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THE EFFECT OF DIFFERENT FEEDING FREQUENCIES ON THE ABSOLUTE GROWTH OF WHITELEG SHRIMP (*Litopenaeus vannamei*) SIZE PL 6 (30 DAYS)

Pengaruh Frekuensi Pemberian Pakan Yang Berbeda Terhadap Pertumbuhan Mutlak Udang Vaname (*Litopenaeus vannamei*) Ukuran PL 6 (30 Hari)

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ABSTRACT

Whiteleg shrimp farming is a significant and leading aquaculture industry in Indonesia. One of the main challenges faced by shrimp farmers is the high cost of feed. Appropriate feeding frequency is crucial to improve feed efficiency, supporting growth, FCR, and survival rates of whiteleg shrimp. This article aims to determine the Effect of Different Feeding Frequencies on the Absolute Growth of Pacific White Shrimp (Litopenaeus vannamei) at the PL 6 stage (30 days old) and their health status, as well as to identify the optimal feeding frequency for achieving peak absolute weight gain and shrimp health. The methodology employed in this study is experimental, with data collected through direct observational methods. The experimental design used is a Completely Randomized Design (CRD) consisting of 4 treatments and 6 replications of varying feeding frequencies: Treatment (A): 3 times per day. Treatment (B): 4 times per day. Treatment (C): 5 times per day. Treatment (D): 6 times per day. The results of this study indicate that the frequency of feeding results in a difference in the growth of vaname shrimp body weight with treatment B with the highest value which will result in profits in vaname shrimp cultivation production.

Keywords: Absolute weight growth, vaname shrimp, feeding frequency

ABSTRAK

Salah satu industri perikanan di bidang budidaya yang cukup besar dan menjadi unggulan di sektor perikanan Indonesia adalah budidaya udang vaname. Salah satu kendala utama dalam budidaya udang yang sering dihadapi petambak adalah biaya pakan yang tinggi. Frekuensi pemberian pakan yang tepat sangat diperlukan untuk meningkatkan efisiensi pakan dalam menunjang pertumbuhan, FCR dan tingkat kelangsungan hidup udang vaname. Artikel ini bertujuan untuk mengetahui Pengaruh Frekuensi Pemberian Pakan yang Berbeda Terhadap Pertumbuhan Mutlak Udang Vaname (*Litopenaeus vannamei*) Ukuran PL 6 (30 Hari) dan kesehatan udang vaname serta untuk mengetahui manakah yang memberikan pertumbuhan berat mutlak yang optimal untuk udang dan kesehatan udang vaname. Metode dalam penelitian ini menggunakan metode eksperimental dengan pengumpulam data yang dilakukan secara obsevatif langsung. Rancangan percobaan yang digunakan dalam penelitian ini berupa Rancang Acak Lengkap (RAL) dengan rancangan percobaan yang digunakan dalam penelitian ini berupa Rancang Acak Lengkap (RAL) dengan 4 perlakuan 6 ulangan frekuensi pemberian pakan yang berbeda yaitu perlakuan (A) 3 kali, Perlakuan (B) 4 kali, perlakuan (C) 5 kali, dan perlakuan (D) 6 kali. Hasil penelitian ini menunjukkan bahwa frekuensi pemberian pakan menghasilkan perbedaan pertumbuhan berat badan udang vaname dengan perlakuan B dengan nilai tertinggi yang akan menghasilkan keuntungan dalam produksi budidaya udang vaname.

Kata kunci: Pertumbuhan berat mutlak, udang vaname, frekuensi pakan

INTRODUCTION

One of the largest aquaculture industries and a leading player in Indonesia's fisheries sector is the cultivation of whiteleg shrimp in ponds. The export volume of whiteleg shrimp (Litopenaeus vannamei) in Indonesia has been increasing annually. According to data from the Central Statistics Agency (2024), the export volume of cultivated shrimp in Indonesia reached 1,240 tons from January to December 2024, compared to 1,990 tons in the same period last year.

