on the results of the research, the results of water quality measurements were obtained, as shown in Table 1.

TABLE 1.
WATER QUALITY

Water Quality Parameters	Measurement Results
Temperature (°C)	26-29
Salinity (ppt)	32-35
pH	7.8-7.9

Based on the results of measurements during the study, it shows that water quality is still in the optimum range, so that the survival of vaname shrimp produced reaches 100%. Temperature, pH, and salinity are interrelated and play a role in increasing the metabolic activity of vaname shrimp. However, if the water quality parameters are not in the optimal range, then the shrimp are not able to maximize the energy they get for growth, causing death in vaname shrimp.

IV. CONCLUSION

Based on the results and discussion, it is concluded that the addition of Moringa leaf meal in vaname shrimp feed has an effective effect on the growth and specific growth rate of vaname shrimp, but does not affect the survival of vaname shrimp.

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