According to data from the Directorate General of Aquaculture (2018), whiteleg shrimp farming in Indonesia is dominated by intensive pond farming, accounting for approximately 40%, or 242,000 hectares, of total national shrimp production. According to data from Aprilia et al. (2020), whiteleg shrimp ponds cover 1.2 million hectares, with a production capacity of 352,220 tons in 2007. 75% of the area is managed by traditional farmers and 25% by semi-intensive and intensive farmers operating under corporate ownership.

According to Rahman et al. (2018), one of the main obstacles in shrimp farming that farmers often face is high feed costs. Kontara et al. (2018) stated that the use of commercial feed accounts for approximately 70% of total production costs. Therefore, efforts are needed to reduce feed costs while maintaining optimal growth and producing a low FCR by regulating the frequency of feeding to avoid overfeeding or underfeeding. Furthermore, overfeeding can negatively impact shrimp and the environment (Nababan et al., 2015). This is reinforced by Ulum et al. (2020), who stated that one application of feeding management is regulating the frequency of daily feeding.

Appropriate feeding frequency is essential to increase feed efficiency in supporting growth, FCR, and the survival rate of aquatic organisms (Fitra et al., 2022). According to Zainuddin et al. (2018), post-larval shrimp are fed 8-12 times per day (every 2-3 hours). As shrimp grow and the length of their pond stay increases, feeding frequency can be reduced, generally reaching a maximum of six times per day. Feeding frequency increases to three to five times per day for 1-15 days (Shilman and Tarno, 2019).

Based on this description, research is needed to investigate the effect of different feeding frequencies on the absolute growth of PL 6 whiteleg shrimp (Litopenaeus vannamei) (30 days).

Determining feeding frequency is a major challenge faced by shrimp farmers, as errors in determining feeding frequency can increase production costs due to uneaten feed and shrimp underfeeding or overfeeding. Therefore, this study was conducted to determine the effect of different feeding frequencies on the absolute growth of PL 6 whiteleg shrimp over 30 days and to determine the feeding frequency that produces optimal growth. This research is expected to provide useful information for shrimp farmers and the general public regarding feed management for PL 6 whiteleg shrimp and serve as a basis for further research. The hypothesis proposed in this study is that different feeding frequencies do not affect the absolute growth of PL 6 size vaname shrimp for 30 days (H0), while the alternative hypothesis states that different feeding frequencies affect the absolute growth of PL 6 size vaname shrimp for 30 days (H1).

RESEARCH METHODS

This research was conducted from October 19, 2025, to February 6, 2026, at the shrimp pond of CV. Suma Marina Probolinggo. The test animals used were whiteleg shrimp (Litopenaeus vannamei) aged DOC 1–30 with an initial weight of approximately 0.004 g in the PL 6 phase, reaching ±2 g at DOC 30. The shrimp were obtained from the CV. Suma Marina Probolinggo pond with a total of 80 shrimp per green net cage, using different feeding frequency treatments, so that a total of 1,920 shrimp were used in this study. The feed used was commercial SGH C1 (crumble) feed with nutritional content including 36% protein, 7% fat, 3% crude fiber, 12% ash, and 11% moisture content.

The research container consisted of a 3,364 m² HDPE-lined pond, divided into 24 16 m² green net cages with a height of 1.4 m to separate the samples. The rearing medium used was a mixture of seawater and borewater, pretreated to achieve optimal water quality. The research materials consisted of whiteleg shrimp and SGH C1 (crumble) feed. The equipment used included stationery, a water wheel, sample bags, a DO meter, a camera, a digital scale, a pH meter, a scoop, a bucket, a 2-inch diameter hose, netting, and.

The method used was an experimental method, with data collection conducted through direct observation. The experimental design used in this study was a Completely Randomized Design (CRD) with four different feeding frequency treatments:

A : Feeding frequency is 3 times (06.00; 13.30; 21.00)
B : Feeding frequency is 4 times (06.00; 11.00; 16.00; 21.00)
C : Feeding frequency is 5 times (06.00; 10.00; 14.00; 18.00, 21.00)
D : Feeding frequency is 6 times (06.00; 09.00; 12.00; 15.00, 18.00, 21.00)

According to Kusriningrum (2012), the determination of the number of repetitions is by using the formula:

$n = (t - 1)(n - 1) \geq 15$

Description:

t: treatment and: repetition then:

$(t – 1)(n - 1) \geq 15$
$(4 – 1)(n - 1) \geq 15$
$3(n – 1) \geq 15$
$3n - 3 \geq 15$
$3n \geq 15 + 3$
$3n \geq 18$
$n \geq 6$

From the formula above, it can be concluded that 6 replications were used. Furthermore, to avoid bias in this experiment, a randomized design was created using a random table, a lottery, or a computerized lottery system (Susilawati M, 2015). A more detailed explanation of the research layout is shown in Figure 1 below.

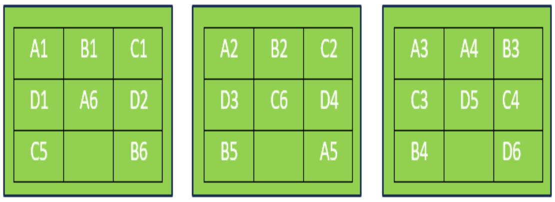

Figure 3.1 Research layout

After the research was completed, the collected data was then analyzed to determine whether there was a response or not of the independent variable to the dependent variable (difference in feeding frequency on the absolute weight of whiteleg shrimp), then an analysis of variance was carried out by comparing the significance value of the F% test. How to compare the significance value of the 5% F test and also the 1% F significance test with the following provisions:

a) If the calculated F > F table 1% then there is a very real difference (very significant).
b) If the calculated F > F table 5%, then there is a real (significant) difference between the treatments.).
c) If the calculated F < F table (usually 5% and 1%) then there is no difference between the treatments (not significant).

Based on the ANOVA results, if the treatments show significant or very significant differences, then the Least Significant Difference (LSD) test can be continued with the following formula: 1. If the calculated F value is <5%, then H0 is accepted, while H1 is rejected, and the treatment is declared to have no significant effect. The LSD test is not continued.

If the calculated F value is 1% > calculated F value > 5%, then H1 is accepted and H0 is rejected, indicating a significant effect of the treatment. 3. If the calculated F value is > 1%, then H0 is rejected, while H1 is accepted, indicating a very significant or very significant effect of the treatment.

The research preparation stage begins with the preparation of the rearing container, namely a pond plot that is washed with seawater and scrubbed until clean. Next, the pond is filled with water that has been collected in a reservoir to a height of 135 cm, in accordance with the ideal range for whiteleg shrimp stocking, which is 120–140 cm. After filling the water, a water wheel was installed to ensure optimal oxygen supply, and sterilization and water conditioning treatments were used to create a stable rearing environment. The test feed was prepared using commercial feed, weighed at a dosage of 2 kg per 100,000 shrimp biomass. Therefore, 2 grams of feed was used for 80 shrimp, with subsequent adjustments using a blind feeding method of 0.20. Feed was weighed daily and adjusted to accommodate different feeding frequencies. The feed was then stored in a safe and easily accessible location.

The next stage was acclimatization and initial weighing of the test animals. Acclimatization lasted 10–20 minutes to acclimate the whiteleg shrimp from their previous environment to the research environment and minimize stress caused by temperature and salinity differences. After acclimatization, the initial shrimp weight (Wo) was measured to determine their initial weight before treatment and to determine the amount of feed during the study. The implementation phase began with the stocking of 80 whiteleg shrimp per cage in one plot. Feeding is done manually by mixing a little water into the feed so that it is not carried away by the wind, and is given according to the specified treatment frequency.

During the study, water quality management was carried out by changing the water every three days with a volume of 10–20% per plot to maintain optimal environmental conditions, as well as siphoning when the water clarity is thick or plankton increases. Water quality observations included temperature, pH, and dissolved oxygen measured using a thermometer, pH meter, and DO meter, then the data were recorded and averaged at the end of the study. At the end of the maintenance period, the absolute weight growth of whiteleg shrimp was measured by weighing the total biomass weight in each cage to obtain the final weight (Wt), which was then calculated based on the difference between the final weight and the initial weight (Wt – Wo).

RESULT AND DISCUSSION

Absolute Weight Growth of Vaname Shrimp

Based on the research results, the average absolute weight was obtained for each different treatment, the average initial weight, the average final weight, and the absolute weight gain of the whiteleg shrimp. The range, average, and standard deviation values for the effect of feeding frequency on whiteleg shrimp in each treatment and replication are presented in Table 4.1 below.

Table 1. Range, mean and standard deviation of absolute weight growth of whiteleg shrimp for each treatment

Treatment	Absolute weight (g)	Average (g)	StDev
A	0,04-0,07	0,05	0,01
B	0,04-0,10	0,07	0,02
C	0,04-0,07	0,06	0,01
D	0,04-0,07	0,06	0,01

Based on Table 1, it can be explained that treatment B showed the highest average absolute weight growth of whiteleg shrimp. Furthermore, treatments C, D, and A experienced the same average decline. Based on the results of statistical tests, treatment B differed and had a higher average growth rate, but not significantly, compared to treatments A, C, and D. Furthermore, treatment A had the lowest growth rate, while treatments C and D had the same but not significantly. For a more detailed graphical image of the absolute weight growth of whiteleg shrimp during the 30-day study, see Figure 1 below.

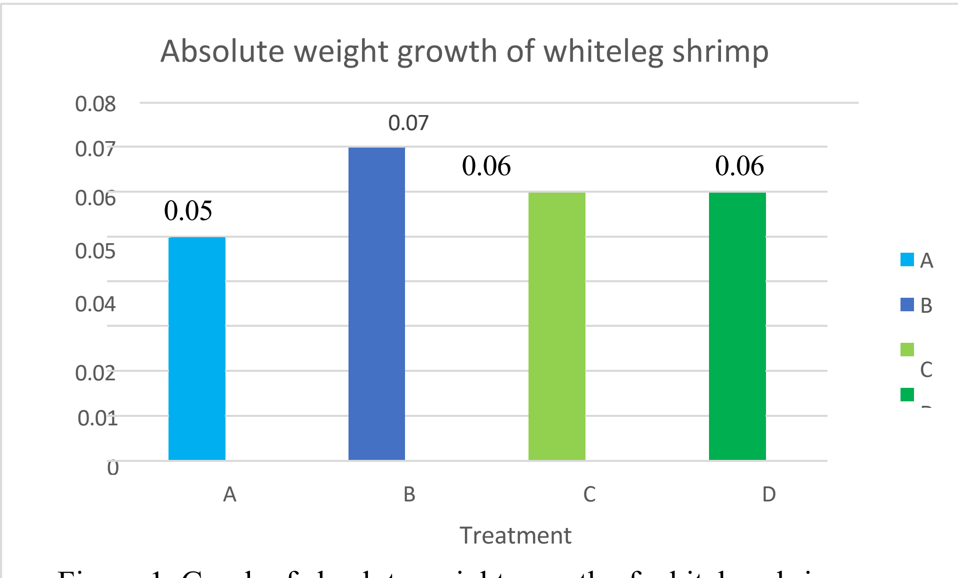

Figure 1. Graph of absolute weight growth of whiteleg shrimp

To determine whether there is a real difference between treatments, an ANOVA test was carried out and the results are presented in Table 4.2 below.

Table 2. Results of the ANOVA test (F test) of the effect of feeding frequency on the absolute weight growth of vaname shrimp.

Sources of Diversity	db	JK	KT (Mean Square)	F-Count	F-Table 5%	F-Table 1%
Treatment	3	0,00103	0,00034	2,05	3,10	4,94
Error	20	0,00337	0,00017			
Total	23	0,00440				

Based on the 5% and 1% ANOVA tests, it can be explained that the frequency of commercial feeding has no real or insignificant effect on the absolute weight growth of whiteleg shrimp aged 6-30 days. Furthermore, because it is not significant, there is no need to conduct a BNT test because the calculated F value <5% table, so H0 is accepted, while H1 is rejected and it is stated that the treatment has no real effect and is not continued with the BNT test.

Water Quality

Temperature

Based on the research results, the water temperature in each treatment on the absolute weight growth of whiteleg shrimp did not have a significant effect on the average value range and ANOVA test. The range of values, averages, and standard deviations of water temperature levels on the absolute weight growth of whiteleg shrimp in each treatment and replication are presented in Table 4.3 below.

Table 4.3 Range, mean and standard deviation of vaname shrimp temperature for each treatment

Treatment	Temperature (oC)	Average (oC)	StDev
A	27-30	28,7	1,00
B	27-30	28,7	0,99
C	27-30	28,6	1,01
D	27-30	28,7	1,00

Based on Table 4.3 above, a relatively similar temperature of 27–30 ºC is still considered normal for whiteleg shrimp. Furthermore, to determine any significant differences between water temperatures in each treatment, an ANOVA test was conducted.

pH

Based on the research results, the water pH in each treatment did not have a significant effect on the absolute weight growth of whiteleg shrimp from the average value range and ANOVA test. The range of values, averages, and standard deviations of water pH levels on the absolute weight growth of whiteleg shrimp in each treatment and replication are presented in Table 4.4 below.

Table 4.4 Range, mean and standard deviation of pH of vaname shrimp for each treatment

Treatment	pH	Average	StDev
A	7,8-8,4	8,1	0,19
B	7,8-8,5	8,1	0,25
C	7,9-8,5	8,1	0,25
D	7,8-8,5	8,1	0,23

Based on Table 4.4 above, a relatively similar pH ranging from 7.8 to 8.5 is still considered normal for whiteleg shrimp. Furthermore, to determine any significant differences between water temperatures in each treatment, an ANOVA test was conducted.

Dissolved Oxygen

Based on the results of the research, dissolved oxygen in water in each treatment on the absolute weight growth of whiteleg shrimp did not have a significant effect on the average value range and ANOVA test. The range of values, averages, and standard deviations of water temperature levels on the absolute weight growth of whiteleg shrimp in each treatment and replication are presented in Table 4.5 below.

Table 4.5 Range, mean and standard deviation of dissolved oxygen of vaname shrimp for each treatment

Treatment	Dissolved oxygen (ppm)	Average (ppm)	StDev
A	4,0-5,9	4,9	0,7
B	4,0-5,9	4,9	0,7
C	4,0-5,9	4,9	0,7
D	4,0-5,9	4,9	0,7

CONCLUSION

Based on the results of research on the effect of different feeding frequencies on the absolute growth of whiteleg shrimp (Litopenaeus vannamei) size PL 6 for 30 days, it can be concluded that differences in feeding frequencies do not have a significant effect on the absolute weight growth of whiteleg shrimp. However, treatment B with a feeding frequency of four times showed the highest average growth value of 0.07 grams, while treatment A with a feeding frequency of three times produced the lowest average growth value of 0.05 grams. During the research, water quality was within the optimal range for whiteleg shrimp growth, with temperatures ranging between 27–30 °C, pH between 7.8–8.4, and dissolved oxygen levels between 4.0–5.9 ppm.

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